

331 Shady Ridge Drive
Monroeville, PA 15146

July 6, 2018

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JUL -6 2018

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

Via Paper Filing

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
400 North Street
Harrisburg, Pennsylvania 17120

RE: **Michele Hriadil and Francis Hriadil v. Duquesne Light Company**
Docket No. C-2016-2571726

Dear Secretary Chiavetta:

Attached please find a copy of Complainants

Response to Respondent's Motion for Summary Judgment

A copy of this document has been served upon Judge Jeffrey Watson, the presiding PA PUC ALJ, and the Respondent's Counsel, Jeremy V Farrell, Esquire, in accordance with Commission regulations.

Please feel free to contact me if you have any questions.

Sincerely,



Francis Hriadil
Complainant
(412) 779-3314
hriadil@attglobal.net

Enclosure

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

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JUL - 6 2018

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

Michele Hriadil and
Francis Hriadil,

Complainant,

vs.

DUQUESNE LIGHT COMPANY,

Respondent.

No: C-2016-2571726

RESPONSE TO
MOTION FOR SUMMARY JUDGMENT

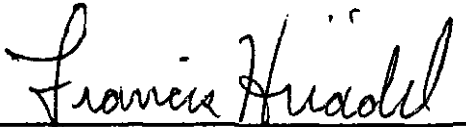
Filed by Michele and Francis Hriadil

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RESPONSE TO MOTION FOR SUMMARY JUDGMENT

TO: THE HONORABLE ALJ JEFFREY A. WATSON

ENCLOSED IS COMPLAINANTS RESPONSE TO RESPONDENTS MOTION FOR
SUMMARY JUDGMENT


Francis Hriadil
July 6, 2018

No: C-2016-2571726

2. Introduction

The Complainants have filed a multitude of material facts, composed of numerous exhibits and supporting documents, with its prior filings to the Commission.

These filings include, but are not limited to:

- Complainant's Formal Complaint, filed and dated October 1, 2016
- Complainant's Response to Respondent's Preliminary Objections to Formal Complaint, filed and dated November 29, 2016
- Complainant's Response Addendum to Respondent's Corrected Preliminary Objections to Formal Complaint, filed and dated December 19, 2016
- Complainant's Response to Respondent's Answer and New Matter to Formal Complaint, filed and dated January 9, 2017, in which Complainants filed a Motion for Summary Judgment against the Respondent and in our behalf.
- Complainant's Response to Respondent's Answer in Opposition to Complainant's Motion for Summary Judgment, file and dated January 20, 2017
- Complainant's Correction to Pulse Transmission Table in Complainant's Response to Respondent's Answer and New Matter to Formal Complaint, filed and dated January 24, 2017.
- Complainant's Notice to Plead New Matter, filed and dated January 24, 2017, in which Complainants filed a Motion for Summary Judgment against the Respondent and in our behalf, and to which the Respondent specifically failed to respond, stating it was not required to respond.
- Complainant's Notice to Plead New Matter #2, filed and dated January 27, 2017, in which Complainants filed a Motion for Summary Judgment against the Respondent and in our behalf, and to which the Respondent specifically failed to respond, stating it was not required to respond.
- Complainant's Notice to Plead New Matter #3, filed and dated February 3, 2017, to which the Respondent failed to respond.
- Complainant's Notice to Plead New Matter #4, filed and dated February 14, 2017, in which Complainants filed a Motion for Summary Judgment against the Respondent and in our behalf, and to which the Respondent failed to respond.

Furthermore, as part of Discovery, Complainants served the Respondent with numerous detailed and official records, reports, testimonies, policy statements, etc. from various recognized institutions, organizations, government and non-government agencies, hearings, etc. that were all fully reviewed, vetted, sourced, and referenced by the Complainants.

These included:

- no less than 77 documents concerning detrimental health and medical issues related to prolonged exposure to RF and ELF radiation such as that emitted by Smart Meters, such as those being deployed by the Respondent.
- no less than 52 documents concerning reliability, safety, or quality problems, etc., related to Smart Meters in general and the SK9AMI7 being deployed by the Respondent
- no less than 10 documents related to state and federal legislation
- no less than 2 documents related to installation issues
- no less than 14 documents related to other related issues

And, they go well beyond what was already submitted to the Commission, in terms of detail, depth, and comprehensiveness.

In its Motion for Summary Judgment, the Respondent flippantly characterizes all of this material as “no evidence.” Complainants respectfully submit, that taken in total, or even in part, these documents, reports, testimonies, transcripts, etc. represent a substantive accumulation of relevant knowledge and foundational facts, including much of the latest findings, and as such represents an overwhelming body of credible evidence in support of Complainants Formal Complaint.

Complainants will address the specific sections of the Respondent’s Motion for Summary Judgment in the following.

3. Respondent’s Motion for Summary Judgment:

II. STATEMENT OF THE CASE (pages 8 - 9 of Respondent’s Motion):

E. Complainants have not offered any medical evidence that they will suffer any adverse health effects if Duquesne Light installs a smart meter at their property.

IV. LAW & ARGUMENT (pages 19 - 20 of Respondent’s Motion)

D. Complainants have offered no medical evidence demonstrating that the installation of a smart meter at their home will cause them to suffer adverse health effects.

Complainants Response:

Both Complainants, Michele Hriadil and Francis Hriadil are elderly. Complainant Francis

Hriadil is 66 years old and retired. Complainant Michele Hriadil is in her early 60s and still working full time. In Discovery, Complainant Francis Hriadil provided hospital medical records to the Respondent sufficiently and irrefutably establishing the musculoskeletal and digestive chronic conditions that he is currently living with. Complainant Michele Hriadil is generally in good health, and desires to stay that way. There is also a family history of certain chronic conditions which are relevant.

The Complainants contacted a number of nationally and internationally recognized experts on the health implications of exposure to RF and ELF radiation from such devices as the Smart Meter being deployed by the Respondent. These experts included but were not limited to: **[Exhibit 01 - Curriculum Vitae's, etc.]**

- Ronald M Powell, PHD (retired)
- Samuel P Milham, MD, MPH (retired)
Author of the book, "Dirty Electricity: Electrification and the Diseases of Civilization" [<https://www.amazon.com/Dirty-Electricity-Electrification-Diseases-Civilization/dp/193890818X>]
- Martin L. Pall, PHD
- Andrew A Marino, MD, JD
- David O Carpenter, MD

These experts were contacted and informed of the specific circumstances of the Complainants, our ages, physical conditions, and living environment, and they were asked for their recommendations concerning the deployment of the Respondent's Smart Meter in a Smart Mesh on our residence, etc. To a person, these experts urged Complainant's to seek to prevent such installation. They provided the Complainants with documentation, testimonies, studies, analyses, etc. all substantiating the detrimental effects that long term exposure to the RF radiation and induced ELF radiation created by Smart Meters, such as those being deployed by the Respondent.

These experts explained that human beings are electrical beings. Our bodies possess a biological electrical grid which is the nervous system. Every cell in the human body

has an electric field. And, there are trillions of electrical connections in the human body grid. Every function in the human body depends on the body's natural, internal electrical signals. The human body is also a human receiving antenna. Its cells cannot stop receiving the signals coming from a Smart Meter, etc. Its cells are disturbed by these signals. And, its cells are not compatible with these signals. Any electrical disruption and failure that the human body suffers at the cellular level leads to disease processes.

Dr. Ronald Powell, PHD Harvard University, a distinguished, retired U.S. Government scientist in Applied Physics who worked for the Executive Office of the President (EOP), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST), testified before the Maryland General Assembly on December 4, 2014. He published the content of his testimony in his document entitled, "A Message to the Maryland General Assembly on the Danger of Smart Meters" by Ronald Powell Phd". This report was supplied as Supporting Document 06 with Complainants Formal Complaint to the PA PUC.

[Exhibit 02]

In his expert testimony, Dr. Powell detailed the specific health problems that have already been linked with the RF radiation given off by these Smart Meters, with specific reference to 3 wide ranging reviews of the findings that have been published by the international biomedical research community, namely "The BioInitiative 2012 Report", "Health Effects of RF -- Research Review" (at the FCC), and "Electromagnetic Sensitivity and Electromagnetic Hypersensitivity: A Summary". Briefly,

(1) The most massive review is the 1479-page BioInitiative 2012 Report, published in December 2012, which considered about 1800 biomedical research publications issued in the last five years. The BioInitiative 2012 Report was prepared by an international body of 29 experts, comprised of Ph.D.s and M.D.s, from 10 countries, including the USA which contributed the largest contingent of experts. It has stated quite emphatically over many years that electromagnetic (EM) and radiofrequency (RF) fields remain thousands of times higher than exposure levels which health studies consistently show to be associated with serious health impact.

(2) A group of 6 doctors in Oregon, led by Paul Dart, M.D., published, in June 2013, their own 74-page review of 279 biomedical research publications entitled.

"Biological and Health Effects of Microwave Radio Frequency Transmissions. A Review of the Research Literature". This review makes the health case against the installation of Wireless Smart Meters, explicitly. The review recommends that levels of RF radiation must be lowered to protect public health, not raised by the installation of Wireless Smart Meters.

(3) Michael Bevington, in 2013, published a book, entitled "Electromagnetic Sensitivity and Electromagnetic Hypersensitivity: A Summary", that summarizes the findings of 1828 biomedical research publications. The book describes the symptoms caused by exposure to electromagnetic radiation, the many diseases associated with such exposure, and the relative risk levels associated with specific sources of electromagnetic radiation. Wireless Smart Meters are in the highest of those risk categories.

There is also reference to a number of Medical Associations such as the American Academy of Environmental Medicine (AAEM) [Exhibit 03] and the American Academy of Pediatrics (AAP) [Exhibit 04]. The report by the AAEM was supplied in Complainants November 29, 2016 Response to Respondent's original Preliminary Objections to Formal Complaint.

All provide irrefutable evidence correlating RF exposure to neurological, cardiac, and pulmonary disease, as well as reproductive and developmental disorders, immune dysfunction, cancer, and other health conditions, including the specific chronic conditions Complainant Francis Hriadil is living with.

Dr Samuel P Milham, MD, MPH, Chronic Disease Epidemiologist, Washington State Department of Health; Clinical Associate Professor, University of Washington School of Public Health; Section Head, Chronic Disease Epidemiology Section, Washington State Department of Health, author of many peer-reviewed scientific papers, etc.; provided direct expert testimony before the Arizona Corporation Commission, Docket # E-01345A-16-0036, April 3, 2017, concerning Smart Meters containing a Switching Mode Power Supply (SMPS) which changes the utility 60 Hz alternating current to DC, such as that used by the Respondent in its Smart Meter the SK9AMI7. He testified concerning the detrimental health effects of the electrical pollution (dirty electricity) generated by the Smart Meter SMPS. Dr. Milham reported on government funded scientific research carried out by professional institutes such as the Electric Power Research Institute, and the National Institute of Environmental Health Sciences (NIEHS)

establishing definitive biological effects related to cancer, including increased cell proliferation, disruption of signal transduction pathways, and inhibition of differentiation." Dr. Milham concluded his testimony stating emphatically, **"It is my professional opinion that smart are a public health hazard."** [Exhibit 05]

Dr. Martin L. Pall, PHD Caltech, Professor Emeritus of Biochemistry and Basic Medical Sciences, WSU; Research Director, The Tenth Paradigm Research Group; author of many peer-reviewed papers; etc., submitted an expert report to the California State Legislature dated August 7, 2017. Below are a few excerpts from his official statement: [Exhibit 06]

- **Thousands of published studies show biological and health effects from electromagnetic fields. We now know the mechanism that can explain these effects.** The mechanism is a function of the electromagnetics of each cell—not solely about heating effects from the radiation (on which present FCC guidelines are based).
- This new understanding [1-7] means **we can debunk the claims of the wireless industry that there cannot be a mechanism for effects produced by these weak EMFs.** The 20 years plus of industry propaganda claims are false. Rather the thousands of studies showing diverse health impacts of these EMFs can be explained. We now have a mechanism, one that is supported by both the biology and the physics, both of which are pointing in exactly the same direction.
- ...the industry propaganda has no scientific support whatsoever.
- According to industry, the forces electromagnetic fields place on electrically charged groups in the cell are too weak to produce biological effects. However, the unique structural properties of the **voltage-gated calcium channel (VGCC) protein** can, it turns out, explain why the force on a cell's voltage sensor from low-intensity EMFs are millions of times stronger than are the forces on singly-charged groups elsewhere in the cell.
- Legislators would best pause to understand the gravity of the biological effects, and the ramifications for physical and mental health, as well as consequences from continual damage to human DNA, and learn the facts from scientists who are independent of the wireless industry, not from the industry lobbyists who have a gigantic conflict of interest.
- **VGCC activation in cells produced by low intensity EMFs can explain long-reported findings that electromagnetic fields and a wide range of biological changes and health effects.**
- The Physics and the Biology are both pointing in the same direction. Both show that **EMFs act primarily via activating the VGCCs in the cells of our bodies.**
- **Pulsed EMFs are, in most cases, more biologically active and therefore more dangerous than are non-pulsed (continuous wave) EMFs.**

- **None of our wireless communication devices are ever tested biologically for safety** – not cell phone towers, not cell phones, not Wi-Fi, not cordless phones, not smart meters.

Andrew A Marino, PHD Biophysics, JD Law Syracuse University; Professor Departments of Neurology, Cellular Biology and Anatomy, and Orthopaedic Surgery, LSU; Member of the Bar in LA and NY, co-author of "The Scientific Basis of Causality in Toxic Tort Cases" published in the Dayton Law Review; etc. provided expert testimony to the PA PUC, Docket No. C-2015-2475023, Maria Povacz v. PECO Energy Company, in which he categorically and definitively refuted and discredited many of the standard assertions and claims about their smart meters made by the various EDCs, including the Respondent and their paid expert witnesses Benjamin Cotts, Phd, PE and Gabor Mezei, Phd, MD. Below are a few excerpts from his official expert testimony: **[Exhibit 07]**

- EDC Expert Witness Assertion: (people) ...have not been harmed by (utility company) Smart Meters, and...(they will not) be harmed in the future.

Dr. Marino: [this assertion] d[oes] not come from scientific analysis. ... in science, a **negative result is universally acknowledged as having low probative value**, because anybody can find nothing. Special talent or training is not needed. The upshot is that **one hundred negative studies can be conclusively refuted by one valid positive result.**

- EDC Expert Witness Assertion: Smart Meters emit electromagnetic energy, that the energy is not unusual.

Dr. Marino: "I agree that Smart Meters emit energy. I do not agree with the assertion that the energy is not unusual because, in the context he used it, the claim is misleading.

Because what or what is not 'unusual' depends completely on the frame of reference. ...If the frame of reference is the natural world as it existed before man-made electromagnetic energy was invented, Smart Meter energy is unusual because it is about a billion times stronger than the corresponding natural level, more or less. If the frame of reference is the location in the houses of the Complainants where the Smart Meters will be installed, then it is unusual because **the resulting energy at those locations will be about a million times stronger compared with pre-installation levels, more or less.**"

- EDC Expert Witness Assertion: The energy is safe because the FCC says so.

Dr. Marino: "According to the FCC, Smart Meters and Cellphones are safe when manufactured according to the presently mandated emission levels. But the FCC defines an emission level as 'safe' if it doesn't result in adverse biological effects caused by heating or cooking of the exposed subject. **Nowhere does the FCC say that Smart Meters are safe with regard to physiological changes caused by physical processes other than heating or cooking. That claim is unsupportable and counter-scientific, and has not been made by the FCC.** [This assertion] is pregnant with the notion that the FCC says that Smart Meters are safe with respect to all possible mechanisms which is not the case."

- EDC Expert Witness Assertion: There have been many reports by expert panels whose consensus is that there is no consistent, reproducible evidence electromagnetic energy causes any biological effects.

Dr. Marino: "This is **extremely misleading.**"

"The thrust of [this assertion] is to assert that all experts agree that man-made electromagnetic energy in the environment, including but not limited to Smart Meters, doesn't cause any biological effects. I know, or have known, many such experts, perhaps most, either personally or by reading their publications, and I can say without any qualification that their consensus is the opposite of [what is asserted here]. Even more counterfactual, [is the trust given] that the experts on [these panels] were disinterested, but historically that has almost never been the case."

- EDC Expert Witness Assertion: ...installation of a Smart Meter wouldn't increase the amount of electromagnetic energy in the house where it is installed.

Dr. Marino: "When electromagnetic energy is created at a specific location the laws of physics almost always require that it add to, not cancel, any preexisting electromagnetic energy. There are exceptions, but they do not apply in a context relevant to this case."

- EDC Expert Witness Assertion: ...the only possible biological effects from man-made electromagnetic energy occur by meaning of heating or cooking tissues. Since Smart Meters can't cause those effects, they must be safe.

Dr. Marino: "(This)...**premise is wrong. There is a very large database of empirical studies in experimental biology that demonstrates beyond reasonable doubt that biological effects can occur at levels of man-made electromagnetic energy actually present in the environment.**"

- EDC Expert Witness Assertion: ...if the (Smart Meter) energy levels were low compared with some reference value, then the (Smart Meter) energy levels wouldn't matter from a health perspective.

Dr. Marino: "...[engineering] activities involve working with what are called 'linear systems', by which I mean things that follow laws whereby if a little change does something, then a change ten times as much will do ten times more. Virtually every system in the world of an engineer works that way.

But, animals and humans are nonlinear systems, by which I mean their laws can allow things to happen which cannot happen in linear systems. For example, human beings can exhibit very strong responses to very small stimuli in the complete absence of a proportion between the cause and the effect. [Any] assumption that the stimulus-response relationships of human beings are governed by linear laws is wrong."

- Current Opinions of Certain Government Agencies: Smart Meters are safe.

Dr. Marino: (Dr. Marino **discounted the credibility of those opinions** for two reasons:)

"First, their positions are **far behind the present state of the science**. They are based on out-moded concepts which the independent workers who study the effects of electromagnetic energy that I know do not regard as reasonable.

Second, the legal structure of federal law as regards the toxic side-effects of man-made environmental electromagnetic energy effectively requires the agencies to discount the health risks due to man-made electromagnetic energy in the environment..."

- Official Positions of Certain Private, National, and International Agencies:
Smart Meters are safe.

Dr. Marino: (as with certain Government Agencies) ...**"their positions are far behind the present state of the science, and are heavily biased in favor of industry positions.** In addition, in all the cases that I know about, the decisions of the agencies were star-chambered processes in which those with opposing views were excluded."

- Excerpts from Dr. Marino's Concluding Remarks to the PA PUC:

(These are equally applicable to the Respondent as their assertions, and that of their expert witnesses, are exactly the same)

- **[there] is a reasonable basis in established science for the Complainants' concern regarding risks to human health caused by man-made electromagnetic energy in the environment, including the type**

of electromagnetic energy emitted by Smart Meters. **These health risks are heightened in the very young, the very old, and in those with preexisting diseases or disorders.**

- electromagnetic hypersensitivity is a documented neurological condition in which the affected person experiences **musculoskeletal, immunological, and/or neurological symptoms** that noticeably flare or intensify upon exposure to man-made electromagnetic energy in the environment.
- there is no justifiable reason ... to not **respect and implement the advice they received from their physicians** that exposure to Smart-Meter energy should be avoided.
- chronic exposure to the electromagnetic energy from Smart Meters *causes risks to human health that go far beyond the capability of the energy to trigger hypersensitivity reactions in sensitive persons.* A large literature in experimental biology indicates that **man-made electromagnetic energy, including that from Smart Meters, causes biological effects involving every essentially physiological process that occurs in living organisms.** A large literature in non-experimental biology shows that man-made electromagnetic energy, including that from Smart Meters, is associated with a plethora of human diseases. **People who suffer from pre-existing conditions are particularly vulnerable...**
- **[the] claim that the FCC has pronounced Smart Meter safe is spurious** because the FCC has made that statement only with regard to the heating and cooking effects of electromagnetic energy. The Complainants have made no claims that Smart Meters are like microwave ovens.
- **[the claim] that expert committees have pronounced smart meters safe, but [the Respondent] has not acknowledged the blatant conflicts-of-interests that infect such committees nor the serious limitations on their reports, such as the failure to address much of the relevant literature.**
- **[any proposal] to expose human beings to smart-meter electromagnetic energy over their objection under conditions that would not be acceptable to any institution in the United States where human experimentation can lawfully be performed. Consequently, coercing the Complainants to endure the risks and uncertainties of such exposure is unwarranted, unjustified, and would amount to involuntary human experimentation...**

David O Carpenter, MD Harvard Medical School, Director, Institute for Health and the Environment and Professor, Environmental Health Sciences School of Public Health, University at Albany;_author/co-author of over 349 major peer-reviewed publications, etc., has been a strong and consistent voice of reason from the health community warning against the unrestrained proliferation of wireless RF emitting devices and technology such as Smart Meters

in a Smart Mesh. He is co-editor of the internationally recognized and acclaimed BioInitiative Report: A Rationale for a Biologically based Public Exposure Standard for Electromagnetic Radiation.

Complainants cannot afford to bring all of these experts from across the country to our Hearing; but, they granted the Complainants permission to submit their documented testimonies etc. to the PA PUC in support of our complaint. Dr. Carpenter, after we contacted him about our circumstances, wrote an expert statement to Your Honor and the Commission [Exhibit 08], in support of our Formal Complaint. This letter was provided to the Respondent in Discovery. Subsequently, Dr Carpenter agreed to participate as an expert witness for the Complainants as long as there was no schedule conflict and he would be permitted to participate telephonically. The Respondent makes direct reference to the Complainants intended expert witness, Dr Carpenter, and the letter he wrote to Your Honor and the Commission in our behalf in their Motion for Summary Judgment. The Respondent makes what the Complainants can only characterize as a nitpicking comment that the letter submitted by Dr Carpenter "does not even mention Complainants let alone opine that Complainants will suffer an adverse health effect when a smart meter is installed at their Residence." The letter was specifically submitted by Dr. Carpenter to You Honor and the Commission with regard to the Complainants and with specific reference to our case, Docket #C-2016-2571726. In his letter, Dr Carpenter clearly and emphatically states the harm imposed by long term chronic exposure to the emissions generated by these RF emitting and ELF inducing devices, some of the multitude of evidence supporting that assertion, and specifically references Duquesne Light Company by name.

These, as well as many other experts, associations, organizations, etc., have established that everyone is susceptible to these emitting devices; however, some groups of individuals are at especially high risk of harm from exposure to RF and LF/ELF radiation: pregnant women and their unborn children, very young children, teenagers, men of reproductive age, seniors (which both Complainants are), and anyone with a chronic health condition (which

Complainant Francis Hriadil has provided medical records establishing the multiple chronic conditions that I have). Members from all of these groups (including but not limited to myself, family members, children, friends, and pets), with various health and medical conditions, either live at or have occasion to visit our residence on a regular basis.

The International Agency for Research into Cancer (IARC), which is part of the World Health Organization (WHO), has determined that Radiofrequency (RF) Electromagnetic Fields (the sort given off by Smart Meters, etc.) belong to the "Group 2B" class of agents, such as lead, engine exhaust, and DDT, and as such, represent a potential "carcinogenic hazard".

Article I, Section 27 of the Constitution of the Commonwealth of Pennsylvania states:

§ 27. The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.
(May 18, 1971, P.L.769, J.R.3)

We have all seen pictures of Beijing (in the news on 12/19/2016 for example), where smog and air pollution is so bad that it causes pollution Red Alerts and the shutdown of factories, schools, etc. We have all seen pictures of London (in the news on 01/26/2017 for example) engulfed in smog, where Black Alert toxic smog and air pollution swamped the capital and children were forced to stay indoors. We see these kinds of pictures and recoil at the sight of it. But, towns and cities in the US are currently being engulfed in, and their citizens are being exposed to, dangerous and toxic RF radiation smog. It is growing so bad that RF devices are now being restricted from schools, nurseries, and daycares for the protection of children. The home environment is even more critical, and requires special consideration and protection as well.

The National Toxicology Program (NTP), a federal interagency group under the National Institutes of Health (NIH) released definitive evidence [**Exhibit 09**] that pulsed RF radiation exposure, at frequencies, intensities, and modulations emitted from cell phones and Smart

Meters, causes **tumor formation** and **DNA damage**. This has been recognized as significant by the American Cancer Society (ACS) **[Exhibit 10]** etc., and has been verified in other studies.

The medical profession officially recognizes the harmful effects that exposure to **nonionizing radiation** has on the human body, and has instituted formal, standardized medical International Classification of Diseases (ICD) codes, such as the American ICD-10-CM (diagnosis) and ICD-10-PCS (procedure) **medical billing codes**. **[Exhibit 11]**

The published literature, etc. of the international biomedical research community on the adverse effects of RF and associated ELF/LF radiation is so vast that it would be impossible to present it all here. The Complainants are submitting only a few examples in this response.

Furthermore, Complainant Francis Hriadil sought the counsel of his doctor. Dr. Martin Gallagher, who is familiar with the chronic conditions that Francis Hriadil is living with, wrote the following official medical recommendation specifically for Francis Hriadil,

“...it is recommended that you not be exposed to RF/EMF frequencies generated by a "Smart Meter" based on your current clinical condition as well as from a preventive standpoint.”

Martin Gallagher, MD, DC, ABOIM [Exhibit 12]

It is noted, with regard to the Respondent's previous comments, that this document “mentions” Complainant Francis Hriadil specifically by name and “opines” that with his established clinical conditions Complainant Francis Hriadil should not be exposed to the emissions generated by a Smart Meter. It is also noted that the Respondent failed to include or mention this medical counsel given to Complainant Francis Hriadil by his doctor in their Brief, though it was provided to the Respondent in Discovery. So, it is clear that the Respondent is being very “selective” in what they are presenting in their Motion, and what they are conveniently leaving out.

This is of utmost and immediate concern to the Complainants, and their future well-being. Concerning our health and medical conditions:

- i. First and foremost, the objective is the prevention of harm, and the prevention of further harm.

“An ounce of prevention is worth a pound of cure” is not simply an irrelevant and antiquated principle. It is a health principle fully supported and endorsed in the US Constitution, and by the US Government, in the National Prevention Council's National Prevention Strategy, and by the US Surgeon General, in the PA Constitution, and by the PA Government, in the Public Utility and Safety Codes, and by the PA PUC.

As an example, one need only refer to the National Prevention Council's published National Prevention Strategy document, which

- establishes the role and responsibility of federal, state, etc. policy makers and officials in prevention
 - sets the strategic direction and priorities as:
 - establishing Healthy and Safe Community Environments, with the top 2 priorities here being:
 - the improvement of the quality of the environment (air, land, water, etc.)
 - the design and promotion of affordable, accessible, safe, and healthy housing
 - empowering people, with the top 3 priorities here being:
 - encourage people to make healthy choices
 - support healthy decision making
 - engage and empower people and communities to plan and implement prevention policies and programs
 - promoting physical, mental, and emotional well-being
 - and documents how prevention can reduce the significant economic burden of disease on the individual and the healthcare system, in addition to improving the length and quality of people's lives
- ii. We live in a connected condominium building structure containing 6 connected units. Our residence has 2 shared common walls, one is our right wall and the other is our left wall. Both adjoining units already have SK9AMI7 Smart Meters installed and operating in those units. So, we are already being exposed to regular RF and LF/ELF radiation leakage due to the close and immediate proximity of those walls, units, and meters.
- iii. Furthermore, most if not all of the entire neighborhood has had the SK9AMI7 Smart Meters installed. So, we are already being exposed to regular RF and LF/ELF radiation whenever we venture out and around the neighborhood, which we now rarely do. Thus, to protect ourselves and minimize our exposure, the quality of our lives has already been negatively impacted in a significant way.

On the one hand, federal, state, and local governments and agencies tout their roles and responsibilities in promoting and ensuring safe and healthy living environments for their constituents, and encouraging, facilitating, and empowering all residents to educate themselves, perform their own due diligence, and make healthy life choices that focus on prevention to

ensure the safety and quality of their lives, yet fail miserably in some critical circumstances to follow through on those duties. Money and influence are generally at the root of those contradictions.

In a recent complaint before the Commission, it is noted that Susan Kreider, in Susan Kreider v. PECO Energy Company, Docket No. C-2015-2469655, asserted that her continued exposure to pulsed radiation emissions produced by a Smart Meter, such as those produced by the Respondent's Smart Meter, that was installed on her residence was, at a minimum, a contributing factor to her compromised health condition. It was established by her that her unilateral removal of that Smart Meter resulted in the improvement of her condition. And, in September 2016, it was ruled by the PA Commission that she had **established a prima facie case of harm caused by Smart Meters**. The case was not carried to final conclusion because Susan Kreider passed away during the course of the Formal Complaint process. But, this does not negate the material fact that the PA Commission officially recognized that sufficient evidence was produced indicating harm was caused from exposure to the emissions of a Smart Meter.

In another recent complaint before the Commission, Maria Povacz in Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023, refused the installation of a smart meter on her residence because of health and safety concerns. On January 26, 2018, PA PUC ALJ Heep issued a Decision in which she stated the following Conclusion of Law,

"The Complainant has established that installation of a smart meter attached to her home would exacerbate ill health effects. 66 Pa.C.S. § 701; 66 Pa.C.S. § 1501; 52 Pa. Code § 57.194."

and issued the following Order,

"That Maria Povacz's claim that her health would be adversely affected by the installation of a smart meter attached to her home is granted."

So, it is a material fact that the PA PUC has officially recognized that exposure to the emissions of a Smart Meter caused harm.

Contrary to the Respondent's generic statements in its Motion for Summary Judgment, all of this, and more that was provided to the Respondent as part of Discovery, comprises substantial admissible evidence, sufficient to satisfy their burden of proof, demonstrating that the installation of a smart meter at their home will cause them to suffer adverse health effects. As documented and testified by Doctors Ronald Powell, PHD; Samuel Milham, MD, MPH; Martin Pall, PHD; Andrew Marino, MD, JD; and David Carpenter, MD; and many others too numerous to include here, this consequence is real and inevitable, and not a matter that can simply be dismissed as mere theory or conjecture. Biological mechanisms of action have now been scientifically established and medically recognized, and especially vulnerable populations, to which both Complainants and visitors to their residence belong, have been identified.

The Complainants have been lifetime customers of Duquesne Light and have always had a good customer relationship with the Respondent, with nary a complaint occurring between us. However, with the intended imposition of this new technology, irrespective of the legitimate warnings issued by various experts, agencies, institutions, and organizations; the particular circumstances of the Complainants who are both elderly (one of a number of categories of individuals who are particularly susceptible to RF and LF/ELF exposure); and Complainant Francis Hriadil's medically documented chronic health conditions and the specific medical counsel of his doctor, the Complainants have been driven to file a Formal Complaint and appeal to the Commission for protection, relief, and accommodation.

Though the Respondent is dismissive of these assessments, etc. they in fact comprise more current, complete, and comprehensive analyses and reviews than the early, limited, and selective "analyses" utilized to provide validation of this wireless technology. And, they are independent, and not tied to any aligned and vested industry interests. Those "analyses" have subsequently been shown to be outdated, questionable or in error, and wholly inadequate. And, prior complaints before the Commission that the Respondent has cited, and which the Complainants have reviewed, that issued rulings based on this flawed "data" are immaterial.

Finally, Complainants submit that Case law has upheld that,

"[I]ndividuals have a constitutional liberty interest in personal bodily integrity that is protected by the Due Process Clause of the Fourteenth Amendment."

see Phillips v. County of Allegheny, 515 F. 3d 224, 235 (3d Cir. 2008),

[<https://www.casemine.com/judgement/us/5914b340add7b0493476515a>]

and

"The right to be free of state-sponsored invasion of a person's bodily integrity is protected by the Fourteenth Amendment guarantee of due process."

see Inre Cincinnati Radiation Litig., 874 F. Supp. 796, 810-11 (S.D. Oh. 1995)

[<https://law.justia.com/cases/federal/district-courts/FSupp/874/796/1478171/>]

4. Respondent's Motion for Summary Judgment:

IV. LAW & ARGUMENT (pages 18 - 19 of Respondent's Motion)

C. Complainants offered no evidence suggesting that Duquesne Light's smart meters or Duquesne Light's smart meter program is unsafe, unreasonable, or inadequate.

3. Dr. Carpenter, whose theories about RF emissions have already been rejected by the Commission, does not claim that Duquesne Light's smart meters are unsafe or violate any applicable standard or that Complainants would suffer adverse health effects from the installation of a smart meter.

Complainants Response:

The Respondent had to reach back 9 years to dig up one old case that involved Dr Carpenter's testimony against EDC PPL. The case was Docket No. A-2009-2082652, Application of PPL Electric Utilities Corporation Filed Pursuant to 52 Pa. Code Chapter 57, Subchapter G, for Approval of the Siting and Construction of the Pennsylvania Portion of The Proposed Susquehanna-Roseland 500 kV Transmission Line in Portions of Lackawanna, Luzerne, Monroe, Pike and Wayne Counties, Pennsylvania. Complainants reviewed this citation in detail.

PPL presented a Dr. Nancy C. Lee, MD affiliated with the CDC and ACS at that time, who reviewed Dr Carpenter's evidence and concluded, at that time, that "the epidemiology studies relied upon by the SCECA's witness, Dr. Carpenter, do not provide a scientific basis to

conclude that exposure to magnetic fields is associated with an increased risk of childhood leukemia." This conclusion relied on a NIH report to Congress dated 1999, a WHO assessment dated 2007, and a Kheifets meta-analysis dated 2008 to justify her conclusion. ALJ Susan D. Colwell accepted this opinion and ruled in favor of PPL.

It has been 10 years since that case, and much work has been done in understanding and establishing the health effects incurred with continued long-term exposure to RF and LF/ELF fields.

Since that time, and as has already been mentioned herein, the World Health Organization (WHO) has updated its position. It is a matter of the public record that on October 20, 2011, the International Agency for Research into Cancer (IARC), which is part of the World Health Organization released a new assessment. They had convened a panel of 31 experts from 14 countries, including the United States, to look at the available evidence. Their verdict (which was provided in Complainants January 9, 2017 Response to Respondent's Answer and New Matter), was that

"Radio Frequency Electromagnetic Fields" (the sort given off by mobile phones and Smart Meters) belong to the "Group 2B" class of agents, such as lead, engine exhaust, and DDT, and as such, represent a potential "carcinogenic hazard".

And, there are now calls to raise the classification to "Group 1." [Exhibit 13]

And also since that time, the National Institutes of Health (NIH) has released definitive evidence that pulsed RF radiation exposure, at frequencies, intensities, and modulations emitted from cell phones and Smart Meters, causes **tumor formation**.

[Exhibit 09] In May 2016, researchers at the National Toxicology Program (NTP), a federal interagency group under the National Institutes of Health (NIH), reported partial findings from a \$25 million animal study of the cancer risk from Radiofrequency (RF) radiation. In the study, rats were exposed to RF radiation at 900 MHz, the frequency used in all Smart Meters. The controlled study showed that RF radiation caused two types of tumors, glioma and schwannoma. None of the control rats (those not exposed to the radiation) developed said

tumors.

Though these are partial findings, it is important to understand that they are by no means preliminary. The NTP report was favorably peer-reviewed by experts [Exhibit 14]. According to the NTP, the effects of RF radiation on these two tumors are final. And, the Federal Government released this partial report because the results have **“broad implications for public health.”** Christopher Portier, retired head of the NTP who helped launch the study, said that this is not just an associated finding. He said that the relationship between the RF radiation exposure and cancer is clear. **“I would call it a causative study, absolutely. They controlled everything in the study. It’s because of the exposure.”** [Exhibit 15]

The authors added that their findings supported WHO’s classification of RF radiation, from cell phones, Smart Meters, etc., as a “Group 2B” class carcinogenic agent.

A review paper in the Electromagnetic Biology and Medicine journal, Volume 35, 2016 – Issue 2, [Exhibit 16] entitled “Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation”, reported that, **in 93 of 100 studies, RF radiation produced a cellular stress response which can lead to DNA damage and cancer.** Others have reported DNA damage as well. And, it is important to note that the NTP study also found evidence of DNA damage.

American Cancer Society (ACS): On May 27, 2016, Otis W. Brawley, M.D., American Cancer Society Chief Medical Officer released the following statement: [Exhibit 10]
(<https://acspressroom.wordpress.com/>)

“For years, the understanding of the potential risk of radiation from cell phones has been hampered by a lack of good science. This report from the National Toxicology Program (NTP) is good science.” (my emphasis)

“The NTP report linking radiofrequency radiation (RFR) to two types of cancer marks a paradigm shift in our understanding of radiation and cancer risk. The findings are unexpected; we wouldn’t reasonably expect non-ionizing radiation to cause these tumors. This is a striking example of why serious study is so important in evaluating cancer risk.” (my emphasis)

"It's interesting to note that early studies on the link between lung cancer and smoking had similar resistance, since theoretical arguments at the time suggested that there could not be a link."

"The new report covers only partial findings from the study, but importantly one of the two cancers linked to cell phone radiation was malignant gliomas in the brain." ... The second cancer, called a schwannoma, is an extremely rare tumor in humans and animals, reducing the possibility that this is a chance finding. **And importantly, the study found a 'dose/response' effect: the higher the dose, the larger the effect, a key sign that this association may be real."**

[This NTP report alone establishes the Material Fact that Smart Meters are a credible threat of harm to the general public, and a clear violation of Section § 1501 of the Public Utility Code.]

The evidence is clear and overwhelming, and it continues to grow. The World Health Organization (WHO) now recognizes it. The National Institutes of Health (NIH) now recognizes it. The American Cancer Society (ACS) now recognizes it. And, so do many other independent public Health and Medical organizations. This can no longer simply be ignored or dismissed.

Dr David Carpenter, one of a number of health experts, recognized both nationally and internationally, has been warning of the dangers for many years now. With regard to these latest findings, Dr Carpenter has stated on the public record that "The trend here is important. The question is, **'Should one be concerned?' The answer is clearly 'Yes.'**"

One ruling made by a Commission ALJ on one case in 2009, does in no way discredit or impair the reputation and expertise of Dr Carpenter, as is evidenced by his extensive curriculum vitae which has been supplied to the Respondent and the Commission, which includes but is not limited to: the many National and International Committees he has served on, the many Honors, Awards and Fellowships he has received, the many Federal Grants Held as Principal Investigator, the over 349 major Peer-Reviewed Publications he has authored or co-authored, etc. in his illustrious career which began in the 1960s.

The PA Commission specifically has recognized Dr Carpenter's expertise, and accepted his expert testimony in a case specifically related to Smart Meters in PA, as recently as Docket No, C-2017-2620710, Richard N. Myers v PPL Electric Utilities Corporation.

In another recent case, in United States District Court, D. Massachusetts, Case No. 15-CV-40116-TSH, entitled "G, a 12-year old minor suing by a fictitious name for privacy reasons, Mother and Father, suing under fictitious names to protect the identity and privacy of G, their minor child, plaintiffs, vs. The Fay school.", Dr. Carpenter was accepted as an expert witness and testified with regard to the health effects of electromagnetic (EM) fields.

Any disparaging criticism or comments by the Respondent implying that Dr. Carpenter, his reputation and standing in the biomedical community, and his expertise in this area is questionable, unreliable, not objective, and not a reflection of the current state of scientific knowledge is completely and categorically without merit.

5. Respondent's Motion for Summary Judgment:

IV. LAW & ARGUMENT (pages 17 - 18 of Respondent's Motion)

C. Complainants offered no evidence suggesting that Duquesne Light's smart meters or Duquesne Light's smart meter program is unsafe, unreasonable, or inadequate.

2. The publications Complainants produced throughout these proceedings are irrelevant because they do not relate to Duquesne Light's smart meter program and are hearsay, which cannot sustain Complainants' burden of proof.

Complainants Response:

The Supreme Court of Pennsylvania Committee on Rules of Evidence has published that "the admissibility of evidence is conditioned upon the proof of foundational facts."

It its Motion, the Respondent makes a generic and dismissive reference to information served by the Complainants that was obtained from the internet. The Respondent refers to these simply and derogatorily as "internet articles," and attempts in one broad stroke to denigrate, in their entirety, their accuracy, reliability, validity, and applicability,. Complainants wish to point out the fact that many of the world's biomedical research, scientific, engineering, security, economic, governmental agency, law, etc. journals now publish online exclusively. They have abandoned hard copy entirely. All government agencies, including Public Utility Commission, have internet websites for the dissemination of information. The reasons for this

are that publication online is less expensive and greatly furthers accessibility to the audiences for these publications, and for this information. Complainants respectfully submit that individual sources of information need to be judged solely by their quality and merit, and not simply by their method of delivery. Inaccuracies and misprints are possible no matter what medium is utilized. And, truth and accuracy is not automatically in question just because a source material may have been obtained from the internet. Unlike, hardcopy media, mistakes in source material on the internet are subject to much more substantive review, and are readily updatable and correctable.

In Discovery, and in previous filings with the Commission, Complainants filed official public records; government, scientific, medical, and health reports and publications; investigative news and industry reports; expert reports and testimonies; Utility Commission records; peer-reviewed scientific reports; medical records; doctor recommendations; Congressional, Legislative, Judicial, and Executive hearing records, EDC documents and public statements, industry reports, official institution and agency releases, etc., most in written format and some in video format, to substantiate our claims and Formal Complaint.

This written and video documentation was fully reviewed, sourced, and referenced, the foundational facts comprising this material have been established via multiple sources providing corroboration. They have either been accepted in prior judicial court cases, public hearings by various commissions, legislatures, and or congressional committees, etc. or fall within the admissibility guidelines established by:

Title 66, Part I. Pa. Public Utility Code

66 Pa. Chapter 3, Subchapter B. Investigations and Hearings

66 Pa. C.S. § 332 (b) - Admissibility of evidence

66 Pa. C.S. § 332 (c) - Submission of evidence

Federal Rules of Evidence: 801-03, 901

Rule 803. Hearsay Exceptions; Availability of Declarant Immaterial

Rule 901. Requirement of Authentication or Identification

and, Pa. Code Title 225, Rules of Evidence.

The Respondent claims that the body of evidence filed by the Complainants *“do(es) not relate to Duquesne Light or its smart meter program.”* Complainants respectfully submit that this assertion is illogical and completely without merit. There is nothing patently unique or exclusive to the Respondent's Smart Meter, or how it is being operated by Duquesne Light in its Smart Mesh. To the contrary, there is substantial commonality between the Respondent's Smart Meter and its operation in its Smart Mesh, and other similar programs being implemented in other locations, many of those of which are being implemented on a voluntary basis. The Respondent utilizes an Itron/Centron OpenWay Smart Meter that is being utilized by other EDCs. Where there are pertinent differences of note, the Complainants have made a conscientious effort to point those out.

Specifically, the material facts are:

- the Respondent's Itron/Centron OpenWay SK9AMI7 meter is a wireless, digital Smart Meter with co-located transceivers operating at 900 MHz and 2.3 GHz, respectively, in a Smart Mesh. Their Smart Meter draws power from the electric service line via a Switch Mode Power Supply (SMPS), and it is constructed primarily of electronic components and various plastic and polymer materials, etc. Though there may be some superficial differences between various Smart Meters currently in use in a Smart Mesh, they all operate fundamentally the same way and obey the same laws of physics.
- the specific Itron/Centron OpenWay SK9AMI7 Smart Meter being deployed by the Respondent in a Smart Mesh, is also being deployed in Smart Meshes by other Pennsylvania EDCs such as FirstEnergy in Pennsylvania, and by other EDCs elsewhere, such as FortisBC Energy Inc. in British Columbia.
- the Respondent has stated in its Smart Meter Technology installation plan, the “Duquesne Light Company Final Smart Meter Technology Procurement and Installation Plan” Docket Nos. P-2012- M-2009-2123948, presented to the Commission that it has structured its SK9AMI7 Smart Meter deployment in the same manner as several EDCs in California, Nevada, and Illinois. These EDCs contracted out the Smart Meter installation to companies, such as Wellington Power Corporation being utilized in here in Pennsylvania by the Respondent, who hire temporary workers with unclear electrical or professional expertise. [stated in our New Matter #3]

6. Respondent's Motion for Summary Judgment:

IV. LAW & ARGUMENT (pages 12 - 17 of Respondent's Motion)

C. Complainants offered no evidence suggesting that Duquesne Light's smart meters or Duquesne Light's smart meter program is unsafe, unreasonable, or inadequate.

1. Complainants' personal belief that smart meters are unsafe, and the arguments that stem from those beliefs, do not constitute evidence through which they can sustain their burden of proof.

Complainants Response:

6.1. Complainants Knowledge and Backgrounds

In its Motion, the Respondent attempts to present and frame a picture and representation of the Complainants as essentially ignorant of this technology; the specific form, fit, and function of Duquesne Light's Smart Meter in its Smart Mesh; its specific operating parameters and characteristics; and the inherent and increased risks that this technology poses to the Complainants in particular, who are elderly, etc. The Respondent offers their vested "industry view" and avers that the Complainants have formed their complaint, claims, and "personal beliefs" in isolation of recognized scientific, medical, and health evidence.

In served submissions to the Commission as part of our complaint and request for accommodation and relief, and to the Respondent as part of Discovery, Complainants have produced a multitude of published independent, reputable, and official analyses, reports, and assessments that have been issued by numerous governmental, legal, scientific, medical, and health authorities and agencies. They all point to the inescapable material fact that the Respondent's intended Smart Meter technology, and the Smart Mesh Grid that it is a component of, represents a credible threat of harm and risk. These assessments, etc., which have been carried out by numerous recognized technical and medical authorities, etc., are well documented and have been fully reviewed, sourced, and referenced by the Complainants. They have been accepted into evidence by the PA Public Utility Commission, by Utility Commissions of other states, and in various Legislatures, Congressional Committees, and

Agency Hearings. And, where transcripts of legal testimonies have been provided, those testimonies were given under oath. Furthermore, the PA Commission has already ruled in at least 2 complaints that evidence of harm has been proven. It is these authorities who are issuing these assessments and warnings. They are not mere contrivances or fabrications on the part of the Complainants. The Complainants assertions are not based on blind opinions, superficial feelings, or a lack of knowledge as Respondent's motion wishes to imply.

Further, the Respondent attempts to minimize in the extreme, the educational and professional backgrounds and the technical competence and acumen of the Complainants.

Under Pennsylvania law, a person qualifies as an expert witness if, through education, occupation or practical experience, the witness has a reasonable pretension to specialized knowledge on the matter at issue.

Complainant Francis Hriadil

- has an advanced degree from M.I.T, and has had a long career performing work as a recognized engineering professional and inventor, on classified and unclassified programs, requiring expertise in engineering, analysis, advanced technology, mathematics, and physics.
- has worked in the Defense sector on both advanced strategic and tactical missile programs.
- has designed, invented, and received a patent on advanced technical equipment incorporating technology, materials, and electrical components, etc. more involved than that used in a smart meter.
- and as the owner of 2 technologically based businesses, had access to various industry publications not available to the general public.

Complainant Michele Hriadil

- Extensive experience in the analysis, design, development, testing, implementation and support of custom software for complex distributed computer based systems. Technologies used include: ASP.NET, ASP, Ajax, Visual Basic, c#, SQL Server, Reporting Services, Crystal Reports, Javascript.
- has held positions as Technology Consultant, Lead Developer, and System Architect, including a role as back-up Systems Administrator.

[Exhibit 17 - Francis and Michele Hriadil curriculum vitae's]

A Smart Meter "expert" clearly lacks the necessary background and expertise to speak intelligently on the advanced strategic and tactical missile technology that Complainant Francis Hriadil has worked on, or on the advanced equipment he has invented and patented. Smart Meter technology can by no means be classified as "rocket science." Complainants respectfully submit that Francis Hriadil understands and can intelligently discuss all of the technical details that have been released on Smart Meters and their operation in a Smart Mesh. And, Complainant Michele Hriadil, with her education and professional background in computer science and information technology also make her equally knowledgeable concerning the handling and managing of computer databases, interfaces, etc.

As one example, Complainant Francis Hriadil, took the Duty Cycle and Transmission Times data published by Itron for their SK9AMI7 OpenWay Smart Meter, the one being deployed by the Respondent, and calculated the corresponding numbers of pulse transmissions occurring within a 24 hr period. **[Exhibit 18]**

	Duty Cycle	Time in 24 hr	Number of Pulse Transmissions in 24 hr
Minimum	0.02%	18.31 sec	423 (once every 3.40 min)
Mean	0.06%	53.14 sec	1,268 (once every 1.14 min)
Maximum	0.58%	497.80 sec	12,257 (once every 7.0 sec)
Abs Max	5.0%	~ 4,291 sec	105,667 (once every 0.82 sec)
"Expected" Max	1.0%	~ 858 sec	21,133 (once every 4.1 sec)

This was submitted to the Commission as supporting evidence by the Complainants. The results of this analysis were not contested by the Respondent, and were actually confirmed by the Respondents in their responses to Complainants Discovery Interrogatories.

Where Complainants lack direct credentialed professional expertise in a certain specific area of relevance, such as health, medicine, etc, they have submitted the independent testimony, views, and statements provided by recognized experts in those specific areas.

6.2. Smart Meter Pulsed Transmissions and Switch Mode Power Supply (SMPS)

In their Motion, the Respondent attempts to make the following argument.

"For example, the support Complainants offer for their argument that Duquesne Light's smart meters will endanger their health is that the meters use pulsed transmissions and an AC/DC circuit to draw power from the homeowners' interior electrical wiring. ... But that is merely a description of how smart meters work. In other words, Complainants make the circular argument that Duquesne Light's smart meters are unsafe because they operate like a smart meter."

This argument cannot be taken seriously. Is it a circular argument to say that a gun is unsafe because it operates like a gun? No one questions that guns have triggers, use bullets, and have barrels that shoot those bullets, and as a result they are dangerous.

The Respondent's Smart Meter uses a Switch Mode Power Supply (SMPS) to power its operation, and uses numerous pulsed transmissions, 1,000s - 10,000s - 100,000s of times a day, to operate in its Smart Mesh. This is admitted by the Respondent. Numerous experts, including but not limited to Ronald Powell, PHD; Samuel Milham, MD, MPH; Martin Pall, PHD; Andrew Marino, MD, JD; and David Carpenter, MD, have attested to the material facts that

- the RF transmissions from Smart Meters are harmful
- pulsed EMFs are, in most cases, more biologically active and therefore more dangerous than are non-pulsed (continuous wave) EMFs
- the Smart Meter Switch Mode Power Supply (SMPS) causes voltage spiking and harmonics in the home's interior electrical wiring, which induces secondary pulsed LF/ELF radiation in the home which is also harmful

Furthermore, the PA Public Utility Commission has already recognized in official rulings that Smart Meters produced harm.

6.3. Safety and Compliance with Code, etc.

The Respondent adds,

"But since installing a smart meter is not a violation of the Code, Complainants must prove more than that; they must prove that there is something about Duquesne Light's smart meter program in particular that violates the Code. Complainants, however, identified no legal or industry standard that there is something inadequate or unsafe about the manner in which Duquesne Light's smart meters operate."

Contrary to the Respondent's assertion here, the Complainants have supplied substantial foundational facts and evidence, in our direct filings to the Commission and our Discovery responses to the Respondent, that, at a minimum, the operation of the Respondent's Smart Meter in its Smart Mesh is in direct violation of 66 Pa.C.S. § 1501; 52 Pa. Code § 57.194. And, has been previously cited, the Commission has already ruled in other complainants that Smart Meter code violations have occurred.

Every provider of Smart Meters is provided with a Grant of Equipment Authorization by the FCC to which it must adhere. This Equipment Authorization is valid only for the equipment identified on the authorization certificate, and valid only under the FCC's specific rules and regulations for proper installation. Separate Grants of Equipment Authorization were issued for the SK9AMI7 Smart Meter and the 802.15.4 ZigBee Module. The requirements on those authorizations state the following: **[Exhibit 19]**

SK9AMI7 900 MHz LAN:

"Limited Modular Approval. Power listed is conducted. This device must be professionally installed and is limited to installation for mobile and fixed applications only. This grant is valid only when the device is installed by the grantee or contractors employed by the grantee who are instructed to ensure that the end-user has no manual instructions to remove or install the device. The transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Installers and end-users must be provided with transmitter operation conditions for satisfying RF exposure compliance. Class II Change to add RF filter and new antenna type as described in this filing."

802.15.4 2.4 GHz ZigBee Module:

"Output power listed is conducted. Modular approval. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Approval is limited to OEM installations only. OEM integrators must be provided with antenna installation instructions. OEM integrators and end-users must be provided with transmitter operating conditions for satisfying RF exposure compliance. This grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. The only antennas approved for use with this module are those documented under the filings of this FCC ID."

The **FCC Grants of Equipment Authorization** are quite clear in requiring that:

- **antenna(s) must provide a separation distance of at least 20 cm from all**

persons

- **end-users must be provided with antenna installation and transmitter operating conditions for satisfying RF exposure compliance**
- **antenna(s) must not be co-located with any other antenna or transmitter**
- **antenna(s) must not be or operating in conjunction with any other antenna or transmitter**
- **the meters must be professionally installed**

As indicated in Complainants (our) November 29, 2016 Response to Respondent's Preliminary Objections filing, our electrical meter junction box is located on the front of our residence where the living room is located, and is right next to the bench we use when sitting on our front patio/porch. So, when we use our front bench, we are in close proximity to the Smart Meter and its emissions.

The Respondent Duquesne Light does not provide any safety enclosure to maintain this safe 20 cm (8 inch) separation distance. There is nothing to prevent the homeowner, family members, children, pets, etc. from coming into close proximity to the Smart Meter on a regular basis, when carrying out normal activities around the residence. Further, the Respondent does not post any notice or warning on the Smart Meter, and does not even inform homeowners and their family members to always remain a "safe" distance away from the Smart Meter.

It is also important to mention that EDCs, including Respondent Duquesne Light, routinely state, based on a "study" carried out by the California Council of Service and Technology (CCST), that

"smart meters, when installed and maintained properly, result in lower RF emission than most common household electronic items, such as cell phones, microwaves, wireless internet, baby monitors, and garage door openers."

and that

"Smart Meter RF emissions are orders of magnitude less than that of a cell phone."

This CCST "study" has been disputed and totally discredited by no less than 13 separate and independent expert sources [Exhibit 20]. And, it was established that

the whole body exposure from a Smart Meter is actually orders of magnitude higher than that of a cellphone. [Exhibit 20 - Hirsch Analysis]

Cell phone manuals warn that people should stay 1 - 2 cm away from a cell phone; but, the FCC requires at least a 20 cm (8 inch) separation from a Smart Meter, which is an order of magnitude greater distance. Even the FCC's own regulations inherently recognize the greater strength of the pulsed Smart Meter emissions, as Complainants (we) have established in our other filings, and the greater separation distance that is necessary. The numbers tell the real truth.

Also, Complainants (we) established that we live in a condominium complex composed of buildings containing 6 connected condominium units per building. Each unit shares one or more walls. *Our unit is an interior unit and shares two walls, one with each of our neighboring units on either side of us.* Thus, the electrical meter boxes are co-located in close proximity to each other.

Further, the 900 MHz and 802.15.4 2.4 GHz ZigBee transmitters and antennas are both co-located on the SK9AMI7. These transmitters and antennas are set up to work in conjunction with the HAN and RF appliances and other Smart Meters in the mesh network.

The FCC created these regulations to provide at least some measure of safety. Any one of these violations alone would negate the FCC Grant of Equipment Authorization, yet multiple violations are clearly evident. And, as such, they represent a credible threat of harm and a clear violation of Pa. Codes 66 Pa. C.S. § 1501 and 52 Pa. Code § 57.194.

In our Discovery interrogatories the Complainants submitted direct questions to the Respondent asking for the scientific evidence proving that the operation of their Smart Meter in its Smart Mesh is safe and will not negatively affect the health and/or medical condition(s) of Michele Hriadil who is elderly, Francis Hriadil who is elderly with established chronic medical conditions, and/or any pets or animals, and/or any visitors including but not limited to the elderly, children, babies, pregnant women and their fetuses, etc. The Respondent's repeated response

to our multiple specific interrogatories was

“...the company's smart meter implementation and procurement plan has been approved by the Pennsylvania Public Utility Commission, which is prima facie evidence that it is reasonable, safe, and in compliance with the law.”

So, the Respondent on the one hand attempts to criticize and dismiss arguments made by the Complaints by incorrectly characterizing them as “circular arguments.” Yet, the Respondent turns right around and presents a true circular argument stating that their Smart Meters are reasonable, safe, and in compliance because they “are” reasonable, safe, and in compliance, because “the Commission says so.” Yet, the Commission has never stated such, has relied solely, especially early on, on flawed assurances by the utility industry, and has found and ruled in recent cases that Smart Meters have caused harm. As such, the Commission has recently acknowledged, at a minimum, that Smart Meters in a Smart Mesh are not unequivocally reasonable, safe, and in compliance as the Respondent asserts. Complainants reviewed the Respondent’s smart meter implementation and procurement plans. We cannot find any information contained therein that in any way validates the safety of the Respondent’s Smart Meters in its Smart Mesh.

Further, the Respondent repeated, and continues to repeat, the falsehood that

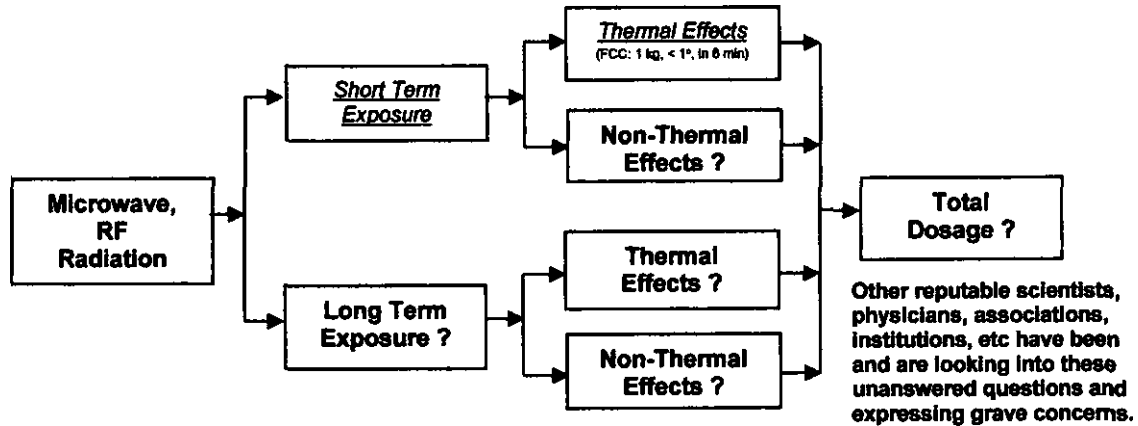
“...the meters operate within the [safety] limits established by the FCC...”

As shown repeatedly in Complainants filings to the Commission, recognized experts have unequivocally refuted this false claim. And, as has been already been mentioned herein, the Commission recently received expert testimony from expert witness, Andrew Marino, who possesses a PHD in Biophysics and a JD in Law, that **[Exhibit 07]**

- **“[any claim that the] FCC has pronounced Smart Meters safe is spurious because the FCC has made that statement only with regard to the heating and cooking effects of electromagnetic energy. The Complainants have made no claims that Smart Meters are like microwave ovens.”**
- **“Nowhere does the FCC say that Smart Meters are safe with regard to physiological changes caused by physical processes other than heating or cooking. That claim is unsupportable and counter-scientific, and has not been made by the FCC. [This assertion] is pregnant with the notion that the FCC says**

that Smart Meters are safe with respect to all possible mechanisms which is not the case."

Specifically, "what did the FCC assess", and "what did they not assess"?



The FCC considered only the thermal effects of short term exposure. They did not assess non-thermal effects, and they did nothing to assess long term exposure.

6.4. Smart Meter vs Current Meter

The Respondent makes the statement,

"the undisputed evidence is that the voltage and harmonics introduced by the smart meter are not different than the meter currently at use at Complainants' property, which Complainants want to keep."

The Complainants currently have an Analog Meter that possesses some digital electronics that operate in either a Wake-up or Bubble-up manner. The Respondent has never provided information to the Complainants specifically detailing the operation of our current meter. The most appropriate meter that has been recommended for use with the Complainants is a traditional fully analog electro-mechanical meter. Other customers that have been issued such accommodation simply phone, email, or mail in their meter reading once a month, and require no visit by utility company personnel to obtain that reading. The presence of some digital electronics on Complainants current meter does not make it the equivalent of a Smart Meter operating in a Smart Mesh. The operating parameters, characteristics, and environment are completely different. Ronald Powell PHD, for one, has carried out a detailed assessment of

various classes of electric meters and rated them according to health, privacy, and security risks. In all cases, a Smart Meter in a Smart Mesh is rated worst in all 3 categories across all classes of electric meters in use today. This analysis was supplied as part of Complainants Formal Complaint, and as part of Discovery to the Respondent.

[Respondent's Motion for Summary Judgment, Appendix Tab 5 - Complainants Formal Complaint Supporting Document 05 - "Ranking Electricity Meters for Risk to Health, Privacy, and Cyber Security" by Ronald Powell PHD]

Furthermore, the Respondent in its response to Discovery Interrogatories submitted by the Complainants admits

"Since smart meters are solid state electronic devices and Ferrous meters are electro-magnetic devices, their behavior is different."

[Respondent's Motion for Summary Judgment, Appendix Tab 4 - Respondent's Responses to Set #1 of Discovery Requests - Answer to Complainant Interrogatory 1. q., page 9]

6.5. Duty Cycle

The Respondent makes the assertion that Duquesne Light's meters operate at "very low duty cycles." Yet, they fail to mention that this represents at a minimum 1,000s - 10,000s of pulsed transmissions occurring unceasingly both day and night throughout the day, with the potential for pulsed transmissions as high as 100,000s of times a day. And, their own sample data [Refer to the Table shown on page 28, herein] indicates that the Duty Cycle of individual Smart Meters varies widely. The data that has been presented reflects only hourly data accumulation rates, not the 15 min or less accumulation rates that their Smart Meters are capable of operating at. The specific Duty Cycle of a specific meter on a person's residence is not revealed, nor is it guaranteed that it is low and will remain low. Factors affecting an individual's Duty Cycle and Smart Meter operation include the location of the residence in the Smart Mesh, the operating performance of the other meters in the Mesh, and the "business processes," data accumulation rates, and read schedules being implemented by the Respondent. None of this information is provided to the homeowner. Homeowners are completely in the dark as to what is going on with the Smart Meters on their residences, etc.

6.6. Contribution of Respondent's Smart Meter to the RF environment.

The Respondent asserts

"the contribution of Duquesne Light's smart meter to the RF environment is negligible, smaller even than the RF devices already in Complainants' home."

based on an "assessment" by Respondent expert Benjamin Cotts, PhD., P.E.

This "assessment" is conjecture and pure supposition. Dr. Cotts was provided with information provided to the Respondent by the Complainants in Discovery. This information included a list of the current radiofrequency devices in the Complainants residence.

Complainants supplied the Respondent with a list consisting of two Verizon Samsung Note 3 cellphones, a Verizon FIOS Router, a Dell laptop computer, a custom built desktop computer, a multi-function printer, and an Xbox 360. Dr. Cotts carried out his assessment considering unconstrained use of these devices, not how the Complainants use them and the preventative safety measures that they employ. With the age and chronic conditions of Francis Hriadil, the Note 3 was researched and selected as a safety measure in case something happened. The Note 3 was selected because it has one of the lowest SAR ratings on the market. Further, it is covered with a shielded pouch, and is used only in speaker mode or with an airtube headset. The Xbox 360 is never connected to the Wi-Fi and is used with wired USB controllers, when it is used, which is rarely. The printer, computers, etc. are used on occasion with the Wi-Fi network but USB hardline cords are used to connect these devices whenever possible. Wi-Fi is used only as needed. The Wi-Fi router is completely enclosed in a shielding pouch which allows the router's Wi-Fi function to operate when it is turned on, but reduces its radiation output by 90-95%. And, all of these devices are normally off unless in use. The "assessment" by Dr. Cotts does not reflect any of this, and is simply speculation and guesswork.

So, what is the nature of the new radiation environment being introduced onto the Complainants living environment? The facts with regard to the Respondent's Smart Meter and its deployment are:

- The SK9AMI7 Smart Meter produces 1,000s - 10,000s - 100,000s of pulsed (strobe-like) transmissions on a regular basis throughout the day, which produces RF radiation in all directions.
- The SK9AMI7 Smart Meter uses a Switch-Mode Power Supply (AC/DC switching circuitry) to draw power from the homeowner's electrical line.

This introduces voltage spiking and harmonics in the homeowner's interior electrical wiring, which causes the homeowner's interior electrical wiring to emit pulsed LF/ELF radiation throughout the interior of the homeowner's residence every time it draws power.

- Established science indicates there are many conditions that can affect and influence Radiofrequency (RF) and Low Frequency (LF/ELF) radiation levels in the home environment. No assessment, account, or accommodation is provided by the Respondent for
 - uncertainties about the existing RF environment that exist at a location, such as how much RF exposure already exists at a location.
 - what kind of reflective and re-radiation interior and exterior environments exist at a location. (It is established science that reflections and re-radiation can occur from common building materials ((tile, concrete, stainless steel, glass, ceramics, etc.)) and highly reflective appliances and furnishings that are common in kitchens, etc.)
 - how interior and exterior space is utilized near walls where the Smart Meters are mounted.
 - the specific physical condition(s) of the residents, and all likely visitors to the residence, including but not limited to age, medical condition(s), disabilities, medical implants, relative health, reliance on critical care equipment that may be subject to electronic interference, etc..
 - the location of the Smart Meter on the residence in close proximity to, or in co-location with, other Smart Meters on the same building, such as with connected condominiums (like the Complainant's Property), apartment buildings, etc..
 - unrestrained access to areas of the Property where their Smart Meter(s) are located.

Studies by independent experts have established that all of these factors can significantly increase the RF exposure environment in the home. **[Exhibit 20]**

- Homeowners and residents are not provided with any written notice of the dangers and inherent risks associated with being in close proximity to the Smart Meter on a regular basis.
 - No safety barrier is provided to ensure and maintain the required safe separation distance for all persons, children, animals, etc.
 - Similarly, no warning labels are provided on the Smart Meters related to proximity to the meters RF transmitters.

This was all verified by Respondent's answers to the Complainants Discovery Interrogatories.

And, again, Complainants refer Your Honor to the testimony given before the PA PUC by Andrew A Marino, PHD Biophysics, JD Law, and copied herein, in which he testified that

- Smart Meter energy is unusual because it is about a billion times stronger than the corresponding natural level
- when electromagnetic energy is created at a specific location the laws of physics almost always require that it add to, not cancel, any preexisting electromagnetic energy
- animals and human beings are nonlinear systems and as such can suffer very detrimental effects from prolonged chronic exposure to the RF and LF/ELF emissions created by a Smart Meter
- [the] health risks are heightened in the very young, the very old, and in those with preexisting diseases or disorders.

6.7. Smart Meter Fires

The Respondent asserts

"there is no evidence suggesting that Duquesne Light's smart meters are prone to overheating or have caught fire"

and

"Complainants offer no evidence that Duquesne Light's smart meters actually caused a fire."

The Respondent provided evidence that their meters have been certified as UL 2735 compliant.

Complainants reviewed UL 2735 and this is what Complainants have learned.

- UL's official statement on the online certificate 1POCZ.E470764 - Meters, Electric Utility

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product. **[Exhibit 21]**

- UL 2735 is still not part of the Nationally Recognized Testing Laboratory (NRTL) program.

Complainants concede that this is one step in the right direction to improve safety; but, it is not the equivalent of a full UL Mark, which still does not appear on the SK9AMI7 OpenWay Smart Meter being deployed by the Respondent. There are additional safety features that are needed and should be incorporated.

And, that does not negate the fact the the SK9AMI7 Smart Meter has been involved in fires. Complainants have cited, as an example, a recent incident that occurred right here in Pennsylvania and was reported in the press. On January 20, 2017, a power outage occurred in Brookville Borough in Jefferson County. The cause was a power surge. The Associated Press reported

"The 911 calls started pouring in just after noon in the tiny western Pennsylvania town of Brookville. The electrical meter is on fire. The house siding is burning. My power strip is smoking. The computer is fried. The carpeting is singed. Our light bulb exploded.

A power company says a failed power line component was to blame for an electrical surge Jan. 20 in Brookville, population 4,000. When it was over, 500 to 1,000 residents were affected, said Tracy Zents, the director of Jefferson County's Department of Emergency Services.

"I've been doing this a little over 30 years, and this is definitely a first for me," Zents said. "We were fortunate that nobody was hurt."

The volume of calls quickly overwhelmed the local volunteer fire department 70 miles northeast of Pittsburgh, which had to call three other departments for help, Zents said.

Even the police department wasn't spared. The surge tripped the department's main office radio, so the initial emergency calls were missed, said Chief Jason Brown."

It was "a first" because the Borough never had Digital Smart Meters before. The description of the burning meters, the burning siding, and the property damage that occurred, along with pictures, can be found in the news reports that covered the occurrence. Two have been provided in **[Exhibit 22]** Brookville Borough area is "serviced" by FirstEnergy which utilizes the same Centron/Itron SK9AMI7 Digital Smart Meter **[Exhibit 22]** in a Smart Mesh currently being deployed in our area by Duquesne Light. And, this instance of Smart Meter fires from a voltage/power surge in Brookville Borough is not just an isolated case. There have been many others across the world. So, UL 2735 does not negate or eliminate this power surge vulnerability that is an inherent flaw in a Smart Meter, and it does not match the power surge resistance inherent in the traditional electro-mechanical analog meter. So, it is a material fact that the Itron SK9AMI7, the specific meter being deployed by the Respondent, has been

involved in fires in PA.

6.8. Respondent Installation Protocols and Safety

The Respondent asserts,

“... Complainants argue that Duquesne Light’s manner of installing smart meters is unsafe because the Company does not use certified electricians and because Francis Hriadil, based on a few installations he watched in his neighborhood, believes that the Company values speed over safety.”

Respondent Duquesne Light, stated in its Smart Meter Technology installation plan, the “Duquesne Light Company Final Smart Meter Technology Procurement and Installation Plan” Docket Nos. P-2012- M-2009-2123948, that it structured its SK9AMI7 Smart Meter deployment in the same manner as several EDCs in California, Nevada, and Illinois. These EDCs contract out the Smart Meter installation to companies, such as Wellington Power Corporation used by the Respondent here in Pennsylvania. Typically, these “installers” receive only a few weeks of training before being dispatched into the field. It was noted in Complainants previous filings that faulty installations have been suspected causes in several cases where Smart Meters caused fires and explosions.

A former employee of a Smart Meter installing contractor Wellington Energy of California turned whistleblower, making the statement,

“There was a lot of pressure on workers to install as many meters as possible in a day in order to earn bonuses.”

Based this statement, and on the speed of the installations observed by Francis Hriadil in his neighborhood, Complainants submitted questions to the Respondent in an attempt to discover the nature and specifics of their “meter installers” program and protocols, and the truthfulness of the existence of a bonus program for speedy deployment. Complainants requested:

- the length and content of the training program provided to their “meter installers”
- the specific professional certifications that are awarded to trainees who complete the training program and are put into field to install their Smart Meters
- the specific installation protocols and procedures that are followed to ensure the safety of its customers/homeowners

- confirmation of the existence of a quota/bonus program for installers based on numbers and speed of deployment

The Respondent essentially only responded that their installers pass a written test, carry out a "routine" visual inspection of the interior of the meter box at the residence, and install the meter in what is called a "hot install", where the meters are just simply and quickly changed out without turning off power to the residence. The Respondent objected to the questions and refused to answer them fully. The Respondent refused to specify the length and content of their training program, would not confirm or identify any professional certification that is bestowed on their installers when they pass the training program, and refused to confirm or deny the existence of a quota/bonus program. The Respondent objected and refused to answer. The Complainants filed a *Motion to Compel with Your Honor to obtain the answers to these important questions*. But, Your Honor ruled that the Respondent did not have to answer.

The FCC Grant of Equipment Authorization for the Respondent's SK9AMI7 Smart Meter, specifically states, "This device must be professionally installed." Since the Respondent has not validated that its "meter installers" are professionals, such as certified electricians, Complainants can only surmise that they are not, and that this aspect of the FCC Grant of Equipment Authorization is also not in compliance. Also, the Respondent stated that it keeps no records of the meter box conditions its installers find in the field. So, there is no verification that nothing other than a quick cursory inspection is being carried out.

Because of this, and the fact that the Respondent was not compelled to answer all of the questions submitted by the Complainants, as part of Discovery, regarding the specifics of the deployment program, there are many unresolved issues and questions that still remain unanswered, and that is troubling.

6.9. Hacking and Security of the Smart Meter

The Respondent asserts,

"Complainants offer no evidence that Duquesne Light's smart meters actually ... have been hacked."

The Complainants have no direct observability into the specifics of the security measures employed by the Respondent with its Smart Meters, Smart Mesh, and its data handling, storage, and processing. It is government, industry, and security experts who have raised concerns about the inherent vulnerabilities present in the Smart Grid technology.

The Respondent asserts that their Smart Meter and Smart Mesh wireless network is "secure". This is another assertion that is easily and routinely made; but, it cannot be substantiated even to a reasonable degree. Anyone that has even a peripheral understanding of networks, understands how dubious this kind of claim really is. **One only needs to refer to the frequent reports by industry and the press of many and increasing occurrences of breaches in "secure" networks, all of which use industry-recognized cybersecurity measures.**

And, when breaches occur, the occurrence is kept secret, and the public and clients involved may not learn about the compromise for months or years later, if then. For example, the industry insider journal CRN reported **significant data breaches** in 2016 of Centene, the Federal Bureau of Investigation (FBI), Department of Homeland Security (DHS), Seagate, the Internal Revenue Service (IRS), the Federal Deposit Insurance Corporation (FDIC), etc., declaring that "no one is immune." In Dec 2016, Time magazine ran a feature on the hack of 1 billion Yahoo users, declaring that, "It's a nightmare for the company and for a billion of its users." In Dec 2017, media industry insider news service CNET reported **significant data breaches and hacks** of Equifax (143 million Americans), Cloudbleed, the French Election, the widespread WannaCry ransomware attacks, FedEx, Merck, Maersk, HBO, Uber, etc. And, the data breach of Yahoo in 2016 was revealed to involve 3 billion customers, not the 1 billion that was originally reported. Redmond Channel Partner, a Microsoft industry journal, discussed the appearance of a new category of attacks called "KRACK," for "key reinstallation attacks." And,

there are many more such occurrences - too many to be included here; but, these reports are frequent and are part of the public record. The material fact is that **all of these hacked companies and agencies use industry-recognized cybersecurity measures.**

Industry analyst and smart grid expert, Bob Lackhart, with Pike Research, has stated openly that smart meters remain one of the weakest links in the smart grid security chain.

"It would be naive to think that smart meters will not be successfully attacked. They will be. ... In fact, smart meters represent a worst-case scenario in terms of security: the devices lack sufficient power to execute strong security software; they are placed in physically non-secure locations; and they are installed in volumes..." [Exhibit 23]

In 2015, the U.S. government released a warning that **sensitive computer systems that maintain the electrical grid are increasingly being attacked**, according to a Congressional Research Service (CRS) report entitled, "Cybersecurity for Power Systems," was not initially made public. In 2017, the US Energy Department put out a warning that **the country's electrical grid is in "imminent danger" of cyberattack**. This came a month after blackouts caused by hacks ran throughout Ukraine. A former Director of the CIA, James Woolsey, has gone on public record stating,

"What they're doing now, they're constructing what they call a smart grid. And they're going to make it easier for you and me to call our homes on our cell phone and turn down our air conditioning on a hot afternoon if we're not there. Great. But, that may well mean that a hacker in Shanghai with his cell phone can do the same thing or worse. And, a so-called smart grid that is as vulnerable as what we've got is not smart at all. It's a really, really stupid grid."

One does not have to be a credentialed security expert to realize that there is a serious problem here. This "Smart Grid" program, with its Smart Meters, is essentially taking an electrical infrastructure that had many inherent built-in physical safeguards that made hacking physically impossible to carry out system-wide, due primarily to the use of an Analog Meter based infrastructure, and is creating an electrical distribution network based on "Smart Meters" that is vulnerable to hacking at any relay or entry point along the electrical network. The EDC's Power Generation Facilities, the EDC's Power Distribution Facilities, the EDC's Data

Storage Facilities, the EDC's Data Analysis Facilities, the EDC's Cellular WWAN, the EDC's Cell Relays, all the way down to the individual EDC Smart Meters on each and every residence and building - all are now vulnerable to hacking. Instead of a system that has only a limited number of vulnerable points, we will now have a system that is vulnerable from top to bottom, anywhere and everywhere, and at all levels. This is not mere conjecture on the part of the Complainants, it is an acknowledgement of the reality and inherent insecurity of the situation. The word "secure" cannot reasonably be applied to this type of network grid, and it cannot be realistically guaranteed. Hacking is inevitable. Many experts more knowledgeable than the Complainants have sounded warnings about this situation. Nothing that the Respondent provided in Discovery does anything to mitigate this major security vulnerability.

6.10. Perfect vs Adequate, Efficient, Safe, and Reasonable Service

Finally, the Respondent asserts that the Complainants are

"... asking to Duquesne Light to provide perfect service. Duquesne Light, however, is not required by the Code to provide perfect or flawless service."

In Discovery, Complainants asked the Respondent what guarantees does the Respondent provide that its claims that its wireless Smart Meter system is harmless, safe, and reliable; the manner of installing its Smart Meters is safe; its smart meter system is secure; its Smart Meter system will not damage or negatively affect our Property; and our personal data collected by its Smart Meter system will remain secure and private. Complainant also asked what written warranty does the Respondent provide to that effect. A guarantee and warranty of some kind is normally provided in any purchase in the market place. The Respondent's response essentially was and remains that it is operating under the authority and auspices of the PA Public Utility Commission, and that no guarantee or warranty is provided for anything.

The Complainants also asked how many incidents have occurred, and how many customers have filed concerns and complaints with the Respondent Duquesne Light, concerning its Smart Meters with regards to, but not limited to health, safety, reliability, fires,

privacy, security, electrical and device interference, increased and increasing electrical bills, and over-billing charges. The Respondent refused to answer this question. Complainants filed a motion with Your Honor to compel the Respondent to answer; but Your Honor ruled that the Respondent did not have to answer. So, the information related to these questions remains secret and unprovided by the Respondent. None of this generally becomes public knowledge; but, the Complainants were able to find one Pittsburgh KDKA News report entitled, "Smart Meters Pose Ongoing Issues for Duquesne Light Customers." [Exhibit 24]

Contrary to the Respondent's assertion that Complainants are demanding "perfect" or "flawless" service, the Complainants respectfully submit that this is not the case. But, Complainants are seriously raising the issue of what is considered reasonable.

Is it reasonable to deploy a system and technology that does not fulfill its claimed benefits in cost, in rate changes, and in energy savings? In 2014, in a written submission filed with the Massachusetts PUC, Northeast Utilities stated that [Exhibit 25]

- *"There is no rational basis for ... mandated implementation of [smart meters]."*
- *"There is no cost justification that can support the implementation of [smart meters]."*
- *"Mandating [smart meters] creates an intractable obstacle to grid modernization."*
- *"An Advanced Metering System is not a 'basic technology platform' for grid modernization, and is not needed to realize 'all of the benefits of grid modernization.'"*
- *"The cost remains unjustified by the benefits."*

The Attorneys General of at least 3 states have come out and opposed Wireless Smart Meters because the costs outweigh any claimed financial benefits to the customer.

- The Attorney General of Illinois, Lisa Madigan, stated the following:
"The utilities want to experiment with expensive and unproven smart grid technology, yet all the risk for this experiment will lie with consumers."
"Consumers don't need to be forced to pay billions for so-called smart technology to know how to reduce their utility bills. We know to turn down the heat or air conditioning and shut off the lights. The utilities have shown no evidence of billions of dollars in benefits to consumers from these new meters, but they have shown they know how to profit. I think the only real question is: How dumb do they think we are?"

- The Attorney General of Connecticut, George Jepsen, concluded the following:
*"Connecticut Light & Power Co.'s plan to replace existing electric meters with advanced technology [that is, Wireless Smart Meters] would be **very expensive and would not save enough electricity for its 1.2 million customers to justify the expense.**"*
"The pilot results showed no beneficial impact on total energy usage. And, the savings that were seen in the pilot were limited to certain types of customers and would be far outweighed by the cost of installing the new meter systems."
- The Attorney General of Michigan, Bill Schuette, stated the following:
*"A net economic benefit to electric utility ratepayers from Detroit Edison's and Consumers smart meter programs has yet to be established. In the absence of such demonstrated benefit, the Attorney General has opposed, and will oppose any Commission action that **unjustly and unreasonably imposes the costs of such programs upon ratepayers.**"*

In testimony that Duquesne Light Company gave before the PUC on August 14, 2009, concerning Duquesne Light's Smart Meter Procurement and Installation Plan, Docket No. M-2009-2123948 Exhibit C, for its deployment of the SK9AMI7 Smart Meter, the following question was asked of Duquesne Light Technology Director Ruth Ann DeLost by a member of the PUC: **[Exhibit 26]**

Line 22 Q. Does Duquesne expect to achieve significant cost savings with the
 Line 23 implementation of Smart Meters?

Page 8

Line 1 A. No. ...

Page 9

In their Installation Plan, the Respondent further admits that "Duquesne Light has only received a few requests for a smart meter."

[Respondent's Motion for Summary Judgment, Appendix Tab 2 - Duquesne Light Company Final Smart Meter Technology Procurement and Installation Plan, Docket Nos. P-2012, M-2009-2123948, June 29, 2012, 2.b. Customer Requests, page 36.]

In testimony given before the British Columbia Utilities Commission in the Matter of the Utilities Commission Act R.S.B.C. 1996, Chapter 473 And Re: FortisBC Energy Inc. Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project; Kelowna, B.C.; March 11, 2013; the following question was asked and answered about

its deployment of the SK9AMI7 Smart Meter in its Smart Mesh. [Exhibit 27]

Note: (Mr. WARREN is Mr. MARK RICHARD WARREN, Affirmed representative of FortisBC Inc., an EDC, testifying before the Utilities Commission in Kelowna, B.C.)

FortisBC Inc. CPCN for AMI
Volume 7, March 11, 2013

Page: 1334

12 MR. FLYNN: Q: In a typical – well, let's discuss
13 mod appliances. How many smart appliances do you envision
14 each home having?
15 MR. WARREN: A: So, I think we talked about this on a
16 previous day, that we're estimating that over time
17 that we're hoping that 30 percent of – or our best
18 guess is that 30 percent of homes will have an in-home
19 display.

What Mr. WARREN is admitting here is that their best hope is that maybe 30 percent of homes would even consider using this "empowerment". And, that number is clearly pulled right out of the air. No justification is ever given for even that low of a number.

In investigative reports carried out by consumers advocacy publications such as Consumers Digest, it is indicated that these Smart Meter programs represent little more than a **"boondoggle being foisted on consumers by politically influential companies"** who are looking to make huge profits. And, they found that the **negative consequences outweigh any claimed benefits** in cost, in rate changes, and in energy savings.

Is it reasonable to replace mature, robust device, that has a demonstrated service life of more than 30 - 40 yrs with an immature, more fragile device, in which industry experts predict will have a service life of only 5 - 7 yrs? On October 21, 2015, in testimony in Congress before the Committee on Science, Space, and Technology, Mr. Bennett Gaines, Senior Vice President, Corporates Services, Chief Information Officer, FirstEnergy Service Company, which is deploying the same SK9AMI7 Smart Meter as the Respondent in a Smart Mesh here in Pennsylvania, stated for the record that

"These devices are now computers, and so they have to be maintained. They don't have the life of an existing [analog] meter which is 20 to 30 years. These devices have a life of between 5 to 7 years."

Is it reasonable to replace an inexpensive, cost effective device that costs approximately \$35 to replace with one that costs approximately \$200 - \$300 to replace?

Is it reasonable to replace a device that is inherently private and secure with one that industry and government experts, no less than the previous head of the FBI have publically stated is insecure (in that it complicates and decreases security), hackable, compromises privacy, and can be surreptitiously monitored?

Is it reasonable to replace a proven device that is inherently environmentally benign with one that emits harmful RF radiation and induces harmful LF/ELF radiation, that pulses like an invisible strobe 1000s - 10000s - 100,000s of times unendingly and relentlessly throughout the day, and that the World Health Organization (WHO) categorizes no differently than lead, engine exhaust, or DDT?

Is it reasonable to replace a device that has been proven to have no detrimental effect on the health of human beings with a device that causes RF and LF/ELF radiation exposure that medical and health officials, and others, including the WHO, states is harmful to human beings, and one that the PA PUC has recognized in recent rulings harms people?

Is it reasonable to install such a device irrespective of residents age, physical conditions, ailments, and living circumstances, which make them particularly vulnerable, and is against the medical advice of their doctors, and provide no accommodation for those conditions or circumstances?

Is it reasonable or even legal to install a device and in a manner that violates aspects of the FCC Grant of Equipment Authorization?

Is any of this reasonable, and in complete compliance with the letter and intent of the PA Public Utility Code including but not limited to

66 Pa. C.S. § 1501

Every public utility shall furnish and maintain adequate, efficient, safe, and reasonable service and facilities, ... as shall be necessary or proper for the accommodation, convenience, and safety of its patrons, ...

52 Pa. Code § 57.194.

(a) An EDC shall furnish and maintain adequate, efficient, safe and reasonable service and facilities, and shall make repairs, changes, alterations, substitutions, extensions and improvements in or to the service and facilities necessary or proper for the accommodation, convenience and safety of its patrons, employees and the public.

Can a program of this nature be logically, ethically, morally, or legally, be sanctioned and justified to be truly in the public interest? The Complainants are not seeking perfection here. The Complainants are simply appealing for common sense, logic, and some measure of justice and compassion in our request to obtain accommodation and relief for our own protection, safety, and well-being.

The Respondent cries that the Complainants are trying to impose an unrealistic and unfair standard of perfection on it, its Smart Meter, and its program, yet they turn right around and argue to impose just such an unattainable standard of perfection when it comes to the Complainants, our backgrounds and knowledge, our experts, our vetted evidence, etc., all comprising the foundational facts forming a cognizable basis for the Complainants Formal Complaint and our reasonable request for relief. The Respondent does not accept, and will never accept, any evidence as valid that disagrees with their vested industry view. To argue that this is what must happen is a standard of perfection that is not possible to obtain.

7. Respondent's Motion for Summary Judgment:

II. STATEMENT OF THE CASE (pages 7 - 8 of Respondent's Motion)

D. Duquesne Light installs its meters in a safe manner.

Complainants Response:

This was addressed in Section 6.8. (pages 40 - 41, herein).

8. Respondent's Motion for Summary Judgment:

II. STATEMENT OF THE CASE (page 7 of Respondent's Motion)

C. Duquesne Light employs various industry-recognized cybersecurity measures to protect its assets, including its smart meter network, and customer information.

Complainants Response:

This was addressed in Section 6.9. (pages 41 - 44, herein).

9. Respondent's Motion for Summary Judgment:

II. STATEMENT OF THE CASE (pages 4 - 7 of Respondent's Motion)

B. The Commission approved Duquesne Light's smart meter implementation plan, and the smart meters being deployed by Duquesne Light comply with the applicable FCC regulations and ANSI Standards and are UL certified.

IV. LAW & ARGUMENT (pages 11 - 12 of Respondent's Motion)

B. It is uncontested that Duquesne Light's smart meters comply with all applicable industry and regulatory standards.

Complainants Response:

This was addressed in;

- Section 3. (pages 4 - 19, herein)
- Section 4. (pages 19 - 23, herein)
- Section 6. (pages 26 - 49, herein)

Note: Respondent referenced their November 11, 2016 filing entitled "Answer and New Matter to Formal Complaint." Complainants responded comprehensively and completely to the Respondent's filing in its "Response to Respondent's Answer and New Matter to Formal Complaint", filed and dated January 9, 2017.

10. Respondent's Motion for Summary Judgment:

II. STATEMENT OF THE CASE (page 3 of Respondent's Motion)

A. Pennsylvania law requires that Duquesne Light install smart meters for all of its Customers.

II. STATEMENT OF THE CASE (pages 4 - 7 of Respondent's Motion)

B. The Commission approved Duquesne Light's smart meter implementation plan, and the smart meters being deployed by Duquesne Light comply with the applicable FCC regulations and ANSI Standards and are UL certified.

Complainants Response:

First, the Respondent referenced their November 11, 2016 filing entitled "Answer and New Matter to Formal Complaint." Complainants responded comprehensively and completely

to the Respondent's filing in its "Response to Respondent's Answer and New Matter to Formal Complaint", filed and dated January 9, 2017.

The Respondent makes reference to what "Pennsylvania law requires" with regards to its Smart Meter deployment.

Act 129, as signed into law in 2008 by Governor Rendell, explicitly states:

"Section § 2807 of the Public Utility Code provides:

- (f) Smart meter technology and time of use rates.
 - (2) Electric distribution companies shall furnish smart meter technology as follows:
 - (i) **Upon request from a customer that agrees to pay the cost of the smart meter at the time of the request. (emphasis added)**
 - (ii) In new building construction.
 - (iii) In accordance with a depreciation schedule not to exceed 15 years.

66 Pa. C.S. § 2807(f)(2)."

66 Pa. C.S. § 2807(f)(2) has as its first and foremost tenet, § 2807 (f) (2) (i), that EDCs shall furnish smart meter technology "upon request from a customer that agrees to pay the cost of the smart meter at the time of the request". This is a voluntary opt-in provision which explicitly states that **customers may choose to join the Smart Meter program if they so desire**, and if they do request a Smart Meter, the EDCs cannot deny those requests. It is a material fact that **the Complainants have never requested an opt-in to this Smart Meter program. We have never requested a Smart Meter. And, we have never agreed to pay the cost of a Smart Meter.**

The Respondent repeatedly makes reference to there being no "opt-out" provision in Act 129. This however does not negate the material fact that there is no need to "opt-out" of a program that one has never "opted-into." Furthermore, any act of the Legislature or Implementation Order by the Commission that creates a "universal mandate" requiring the installation of a Smart Meter that is inadequate, inefficient, harmful, unsafe, and/or

unreasonable, and does not provide for the accommodation, convenience and safety of its patrons and the public, is in direct violation of Pa. Codes. 66 Pa. C.S. § 1501 and 52 Pa. Code § 57.194, at a minimum. Any act of the Legislature or Implementation Order by the Commission that introduces a carcinogenic pollutant into the natural living environment of its residents is a violation of Article I, § 27 of the Constitution of the Commonwealth of Pennsylvania.

Concerning the language of Act 129 and 66 Pa. C.S. § 2807(f)(2) and the intent of the Legislature, Complainants wish to point out the material fact that, as the term “opt-out” does not appear, so too the terms “mandated”, “mandatory”, “100% of all customers”, “all existing meters without exception”, or words to that effect do not appear as well. This language simply is not there. Thus, the same logic used to justify that an “opt-out” doesn’t exist, likewise justifies that a “universal mandate” doesn’t exist either. This is made even more evident when one reviews the entire legislative record of Act 129 and sees that all earlier versions of the Bill contained language indicating an explicit mandate, but that this language was removed:

House Bill 2200 PN 3218 , Regular Session 2007-2008, (20080H2200B3218, page 16):

stipulated “ONE HUNDRED PERCENT OF ITS CUSTOMERS”

House Bill 2200 PN 3233, (20080H2200B3233, page 16):

stipulated “One hundred percent of its customers”

House Bill 2200 was amended, (20080H2200B4429, pages 37 and 38):

And stipulated replacement “OF EXISTING METERS”

The proposed language of these early versions was very clear in the intent, and that intent was for universal deployment.

However, Legislators such as Representative Benninghoff and others, raised concerns and objections to this language. Representative Benninghoff, for one, made the following specific statements and comments for the public record on page 395 of the House Journal, Feb. 11, 2008:

"... do we want a statewide mandate? Do we want the government telling you that you have to have a meter put in your property?"

"... there is no other State in the Commonwealth that has done this in the past, ..."

"...if this technology is so accurate and so helpful and such a cost reduction in savings for the consumer, why is it not being used unilaterally across this great nation?"

(It is noted and it remains a material fact, as Complainants have pointed out in our previous filings, that there is **no Federal mandate** requiring the deployment of Smart Meter technology across the country. There is no Federal law mandating that the general public, or individual consumers, must join a Smart Grid program. The only requirement is that the consumer must be offered a Smart Meter which they can choose to accept or refuse. Or, the consumer can request a Smart Meter and volunteer to opt-in to the Smart Grid.)

As a result of these objections, any language indicating an **"explicit mandate"** was **completely stripped from the final version of House Bill 2200**, and it was passed and signed as Act 129. Furthermore, upon passage of Act 129, the General Assembly documented quite clearly in the Legislative Record, in Senate Journal Pages 2626-2631, Oct. 8, 2008, what its intention and direction was. It is re-iterated here, as it was in Complainants January 27, 2017 Notice to Plead New Matter #2, January 9, 2017 Response to Respondent's Answer and New Matter, and November 29, 2016 Response to Respondent's Preliminary Objections,

- Senator Tomlinson states with regard to House Bill No. 2200 as amended by the Senate, and subsequently signed by Governor Rendell as Act 129, that
"It is not mandated, but it allows for ... anyone who wants to purchase a smart meter which they feel will help them manage their electric load better."
- Senator Boscola states,
"We also made sure that smart meters would not be mandated for every single ratepayer. Not only is that a smarter approach to smart meter deployment, but it will also save electric customers hundreds of millions of dollars paying for something that will not provide a real benefit in their own households."
- Senator Fumo states,
"In addition, we did not mandate smart meters, but we made them optional."

These declarations by the legislators who passed Act 129 are unequivocal, unambiguous, and incontrovertible. This documented historical legislative record confirms the true intent of the

General Assembly that the deployment be optional and voluntary.

The Commission subsequently created its PA Smart Meter Procurement and Installation Implementation Order stating its “belief” as to what the intention of the Legislature was, and Complainants continue to aver that this “belief” and Implementation Order is in error, as is shown by the Legislative record. The Complainants also aver that the Commission has the authority to correct this error, and also under its public safety mandate as defined in the Pennsylvania Public Utility Code, has the authority to grant waivers for individuals, or classes of individuals, facing potential risk or harm irrespective of how the language of Act 129 is interpreted. Complainants have filed our Formal Complaint with the belief that the PA PUC will recognize that doing this is in the best interest of residents of Pennsylvania and the general public, who it exists to serve and protect.

Furthermore, and other issues aside, the language of Act 129 clearly defines a goal and timetable of 15 years, that is $2008 + 15 \text{ years} = 2023$. The material fact is that it is only 2018, and 2023 is still many years away. In its “Smart Meter Q&A” document, which is available online on the PA PUC website, the Commission officially states that

“Smart meters are being installed in new construction and at individual customers’ request, with the goal of all customers utilizing smart meters by 2023.” [Exhibit 28]

Reference: [http://www.puc.pa.gov/General/consumer_ed/pdf/13_Smart%20Meters.pdf]

Again, the Complainants re-iterate that it is only 2018, and 2023 is still years away. And, no matter how the language of Act 129 is interpreted, it also remains a material fact that the **Complainants have never agreed to the immediate and accelerated installation of the Respondent’s Smart Meter on their residence, well before the Act 129 stipulated timetable of 2023.** Until that date is reached, the Complainants respectfully submit that we are not in violation of any provision of the statute.

The Respondent, in successive installation plans, has pushed for, and continues to push for, more accelerated deployment of its Smart Meters and Smart Mesh. First, it wanted to

deploy by 2020. Now, it is striving at “break-neck speed” to deploy even more rapidly, by the end of 2018. So, while the Respondent “assures” the Commission and residents that its first priority is safety, there is a clear and concerted effort on its part to deploy its devices as quickly as possible. And, the Complainants wish to remind Your Honor, that in Discovery, when Complainants asked if there was a bonus incentive program with the Respondent’s meter installers based on how many and how quickly they changed out its meters, the Respondent objected and was not subsequently compelled to answer. The fact is that the Respondent never answered the question, and has never denied the existence of that type of bonus program.

As stated earlier, in their Installation Plan, the Respondent admits that “Duquesne Light has only received a few requests for a smart meter.”

[Respondent’s Motion for Summary Judgment, Appendix Tab 2 - Duquesne Light Company Final Smart Meter Technology Procurement and Installation Plan, Docket Nos. P-2012, M-2009-2123948, June 29, 2012, 2.b. Customer Requests, page 36.]

So, while there is no overriding demand by residents to get this device, the Respondent is proceeding rapidly to finish deployment well before the more measured and prolonged schedule stipulated in Act 129.

The Commission has some discretionary authority to issue interpretive rules and Implementation Orders. But, this authority is not unconstrained. The Commission must adhere to very strict guidelines and limitations.

The Supreme Court of Pennsylvania has ruled that

for an “interpretative rule” to be viable, said “interpretive rule”

“must genuinely track the meaning of the underlying statute, rather than establish an extrinsic substantive standard.”

See, Borough of Pottstown v. Pennsylvania Municipal Retirement Board, 712 A.2d 741(Pa. 1998).

and

“...Implementation Orders are not adjudications, they should not be construed to have created “binding norms” that have the force of law. If they are so interpreted, then the Implementation Orders would be illegal, because they are

in the nature of unpromulgated regulation.”

See, e.g., Pa. Human Relations Commission v. Norristown Area School District, 374 A.2d 671, 679 (Pa. 1977), *Hardiman v. Commonwealth, Department of Public Welfare*, 550 A.2d 590 (Pa. Comwlth. 1988).

As such, any interpretation of Act 129 that is contrary to and conflicts with the language and stated intent of the Legislature, as documented in the House Journal and Legislative Record, and the timetable of 2023 stipulated in the statute, and the official policy statement on the PA PUC website, the Complainants respectfully submit would constitute the establishment of an “extrinsic substantive standard” and “binding norm”, in violation of rulings of the Supreme Court of Pennsylvania.

11. Respondent's Motion for Summary Judgment:

IV. LAW & ARGUMENT (page 10 of Respondent's Motion)

A. Installing a smart meter at Complainants' residence does not violate the Code.

Complainants Response:

The Complainants previous filings with the Commission and the Respondent which are listed in

- Section 2. (pages 3 - 4 , herein),

and the material specifically discussed and presented in:

- Section 3. (pages 4 - 19, herein)
- Section 4. (pages 19 - 23, herein)
- Section 6. (pages 26 - 49, herein)

and the additional foundational facts and evidence, that there was insufficient time to discuss herein but were served to the Respondent in Discovery according to Commission requirements, constitute a preponderance of admissible evidence that the installation of the Respondent's SK9AMI7 OpenWay Smart Meter on the Complainants residence, at a minimum, violates:

- 66 Pa. C.S. § 1501 of the Public Utility Code,
- 52 Pa. Code § 57.194.

- Article I, Section 27 of the Constitution of the Commonwealth of Pennsylvania.
- The Complainants constitutional liberty interest in personal bodily integrity that is protected by the 14th Amendment of the US Constitution.

In addition, Complainants add that the justification given for installation of Respondent's Smart Meter in its Smart Mesh Network is that it is being implemented "for the public good" under the authority and auspices of the PA Public Utility Commission. This technology utilizes signal hopping from one person's home or business to another, turning the owner's property into a communication "relay station" for the utility, regardless of the property rights and desires of the property owner. So, the Complainants are being changed, in principle, from an end-user of a utility service to an essential hub component in the Respondent's communication network. This "imposed use" of private property for "the public good" under the authority of a government agency is providing economic benefit to the Respondent. It deprives residents safe access and use of part of their property, because of the harmful pulsed RF radiation that is emitted, without accommodation and just compensation for the property owner and residents. In principle, this is a violation of the inalienable private property rights of the property owner which is protected under the 5th Amendment of the US Constitution.

So, in addition to Code violations, there are violations of inalienable rights protected by the US and Pennsylvania Constitutions, only two of which have been mentioned briefly here in Complainants response to the Respondent's Motion.

12. Respondent's Motion for Summary Judgment:

IV. LAW & ARGUMENT (pages 20 - 21 of Respondent's Motion)

E.' The Commonwealth Court's Romeo decision does not allow Complainants to evade summary judgment where they marshaled no evidence in support of their claims.

Complainants Response:

Complainants have responded in full and in detail to Respondent's Motion and aver that we have marshalled sufficient foundational facts and admissible evidence to support our claims and Formal Complainant.

Complainants have submitted a number of filings to the Commission:

- Response to Respondent's Answer and New Matter to Formal Complaint, filed and dated January 9, 2017
- Notice to Plead New Matter (#1), filed and dated January 24, 2017
- Notice to Plead New Matter #2, filed and dated January 27, 2017
- Notice to Plead New Matter #3, filed and dated February 3, 2017
- Notice to Plead New Matter #4, filed and dated February 14, 2017

Complainants filed a Motion for Summary Judgment against the Respondent, and in our behalf, in each of these Responses and Pleadings. The Respondent specifically failed to respond to the material facts that were presented, stating that it was not required to respond in the cases of New Matters (#1) and #2, and failed to respond at all to New Matters #3 and #4. Even though the Respondent did not respond to these New Matters, and the material facts provided, therein, and our requests for Summary Judgment against the Respondent could have been, and we respectfully submit should have been, granted at that time, it was ruled by Your Honor that a Hearing should be held.

13. The Complainants respectfully aver that the utility industry, including the Respondent Duquesne Light Company, have oversold the cost-effectiveness, energy savings, negligible environmental impact, safety, security, privacy, harmlessness, and reasonableness of this wireless end-point metering technology to the government of PA and the Commissioners of the PA PUC. The financial, health, and environmental consequences and burden of this program is something that the residents of Pennsylvania rightly should not have to bear,

The officially stated mission of the Public Utility Commission, as specified in its Mission Statement which is documented on the Commission's internet website, is to:

- **balance the needs of consumers and utilities;**
- **ensure safe and reliability utility service at reasonable rates;**
- **protect the public interest;**
- **educate consumers to make independent and informed utility choices;**
- further economic development;
- and, foster new technologies and competitive markets in an **environmentally sound manner.**

(emphasis added)

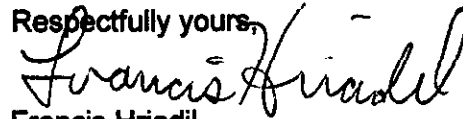
As such, it is the Commission's fundamental duty, as a public service governmental agency operating under the United States and Pennsylvania constitutions and the Pennsylvania Utility Code, to safeguard the well-being of all residents of Pennsylvania regardless of age, sex, race, religion, condition, and circumstance.

Complainants aver that we have adequately addressed each of the Respondent's points argued in its Motion for Summary Judgment; that we have established that our Formal Complaint and claim remains valid and cognizable, has merit, and retains its legal sufficiency; that we have marshalled sufficient foundational facts and evidence that this is a matter that is of detrimental personal and physical consequence to the Complainants and one that is in the public interest; and finally that we have established that the Respondent has no basis to ask for our complaint to be dismissed and our requested accommodation be denied to relieve us from a device that we never requested or agreed to pay for, that emits pulsed radiation that both elderly Complainants and various relatives and friends who visit their residence are more susceptible to suffer harm from, that Francis Hriadil's doctor specifically recommends that he avoid due to his chronic conditions, that the Commission has already ruled has harmed people, and that violates not only aspects of the Pa. Code but also infringes on a number of rights, privileges, immunities, and protections afforded us as citizens of the United States and residents of the Commonwealth of Pennsylvania.

WHEREFORE, in light of these circumstances, Complainants Michele Hriadil and Francis Hriadil respectfully request that the Respondent's Motion for Summary Judgment be denied.

Complainant's Certificate of Service has been filed with the Commission's Secretary, in accordance with Commission Regulations.

Respectfully yours,

A handwritten signature in black ink that reads "Francis Hriadil". The signature is written in a cursive style with a large, stylized "F" and "H".

Francis Hriadil
(412) 779-3314
331 Shady Ridge Drive
Monroeville, PA 15146
July 6, 2018

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

**Michele Hriadil and
Francis Hriadil,**

Complainant,

vs.

DUQUESNE LIGHT COMPANY,

Respondent.

No: C-2016-2571726

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SECRETARY'S BUREAU**

**COMPLAINANTS EXHIBITS
for
RESPONSE TO
RESPONDENT'S MOTION FOR SUMMARY JUDGMENT**

28 Exhibits

July 6, 2018

Filed by Michele and Francis Hriadil

**hriadil@attglobal.net
(412) 779-3314
331 Shady Ridge Drive
Monroeville, PA 15146**

EXHIBIT 01

Background

Ronald M Powell, PHD (retired)

Retired U.S. Government scientist (Ph.D., Applied Physics, Harvard University, 1975).

During Government career, worked for the Executive Office of the President, the National Science Foundation, and the National Institute of Standards and Technology.

For these organizations, respectively, addressed Federal R&D program evaluation, energy policy research, and measurement development in support of the electronics and electrical-equipment industries and the biomedical research community.

Currently active with other scientists and with doctors around the nation on the impact of the environment - including the radiofrequency environment - on human health..

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{ <http://www.sammiham.com/vitae.shtm> }

Samuel P. Milham, MD, MPH Curriculum Vitae

Birth Date: May 12, 1932

Education Union College, Schenectady, New York, September

Experience 1950-June 1954, B.S. Sigma Xi, Fuller Chemistry Prize

New York State Medical Scholarship.

Albany Medical College, September 1954-June 1958, M.D. Alpha Omega Alpha.

Intern, U.S. Public Health Hospital, Boston, Massachusetts, July 1958-July 1959.

U.S. Public Health Service Residency in Public Health. Assigned to Monroe County Health Department, Rochester, New York, July 1959-August 1960.

Johns Hopkins School of Hygiene and Public Health, September 1960-June 1961, M.P.H.

Senior Resident in Epidemiology, Epidemiology Residency Program, New York State Department of Health, June 1961-1962.

Development Consultant, New York State Department of Health, 1963-1967.

Assistant Professor, Department of Pediatrics, Albany Medical College, July 1964-1967.

Diplomate, American Board of Preventive Medicine, June 1966.

Associate Professor, University of Hawaii School of Public Health and Medical School, 1967-1968.

Travel Fellowship, IARC 1971.

Section Head, Epidemiology Section, Washington

State Department of Health, 1968-1986.

Travel Fellowship, International Cancer Research Technology Transfer, 1981.

Washington State Public Health Association Annual Award, 1986.

Chronic Disease Epidemiologist, Washington State Department of Health, 1968-1988.

Clinical Associate Professor, University of Washington School of Public Health, 1968--.

Section Head, Chronic Disease Epidemiology Section, Washington State Department of Health, 1988-May 1992.

Adjunct Professor, Mount Sinai School of Medicine, 1989--.

Robert Carl Strom Foundation Humanitarian Award, 1990.

Member of Bioelectromagnetics Society, 1984--.

Self-employed, June 1992.

Elected to Fellowship, Collegium Ramazzini, October 1994.

Ramazzini Award, 1997

Special Congenital defects, occupational and

Interests: environmental illness, methods in occupational studies, EMF epidemiology.

Publications

P = peer reviewed article

L = letter

M = monograph

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P Milham, Samuel and Hesser, Jana E. Hodgkin's Disease in Woodworkers. Lancet, pp. 136-1173, July 1967.

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EDUCATION

Institutions, degrees, dates

Organization and Location	Degree	Date
Johns Hopkins University Baltimore, MD	B.A.	1962
California Institute of Technology, Pasadena, CA	Ph.D.	1968

EXPERIENCE

Positions and dates

Reed College, Portland, OR	1967-72	Assistant Professor of Biology
Department of Botany, Indiana University, Bloomington, IN	May-June 1971	Visiting Research Associate
Program in Genetics and Department of Chemistry, Washington State University, Pullman, WA	9/16/72- 9/15/75	Assistant Professor of Genetics and Chemistry
Program in Genetics and Program in Biochemistry/Biophysics, Washington State University, Pullman, WA	4/12/73	Elected to Graduate Faculty in Genetics and Biochemistry
	9/16/75- 1/31/81	Associate Professor of Genetics and Biochemistry
Program in Genetics, Washington State University, Pullman, WA	9/16/78- 9/15/79	Acting Chairman, Program in Genetics
Department of Physiology, Yale University, New Haven, CT	9/16/79- 9/15/80	Visiting Associate Professor (during professional leave)
Departments of Genetics and Cell Biology and Biochemistry/ Biophysics, Washington State University, Pullman, WA	2/1/81- 9/15/83	Associate Professor of Genetics and Cell Biology and Biochemistry
	9/16/83- 8/15/96	Professor of Genetics and Cell Biology and Biochemistry
Department of Pharmacology, University of California, San Francisco, Ca	5/15/86 12/31/86	Adjunct Professor of Pharmacology (professional leave)

Washington State University, Vancouver, WA	8/16/94- 5/16/96	Coordinator of Sciences
Department of Biochemistry/Biophysics and Basic Medical Sciences Program	8/16/96-99	Professor of Biochemistry and Basic Medical Sciences
School of Molecular Biosciences and Basic Medical Sciences Program	8/16/99- 8/15/08	Professor of Biochemistry and Basic Medical Sciences
Professor Emeritus of Biochemistry and Basic Medical Sciences, WSU and Research Director, The Tenth Paradigm Research Group, Portland, OR	8/15/08-	

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MEMBERSHIPS

HONOR SOCIETIES

Phi Beta Kappa
Alpha Epsilon Delta
Sigma Xi
Member of Panel of Advisors of Environmental Law Centre in London
Clinician of the Month, Healthcomm International (October, 1999),
Member Scientific Advisory Board of Ariston Pharmaceuticals

PROFESSIONAL SOCIETIES AND OTHER HONORS

American Society of Biochemistry and Molecular Biology
International Association for Chronic Fatigue Syndrome

Publications from 2001:

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EDUCATION

Ph.D., Biophysics, Syracuse University, Syracuse, NY, 1968

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POSITIONS HELD

Research Biophysicist, Veterans Administration Medical Center, Syracuse, New York, 1964-1981

Assistant Professor, Department of Orthopaedic Surgery, SUNY Upstate Medical Center, Syracuse, New York, 1972-1981

Assistant Professor, Department of Orthopaedic Surgery, Louisiana State University Medical Center, Shreveport, Louisiana, 1981-1985

Associate Professor, Department of Orthopaedic Surgery, Louisiana State University Medical Center, Shreveport, Louisiana, 1985-1989

Professor: Department of Neurology, Louisiana State University Health Sciences Center, Shreveport, Louisiana, 2010 to 2014

Department of Cellular Biology and Anatomy, Louisiana State University Medical Center, Shreveport, Louisiana, 1989 to 2014

Department of Orthopaedic Surgery, Louisiana State University Health Sciences Center, Shreveport, Louisiana, 1989-2010

Manager: ABR Analytics, 2014 to present

BAR MEMBERSHIP:

New York, 1975-present

Louisiana, 1995-present

BOOKS

1. Electromagnetism & Life. with R.O. Becker. State University of New York Press, Albany, 1982.

2. Electric Wilderness. A.A. Marino and J. Ray. San Francisco Press, San Francisco, 1986.

3. Modern Bioelectricity. A.A. Marino, ed. Marcel Dekker, New York, 1988.

4. Going Somewhere: Truth About a Life in Science. Andrew Marino. Cassandra Publishing, Belcher, LA, 2010.

5. Electromagnetism & Life, Facsimile Edition. A.A. Marino and R.O. Becker. Cassandra Publishing, Belcher, LA, 2010.

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LAW REVIEW

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PAPERS

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ABSTRACTS & REPLIES

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31. EMF effects on viral replication: A possible explanation for the conflicting reports regarding protein synthesis. J. Slacsek, H.E. Gilleland, Jr., L.B. Gilleland & A.A. MARINO. *Abstracts from the 18th Annual Meeting of the Bioelectromagnetics Society*, Victoria, B.C., Canada, 1996.
30. Comments on "Short exposures to 60 Hz magnetic fields do not alter MYC expression in HL60 or Daudi cells." A.A. MARINO. *Radiation Res.* 145(4): 513-515, 1996.
29. Management of osteolytic metastases and impending or pathologic fracture of the femur. F.L. Ampil, K.K. Sadasivan, A.A. MARINO & H.W. Chin. *Abstracts from the XXIX World Congress of the International College of Surgeons*, London, 1994.
28. Transient electromagnetic fields alter growth rate of rabbit synoviocytes (HIG-82) in vitro. A.A. MARINO, I. Iliev, J.P. Mains, F.X. Hart & R. Wolf. *FASEB J.* 8(4):A398, 1994.
27. rhIL-1 β alters membrane potential in rabbit synoviocytes (HIG-82) in vitro. I. Iliev, A. MARINO, K. Sadasivan & R. Wolf. *FASEB J.* 8(4):A138, 1994.
26. DC magnetic field alters membrane potential in IEC-18 epithelial cells. I. Iliev & A. MARINO. *FASEB J.* 7(3):A353, 1993.
25. Classical and modern bioelectricity. A.A. MARINO. *Medicine in Small Doses*, CME, LSUMC-S, Vol. 12, May, 1991.
24. Development of a diagnostic test for sensitivity to electromagnetic fields based on quantitative analysis of brain waves. A.A. MARINO, G.B. Bell & A. Chesson. *Proc. 9th Annual Intl. Symposium on Man and His Environment in Health and Disease*, p. 35, 1991.
23. Potential health risks due to powerline and substation electric and magnetic fields: Miskic Subdivision. A.A. MARINO. *Environmental Impact Report*, Santa Cruz, CA, 1990.
22. On the relationship between surface electrical potentials and cancer. A.A. MARINO, D.M. Morris & T. Keys. *J. Bioelectricity* 8:279, 1989.

21. Percutaneous electrical treatment of large malignant tumors in mice. D.M. Morris & A.A. MARINO. Proc. 13th Ann. Surgical Symposium, Assoc. of VA Surgeons, San Antonio, Texas, 39, 1989.
20. Tissue reaction to high-strength polyethylene fibers used in functional repair of rabbit gastrocnemius tendons. A.A. MARINO, E.L. Anglin, R.B. Misra & S. Fronczak. Orthop. Trans. 10: 261, 1986.
29. Role of electricity as an adjunct to management of orthopaedic infection. A.A. MARINO & J.A. Albright, in Current Status of Electricity in the Clinical Sciences, Univ. of Connecticut (Orthopaedic Surgery), pp. 29-30, 1985.
18. Medically significant effects of electromagnetic radiation. A.A. MARINO, in Electromagnetic Fields and Biomembranes, Sofia University, Sofia (Bulgaria), 90-92, 1986.
17. Long-term tissue reaction to carbon fibers. A.A. MARINO & S.J. Fronczak. (Extended Abstract), in Biomedical Engineering V: Recent Developments, Proc. 5th Southern Biomedical Engineering Conference, 530-533, 1986.
16. Biological reaction to high-strength polyethylene implants. A.A. MARINO, E.L. Anglin, R.P. Misra & C. Boudreaux. Trans. 32nd Annual ORS 11: 105, 1986.
15. Uptake of Tc-99m MDP at fracture sites in rabbits following electrical stimulation. M.J. Wood, A.A. MARINO, C. Ashley & M.M. Hackley. Official Proceedings of the Annual Meeting of the Radiological Society of North America, Washington, DC, 1985.
14. Regrowth of rabbit Achilles tendons around carbon-fiber implants. R.D. Specian, A.A. MARINO & J.A. Albright. Anat. Rev. 211(3): A182-A183, 1985.
13. Electromagnetic pollution. A.A. MARINO, in Transactions of the 3rd Annual International Symposium on Man and his Environment, Human Ecology Research Foundation of the Southwest, Dallas, Texas, 1985.
12. The Battelle studies: an analysis. A.A. MARINO & Maria Reichmanis, in Proceedings of the 6th Annual Meeting of the Bioelectromagnetics Society, p. 15, 1984.
11. Health aspects of environmental electromagnetism. A.A. MARINO, in Transactions of the 2nd Annual International Symposium, Man and His Environment, Wadley Institutes, Dallas, TX, 1984.
10. Carbon-fiber reconstruction of Achilles tendons in rabbits. A.A. MARINO, V. Malakanok, J. Albright, B. Specian & M. Keating, in Transactions of the 30th Annual ORS Meeting 9: 367, 1984.
9. Silver nylon cloth; in vitro evaluation of antimicrobial activity. E.A. Deitch & A.A. MARINO, in Transactions American Burn Association, p. 58, 1984.
8. Electrical augmentation of the anti-bacterial activity of silver-nylon. A.A. MARINO, V. Malakanok, E.A. Deitch & J. Albright, in Transactions of the 3rd Annual Meeting of the Bioelectrical Repair and Growth Society 3: 36, 1983.
7. Electrical properties of silver-nylon. A.A. MARINO, V. Malakanok, E.A. Deitch & J. Albright, in Transactions of the 3rd Annual Meeting of the Bioelectrical Repair and Growth Society 3:36, 1983.
6. Electrical stimulation in orthopaedics: past, present and future. A.A. MARINO, in Transactions of the First Annual Meeting of the International Society of Bioelectricity 1: 3, 1983.
5. Reply to comments of Robert F. Smith. A.A. MARINO, Maria Reichmanis, F.S. Perry & R.O. Becker. Health Phys. 44: 700, 1983.
4. Reply to comments on "environmental power-frequency magnetic fields and suicides". A.A. MARINO, F.S. Perry & R.O. Becker. Health Phys. 44(6): 698-699, 1983.
3. The electrical environment produced at bone fracture sites by inductive coupling. F.X. Hart & A.A. MARINO, in Transactions of the 2nd Annual Meeting of the Bioelectrical Repair and Growth Society 2: 70, 1982.
2. Silver-nylon: a new anti-bacterial agent. A.A. MARINO, E.A. Deitch & J.A. Albright, in Transactions 2nd Annual Meeting, Bioelectrical Repair and Growth Society 2: 54, 1982.
1. The foundations of bioelectricity. A.A. MARINO. J. Bioelectricity 1:iii, 1982.

CURRICULUM VITAE

Name: David O. Carpenter

Home Address: 2749 Old State Road
Schenectady, New York 12303

Positions Held:
Director, Institute for Health and the Environment
University at Albany
Professor, Environmental Health Sciences
School of Public Health, University at Albany
5 University Place, A217, Rensselaer, NY 12144

Education: 1959 B.A., Harvard College, Cambridge, MA
1964 M.D., Harvard Medical School, Boston, MA

Positions Held:

9/61-6/62 Research Fellow, Department of Physiology, University of Göteborg, Sweden with Professor Anders Lundberg
7/64-6/65 Research Associate, Department of Physiology, Harvard Medical School, Boston, MA under the direction of Dr. Elwood Henneman
7/65-2/73 Neurophysiologist, Laboratory of Neurophysiology, National Institutes of Mental Health, Dr. Edward V. Evarts, Chief, Assistant Surgeon, USPHS, currently a Reserve Officer in the USPHS.
2/73-3/80 Chairman, Neurobiology Department Armed Forces Radiobiology Research Institute, Defense Nuclear Agency, Bethesda, MD
3/80-9/85 Director, Wadsworth Center for Laboratories and Research, New York State Department of Health, Albany, NY
9/85-1/98 Dean, School of Public Health, University at Albany
9/85-Pres. Professor, Departments of Environmental Health Sciences and Biomedical Sciences, School of Public Health, University at Albany.
9/85-7/98 Research Physician, Wadsworth Center for Laboratories and Research, New York State Department of Health, Albany, NY
1/98-1/05 Adjunct Professor in the Center for Neuropharmacology & Neuroscience, Albany Medical College, Albany, NY
2001-Pres. Director, Institute for Health and the Environment, University at Albany, SUNY, Rensselaer, NY. The Institute was named a Collaborating Center of the World Health Organization in 2011.
2005-Pres. Senior Fellow, Alden March Bioethics Institute, Albany Medical College/Center, Albany, New York
Editor-in-Chief: Cellular and Molecular Neurobiology, 1981 - 1987
Editorial Advisor: Cellular and Molecular Neurobiology, 1987 - Present
Editorial Boards: Journal of Public Health Management and Practice, 1995 - 2002
International Journal of Occupational Medicine & Environmental Health 1996 - Present

Journal of Alzheimer's Disease - Associate Editor, 2007-2009
Reviews in Environmental Health, 2008-present
International Archives of Occupational and Environmental Health, 2009-present.
Journal of Environmental and Public Health, 2009-present.
Environmental Health Perspectives, 2010-present

National and International Committees:

1978, 1981 Physiology Study Section (Ad hoc member)
1979-1985 NIH International Fellowship Study Section
1974-1981 Member, Steering Committee of the Section on the Nervous System, American Physiological Society (Chairman of the Committee, 9/76-4/80)
1981-1989 Member, USA National Committee for the International Brain Research Organization
1985-1986 Committee on Electric Energy Systems of the Energy Engineering Board, National Research Council
1986-1987 Member, Neurophysiology Peer Panel for the National Aeronautics and Space Administration
1987-1989 Member, Science Advisory Council of the American Paralysis Association
1987-1990 Advisory Panel for the Electric Energy System Division, U.S. Department of Energy
1985-1993 Committee #79, National Council on Radiation Protection and Measurements
1986-1997 Member, Legislative and Education Committees, Association of Schools of Public Health
1989-1994 Member, Neuroscience Discipline Working Group, Life Sciences Division of the NASA
1994, 1995 Federation of American Societies for Experimental Biology Consensus Conference on FY 1995 Federal Research Funding
1994-1997 Member, Legislative Committee of the Association of Schools of Public Health
1997 Member, Executive Committee of the Association of Schools of Public Health
1997-2000 National Advisory Environmental Health Sciences Council of the National Institutes of Health
1998-Pres. Member, U.S. Section of the Great Lakes Science Advisory Board of the International Joint Commission
2000-Pres. Member, Board of Directors, Pacific Basin Consortium for Hazardous Waste Health and Environment; Treasurer, 2001-2004, 2008-pres; Chair, 2004-2008
2001-2008 United States Co-Chair, Workgroup on Ecosystem Health of the Science Advisory Board of the International Joint Commission
2002-2003 Member, Committee on the Implications of Dioxin in the Food Supply, The National Academies, Institute of Medicine
2003-2008 Member, United States Environmental Protection Agency, Children's Health Protection Advisory Committee
2003-Pres. Chair, Advisory Committee to the World Health Organization and National Institute of Environmental Health Sciences on collaborative activities.
2007-2011 Chair, Workgroup on Risks vs. Benefits of Fish Consumption, Science Advisory Board, International Joint Commission.

State and Local Committees:

- 1980-1987 Executive Secretary, New York State Power Lines Project
- 1985-1989 Board of Scientific Advisors, Institute of Basic Research, OMRDD, N.Y.
- 1986-1989 Member, Steering Committee, Health Policy and Administrative Consortium of the Capital District
- 1991-1992 Member, Connecticut Academy of Sciences and Engineering Committee on Electromagnetic Field Health Effects
- 1991-1992 Member, Board of Directors of the Capital District Chapter of the Alzheimer's Disease and Related Disorders Association, Inc.
- 1991-1992 Member, State Task Force for the Reform of Middle Level Education in NY State
- 1992-1993 Member, State Needs Task Force on Health Care and Education
- 1987-1998 Delegate-at-Large, New York State Public Health Association
- 1991-1995 Member, Board of Directors of the Capital District Amyotrophic Lateral Sclerosis Association
- 1994 Chair, Council of Deans, University at Albany, SUNY
- 1997-2008 Member, Board of Directors, (Chair 1998-2004) Albany-Tula Inc.: A Capital Region Alliance
- 2000-Pres. Member, Board of Directors, Healthy Schools Network, Inc.
- 2000-2003 Member, Medical Advisory Board, Hepatitis C Coalition, New York
- 2000-2004 Member, Environmental Protection Agency /National Association of State Universities and Land Grant Colleges Task Force
- 2001-2008 Member, Board of Directors, Environmental Advocates of New York
- 2004-2007 Member, Ad Hoc Advisory Group on Brownfield Cleanup Standards
- 2005-Pres. Member, Schooling Chefs Curriculum Advisory Board
- 2005-2008 Member, Board of Directors, Citizens Environmental Coalition
- 2006-2009 Member, Board of Directors, Marine Environmental Research Institute
- 2007-2009 Member, New York State Renewable Energy Task Force

Honors, Awards and Fellowships:

- 1959 B.A. awarded magna cum laude. Thesis entitled "Metamorphosis of visual pigments: A study of visual system of the salamander, *Ambystoma tigrinum*" (Thesis advisor, Professor George Wald)
Elected to Phi Beta Kappa and to Sigma Xi
- 1964 M.D. awarded cum laude for a thesis in a special field. Thesis entitled "Electrophysiological observations on the importance on neuron size in determining responses to excitation and inhibition in motor and sensory systems" (Thesis advisor, Dr. Elwood Henneman)
- 1964 Awarded the Leon Resnick Prize given to a Harvard Medical School graduate showing promise in research
- 1970 Awarded the Moseley Traveling Fellowship for study in England (Fellowship declined)
- 1971 Invited as Visiting Professor of Physiology, Centro de Investigacion y de Estudios Avanzados, del Institute Politecnico Nacional, Mexico 14, D.F., Mexico, for 3 months

- 1982, 1986 Visiting Professor of Physiology, Department of Physiology, Kyushu University, Fukuoka, Japan, for a period of three months each
- 1987
- 1989 Awarded Jacob Javits Neuroscience Investigator Award from the National Institute of Neurological and Communicative Diseases and Stroke
- 1999 Awarded Homer N. Calver Award from the American Public Health Association for studies in environmental health.
- 2001 Awarded 2001 Academic Laureate from the University at Albany Foundation.
- 2010 Awarded the Albion O. Bernstein, M.D. Award in recognition of an outstanding contribution to public health and the prevention of disease through lifelong research of environmental health hazards and for limitless devotion to medical education by the Medical Society of the State of New York.

Federal Grants Held: (Principal Investigator Only)

- 1980-1983 United States Air Force, "Mechanisms of Radiation-Induced Emesis in Dogs", \$76,847 total direct costs.
- 1982-1988 National Institute of Health, "Mechanisms of Desensitization at Central Synapses", \$464,786 total direct costs.
- 1984-1986 Defense Nuclear Agency, "Mechanisms of Radiation-Induced Emesis in Dogs", \$330,504 total direct costs.
- 1986-1996 National Institute of Health, "Mechanisms of Excitatory Amino Acids Actions and Toxicity", 1986-1989 \$231,848 total direct costs; 1990-1996 \$562,926 total direct costs.
- 1989-1993 National Institute of Health, "Mechanisms of Lead Neurotoxicity" \$373,576 total direct costs
- 1990-1995 National Institute of Environmental Health Sciences, Superfund Basic Research Program, "Multidisciplinary Study of PCBs and PCDFs at a Waste Site", D.O. Carpenter, P.I. \$5,783,419 total direct costs.
- 1995-2001 Fogarty International Center, National Institutes of Health, International Training Program in Environmental and Occupational Health. A Central/Eastern European Environ/Occup Training Program, D.O. Carpenter, P.I. \$657,520 total costs.
- 1995-2001 National Institute of Environmental Health Sciences, Superfund Basic Research Program, "Multidisciplinary Study of PCBs," D.O. Carpenter, P.I. \$12,653,709 total direct costs.
- 1998-1999 Environmental Protection Agency, A Indoor Air Risk at Akwesasne - Pilot Project, D.O. Carpenter, P.I. \$9,996 total costs.
- 2000-2002 Association Liaison Office for University Cooperation in Development, A Cooperative Program in Environmental Health between the Institute of Public Health at Makerere University, Kampala, Uganda and the School of Public Health, University at Albany, USA, D.O. Carpenter, P.I. \$96,432 total costs.
- 2001-2007 Fogarty International Center, National Institutes of Health, International Training Program in Environmental and Occupational Health. A Multidisciplinary Environmental Health Training, D.O. Carpenter, P.I. \$850,000 total costs.
- 2006-2011 Pakistan-US Science and Technology Cooperative Program (US National Academy of Sciences). "Association of particulate matter with daily morbidity in

- an urban population," D.O. Carpenter, P.I., \$391,104 total costs.
- 2009-2013 Exploratory Center on Minority Health and Health Disparities in Smaller Cities. Project 2: Environmental contaminants and reproductive health of Akwesasne Mohawk women. \$387,825 for year 1. D.O. Carpenter, Co-PI.
- 2010-2013 Department of the Army, "Gulf War Illness: Evaluation of an Innovative Detoxification Program: D.O. Carpenter, P.I., \$636,958 total costs.
- 2010-2013 Higher Education for Development of the United States Agency for International Development, "Drinking Water Supply, Sanitation, and Hygiene Promotion: Health Interventions in Two Urban Communities of Kampala City and Mukono Municipality, Uganda". D. O. Carpenter, P.I., \$299,736 total costs.
- 2011-2016 National Institute of Environmental Health Sciences (1R01ES019620), "Protecting the health of future generations: Assessing and preventing exposures." PK Miller, FA von Hippel, CL Buck and DO Carpenter, Co-P.I.s, \$471,521 for the period 8/08/11-4/30/12, \$2,354,871 for the period 2011-2016.

Research Interests:

- Exposure to persistent organic pollutants and risk of diabetes, cardiovascular disease, and hypertension.
- Cognitive and behavioral effects of environmental contaminants on children (IQ, ADHD) and older adults (dementias, Parkinson's Disease and ALS).
- Ionizing and non-ionizing radiation biology.
- Effects of air pollution on respiratory and cardiovascular function.

Other Professional Activities:

Host, The Public Radio Health Show (a 30 min public health information show carried on 170+ stations nationwide), plus the Armed Forces Radio Network and Voice of America, 1985-2001. Authored a biweekly health column in The Troy Record, a local newspaper, 1997-1999.

Major Peer-Reviewed Publications:

1. Carpenter, D.O., Lundberg, A. and Norrsell, U. Effects from the pyramidal tract on primary afferents and on spinal reflex actions to primary afferents. *Experientia*, 18:337, 1962.
2. Carpenter, D.O., Engberg, I. and Lundberg, A. Presynaptic inhibition in the lumbar cord evoked from the brain stem. *Experientia*, 18:450, 1962.
3. Carpenter, D.O., Lundberg, A. and Norrsell, U. Primary afferent depolarization evoked from the sensorimotor cortex. *Acta Physiol. Scand.*, 59:126-142.
4. Carpenter, D.O., Engberg, I., Funkenstein, H. and Lundberg, A. Decerebrate control of reflexes to primary afferents. *Acta Physiol. Scand.*, 59:424-437, 1963.
5. Carpenter, D.O., Engberg, I. and Lundberg, A. Differential supraspinal control of inhibitory and excitatory actions from the FRA to ascending spinal pathways. *Acta Physiol. Scand.*, 63:103-110, 1965.

6. Henneman, E., Somjen, G.G. and Carpenter, D.O. Excitability and inhibitory of motoneurons of different sizes. *J. Neurophysiol.*, 28:599-620, 1965.
7. Henneman, E., Somjen, G.G. and Carpenter, D.O. Functional significance of cell size in spinal motoneurons. *J. Neurophysiol.*, 28:560-580, 1965.
8. Somjen, G.G., Carpenter, D.O. and Henneman, E. Selective depression of alpha motoneurons of small size by ether. *J. Pharmacol.*, 148:380-385, 1965.
9. Somjen, G., Carpenter, D.O. and Henneman, E. Response of motoneurons of different sizes to graded stimulation of supraspinal centers of the brain. *J. Neurophysiol.*, 28:958-965, 1965.
10. Carpenter, D.O., Engberg, I. and Lundberg, A. Primary afferent depolarization evoked from the brain stem and the cerebellum. *Arch. Ital. Biol.*, 104:73-85, 1966.
11. Carpenter, D.O. and Henneman, E. A relation between the threshold of stretch receptors in skeletal muscle and the diameter of axons. *J. Neurophysiol.*, 29:353-368, 1966.
12. Carpenter, D.O. Temperature effects on pacemaker generation, membrane potential, and critical firing threshold in *Aplysia* neurons. *J. Gen. Physiol.*, 50:1469-1484, 1967.
13. Chase, T.N., Breese, G., Carpenter, D., Schanberg, S. and Kopin, I. Stimulation-induced release of serotonin from nerve tissue. *Adv. Pharmacol.*, 6A:351-364, 1968.
14. Carpenter, D.O. and Alving, B.O. A contribution of an electrogenic Na⁺ pump to membrane potential in *Aplysia* neurons. *J. Gen. Physiol.*, 52:1-21, 1968.
15. Olson, C.B., Carpenter, D.O. and Henneman, E. Orderly recruitment of muscle action potentials. *Arch. Neurol.*, 19:591-597, 1968.
16. Carpenter, D.O. Membrane potential produced directly by the Na⁺ pump in *Aplysia* neurons. *Comp. Biochem. Physiol.*, 35:371-385, 1970.
17. Carpenter, D.O. and Gunn, R. The dependence of pacemaker discharge of *Aplysia* neurons upon Na⁺ and Ca⁺⁺. *J. Cell. Physiol.*, 75:121-127, 1970.
18. Kraus, K.R., Carpenter, D.O. and Kopin, I. R. Acetylcholine-induced release of norepinephrine in the presence of tetrodotoxin. *J. Pharmacol. Exp. Therap.*, 73:416-421, 1970.
19. Barker, J.L. and Carpenter, D.O. Thermosensitivity of neurons in the sensorimotor cortex of the cat. *Science*, 169:597-598, 1970.
20. Carpenter, D.O., Hovey, M.M. and Bak, A. Intracellular conductance of *Aplysia* neurons and squid axon as determined by a new technique. *Int. J. Neurosci.*, 2:35-48, 1971.
21. Carpenter, D.O., Breese, G., Schanberg, S. and Kopin, I. Serotonin and dopamine: Distribution and accumulation in *Aplysia* nervous and non-nervous tissues. *Int. J. Neurosci.*, 2:49-56, 1971.
22. Hovey, M.M., Bak, A.F. and Carpenter, D.O. Low internal conductivity of *Aplysia* neuron somata. *Science*, 176:1329-1331, 1972.
23. Carpenter, D.O. Electrogenic sodium pump and high specific resistance in nerve cell bodies of the squid. *Science*, 179:1336-1338, 1973.
24. Carpenter, D.O. and Rudomin, P. The organization of primary afferent depolarization in the isolated spinal cord of the frog. *J. Physiol. (Lond.)*, 229:471-493, 1973.
25. Shain, W., Green, L.A., Carpenter, D.O., Sytkowski, A.J. and Vogel, Z. *Aplysia* acetylcholine receptors: Blockage by and binding of α -bungarotoxin. *Brain Res.*, 72:225-240, 1974.
26. Pierau, Fr.-K., Torrey, P. and Carpenter, D.O. Mammalian cold receptor afferents: Role of an electrogenic sodium pump in sensory transduction. *Brain Res.*, 73:156-160, 1974.

27. Saavedra, J.M., Brownstein, M.J., Carpenter, D.O. and Axelrod, J. Octopamine: Presence in single neurons in *Aplysia* suggests neurotransmitter function. *Science*, 185:364-365, 1974.
28. Willis, J.A., Gaubatz, G.L. and Carpenter, D.O. The role of the electrogenic sodium pump in modulation of pacemaker discharge of *Aplysia* neurons. *J. Cell. Physiol.*, 84:463-472, 1974.
29. Brownstein, M.J., Saavedra, J.M., Axelrod, J., Zeman, G.H. and Carpenter, D.O. Coexistence of several putative neurotransmitters in single identified neurons of *Aplysia*. *Proc. Natl. Acad. Sci. (USA)*, 71:4662-4665, 1975.
30. Carpenter, D.O. and Gaubatz, G.L. Octopamine receptors on *Aplysia* neurons mediate hyperpolarization by increasing membrane conductance. *Nature*, 252:483-485, 1974.
31. Pierau, Fr.-K., Torrey, P. and Carpenter, D.O. Afferent nerve fiber activity responding to temperature changes of the scrotal skin of the rat. *J. Neurobiol.*, 38:601-612, 1975.
32. Carpenter, D.O. and Gaubatz, G.L. H₁ and H₂ histamine receptors on *Aplysia* neurons. *Nature*, 254:343-344, 1975.
33. Carpenter, D.O., Hovey, M.M. and Bak, A.F. Resistivity of axoplasm. II. Internal resistivity of giant axons of squid and *Myxicola*. *J. Gen. Physiol.*, 66:139-148, 1975.
34. Zeman, G.H. and Carpenter, D.O. Asymmetric distribution of aspartate in ganglia and single neurons of *Aplysia*. *Comp. Biochem. Physiol.*, 52C:23-26, 1975.
35. Pierau, Fr.-K., Torrey, P. and Carpenter, D.O. Effect of ouabain and potassium-free solution on mammalian thermosensitive afferents *in vitro*. *Pflügers Arch.*, 359:349-356, 1975.
36. Swann, J.W. and Carpenter, D.O. The organization of receptors for neurotransmitters on *Aplysia* neurons. *Nature*, 258:751-754, 1975.
37. Yarowsky, P.J. and Carpenter, D.O. Aspartate: distinct receptors on *Aplysia* neurons. *Science*, 192:806-809, 1976.
38. Foster, K.R., Bidinger, J.M. and Carpenter, D.O. The electrical resistivity of aqueous cytoplasm. *Biophys. J.*, 16:991-1001, 1976.
39. Carpenter, D.O., Greene, L.A., Shain, W. and Vogel, Z. Effects of eserine and neostigmine on the interaction of α -bungarotoxin with *Aplysia* acetylcholine receptors. *Mol. Pharmacol.*, 12:999-1006, 1976.
40. Saavedra, J.M., Ribas, J., Swann, J. and Carpenter, D.O. Phenylethanolamine: A new putative neurotransmitter in *Aplysia*. *Science*, 195:1004-1006, 1977.
41. Carpenter, D.O., Swann, J.W. and Yarowsky, P.J. Effect of curare on responses to different putative neurotransmitters in *Aplysia* neurons. *J. Neurobiol.*, 8:119-132, 1977.
42. Yarowsky, P.J. and Carpenter, D.O. GABA mediated excitatory responses on *Aplysia* neurons. *Life Sci.*, 20:1441-1448, 1977.
43. Willis, J.A., Myers, P.R. and Carpenter, D.O. An ionophoretic module which controls electroosmosis. *J. Electrophysiol. Tech.*, 6:34-41, 1977.
44. Yarowsky, P.J. and Carpenter, D.O. Receptors for gamma-aminobutyric acid (GABA) on *Aplysia* neurons. *Brain Res.*, 144:75-94, 1978.
45. Carpenter, D.O., Gaubatz, G., Willis, J.A. and Severance, R. Effects of irradiation of *Aplysia* pacemaker neurons with 20 MeV electrons. *Rad. Res.*, 76:32-47, 1978.
46. Yarowsky, P.J. and Carpenter, D.O. A comparison of similar ionic responses to gamma-aminobutyric acid and acetylcholine. *J. Neurophysiol.*, 41:531-541, 1978.
47. Blum, B., Auker, C.R. and Carpenter, D.O. A head holder and stereotaxic device for the rattlesnake. *Brain Res. Bull.*, 3:271-274, 1978.

48. Swann, J.W., Sinback, C.N. and Carpenter, D.O. Dopamine-induced muscle contractions and modulation of neuromuscular transmission in *Aplysia*. *Brain Res.*, 157:167-172, 1978.
49. Swann, J.W., Sinback, C.N. and Carpenter, D.O. Evidence for identified dopamine motor neurons to the gill of *Aplysia*. *Neurosci. Lett.*, 10:275-280, 1978.
50. Keibian, P.R., Keibian, J.W. and Carpenter, D.O. Regulation of cyclic AMP in heart and gill of *Aplysia* by the putative neurotransmitters, dopamine and serotonin. *Life Sci.*, 24:1757-1764, 1979.
51. Carpenter, D.O. Interchangeable association of neurotransmitter receptors with several ionophores. *Brain Res. Bull.*, 4:149-152, 1979.
52. Pellmar, T.C. and Carpenter, D.O. Voltage-dependent calcium current induced by serotonin. *Nature*, 277:483-484, 1979.
53. Ruben, P.C., Swann, J.W. and Carpenter, D.O. Neurotransmitter receptors on gill muscle fibers and the gill peripheral nerve plexus in *Aplysia*. *Canad. J. Physiol. Pharmacol.*, 57:1088-1097, 1979.
54. Pellmar, T.C. and Carpenter, D.O. Serotonin induces a voltage-sensitive calcium current in neurons of *Aplysia californica*. *J. Neurophysiol.*, 44:423-439, 1980.
55. Parver, L.M., Auker, C. and Carpenter, D.O. Choroidal blood flow as a heat dissipating mechanism in the macula. *Am. J. Ophthalmol.*, 89:641-646, 1980.
56. Mell, L.D., Jr. and Carpenter, D.O. Fluorometric determination of octopamine in tissue homogenates by high-performance liquid chromatography. *Neurochem. Res.*, 5:1089-1096, 1980.
57. Braitman, D.J., Auker, C.R. and Carpenter, D.O. Thyrotropin-releasing hormone has multiple actions in cortex. *Brain Res.*, 194:244-248, 1980.
58. Meszler, R.M., Auker, C.R. and Carpenter, D.O. Fine structure and organization of the infrared receptor relay, the lateral descending nucleus of the trigeminal nerve in pit vipers. *J. Comp. Neurol.*, 196:571-584, 1981.
59. Auker, C.R., Parver, L.M., Doyle, T. and Carpenter, D.O. Choroidal blood flow: I. Ocular tissue temperature as a measure of flow. *Arch. Ophthalmol.*, 100:1323-1326, 1982.
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PREVIOUS DEPOSITIONS AND TESTIMONY (past seven years):

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Charles W. Adams, et al., vs. Cooper Industries, Inc. et al., deposited for the plaintiffs, 28-29 September 2006. Donna Keene Holt, Attorney. 865-212-3294.

Arthur D. Dyer et al. vs. Waste Management et al., deposited for the plaintiffs, 2 November 2006. Mark L. Thomsen, Attorney. Cannon & Dunphy, Brookfield, WI 53008.

Clopton et al. vs. Monsanto, deposited for the plaintiffs, 31 January 2007. Robert Roden, Attorney. 406-525-2665.

Marty Paulson et al. vs. Monsanto, deposited for the plaintiffs, 7 August 2007. Torger Oaas, Attorney. 406-525-2665.

John Edward Martinez and Gladys Yolanda Martinez vs. Entergy Corporation et al., deposited for the plaintiffs, 16 April 2008. Julie Jacobs, Attorney. 504-566-1704.

Fannie Wayne et al. vs. Pharmacia Corporation, et al., deposited for the plaintiffs, 29 October 2008. John E. Norris, Attorney. 205-541-7759.

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2009. Paula Maccabee, Attorney. 651-775-7128.

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Zina G. Bibb, et al. v. Monsanto Company et al. Deposed for plaintiffs, 28 April 2010. W. Stuart Calwell, Attorney. 304-343-4323.

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Ronald Cybart et al., Michael Campanelli, and Donald and Theresa Shea, et al. v. CL&P. Deposed for the plaintiffs. 15 July 2011. Benson A. Snaider, Attorney.

Maria Snoops vs. Lyon Associates, Inc. and Insurance Co of the state of Pennsylvania. Deposed for the plaintiff, 1 November 2011. Matthew J. Witteman, Attorney. 415-363-3106.

John Edward Martinez and Gladys Yolanda Martinez v. Entergy Corporation, et al., Deposed for the plaintiff, 19 December 2011. J. Patrick Connick, Attorney. 504-347-4535.

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EXHIBIT 02

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

December 4, 2014 Ronald M. Powell, Ph.D.

A Message to the Maryland General Assembly The Health Argument for Replacing Wireless Smart Meters with a Safe Metering Technology in Maryland

The electric power companies of Maryland made a dreadful mistake when they elected to install Wireless Smart Meters to measure electrical power. Wherever these meters are installed, they threaten the health of all residents in the community, violate their privacy, increase the cyber vulnerability of the supply of electricity to their homes, decrease their personal security and safety, and threaten property values in the community. And Wireless Smart Meters do all of this without any persuasive evidence of a financial benefit to the customers commensurate with the cost of the Wireless Smart Meter system.

All of these consequences are important for Marylanders; but the health threat is particularly tragic. If you care about the health of Marylanders, including the health of your own family, and about the cost of health care in Maryland, do consider the information presented here and the many supporting references cited. This document describes the health problems that the biomedical research community has found caused by exposure to the type of radiation -- radiofrequency radiation (at microwave frequencies) -- emitted by Wireless Smart Meters.

Who am I?

I am a retired U.S. Government scientist (Ph.D., Applied Physics, Harvard University, 1975). During my Government career, I worked for the Executive Office of the President, the National Science Foundation, and the National Institute of Standards and Technology. For those organizations, respectively, I addressed Federal R&D program evaluation, energy policy research, and measurement development in support of the electronics and electrical-equipment industries and the biomedical research community. I currently interact with other scientists and with doctors around the nation on the impact of the environment -- including the radiofrequency environment -- on human health.

What is the health problem with Wireless Smart Meters?

Wireless Smart Meters transmit radiofrequency (RF) radiation to transfer data about electric power consumption back to the electric power companies, to communicate with other Wireless Smart Meters, and, soon, to communicate with Wireless Smart Appliances inside each home. The installation of these Wireless Smart Meters was undertaken in spite of the fact that the international biomedical research community, and medical practitioners, are increasingly finding that a wide variety of biological effects are being caused by RF radiation at levels much lower than earlier understood, and well below the levels produced by Wireless Smart Meters.

The RF radiation from Wireless Smart Meters is particularly threatening to health because that radiation is so persistent and so powerful. California court documents, describing the same Wireless Smart Meters used here in Maryland, indicate that each of these meters issues its pulses of RF radiation, on average 10,000 times per day, and up to a maximum 190,000 times per day, 24/7, forever. Further, the power level of each pulse is about 1000 milliwatts, placing Wireless Smart Meters among the most powerful RF radiators likely to be present in a residential environment.

References:

http://emfsafetynetwork.org/wp-content/uploads/2011/11/PGERFDataOpt-outalternatives_11-1-11-3pm.pdf

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

Why don't Federal regulations protect the public from such high levels of RF radiation?

The Federal Communications Commission (FCC) is responsible for the regulations that set the Maximum Permitted Exposure (MPE) limits for RF radiation. Unfortunately, the current regulations are based primarily on outdated 1980s thinking, when only the heating effects of RF radiation on the body were considered. Since then, the biomedical research community has demonstrated, in hundreds of published studies, that there are an enormous number of biological effects of concern, entirely aside from heating. And the number of discovered effects continues to grow.

In short, current FCC regulations are entirely out of date and are too permissive to protect the public from harm. This problem has been recognized in legislation proposed in the U.S. House of Representatives (H.R. 6358). But, even if that legislation becomes law, it will be years before more protective regulations are developed and issued. In the meantime, each of the states in the USA is on its own to protect its residents.

[Thus, the question is: Will Pennsylvania act to protect its residents?]

References:

Summary of H.R. 6358:

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

Full copy of H.R. 6358:

http://thomas.loc.gov/home/gpoxmlc112/h6358_1h.xml

What biological effects does exposure to RF radiation cause?

Some of the biological effects of exposure to RF radiation can be readily sensed (the "symptoms"). Other biological effects cannot be readily sensed, at least not until an advanced state of harm has been reached. Unfortunately, you can be harmed by the latter even when you are free of the "symptoms".

[That is, you can be harmed with no warning.]

(1) Biological effects of RF radiation from Wireless Smart Meters that can be sensed (the "symptoms") include these:

pressure in head
difficulty concentrating
ringing, buzzing/tinnitus in the ears
insomnia
headaches
heart racing, arrhythmia
memory problems
agitation
dizziness
tingling, burning skin
fatigue
involuntary muscle contractions
eye/vision problems
numbness

Reference:

Pre-Filed Testimony of Richard Conrad, Ph.D., Appendices 2 and 3

<http://www.mainecoalitiontostopsmartmeters.org/wp-content/uploads/2013/01/Exhibit-9-Conrad-Web.pdf>

(2) Biological effects of RF radiation that cannot be readily sensed (except for some on the first line below), until they have reached an advanced state of harm, include these:

sleep, neuron firing rate, EEG, memory, learning, and behavior difficulties
stress proteins, heat shock proteins, and disrupted immune function
reproduction and fertility effects
brain tumors and blood-brain barrier penetration
cancer (other than brain) and cell proliferation
oxidative damage, reactive oxygen species and DNA damage, and DNA repair failure
disrupted calcium metabolism
cardiac, heart muscle, blood pressure, and vascular effects

Reference:

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

Where can you find analyses of the research literature documenting the biological effects of RF radiation?

The published literature of the international biomedical research community on the adverse effects of RF radiation is so vast that it would be difficult to read it all. But three very wide ranging reviews of this literature have made the findings more accessible:

(1) The most massive review is the 1479-page BioInitiative 2012 Report, published in December 2012, which considered about 1800 biomedical research publications issued in the last five years. The BioInitiative 2012 Report was prepared by an international body of 29 experts, heavy in Ph.D.s and M.D.s, from 10 countries, including the USA which contributed the largest contingent of experts (10).

Reference:

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

(2) A group of six doctors in Oregon, led by Paul Dart, M.D., published, in June 2013, their own 74-page review of 279 biomedical research publications. This review makes the health case against the installation of Wireless Smart Meters, explicitly. The review recommends that levels of RF radiation must be lowered to protect public health, not raised by the installation of Wireless Smart Meters. This review is posted on the website of the Federal Communications Commission, at the link entitled "Health Effects of RF - Research Review (97)".

Reference:

Biological and Health Effects of Microwave Radio Frequency Transmissions, A Review of the Research Literature, A Report to the Staff and Directors of the Eugene Water and Electric Board, June 4, 2013 (<http://apps.fcc.gov/ecfs/comment/view?id=6017465430>).

(3) Michael Bevington, in 2013, published a book that summarizes the findings of 1828 biomedical research publications. The book describes the symptoms caused by exposure to electromagnetic radiation, the many diseases associated with such exposure, and the relative risk levels associated with specific sources of electromagnetic radiation. Wireless Smart Meters are in the highest of those risk categories.

Reference:

Michael Bevington, Electromagnetic Sensitivity and Electromagnetic Hypersensitivity: A Summary, 2013 (<http://www.es-uk.info>).

Are some groups of people at especially high risk of harm from RF radiation?

Yes. The above literature reviews indicate that some groups of individuals are at especially high risk of harm from exposure to RF radiation: pregnant women and their unborn children, very young children, teenagers, men of reproductive age, seniors, and anyone with a chronic health condition.

What is the latest disquieting information about the biological effects of RF radiation?

As the research community's investigations proceed, additional biological effects are being found and others are coming under investigation. One of the most important coming under investigation now is the plausibility of a link between RF radiation and autism. A link is suspected because the biological effects known to be caused by RF radiation are remarkably similar to the biological anomalies exhibited by autistic children.

That link has not yet been scientifically established. But if that link does prove true, and thus that RF radiation is found to be one of the environmental stressors contributing to autism, then we may, at last, have an explanation as to why the incidence of autism is growing as quickly as the use of wireless devices themselves. Autism now affects 1 in about 50 children, mostly boys.

Reference:

Martha R. Herbert, Cindy Sage, Autism and EMF? Plausibility of a pathophysiological link part I and part II, Pathophysiology, Volume 20(3), pages 191-209 and 211-34, June 2013 (<http://www.pathophysiologyjournal.com/article/S0928-4680%2813%2900037-0/abstract>).

What are medical associations saying about RF radiation from Wireless Smart Meters and other wireless devices?

The American Academy of Environmental Medicine, which trains medical doctors in preparation for the tests required for Board Certification in Environmental Medicine, recommends:

"Avoidance of smart meter EMF/RF emissions based on health considerations, including the option to maintain analog meters."

"A moratorium on smart meters and implementation of safer technology."

Reference:

AAEM, "Smart Meter Case Series", October 23, 2013 (<http://marylandsmartmeterawareness.org/wp-content/uploads/2014/02/AAEM-Smart-Meters.pdf>).

The American Academy of Environmental Medicine also states:

"The AAEM strongly supports the use of wired Internet connections, thereby encouraging prudent minimization of exposure to RF such as from WiFi, cellular and mobile phones and towers, and "smart meters."

"The peer reviewed, scientific literature demonstrates the correlation between RF exposure and neurological, cardiac, and pulmonary disease as well as reproductive and developmental disorders, immune dysfunction, cancer and other health conditions. The evidence is irrefutable."

Reference:
AAEM, "Wireless Radiofrequency Radiation in Schools", November 14, 2013
(<http://aaemonline.org/docs/WiredSchools.pdf>).

, whose 60,000 doctors care for our children, has supported the development of more restrictive The American Academy of Pediatrics (AAP) standards for RF exposure that would better protect the public:

"It is essential that any new standards for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded through their lifetimes."

Reference:
Letter from the AAP to the Honorable Dennis Kucinich, U.S. House of Representatives, December 12, 2012 (<http://www.scribd.com/doc/118348085/AAP-Supports-Child-Cell-Phone-Protection>).

How are other states and communities responding to Wireless Smart Meters?

In California, which got Wireless Smart Meters early (2010), 57 towns, cities, counties, and other jurisdictions have opposed the mandatory installation of Wireless Smart Meters. Of these jurisdictions, 15 have banned the installation of Wireless Smart Meters altogether.

Reference:
<http://stopsmartmeters.org/how-you-can-stop-smart-meters/sample-letter-to-local-government/ca-local-governments-on-board/>

The Attorneys General of three states have opposed Wireless Smart Meters because they find that the costs outweigh any claimed financial benefits to the customers.

The Attorney General of Illinois, Lisa Madigan, indicates the following:

"The utilities want to experiment with expensive and unproven smart grid technology, yet all the risk for this experiment will lie with consumers."

"Consumers don't need to be forced to pay billions for so-called smart technology to know how to reduce their utility bills. We know to turn down the heat or air conditioning and shut off the lights. The utilities have shown no evidence of billions of dollars in benefits to consumers from these new meters, but they have shown they know how to profit. I think the only real question is: How dumb do they think we are?"

Reference:
<http://www.lisamadigan.org/Newsroom/lisainthenews/item/2011-06-lisa-madigan-opinion-editorial-comed-experiment-too>

The Attorney General of Connecticut, George Jepsen, concluded the following:

"Connecticut Light & Power Co.'s plan to replace existing electric meters with advanced technology [that is, Wireless Smart Meters] would be very expensive and would not save enough electricity for its 1.2 million customers to justify the expense, Attorney General George Jepsen said Tuesday."

"The pilot results showed no beneficial impact on total energy usage," Jepsen said. "And, the savings that were seen in the pilot were limited to certain types of customers and would be far outweighed by the cost of installing the new meter systems," he said."

Reference:
(http://www.ct.gov/ao/lib/ao/press_releases/2011/020811clpmeters.pdf)

The Attorney General of Michigan, Bill Schuette, stated the following:

"A net economic benefit to electric utility ratepayers from Detroit Edison's and Consumers smart meter programs has yet to be established. In the absence of such demonstrated benefit, the Attorney General has opposed, and will oppose any Commission action that unjustly and unreasonably imposes the costs of such programs upon ratepayers."

Reference:
<http://efile.mpsc.state.mi.us/efile/docs/17000/0408.pdf>

Throughout the USA, 33 of the 50 states now have Wireless Smart Meter opposition groups, providing strong evidence of growing public awareness and concern. [Including Pennsylvania]

Reference:
<http://www.takebackyourpower.net/directory/us/>

Left unattended, will the health problem posed by Wireless Smart Meters get better or worse?

The health problem will get much worse and quickly. Wireless Smart Appliances, such as smart electric stoves, and smart electric clothes dryers, are in the offing. They, too, will contain wireless RF transmitters and receivers. These Wireless Smart Appliances are designed to use RF radiation to communicate with Wireless Smart Meters so that the electric power company will know what each Wireless Smart Appliance in every home is doing all the time. Thus, not only will the Wireless Smart Meters be sending RF radiation into the home to probe for data from the Wireless Smart Appliances, but also the Wireless Smart Appliances will be responding by sending their own RF radiation throughout the home. The result will be a steadily increasing level of RF radiation in the home, further increasing the health risk.

Why is there a special urgency to this problem?

While some of the biological effects of RF exposure can be reversed by reducing exposure, a quick examination of the lists of biological effects above will indicate that many of these effects are not reversible. For example, once you have cancer, reducing RF exposure may not be sufficient to enable recovery, even though it may help with recovery. Simply stated, the longer that RF exposure at high levels is permitted to persist, the more difficult it will become to undo the harm. Many Marylanders have already been exposed to the RF radiation from Wireless Smart Meters for more than one year. Why are Wireless Smart Meters a community issue, not just an individual issue?

The RF radiation from each Wireless Smart Meter does not stop at the boundaries of the property on which that Wireless Smart Meter has been installed. Also, the radiation readily penetrates ordinary home-construction materials. If this were not true, Wireless Smart Meters would be of no use to the electric power companies for returning consumption data to them or for communicating with forthcoming Wireless Smart Appliances inside the home.

In fact, every resident in a community is irradiated by every Wireless Smart Meter in that community, just to varying degrees. Each Wireless Smart Meter near to a given resident produces more radiation in his home than each Wireless Smart Meter farther away. But there are so many more Wireless Smart Meters that are farther away that, together, they count, too. For example, in my community of Montgomery Village, MD, there are more than 14,000 Wireless Smart Meters installed on our homes. Together, they issue an average of 140 million pulses of RF radiation every day, up to a maximum of 2.7 billion pulses per day. There is now no place in our community where a resident can go where he is not near to many Wireless Smart Meters and within reach of so many more Wireless Smart Meters that are farther away.

The implication is that no resident can solve his radiation problem just by having his own Wireless Smart Meter replaced with a safe meter, even though his own Wireless Smart Meter is the single greatest contributor to the radiation level in parts of his home. Rather, all of his neighbors must have their Wireless Smart Meters replaced, too. This fact is already stressing relationships among neighbors who have varying degrees of understanding of the health threat. If Wireless Smart Meters are allowed to continue in use, this stress can tear communities apart.

In short, once Wireless Smart Meters have been installed on your home and in your community, your home is no longer your castle. Rather, your home is now your electric power company's castle.

How can the Maryland General Assembly help through legislation?

[So, what is Pennsylvania going to do? Are Pennsylvania residents any less valued than Maryland residents?]

(1) If you want to provide SOME help to SOME Maryland residents, then at least:

Write into law a permanent permission for individual ratepayers to opt out of having any type of wireless meter, including a Wireless Smart Meter, and without fees. No one should have a wireless meter imposed upon him. Nor should anyone have to pay a penalty to protect the health of his family and his community. Specifically, grant ratepayers the right to have a safe meter, including especially the safest meter of all which is the "traditional analog mechanical meter with no wireless communications capability". This type of meter does not emit RF radiation at all. And this type of meter also has a long history of reliability and accuracy.

(2) If you want to provide SOME help but to MORE Maryland residents:

Extend to all renters, including those renting office space, the same rights extended to ratepayers in (1) above. Otherwise, their health will remain at the mercy of their landlords, who may not understand, or care, about the health risks to their renters.

(3) If you want to SOLVE the health problem for ALL Maryland residents equally:

Place a moratorium on the further installation of wireless meters, including Wireless Smart Meters, throughout Maryland. Then mandate a rollback of the installation of all wireless meters, including all Wireless Smart Meters, throughout the state. Specifically, grant homes and businesses the right to have a safe meter, including especially the "traditional analog mechanical meter with no wireless communications capability". That is the **only way** to protect all of the residents of the state, because each resident is irradiated not only by his own Wireless Smart Meter but also by the Wireless Smart Meters of his neighbors. Finally, right at least part of the wrong done to those who have opted out by ordering the refunding of all Opt Out fees that they have paid.

If I can be of assistance to you or your staff in assessing the documentation justifying such steps, please do not hesitate to contact me.

I urge you to look deeply into this major challenge to the health of all Marylanders. Only you can prevent the dreadful mistake made by the electric power companies from becoming a health disaster for all Maryland residents. Please take protective action now.

Thank you for your attention.

Regards,

Ronald M. Powell, Ph.D.

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EXHIBIT 03



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American Academy of Environmental Medicine Recommendations Regarding Electromagnetic and Radiofrequency Exposure

Physicians of the American Academy of Environmental Medicine recognize that patients are being adversely impacted by electromagnetic frequency (EMF) and radiofrequency (RF) fields and are becoming more electromagnetically sensitive.

The AAEM recommends that physicians consider patients' total electromagnetic exposure in their diagnosis and treatment, as well as recognition that electromagnetic and radiofrequency field exposure may be an underlying cause of a patient's disease process.

Based on double-blinded, placebo controlled research in humans,¹ medical conditions and disabilities that would more than likely benefit from avoiding electromagnetic and radiofrequency exposure include, but are not limited to:

- Neurological conditions such as paresthesias, somnolence, cephalgia, dizziness, unconsciousness, depression
- Musculoskeletal effects including pain, muscle tightness, spasm, fibrillation
- Heart disease and vascular effects including arrhythmia, tachycardia, flushing, edema
- Pulmonary conditions including chest tightness, dyspnea, decreased pulmonary function
- Gastrointestinal conditions including nausea, belching
- Ocular (burning)
- Oral (pressure in ears, tooth pain)
- Dermal (itching, burning, pain)
- Autonomic nervous system dysfunction (dysautonomia).

Based on numerous studies showing harmful biological effects from EMF and RF exposure, medical conditions and disabilities that would more than likely benefit from avoiding exposure include, but are not limited to:

- Neurodegenerative diseases (Parkinson's Disease, Alzheimer's Disease, and Amyotrophic Lateral Sclerosis).²⁻⁶
- Neurological conditions (Headaches, depression, sleep disruption, fatigue, dizziness, tremors, autonomic nervous system dysfunction, decreased memory, attention deficit disorder, anxiety, visual disruption).⁷⁻¹⁰
- Fetal abnormalities and pregnancy.^{11,12}
- Genetic defects and cancer.^{2,3,13-19}
- Liver disease and genitourinary disease.^{12,20}

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Because Smart Meters produce Radiofrequency emissions, it is recommended that patients with the above conditions and disabilities be accommodated to protect their health. The AAEM recommends: that no Smart Meters be on these patients' homes, that Smart Meters be removed within a reasonable distance of patients' homes depending on the patients' perception and/or symptoms, and that no collection meters be placed near patients' homes depending on patients' perception and/or symptoms.

Submitted by: Amy L. Dean, DO and William J. Rea, MD

Approved July 12, 2012 by the Executive Committee of the American Academy of Environmental Medicine

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EXHIBIT 04

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December 12, 2012

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

Dear Representative Kucinich:

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

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

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

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

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

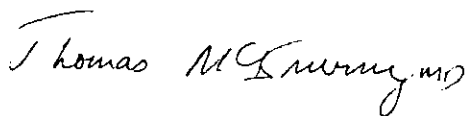
In May 2011, the International Agency for Research on Cancer (IARC), the United Nations' World Health Organization's (WHO) agency promoting international cancer research collaboration, classified RF energy as "possibly carcinogenic to humans." In addition, the National Cancer Institute has stated that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

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

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

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

Sincerely,



Thomas K. McInerney, MD, FAAP
President

ORIGINAL

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BEFORE THE ARIZONA CORPORATION COMMISSION

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Arizona Corporation Commission

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GB

IN THE MATTER OF THE
APPLICATION OF ARIZONA PUBLIC
SERVICE COMPANY FOR A HEARING
TO DETERMINE THE FAIR VALUE OF
THE UTILITY PROPERTY OF THE
COMPANY FOR RATEMAKING
PURPOSES, TO FIX A JUST AND
REASONABLE RATE OF RETURN
THEREON, TO APPROVE RATE
SCHEDULES DESIGNED TO DEVELOP
SUCH RETURN.

DOCKET # E-01345A-16-0036

**DIRECT TESTIMONY OF DR. SAM
MILHAM, MD, MPH ON BEHALF OF
WARREN WOODWARD AND IN
OPPOSITION TO THE SETTLEMENT
AGREEMENT**

IN THE MATTER OF FUEL AND
PURCHASED POWER PROCUREMENT
AUDITS FOR ARIZONA PUBLIC
SERVICE COMPANY

DOCKET # E-01345A-16-0123

Sam Milham, Witness in the above proceeding on behalf of Intervenor Warren

Woodward, hereby submits his Direct Testimony.

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I. INTRODUCTION

Q. Please state your name, address, and occupation.

A. Samuel Milham MD, MPH, 2318 Gravelly Beach Loop NW, Olympia WA 98502.
I am a semi-retired physician-epidemiologist.

Q. What is your professional and educational background?

A. I have a bachelor of science degree from Union College in Schenectady NY, an MD degree from Albany Medical College in Albany NY, and a masters of public health degree from Johns Hopkins University in Baltimore MD. I have worked for health departments and universities. I have over 100 peer reviewed scientific publications, many of which deal with the health effects of electromagnetic fields. I have written a book called *Dirty Electricity*. I have a website: www.sammilham.com with copies of recent publications and a curriculum vitae which lists all my publications. I have been consulted by dozens of people concerned about the health effects of their smart meters.

Q. What is the purpose of your direct testimony in these proceedings?

A. I discuss the effects of Arizona Public Service smart meters on the health of people residing and working in areas where these devices have been deployed.

Q. Have you testified previously before the Commission?

A. No.

II. SUMMARY OF DIRECT TESTIMONY

Q. Please summarize your direct testimony.

A. The APS "smart" meters are electronic devices which replaced the old electro-mechanical analog meters used to measure electric power consumption for billing purposes. The smart meters have circuitry to measure power consumption, and a microwave transmitter to send this information to the utility. The health effects of microwave exposures are well known. All transmitters, including the microwave transmitters in smart meters, operate on direct current (DC). The APS smart meters contain a switching mode power supply (SMPS) which changes the utility 60 Hz alternating current to DC. I will limit my testimony to the health effects of the electrical pollution (dirty electricity) generated by the smart meter SMPS. The dirty electricity problem is compounded by the utility using the earth as a primary neutral return to the substation.

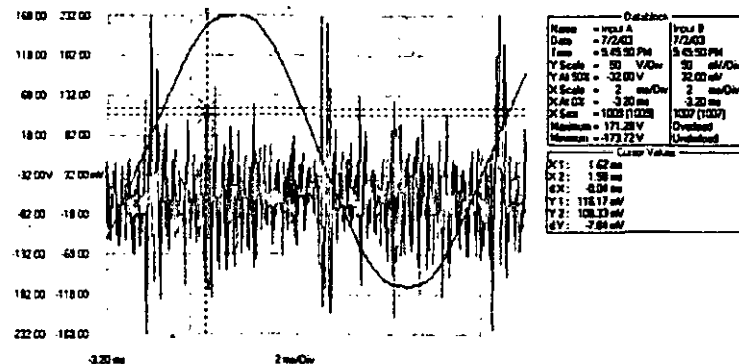
III. DIRECT TESTIMONY

Q. Please describe dirty electricity.

A. "Dirty electricity" or "dirty power" are terms coined by the electric utilities to describe the electrical pollution consisting of high frequency voltage transients and harmonics riding along on the 50 or 60 Hz wave form and contaminating the electricity delivered to users. Dirty electricity is generated by arcing and sparking, especially brush arcing in generators and electrical motors and any device which interrupts current flow, especially switching mode power supplies. These include computers, battery chargers, cell towers, compact fluorescent lights, variable frequency drives, grid tied solar and

wind power, and transmitters including smart meters. Dirty electricity is measured with a Graham/Stetzer meter (G/S meter) also known as a Microsurge II meter (MS II meter), which is plugged into electric outlets (Graham, 2005). This meter displays the average rate of change (dV/dT) of these high frequency voltage transients that exist everywhere on electric power wiring and gives a numerical output in Graham/Stetzer or G/S units. It is possible to short out the dirty electricity in wiring by plugging capacitive filters into electrical outlets.

Here's what dirty electricity looks like on an oscilloscope. The pink tracing is dirty electricity, and shouldn't be there.



THE WAVEFORM WAS COLLECTED IN ROOM 114 AT THE ELGIN/MILLVILLE PW HIGH SCHOOL. CHANNEL 1 WAS CONNECTED TO THE 120 VAC UTILITY SUPPLIED POWER RECEPTACLE. CHANNEL 2 WAS CONNECTED TO THE SAME POTENTIAL, EXCEPT THROUGH THE GRAHAM UBIQUITOUS FILTER. (REMOVES THE 60 HERTZ) THE AREA BETWEEN THE CURSORS REPRESENTS A FREQUENCY OF 25 KILO HERTZ. A TEACHER WHO PREVIOUSLY OCCUPIED THE ROOM DIED OF BRAIN TUMORS AND THE TEACHER IN THE ADJACENT ROOM DIED OF LEUKEMIA.

Q. What is the evidence that dirty electricity causes health problems?

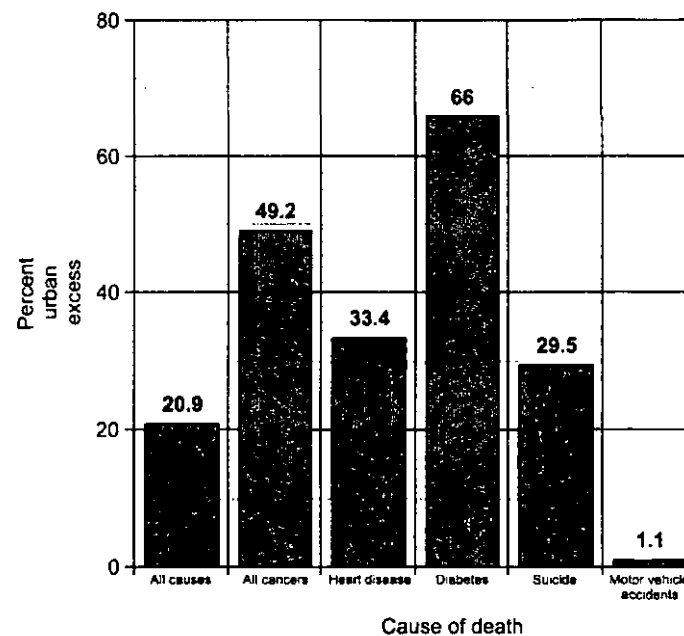
A. Edison's nine "Jumbo" generators had serious brush arcing problems and commutator wear. This means that from the very beginning of electrification in the U.S. in 1892 and the rest of the world, dirty electricity was being sent out into the grid. In an attempt to control the arcing, he added metallic mercury to the commutators, but this caused illness in his workers. Brushed generators and motors have the same problem today.

The health and mortality effects of electrification and dirty electricity happened so gradually, and on such a wide scale, that they went virtually unnoticed, and the major illnesses that can be attributed to them came to be considered "normal" diseases of modern civilization. By 1900, most cities in the world were electrified, but it took over 50 years for US farms and rural areas to get electricity.

By 1940, more than 90 percent of all the residences in the northeastern United States and California were electrified. By 1940, almost all urban residences in the United States were electrified and urban residents were, therefore, exposed to electromagnetic fields and dirty electricity in their residences and at work, while rural residents were exposed to varying levels of EMFs and dirty electricity, depending on the progress of rural electrification in their states. In 1940, only 28 percent of residences in Mississippi were electrified, while five Southern states had less than 50 percent of residences electrified. Eleven states, mostly in the Northeast, had residential electrification rates above 90 percent. In the highly electrified Northeastern states and in

California, urban and rural residents could have similar levels of EMF exposure, while in states with low levels of residential electrification, there were potentially great differences in EMF exposure between urban and rural residents. It wasn't until 1956 that these differences finally disappeared. What was already known by then, but not appreciated, was that urban death rates were much higher than rural rates for cardiovascular diseases, malignant neoplasms, diabetes and suicide in the 1930 and 1940 United States mortality data. In 1930, urban cancer death rates were 58.8 percent higher than rural cancer death rates.

1940 US white resident crude death rates: percent urban excess



Rural death rates were significantly correlated with the level of residential electric service by state for most of the causes examined. It is difficult to believe that mortality differences of this magnitude could go unexplained for more than seventy years after first being reported, and forty years after they had actually been noticed and commented upon. I suspect that in the early part of the twentieth century, nobody was looking for answers or knew how to properly frame the appropriate broad epidemiologic questions.

By the time electromagnetic field (EMF) epidemiology began in earnest in 1979, the entire population was exposed to EMFs. There was then simply no way to find an unexposed control group; therefore, all studies were potentially biased. Cohort studies, which follow groups of people forward in time, were by then using EMF-exposed population statistics to compute expected values, and case-control studies were comparing more exposed cases to less exposed controls. By way of analogy, the mortality from lung cancer in two-pack-a-day smokers is more than twenty times that of non-smokers, but only three times that of one-pack-a-day smokers. Extending that analogy to EMFs, after 1956, the EMF equivalent of a non-smoker ceased to exist in the United States, with the exception of the small Amish population.

The Old Order Amish (OOA) in North America live without electricity. They have less than half the cancer incidence of the US population (Westman, 2010), and about half the type 2 diabetes prevalence as other US citizens despite having the same body mass index (Hsueh et al, 2000). Cardiovascular disease (Hamman, 1981), Alzheimer's disease (Holder, 1998) and suicide (Kraybill, 1986) are reported to be less common in the OOA. A pediatric group practice in Jasper Indiana which cares for 800 Amish families has not diagnosed a single child with ADHD, and childhood obesity is almost unseen in this population (Ruff, 2005). Remarkably, the life expectancy of the OOA has been about 72 years for the past 300 years for both men and women. In 1900, the life expectancy of U.S. white males was 46.3 years and 48.3 years for white females.

In 2008 I coauthored a study of a cancer cluster in school teachers at a La Quinta, California middle school (see Milham and Morgan, 2008 at my website) which indicated that high frequency voltage transients (also known as dirty electricity), were a potent universal carcinogen with cancer risks over 10.0 and significant dose-response for a number of cancers. They have frequencies between 2 and 100 kHz. These findings are supported by a large cancer incidence study in 200,000 California school employees which showed that the same cancers and others were in excess in California teachers statewide (Reynolds et al, 1999). Power frequency magnetic fields (60 Hz) measured at the school were low and not related to cancer incidence, while classroom levels of high frequency voltage transients (dirty electricity) measured at the electrical outlets in the classrooms accurately predicted a teacher's cancer risk. These fields are potentially present in all wires carrying electricity and are an important component of ground currents returning to substations. This helped explain the fact that professional and office workers, like the school teachers, have high cancer incidence rates. It also explained why indoor workers had higher malignant melanoma rates, why melanoma occurred on parts of the body which never are exposed to sunlight, and why melanoma rates are increasing while the amount of sunshine reaching earth is stable or decreasing due to air pollution. A number of very different types of cancer had elevated risk in the La Quinta school study, in the California school employees study, and in other teacher studies. The only other carcinogenic agent which acts like this is ionizing radiation.

The 2008 study at the La Quinta, California middle school was followed by a study at Vista del Monte elementary school in North Palm Springs, California. This school, like many others had a cell phone tower on campus within 40 feet of a classroom wing. The teachers at this school reported a cancer cluster in the office and teaching staff, and hyperactivity in students in certain classrooms. The entire school had very high dirty electricity readings from the inverter or SPMS in the cell tower. Their dirty electricity levels were higher than those at the La Quinta school. The Vista del Monte G/S readings averaged 1,300 compared to 750 at La Quinta. Fifty G/S units make some people ill. The cancers (twelve cancers, including six female breast cancers among seventy-five personnel employed at the school since 1990) were over-represented in the wing of the school closest to the cell tower, and the G/S readings were highest in the classrooms closest to the cell tower base. At the same stage of the investigation, La Quinta school had eleven cancers in 137 teachers. A fourth grade teacher complained that her students were hyperactive and un-teachable. The outlets in her room measured over 5,000 Graham/Stetzer units. On a Friday afternoon after school, I reduced the measured dirty electricity in the wiring from over 5,000 to less than 50 Graham/Stetzer units with five plug-in filters from Stetzer Electric. With no change in either cell tower radiation or the lighting, the teacher reported an immediate dramatic improvement in student behavior in the following week. They were calmer, paid more attention and were teachable all week except for Wednesday when they spent part of the day in the library.

Later, the teacher told me that she could change the behavior of the children by removing and reinserting the filters. The change took between 30 and 45 minutes. This young teacher also became the thirteenth cancer case in this small teachers' cohort. Filtering the wiring of schools, homes and offices to short out dirty electricity can make dramatic differences in health.

Cell tower transmitters like all transmitters, operate on direct current. They also use the DC to charge their back-up batteries. The utility 60 Hz AC is changed to DC by a switching power supply which generates dirty electricity which contaminates the grid. People who are concerned about health issues regarding cell towers focus on the RF emissions, but dirty electricity is another unrecognized important exposure. A Brazilian study (Dode et al, 2011) showed higher cancer rates within 500 meters of the cell tower base and a dose-response with distance from the tower. Since the transmitted RF intensity decays as the square of the distance from the tower, the dirty electricity is the more likely cause of cancer out to 500 meters.

In 2011 the Lancet published a paper (Danaei et al, 2011), listing fasting plasma glucose (FPG) and diabetes prevalence in 199 countries and territories around the world. Islands are over-represented in places with high blood glucose and diabetes prevalence (Milham, 2013 b). Seven of ten of the places with highest FPG in males are small islands, many in Oceania, while only one of the ten places with the lowest FPG are. In 2011, the same group, Global Burden of Metabolic Risk Factors in Chronic Diseases

Collaborating Group, also published a similar analysis of body mass index (obesity) (Finucane MM et al, 2011), with nearly identical results. I believe that the world wide epidemics of diabetes and obesity are both due to exposure to dirty electricity on electric utility wiring coming from generator brush arcing, bad wiring connections and from cell tower switching power supplies. Islands without fuel supplies are likely to import diesel oil to fuel generator sets which generate dirty electricity which rides along on the 50 and 60 Hz transmission frequencies. If the islands of Oceania are cleaned up electrically, it may take a generation to see the effects.

De-Kun Li (Li DK 2011, 2012) has published two important prospective studies showing that magnetic field exposure during pregnancy increases the risk of asthma and obesity in offspring. Asthma and obesity are rare in Amish children. I believe that magnetic fields are a surrogate for dirty electricity in these studies. I think I also know the etiology of the excess suicides, post traumatic stress disorders, and a number of other Gulf War illnesses. About 85 percent of the fuel oil imported into Afghanistan and Iraq is used for air conditioning at a cost of \$ 20.2 billion per year (2011 report). The portable diesel-fueled generator sets which power the air conditioners generate dirty electricity. The wiring also can't be very good, because of the reports of increased accidental electrocution in military personnel in Iraq and Afghanistan. Interestingly, Navy and Air Force personnel don't share the recent suicide increase seen in the Army and Marine Corps.

The highest asthma prevalence rate reported is in the population of Tristan da Cunha, a small Atlantic island with six diesel generator sets for electrical power.

For over eighty years, economists have noted a paradoxical improvement in health indices (declining mortality rates and increasing life expectancy) during economic recessions. Mortality rates increase and life expectancy decreases during economic expansions. The title of a paper (Tapia Granados and Ionides, 2008) "The reversal of the relation between economic growth and health progress: Sweden in the 19th 20th centuries" says it all. The expected decline of health indicators with economic recessions and improvement with economic growth in the 19th century Sweden was reversed in the 20th century, giving the counter-intuitive pattern of higher mortality and lower life expectancy in economic expansions and improvement of these indices in recessions. The change or "tipping point" occurred at the end of the 19th century or early in the 20th century when electrification was introduced into Sweden. All 5 of the reversals of annual industrial electric energy use in the U.S. between 1912 and 1970 were accompanied by recessions with lowered GDP, increased unemployment, decreased mortality and increased life expectancy. The mortality improvement between 1931 and 1932 by state in the U.S. strongly favored urban (electrified) areas over rural areas. Rural unemployment is positively correlated with residential electrification percentage by state in 1930. The health effects of economic change are mediated by electrical exposure (Milham, 2013 a). In recessions, the electric motors which turn the wheels of industry are stilled. The

improvement of health indices in Nazi occupied Europe in WW II and in Cuba during their recent economic collapse were not due to caloric restriction, but to lowered EMF and dirty electricity exposure.

Q. How does the dirty electricity from smart meters expose people?

A. Because it is at the front end of a building's wiring, the dirty electricity from the smart meter's SMPS has a gateway into that building's wiring, and also into the earth via the house ground. The house wiring acts as an antenna and the fields capacitively couple to the body through the air within 6 to 8 feet of the house wiring or extension cords plugged into the outlets. The ground (green screw) in the breaker box is connected to the utility neutral wire for return to the substation. The grounded Wye grid with numerous connections between the neutral and the earth and inadequate neutral wire current carrying capacity, means that most of the return currents travel in the earth for substation return. This violates the National Electric Safety Code rules 92 D and 215 B, and most state public utility rules. The dirty electricity in the earth makes cows ill and gets into homes thorough conductive water, gas and sewer pipes, utility electric service, and through the foundation rebar in homes built on a concrete slab.

Smart metered neighborhoods have higher dirty electricity levels in the earth. It is possible to get smart meter wave forms in homes without a smart meter and with the electrical service shut off.

Q. How do you think dirty electricity causes health problems?

A. We are electrochemical soup at the cellular and organ level. Think of ECG (electrocardiogram), EEG (electroencephalogram), and EMG (electromyogram). We evolved in a complex EMF environment with an interplay of natural terrestrial and extra-terrestrial EMF sources from solar activity, cosmic rays, and geomagnetic activity. I believe that our evolutionary balance, developed over the millennia, has been severely disturbed and disrupted by man-made EMFs. I believe that man-made EMFs, especially dirty electricity, are chronic stressors and are responsible for many of the disease patterns of electrified populations. The dramatic differences in mortality in 1940 U.S. data between electrified urban areas and non-electrified rural areas is reported in detail in a 2010 paper (Milham, 2010).

The inescapable conclusion of these findings is that the twentieth century epidemic of the so-called diseases of civilization, including cardiovascular disease, cancer, diabetes and also suicide, was caused by electrification, especially dirty electricity, and the unique biological responses we have to it. A large proportion of these diseases may therefore be preventable.

Q. Can you provide studies that show nerve disruption caused by the same kilohertz frequencies that are generated by APS's smart meters?

A. Yes. In Exhibit A I have provided a good sampling of abstracts that address those particular frequencies. I have highlighted some of the salient language.

Q. Is there any government funded science or professional institutes that

acknowledge biological affects from current absorbed by human body?

A. Yes. In Exhibit B I have provided one such example, a study by the Electric Power Research Institute, and it quotes from the National Institute of Environmental Health Sciences (NIEHS) as saying that at a certain level of contact current (which happens to be similar to the exposure a person would have when sleeping next to a wall with a smart meter on the other side) there are "biological effects relevant to cancer."

In addition to these relative aspects of dose, the absolute (as well as modest) level of contact current modeled (18 μ A) produces average electric fields in tissue along its path that exceed 1 mV/m. At and above this level, the NIEHS Working Group [1998] accepts that biological effects relevant to cancer have been reported in "numerous well-programmed studies". The effects the Working Group cites are "increased cell proliferation, disruption of signal transduction pathways, and inhibition of differentiation". The NIEHS endorses this conclusion in its final EMF RAPID report [1999].

Q. Does the human body absorb frequencies at the same rate?

A. No, frequencies over 1.7 kHz are absorbed much easier than the 60 Hertz supplied by the utility. At 60 Hertz, the total body impedance is over 3,000 ohms. At 1.7 kHz, the impedance of the skin drops to 500 ohms and continues to drop as frequency increases.

At 100 kHz, the impedance is approximately 435 ohms. In layman's terms this means that at high frequencies (over 1.7 kHz) this energy goes internal to the human body. For more information, see the excerpt of the reference book, *Electrical Stimulation and Electropathology*, by J. Patrick Reilly at Exhibit C.

IV CONCLUSION

Q. DO YOU HAVE ANY CONCLUDING REMARKS?

A. Yes. It is my professional opinion that smart meters are a public health hazard.

V REFERENCES

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Dode AC et al. Mortality by neoplasia and cellular telephone base stations in the Belo

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[<https://ehtrust.org/wp-content/uploads/Pall-Letter-to-CalLegis-FINAL-8-7-17.pdf>]

Martin Pall, PhD

August 7, 2017

Dear California Legislators,

I am Dr. Martin Pall, Professor Emeritus of Biochemistry and Basic Medical Sciences at Washington State University. I am a published and widely cited scientist on the biological effects of electromagnetic fields and speak internationally on this topic. I am particularly expert in how wireless radiation impacts the electrical systems in our bodies. I have published 7 studies showing there exists exquisite sensitivity to electromagnetic fields (EMFs) in the voltage sensor in each cell, such that the force impacting our cells at the voltage sensor has massive impact on the biology on the cells of our bodies [1-7]. These papers are discussed in over 360,000 web sites which can be easily found by Googling (Martin Pall electromagnetic). I received my PhD at Caltech, one of the top scientific institutions in the world.

EMFs act by activating channels in the membrane that surrounds each of our cells, called voltage-gated calcium channels (VGCCs). The EMFs put forces on the voltage sensor that controls the VGCCs of about 7.2 million times greater than the forces on other charged groups in our cells [4,6,7]. This is why weak EMFs have such large biological effects on the cells of our bodies! EMFs works this way not only on human and diverse animal cells [1-7] but also in plant cells [7] so that this is a universal or near universal mechanism of action.

Thousands of published studies show biological and health effects from electromagnetic fields. We now know the mechanism that can explain these effects. The mechanism is a function of the electromagnetics of each cell—not solely about heating effects from the radiation (on which present FCC guidelines are based).

This new understanding [1-7] means we can debunk the claims of the wireless industry that there cannot be a mechanism for effects produced by these weak EMFs. The 20 years plus of industry propaganda claims are false. Rather the thousands of studies showing diverse health impacts of these EMFs can be explained. We now have a mechanism, one that is supported by both the biology and the physics, both of which are pointing in exactly the same direction. I am sending as a separate document a list of 134 reviews, each of which provides from 12 to over a thousand individual citations showing health impacts of low intensity EMFs, EMFs that the telecommunications industry claims cannot have such effects. These 134 reviews and thousands of primary scientific papers they cite show that the industry propaganda has no scientific support whatsoever.

The consensus among independent scientists on this is further confirmed by the 2015 (and later) appeal made to the United Nations and member states, stating that the current EMF safety guidelines are inadequate because they do not take into consideration non-thermal effects. This was signed by 225 scientists from 41 countries, each of whom had

published peer reviewed studies on EMF health effects – a total of 2,000 papers published in this area by the signers, a substantial fraction of the total publications in this area.

According to industry, the forces electromagnetic fields place on electrically-charged groups in the cell are too weak to produce biological effects. However, the unique structural properties of the voltage-gated calcium channel (VGCC) protein can, it turns out, explain why the force on a cell's voltage sensor from low-intensity EMFs are millions of times stronger than are the forces on singly-charged groups elsewhere in the cell.

It would be a disaster for the health of Californians to be exposed to the antennas envisioned in SB.649. The State of California would be making a grave mistake to proceed with supporting the commercial interests of the wireless industry with this legislation. **Legislators would best pause to understand the gravity of the biological effects, and the ramifications for physical and mental health, as well as consequences from continual damage to human DNA, and learn the facts from scientists who are independent of the wireless industry, not from the industry lobbyists who have a gigantic conflict of interest.**

VGCC activation in cells produced by low intensity EMFs can explain long-reported findings that electromagnetic fields and a wide range of biological changes and health effects. The first 6 of these (see below) were well documented 46 years ago in the U.S. Office of Naval Medical Research report, published in 1971 [8]. The others that follow have been extensively documented subsequently in the peer-reviewed scientific literature:

- 1) Various neurological/neuropsychiatric effects, including changes in brain structure and function, changes in various types of psychological responses and changes in behavior.
- 2) At least eight different endocrine (hormonal) effects.
- 3) Cardiac effects influencing the electrical control of the heart, including changes in ECGs, producing arrhythmias, changes that can be life threatening.
- 4) Chromosome breaks and other changes in chromosome structure.
- 5) Histological changes in the testes.
- 6) Cell death (what is now called apoptosis, a process important in neurodegenerative diseases).
- 7) Lowered male fertility including lowered sperm quality and function and also lowered female fertility (less studied).
- 8) Oxidative stress.
- 9) Changes in calcium fluxes and calcium signaling.
- 10) Cellular DNA damage including single strand breaks and double strand breaks in cellular DNA and also 8-OHdG in cellular DNA.
- 11) Cancer which is likely to involve these DNA changes but also increased rates of tumor promotion-like events.
- 12) Therapeutic effects including stimulation of bone growth.
- 13) Cataract formation (previously thought to be thermal, now known not to be).
- 14) Breakdown of the blood-brain barrier.
- 15) Melatonin depletion and sleep disruption.

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They may be low intensity but with regard to the VGCCs, electromagnetic fields can have a tremendously powerful impact on the cells of our bodies. Furthermore, published studies showing that calcium channel blocker drugs block or greatly lower biological effects from electromagnetic fields confirm there is a VGCC activation mechanism that is causing various effects. Higher frequency electromagnetic fields from 5G technologies on the horizon pose even greater biological concern than those to which we are exposed today. We should be moving, instead, to wired technologies at every opportunity, based on what we know in science today, not expanding and supporting the proliferation of wireless.

I want to make several additional points very clear:

1. **The Physics and the Biology are both pointing in the same direction. Both show that EMFs act primarily via activating the VGCCs in the cells of our bodies.**
2. DNA damage known to be produced by these EMFs occur in human sperm and may also occur in human eggs, leading to large increases in mutation in any children born. It is thought that an increase in mutation frequency of 2.5 to 3-fold will lead to extinction because of accumulation of large numbers of damaging mutations. We may already be over this level, and if so, simply continuing our current exposures will lead to eventual extinction. Further increases in exposures will be more rapidly self-destructive.
3. **Pulsed EMFs are, in most cases, more biologically active and therefore more dangerous than are non-pulsed (continuous wave) EMFs.** All cordless communication devices communicate via pulsations, because it is the pulsations that carry the information communicated. All the industry claims of safety are based on a theory (only thermal effects) that was known to be wrong back in 1971 [8] – and that was before many thousands of additional studies were published providing massive confirmation that industry claims are false.
4. The industry is trying to move to much higher frequencies because these much higher frequencies allow much higher pulsations and therefore much higher transmission of information. However, these higher pulsation rates make these ultra-high devices vastly more dangerous. This is part of the reasons why it is so important to vote down SB.649.
5. **None of our wireless communication devices are ever tested biologically for safety – not cell phone towers, not cell phones, not Wi-Fi, not cordless phones, not smart meters and certainly not 5G phones, or radar units in cars – before they are put out to irradiate an unsuspecting public.**
6. The telecommunications industry has corrupted the agencies that are supposed to be regulating them. The best example of this is that the FCC which regulates EMFs in the U.S. is a “captured agency”, captured by the industry it is supposed to regulate, according to an 8 chapter document published by the Edmond J. Safra Center for Ethics at Harvard University [9]. Is it any wonder, therefore, that the industry keeps touting that their devices are within the safety guidelines set by the FCC?

I urge you to do the right thing on behalf of the health of Californians and future generations. Please let me know if I can provide further information. (503) 232-3883.

Sincerely,
Martin Pall, PhD (Caltech, 1968)
Professor Emeritus of Biochemistry and Basic Medical Sciences
Washington State University

Citations:

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Expert Report of Andrew A Marino

August 8, 2016

This report was prepared by Andrew A. Marino at the request of Stephen G. Harvey, counsel for Maria Povacz, Laura Sunstein Murphy, Diane and Stephen Van Schoyck, Cynthia Randall, and Paul Albrecht as Complainants in litigation before the Pennsylvania Utility Commission with PECO as the Respondent. For convenience of presentation on complex subject matter, the report is presented in question and answer format.

Purpose

Q. What is the purpose of your report?

A. My first purpose is to express my professional opinion that there is a basis in established science for Complainants' concern regarding risks to human health caused by man-made electromagnetic energy in the environment, including the type of electromagnetic energy emitted by smart meters, and to describe the scientific basis of my opinion with particularity.

My second purpose is to express and explain my professional opinion that it would be unreasonable to involuntarily and chronically expose the Complainants to the electromagnetic energy emitted by smart meters. Scientific evidence indicates that the neurological syndrome of electromagnetic hypersensitivity exists. There is a reasonable basis to believe that the symptomatology of the Complainants and its relation to smart-meter electromagnetic energy is factual. There is a basis in established science to

support the Complainants' concerns that future exposure to smart-meter energy will worsen their already precarious medical conditions. Ample scientific evidence indicates that the aforementioned exposure would be a risk to the health of the Complainants.

Qualifications

Q. What are your qualifications to express these opinions.

A. I earned a PhD in biophysics in 1968 and a JD in 1974. My curriculum vitae is attached as Exhibit 1. Briefly, from 1964 to 2014, I worked full-time teaching and performing research in the area of experimental biology that deals with the role of natural electromagnetic energy in animals and human beings, and with the effects of man-made electromagnetic energy on animals and human beings. I retired from those duties in 2014 and began working on developing commercial technology capable of obtaining clinical diagnostic information from measurements of the electroencephalogram, which is the natural electromagnetic energy emitted by the brain.

Q. Where did you conduct your research on electromagnetic energy?

A. For the first sixteen years of my career, at the Veterans Administration hospital in Syracuse, New York. For the next thirty-three years, my research laboratory was in the LSU medical school in Shreveport Louisiana, where I served full-time as a professor in the departments of orthopedic surgery, neurology, and cellular biology and anatomy.

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Q. Regarding your teaching responsibilities, what did you teach, and to whom?

A. To medical students, I taught musculoskeletal medicine, the scientific basis of medicine, experimental biology, human research methods, and the legal-ethical responsibilities of physicians. To graduate students I taught the cognitive structure of science, which is the framework within which researchers make valid observations and attach meaning to them, and I taught particular techniques of experimental biology. To medical residents and medical fellows I taught specialized subjects, for example, methods of analysis of the electrical activity of the brain, and general subjects, for example how to formulate a clinically relevant hypothesis and then answer it by means of an animal or human experiment.

Q. What area of science is relevant to the issue of health risks posed by smart meters?

A. The general area is experimental biology, by which I mean the scientific method for finding reliable knowledge about living systems.

Q. Did you author peer-reviewed scientific publications in your area of expertise?

A. I wrote many peer-reviewed publications dealing with all aspects of electromagnetic energy, including its biological effects on humans, animals, cells, its biophysical effects on biological molecules, and its engineering

characteristics. These publications are listed in my curriculum vitae which is attached as Exhibit 1.

Q. What is electromagnetic energy?

A. It is one of the four basic forces in the universe. Electromagnetic energy is present within all living things; it regulates the function of every cell in the body and serves as one of the two basic languages of the brain, the heart, the nervous system, and the musculoskeletal system. Electromagnetic energy occurs naturally in the environment, for example, the earth's magnetic field, and has a profound influence on all basic biological phenomena including growth regulation and control, circadian rhythms, and spatial orientation. Since the beginning of the twentieth century, and particularly after the end of World War II, the levels of man-made electromagnetic energy occurring in the general and work-place environments have risen dramatically as a result of man's economic and social activities.

Q. What activities?

A. The things that characterize and define modernity: the telegraph, radio, television, radar, powerlines, cell phones, wireless networks, smart meters, and innumerable other similar examples.

Q. What kind of human experiments did you do, and why?

A. In clinical research involving patients suffering from orthopedic diseases, my colleagues and I applied simulated natural electromagnetic energy for the purpose of bringing about cures. In laboratory research, we exposed clinically normal volunteers to simulated man-made electromagnetic energy of the type and at the levels that are pervasively present in the environment. Our goal was to obtain fundamental knowledge about how the human body detected the presence of man-made electromagnetic energy.

Q. What was the objective of the laboratory research that involved the normal volunteers?

A. There are three basic kinds of theories regarding how man-made electromagnetic energy can affect the human beings and animals. Each theory hypothesizes a different process regarding how the energy interacts with the living system. My objective was to test the theory that the process is *sensory transduction*, which is how the body detects all other signals including light, sound, heat, pressure, and pain. Previous research by my colleagues and I had indicated that transduction was a likely process by which the body detected electromagnetic energy. See *Electromagnetism and Life* (Exhibit 1) and Exhibit 2 at No. 75, 90, 94, and 98.

Q. Were the experiments completely safe for the volunteers?

A. The present scientific evidence regarding the health risks due to man-made electromagnetic energy link *chronic exposure* to disease. By that term I mean exposure that is continuous and/or continual. The volunteers were exposed to the energy for only about ten minutes. That information was presented to them in a written informed-consent document whose content was approved by an impartial committee, as required by federal law. They were told that there were no known risks because exposure would last for only a few minutes, but the volunteers were not told that the experiment was completely safe. Such statements cannot be proven and are therefore not permitted in consent forms for human studies.

Q. What were the results of the experiments?

A. Briefly, that human beings have the sensory capability to detect man-made electromagnetic energy of the type present in the general environment, including the type produced by smart meters. Information concerning the presence of the energy in the subject's environment is transmitted to the brain, where it is processed. These publications are listed in Exhibit 2 at No. 60, 61, 64, 68, 69, 70, 74, 75, 83, 84, 94, 96, 97, 100, and 102.

Q. What were the consequences in the volunteers after they detect the electromagnetic energy?

A. Systems in the body discarded the information because it served no useful purpose for the body, by which I mean an evolutionarily conditioned purpose. Information contained in light or sound, as examples, is key to the survival of animals and humans. In contrast, man-made electromagnetic energy in the environment has no biological benefit. From a physiological perspective purpose the energy is a kind of pollution because it was not put in place with the intention of affecting the human body. The key point of the experiments was to prove that the information entered the body, which is an absolutely necessary step for any adverse changes to eventually develop.

Q. If the information is discarded, how can adverse effects subsequently develop?

A. One possibility is that process of discarding information has a physiological cost. Discarding information is an adaptive process, but the ability of the body to adapt is finite. If that ability is exceeded the result can be clinically recognizable stress and/or stress-related disorders. Such conditions, in turn, promote the development of disease.

Q. How many times does the adaptive process need to occur before adverse effects occur?

A. We did not address that question in our experiments. Within the framework of these experiments I can say only that the information activates various cells in the brain, but not the cells that produce consciousness. We know

that was the case because the volunteers were always unaware of the presence of the energy to which they were exposed, even though it changed the electrical activity of their brains.

Q. Would you briefly describe how you did these experiments and what you measured?

A. I designed and built an apparatus that permitted me to expose the volunteers to man-made electromagnetic energy. During the experiment I continuously recorded the electroencephalogram from six locations on the scalp. The energy was turned on and off according to a timing pattern that was unknown to the volunteer. Using technical methods of data analysis that I developed with colleagues, we compared the electrical activity in the brain that occurred in the presence and absence of the energy. In essentially every volunteer, we found to a statistical certainty that the brain activity differed between the two conditions, meaning that each volunteer had detected the energy, which is a condition precedent to all biological effects caused by man-made electromagnetic energy.

Q. What kind of animal experiments did you do, and why?

A. I did experiments on rats, mice, rabbits, and fish. Different experiments were done for different purposes.

One purpose was to test my hypothesis regarding the physiological process by which chronic exposure to man-made electromagnetic energy can

ultimately lead to human disease and disorders. There are several basic kinds of theories. Our theory was that exposure was a stress on the body, and that if the stress continued too long the body's inherent protective and adaptive mechanisms would ultimately break down, resulting in clinical disease. We tested our theory by measuring endpoints in rats and mice that would be expected to be altered if the electromagnetic energy were a stressor, and we were successful.

Another purpose was to determine the anatomical location of the cells in the body that actually detected the man-made electromagnetic energy. There are two basic kinds of theories regarding this issue, one holding that *all* cells can detect the energy, the other that only specialized cells can detect the energy, similar to specialization that accounts for the detection of light, sound, taste, pressure, and pain. We favored the latter theory and tested it using rabbits, which are sufficiently large that the energy can be reasonably localized, permitting assessment of whether the rabbits' brain electrical activity is altered when the energy was present. These studies were successful.

A third purpose was to test my hypothesis regarding the biophysical process responsible for detection of environmental-level man-made electromagnetic energy. There are three major types of theories in this area. One theory holds that none exists. This theory originated in Germany during World War II, and is outmoded even though it remains as the basis of the present FCC rules regarding safety of cellphones and smart meters. A second theory envisions direct effects of the energy on the DNA of the subject. A third theory is based on the process of sensory transduction, which I described hereinabove.

My colleagues and I conducted experiments with fish to test whether a particular biophysical process could account for the sensory-transduction of low-frequency electromagnetic energy, and we were successful.

The results of the experiments I described can be found in Exhibit 2 at No. 1, 54, 66, 76, 85, 86, 88, 89, 92, 92, 99, 102, 104, 110, 111, 112, 118, 119, and 120.

Q. Why did you use fish?

A. Because the methodology we used, one of the most advance techniques presently used in experimental biology, would have been impossible in any other animal species.

Q. Is the biophysical process you described the same one that accounts for how the electromagnetic energy from smart meters is detected?

A. No. It cannot serve as a biophysical explanation for detecting smart-meter energy. But in a recent human experimental study I presented evidence for a different biophysical process that can provide such an explanation (Exhibit 2 at No. 1).

Electromagnetic Energy

Q. Are there different types of electromagnetic energy?

A. At an engineering level there is an infinity of technically different types of electromagnetic energy. Essentially, at an engineering level, every kind of

energy-emitting device emits a different type of energy, as does every brand of each such device. But with respect to the issue of health risks posed by exposure to man-made electromagnetic energy, including that emitted by smart meters, there is no material difference among the infinity of technically different types because there is no empirical evidence that they produce different kinds of biological effects. Consequently the technical differences are irrelevant, at least for the purposes of assessing human health risks.

Q. What is the basis of your opinion that they are irrelevant?

A. There is a large scientific literature regarding the effects on human beings and animals caused by man-made environmental electromagnetic energy, but the literature contains no credible indication that the effects are related to differences in the technical type of the electromagnetic energy. Actually the opposite is true, as I first pointed out in 1982, in *Electromagnetism & Life* (see Exhibit 1).

Q. What do you mean when you say that the opposite is true?

A. In my book I presented clear evidence that the same biological effect could be produced by technically different types of man-made electromagnetic energy. Since the book was published there have been many confirmations of my original conclusion. From animal studies we can now see that essentially any biological system in the body can be altered by environmental-strength levels of

any technical type of electromagnetic energy. See Exhibit 2 at No. 7, 16, 18, 19, 23, 29, 35, 48, 51, 67, 72, 82, 87, 88, 89, 91, 92, 93, 122, 128 and 140.

Q. You said there were no technically different types of electromagnetic energy as regards evaluating health risks of man-made electromagnetic energy. Are there general types of electromagnetic energy?

A. Yes. I think it is useful to divide man-made electromagnetic energy into two classes, based on the biophysics of the process by which the human body detects them (see Exhibit 2 at No 1 and 76). Almost all commercial sources of electromagnetic energy fall into one or both classes, which I will call *low frequency* and *high frequency*. Examples of sources in the low-frequency class include low-voltage and high-voltage powerlines, household wiring, electric blankets, electric lights, computers, battery chargers, arc welders, and electric cars. Examples of sources in the high-frequency class include radio and television signals, radar, microwave ovens, wireless networks, computers, cellphones, and smart meters. Both classes of electromagnetic energy can cause the same biological effects in animals and human beings, meaning that the risks suggested by the observed effects are more or less the same for the two classes

Health Risks Due to Man-made Environmental Electromagnetic Energy

Q. When you said that there is a basis in established science for serious concern regarding risks to human health caused by man-made electromagnetic energy in the environment, what did you mean by "established science."

A. I meant the two types of peer-reviewed publications that are the primary repository of our scientific knowledge about living systems including, of course, knowledge about the effects of electromagnetic energy on living things. The two types are *experimental studies* and *epidemiological studies*.

Q. What are experimental studies?

A. Experimental studies are well-established formal procedures for generating knowledge about nature. Generally, they involve the randomization of subjects to groups that are or are not exposed to the factor of interest, electromagnetic energy for example, measurement of a chosen biological parameter, statistical comparison of the measurements between the two groups, and a conclusion regarding whether or not the energy caused a change in the parameter measured. Such studies produce the most reliable type of scientific knowledge because they can rationalize the existence of cause-and-effect-relationships. As with all scientific studies, experimental studies have fundamental limitations.

Q. What are epidemiological studies?

A. They are non-experimental studies in which pre-existing information such as health data collected by government agencies is analyzed to assess whether a particular disease or disorder is statistically associated with a factor of interest, smoking for example. Such studies produce the most relevant type of scientific knowledge regarding health risks of electromagnetic energy because their

conclusions apply directly to human beings. Nevertheless their probative value is far more limited compared with experimental studies. This limitation arises directly from the logical structure of epidemiological studies.

Q. What do you mean?

A. Epidemiological studies are inherently incapable of evidencing a cause/effect relationship. The strongest kind of a conceptual link epidemiological studies can yield is that of an *association*. Associations sometimes foreshadow causal connections, sometimes not, and the investigator never knows which conclusion is correct

Q. What do you mean by "health risk" and how is its existence determined scientifically?

A. By that term I mean a factor or condition that is reasonably suspected of contributing to the development of human disease or disorder.

There are two scientific methods for producing evidence that a specific factor or condition is a health risk. The traditional method for evaluating novel factors or conditions is to expose animals to the factor or condition and observe what happens. This method is commonly used to evaluate the safety of herbicides, pesticides, and cosmetics, food additives, and the safety of drugs.

Epidemiological studies constitute the second scientific method. They come into play when the factor or condition is not novel, but rather is generally present in the human environment. If the factor or condition is a risk factor, then a

natural experiment will have actually been performed, and evidence of possible adverse associations should be discoverable by studying sick people and assessing whether they had more of the factor or condition than did people who didn't get sick.

Public concern about a factor or condition is sometimes triggered by an epidemiological study that seems to suggest that the factor or condition is associated with the occurrence of a human disease or disorder. Typically the concern is amplified because there is no experimental evidence from animal studies showing safety.

Q. Is this what happened to the manufacturers of smart meters?

A. Yes. Many independent investigators throughout the world did epidemiological studies of the possible health risks of man-made electromagnetic energy from various sources, and these investigators reported that the energy was associated with a wide range of human diseases and disorders. See Exhibit 2 at No. 2, 15, 20, 21, 22, 25, 31, 32, 33, 38, 40, 41, 42, 44, 46, 47, 49, 62, 63, 71, 73, 79, 81, 82, 87, 95, 113, 121, 129, 130, and 133.

Q. Is the list exhaustive?

A. No.

Q. Why do you conclude that there is a basis in established science for serious concern regarding risks to human health caused by man-made

electromagnetic energy in the environment, including the type of electromagnetic energy emitted by smart meters?

A. Because both methods in experimental biology for assessing whether a factor or condition is a possible health risk, namely experimental studies and epidemiological studies, individually and together, indicate that man-made environmental electromagnetic energy is a health risk. Numerous peer-reviewed scientific studies in experimental biology involving the effects of man-made electromagnetic energy, including the type produced by smart meters, have shown that such energy causes a wide range of biological effects on the endocrinological, immunological, cardiovascular, hematological and neural systems of the body, and on growth and healing. The results of these studies are the best evidence obtainable by means of the scientific method regarding the possible existence of health risks to humans. Consequently these studies directly support the conclusion that exposure to man-made electromagnetic energy is a health risk to humans. In addition, many independent epidemiological studies indicate that man-made environmental electromagnetic energy is associated with a broad range of human diseases and disorders, especially cancer. It is difficult for me to imagine what further evidence would be needed to establish that there is a basis in established science for serious concern regarding risks to human health caused by man-made electromagnetic energy in the environment, including the type of electromagnetic energy emitted by smart meters.

Electromagnetic Hypersensitivity

Q. What is electromagnetic hypersensitivity?

A. It is a physiological condition in which the affected person experiences musculoskeletal, immunological, and/or neurological symptoms that flare or intensify upon exposure to man-made electromagnetic energy in the environment.

Q. Can you be more specific regarding what the symptoms are?

A. There are many reports in the literature in which investigators have listed or classified the symptoms. See Exhibit 2 at No. 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 24, 26, 30, 31, 32, 33, 34, 36, 38, 39, 40, 41, 45, 52, 55, 57, 63, 65, 77, 123, 124, 125, 126, 127, 134, 135, 136, 137, 138, 139. Essentially, the list consists of all the undesirable somatic reactions that human beings can experience. The complaint that people who suffer from electromagnetic hypersensitivity have in common is that they feel discomforted and/or unwell. They exhibit a general syndrome of just being sick, as opposed to exhibiting symptoms that are pathognomonic for a particular disease.

Q. Are you saying that man-made electromagnetic energy causes the symptoms?

A. Yes, in the but-for sense of causality.

Q. What do you mean by the but-for sense?

A. This is an important point. The available scientific and clinical evidence shows that man-made electromagnetic energy can trigger a symptomatic response in some human beings. Most studies indicate 5-10% of the general population self-report as suffering from electromagnetic hypersensitivity. See Exhibit 2 at No. 141, 142, 143, and 144. The energy isn't a complete causal explanation for the syndrome in the sense that gravity explains why objects fall. In a particular sufferer the energy causes the symptoms in the sense that the symptoms would not exist at that time but for the presence of the energy. Because human beings are all different, the precise level of the energy that can trigger a response, the precise set of symptoms, and their requisite level and duration of exposure differ profoundly among sufferers. Presently the precise reasons why some humans report symptoms from man-made electromagnetic energy and others do not, why the symptoms vary from person to person, and how the symptoms depend on the levels and duration of exposure are all unknown. But these unresolved issues do not undermine the scientific conclusion that man-made electromagnetic energy causes the reported symptoms in some human beings.

Q. Including energy from smart meters?

A. Yes. That's the most reasonable inference I can make from the available evidence. There is no empirical evidence whatsoever to suggest that smart meters are somehow different from other sources of electromagnetic energy in

some meaningful way that would eliminate concern about health risks or about triggering hypersensitivity reactions.

Q. Have the possible health risks of smart meters with respect to hypersensitivity been studied in experiments?

A. There are no published experimental studies, either by independently-funded investigators or by the industry.

Q. Is electromagnetic hypersensitivity like an allergic reaction?

A. Yes, in the sense that symptoms can flare or intensify when the person suffering from the disorder is exposed to levels of electromagnetic energy that normally don't trigger a symptomatic response in most people. But the condition is probably mediated by an aberration in the body's overall electrical regulatory system, not by an aberration in the body's biochemical-based regulatory systems, such as those that produce type-1 and type-4 allergic reactions.

Q. Is electromagnetic hypersensitivity a new condition that has just begun to appear recently?

A. During the last 35 years I met many people with self-diagnosed electromagnetic hypersensitivity. Public concern about it increased greatly during that period, especially after the increase in man-made energy in the environment that occurred following development of cellphones and wireless networks. Electromagnetic hypersensitivity can now be recognized as a part of

the larger problem regarding the public-health risks of man-made environmental electromagnetic energy.

Q. In what way is it a part of a larger problem?

A. Historically cancer was the focus of the risks due to electromagnetic energy, particularly cancer of the blood from low-frequency energy such as that from powerlines, and brain cancer from high frequency energy such as that from cellphones. Less attention was given to electromagnetic hypersensitivity. There was common notion that the sufferer could fix the problem by simply avoiding exposure to the device that emitted the energy. We can now see that is not always easy to do, as this case shows. Also the rules for diagnosing electromagnetic hypersensitivity have not been finalized in the sense of specific guidelines for use by primary-care physicians.

Q. Have you conducted human studies on electromagnetic hypersensitivity?

A. My colleagues and I conducted a controlled study in which we demonstrated to a statistical certainty that electromagnetic hypersensitivity was a real neurological syndrome, and the results were published See Exhibit 2 at No. 56.

Q. Would you briefly describe the study?

A. The subject was a young female physician with multiple neurologic and somatic symptoms including headaches, hearing and visual disturbances,

subjective sleep disturbances and non-restorative sleep, and musculoskeletal complaints, all of which she reported could be precipitated by exposure to environmental electromagnetic energy and abated by moving away from the energy source. Among the triggering devices she identified were cell phones, computers, powerlines, and various common electrical devices.

During extensive pre-study interviews she credibly explained the reasons for her belief that energy from common environmental sources could provoke symptoms. Her ability to do so was an important consideration in our decision to commit resources to the study, because, in my experience, those who suffer from electromagnetic hypersensitivity are usually not suitable volunteers for a scientific study of the syndrome

After she agreed to medical tests that were appropriate for evaluating her medical condition, she underwent a physical exam, a comprehensive neurologic exam, a clinical electroencephalogram, non-contrast magnetic resonance imaging of the brain, an overnight sleep study with video and expanded EEG montage, a standard laboratory evaluation of serum electrolytes and blood chemistry, liver function tests, and serum fasting cortisol determination. In the judgments of her attending physicians, none of her signs and symptoms supported a diagnosis in terms of any generally recognized specific medical disorder.

When my colleagues and I exposed her to electromagnetic energy in a scientific study under properly controlled conditions, she developed temporal pain, headache, muscle twitching, and skipped heartbeats. All these symptoms

occurred within 100 seconds after initiation of exposure to the energy. The causal link between the electromagnetic energy and the symptoms was proved to greater than a 95% certainty.

Q. How was it possible to be so certain that the subject actually suffered from electromagnetic hypersensitivity?

A. Because the determination was not a subjective clinical diagnosis but rather was based on the use of an objective scientific method, with appropriate use of statistical analysis.

Q. Would you describe how you were able to make that determination?

A. The subject sat in chair in a dark quiet room. The source of the electromagnetic energy was near her head, but she never knew whether or not the source was emitting energy at any particular time. A large number of separate trials were conducted to assess whether she exhibited any symptomatic response to the energy.

Q. What do you mean by a trial?

A. A trial consisted of a 100-second interval during which pulsed electromagnetic energy was or was not applied; the actual condition was chosen by the experimenter but was not known by the subject. When the interval began she had no symptoms. After it ended I interviewed her and asked whether she experienced any symptoms. If yes, I asked her to describe the symptoms, and to

characterize them as *mild* or *moderate*. Then I waited until she told me that the symptoms had abated. When they did we began a new trial. If no symptoms were reported we began the next trial immediately.

Q. What was the reason for doing many trials?"

A. From a scientific perspective it was necessary to compare the subjects self-reported symptoms between times when the energy was present or absent. That is the only possible way to show a causal link.

Q. Did the subject know when the energy was present?"

A. No. She wasn't told, she couldn't perceive it like a sound or a touch, and the experimental equipment was hidden from her view so that she had no cue when the energy was present.

Q. What was the basic result of the study?

A. Her symptoms sometimes began almost immediately after exposure to the energy began, and sometimes after the energy had been present for a few seconds. She reported moderate symptoms in 100% of the trials where the energy was present. She never reported a false result, by which I mean a claim that she had moderate symptoms following an interval where I did not apply the energy, which is called a sham trial.

Q. So the corresponding result for the sham trial was 0%?

A. Correct.

Q. You said that you didn't tell the subject when the electromagnetic energy was being applied. Is it nevertheless possible that she could have perceived it, like a light beam or a touch?

A. Based on our present knowledge, man-made environmental-strength electromagnetic energy is not consciously detected by human beings. We therefore expected that the subject would not be conscious of the presence of the electromagnetic energy that we applied. We conducted a separate study of that question and proved that she was not conscious of the presence of the energy, as expected. That was an important observation because, taken together with the observation showing 100% occurrence of moderate symptoms, the overall results provided our first insight into how the brain of persons suffering from electromagnetic hypersensitivity processes information.

Q. What is this first insight?

A. We showed that the subject was not aware of the energy but that it nevertheless triggered various somatic symptoms. The symptoms must therefore have been generated and controlled by information-processing in her brain that occurred below the level of the cerebral cortex, which is where consciousness is created. Then, as a result of information-processing in lower brain regions, the brain initiated electromagnetic and hormonal signals that initiated responses by

various organs in the body. This is the fundamental way the brain responds when it receives any sensory information, in the presence or absence of awareness, including but not limited to the presence of man-made electromagnetic energy. A prototypical response of the body to the presence of man-made electromagnetic energy is the triggering in the body of a condition known as stress. In most persons, the effect of the stress is not recognized clinically until after the person develops a clinically recognized disease. In hypersensitive persons, in contrast, the initial reactive process in the brain are overactive, and go beyond the initiation of stress, thereby immediately trigger somatic symptoms.

Q. Did you make any other observations that in your opinion are relevant to his case?

A. Yes. Based on our previous studies regarding how human beings and animals detect man-made electromagnetic energy, we expected that pulsed energy would be more effective than non-pulsed energy in producing symptomatic responses, and that was what we observed and reported in the provocation study. Smart meters emit pulsed energy.

Q. What overall conclusion do you draw from this study?

A. That, to a scientific certainty, the neurological syndrome known as electromagnetic hypersensitivity actually exists, as we showed using the scientific and diagnostic procedures I just described.

Q. Couldn't the same tests be done to determine whether the Complainants in this case actually suffer from electromagnetic hypersensitivity?

A. I estimate that the total cost of our study was between \$500,000 and \$1,000,000. But not only would the cost of performing the study routinely be prohibitive, it would be quite unnecessary.

Q. Why do you say that it would be unnecessary?

A. Because the objective of our study was not to diagnose electromagnetic hypersensitivity but to accomplish the far more difficult and expensive objective of establishing the existence of the neurological syndrome. Having established that such a syndrome exists, it now becomes the responsibility of clinicians to formulate diagnostic guidelines. Such efforts are underway at institutions around the world. See Exhibit 2 at No. 4, 12, 30, 52, 59, 125, 126, 127, 135, 136, 137, 138, and 19.

After guidelines are developed and put into effect, the result will be a system to diagnose hypersensitivity in specific subjects. I anticipate that the guidelines will include some form of a provocation test, like the RAST for allergies. But as with allergies, the diagnosis will be based on the treating physician's experience and personal observations of the particular patient in relation to the general guidelines, not on an objective scientific study such as the one done by colleagues and me.

The Complainants

Q. Why is the exposure of the Complainants to the electromagnetic energy from smart meters unreasonable?

A. Maria Povacz, Laura Sunstein Murphy, [REDACTED], and Cynthia Randall all suffer from serious diseases, disorders, and somatic symptomatology. They report that some of their present symptoms are caused by the electromagnetic energy from smart meters, and they express concerns that their present disease conditions are likely to be worsened by exposure to the electromagnetic energy emitted by smart meters. There is a sound basis in experimental biology that supports their concerns regarding the consequences to their health that have occurred and that may occur due to future chronic exposure to the electromagnetic energy emitted by smart meters. Under the conditions pertinent to the conditions of this case, coercing the Complainants to endure these risks and uncertainties is unwarranted, unjustified, and would amount to involuntary human experimentation by PECO. For all these reasons individually and especially taken together, it would be unreasonable to forcibly expose the Complainants to smart-meter electromagnetic energy.

Q. What serious disease and disorders are you referring to and how are they linked to the electromagnetic energy from smart meters?

A. I will answer with respect to the Complainants individually. For purposes of this report, I am assuming that all of the facts referenced herein will be proved by the Complainants through testimony, records, or otherwise.

[illegible]

their symptoms, not to conduct experiments to determine what caused those conditions. The treatment and advice rendered to a patient by a physician is governed by a consideration of the best interests of the patient. [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
Cynthia Rendall

Cynthia was [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]. She has been advised by her physician to avoid exposure to electromagnetic energy.

Cynthia is justifiably concerned about the health risks of a smart meter because she has a long history of cancer, and there is strong evidence in the peer-reviewed scientific literature indicating that man-made electromagnetic energy causes stress, and that added stress is strongly counter-indicated in all persons suffering from cancer for the reason that stress initiates complicates and/or exacerbates disease. See Exhibit 2 at No. 2 7, 14, 15, 17, 25, 28, 35, 37, 38, 39, 40, 41, 42, 44, 48, 51, 53, 54, 71, 81, 82, 93, 103, 105, 106, 107, 108, 109, 111, 114, 115, 116, 117, 118, 119, 130, 131, and 140. In the face of the existing

scientific literature and the recommendations of treating physicians, it would be unreasonable for PECO to force Cynthia to undergo chronic exposure to the energy emitted by its smart meters.

Laura Sunstein Murphy

[REDACTED] A smart meter was installed on her home in 2002, but she was not made aware that the meter was a source of electromagnetic energy. Soon thereafter, and continuing for the next 14 years, she developed a long list of symptoms and medical problems, including [REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] In 2015, during litigation occasioned by her refusal to allow installation of a new smart meter, she learned that the original meter had been emitting electromagnetic energy for the past 14 years. For the first time, she took many specific steps to reduce her exposure to the electromagnetic energy but her discomfort continued. Her symptomatology improved when the smart meter was replaced by an analog meter; she felt better, [REDACTED]
[REDACTED] Her symptoms suddenly returned, and after an investigation she learned that PECO had reinstalled a smart meter. After it was once again removed and replaced by an analog meter, her health again began to improve.

In my opinion there is enough scientific information and diagnostic capability to sustain the judgment that Laura symptoms were triggered by smart- meter energy. It is sad that a lay person such as Laura is forced to try to conduct experiments and prove by an excessively high evidentiary standard that a link exists between her symptoms and PECO's smart meter. The striking reality to me is that the remedy Laura seeks seems be a small burden for PECO but a large benefit to her. It is not my intention to opine directly on PECO's burden, but rather to recognize that there are health-related costs associated with the use of smart meters. My opinion is that the state of the science, the context of her symptoms, and opinions of her physician, and the reasonableness of the solution she seeks, taken together, indicate that she should not be forced to chronically endure exposure to smart-meter energy in her own home.

Scientific studies can and have shown the existence of electromagnetic hypersensitivity, but they cannot provide a clinical diagnosis, which is the exclusive province of the diagnosing physician. A diagnosis is an algorithmic approach to a disease or disorder that has been formulated by specialists in the different relevant areas of clinical medicine, and adopted by consensus.

Clinicians cannot presently diagnose electromagnetic hypersensitivity in accordance with any consensus algorithm because none has yet been developed. But even in the absence of a universally established algorithm for a diagnosis, all clinicians have an ethical responsibility to guide and warn their patients, and to err on the side of patient safety. In the present cases, since a physician supports her position, it seems unimaginable that PECO would be permitted to ignore that advice, to Laura's detriment.

Maria Povacz

In 2012, shortly after PECO installed a new smart meter about ten feet from her bedroom, Maria began to [REDACTED]

She took numerous steps to reduce her exposure to electromagnetic energy, but these measures were not sufficient in relieving her discomfort. In 2014, she was clinically diagnosed with electromagnetic hypersensitivity syndrome. When she travelled abroad, she felt much better. When she returned home, her symptoms resumed.

Maria's case echoes the unfairness that results from failure to respect the recent scientific and clinical developments regarding electromagnetic hypersensitivity. Maria can do no more than she has done to explain what has happened to her body in relation to smart-meter electromagnetic energy. She knows that there are many sources of such energy in the modern world, and that in all likelihood she will still be faced with challenges after the present matter is resolved. Even so, the link between smart-meter energy and her medical condition is sufficiently strong that is reasonable for her to avoid such exposure and unreasonable for PECO to mandate it.

PECO Experts

Q. Have you read the curriculum vitae of Dr. Mark Israel?

A. Yes.

Q. What is his specialty?

A. He is a pediatrician with a sub-specialty in oncology.

Q. Is he also an experimental biologist?

A. Yes. He has co-authored many peer-reviewed publications in his area of expertise.

Q. What is his area as assessed from his publications?

A. The biochemistry and molecular biology of cancer.

Q. Did you find any evidence to suggest that he has worked in the area of experimental biology that deals with the biological effects on electromagnetic energy?

A. No.

Q. Have you read Dr. Israel's testimonies dated May 18, 2016 and May 20, 2016?

A. Yes.

Q. What do you understand his conclusion to be?

A. That neither Maria Povacz nor Laura Sunstein Murphy have been harmed by PECO's smart meters, and that neither of them will be harmed in the future.

Q. What do you understand to be the bases for these conclusions?

A. His conclusion that the Complainants have not been harmed was based on his medical evaluation of the testimony of the Complainants.

Q. What was the basis of his conclusion that the Complainants will not be harmed in the future by electromagnetic energy from smart meters?

A. The basis appears to be a medical evaluation of a literature review that he conducted regarding the biological effects of electromagnetic energy.

Q. Do you know him to be a worker in the field of biological effects of electromagnetic energy?

A. No. As best I can tell, he became seriously interested in the area at about the time this litigation commenced.

Q. Do you have any opinion regarding his "medical evaluation" of the Complainants?

A. Dr. Israel uses the term "medical evaluation" equivocally. At times he seems to employ the orthodox meaning, that of a conclusion of a treating

Q. Why would exposure of the Complainants in this case to the electromagnetic energy from smart meters be involuntary human experimentation?

A. Human experimentation is the testing of a scientific hypothesis in an experiment that involve human subjects. If the subjects have not given their written informed consent, the experimentation is involuntary. In my opinion, that is exactly what PECO is doing.

Q. Are their official rules for human experimentation?

A. Yes. They developed after World War II and became codified in federal law in 1976.

Q. What are these rules?

A. Perhaps the best way to answer the question would be to describe how they presently function. There are presently about 800 institutions in the United States, more or less, where human research may be lawfully performed. Assume that investigators at one of these institutions wanted to expose human subjects to the electromagnetic energy from smart meters. The investigators would be required to apply to the institution's research board for human research (IRB) for permission to do the study. The backgrounds of the members of the IRB are specified by law, as are the extensive procedural rules that must be followed. Principal among them are the requirements that the investigators provide a written description of exactly what they plan to do, and that they secure written

informed consent from each volunteer in the study, using a form specifically approved by the IRB in which full disclosure is made regarding all aspects of the study, especially including the risks. It is not legally possible to claim that there are no risks. It is also not legally possible for investigators to conduct a study without following these rules.

PECO is intentionally exposing human subjects to the electromagnetic energy from smart meters, which is something that cannot be done by any research institution in the United States without first securing permission and consent within the context of federal laws. The upshot is a Kafkaesque situation in which *bona fide* investigators cannot study the risks of smart-meter electromagnetic energy unless they follow stringent rules, especially the rule involving consent, and yet PECO can involuntarily expose human subjects in the absence of any oversight whatsoever. Equally disturbing, PECO has not disclosed any plan to collect health data as it tests its hypothesis that exposure to its energy is safe, an omission that guarantees PECO will never find evidence of adverse effects.

Q. Have you personally had any experience with the IRB?

A. All of my human studies were approved by my institution's IRB, I served as a member of the IRB for ten years, five years as its chairman.

Q. Does he claim that the symptoms aren't real?

A. No. That's not possible because symptoms are subjective. He acknowledges that the sufferer might actually have symptoms, but he denies the possibility that the symptoms might be caused by man-made electromagnetic energy. He employs the term "idiopathic environmental intolerance" to underscore his point that the trigger is some unknown factor in the environment, except that it can't be manmade electromagnetic energy.

Q. Have you had any contact with Rubin?

A. Not directly. The Bioelectromagnetics Society invited us both to appear at their annual meeting in 2015 and debate the issue of electromagnetic hypersensitivity. I accepted, but Rubin declined, so the debate never took place.

Q. Have you had any indirect contact with him?

A. Following publication of our provocation study, he wrote twice to the journal editor, commenting on what he believed to be errors in our work. We pointed out the errors in his analyses of our work and the entire correspondence was published in the journal See Exhibit 2 at 43 and 50.

Q. Would you explain the relation between your work and his work?"

A. The nominal purpose of his experiments was to find electromagnetic hypersensitivity. But he didn't find it so he concluded essentially that it didn't exist. But in science a negative result is universally acknowledged as having low

probative value, because anybody can find nothing. Special talent or training is not needed. The upshot is that a hundred negative studies can be conclusively refuted by one valid positive result. This is why negative studies are usually not published. Our one study showed that he was wrong to interpret his observations to mean that electromagnetic hypersensitivity did not exist.

Q. In your opinion, why did his studies fail?

A. In Rubin's perspective, the only way to scientifically prove that man-made electromagnetic energy could cause somatic symptoms in self-diagnosed sufferers was to first pick a symptom to be studied. Then, after assembling a group of self-diagnosed sufferers who had that particular symptom, he designed the statistical structure of his study such that the cause/effect link between the energy and the symptom could not be detected unless the symptom was precisely reproducible in each subject during repeated trials, and also in all subjects. This design was a near certain guarantee that he would not find what he professed to be seeking because sufferers are human beings, not machines, and they do not react like machines. Consequently, at the statistical level, Rubin simply averaged away reality, like the man with his feet in a fire and his head in a block of ice who reported that his body temperature was normal, on average.

Q. How did your study differ in this regard?

A. We assumed that any symptoms triggered by the energy we applied would be specific to the subject, rather than universal reactions that were similar

physician, but he is not a treating physician bound by ethical duty to advance the best interest of the patient.

Q. What other way does Dr. Israel employ the term?

A. He sometimes employs "medical evaluation" idiosyncratically to mean, judging from context, that he reads the scientific literature dealing with the experimental biology of electromagnetic fields, the epidemiological studies dealing with that topic, and the opinion of various agencies and blue-ribbon committees, and evaluates that literature using his skills as a physician, leading him to opine that the Complainants have not been injured by exposure to smart meters and even in the future they will not be injured by smart-meter energy. When Dr. Israel uses "medical evaluation" in this sense, to mean the analysis of peer-reviewed scientific publications by a physician who has not actually done research on the subject in question I have a definite opinion, namely that it is ineffective and fruitless. Science and medicine each have rules for generating and recognizing knowledge, and the two systems are different. Confounding the two sets of rules, as he did, is unhelpful and unfortunate, and ultimately impossible. He clearly rejects the idea of electromagnetic hypersensitivity, but he didn't get to that conclusion by conducting an authoritative scientific analysis of the literature based on familiarity and experience in the area.

Q. In your opinion, how did he reach that conclusion?

A. I cannot tell from his testimony. But I can say with considerable confidence it didn't come from scientific analysis. Then he rationalized his choice by cherry-picking published studies that fit his mindset, particularly the work of Rubin. Dr. Israel's reliance on Rubin was to me the clearest possible indication that he does not know the territory related to the health risks of electromagnetic energy.

Q. Are you familiar with Rubin's work?

A. Yes.

Q. What is your understanding of what he is and what he says about electromagnetic hypersensitivity?

A. He is a psychologist who claims that electromagnetic hypersensitivity is a form of mental illness.

Q. What kind of mental illness?

A. A psychosomatic disorder, by which he seems to mean that the sufferers only imagine that their symptoms are caused by man-made electromagnetic energy.

in nature and intensity to the reactions of all true hypersensitivity sufferers. We allowed for the possibility that the same subject could exhibit different symptoms during independent trials. For example, if a sufferer reported knee pain in the first trial, fatigue or weakness in the second, and a headache in the third, we counted the results as three reports of a link between exposure and a hypersensitivity reaction. Rubin would count the reports as a failure to find a link because the symptoms were all different. Finally, we used the experimental subject as her own control. That was the purpose of the sham trials.

Q. You said the subject's symptoms were mild or moderate. Did she have any severe symptoms?

A. Yes. That happened, depending on how long she was exposed and on the level of the electromagnetic energy I applied. But our study was not intended to address the issue of symptom severity, but rather to prove the existence of a causal link between electromagnetic energy and symptoms. To accomplish this objective, it was necessary to conduct a sufficient number of independent trials to be able to show to a statistical certainty that she reported symptoms more often during actual exposure intervals compared with sham intervals, which were the intervals when the energy was not applied. When the symptoms were severe they did not abate for hours, which made it impractical to do the study. During a period of about a week, by trial and error, I learned how low to set the energy level so that her symptoms following a 100-second exposure would abate in less than about 15 minutes. Our identification of that threshold made it possible to

achieve our study objective, but it also precluded us from studying the link between exposure and severe symptoms.

Q. Overall, do you disagree with Dr. Israel's analysis?

A. Yes. I think that Dr. Israel's testimony was polemical not analytical. Essentially he doesn't accept the existence of electromagnetic hypersensitivity. I think his perspective is understandable because the research area involving electromagnetic bioeffects is far from his routine responsibilities as a physician. Nevertheless it is not credible for him to enter this field, make a "medical evaluation," and then ask to be believed because he is a doctor, which is what it seems to me that he did.

Q. Have you read the curriculum vitae of Dr. Christopher Davis?

A. Yes.

Q. What is his specialty?

A. He is an engineer.

Q. Is he also an experimental biologist?

A. No, but his research-related activities have been heavily supported by many industrial and government agencies, and he has co-authored many peer-reviewed publications in his area of expertise.

Q. What is his area of expertise as assessed from his publications?

A. Engineering support. He has assisted investigators studying many different kinds of problems. For examples, the solid-state, viscoelastic, light-transmission, and electrical properties of various materials, and the dynamics of wireless networks.

Q. Did you find any evidence to suggest that he has worked in the area of experimental biology that deals with the biological effects on electromagnetic energy.

A. No

Q. Have you read the testimonies of Dr. Davis dated May 18, 2016 and May 20, 2016?

A. Yes.

Q. What did you understand was the substance of what he said?

A. That smart meters emit electromagnetic energy, that the energy is not unusual, and that the energy is safe because the FCC says so.

Q. Do you agree with what you understood him to say?

A. I agree that smart meters emit energy. I don't agree with the assertion that the energy is not unusual because, in the context he used it, the claim is misleading.

Q. Why is it misleading?

A. Because what is or is not "unusual" depends completely on the frame of reference. If the symptoms of the Complainants is frame of reference, the energy is unusual because at least some of their symptoms didn't develop in the absence of the smart-meter energy. If the frame of reference is the natural world as it existed before man-made electromagnetic energy was invented, smart-meter energy is unusual because it is about a billion times stronger than the corresponding natural level, more or less. If the reference frame is the location in the houses of the Complainants where the smart meters will be installed, then it is unusual because the resulting energy at those locations will be about a million times stronger compared with the pre-installation levels, more or less.

Q. Why do you disagree with Dr. Davis's testimony concerning the FCC?

A. Because it is misleading. According to the FCC, smart meters and cellphones are safe when manufactured according to the presently mandated emission levels. But the FCC defines an emission level as "safe" if it doesn't result in adverse biological effects caused by heating or cooking of the exposed subject. Nowhere does the FCC say that smart meters are safe with regard to physiological changes cause by physical processes other than heating or cooking. That claim is unsupportable and counter-scientific, and has not been made by the FCC. Dr. Davis's testimony is pregnant with the notion that the FCC says smart meters are safe with respect to all possible mechanisms, which is not the case.

Q. Dr. Davis testified that he agrees with the FCC statement on its website that adverse biological effects from non-thermal exposure levels of electromagnetic energy are ambiguous and unproven. Do you agree?

A. I am familiar with what the FCC means by "ambiguous" and "unproven," with the legal context that governs its jurisdiction, with the extent to which the experiments the FCC is required by law to consider are specifically designed to create ambiguity, and with the overwhelming economic and sociological consequences if the FCC were to say otherwise. In my opinion, in the context of this case, the FCC issue is a red herring.

Q. Dr. Davis testified that installation of a smart meter wouldn't increase the amount of electromagnetic energy in the house where it was installed. Do you agree?

A. No. When electromagnetic energy is created at a specific location, the laws of physics almost always require that it add to, not cancel, any preexisting electromagnetic energy. There are exceptions, but they do not apply to context relevant this case.

Q. Dr. Davis testified that there have been many reports by expert panels whose consensus is that there is no consistent, reproducible evidence that electromagnetic energy causes any biological effects. Do you agree?

A. Yes, but considering the purpose for which he offered the testimony, it is extremely misleading.

Q. What do you mean, why is it misleading?

A. The thrust of his testimony is to assert that all experts agree that man-made electromagnetic energy in environment, including but not limited to smart meters, doesn't cause any biological effects. I know or have known many such experts, perhaps most, either personally or by reading their publications, and I can say without any qualification that their consensus is the opposite of the one Dr. Davis has asserted. Even more counterfactual, Dr. Davis trusts that the experts on the panels he cited were disinterested, but historically that has almost never been the case.

Q. What do you understand to be Dr. Davis's testimony regarding the possibility that smart meters can cause human disease or trigger hypersensitivity reactions?

A. I believe he conceptualizes that the only possible biological effects from man-made electromagnetic energy occur by means of heating or cooking tissues. Since smart meters can't cause those effects, they must be safe.

Q. Do you agree with him?

A. No, because his premise is wrong. There is a very large data base of empirical studies in experimental biology that demonstrates beyond reasonable doubt that biological effects can occur at levels of man-made electromagnetic energy actually present in the environment.

Q. What do you understand to be Dr. Davis's testimony regarding his measurements of man-made electromagnetic energy actually present in the environment, including levels produced by smart meters.

A. I believe he conceptualizes that the results of brief, spatially and temporally localized measurements at particularly chosen locations can adequately characterize the electromagnetic environment of the homes of the Complainants, and he did so to in a manner that, at least on the surface tends to trivialize the concerns of the Complainants.

Q. Do you agree with him?

A. No. His testimony in this regard was highly misleading.

Q. In what way?

A. In two ways. He testified that the electromagnetic energy from PECO's smart meter in Ms. Povacz was 246 times smaller than the level in New Hope, PA. But that comparison was strongly dependent on the locations of the measurements. If he made the measurements at different locations from the smart meter and at different locations in New Hope, he could easily have found that the level in Ms. Povacz house was 246, or even 2046, times greater than the level in New Hope. A meaningful comparison of ambient levels is extremely difficult. Dr. Davis didn't even come close to accomplishing this task. Second, I think that Dr. Davis's testimony created the false impression that time is not a material factor in an attempt to establish a comparison. At virtually all

representative points in the general environment, the actual levels of man-made electromagnetic energy vary over extremely wide ranges. A variation of 1,000,000% would not be unusual, and a variation of 1,000% would be extremely common. In so far as I could determine, Dr. Davis did not consider this factor.

Q. What do you understand to be Dr. Davis's testimony regarding the relation between how much of a change in the existing level of electromagnetic energy caused by smart meters must occur before the matter of health risks is raised?

A. I understood him to mean that if the PECO energy levels were low compared with some reference value then the PECO energy wouldn't matter from a health perspective.

Q. Do you agree with him?

A. No. I understand his perspective. He is an engineer and his professional activities involves working with what are called linear systems, by which I mean things that follow laws whereby if a little change does something, then a change ten times as much will do ten times more. Virtually every system in the world of an engineer works that way. But animals and human beings are nonlinear systems, by which I mean that their laws can allow things to happen which cannot happen in linear systems. For example, human beings can exhibit very strong responses to very small stimuli in the complete absence of a proportion between the cause and the effect. Dr. Davis's assumption that the stimulus-response relationships of human beings are governed by linear laws is wrong. See Exhibit

2 at No. 84, 88, and 89. Consequently he has no rational basis to argue that PECO's energy is too small to matter.

Opinions of Agencies

Q. In forming the opinions you expressed here, have you taken into consideration the official positions of government agencies regarding safety regulations concerning electromagnetic energy?

A. I know about those positions generally, but for at least two reasons they have not had a significant impact on my opinions. First, their positions are far behind the present state of the science. They are based on out-moded concepts which the independent workers who study the effects of electromagnetic energy that I know do not regard as reasonable. Second, the legal structure of federal law as regards the toxic side-effects of man-made environmental electromagnetic energy effectively requires the agencies to discount the health risks due to man-made electromagnetic energy in the environment.

Q. What legal structure are you referring to?

A. The Radiation Control for Health and Safety Act of 1968. See Exhibit 2 at No 78.

Q. What does that law have to do with the issues in this case?

A. In 1962, following the birth of thousands of armless and legless babies in Europe caused by thalidomide that had been sold to pregnant women, the US Congress required drug companies to provide pre-market scientific evidence of

the safety of new drugs. In 1968, Senator Rogers, of Florida proposed applying the same social principle to devices that emitted man-made electromagnetic energy into the environment. His proposal, The Radiation Control for Health and Safety Act of 1967, would have authorized the government to perform research and regulate the safety of all devices that emitted man-made electromagnetic energy. But opponents of this principle, the industries that manufactured and sold energy-emitting devices, successfully argued that the health impact of man-made electromagnetic energy should be assessed subsequent to marketing. This policy shifted the burden of proof to the party asserting injury and was subsequently adopted by all federal agencies. Each relevant federal agency therefore begins with the assumption of safety, and requires any aggrieved litigant to prove non-safety.

Q. In forming the opinions you expressed here, have you taken into consideration the official positions of private national and international agencies regarding safety regulations concerning electromagnetic energy?

A. I know about their positions generally, but they have not had a significant impact on my opinions because their positions are far behind the present state of the science, and are invariably heavily biased in favor of industry positions. In addition, in all the cases that know about, the decisions of the agencies were star-chamber processes in which those with opposing views were excluded.

Q. Is it your opinion that the only ethical basis for assessing the health risks of electromagnetic energy from devices such as smart meters is knowledge gained from animal studies?

A. Yes, at least with regard to prospective studies.

Q. What do you mean?

A. We suspect that the energy from such devices is a serious health risk. More definitive studies are needed, but such studies will be expensive, and there is no independent source of funds for independent investigators to perform the needed studies. This vacuum is presently being filled by epidemiological studies, which are retrospective analyses of databases of unfortunate persons who have already died or developed disease. Because of their logical structure, epidemiological studies can never answer the basic questions. But far worse is the fact that industry and government are intentionally relying on such studies to provide an answer. In my view, that intention amounts to an egregiously unacceptable form of involuntary human experimentation.

Q. Are the needed animal studies being performed?

A. No. In the US, pursuant to the policy that established by the Radiation Control Law in 1968, such studies are generally regarded a private responsibility. There are no sufficient funds for independent investigators to carry out such studies.

Conclusion

Q. What are your conclusions?

A. First, here is a reasonable basis in established science for the Complainants' concern regarding risks to human health caused by man-made electromagnetic energy in the environment, including the type of electromagnetic energy emitted by smart meters. These health risks are heightened in the very young, the very old, and in those with preexisting diseases or disorders.

Second, electromagnetic hypersensitivity is a documented neurological condition in which the affected person experiences musculoskeletal, immunological, and/or neurological symptoms that noticeably flare or intensify upon exposure to man-made electromagnetic energy in the environment. About 5-10% of the general public are self-reported to suffer from this disorder.

Third, the Complainants were forced into the almost impossible position of conducting experiment on themselves to prove to PECO's satisfaction that their claims of a link between their symptoms and electromagnetic energy from smart meters were sufficiently credible as to warrant some remediable action by PECO.

Fourth, there is no justifiable reason for PECO to doubt the reality of the Complainants' symptoms, to question their intentions in seeking relief, or to not respect and implement the advice they received from their physicians that exposure to smart-meter energy should be avoided.

Fifth, chronic exposure to the electromagnetic energy from smart meters causes risks to human health that go far beyond the capability of the energy to trigger hypersensitivity reactions in sensitive persons. A large literature in

experimental biology indicates that man-made electromagnetic energy, including that from smart meters, causes biological effects involving every essentially physiological process that occurs in living organisms. A large literature in nonexperimental biology shows that man-made electromagnetic energy, including that from smart meters, is associated with a plethora of human diseases. People who suffer from pre-existing conditions are particularly vulnerable, and all the Complainants suffer from such conditions.

Sixth, PECO's claim that the FCC has pronounced smart meter safe is spurious because the FCC has made that statement only with regard to the heating and cooling effects of electromagnetic energy. The Complainants have made no claims that smart meters are like microwave ovens.

Seventh, PECO has claimed that expert committees have pronounced smart meters safe, but PECO has not acknowledged the blatant conflicts-of-interests that infect such committees nor the serious limitations on their reports, such as the failure to address much of the relevant literature.

Eighth, PECO proposes to expose human beings to smart-meter electromagnetic energy over their objection under conditions that would not be acceptable to any institution in the United States where human experimentation can lawfully be performed. Consequently, coercing the Complainants to endure the risks and uncertainties of such exposure is unwarranted, unjustified, and would amount to involuntary human experimentation by PECO.



22 October 2017

Pennsylvania Public Utilities Commission
400 North Street
Harrisburg, Pennsylvania 17120

Judge Jeffrey Watson
PA PUC Pittsburgh Administrative Law Judge Office
310 Fifth Ave, Suite 220
Piatt Place
Pittsburgh, PA 1222

RECEIVED

JUL - 6 2018

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

Re: Case C-2016-2571726

Dear Sirs/Madams:

This is concerning potential adverse health effects associated with exposure to radiofrequency (RF) radiation, specifically that from electronic utility meters. I am a public health physician and former Dean of the School of Public Health at the University at Albany. I have been involved in review and analysis of studies on electromagnetic fields, including radiofrequency fields, for many years. I served as the Executive Secretary to the New York State Powerlines Project in the 1980s, and have published several reviews on the subject. In addition I was invited to present to the recent President's Cancer Panel on the subject of powerline and radiofrequency fields and cancer, and the publication that came from that Panel is attached. I have edited two books on effects of EMFs, including RF radiation. I served as the co-editor of the Bioinitiative Report (www.bioinitiative.org), a comprehensive review of the literature on this subject. The public health chapter from this report was subsequently published in a peer reviewed journal, which is attached. This is a subject which I know well, and one on which I take a public health approach that has as a fundamental principle the need to protect against risk of disease even when one does not have all the information that would be desirable.

There is clear and strong evidence that intensive use of cell phones increases the risk of brain cancer, tumors of the auditory nerve and cancer of the parotid gland, the salivary gland in the cheek by the ear. The evidence for this conclusion is detailed in many publications in the peer-reviewed scientific literature. Most recently the National Toxicology Program reported that chronic exposure of rats to cell phone radiation resulted in the development of the same kinds of brain cancer and auditory nerve tumors (although in this case in the heart not the ear) that are seen in human using cell phones excessively. Electronic meters use similar radiofrequency radiation, in some cases exposing the whole body to levels of radiofrequency radiation similar to cell phones. The difference between a cell phone and an electronic meter environment is that while the cell phone is used only intermittently a smart meter environment is continuous. There is also strong evidence that leukemia rates are increased among people living near to powerful AM radio transmission towers. Because WiFi, radio transmission towers and electronic meters all generate similar RF radiation, my conclusion is that if the whole body is exposed, leukemia is

the major cancer of concern, while if only the head is exposed as in using a cell phone, one sees increased risk of local cancers, such as brain cancer. There are a variety of other health effects reported as a result of exposure to RF radiation, but in my judgment the increased risk of cancer is both the best documented and the disease of greatest concern.

There have been few careful studies specifically of the health effects of electronic meters to my knowledge, in great part because they haven't been around very long. But they utilize the same type of RF radiation that is used in cell phones. It should be noted that the World Health Organization has declared radiofrequency radiation to be a possible human carcinogen. While it is true that the nature of exposure to RF from electronic meters is not significantly different from that coming from other wireless devices, what is important is cumulative, aggregate exposure. My position is that we should practice "prudent avoidance", which is to say reduce unnecessary exposure to the degree possible until the magnitude of risk is fully understood.

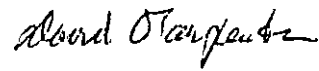
My specific concerns about electronic meters are as follows:

1. The benefit of the electronic meters is entirely to the utilities, and is economic in nature. If they install these meters they can fire those individuals who at present are employed to go around reading meters. Thus this is a job-killing proposal, and will increase unemployment which is already too high.
2. When an electronic meter is installed residents have no choice in the matter or ability to avoid exposure. But every individual has the option to use or not use other personal wireless devices. There is a major difference between an exposure which an individual chooses to accept and one that is forced on individuals who can do nothing about it.
3. Most electronic meters transmit signals to the utility for relatively short periods of time, but generate radiofrequency pulses at frequent intervals all day and night. Thus the device continuously generates RF radiation that will expose anyone nearby 24/7.
4. The evidence for adverse effects of radiofrequency radiation is currently strong and grows stronger with each new study. Analog meters with shielded cable do not increase exposure.
5. The installation of these meters also pose security and privacy concerns as they will allow the utility to monitor individual appliance usage and can be hacked.

As a public health physician with specific expertise in the human effects of radiofrequency radiation, I urge you to require Duquesne Light Company to install analog meters where residents request them. At the very least individuals concerned about their health and the health of their families should be allowed to choose an analog meter. Analog meters have withstood the test of time for safety and are not a source of RF radiation. Installation of electronic meters will adversely affect the health of Pennsylvania residents and will ultimately invite legal action arising from the development of diseases known to be associated with exposure to RF radiation.

Thank you for the opportunity to comment on this important public health concern, and on the general issue of electronic meters. The use of electronic utility meters is unwise from both a public health point of view, which is where my expertise lies, but and also from a purely short and long-term economic point of view.

Yours sincerely,

A handwritten signature in cursive script, appearing to read "David O. Carpenter".

David O. Carpenter, M.D.

Director

Institute for Health and the Environment

University at Albany

EXHIBIT 09

Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposures)

Draft 5-19-2016

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1 Abstract

2 The US National Toxicology Program (NTP) has carried out extensive rodent toxicology and
3 carcinogenesis studies of radiofrequency radiation (RFR) at frequencies and modulations used in
4 the US telecommunications industry. This report presents partial findings from these studies. The
5 occurrences of two tumor types in male Hartman Sprague Dawley rats exposed to RFR, malignant
6 gliomas in the brain and schwannomas of the heart, were considered of particular interest, and
7 are the subject of this report. The findings in this report were reviewed by expert peer reviewers

8 selected by the NTP and National Institutes of Health (NIH). These reviews and responses to
9 comments are included as appendices to this report, and revisions to the current document have
10 incorporated and addressed these comments. Supplemental information in the form of 4
11 additional manuscripts has or will soon be submitted for publication. These manuscripts describe
12 in detail the designs and performance of the RFR exposure system, the dosimetry of RFR
13 exposures in rats and mice, the results to a series of pilot studies establishing the ability of the
14 animals to thermoregulate during RFR exposures, and studies of DNA damage.
15
16 Capstick M, Kuster N, Kühn S, Berdinas-Torres V, Wilson P, Ladbury J, Koepke G, McCormick
17 D, Gauger J, Melnick R. A radio frequency radiation reverberation chamber exposure system for
18 rodents
19
20 Yijian G, Capstick M, McCormick D, Gauger J, Horn T, Wilson P, Melnick RL and Kuster N.
21 Life time dosimetric assessment for mice and rats exposed to cell phone radiation
22

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1 Wyde ME, Horn TL, Capstick M, Ladhury J, Koepke G, Wilson P, Stout MD, Kuster N,
 2 Melnick R, Bucher JR, and McCormick D. Pilot studies of the National Toxicology Program's
 3 cell phone radiofrequency radiation reverberation chamber exposure system
 4
 5 Smith-Roe SL, Wyde ME, Stout MD, Winters J, Hobbs CA, Shepard KG, Green A, Kissling
 6 GE, Tice RR, Bucher JR, Witt KL. Evaluation of the genotoxicity of cell phone radiofrequency
 7 radiation in male and female rats and mice following subchronic exposure

1 **Report of Partial Findings from the National Toxicology Program**
 2 **Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in**
 3 **Hsd: Sprague Dawley® SD rats (Whole Body Exposures)**

4 Draft 5-19-2016

5
 6 **SUMMARY**

7 The purpose of this communication is to report partial findings from a series of radiofrequency
 8 radiation (RFR) cancer studies in rats performed under the auspices of the U.S. National
 9 Toxicology Program (NTP).¹ This report contains peer-reviewed, neoplastic and hyperplastic
 10 findings only in the brain and heart of Hsd:Sprague Dawley® SD¹ (HSD) rats exposed to RFR
 11 starting *in utero* and continuing throughout their lifetimes. These studies found low incidences of

12 malignant gliomas in the brain and schwannomas in the heart of male rats exposed to RFR of the
 13 two types [Code Division Multiple Access (CDMA) and Global System for Mobile
 14 Communications (GSM)] currently used in U.S. wireless networks. Potentially preneoplastic
 15 lesions were also observed in the brain and heart of male rats exposed to RFR.

16
 17 The review of partial study data in this report has been prompted by several factors. Given the
 18 widespread global usage of mobile communications among users of all ages, even a very small
 19 increase in the incidence of disease resulting from exposure to RFR could have broad
 20 implications for public health. There is a high level of public and media interest regarding the
 21 safety of cell phone RFR and the specific results of these NTP studies.

¹ NTP is a federal, interagency program, headquartered at the National Institute of Environmental Health Sciences, part of the National Institutes of Health, whose goal is to safeguard the public by identifying substances in the environment that may affect human health. For more information about NTP and its programs, visit <http://ntp.niehs.nih.gov>

1 Lastly, the tumors in the brain and heart observed at low incidence in male rats exposed to GSM-
2 and CDMA-modulated cell phone RFR in this study are of a type similar to tumors observed in
3 some epidemiology studies of cell phone use. These findings appear to support the International
4 Agency for Research on Cancer (IARC) conclusions regarding the possible carcinogenic
5 potential of RFR.²

6
7 It is important to note that this document reviews only the findings from the brain and heart and
8 is not a complete report of all findings from the NTP's studies. Additional data from these
9 studies in Hsd:Sprague Dawley® SD³ (Hartan) rats and similar studies conducted in B6C3F₁/N
10 mice are currently under evaluation and will be reported together with the current findings in two
11 forthcoming NTP Technical Reports.

12 STUDY RATIONALE

13 Cell phones and other commonly used wireless communication devices transmit information via
14 non-ionizing radiofrequency radiation (RFR). In 2013, IARC classified RFR as a *possible human*
15 *carcinogen* based on "limited evidence" of an association between exposure to RFR from heavy
16 wireless phone use and glioma and acoustic neuroma (vestibular schwannoma) in human
17 epidemiology studies, and "limited evidence" for the carcinogenicity of RFR in experimental
18 animals. While ionizing radiation is a well-accepted human carcinogen, theoretical arguments
19 have been raised against the possibility that non-ionizing radiation could induce tumors
20 (discussed in IARC, 2013). Given the extremely large number of people who use wireless

² IARC (International Agency for Research on Cancer). 2013. Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields. IARC Monogr Eval Carcinog Risk Hum 102. Available: <http://monographs.iarc.fr/ENG/Monographs/vol102/mono102.pdf> [accessed 26 May 2016].

1 communication devices, even a very small increase in the incidence of disease resulting from
2 exposure to the RFR generated by those devices could have broad implications for public health.

3 DESCRIPTION OF THE NTP CELL PHONE RFR PROGRAM

4 RFR emitted by wireless communication devices, especially cell phones, was nominated to the
5 NTP for toxicology and carcinogenicity testing by the U.S. Food and Drug Administration
6 (FDA). After careful and extensive evaluation of the published literature and experimental
7 efforts already underway at that time, the NTP concluded that additional studies were warranted
8 to more clearly define any potential health hazard to the U.S. population. Due to the technical
9 complexity of such studies, NTP staff worked closely with RFR experts from the National
10 Institute of Standards and Technology (NIST). With support from NTP, engineers at NIST
11 evaluated various types of RFR exposure systems and demonstrated the feasibility of using a
12 specially designed exposure system (reverberation chambers), which resolved the inherent
13 limitations identified in existing systems.

14 In general, NTP chronic toxicity/carcinogenicity studies expose laboratory rodents to a test
15 article for up to 2 years and are designed to determine the potential for the agent tested to be
16 hazardous and/or carcinogenic to humans.³ For cell phone RFR, a program of study was
17 designed to evaluate potential, long-term health effects of whole-body exposures. These studies
18 were conducted in three phases: (1) a series of pilot studies to establish field strengths that do not
19 raise body temperature, (2) 28-day toxicology studies in rodents exposed to various low-level
20 field strengths, and (3) chronic toxicology and carcinogenicity studies. The studies were carried
21 out under contract at IIT Research Institute (IITRI) in Chicago, IL following Good Laboratory

³ Specifications for the Conduct of NTP Studies, http://ntp.niehs.nih.gov/ntp/htdocs/ultra_low_dose/n2011.pdf

1 Practices (GLP). These studies were conducted in rats and mice using a reverberation chamber
2 exposure system with two signal modulations {Code Division Multiple Access (CDMA) and
3 Global System for Mobile Communications (GSM)} at two frequencies (900 MHz for rats and
4 1900 MHz for mice), the modulations and frequency bands that are primarily used in the United
5 States.

6

ACS Responds to New Study Linking Cell Phone Radiation to Cancer

Posted on May 27, 2016 by David Sampson

The U.S. National Toxicology Program (NTP) has released partial results

[<https://www.biorxiv.org/content/biorxiv/early/2016/05/26/055699.full.pdf>]

from an animal study of the effect of radiofrequency radiation associated with cell phones. The group found radiofrequency radiation was linked to a higher risk of two cancers. Below is a response from **Otis W. Brawley, M.D., American Cancer Society Chief Medical Officer**.

“For years, the understanding of the potential risk of radiation from cell phones has been hampered by a lack of good science. This report from the National Toxicology Program (NTP) is good science.

“The NTP report linking radiofrequency radiation (RFR) to two types of cancer marks a paradigm shift in our understanding of radiation and cancer risk. The findings are unexpected; we wouldn’t reasonably expect non-ionizing radiation to cause these tumors. This is a striking example of why serious study is so important in evaluating cancer risk. It’s interesting to note that early studies on the link between lung cancer and smoking had similar resistance, since theoretical arguments at the time suggested that there could not be a link.

“The new report covers only partial findings from the study, but importantly one of the two cancers linked to cell phone radiation was malignant gliomas in the brain. The association with gliomas and acoustic neuromas had been suspected from human epidemiology studies. The second cancer, called a schwannoma, is an extremely rare tumor in humans and animals, reducing the possibility that this is a chance finding. And importantly, the study found a ‘dose/response’ effect: the higher the dose, the larger the effect, a key sign that this association may be real.

“The fact that this finding was observed only in male rats has some wondering if the data is not reliable. It’s important to note that these sorts of gender differences often appear in carcinogenic studies, so the fact they show up here should not detract from the importance of the findings.

“This new evidence will undoubtedly factor into ongoing assessments by regulators to determine the potential cancer risk posed by cell phones. The American Cancer Society eagerly awaits guidance from government agencies, like the U.S. Food and Drug Administration (FDA) and the Federal Communications Commission (FCC), about the safety of cell phone use.

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"The NTP was given the difficult task of trying to answer important questions about the potential cancer risk posed by cell phones, and the group did not shirk from its responsibility. NTP staff were clearly aware of the potential importance of this study and went the extra distance to ensure the best science is used. They used double the number of animals required for this type of study; they convened not one but three panels to look at abnormal tissues from treated animals to ensure that what was identified as a brain and heart tumor was indeed a brain and heart tumor; they solicited review from multiple scientists from outside the NTP to critically review all aspects of the data analysis and study findings, to ensure the findings would stand up to the critical assessment expected once these unexpected findings were released.

"While this study adds significantly to the evidence that cell phone signals could potentially impact human health, it does not actually tell us how certain scenarios of cell phone use change our long-term risks of getting cancer. For example, the animal studies were performed at very high signal strengths, near but below levels that would cause animal tissue to heat up. Additional research will be needed to translate effects at these high doses to what might be expected at the much lower doses received by typical or even high-end cell phone users. Also, cell phone technology continues to evolve, and with each new generation, transmission strengths have declined and with it radio frequency exposures."

EXHIBIT 11

[<http://www.icd10data.com/ICD10CM/Codes/V00-Y99/W85-W99/W90-W90.0>]

2018 ICD-10-CM/PCS Medical Coding Reference - International Classification of Diseases

ICD10Data.com is a reference website designed for the fast lookup of all current American ICD-10-CM (diagnosis) and ICD-10-PCS (procedure) medical billing codes.

The 2018 ICD-10-CM/PCS code sets are now fully loaded on ICD10Data.com.

2018 codes became effective on **October 1, 2017**, therefore all claims with a date of service on or after this date should use 2018 codes.

ICD-10-CM Codes

V00-Y99 External causes of morbidity

W85-W99 Exposure to electric current, radiation and extreme ambient air temperature and pressure

W90- Exposure to other nonionizing radiation

2018 ICD-10-CM Diagnosis Code W90.0

ICD-10-CM Codes Adjacent To W90.0	
<u>W89.1XXS</u>	sequela
<u>W89.8</u> Exposure to other man-made visible and ultraviolet light	
<u>W89.8XXA</u>	initial encounter
<u>W89.8XXD</u>	subsequent encounter
<u>W89.8XXS</u>	sequela
<u>W89.9</u> Exposure to unspecified man-made visible and ultraviolet light	
<u>W89.9XXA</u>	initial encounter
<u>W89.9XXD</u>	subsequent encounter
<u>W89.9XXS</u>	sequela
W90 Exposure to other nonionizing radiation	
W90.0 Exposure to radiofrequency	
<u>W90.0XXA</u>	initial encounter
<u>W90.0XXD</u>	subsequent encounter
<u>W90.0XXS</u>	sequela
<u>W90.1</u> Exposure to infrared radiation	
<u>W90.1XXA</u>	initial encounter
<u>W90.1XXD</u>	subsequent encounter
<u>W90.1XXS</u>	sequela
<u>W90.2</u> Exposure to laser radiation	
<u>W90.2XXA</u>	initial encounter
<u>W90.2XXD</u>	subsequent encounter

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Exposure to radiofrequency

2016, 2017, 2018 Non-Billable/Non-Specific Code

- W90.0 should not be used for reimbursement purposes as there are multiple codes below it that contain a greater level of detail.
- The 2018 edition of ICD-10-CM W90.0 became effective on October 1, 2017.
- This is the American ICD-10-CM version of W90.0 - other international versions of ICD-10 W90.0 may differ.

ICD-10-CM Coding Rules

- W90.0 describes the circumstance causing an injury, not the nature of the injury.

The following code(s) above W90.0 contain annotation back-references that may be applicable to W90.0:

- V00-Y99 External causes of morbidity
- W85-W99 Exposure to electric current, radiation and extreme ambient air temperature and pressure
- W90 Exposure to other nonionizing radiation

Code History

- 2016 (effective 10/1/2015): New code (first year of non-draft ICD-10-CM)
- 2017 (effective 10/1/2016): No change
- 2018 (effective 10/1/2017): No change

External Cause Index entries containing back-references to W90.0:

- Radiation (exposure to)
 - radar W90.0
 - radiofrequency W90.0

Reimbursement claims with a date of service on or after October 1, 2015 require the use of ICD-10-CM codes.
International Classification of Diseases:



EXHIBIT 12

MEDICAL WELLNESS Associates

April 24, 2018

Francis M. Hriadil
331 Shady Ridge Dr.
Monroeville, PA 15146

Re: Smart meter

Dear Mr. Hriadil,

The following letter is being provided at your request as it relates to your concerns about electromagnetic (EMF) or radiofrequency (RF) exposure from a utility "Smart Meter" or AMI.

There has been a great deal of debate over this subject with most of the attention being focused upon the electromagnetic fields being generated by cell phones. In May 2011 the International Agency for Research on Cancer (IARC), a World Health Organization agency, reviewed radiofrequency fields from cell phones and classified them as a Group 2B which is *Possibly carcinogenic to humans*. The operating frequencies of cell phones is between 450 and 2700 MHz with peak powers in the range of 0.1 to 2 watts. A "Smart Meter" operates at a frequency of 902 MHz and 2.4 GHz at a power range around 1 watt.

Currently, the FDA indicates that the weight of scientific evidence has not linked health problems to these frequencies but research continues to examine the potential health implications associated with chronic exposure. The FDA has suggested steps to reduce exposure to radiofrequency energy by doing the following: (1) use cell phones for short conversations or (2) use a hands-free device to place more distance between the head and phone of the user.

The American Academy of Environmental Medicine (AAEM) adopted a position statement on July 12, 2012 on the adverse effects of EMF and RF exposure. In their statement patients that are electromagnetically sensitive may experience a wide variety of adverse health effects. Among the conditions that the AAEM listed that are part of your chief complaints are: paresthesias of fingers and toes, musculoskeletal pain, digestive disturbances, disturbed sleep and fatigue. The combined effects of these various health complaints and the additional emotional stress of being further exposed to higher levels of EMFs is a concern.

In conclusion, it is recommended that you not be exposed to RF/EMF frequencies generated by a "Smart Meter" based on your current clinical condition as well as from a preventive standpoint.

Sincerely, *Martin P. Gallagher, M.D.*

Martin Gallagher, MD, DC, ABOIM
Board Certified Family Medicine
Board Certified Integrative Medicine
Physician Acupuncturist
Chiropractor

MPG/whf

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[<http://www.sbwire.com/press-releases/cancer-expert-declares-cell-phone-and-wireless-radiation-as-carcinogenic-to-humans-849135.htm>]



Cancer Expert Declares Cell Phone and Wireless Radiation as Carcinogenic to Humans

SB wire Press Release

<http://www.sbwire.com/press-releases/cancer-expert-declares-cell-phone-and-wireless-radiation-as-carcinogenic-to-humans-849135.htm>

Longtime World Health Organization advisor Anthony B. Miller M.D. updates opinion linking wireless exposures to cancer based on new scientific evidence.

Teton Village, WY — (SBWIRE) — 08/16/2017 — An expert cancer researcher and advisor to the World Health Organization International Agency for Research on Cancer (WHO/IARC) has issued his scientific opinion that radiofrequency (RF) radiation from any source – such as the signals emitted by cell phones, other wireless and cordless and sensor devices, and wireless networks – fully meets criteria to be classified as a "Group 1 carcinogenic to humans" agent, based on scientific evidence associating RF exposure to cancer development and cancer promotion.

"The evidence indicating wireless is carcinogenic has increased and can no longer be ignored," stated Dr. Anthony B. Miller at a July 31, 2017 lecture in Jackson Hole, Wyoming sponsored by the Environmental Health Trust where international experts presented the best available science on cell phone and wireless radiation. In 2011, WHO/IARC classified RF radiation from any source as a "Group 2B possibly carcinogenic to human" agent. Miller believes the evidence published since 2011 fulfills the requirements to re-classify RF radiation as a "Group 1 carcinogenic to humans" agent.

Miller explained that the basis for his opinion includes recent scientific publications which include the 2017 re-analysis of data from the Interphone study, the 2014 French National CERENAT Study, several new publications on Swedish cancer data, and the 2016 results of the National Toxicology Program.

Dr. Anthony B. Miller is a physician epidemiologist who specializes in cancer etiology, prevention, and screening. Miller is Professor Emeritus at the Dalla Lana School of Public Health of the University of Toronto and Senior Medical Advisor to the Environmental Health Trust. He has been a longtime advisor to the World Health Organization (WHO) and was Senior Epidemiologist for the International Agency for Research on Cancer (IARC). He served as Director of the Epidemiology Unit of the National Cancer Institute of Canada, Chair of the Department of Preventive Medicine and Biostatistics at the University of Toronto, Head of the Division of Cancer Epidemiology at the German Cancer Research Centre, and Consultant to the Division of Cancer Prevention of the U.S. National Cancer Institute. He has performed research about electromagnetic fields and cancer and has served on many committees assessing carcinogenicity of various exposures. Miller was visiting Senior Scientist in the IARC Monographs programme as a reviewer to the scientific literature supporting designation of Radiofrequency Electromagnetic Fields (RF-EMF) as a Group 2B possible carcinogen in 2011.

Other experts agree that the increased evidence now establishes RF radiation as a human carcinogen. For example, researchers Dr. Lennart Hardell and Michael Carlberg have published several epidemiological studies that found increased brain cancer associated with long-term cell phone use and conclude that "RF radiation should be regarded as a human carcinogen causing glioma." In addition, published epidemiological research has also found persons diagnosed with brain cancer had decreased survival rates associated with higher wireless phone use.

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In response to skeptics who claim, "There is no evidence," researchers point to published research that has consistently found increased cancer risk in well-designed case control studies that have looked at persons who used cell phones for more than ten years.

The July 31, 2017 panel presentation included international experts. Dr. Annie Sasco presented the WHO/IARC process used to classify carcinogenic agents. Dr. Devra Davis presented research finding wireless radiation results in sperm damage and alters brain development. Dr. Moe Mellion presented Dr. Iris Udasin's clinical cases of World Trade Center first responders who developed brain cancer after combined environmental exposures to chemical toxins and wireless radiation. Theodora Scarato, MSW presented policies enacted by governments worldwide to reduce RF radiation exposures. Dr. Marc Arazi presented data released by the cell phone radiation test program of the Government of France, which found that when cell phones are tested in body contact positions, RF radiation exposure exceeds regulatory limits. Environmental Health Trust plans to post all lectures and videos from the July 31, 2017 presentation online.

About Environmental Health Trust

Environmental Health Trust (EHT) educates individuals, health professionals and communities about controllable environmental health risks and policy changes needed to reduce those risks. Currently EHT is raising health concerns about cell phones and wireless in schools and recommends practical steps to reduce exposures. The Environmental Health Trust maintains a regularly updated database of worldwide precautionary policies on cell phone radiation and health. The foundation's website is the go-to place for clear, science-based information to prevent disease.

View and Download Dr. Anthony Miller's July 31, 2017 Presentation from the Symposium

<https://ehtrust.org/wp-content/uploads/Dr.-Anthony-Miller-Presentation-July-31-2017.pdf>

Scientific Publications on Cell Phone Radiation and Cancer Referenced in Dr. Miller's Presentation

<https://ehtrust.org/references-cell-phone-radio-frequency-radiation-cancer/>

Watch an excerpt from Dr. Anthony Miller's lecture on July 31, 2017

<https://www.youtube.com/watch?v=bgGJeOVEdQs>

Media Relations Contact

Janet Vasquez

media contact

JV Public Relations NY Inc.

**Actions from Peer Review of the Draft NTP Technical Reports on
Cell Phone Radiofrequency Radiation
March 26-28, 2018**

The National Toxicology Program (NTP) convened the NTP Technical Reports Peer Review Panel ("the Panel") on March 26-28, 2018, to peer review two *Draft NTP Technical Reports on Cell Phone Radiofrequency Radiation*. Meeting information, including the draft reports, is available at the NTP website (<https://ntp.niehs.nih.gov/go/36144>). A meeting report will be prepared and posted to the NTP website when completed.

The Panel was divided into two groups. Panel 1 provided consultation on the reverberation chamber technology and Panel 2 provided recommendations on the study findings and NTP's draft conclusions. NTP will consider these comments when finalizing the technical reports. When completed, the technical reports will be published on the NTP website (<https://ntp.niehs.nih.gov/go/189>).

Panel 1 agreed that the reverberation chamber technology was adequate for generating the fields used to assess the effects of cell phone radiofrequency (RFR) exposure in rats and mice.

Working from NTP's scale of *clear evidence*, *some evidence*, *equivocal evidence*, and *no evidence*, Panel 2 made the following recommendations:

Technical Report TR 596: Cell Phone Radiofrequency Radiation Studies in Mice

Neoplastic Lesions: GSM Modulation

Male B6C3F1/N mice, exposed to GSM-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept (8 yes, 3 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male B6C3F1/N mice based on combined incidences of fibrosarcoma, sarcoma, or malignant fibrous histiocytoma in the skin.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male B6C3F1/N mice based on incidences of alveolar/bronchiolar adenoma or carcinoma (combined) in the lung.

Female B6C3F1/N mice, exposed to GSM-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept (9 yes, 2 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female B6C3F1/N mice based on incidences of malignant lymphoma (all organs).

Neoplastic Lesions: CDMA Modulation

Male B6C3F1/N mice, exposed to CDMA-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept (10 yes, 1 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male B6C3F1/N mice based on incidences of hepatoblastoma in the liver.

Female B6C3F1/N mice, exposed to CDMA-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female B6C3F1/N mice based on incidences of malignant lymphoma (all organs).

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Nonneoplastic lesions: GSM and CDMA Modulations

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusions as written, *Exposure to GSM- or CDMA-modulated cell phone RFR at 1,900 MHz did not increase the incidence of any nonneoplastic lesions in male or female B6C3F1/N mice.*

Technical Report TR 595: Cell Phone Radiofrequency Radiation Studies in Rats

Neoplastic Lesions: GSM Modulation

Male Hsd:Sprague Dawley SD rats, exposed to GSM-modulated cell phone RFR at 900 MHz

- Panel 2 voted to recommend (8 yes, 3 no, 0 abstentions) the conclusion, ***clear evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant schwannoma in the heart.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma or carcinoma (combined) in the prostate gland.
- Panel 2 voted to recommend (7 yes, 4 no, 0 abstentions) the conclusion, ***some evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant glioma in the brain.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on benign or malignant granular cell tumors in the brain.
- Panel 2 voted to accept (10 yes, 1 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma in the pars distalis of the pituitary gland.
- Panel 2 voted to recommend (6 yes, 4 no, 1 abstention) the conclusion, ***some evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of pheochromocytoma (benign, malignant, or complex combined) in the adrenal medulla.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of pancreatic islet cell adenoma or carcinoma (combined).

Female Hsd:Sprague Dawley SD rats, exposed to GSM-modulated cell phone RFR at 900 MHz

- Panel 2 voted to recommend (9 yes, 2 no, 0 abstentions) the conclusion, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of malignant schwannomas in the heart.

Nonneoplastic Lesions: GSM Modulation

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, *Increases in nonneoplastic lesions in the heart, brain, and prostate gland of male rats occurred with exposures to GSM cell phone RFR at 900 MHz.*
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, *Increases in nonneoplastic lesions in the heart, thyroid gland, and adrenal gland in female rats occurred with exposures to GSM cell phone RFR at 900 MHz.*

Neoplastic Lesions: CDMA Modulation

Male Hsd:Sprague Dawley SD rats, exposed to CDMA-modulated cell phone RFR at 900 MHz

- Panel 2 voted to recommend (8 yes, 3 no, 0 abstentions) the conclusion, ***clear evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant schwannoma in the heart.
- Panel 2 voted to recommend (6 yes, 4 no, 1 abstention) the conclusion, ***some evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant glioma in the brain.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma in the pars distalis of the pituitary gland.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma or carcinoma (combined) in the liver.

Female Hsd:Sprague Dawley SD rats, exposed to CDMA-modulated cell phone RFR at 900 MHz

- Panel 2 voted to accept (8 yes, 3 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of malignant glioma in the brain.
- Panel 2 voted to accept (10 yes, 0 no, 1 abstention) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of pheochromocytoma (benign, malignant, or complex combined) in the adrenal medulla.
- Panel 2 voted to recommend (9 yes, 2 no, 0 abstentions) the conclusion, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of malignant schwannoma in the heart.

Nonneoplastic Lesions: CDMA Modulation

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***Increases in nonneoplastic lesions of the heart, brain, and prostate gland occurred in males exposed to CDMA cell phone RFR at 900 MHz.***
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***Increases in nonneoplastic lesions of the brain in females exposed to CDMA cell phone RFR at 900 MHz.***

Exposure to (Cell Phone) RF Radiation Linked to Tumors

May 27, 2016

Scientific American reports on a major new \$25 million animal study that tested the possibility of links between cancer and chronic exposure to the type of radiation emitted from cell phones and wireless devices. The study's author says the relationship between radiation exposure and cancer is clear. It presents some of the strongest evidence to date that such exposure is associated with the formation of rare cancers in at least two cell types in the brains and hearts of rats.

The results, which were posted on a prepublication website run by Cold Spring Harbor Laboratory, are poised to reignite controversy about how such everyday exposure might affect human health.

Researchers at the U.S. *National Toxicology Program*, a federal interagency group under the National Institutes of Health, led the study. They chronically exposed rodents to carefully calibrated radiofrequency (RF) radiation levels designed to roughly emulate what humans experience in their daily lives. The animals were placed in specially built chambers that dosed them with varying amounts and types of this radiation for approximately nine hours per day throughout their two-year lifespans.

"This is by far—far and away—the most carefully done cell phone bioassay, a biological assessment. This is a classic study that is done for trying to understand cancers in humans," says Christopher Portier, a retired head of NTP who helped launch the study and still sometimes works for the federal government as a consultant scientist. "There will have to be a lot of work after this to assess if it causes problems in humans, but the fact that you can do it in rats will be a big issue. It actually has me concerned, and I'm an expert."

The International Agency for Research on Cancer in 2011 classified RF radiation as a possible human carcinogen. But data from human studies has been "inconsistent," NTP has said on its website. Such studies are also hampered by the realities of testing in humans, such as recall bias—meaning cancer patients have to try to remember their cell phone use from years before, and how they held their handsets. Those data gaps prompted the NTP to engage in planning these new animal studies back in 2009.

The researchers found that as the thousands of rats in the new study were exposed to greater intensities of RF radiation, more of them developed rare forms of brain and heart cancer that could not be easily explained away, exhibiting a direct dose-response relationship. Some of the rats had glioma—a tumor of the glial cells in the brain—or schwannoma of the heart. Furthering concern about the findings: In prior epidemiological studies of humans and cell phone exposure, both types of tumors have also cropped up as associations.

In contrast, none of the control rats—those not exposed to the radiation—developed such tumors. But complicating matters was the fact that the findings were mixed across sexes: More such lesions were found in male rats than in female rats. The tumors in the male rats "are considered likely the result of whole-body exposure" to this radiation, the study authors write.

Based on these findings, Portier said that the relationship between radiation exposure and cancer is clear. "I would call it a causative study, absolutely. They controlled everything in the study. It's [the cancer] because of the exposure."

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In the study rats were exposed to RF at 900 megahertz. There were three test groups with each species of each sex, tested at different radiation intensities (1.5, 3 and 6 W/Kg), and one control group. (The lowest-intensity level roughly approximates the levels allowed by U.S. cell phone companies, which is 1.6 W/Kg). Rodents across all the test groups were chronically exposed to RF for approximately nine hours spread out over the course of the day.

The experiments also included both types of modulations emitted from today's cell phones: Code Division Multiple Access and Global System for Mobile. (Modulations are the way the information is carried, so although the total radiation levels were roughly the same across both types, there were differences in how radiation is emitted from the antenna—either a higher exposure for a relatively short time or a lower exposure for a longer time.) Overall, there was no statistically significant difference between the number of tumors that developed in the animals exposed to CDMA versus GSM modulations.

The question is, 'Should one be concerned?' The answer is clearly 'Yes,' says David Carpenter, a public health clinician and the director of the Institute for Health and the Environment at the University of Albany.

This animal study was designed primarily to answer questions about cancer risks humans might experience when they use phones themselves, as opposed to smaller levels of exposure from wireless devices in the workplace, or from living or working near cell phone towers. But it may have implications for those smaller levels as well, Portier says.

The findings shocked many scientists who had been closely tracking the study. "I was surprised because I had thought it was a waste of money to continue to do animal research in this area. There had been so many studies before that had pretty consistently not shown elevations in cancer. In retrospect the reason for that is that nobody maintained a sufficient number of animals for a sufficient period of time to get results like this," Carpenter says.

There are safety steps individuals can take, Carpenter says. Using the speakerphone, keeping the phone on the desk instead of on the body and using a wired headset whenever possible would help limit RF exposure.

EXHIBIT 16

[<https://www.ncbi.nlm.nih.gov/pubmed/26151230>]

US National Library of Medicine National Institutes of Health (NIH)

Electromagnetic Biology and Medicine. 2016;35(2):186-202. doi: 10.3109/15368378.2015.1043557.

Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation.

Yakymenko I1, Tsybulin O2, Sidorik E1, Henshel D3, Kyrylenko O4, Kyrylenko S5.

Abstract

This review aims to cover experimental data on oxidative effects of low-intensity radiofrequency radiation (RFR) in living cells. Analysis of the currently available peer-reviewed scientific literature reveals molecular effects induced by low-intensity RFR in living cells; this includes significant activation of key pathways generating reactive oxygen species (ROS), activation of peroxidation, oxidative damage of DNA and changes in the activity of antioxidant enzymes. It indicates that among 100 currently available peer-reviewed studies dealing with oxidative effects of low-intensity RFR, in general, 93 confirmed that RFR induces oxidative effects in biological systems. A wide pathogenic potential of the induced ROS and their involvement in cell signaling pathways explains a range of biological/health effects of low-intensity RFR, which include both cancer and non-cancer pathologies. In conclusion, our analysis demonstrates that low-intensity RFR is an expressive oxidative agent for living cells with a high pathogenic potential and that the oxidative stress induced by RFR exposure should be recognized as one of the primary mechanisms of the biological activity of this kind of radiation.

[<https://www.ncbi.nlm.nih.gov/pubmed/26151230>]

US National Library of Medicine National Institutes of Health (NIH)

Toxicology and Industrial Health. 2016 Oct 13. pii: 0748233716671206.

Radiofrequency radiation (900 MHz)-induced DNA damage and cell cycle arrest in testicular germ cells in swiss albino mice.

Pandey N1, Giri S2, Das S1, Upadhaya P1.

Abstract

Even though there are contradictory reports regarding the cellular and molecular changes induced by mobile phone emitted radiofrequency radiation (RFR), the possibility of any biological effect cannot be ruled out. In view of a widespread and extensive use of mobile phones, this study evaluates alterations in male germ cell transformation kinetics following RFR exposure and after recovery. Swiss albino mice were exposed to RFR (900 MHz) for 4 h and 8 h duration per day for 35 days. One group of animals was terminated after the exposure period, while others were kept for an additional 35 days post-exposure. RFR exposure caused depolarization of mitochondrial membranes resulting in destabilized cellular redox homeostasis. Statistically significant increases in the damage index in germ cells and sperm head defects were noted in RFR-exposed animals. Flow cytometric estimation of germ cell subtypes in mice testis revealed 2.5-fold increases in spermatogonial populations with significant decreases in spermatids. Almost fourfold reduction in spermatogonia to spermatid turnover (1C:2C) and three times reduction in primary spermatocyte to spermatid turnover (1C:4C) was found indicating arrest in the premeiotic stage of spermatogenesis, which resulted in loss of post-meiotic germ cells apparent from testis histology and low sperm count in RFR-exposed animals. Histological alterations such as sloughing of immature germ cells into the seminiferous tubule lumen, epithelium depletion and maturation arrest were also observed. However, all these changes showed recovery to varied degrees following the post-exposure period indicating that the adverse effects of RFR on mice germ cells are detrimental but reversible. To conclude, RFR exposure-induced oxidative stress causes DNA damage in germ cells, which alters cell cycle progression leading to low sperm count in mice.

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EXHIBIT 17

Curriculum Vitae Francis M Hriadil (retired)

Overview:

Francis Hriadil has an advanced degree from M.I.T, and has had a long career performing work as a recognized engineering professional and inventor, on classified and unclassified programs, requiring expertise in engineering, analysis, advanced technology, mathematics, and physics.

Education:

- University of Pittsburgh, (Pittsburgh, PA)
 - School of Engineering
 - B. of Sc. Mechanical/Aerospace Engineering
(graduated Summa Cum Laude)
(accepted into Pi Tau Sigma - Honorary Mechanical Engineering Society)
(accepted into Sigma Tau - Engineering Honor Society)
(accepted into Tau Beta Pi - Engineering Honor Society)
(accepted into American Institute of Aeronautics and Astronautics)
 - Accepted into Graduate School
- Massachusetts Institute of Technology, M.I.T., (Cambridge, MA)
 - School of Engineering
 - Accepted into Graduate School; transferred to M.I.T
 - M.S. Aeronautics and Astronautics
(Thesis Supervisor - Dr. Richard Battin)
(graduated Summa Cum Laude)
(accepted into Sigma Xi - Scientific Research Society of North America)
 - Accepted into the Doctoral Program
Passed Generals
Began Thesis Research - (left the program for personal reasons)
- Quality, Productivity, and Competitive Position Course Graduate
 - Dr. W. Edwards Deming

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Positions Held:

- University of Pittsburgh School of Engineering, (Pittsburgh, PA)
 - Graduate School Research Assistant
- Massachusetts Institute of Technology, (Cambridge, MA)
 - Graduate School Teaching Assistant
 - Research Assistant/Draper Fellow at the Charles Stark Draper Laboratories
- Northrop Corporation - Precision Products Division (PPD), Electronic Systems Group (Norwood, MA)
 - Classified and Unclassified Programs
 - Technical Staff, Systems Analyst - Tactical Systems Group, Strategic Inertial Systems Group
 - Technical Resident/Office Manager - Hawthorne Operations
 - Member/Senior Member - Strategic Inertial Systems Group
 - Manager/Leader of Process Technology
- Innovative Cleaning Solutions, (Merrimack, NH)
 - Co-Founder, Co-owner
 - (Process Technology Design, Development, Consulting)
 - (Awarded Patent #5,402,806 - Cleaning Apparatus Having a Partitioned Boil Sump, 1995)
 - (selected as an honored member of International Who's Who of Entrepreneurs, 1998)
 - with professional subscriptions to Industrial Equipment News (IEN) trade and industry Newsletters:
 - IEN Today
 - IEN Update
 - Industrial Management Today
 - Engineering News Today
- Internet Advantage, (Nashua, NH)
 - Owner
 - (Internet Consulting)
 - with professional subscriptions to many industry/trade journals including but not limited to:
 - IT Security Bulletin
 - Information Week Today
 - CRN Technology News
 - Network Performance Bulletin
 - Redmond Report Newsletter
 - Oracle Magazine
 - Cloud Computing Bulletin

Details and Dates:

- 1976 - 1981: Massachusetts Institute of Technology, (Cambridge, MA)
 - Graduate School Teaching Assistant
 - Research Assistant/Draper Fellow at the Charles Stark Draper Laboratories
 - Advanced Guidance System Development and Analysis
- 1983 - 1994: Northrop Corporation - Precision Products Division (PPD), Electronic Systems Group (Norwood, MA)
 - Summary: The Analysis, Development, and Support of a Number of Classified and Unclassified Advanced Defense Technology Programs
 - Primarily worked on Classified Strategic Programs
- 1983 - 1987: Technical Staff, Systems Analyst
 - Tactical Systems Group
 - Advanced Tactical System Development and Analysis
 - Strategic Inertial Systems Group
 - Advanced Strategic System Analysis and Testing
 - Lead Engineer on the Division Re-certification Team
 - Vandenberg AFB On-site Testing Support
- 1988: Technical Resident/Office Manager - Hawthorne Operations
 - Division Technical Liaison, Advanced Strategic Systems Analysis and Testing
 - Established and Managed Hawthorne, CA Technical Liaison Office
- 1989 - 1993: Member/Senior Member - Strategic Inertial Systems Group
 - Advanced Systems Design, Development, Construction, Analysis, Testing, Integration, Training, Supervision
 - One of the leads in the development of new manufacturing line process technology. Co-inventor of a new, advanced, and innovative cleaning apparatus having a refrigerated vapor barrier and a partitioned boil sump.
- 1993 - 1994: Manager/Leader of Process Technology
 - Supervised Process Technology Group responsible for the Technical Support of the Division's Various Manufacturing Lines
 - Introduced New Methods and Processes to maintain and improve Manufacturing Yield
- 1994 - 2001: Innovative Cleaning Solutions, (Merrimack, Nashua, NH)
 - Co-Founder, Co-owner
 - Process Technology Design, Development, Consulting

- Design and Development of Advanced Industrial Technology focused on People, Product, and Environment
- Awarded Patent #5,402,806 - Cleaning Apparatus Having a Partitioned Boil Sump, 1995
- Selected as a member of International Who's Who of Entrepreneurs, 1998
- 2002 - Retirement: Internet Advantage, (Nashua, NH)
Owner, Internet Consulting
with professional subscriptions to many industry/trade journals including but not limited to:
 - IT Security Bulletin
 - Information Week Today
 - CRN Technology News
 - Network Performance Bulletin
 - Redmond Report Newsletter
 - Oracle Magazine
 - Cloud Computing Bulletin

Curriculum Vitae
Michele A Hriadil

Overview:

Michele Hriadil has had a long professional career, and is still employed, in the Computer Science and Information Technology field.

Education:

- University of Pittsburgh (Pittsburgh, PA)
 - School of Arts and Sciences
 - B. of Sc. in both Computer Science and Mathematics (graduated Summa Cum Laude)

Positions Held:

- PPG, Inc., (Pittsburgh, PA)
 - Scientific Programmer/Analyst
 - Systems Analyst I
 - Systems Analyst II
- Dravo Automation Sciences, (Pittsburgh, PA)
 - Systems Analyst
- Hewlett Packard Enterprise Company, (Pittsburgh, PA)
(formerly Compaq Computer Corporation)
(formerly Digital Equipment Corporation)
 - Software Specialist III
 - Software Specialist IV
 - Technology Consultant I
 - Awards/Certifications:
 - MCSD Certification
 - Compaq Treasures Significant Contribution Award
 - Catch-a-Star Awards, Digital Equipment Corporation
 - Circle of Excellence Award, Digital Equipment Corporation II
- Contemporary Technologies, Inc, (Pittsburgh, PA)
 - Developer
- ColdCypress, (Bridgeville, PA)
 - Lead Developer
 - Systems Architect
- Pitt Ohio, (Pittsburgh, PA)
 - Application Developer

Details and Dates:

- Professional Summary:

Extensive experience in the analysis, design, development, testing, implementation and support of custom software for complex distributed computer based systems. Technologies used include: ASP.NET, ASP, Ajax, Visual Basic, c#, SQL Server, Reporting Services, Crystal Reports, Javascript.

- Professional Experience:

- 1977 - 1985: PPG, Inc., (Pittsburgh, PA)
 - Scientific Programmer/Analyst, Systems Analyst I, Systems Analyst II
 - Administered and supported research on computer systems.
 - Provided technical support to department staff for various applications.
 - Designed and developed applications, wrote documentation and conducted training.
 - Provided support to end users resolving hardware, system and application related problems.
- 1985 - 1987: Dravo Automation Sciences, (Pittsburgh, PA)
 - Systems Analyst
 - Designed and developed an application to automate the generation of an interface design document detailing network data transfers from a central data dictionary.
 - Developed and supported inter-process communication library routines used by project personnel.
 - Served as the backup for the system administrator.
- 1987 - 2001: Hewlett Packard Enterprise Company, (Pittsburgh, PA) (formerly Compaq Computer Corporation) (formerly Digital Equipment Corporation)
 - Software Specialist III, IV; Technology Consultant I
 - Led the development effort for a prototype system which collected psychiatric data from patients via web based forms and fed it into a data warehouse.
 - Led the technical implementation of a Y2K compliance effort for the computer systems of major steel manufacturer. Succeeded in upgrading all systems with little or no impact on production.
 - Designed, developed and tested several major components of a QA application which automated the comparison of test results with customer and industry specifications to insure compliance.

- Developed a menu application to enable personnel to run the interactive functions of a managed care software package (IDX).
 - Designed and developed a major component of an inventory tracking application for advertising agency jobs. Directed the efforts of a subcontractor team responsible for coding relevant reports and provided technical support to the team.
- 2002 - 2003: Contemporary Technologies, Inc, (Pittsburgh, PA)
 - Developer
 - Developed utilities to track customer requirements through the development life cycle.
 - Developed detailed documentation on the purpose of each utility.
 - Assisted other developers with writing SQL scripts. .
- 2004 - 2009: ColdCypress, (Bridgeville, PA)
 - Lead Developer, Systems Architect
 - Developed/maintained a variety of custom ASP.NET web-based applications.
 - Created backend databases and developed stored procedures to support the web-based applications.
 - Developed reports in both Crystal Reports and SQL Reporting Services.
- 2011 - Present: Pitt Ohio, (Pittsburgh, PA)
 - Application Developer
 - Analyze, design, develop/enhance software applications to meet the needs of business Safety and Sales departments; includes database design, data integration, and reporting.
 - Primarily responsible for SAFETYBOX™, a web based fully inclusive system that combines information and functions from a variety of processes to form a best in class safety, compliance and risk management application. SAFETYBOX™ was selected for a CIO 100 award in 2013.
 - Also provide technical support to end users and business groups on-site, over the phone and through remote access.

EXHIBIT 18

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Analysis Carried Out by Francis Hriadil
of the Pulse Transmissions of the SK9AMI7

submitted in
Complainant's Notice to Plead New Matter,
filed and dated January 24, 2017,
along with Exhibits.

From that filed document:

6. [Concerning] ... the ITRON SK9AMI7 Smart Meter, which Duquesne Light is deploying in Pennsylvania, the ITRON White Paper - "Wireless Transmissions: An examination of OpenWay Smart Meter Transmissions in a 24-Hour Duty Cycle" [Exhibit 3 of 5 (4 pages)] for the ITRON SK9AMI7 OpenWay Centron Smart Meter provides Duty Cycle, Time, and Transmission Burst data.

This data is repeated below:

	Duty Cycle	Time in 24 hr
Mean	0.06%	53.14 sec
Maximum	0.58%	497.80 sec
Minimum	0.02%	18.31 sec
Median	0.06%	49.81 sec

ITRON also states that their Maximum Duty Cycle "expectation" lies somewhere between 1% (14.4 min/day) and 5% (72 min/day). And, in typical fashion, they do not provide an exact Transmission Burst Time Interval; they only state that each transmit burst is less than 150 mSec = 150 millisec = 0.15 sec. The question is, how much less?

Using this ITRON provided data, produces the following pulse transmission results

	Duty Cycle	Time in 24 hr	Number of Pulse Transmissions in 24 hr
Minimum	0.02%	18.31 sec	> 122 (> once every 12 min)
Mean	0.06%	53.14 sec	> 354 (> once every 4 min)
Median	0.06%	49.81 sec	> 332 (> once every 4 min)
Maximum	0.58%	497.80 sec	> 3,319 (> once every 26 sec)
Abs Max	5.0%	~ 4,291 sec	> 28,607 (> once every 3 sec)
"Expected" Max	1.0%	~ 858 sec	> 5,720 (> once every 15 sec)

87 78413

Data from California again, indicates that Smart Meter Transmission Pulses typically last from 2 - 20 millisecc each, not the 150 millisecc upper limit provided by Itron. The shorter the Transmission Pulses are, the more pulses that occur throughout the day. So, we ask again, **what is the actual pulse transmit burst?**

7. Can we get a better idea of what the SK9AMI7 OpenWay Pulse Transmission interval really is and **how the SK9AMI7 actually operates in the field?** It turns out that there is another source of data about the operation of the SK9AMI7 Smart Meter in a Smart Grid, as being deployed by Duquesne Light, that is available that does indeed provide that information.

In documented testimony that was given before the British Columbia Utilities Commission in the Matter of the Utilities Commission Act R.S.B.C. 1996, Chapter 473 And Re: FortisBC Energy Inc. Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project; Kelowna, B.C.; March 11, 2013; 1., the following question was asked and was answered by Dr. YAKOV SHKOLNIKOV, Affirmed FortisBC Inc. expert witness, and was confirmed by Mr. MARK RICHARD WARREN, Affirmed representative of FortisBC Inc. about **the average pulse transmissions per day of the ITRON SK9AMI7 OpenWay Centron Smart Meter.**

[Exhibit 4 of 5 (3 pages)]

FortisBC Inc. CPCN for AMI
Volume 7, March 11, 2013

Page: 1318

- 1 MR. FLYNN: Q: Thank you. **On average, how many pulses**
- 2 **per day would that transmitter emit?**
- 3 DR. SHKOLNIKOV: A: I think the number was filed as
- 4 interrogatory, and the average is approx I believe
- 5 1,286 per bursts of transmission per day.
- 6 R. WARREN: A: **1268.**
- 7 DR. SHKOLNIKOV: A: Oh, **1268.**

(my emphasis)

Furthermore, FortisBC Inc. submitted Exhibit C4-4 FortisBC Inc. Advanced Metering Infrastructure CPCN on October 26, 2012, which stated on page 32, para. 55.0,

[Exhibit 5 of 5 (2 pages)]

BCSEA-SCBC IR1
FBC AMI CPCN

October 26, 2012
Page 32 of 42

55.0 Topic: Health

Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-) Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, p.A-2 (pdf p.564 of 747)

"In the 900 MHz band, the signal power from the ltron AMI7 meter (FCC ID SK9AMI7) is 689 milliwatts (mW) for an antenna gain of 1.66. Under typical use, the duty cycle is between 0.02% and 0.58% with a mean of 0.06%. The maximum duty cycle under all circumstances is 5%."
[underline added]

(my emphasis)

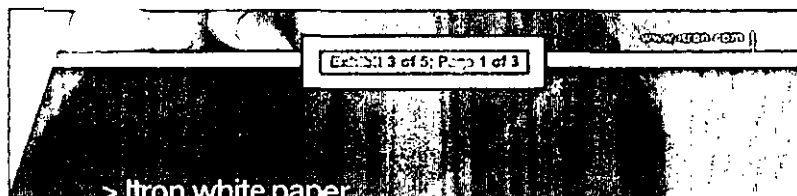
This exactly matches the information supplied in the ITRON White Paper referred to in Section 6., which has been attached as **Exhibit [3]**.

These 2 pieces of documented information establish that the Mean/Average Duty Cycle of 0.06% equates to the quoted average of 1,268 pulse transmissions per day in the field, which further establishes that the actual Transmission Burst Time Interval is closer to 42 millisec = 0.042 sec, than the 150 millisec quoted in the ITRON White Paper.

With this piece of data, the pulse transmission table on page 5 becomes

	Duty Cycle	Time in 24 hr	Number of Pulse Transmissions in 24 hr
Minimum	0.02%	18.31 sec	423 (once every 3.40 min)
Mean	0.06%	53.14 sec	1,268 (once every 1.14 min)
Maximum	0.58%	497.80 sec	12,257 (once every 7.0 sec)
Abs Max	5.0%	~ 4,291 sec	105,667 (once every 0.82 sec)
"Expected" Max	1.0%	~ 858 sec	21,133 (once every 4.1 sec)

8. In either case, **the evidence is clear and incontrovertible that the SK9MIA7 Smart Meters broadcast 100s to 1000s of RF pulse transmissions, like a pulsating strobe, on an ongoing basis throughout the day, 24 hrs a day, 7 days a week.** This is never disclosed to the general public. And, it is completely mischaracterized by the Duquesne Light statement that they "transmit for only short periods every day."



**Wireless
Transmissions:**
*An Examination of
OpenWay Smart Meter
Transmissions in a
24-Hour Duty Cycle*

Jeff French
Applications Engineer

Mika Belanger
Product Line Manager



Exhibit 13 of 5; Page 2 of 3

An Examination of Iron OpenWay® Wireless Transmissions in a 24-hour Duty Cycle

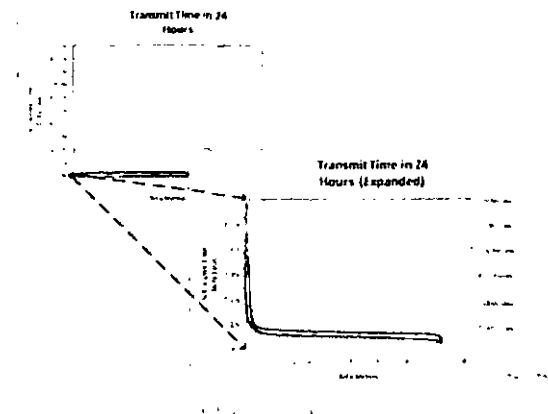


Figure 2 represents a scatter plot of all meters' transmit times. Because the meters transmit for such a small percentage of the time, the first view appears as a solid blue line resting on the x-axis (below 1%). In the expanded view it is possible to see the maximum daily duty cycle is less than 0.07% (transmit time less than 8.64 minutes/day). This view also shows that 96% of the meters have a daily duty cycle of less than 0.07% (transmit time less than 1.44 minutes/day).

	Duty Cycle me	T1
Mean	0.05%	53.14 seconds per day
Maximum	0.58%	497.8 seconds per day
Minimum	0.02%	18.31 seconds per day
Median	0.06%	49.61 seconds per day

Fig. 3 Transmit Time Statistics

Ittron

Exhibit 3 of 5, Page 3 of 3

The table above (*Figure 5*) shows that meter emission times vary, but even the maximum transmission represents less than 1% of the 24-hour period. Median and Mean (in average) times are relatively close together, which indicates the absence of many meters on the extreme ends of the range.

The sample period that was selected represents a day of higher than normal activity for the sample network. During this time, in addition to the two normally scheduled daily meter data reads, there were two crucial updates being transmitted to every endpoint on the network—one for an adjustment for Daylight Savings Time and the other was a crucial firmware update. In a typical day with no updates taking place, the numbers would more than likely be even lower.

Conclusion

OpenWay smart meters are advanced, highly efficient devices. They are able to communicate a large amount of metering and event data in short bursts throughout a 24-hour period (each transmit burst is less than 150mSec.). The worst case meter in the sample population was essentially silent (not transmitting) for over 99.40% of the day while the average meter was silent 99.94% of the day. In terms of FCC regulations for Maximum Permissible Exposure (MPE) limits, the worst case meter was less than 0.09% of the limit mandated by the FCC (0.00051 mW/kg vs 0.61 mW/kg) with the average meter less than 0.009% of the FCC limit (0.000053 mW/kg vs 0.61 mW/kg). (With the duty cycle accounted for, see *Note #3*).

This empirical field data further refines our estimations for maximum duty cycle of Ittron OpenWay meters. When accounting for the variations in cell size and data requests, our expectations for maximum duty cycle are 1% (14.4 min/day). The previous estimate prior to this field data was 5% duty cycle.

Ittron takes all concerns about RF exposure very seriously and continuously strives to ensure its products meet or exceed FCC guidelines and regulations. In the case of OpenWay smart meters, Ittron dramatically exceeds these mandates with a product that generates only a very small fraction of the FCC limits for RF exposure.

Note #1:

The sample meter data was taken from one of Ittron's large-scale, operational network customers. It is representative of the OpenWay smart grid solution. There were 6,865 meters in the population sample, spread across 10 cells (average cell size of ~687 meters). The data for the Cell Masters is included in this analysis.

Exhibit 4 of 5: Page 1 of 3

BRITISH COLUMBIA UTILITIES COMMISSION
IN THE MATTER OF THE UTILITIES COMMISSION ACT
R.S.B.C. 1996, CHAPTER 473

And

Re: FortisBC Energy Inc.
 Application for a Certificate of Public Convenience and
 Necessity for the Advanced Metering Infrastructure Project

Kelowna, B.C.
 March 11, 2013

PROCEEDINGS

BEFORE:

L. Kelsey,	Commission Chair / Panel Chair
N. MacMurchy,	Panel Member
D. Morton,	Panel Member

VOLUME 7

Allwest Reporting Ltd.
 #1200 - 1125 Howe Street
 Vancouver, B.C. V6Z 2K8

Exhibit 4 of 5: Page 2 of 3

FortisBC Inc. CPN for AIB
 Volume 7, March 11, 2013

Page: 1318

1 MR. FLYNN: Q: Thank you. On average, how many pulses
 2 per day would that transmitter emit?
 3 MR. SHULMISTOV: A: I think the meter was filed as
 4 interregulatory, and the average is approx I believe
 5 1,266 per burst of transmission per day.
 6 MR. FLYNN: A: 1200.
 7 MR. SHULMISTOV: A: Oh, 1200.
 8 MR. FLYNN: Q: Why is that different than in California
 9 where it's 14,000 times per day on average?
 10 MR. HARBEN: A: We don't know. They use a different
 11 system at I&M, which I think was the reference that
 12 you gave. So it's not the Itron OpenWay system.
 13 MR. FLYNN: Q: Okay. So your then is what, please, for
 14 the average meter pulsing per day?
 15 MR. HARBEN: A: 1266 was provided in IR responses, an
 16 average.
 17 MR. FLYNN: Q: What's the peak amount, the peak number,
 18 the maximum number they'll pulse per day?
 19 MR. HARBEN: A: We don't have that information that I'm
 20 aware of, but we did have the -- we did file the Itron
 21 White Paper that shows what the maximum duty cycle is,
 22 which would show what the total time of all of those
 23 different transmissions would be at maximum. Which in
 24 about 0.55 percent duty cycle.
 25 **Proceeding Time 11:04 a.m. T25**
 26 MR. FLYNN: Q: Were you aware that in a California

Allwest Reporting Ltd., Vancouver, B.C.

1 California Public Utility Commission that their
2 transmitter is up all the time. There was no sign
3 of the transmitter being down at all. It is
4 that way. Does that make the transmitter up all the
5 time? THE CHAIRMAN: Yes, that's just what the question
6 is.
7 11. THE WIT: At the getting into the details of
8 driver speech equipment, the numbers for the
9 the device in a function of it as they were introduced at
10 an exhibit to the court exhibit. There was
11 an exhibit which listed the numbers and
12 the numbers introduced in the Exhibit report.
13 when the first of the advanced test is active 0.06
14 percent of the time on average, which is about one-
15 fifth of a second in a six minute period. And then it
16 is the maximum observed in the field study they have
17 done is 0.56 percent, and the maximum theoretical duty
18 cycle is about 5 percent of the time. So those are
19 the numbers.
20 THE WIT: At the time of the examination of the
21 "An examination of the
22 OpenWay wireless transmissions in a 24-hour duty
23 cycle", and it is in Appendix B of the IR 151.5

24 Proceeding Time 11:19 a.m. T28

25 THE WIT: Mr. Justice, I would like to have the
26 Commission to be the court's report is in Appendix

Exhibit 5 of 5; Page 1 of 2

FORTISBC INC. ADVANCED METERING INFRASTRUCTURE (AMI) PROJECT
PUBLIC 4-4

REQUESTOR NAME: BC Sustainable Energy Association

INFORMATION REQUEST ROUND NO: 1

TO: FortisBC Inc. (FBC)

DATE: October 26, 2012

PROJECT NO: 3698642

APPLICATION NAME: Application for a Certificate of Public Convenience and Necessity (CPCN) for the Advanced Metering Infrastructure (AMI) Project

Topic: Version of ZigBee

1.1 FortisBC notes that it "is proposing that the advanced meters include HAN functionality at implementation". For the HAN, FortisBC notes that "initially the meters will use ZigBee Smart Profile v1.1... also support Zigbee Smart Energy v2.0".

- 1.1.1 Please explain why the meters need to support two different versions of ZigBee.
- 1.1.2 Will the two versions be running concurrently in the meter, or will they need to be switched (if so, how will the switch be done)?
- 1.1.3 Can an In-Home Display using v1.1 communicate to a meter running with v2.0?
- 1.1.4 Can an In-Home Display using v2.0 communicate to a meter running with v1.1?
- 1.1.5 It is noted that v2.0 "... is being developed ...".
- 1.1.5.1 When is v2.0 expected to be complete, what hurdles need to be overcome before it is complete and what are the risks?
- 1.1.5.2 How can v2.0 be delivered if it is not yet complete?
- 1.1.5.3 What testing has been done for v2.0 or is expected before it is considered complete? Does FortisBC plan any pilot testing?
- 1.1.6 Whose responsibility is it to work out the technical issues for different versions - FortisBC/Itron or the suppliers of the In-Home Display?
- 1.1.7 How will different versions of ZigBee affect the end customer?

Topic: BC SMI Regulation

1.2 FortisBC states: "the Smart Meters and Smart Grid Regulation (2010) details the prescribed requirements of 'Smart Grid' and 'Smart Meter'". Please confirm that the reference is to the Smart Meters and Smart Grid Regulation, B.C. Reg.

¹ Exhibit B-6, BCUC IR 30.1 Response, Page 47, Line 30

² Exhibit B-1, Section 4.1.1, Page 43, Line 14

BCSEA-SCBC IR1
FBC AMI CPCN

Exhibit 5 of 5; Page 2 of 2

October 26, 2012
Page 32 of 42

54.2 Has Exponent, Inc. provided reports on radiofrequency exposure and health in relation to advanced metering infrastructure for clients other than FBC? If so, please provide the number of such reports by year.

54.3 Please provide a copy of any other report by Exponent on RF exposure and health in relation to the Itron AMI7 meter.

55.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, p.A-2 (pdf p.564 of 747))

To the BC model, the duty cycle from the Itron AMI7 meter is FCC ID SK9AM17 is 0.1% (0.001) for an antenna gain of 1.68. Under typical use, the duty cycle is between 0.02% and 0.58% with a mean of 0.06%. The maximum duty cycle under full load is 0.58% (under full load).

55.1 Please confirm that the Itron AMI7 meter (FCC ID SK9AM17) is the model of advanced meter in FBC's AMI Project. If not, please explain.

55.2 Please confirm that the characteristics of the Itron AMI7 meter described in the passage quoted above accurately describe the characteristics of the advanced meters in the configuration and usage that FBC proposes in the AMI Project.

55.3 Please describe the term "duty cycle" in this context.

55.4 What does a duty cycle "between 0.02% and 0.58% with a mean of 0.06%" and a maximum of "5%" mean in terms of seconds or minutes per hour or per day?

55.4.1 Does this duty cycle include all data from the meter, including data for supporting the mesh network and other network traffic?

55.5 Please explain why the duty cycle is given as a range. Does the duty cycle range apply to each specific installed meter, or to the fleet of meters? Will some installed meters be at the low end of the range while others are at the high end of the range? What factors determine the length of the duty cycle for a particular meter; for the fleet of meters?

55.6 In what circumstances does the maximum duty cycle of 5% occur? Would this occur with a specific installed meter, or with the fleet of meters? How frequently does the maximum duty cycle of 5% occur?

55.7 Please define the mean duty cycle. Is it a weighted average? Does the mean duty cycle of 0.06% include the expected occurrences of the maximum duty cycle?

55.8 Please provide a copy of "Analysis of Radio Frequency Exposure Associated with Itron OpenWay® Communications Equipment" by Itron, Inc. and "Wireless Transmissions: An Examination of OpenWay Smart

[<https://fccid.io/SK9AMI7>]

TCB	GRANT OF EQUIPMENT AUTHORIZATION Certification Issued Under the Authority of the Federal Communications Commission By:	TCB
	Advanced Compliance Solutions, Inc. 5015 B.U. Bowman Drive Buford, GA 30518	Date of Grant: 08/15/2012 Application Dated: 08/15/2012
Iron Electricity Metering, Inc. 313 North Highway 11 West Union, SC 29696		
Attention: Lee Littlejohn, Compliance Engineer		
NOT TRANSFERABLE EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.		
FCC IDENTIFIER: SK9AMI7 Name of Grantee: Iron Electricity Metering, Inc. Equipment Class: Part 15 Spread Spectrum Transmitter Notes: AMI7 Module Modular Type: Limited Single Modular		
Grant Notes	FCC Rule Parts	Frequency Range (MHZ)
	15C	902.4 - 927.6
	15C	902.25 - 927.75
	15C	909.6 - 921.8
		Output Watts
		0.701
		0.684
		0.689
		Frequency Tolerance
		Emission Designator
Limited Modular Approval: Power listed is conducted. This device must be professionally installed and is limited to installation for mobile and fixed applications only. This grant is valid only when the device is installed by the grantee or contractors employed by the grantee who are instructed to ensure that the end-user has no manual instructions to remove or install the device. The transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Installers and end-users must be provided with transmitter operation conditions for satisfying RF exposure compliance. Class II Change to add RF filter and new antenna type as described in this filing.		

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SECRETARY'S BUREAU

[<https://fccid.io/TYOJN5121M6>]

TCB

GRANT OF EQUIPMENT
AUTHORIZATION
Certification
Issued Under the Authority of the
Federal Communications Commission
By:

TCB

Curtis-Straus LLC
One Distribution Center Circle Suite #1
Littleton, MA 01480

Date of Grant: 10/30/2008
Application Dated: 10/27/2008

NXP Laboratories UK Ltd
Furnival St
Sheffield, S1 4QT
United Kingdom

Attention: Conrad Farlow

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: TYOJN5121M6
Name of Grantee: NXP Laboratories UK Ltd
Equipment Class: Digital Transmission System
Notes: 802.15.4/ZigBee Module
Modular Type: Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designator
	15C	2405.0 - 2480.0	0.001		

Output power listed is conducted. Modular approval. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Approval is limited to OEM installations only. OEM integrators must be provided with antenna installation instructions. OEM integrators and end-users must be provided with transmitter operating conditions for satisfying RF exposure compliance. This grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. The only antennas approved for use with this module are those documented under the filings of this FCC ID.

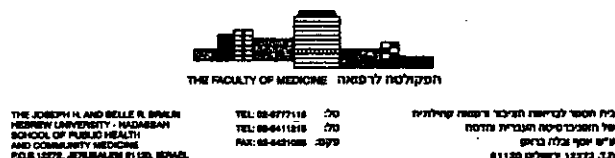
EXHIBIT 20

Expert Reports Refuting the CCST Report "Health Impacts of Radiofrequency from Smart Meters"

01. Elihu Richter, MD, MPH Download Letter 
Hebrew University, Hadassah
School of Public Health and Community Medicine
Occupational and Environmental Medicine
02. David O. Carpenter, MD, Director, Institute for Health and the Environment Download Letter 
University at Albany, New York
03. Olle Johansson, PhD Download Letter 
Department of Neuroscience, Experimental Dermatology Unit
Karolinska Institute, Sweden
04. Lukas Margaritis, PhD, Professor of Cell Biology and Electron Microscopy Download Letter 
University of Athens, Greece,
Adamantia F. Fragopoulou, Biologist, PhD Cand.
University of Athens, Greece
05. Samuel Milham, MD, MPH Download Letter 
Epidemiologist, Retired – Washington State Health Department
06. Magda Havas, PhD Download Letter 
Environmental and Resource Studies
Trent University, Ontario, Canada
07. Nancy Evans, BS Download Letter 
Health Science Consultant
San Francisco, CA
08. Cindy Sage, MA Download Letter 
Sage Associates
Co-Editor, BioInitiative Report Download Letter 
Author – Smart Meter RF Assessment Report
Santa Barbara, CA
09. Raymond Richard Neutra M.D. Dr. PH Download Letter 
Albany, CA
10. Janet Newton, President Download Letter 
EMR Policy Institute
Marshfield, Vermont
11. Karl Maret, MD Download Letter 
Dove Health Alliance
Aptos, California
12. Yasuko Kato, Association Director Download Letter 
VOC-EMF Measures Research
Hokkaido, Japan
13. Daniel Hirsch Download Letter 
Radiation expert, Senior lecturer on nuclear policy, and UCSC instructor
University of California, Santa Cruz, California

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EXHIBIT 20-01-RICHTER



Hebrew University-Hadassah
School of Public Health and Community Medicine
Unit of Occupational and Environmental Medicine
<http://www.md.huji.ac.il/depts/occenvmed/>
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elihur@ekmd.huji.ac.il, stein444@gmail.com

26 January, 2011

Susan Hackwood, PhD
Executive Director
California Council on Science and Technology

Lora Lee Martin, Director
Strategic Policy Initiatives and Government Affairs
California Council on Science and Technology

Subject: Letter of Comment on Smart Meter Report

I have been invited by colleagues to submit my Commentary on CCST Report and Recommendations for Smart Meters using RF. My comments are based on the information summarized in the BioInitiative Report and the Seletun Reports, as well as the other reports in the recent scientific literature. The broader context for my commentary are the consequences of our past failures in environmental epidemiology to heed early warnings from other many population wide exposures in yesteryear, notably lead.

Personal Background: I am a medical epidemiologist who has assessed source-exposure-effect relationships for many chemical and physical agents over the past 40 years. This work has included work on lead, asbestos and smoking, pesticides, solvents, air pollution, and mixed exposures and ionizing radiation. Since the late 1980's I served as Head of the Unit of Occupational and Environmental Medicine in Hebrew University-Hadassah School of Public Health and Community Medicine in

Jerusalem Israel. I have also been involved in issues having to do with the medical ethics in public health, and served for several years as Chairman of the Ethics and Philosophy Committee of the International Society for Environmental Epidemiology and I am a member of the Collegium Ramazzini. I have published more than 100 scientific papers in the peer reviewed literature. Since the 1980's, I have had the opportunity to assess the case for a cause effect relationship with many workers with past cancer and past severe exposures to RF/MW, often after short latent periods. I have also supervised projects assessing community exposures to RF/MW and ELF in Jerusalem. I have reported on cases of brain cancer in individuals with latency periods of less than 10 years and am currently writing an investigation of a cluster of cancer in workers with extremely high occupational exposures to RF. I helped draft the Benevento and Seletun statements. In recent years, I have been particularly active assessing the use and scope of the Precautionary Principle in examining the anticipated risks from alternative technologies.

1. Smart grid networks, if using RF, will generate 24/7 round the clock ubiquitous involuntary indoor exposures to RF – in the everyday background environment of everyone in California in human habitats. The background exposures produced by these grids will be substantially greater than those from point source WI-FI routers, microwave ovens and cell phones. These whole body exposures, though perhaps below levels of current regulatory standards, (INCRIP-WHO, and IEEE), will exceed cumulative time weighted exposures producing the above outcomes, based on the literature.
2. Based on the evidence in peer reviewed studies on the effects on these endpoints and the exposure projections in Sage Associates' landmark report (see Sage, http://sagereports.com/smart-meter-rf/docs/Table7-8ElectricMeters_R1000_TA1-90Final.pdf) this project exposes large percentages of the general population to highly alarming involuntary exposure risk scenarios, taking into account an array of modifying factors e.g. background exposures, distance, reflection, and factors influencing access to exposure areas.
3. Since the publication of the Benevento Resolution and the BioInitiative Report, the body of evidence concerning health risks from exposures to RF continues to accumulate. In particular from cell phone use. Cell phone use involves the delivery of a high concentration of non-ionizing radiation to the skull and brain for relatively brief periods of time over a 24 hour period as result of voluntary decisions by users—a situation far less aggressive to the general population than involuntary exposure from the proposed Smart Meters. Models for predicting penetration into the whole body are now available, based on those developed by Gandhi and by Kuster. These models draw attention in particular to the risks from exposure to the young.

Appendix - 10-05 1185075

4. The exposures from Smart Meters are the equivalent of exposure of the entire population—the young, the old, the newborn, the unborn, and the sick, to environmental tobacco smoke, even if most members of the population do not smoke.
5. There is a huge body of evidence to refute the claim the so-called “hot muffin theory” that there are no effects from sub-thermal exposures to NIR, and specifically RF/MW (Benevento Statement, BioInitiative Report, London Report) The effects pertain to ROS- Reactive Oxygen Species, cellular changes, effects on DNA, and neurobehavioral effects-- e.g. deficits in memory, mood changes, fatigue, headache, as well as electro hypersensitivity and cancer, and effects on those with electronic medical implants. It is important to note that there are also concerns about the production of dirty electricity, itself a risk factor for many of these outcomes (Milham).
6. Models of carcinogenicity or exposures to toxic and physical agents and cancer postulate that we cannot be certain there is a threshold (based on the DNA single hit model). These models also postulate roughly linear dose response relationships and recognize groups and age windows for special risks—e.g. fetuses, newborns, persons who are immunocompromised and those with sensitivities on the basis of mechanisms which are still poorly understood. For populations, it is probable that similar dose response models for exposure-risk relationships apply even though mechanisms involve resonance models of intensity and frequency.
7. It is fair to say that we are no longer talking about mere precaution of uncertain risk, but about prevention of highly probable and known risks. Based on the accumulating evidence, it is now fairly certain that there will be widespread adverse public health impacts. What remains uncertain is how many will be affected, and whether there are time weighted intensity of exposure thresholds, below which there will be absence of risk.
8. The most plausible scenario is that there will be 'small' increases in individual risk for the incidence of occurrence (e.g. cancer) or incidence and severity (e.g. neurobehavioral effects), applied to the entire population from these networks/ large population wide increases in absolute numbers of people with adverse outcomes. The epidemiologist Geoffrey Rose articulated the principle that small increases in so-called sub-threshold exposures result in many more individuals with illness in the entire population than high exposures delivered to small numbers of people. *This principle applies to the scenario of population-wide effects from exposures to RF from networks of Smart Meters and concerns about dirty electricity.*
9. Were these population-wide exposures to smart meters to be part of a project carried out in a medical setting, to test the risks and benefits of a new technology on human health and well being, it would be rejected by a Medical Institutional Review Board on ethical grounds as an unethical exercise in human experimentation.
10. The risks we are assessing today from exposure to RFMW and dirty electricity from Smart Meters placed everywhere recalls the story of population-wide exposure to lead in gasoline – a subject concerning which I have much direct personal experience. In the 1970s, a mere 35 yrs ago, we were arguing as to whether or not an everyday blood lead level of 30ug/dl was a health risk. By 1979, that threshold dropped to 20ug/dl and thereafter through the 1980s to 10ug/dl for children, and now we are not certain whether there is a threshold below which there are no discernable adverse neurobehavioral effects, especially for *in utero* and newborn exposures. We now know, in retrospect, that the entire urban population, notably children, were receiving exposures which were impairing their IQ, emotional well being, and long term growth and development. These findings led to the elimination of lead from gasoline. In retrospect, we were not heeding the early warnings regarding an impending population-wide hazard with disastrous effects. I suggest that in the case of population-wide exposure to RF, the situation is similar, with one exception: The warnings may no longer be early.
11. Population-wide exposure to man-made NIR represents a scenario relatively new in the history of biology. It is difficult to assess risks from these new exposures and their frequencies and wave patterns using experience based on exposure to background naturally occurring NIR. Instead, we are required to rely on experimental studies and epidemiology of exposure-effect relationships, using endpoints such as effects on stem cells, leaks from the blood brain barrier, as well neurological, cardiac and cancer endpoints. In addition, there are additional vulnerabilities to the eyes and to the testes.
12. I warn that we may be on the cusp of a similar scenario here with regard to community wide exposures to RF/MW and dirty electricity from Smart Meters — with one exception: there are safe alternatives.
13. The Precautionary Principle, in its various formulations, specifies that where there is uncertainty concerning the possibility of health risks from a new technology, the costs of doing nothing to prevent the exposure (e.g. a false negative) may be greater than a false positive (taking preventive action). I add that in applying the Precautionary Principle, we are required to weigh the risks and benefits from 3 options: doing nothing (i.e. no Smart Meters), and doing something (Smart Meters with RF) or a different kind of Meters using fiberoptics. We recognize that doing

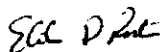
nothing carries itself certain risk having to do with the operations of the electrical ssgrid system.

But alternative technology- smart meters powered by fiber optics, which are without known risk, can be used to achieve the same objective.

14. There is no excuse for avoiding this investment with a permanent enduring protection for the public in avoiding and not introducing fiber optics. For reasons just stated, it will be bad ethics and bad technology and, possibly wanton negligence, recklessness and incompetence to wilfully forego the last option.

I thank the Commission for the opportunity to submit my comments.

Elihu D Richter MD, MPH (Assoc Professor)



References:

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2. Pathophysiology Journal, Special Issue 16: Volumes 1 and 2, 2009. Elsevier Press. *There are chapters on low-intensity radiofrequency and wireless radiation health effects based on scientific literature from the realms of genotoxicity, genomics and proteomics, neurology, blood-brain barrier effects, stress (heat shock) proteins, immunology and inflammatory diseases, cancer and public health consequences of ignoring warnings given global proliferation of wireless exposures at billions of times greater levels than earth and humans evolved with.*
3. WHO Research Agenda, 2010. WHO research agenda for radiofrequency fields, © World Health Organization 2010
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14. Grandjean P, Bellinger D, Bergman A, Cordier S, Davey-Smith G, Eskenazi B, Gee D, Gray K, Hanson M, van den Hazel P, Heindel JJ, Heinzow B, Hertz-Picciotto I, Hu H, Huang T, Jensen TK, Landrigan PJ, McMillen C, Murata K, Ritz Schoeters G, Skakkebaek NE, Skerfving S, Weihe P. 2007. The Faroes Statement: Human Health Effects of Developmental Exposure to Chemicals in Our Environment. Nordic Pharmacological Society. *Basic & Clinical Pharmacology & Toxicology* 102:73–75

EXHIBIT 20-02-CARPENTER



Institute for Health and the Environment
and
Department of Environmental Health Sciences
School of Public Health

This is a report on the review of the California Council on Science and Technology document, "Health Impacts of Radiofrequency from Smart Meters". I am a public health physician and former Dean of the School of Public Health at the University at Albany. I have been involved in review and analysis of studies on electromagnetic fields, including radiofrequency fields, for many years. I served as the Executive Secretary to the New York State Powerlines Project in the 1980s, and have published several reviews on the subject and have edited two books. In addition I was invited to present to the recent President's Cancer Panel on the subject of powerline and radiofrequency fields and cancer.

This document is not an accurate description of the state of the science on the issue of radiofrequency fields, and is full of inaccuracies. My specific concerns are as follows:

1. The benefit of the smart meters is entirely to the utilities, and is economic in nature. If they install smart meters they can fire those individuals who at present are employed to go around reading meters. Thus this is a job-killing proposal, and will increase unemployment in a state that already has too much.
2. When a smart meter is installed residents have no choice in the matter nor ability to avoid exposure. But every individual has the option to use or not use other personal wireless devices, until more is known about health consequences of chronic RF exposure. There is a major difference between an exposure which an individual chooses to accept and one that is forced on individuals who can do nothing about it.
3. The statement "The potential for behavioral disruption from increase body tissue temperatures is the only biological health impact that has been consistently demonstrated and scientifically proven to result from absorbing RF within the band of the electromagnetic spectrum that smart meters use" is totally wrong. In the first place there are many adverse health effects other than "behavioral disruption" demonstrated as a result of tissue heating. The evidence for increased risk of brain tumors, acoustic neuromas and parotid gland tumors in individuals who have used a cell phone for 10 years or more is consistent, and the tumors occur predominantly on the side of the head where the phone is used. There is also strong and consistent evidence for increased risk of leukemia in individuals who live near to high power AM radio transmission towers, even though this report characterizes such exposures as being "quite low" and show in Figure 7 that they are lower than the RF fields from smart meters.
4. The statement "The scientific consensus is that body temperatures must increase at least 1°C to lead to potential biological impacts from the heat" is totally wrong, and makes it obvious that no persons with medical or biological expertise participated in this report. Every enzyme system in the body is exquisitely sensitive to temperature, and increases activity by even a fraction of a degree increase in temperature. In fact all RF generates heat, and what is defined as "non-thermal" is only a function of our ability to measure the temperature increase.
5. The statement "While concerns of brain cancer associated with mobile phone usage persist, there is currently no definitive evidence linking cell phone usage with increased incidence of cancer" is incorrect. The evidence is strong and consistent among studies looking at long-term and intensive use of cell phones. The AM radio studies mentioned above are also relevant, particularly because like smart phones radio transmission towers give whole body radiation, not just to the head.
6. The statement "There currently is no conclusive scientific evidence pointing to a non-thermal cause-and-effect between human exposure to RF emissions and negative health impacts" is



Institute for Health and the Environment
and
Department of Environmental Health Sciences
School of Public Health

inaccurate, and depends totally on what one defines as conclusive". In biology and medicine there is nothing that is 100% proven. We rely on statistical significance and weight of evidence when drawing conclusions about health effects. When one uses these definitions there is conclusive scientific evidence for adverse health effects in humans.

7. The evidence for adverse effects of radiofrequency radiation is currently strong and grows stronger with each new study. Wired meters with shielded cable do not increase exposure. The report clearly indicates that "smart meters could conceivably be adapted to non-wireless transmission of data. However, retrofitting millions of smart meters with hard-wired technology could be difficult and costly." Clearly the answer to this dilemma is not to install wireless smart meters to begin with.

Thank you for the opportunity to comment on this faulty report, and on the general issue of smart meters. Their use is unwise from both a public health point of view, which is where my expertise lies, but and also from a purely short and long-term economic point of view.

Yours sincerely,

A handwritten signature in cursive script, appearing to read 'David O. Carpenter'.

David O. Carpenter, M.D.
Director, Institute for Health and the Environment
University at Albany

EXHIBIT 20-03-JOHANSSON



Karolinska Institutet
Department of Neuroscience
Experimental Dermatology Unit

Stockholm, January 17, 2011

To whom it may concern

The California Council on Science and Technology, 1130 K Street, Suite 280, California 95814, USA, has recently released its report on wireless smart meters ("Health Impacts of Radio Frequency from Smart Meters"). In it, the possibility of any low-intensity health consequences of chronic exposure to pulsed microwave exposure is denied. However, in the current field of science, the present state-of-the-art regarding this issue is not so simple.

Wireless communication is now being implemented in our daily life in a very fast way. At the same time, it is becoming more and more obvious that the exposure to electromagnetic fields not only may induce acute thermal effects to living organisms, but also non-thermal effects, the latter often after longer exposures. This has been demonstrated in a very large number of studies and includes cellular DNA-damage, disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier, impact on vessel and immune functions, and loss of fertility. Whereas scientists can observe and reproduce these effects in controlled laboratory experiments, epidemiological and ecological data derived from long-term exposures reflect in well-designed case-control studies the link all the way from molecular and cellular effects to the living organism up to the induction and proliferation of diseases observed in humans. It should be noted that we are not the only species at jeopardy, practically all animals and plants may be at stake. Although epidemiological and ecological investigations as such never demonstrate causative effects, due to the vast number of confounders, they confirm the relevance of the controlled observations in the laboratories.

Because the effects are reproducibly observed and links to pathology cannot be excluded, the precautionary principle should be in force in the implementation of this new technology within the society. This will be the only method to support the sustainability of these innovative wireless communication technologies. The February 2, 2000 European Commission Communication on the Precautionary Principle notes: "The precautionary principle applies where scientific evidence is insufficient, inconclusive or uncertain and preliminary scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen by the EU". Therefore, policy makers immediately should strictly control exposure by defining biologically-based maximal exposure guidelines also taking into account long-term, non-thermal effects, and including especially vulnerable groups, such as the elderly, the ill, the genetically and/or immunologically challenged, children and fetuses, and persons with the functional impairment electrohypersensitivity.

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Karolinska Institutet
Department of Neuroscience
Experimental Dermatology Unit

In November, 2009, a Scientific Panel comprised of international experts on the biological effects of electromagnetic fields met in Seletun, Norway, for three days of intensive discussion on existing scientific evidence and public health implications of the unprecedented global exposures to artificial electromagnetic fields (EMF) from telecommunications and electric power technologies. This meeting was a direct consequence of on-going discussions already from the mid-nineties, when cellular communications infrastructure began to rapidly proliferate, and stretching through, among many, the Benevento (2006), Venice (2008) and London (2009) Resolutions from this decade, and involving important conclusions drawn from the 600-page Bioinitiative Report published August 31, 2007, which was a review of over 2,000 studies showing biological effects from electromagnetic radiation at non-thermal levels of exposure, which partly was published subsequently in the journal Pathophysiology (Volume 16, 2009).

The Seletun Scientific Statement (2011) recommends that lower limits be established for electromagnetic fields and wireless exposures, based on scientific studies reporting health impacts at much lower exposure levels. Many researchers now believe the existing safety limits are inadequate to protect public health because they do not consider prolonged exposure to lower emission levels that are now widespread.

The body of evidence on electromagnetic fields requires a new approach to protection of public health: the growth and development of the fetus, and of children; and argues for strong preventative actions. These conclusions are built upon prior scientific and public health reports documenting the following:

- 1) Low-intensity (non-thermal) bioeffects and adverse health effects are demonstrated at levels significantly below existing exposure standards.
- 2) ICNIRP/WHO and IEEE/FCC public safety limits are inadequate and obsolete with respect to prolonged, low-intensity exposures.
- 3) New, biologically-based public exposure standards are urgently needed to protect public health world-wide.
- 4) It is not in the public interest to wait.

• EMR exposures should be reduced now rather than waiting for proof of harm before acting. This is in keeping with traditional public health principles, and is justified now given abundant evidence that biological effects and adverse health effects are occurring at exposure levels hundreds to thousands of times below existing public safety standards around the world.

• There is a need for mandatory pre-market assessments of emissions and risks before deployment of new wireless technologies. There should be convincing evidence that products do not cause health harm before marketing. Such decisions may have to be quickly revised given new evidence.

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• The use of telephone lines (land-lines) or fiber optic cables for SmartGrid type energy conservation infrastructure is recommended. Utilities should choose options that do not create new, community-wide exposures from wireless components of SmartGrid-type projects. Future health risks from prolonged or repetitive wireless exposures of SmartGrid-type systems may be avoided by using fiber-optic cable. Energy conservation is endorsed but not at the risk of exposing millions of families in their homes to a new, involuntary source of wireless radiofrequency radiation, the effect of which on their health not yet known.

I encourage governments to adopt a framework of guidelines for public and occupational EMF exposure that reflect the Precautionary Principle. The Precautionary Principle states when there are indications of possible adverse effects, though they remain uncertain, the risks from doing nothing may be far greater than the risks of taking action to control these exposures. The Precautionary Principle shifts the burden of proof from those suspecting a risk to those who discount it — as some nations have already done. Precautionary strategies should be based on design and performance standards and may not necessarily define numerical thresholds because such thresholds may erroneously be interpreted as levels below which no adverse effect can occur.

You often hear about "safe levels" of exposure and that there is "no proof of health effects", but my personal response to these seemingly reassuring statements is that it is very important to realize, from a consumer's point of view, that "no accepted proof for health effects" is not the same as "no risk". Too many times, 'experts' have claimed to be experts in fields where actually the only expert comment should have been: "I/we just do not know". Such fields were e.g. the DDT, X-ray, radioactivity, smoking, asbestos, BSE, heavy metal exposure, depleted uranium, etc., etc., etc., where the "no risk"-flag was raised before true knowledge came around. Later on, the same flag had to be quickly lowered, many times after enormous economic costs and suffering of many human beings. Along those lines, it is now (regarding "the protection from exposure to electromagnetic fields" issue) very important to clearly identify the background and employment (especially if they sit, at the same time, on the industry's chairs) of every 'expert' in different scientific committees, and likewise. It is, of course, very important (maybe even more important?) to also let 'whistleblowers' speak at conferences, to support them with equal amounts (or even more?) of economical funding as those scientists and other 'experts' who, already from the very beginning, have declared a certain source or type of irradiation, or a specified product, to be 100% safe.

In the case of "protection from exposure to electromagnetic fields", it is thus of paramount importance to act from a prudence avoidance/precautionary principle point of view. Anything else would be highly hazardous! Total transparency of information is the key sentence here, I believe consumers are very tired of always having the complete truth years after a certain catastrophe already has taken place. For instance, it shall be noted, that today's recommendation values for wireless systems, the SAR-value, are just recommendations, and not safety levels. Since scientists observe biological effects at as low as 20 microWatts/kg, is



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it then really safe to irradiate humans with 2 W/kg (i.e., with 100,000 times stronger radiation!), which is the recommendation level for us? And, furthermore, it is very strange to see, over and over again, that highly relevant scientific information is suppressed or even left out in various official documents, as high up as at the governmental level of society. This is not something that the consumers will gain anything good from, and, still, the official declaration or explanation (from experts and politicians) very often is: "If we (=the experts) would let everything out in the open, people would be very scared and they would panic." Personally, I have never seen this happen, but instead I have frequently seen great disappointment from citizens who afterwards have realized they have been fooled by their own experts and their own politicians.

Another misunderstanding is the use of scientific publications (as the tobacco industry did for many years) as 'weights' to balance each other. But you can NEVER balance a report showing a negative health effect with one showing nothing! This is a misunderstanding which, unfortunately, is very often used both by the industrial representatives as well as official authorities. The general audience, naturally, easily is fooled by such an argumentation, but if you are bitten by a deadly poisonous snake, what good does it make for you that there are 100 million harmless snakes around?

In many commentaries, debate articles and public lectures - for the last 20-30 years - I have urged that completely independent research projects must be inaugurated immediately to ensure our public health. These projects must be entirely independent of all types of commercial interests; public health cannot have a price-tag! It is also of paramount importance that scientists involved in such projects must be free of any carrier considerations and that the funding needed is covered to 100%, not 99% or less. This is the clear responsibility of the democratically elected body of every country.

Many smart meters are close to beds, kitchens, playrooms, and similar locations. These wireless systems are never off, and the exposure is not voluntary. The smart meters are being forced on citizens everywhere. Based on this, the inauguration of smart meters with grudging and involuntary exposure of millions to billions of human beings to pulsed microwave radiation should immediately be prohibited until 'the red flag' can be hauled down once and for all.

With my very best regards,
Yours sincerely,

Olle Johansson, Assoc. Prof.,
The Experimental Dermatology Unit,
Department of Neuroscience,
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EXHIBIT 20-04-~~DE~~-MARGARITIS



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Athens, January 16th 2011

To whom it may concern

The California Council of Science and Technology has released a report on WIRELESS SMART METERS, in which any relation with health hazards has been bypassed. It is however "common secret" between the researchers in the field of electromagnetic biology that such a statement has absolutely no scientific validity for the following reasons.

1. Life on the planet earth has evolved in the absence of such non-ionizing radiation and accumulating evidence suggests that no defence mechanisms have been evolved. Therefore there is no reference point for "safely limits".
2. All other devices mentioned in the report (mobile phones, microwave ovens, etc.) can be deliberately used at a safe situation (i.e. hands free utilization for mobile phone, keep safe distances from the microwave oven or the Wi-Fi when in use).
3. Even if other wireless devices emit radiation in the same area, this does not mean that more can be installed with less radiation emission simply because there is strong evidence: a) for no threshold health limit, b) for cumulative health effects.
4. It is not true (as mentioned in the report) that there is no evidence for mechanism on non-thermal. ROS formation is more and more shown to be a key first response cascading all rest effects (DNA damage, tumour formation, memory deficits, fatigue, sleep disorders, etc.).
5. The argument that "more and more wireless devices will be used in daily life" is not and cannot be taken as obligatory. Who can support that the constitution, any constitution of any country should allow installations to take place (as the one with Smart Meters) against the rights for health of the citizens.
6. The safety guidelines by ICNIRP are 12 years old, this by itself, after an enormous accumulation of research data implies that

the threshold limits should have been updated, and they have not. In fact NO GUIDELINES FOR CONSTANT EXPOSURE HAVE BEEN ESTABLISHED SO FAR.

SOLUTION?

There may be a solution by optical fibers which are all over the place utilized in communication, so why not use them in this application as well.

Yours sincerely,

Lukas H. Margaritis
Professor of Cell Biology and Electron Microscopy

Adamantia F. Fragopoulou
Biologist, Researcher

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EXHIBIT 20-~~08~~^{DS}-MILHAM

To Lora Lee Martin:

Critique of CCST's report, "Health Impacts of Radio Frequency from Smart Meters."

From: Samuel Milham MD, MPH

82181 Bergman Dr

Indio CA 92201

Dear Ms. Martin,

My name is Samuel Milham. I am a physician /epidemiologist , specializing in occupational medicine and in the health effects of electromagnetic fields (EMF). I was the first to document the link between occupational electromagnetic field exposure and cancer. My website www.sammilham.com has links to my recent papers, to my CV and to my new book, *Dirty Electricity* which presents evidence that most of the so-called diseases of civilization are due to EMF exposure not lifestyle.

Your report, unfortunately, reads as if were written by PG and E or Edison, and pays no attention at all to a very important EMF exposure variable, dirty electricity (high frequency voltage transients and harmonics).

Smart meters transmit their data via radio frequency (RF) either through the air or on utility wiring. The electronics of all transmitters operate on direct current (DC), which is obtained using inverters and switching power supplies in the meter which interrupt the grid AC current flow and generate dirty electricity which flows back to the grid on the 60 Hz AC throughout the substation service area. Interrupting current flow generates dirty electricity. Stetzer Electric markets a plug- in meter which measures dV/dT , the average rate of change of voltage on the wiring between 2 and 100 KHz, and capacitive filters to reduce the dirty electricity levels.

The grid was originally built so that all the electricity which flowed from the substation returned through the neutral wires. When people started using computers and other electrical devices with non-linear loads, the existing neutrals couldn't handle the loads and fires resulted. The electrical building codes were revised to require more robust in- building neutrals, but the utilities got off the hook by instead of beefing up their neutrals, they simply tied the neutrals to the earth so that now, about 70% of the electricity delivered from the substation , returns there via the ground. The California PUC rule 33.2 forbids using the earth

for return currents, but this didn't stop PG and E or Edison from running wires down every other power pole connecting the neutral to the earth. Here is the PUC rule: (the bold font is mine)

General Order 95

Section III

Requirements for All Lines

33.2 Ground or Earth as a Conductor

Ground or earth shall not be used as a normal return or circuit conductor. In direct current supply systems or in single phase or polyphase supply systems, a neutral or any other conductor shall be used under normal use as a return or circuit conductor; however, **the grounding of the neutral or any other conductor is not permitted as a normal return or circuit conductor.** The neutral or any other conductor is permitted to be grounded only for the purposes of stabilization and protection.

Note: Revised January 19, 1994 by Resolution SU-25.

Violation of this rule has created health problems in farm animals and families, and dirty electricity gets into our homes and offices and schools via ground rods and electrically conductive plumbing. I have measured higher EMFs in homes with the electrical service turned off due to unbalanced current flow.

In the last few weeks, I have been contacted by two electrohypersensitive California women, both of whom had to move out of their homes because of illness as smart meters were being introduced into their neighborhoods, before smart meters were attached to their homes. A third east coast woman sent me an oscilloscope wave form obtained in her home with the electrical service turned off and no smart meter on her house. The neighborhood had smart meters deployed which used utility wiring to submit information to the substation. The frequency of the wave form was exactly that used to transmit smart meter information. (I'll provide names and contact information on request). In the California cases the residences were too far from the transmitting smart meters to be affected by the RF. I believe that in all three cases, the damaging signal was dirty electricity in the wiring and the ground currents coming from the deployed meters.

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My hypothesis is easy enough to test. Dirty electricity levels measured in homes, offices and schools should increase after the meters are deployed. Dirty electricity levels measured in the utility drops and in the earth will also increase as the meters are deployed. Since dirty electricity is a potent carcinogen (see attached paper and pp. 78-80 in my book), and causes numerous health problems, the only way to avoid a public health catastrophe is to send the smart meter information over existing telephone land lines or go back to the analog meters. I'm not making light of or ignoring the RF pollution caused by the smart meters, but think the dirty electricity may be a more serious and intractable problem.

My contact information is available on my website.

Respectfully, Sam Milham MD, MPH

EXHIBIT 20-~~06~~-HAVAS 06

Havas Submission to CCST "Report on Smart Meters".

For those interested, below is my invited submission to CCST as part of a *Technical Response Team*.

Date: October 12, 2010
From: Magda Havas, BSc, PhD
To: CCST

Submission on Smart Meters.

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

In my opinion, the FCC standard for Smart Meters is not sufficient to protect public health. This is based on the following facts:

- 1.1 **Thermal vs. Non-thermal Debate.** The thermal vs. non-thermal debate is largely a red herring that has been perpetuated for decades and has influenced the type of research done in the United States. The FCC standard is based on a thermal effect. It was originally based on the amount of radiation that would heat an adult male in the US military exposed to radar. While the heating effect is not disputed, biological effects, some of which have adverse health consequences, occur well below the thermal guideline (Inglis 1970). As a consequence various countries in the world are opting for a "biologically" based guideline rather than a "thermal" guideline, which takes into account not only adult males in peak physical conditions but children, pregnant women, the elderly, and those who have developed electrohypersensitivity (EHS). I will return to the concept of EHS later.
- 1.2 **Guidelines in Russia, Switzerland, Poland, and China** are well below the FCC standard (i.e. 10 vs. 1000 microW/cm² or 1% of FCC guidelines). Some military and government insiders tried to get U.S. guidelines reduced decades ago but were not successful (Pollack and Healer 1967, Dodge 1969). Steneck et al. (1980) provides an excellent account of how the U.S. standards were established for radio frequency radiation.
- 1.3 **Our exposure to radio frequency radiation (RFR) is increasing exponentially** as we design more equipment that relies on higher frequencies in the electromagnetic spectrum. Prior to World War II, this type of radiation was negligible. Today we have radar (military, marine, aviation, and weather), we have cell phone antennas, radio and TV broadcast antennas, and a growing number of WiFi hotspots, citywide WiFi and Wi-Max antennas. Inside buildings we have cordless phones, many of which emit microwave radiation even when they are not being used; wireless alarm systems; wireless baby monitors, wireless computers, iPads, and Smart Phones that can connect to wireless internet or WiFi. More children are playing wireless video games than ever before and radio frequency identification devices (RFID) are placed into

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

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

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

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

- 1.5 In addition to sensitive people, Switzerland also identifies *Places of Sensitive Use* (German acronym is OMEN). These places include: living rooms; classrooms and kindergartens; hospitals and nursing homes; permanent jobs (where people spend more than 2.5 days per week); and playgrounds. For these OMEN sites, the Swiss government recommends that greater precaution be taken for long-term exposure to weak radiation. In these places, radiation from wireless microwave base stations (such as cordless phones or WLAN/WiFi) may exceed radiation from nearby cell phone base stations and hence these devices must generate emissions as low as possible. For more information visit <http://www.bag.admin.ch/themen/strahlung/00053/index.html?lang=en>

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

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

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

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

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

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

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

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

- 2.3 An additional point I would like to make relates to **dirty electricity**.

Wires can act like antennas and the radiation produced by radio frequency generating devices can flow along and reradiate from wires both inside and outside the home. This contributes to dirty electricity and localized radiation exposure. Dirty electricity has been associated with cancers (Milham and Morgan 2008); health and behavior problems in schools (Havas and Olstad 2008); and both diabetes and multiple sclerosis (Havas 2006). From a human health perspective and to protect sensitive electronic equipment it is

important to maintain good power quality and to prevent radiation from smart meters flowing along wires.

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

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Chronology:

On July 30, 2010, California State Assembly Member Jared Huffman (San Rafael) asked the California Council on Science and Technology (CCST) to provide an assessment of the safety of Smart Meters.

On August 16, 2010, CCST agreed to compile and assess the evidence available to address the following two issues:

1. Whether FCC standards for Smart Meters are sufficiently protective of public health taking into account current exposure levels to radiofrequency and electromagnetic fields.
2. Whether additional technology specific standards are needed for Smart Meters and other devices that are commonly found in and around homes, to ensure adequate protection from adverse health effects.

On October 4, 2010, I was invited to be part of a Technical Response Team and, as part of that team, I was asked to provide a written response to two key concerns mentioned above.

On October 12, 2010, I submitted my report to CCST.

On December 13, 2010, I was informed that CCST was not appending any documents to their report, nor were they making these documents available to others, but they were recognizing those who contributed.

On January 11, 2011, CCST released their report "Health Impacts of Radio Frequency from Smart Meters" on their website: <http://www.ccst.us/news/2011/20110111smart.php>. CCST is receiving public comments until January 31, 2011.

EXHIBIT 20-07- EVANS

**Comments on
California Council on Science and Technology's Smart Meter Report,
January 2011
Nancy Evans, Health Science Consultant, San Francisco**

This report ignores a fundamental public health principle: prevention of harm through a precautionary approach, based on evidence of harm rather than absolute proof of harm. CCST dismissed the substantial body of evidence indicating that *non-thermal* effects of radiofrequency radiation (RF) are real and include cancer as well as neurological effects.¹ *There are no federal standards for RF exposure based on long-term, chronic exposure or on non-thermal effects, precisely the type of exposure from smart meters and the most likely to cause human health effects.* Even standards for personal wireless devices such as cell phones are based solely on absorbed heat, measured by a unit called the Specific Absorption Rate (SAR).

This report also fails to consider the total exposure to RF, which has increased exponentially because of cell phone antennas and broadcast towers. Wi-Fi networks blanket entire neighborhoods and cities as well as homes, schools, cafes and stadiums. Smart meters add one more layer of involuntary chronic exposure to RF.

It is misleading to compare smart meters to cell phones and other wireless devices that are used voluntarily and that some people choose not to use because of the potential health effects. Mandating wireless smart meters in homes is radiation without representation: an infringement of personal and property rights.

As epidemiologist John Goldsmith wrote in 1995, "There are strong political and economic reasons for wanting there to be no health effect of RF/MW (radiofrequency/microwave) exposure, just as there are strong public health reasons for more accurately portraying the risks. Those of us who intend to speak for public health must be ready for opposition that is nominally but not truly scientific."²

Nancy Evans

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¹ BioInitiative Working Group, Cindy Sage and David O. Carpenter, Eds. (2007). BioInitiative Report: A rationale for a biologically based public exposure standard for Electromagnetic Fields (ELF and RF). www.bioinitiative.org

² Goldsmith J (1995). Epidemiologic evidence of radiofrequency radiation (microwave) effects on health in military, broadcasting, and occupational studies. *International Journal of Occupational and Environmental Health* 1:47-57.

EXHIBIT 20-08-SAGE



January 17, 2011

Susan Hackwood, PhD
Executive Director
California Council on Science and Technology

Lora Lee Martin, Director
Strategic Policy Initiatives and Government Affairs
California Council on Science and Technology

Subject: Letter of Comment on Smart Meter Report

This letter addresses the CCST Smart Meter Report issued on January 11, 2011. Overall, the report does begin to highlight international scientific concerns about chronic, low-intensity radiofrequency radiation exposures. Radiofrequency radiation health risks have been and continue to be addressed by scientific bodies around the world as a credible threat to health.^{1,4}

The Report text provides an introduction to the science and public health questions on health impacts that can reasonably be expected from chronic exposure to low levels of RF in close proximity to occupied space in homes, schools and other daily living environments.

Conclusions Are Not Supported by Evidence of Compliance with FCC Safety Limits

There is no solid basis in the CCST report to conclude (or to support the contention) that FCC public safety limits are met for smart meters, in the manner installed and operated.

Conclusions Disregard Evidence in the Report for Possible Health Risk

The text of the report only partially documents potential health risks from low-level, chronic exposure to radiofrequency radiation. The conclusions ignore this discussion.

Conclusions Do Not Follow from Report

Conclusions of the report are inconsistent with the report's more balanced warnings about possible risks to health. The overall legitimacy of the report is cast into doubt as a result.

CCST's report could equally well have concluded *'there is ample evidence to advise the California Legislature that, based on multiple studies of radiofrequency radiation below current FCC safety limits, it is advisable to issue a cautionary warning on the wireless component of smart meters until a full assessment of their effects is completed by*

independent experts. Further, it can be concluded that the continued rollout of wireless smart meters may increase public health risks on a widespread basis and should be reconsidered in light of the existing scientific evidence and public health warnings for such chronic exposures to pulsed RF.'

I was one of the expert reviewers invited by CCST to submit comments for the Committee. CCST asked several experts to answer two questions (see below). Since the Report conclusions apparently ignored much of the expert and committee input – only intervention by the final editor(s) to disregard key evidence explains how CCST's final conclusions could give rise to the "all clear" message.

Questions asked of Invited Expert Reviewers

- 1) Are the current FCC standards for smart meters sufficiently protective of public health, taking into account current exposure levels to radiofrequency (RF) and electromagnetic fields?
- 2) Are additional technology-specific standards needed for smart meters and other devices that are commonly found in and around homes, to ensure adequate protection from adverse health effects?

CCST Report Conclusions

- 1) *"The FCC standard provides a currently accepted factor of safety against known thermally induced health impacts of smart meters and other electronic devices in the same range as RF emissions. Exposure levels from smart meters are well below the thresholds for such effects."*

This conclusion presents a partial response to Question 1 – only that the FCC's thermal standards are adequate (these standards prevent only heating and burning of tissues, and shock hazard, however). The conclusion does not address non-thermal (or low-intensity) RF exposures, which is really the point. It also is silent on FCC violations of public safety limits, which have been calculated to occur.¹³

- 2) *"There is no evidence that additional standards are needed to protect the public from smart meters."*

By ignoring evidence for low-intensity RF adverse health effects, the Report essentially then dismissed the need for changes in public safety standards for pulsed RF. This conclusion simply cannot be reconciled with the evidence presented in the report (thin as it is), nor with the larger body of evidence known to experts in this field. That evidence is now widely discussed by international health and safety experts who find the existing thermal standards inadequate to protect public health.¹²

FCC Violations and Excessively High RF Exposures are Ignored

Another report issued on January 1, 2011 is titled *Assessment of Radiofrequency Microwave Radiation Emissions from Smart Meters* by Sage Associates.¹¹ It documents what RF levels may be expected. The Assessment seems not to have been considered either by the CCST experts nor the Committee.

The Assessment identified where and under what conditions smart meters can cause FCC violations of public safety limits as the meters are typically installed and operated. The CCST report concludes that all smart meter RF exposures will be well below the FCC safety limits, and this is erroneous.

To date, there have been no other studies that provide sufficient information to support the claim that smart meters comply with FCC regulations. In fact, there is solid evidence from a review of the FCC Grants of Authorization and attached FCC RF exposure studies that many thousands (perhaps millions) of meters are in clear violation of one or more of the explicit limitations noted on each FCC Grant of Authorization. The FCC Grants of Authorization are void unless meters are installed in compliance with every one of those limitations.

The Assessment also shows many cases where, although the FCC safety limits may not be violated, excessively high RF levels from smart meters would be predicted to occur within the home or in other occupied space. In many instances, predicted RF levels are many times higher than those reported to cause adverse health effects.⁹⁻¹²

Such exposures, if chronic, would reasonably be expected to result in increased disease and disability.

Misleading Comparisons Are Made to Cell Phones

CCST's report makes misleading comparisons of RF exposures from cell phone use and from smart meters, an apparent effort to minimize public health concern. If the FCC had thought smart meters would be held to the head in normal operation, they would have required smart meters to be tested for SAR compliance, not power density. These are not the same, and to compare them is wrong.

Cell phones produce a high, localized RF exposure at the head. They are presumed to be used within 20 centimeters (8") of the body. Smart meters, like cell towers, create whole-body exposure rather than localized exposure in most circumstances, and specific FCC compliance depends on keeping a 20 cm or greater distance from the meter. Cell phone use is voluntary; smart meter exposure is involuntary. Cell phone use is sporadic or intermittent, but smart meter exposure estimates are 'all over the map'. There is great uncertainty on this point, and as such, the outcome cannot be known; therefore, no assertion of safety or compliance can be given.

RF Levels from Smart Meters are Unreconciled and Need Assessment

PG&E's sole figure for RF exposure was given during CPUC proceedings as 1/6000th of the federal health (sic) limit. Nothing is given about the specific conditions under which this estimate might be true (antenna make and model, duty cycle, which FCC formula, what reflection factor, one meter or multiples, etc). However, from that single data point, we calculate that RF exposure to be 0.11 $\mu\text{W}/\text{cm}^2$ at 10 feet (where the FCC safety limit is known to be 655 $\mu\text{W}/\text{cm}^2$ at the frequencies 915 MHz and 2405 MHz). This means that at 10 feet from the meter, PG&E says the RF level will be 0.11 $\mu\text{W}/\text{cm}^2$.

Kundi and Hutter (Pathophysiology, 2009)² say they *don't yet find RF health impacts at levels below 0.05 to 0.1 $\mu\text{W}/\text{cm}^2$* but do find consistent evidence of adverse health impacts at levels generally above that (based on at least eight cell tower studies conducted internationally). These figures were for healthy adult populations.

From the CCST Report, figures 1 and 7 (identical) give a comparison of RF levels from various sources, including two estimates for smart meters. They are 4 $\mu\text{W}/\text{cm}^2$ at 10 feet, and 40 $\mu\text{W}/\text{cm}^2$ at 3 feet away (no source is identified for these estimates, and again, the operational conditions are unspecified). Another estimate from CCST's report (pages 17 and 22) says that a 'worst case' RF estimate – a meter that transmits continuously – would produce 60% of the FCC limit (which is 655 $\mu\text{W}/\text{cm}^2$ for the combined antenna frequencies), or 393 $\mu\text{W}/\text{cm}^2$. However, the location at which this RF exposure level is calculated to occur is not given. The information is not useful. But, given the peer-reviewed scientific literature, any of these estimates is too high for chronic exposure to pulsed RF.¹²

No one can reconcile or separate reasonable from unreasonable RF predictions without some better, more systematic computer modeling of RF exposures.

Cumulative RF is Not Assessed Prior to Meter Installation

None of the PG&E or the EPRI estimates includes any provision for 'what amount of RF exists already' and does the smart meter's additional RF burden push that location over the FCC limit. The CCST report does not consider cumulative sources of RF (WI-FI, nearby cell tower(s), AM, FM, TV, HAM transmitters, etc). The cumulative RF burden must be considered, including ongoing RF exposures from existing sources.

Further, since these meters are part of a radiofrequency surveillance and communications system that includes cell antennas (to relay RF signals to the utility) and eventually, power transmitters on/within appliances (to relay RF signals within the home to the smart meter), these critical omissions in the overall RF burden placed on people from the 'smart meter program' should be assessed. No one can install a smart meter and make a blanket assertion the environment still complies with public safety standards in the after condition, if the before condition is not known. RF exposures from multiple sources are additive.

Recommendations to CCST

- 1) Advise the California Legislature that further assessment of smart meter impacts to public health and safety are necessary before further deployment.
- 2) Recommend de-activation of wireless transmitters in meters already installed pending further review.
- 3) Recommend that California Legislative hearings be scheduled on smart meters.
- 4) Post in their entirety each of the written expert review letters to CCST.
- 5) Recommend that the California Department Public Health receive and log smart meter health complaints.

Thank you for the opportunity to comment on the CCST draft report on smart meters.

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EXHIBIT 20-09-NEUTRA

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January 30, 2011

CCST

Dear Sirs,

Some citizens are worried about the involuntary application of wireless real time monitoring of their electricity use. Their concerns relate to the invasion of privacy and the addition of radio frequency (RF) electromagnetic and electric and magnetic exposures from meters in their own homes and in their neighborhoods. Some have pointed out that there are other technologies now in use in other countries that avoid the exposures.

Public officials approached you with a very narrow framing of the issue asking you:

- (a) if one could guarantee an absence of health effects if RF exposures were always below current thermally based standards.
- (b) If other standards were needed to deal with non-thermal health effects

You answered:

- 1. The FCC standard provides a currently accepted factor of safety against known thermally induced health impacts of smart meters and other electronic devices in the same range of RF emissions. Exposure levels from smart meters are well below the thresholds for such effects.
- 2. There is no evidence that additional standards are needed to protect the public from smart meters.

Your first answer doesn't respond to the official's first question at all, instead it states what all parties agree to, the standard protects against thermal effects and smart meters emit fields that are below the standard.

Your second answer is technically a falsehood. There is lots of evidence that would suggest that RF and ELF exposures well below the current standards may be capable of causing added lifetime risk that exceed the benchmark which triggers health based regulations (1 per hundred thousand). You could have turned your second answer into a true statement by saying something like this:

"When our panel, that included no epidemiologists, reviewed the extensive literature, epidemiological and non epidemiological on non-thermal RF exposures, we concluded that it is *not* beyond a reasonable doubt that non-thermal exposures are capable of adding life-time risks of regulatory concern. This is because we would require a clear understanding of the physical induction

mechanism, the carcinogenic mechanism and toxicological and epidemiological effects well above the resolution power of the studies before we would say that non-thermal exposures can cause significant risk at the 'beyond a reasonable doubt level'."

A beyond a reasonable doubt standard is required in criminal proceedings and would be inappropriate in a civil proceeding, where only a "more likely than not" standard is required. We were all reminded of this in the famous OJ Simpson trials.

So, what certainty standard is applicable here? How certain to we have to be of how much risk before we move from the status quo to cheap and expensive measures to reduce smart phone exposures? On page 24 you say "... retrofitting millions of smart meters with hard wired technology could be difficult and costly. Perhaps more importantly, retrofitting smart meters would not address the significantly greater challenge presented by the billions of mobile phones in use globally."

This sentence also includes important unstated assumptions:

- a) If other actors are exposing you to harm more intensely than I, then I have no moral duty to remove my less intense harm until he removes his.
- b) It would not be cost beneficial to switch to wired smart meters
- c) It would raise utility rates substantially to switch to wired smart meters.
- d) I have no moral duty to switch to a lower exposure meter, even if the impact on utility bills are minimal.

I provided your staff with a link to the many projects of the California EMF Program at www.chib.org/emf. In it they would have found our analysis of policy issues with regard to power lines and house wiring and our extensive risk evaluation. In it we assessed the available options and their costs. You made no attempt to do this even in a rough way. Then we examined what the adoption of these options would do to utility rates. You did not do that either. Then we asked how certain we would have to be of how much added lifetime risk of disease before it would be cost beneficial to move to the cheap and expensive options. A certainty well below the "more likely than not" standard would have sufficed to justify cheap options to even a hard hearted utilitarian. We also explicitly carried out a duty ethics analysis of the situation which you did not do. In our risk evaluation we tried to avoid the pitfalls of misleading language, such as using the phrase "no evidence" to stand for "the evidence doesn't convince us." As you know this phrase is much beloved by those who deny human influences on global climate change. Then we avoided expressing exposures as fractions of irrelevant standards as you have done. We avoided expressing our scientific certainty as a dichotomy between "beyond a reasonable doubt" and "not beyond a reasonable doubt" as you effectively have done. This dichotomous formulation has also been avoided in reports on the human effects in

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Global Climate Change. Finally we made explicit the rules for weighting various streams of scientific evidence to develop our degree of certainty. You provided neither your factual grounds nor rules of inference for justifying your "no evidence" statement. Expressing smart phone exposures as a fraction of the thermal standard makes it sound small, expressing it as a multiple of the background would make it sound alarming. Your graph was enough.

I said at the beginning that the public officials framed their question in a narrow way and a way that was overly focused on numerical standards as a solution to environmental and occupational hazards. We don't control automobile trauma with a standard, we control it with a technical solution, seat belts, airbags and traffic rules. We don't control the carcinogenic risk from wood dust by a wood dust standard, we mandate dust masks and air vents. I personally don't think we know enough about the exposure metric to set a standard at this time.

The solution to any risks of regulatory concern from PG &E's smart meters could be to switch to wired smart meters now and gradually replace the wireless ones *if the rate payers can live with the impact to their utility bills.*

If the public officials narrowed their questions with the intent of receiving an answer that would take this issue off their radar screen, then you have responded in a narrow way that would serve such a purpose.

This is not the way I would like to see public policy pursued. Unfortunately you are not alone in this pattern of language use, hidden assumptions and making the uncertain seem certain so as to provide cover for policy.

Sincerely yours

Raymond Richard Neutra MD. DrPH

EXHIBIT 20-10- NEWTON



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To: California Council on Science and Technology

Date: 31 January 2011

RE: Comment on: Health Impacts of Radio Frequency from Smart Meters
Response to Assembly Members Huffman and Monning (CCST Report)

Cc: via E-mail to:
California Assemblyman Jared Huffman
California Assemblyman Bill Monning

Thank you for the opportunity to comment on this important public health policy issue.

The EMR Policy Institute (EMRPI) is a national advocacy organization established in 2003 whose goal is to create better cooperation between public health regulatory agencies in order to mitigate unnecessary hazardous electromagnetic radiation (EMR) exposures. We educate policy makers and the public on the need for sound, biologically-based human safety policy that protects public health regarding EMR exposures across the electromagnetic spectrum.

EMRPI continues to challenge the inadequacy of the US safety policy on electromagnetic and RF radiation exposures by submitting official comment to key federal agencies. Our record of formal comment as individuals and through our organization dates back to 1997. It includes official comment to key federal agencies such as the NAS, FCC, FDA, GAO, NIOSH, NTIA and DOJ.

The directors of EMRPI have participated in taking three cases to the US Supreme Court challenging the FCC's RF safety policy as **inadequate to protect**

all members of the public. In each case the Court denied certiorari on procedural grounds.

This EMRPI Comment is based upon our 14-year record of scrutiny of the inadequacies in the current FCC radiofrequency radiation policy that was put in place in 1997. Since 1997 the FCC has resisted all calls to address these inadequacies, i.e., to develop biologically-based safety limits for human exposure to RF radiation that protect all members of the public.

Currently there are three U.S. federal mandates promoting wireless technologies that can adversely affect the health and well being of all Americans, and especially those who require Implanted Medical Devices (IMDs) as well as those who suffer from the functional impairments of EHS and Radiofrequency Sickness. These population subgroups warrant protection by the under Americans with Disabilities Act provisions. There is no federal agency coordination to enforce these provisions. The mandates are:

- Wireless broadband
- SmartGrid and Smart Meters (wireless utility meters)
- Unlicensed commercial use of TV White Spaces spectrum.

Ubiquitous involuntary exposure to Electromagnetic Interference (EMI) with IMDs from these sources as well as from the plethora of wireless consumer devices now on the market presents the greatest potential for harm for Americans with IMDs. The FCC's focus on EMI and "safety" continues to protect devices rather than members of the public as found in its 2009 announcement of its International TV White Spaces Fellowship and Training Initiative:

*... by building on a proven concept: the safe deployment of new, intelligent devices in the unused spectrum that exists between television channels **without causing undue interference to adjacent users.** (Emphasis added.)*

"Adjacent users" refers to commercial communications devices rather than to humans with IMDs.

In view of California's initiative to deploy wireless smart meters statewide EMRPI submits the following comment on the CCST Report:

1. The January 2011 CCST Report misses out on a key opportunity to address its own "Key Report Findings" and "Other Considerations" by failing to provide the public with

a clear analysis of the scientific record upon which the current FCC RF radiation safety policy is based. On p. 8 The CCST Report specifically references the 2008 National Academies of Science Report: **Identification of Research Needs Relating to Adverse Health Effects of Wireless Communication** (NAS Report at: www.nap.edu/catalog.php?record_id=12036) The National Academies of Science performs provides a parallel service for the US federal government that the CCST does for the State of California, yet the CCST Report fails to include the specific details of the 2008 NAS Report findings.

2. Safety regulations are based on the published record of scientific studies in a given field. The NAS Report enumerates the holes in the RF research record upon which FCC RF safety policy is based. In failing to include the NAS Report findings, the CCST Report missed the mark for explaining its own Key Finding #3 – *To date, scientific findings have not identified nor confirmed negative health effects from potential non-thermal impacts of RF emissions such as those produced by existing common household electronic devices and smart meters. . . and Other Considerations #3 – Consumers should be provided with clearly understood information about the radiofrequency emissions of all devices that emit RF including smart meters.*
3. On p. 7 CCST Report states that: *Given current scientific knowledge, the FCC guideline provides a more than adequate margin of safety against the known thermal effects.* It fails, however, to specify the holes in the “current scientific knowledge” delineated in the NAS Report.
4. On p. 8 CCST Report states that: ***At this time there is no clear evidence that additional standards are needed to protect the public from smart meters or other common household electronic devices.*** However, the 2008 NAS Report documents the need to characterize specific aspects of real-life public exposure to RF radiation that are not addressed in the scientific record upon which the current FCC RF safety policy is based (see pp. 13-44):
 - a. Exposure of juveniles, children, pregnant women, and fetuses both for personal wireless devices (e.g., cell phones, wireless personal computers [PCs]) and for RF fields from base station antennas.

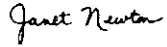
- b. Variability of exposures to the actual use of the device, the environment in which it is used, and exposures from other sources.
- c. Multilateral exposures.
- d. Multiple frequency exposures.
- e. Location of use (both geographic location and whether a device is primarily used indoors or outdoors).
- f. Models for men and women of various heights and for children of various ages.
- g. Exposure to rooftop maintenance workers and to members of the public that live in close proximity to multiple co-located base station antennas.
- h. Exposure to subpopulations among maintenance employees.
- i. Chronic exposures that are similar to those from existing TV and radio antennas.
- j. Multilateral exposure to the typical arrangement of four to six antennas with multiple frequencies, rather than a single antenna radiating at a single frequency from a single direction as used in laboratory studies.
- k. Exposure to others sources of RF radiation such as cordless phones, wireless computer communications, and other communications systems.
- l. Exposure to the hand or the human lap or parts of the body close to the device.
- m. RF exposure in close proximity to metallic adornments and implanted medical devices (IMDs) including metal rim glasses, earrings, and various prostheses (e.g., hearing aids, cochlear implants, cardiac pacemakers).
- n. Models for whole-body exposure due to base station antennas.
- o. Sufficiently long exposure and follow-up to allow for detection of effects that occur with a latency of several years.
- p. Lack of information concerning the health effects associated with living in close proximity to base stations.
- q. Research that includes children, the elderly, and people with underlying diseases.
- r. Research on possible adverse RF effects identified by changes in EEG activity.
- s. Lack of information on possible neurophysiologic effects developing during long-term exposure to RF fields.

- t. Studies focusing on possible adverse RF effects identified by changes in cognitive performance functions.
 - u. Effects of RF exposure to the sensitive biological targets of neural networks.
 - v. Possible effects of RF exposure on fetal and neonatal development.
 - w. Possible influences of exposure on the structure and function of the immune system, including prenatal, neonatal, and juvenile exposures.
 - x. Possible influences of RF exposures on the structure and function of the central nervous system, including prenatal, neonatal, and juvenile exposures.
5. At p. 8 CCST Report states that: *No clear causal relationship between RF emissions and non-thermal human health impacts has been scientifically established, nor have the mechanisms that might lead to such biological impacts been clearly identified.* In this statement CCST Report leaves the inaccurate impression that science has established the "mechanism" or cause of development of other diseases such as cancer, Alzheimers' Disease or ALS, which is not the case. Lack of a single mechanism for causation of adverse health effects arising from exposure to non-thermal levels of RF emissions is not a valid rationale to negate the scientific evidence demonstrating these non-thermal effects.
6. Illustrating inadequate protection under the current FCC RF safety policy is the experience of geophysics professor Gary Olhoeft PhD with the critical EMI problems he encounters daily with his Medtronic Deep Brain Stimulator (DBS). Prof. Olhoeft's comment was read at the first Public Comment period at the July 26-27, 2010 FCC-FDA combined public meeting on, "Enabling the Convergence of Communications and Medical Systems." Despite Dr. Olhoeft's insightful analysis and account of this one example of EMI between wireless systems and his DBS, neither the FCC moderator nor the FDA moderator of the following day's panel on Electromagnetic Compatibility (EMC) raised one question on this EMI topic so critical to the life, health and well being of millions of Americans. Even the last panel discussion, Electromagnetic Compatibility – How to Promote EMC, made no mention of compatibility with implanted electronic medical devices such as Deep Brain Stimulators that treat Parkinson's patients, or insulin pumps for diabetics, for example.

- Professor Olhoeft submitted his written Comment in the current US Department of Justice Advanced Notice of Proposed Rule Making proceeding. See also the video of his presentation at the 2009 EMRPI scientific conference, "Electromagnetic Radiation Impacts on Human Health," at: www.youtube.com/watch?v=jo-B6LWfVzw&feature=related
7. No federal agency is keeping track of cumulative wireless power density, nor identifying critical levels and locations where individuals who require IMDs may be at risk.
8. The FCC continues to issue compliance statements for new wireless devices and systems without regard for existing RF levels. Those most seriously threatened are the NIH-estimated 20 million Americans who require IMDs. These 20 million Americans account for 8-10% of the US population. The most serious threat to them is from Smart Meters and wireless broadband because of their ubiquitous deployment throughout the public's living and working environments and now throughout medical treatment settings.
9. In stark contrast to the lack of public health concern in key US federal and state agencies are these precautionary provisions called for in The European Parliament April 2009 Resolution approved by a vote of 559-22:
www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0216+0+DOC+XML+V0//EN
- **Particular consideration of biological effects**, especially given that some studies have found the most harmful effects at lowest levels;
 - **Evaluation of potential long-term adverse effects of mobile telephony radio frequencies;**
 - **Increased investigation of harmful effects of multiple exposures to different EMF sources**, particularly for children;
 - **Member States to follow the example of Sweden and to recognize persons that suffer from electrohypersensitivity as being disabled so as to grant them adequate protection as well as equal opportunities;**
10. Because individuals with electronic IMDs and EMR functional impairments are

inherently sensitive to RF and EMR exposures, EMRPI strongly urges the State of California to broaden #4 of CCST Other Considerations to require Smart Grid / Smart Meter options that employ fiber optic and hard-wired data transmission rather than wireless transmitting Smart Meters.

Respectfully submitted by
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EXHIBIT 20-11-MARET

Commentary on the California Council on Science and Technology Report "Health Impacts of Radio Frequency from Smart Meters"

By Dr. Karl Maret
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January 30, 2011

This is a commentary on the California Council on Science and Technology (CCST) report, "Health Impacts of Radio Frequency from Smart Meters" published January 2011. I submit that the CCST report, written in response to health concerns expressed by Assembly Members of the California Legislature, contains inaccuracies and minimizes the biological effects and health impacts of non-thermal radiofrequency radiation, such as those produced by wireless technologies including Smart Meters.

For the record, my qualifications to make this commentary are that I hold a Bachelor of Science in Electrical Engineering, a Master of Engineering degree in Biomedical Engineering, and a Medical Doctor degree and have additionally completed a four year post-doctoral fellowship in physiology. I have been interested in the health effects of electromagnetic fields (EMFs) for many years and given lectures about the potential health impacts of non-ionizing radiations, both in Europe and the United States. I am president of a non-profit foundation interested in energy medicine, a sub-specialty within the field of Complementary and Alternative Medicine (CAM) as defined by the National Center for Complementary and Alternative Medicine (NCCAM), a center within the U.S. National Institutes of Health (NIH).

My specific concerns with the report are as follows:

1. The minimization of the problem of non-thermal microwave radiation;
2. The minimization of the need for lower exposure standards;
3. The increase in radiation levels at potential local hotspots through reflection;
4. The lack of information about the impact of pulsed radiation from Smart Meters;
5. The lack of information on the health impacts of night-time radiation from Smart Meters;
6. The lack of modeling or actual measurements of the contribution from Smart Meters to the existing background microwave radiation;
7. The lack of health and environmental consideration by the CPUC when the Advanced Metering Infrastructure (AMI) was approved.

Until these issues are more fully addressed it is recommended that the current Smart Meter deployment using radiofrequency radiation (RFR) be halted pending a more unbiased reassessment of the potential health issues associated with these meters, including a reassessment of the Advanced Metering Infrastructure (AMI) program approved by the California Public Utilities Commission (CPUC) without any environmental impact assessment. Further, that the California public be offered the option to opt out of this program, which at present is mandatory for every dwelling.

1. Minimization of Non-thermal Microwave Radiation from Smart Meters

On page 4 of the CCST report it states that "To date, scientific studies have not identified or confirmed negative health effects from potential non-thermal impacts of RF emissions such as those produced by existing household electronic devices or smart meters." This finding minimizes the extensive body of scientific research on the biological effects of non-thermal electromagnetic fields. The biological effects of low-level, non-thermal electromagnetic fields have been researched for over 30 years. The respected 2007 Handbook of Biological Effects of Electromagnetic Fields edited by Barnes and Greenebaum (1) states on page 377:

"The biophysical lore prevailing until the late 1980s and lingering to this day is that, unless the amplitude and frequencies of an applied electric field were sufficient to trigger an excitable membrane (e.g. heart pacemaker), produce tissue heating or move an ion along a field gradient, there could be no effect. However, this position had to be changed as the evidence for weak (non-thermal) EMF bioeffects became overwhelming."

Prof. Arthur Pilla, PhD
Professor of Biomedical Engineering, Columbia University

There are numerous reports on the potential health effects of non-thermal electromagnetic fields. Early reports include papers by Frey (1993), Lai (2000) and Hyland (2000), among many others. An international working group has delineated many additional scientific findings (Bioinitiative report, 2007). Special editions of the journal Pathophysiology were specifically dedicated to this topic recently (Pathophysiology, 2009). Recently, the European Journal of Oncology published an entire monograph entitled "Non-Thermal Effects and Mechanisms of Interaction between Electromagnetic Fields and Living Matter" outlining non-thermal effects on living systems. This came from the National Institute for the Study and Control of Cancer and Environmental Diseases "Bernardino Mamazzini" (Giuliani & Soffritti, 2010).

The CCST report further states that, "Without a clearer understanding of the biological mechanisms involved, identifying additional standards or evaluating the relative costs and benefits of those standards cannot be determined at this time." I strongly disagree with this conclusion as there is now a large body of scientific literature describing several key mechanisms for the action of weak electromagnetic fields. These include, among others:

- removal of calcium ions bound to cellular membranes, leading to their weakened structure and changed cellular functioning
- change of calcium ion leading to changes in metabolic processes in cells,
- the leakage of calcium ions into neurons generating spurious action potentials,
- fragmentation of DNA in cells seen through the Comet assay
- changes in the blood-brain barrier in animals after microwave exposure
- defined cellular stress response, including the production of heat shock proteins (HSP), that are triggered electromagnetically at non-thermal levels that require much less energy than when triggered by heat (so-called thermal considerations)
- activation of specific genes by exposure to non-thermal electromagnetic fields leading to gene transcription to form RNA, the first stage in the synthesis of proteins

always considered as a whole, based on the weight of evidence approach and incorporating different lines of scientific enquiry, epidemiologic evidence, as most relevant, is given the greatest weight.

Several European countries, having taken a deeper look at recent scientific data, are beginning to follow a different approach to the RFR question. They recommend prudent avoidance in siting cell tower antenna installations near schools, hospitals or wherever people congregate. This approach is part of what is called the Precautionary Principle, which has been adopted in many countries, including the U.S., for various applications in international treaties. The Precautionary Principle holds that when questions of safety are concerned, precautions should be taken to protect public health even if scientific data is incomplete, or the mechanisms of action are not understood (Levitt, 2000; Kheifets et al., 2001).

3. The increase in radiation levels at potential local hotspots through reflection

Although it is true that the Smart Meters comply with current U.S. Federal Communications Commission (FCC) guidelines because they operate below the existing power density thresholds, power density is not the only factor determining biological effects from radiofrequency radiation. The power density level safety standards are solely based on thermal considerations, yet it is the non-thermal radiation levels that are the key to potential health impacts. The non-thermal effects occur at lower levels from various emitting radiators now in common use including cell phones, cordless phones, Wi-Fi, Wi-Max, to name only some. Smart Meters add to this cumulative ubiquitous low-level background microwave environment.

RFR can increase to higher levels than anticipated due to surface and ground reflections from the various radiators. (Hondou, 2002; Hondou et al, 2006; Vermeeren et al, 2010), even at some distance from the sources. These scientific studies suggest that reflectivity from other metallic surfaces and reflective materials could increase the power density of the RF fields significantly, leading to the development of hot spots in our homes. Richard Tell Associates report commissioned by PG&E in 2005, and updated in 2008, contained calculations of the intensity of RF fields produced by the Smart Meters that included only ground reflections estimated to increase the field strength by 1.6 times (equivalent to a 2.56-fold increase in the power density). In light of recent scientific findings and actual computer modeling studies, the Tell estimate of ground reflectivity may be significantly too low and does not address the development of possible hotspots in the home. If microwave hotspots occurred near sleeping quarters or near a baby's crib, their health impact could be highly significant. Sage Associates report, which made some estimates of Smart Meter impacts through computer modeling, even suggests that under certain assumptions the emissions from Smart Meters and their local reflections might even exceed FCC standards (Sage, 2011).

The CCST report never even acknowledged the need for computer modeling to ascertain the potential risk of higher microwave radiation levels in our homes as a result of Smart Meter installation, alone or in interaction with other microwave emitters. We believe that such modeling is vital if the public is to know the potential for the development of hot spots in sensitive living areas. The Richard Tell Associates study carried out for PG&E did not consider other microwave sources in the environment stating, "The study does not take into

account the potential for RF fields that may be produced by other devices or systems that are not part of the Smart Meter program upgrade. Such devices or systems include cellular telephones, cellular telephone base stations, broadcast radio and TV stations, microwave ovens used in the home or any other source of RF energy."

4. The lack of information about the impact of pulsed radiation from Smart Meters

There is a considerable difference between the biological impact of pulsed microwaves, as produced by Smart Meters, compared to continuous waves, such as those produced by microwave ovens. No distinction is made in the safety criteria between continuous and pulsed waves because of the narrow-minded focus on thermal damage alone. Many scientific studies have pointed out that radiofrequency radiation with different modulations and pulse characteristics produce different biological effects even though they may produce the same pattern of different specific absorption rate distribution and tissue heating (Levitt & Lai, 2010).

Peer-reviewed studies have shown that the differences in modulation patterns and waveforms can produce quite different biological effects. They include the works of Arber and Lin (1985); Campisi et al (2010); Huber et al. (2002); Luukkainen et al. (2009); d'Ambrosio et al (2002), among many others. Already Soviet research in the 1960s showed that pulsed waves induced stronger and often inhibitory biological and neurological effects than continuous waves (Osipov, 1965). A review of the hazards to U.S. military personnel from high frequency electromagnetic radiation was provided by Pollack (1967) which gives an overview of the extensive Eastern European research in this field.

Marha (1963) described allowable intensities for frequencies above 300 MHz in Czechoslovakia for continuous waves as 25 uW/cm² but limited pulsed waves to only 10 uW/cm². Note that these Czech recommended levels were considerably lower than the approximately 600 uW/cm² allowed for the RFR from Smart Meters operating in the low 900 MHz band mandated by the FCC based on only thermal consideration. Also not well known in the West is the Soviet work showing the adverse effect of non-thermal pulsed microwave radiation on cardiac rhythms in animals (Presman & Levitina, 1962).

The CCST report is misleading because it compares the Smart Meter emissions to those of microwave ovens. Microwave ovens produce much higher power output but are not modulated or pulsed in any way. It is imperative to understand that it is the modulation or pulsation pattern that leads to biological effects at non-thermal power levels. Biologically-sensitive amplitude windows have been found at specific frequencies that lead to the selective release of calcium from cell membranes. However, above and below these unique power densities there is no observable effect. Pulses and square waves have the greatest biological impact because they produce rapid changes in voltage across biological membranes. Un-modulated carrier waves have little or no biological effect except if their power is sufficient high, such as in microwave ovens. Comparing the power levels between modulated and un-modulated devices, as the CCST report does, is thus misleading.

The potential health effects from chronic exposure to pulsed, low power density level electromagnetic fields might take several years to appear. These types of radiations produced

by Smart Meters are of concern for their potential health impacts on the electrically hypersensitive part of the population. In Sweden, electrohypersensitivity (EHS) is an officially recognized functional impairment; however it is not regarded as a disease (Johansson, 2006). Electrical hypersensitivity has been reported by many authors from various industrialized countries over the last 20 years. The CCST report does not consider this segment of our population at all. Yet in the United Kingdom there are excellent resources about this condition, especially the work of Bevington (2010) containing over 700 references.

The ICNIRP, IEEE and ANSI standards that are currently in effect consider only thermal effects of microwave radiation where the energy absorption is fairly linear and thus the protective guidelines are logical. However these energy absorption guidelines would not be appropriate when frequency-specific amplitude windows are involved leading to adverse biological effects that can depend on modulation patterns, pulse repetition rates, duty cycles, and other frequency spectrum characteristics. With the current PG&E-mandated Smart Meter program having a 20-year life expectancy, Californians will be living with potential health impacts from this unproven technology in our homes for the next two decades.

5. The lack of information on the health impacts of night-time radiation from Smart Meters

Another problem that was not addressed in the CCST report is potential health effect of microwave radiation exposure during our sleep which may adversely affect our biological and circadian rhythms (daily physiological regulatory cycles). Smart Meters will pulse intermittently day and night and may have an adverse effect on sleep cycles. We do not use our cellphones during sleep, yet Smart Meters will continue to emit pulsed RFR all night long.

Exposure to microwave/radiofrequency fields affect the neuroendocrine system causing neuroendocrine chemical modulations and behavioral reactions. Already in 1970s it was known that resonant absorption within the cranium may result in the focusing of energy and the production of electromagnetic "hot spots" in the brain (Johnson & Guy, 1972). Microwaves may disturb the critical hormonal regulatory areas including the hypothalamic-pituitary axis through "low intensity" exposure. The body may elicit "different responses relative to the timing of the exposure with respect to circadian rhythm" (Michaelson, 1982). At night, while sleeping, the body is principally in a repair mode and the exposure to microwave radiation from Smart Meters may potentially be more damaging than exposure during the day. It is vital that long-term exposure studies during the night be carried out to determine if Smart Meter pulsed microwave radiation could have an adverse biological effect on our population.

The European Commission's Scientific Committee on Emerging and Newly Identified Health Risks report on "Health Effects of Exposure to EMF" stated that *"No health effect has been consistently demonstrated at exposure levels below the ICNIRP limits established in 1998. However, the data base for this evaluation is limited especially for long-term low-level exposure"* (SCENIHR, 2009). In other words, we just don't know what will be the long-term

effect of consistent low level exposure of RFR such as those imposed by Smart Meters in addition to the other microwave radiation sources now increasingly being used in our homes.

6. The lack of modeling or actual measurements of the contribution from Smart Meters to the existing background microwave radiation

The CCST report is misleading on page 20 where it says that the exposure levels to people living in metropolitan areas is quite low, around 0.005 uW/cm^2 . They base their assertions on an outdated report from July 1986 made by the U.S. Environmental Protection Agency entitled *The Radiofrequency Radiation Environment: Environmental Exposure Levels and RF Radiation Emitting Sources*, EPA 520/1-85-014. This data is totally outdated since it reflects the situation before the modern cellular telephone networks were put in place.

Already in 2000, in Sweden, the radiofrequency and microwave radiation levels in urban areas were approximately ten times higher than they were in the 1980s—and most of the increase is due to wireless communications, according to Dr. Yngve Hamnerius of Chalmers University of Technology in Göteborg, Sweden. Hamnerius measured radiation levels in the 30 MHz-2 GHz frequency range at 26 sites across Sweden with varying levels of urbanization. In cities, the median power density was 0.05 uW/cm^2 , with a 61% average contribution from GSM cell tower base stations. (Microwave News, July/August 2000). In the U.S., we do not have any up-to-date data since the U.S. Environmental Protection Agency has not carried out any research studies for two decades. I have personally measured background microwave radiation levels that are hundreds of times higher in many metropolitan areas than the values described in the CCST report using 1986 EPA data.

This increasing amount of background microwave radiation has become of medical concern in many parts of the world. For example in March 23, 2009 European scientists called for a reassessment of the damaging health impacts of increasing levels of electromagnetic radiation (Electrosensibilité : Appel des scientifiques du 23-03-2009). Similarly, in November 2009 a meeting of international experts on the biological effects of electromagnetic fields met in Stavanger, Norway to discuss the unprecedented global exposures to artificial electromagnetic fields from communication and power technologies. Many scientists at this meeting recommended that lower limits be established for electromagnetic fields and wireless exposures due to the health impacts at much lower exposure levels than are now considered safe.

The United States government essentially stopped all research on RF radiation effects on the environment, including population exposure, in 1996. The Environmental Protection Agency's budget and staffing for RF radiation activities was \$821,000 from 1990 to 1995 and only \$25,000 between the years 1996 to 2000 (Levitt, 2000, page 271). Essentially, there was no government money spent in the last 15 years by the EPA to fund a reexamination of the RF exposure limits by the National Council on Radiation Protection and Measurement (NCRP). Our changing microwave environment is thus not being studied by our federal government. If the federal government is not looking after our health concerns concerning low level electromagnetic fields, it is imperative that utilities have their new microwave technologies evaluated by state government research laboratories or public health

organizations prior to letting this technology be deployed on a largely unaware California public.

What is needed is an up-to-date series of measurements in dense urban environment that measures the combined RFR levels from all radiating emitters and estimates or measures the cumulative effect of Smart Meters and collectors to radiation exposure levels in homes. This must include all RFR emitters that are connected to the MESH and home area networks (HAN) as deployed by PG&E. Only independent assessments or measurements of these radiation levels ought to be considered, not those conducted by companies that have direct or indirect connection to the utilities. Until these studies are available, it is recommended that the Precautionary Principle be adopted.

7. The lack of health and environmental consideration by the CPUC when the Advanced Metering Infrastructure (AMI) was approved.

On July 20, 2006, the California Public Utilities Commission (CPUC) issued their final opinion, Decision 06-07-027, authorizing Pacific Gas and Electric to deploy an Advanced Metering Infrastructure (AMI) that would lead to the automation of 5.1 million electric meters and 4.2 million gas meters. The CPUC decision was in response to PG&E's application 05-06-028 filed on July 16, 2005. In Section 7 (Technology) of this CPUC decision, the AMI deployment was described as using Power Line Carrier technology for electric meters and a fixed network system with radio frequency communications channels owned by PG&E for gas meters. The system was to have a useful life of 20 years. In section 15 (Environmental Review) of the Decision, it stated that there is no need for an analysis of PG&E's AMI deployment pursuant to the requirements of the California Environmental Quality Act (CEQA). It appeared that due to the suggested Power Line Carrier technology to be employed, the health or environmental effects were not considered at the time and the CPUC felt under no legal obligation to undertake any environmental review before approving the PG&E application.

On March 12, 2009, the CPUC made another Decision 09-03-026 in response to PG&E's application A.07-12-009 filed on December 12, 2007 to expand the AMI program significantly. Now the CPUC approved the establishment of microwave mesh networks as well as incorporating a Home Area Network (HAN) gateway device into advanced electric meters to support in-home HAN applications; and upgrading PG&E's electric meters to solid state meters, now called Smart Meters. In this decision, which conveniently expanded its 2006 AMI deployment decision, there was absolutely no mention of any environmental or health impact even though a whole new radiofrequency technology infrastructure was now approved for deployment on every home and business in California. We believe that this decision represents a gross degree of negligence by the CPUC in protecting the health and safety of the citizens of California. The CPUC needs to readdress the health and safety issues directly and immediately halt the installation of the Smart Meter program pending clarification of the issues raised by many scientific investigators who have commented on the inadequacy of the CCST report.

Conclusions

The time needed for a new technology to be developed and rolled out is much shorter than the time needed for research to investigate the possible health effects on the general population. The current Advanced Metering Infrastructure using microwaves in the 900 MHz frequency spectrum approved by the CPUC is going to adversely impact the physiology and ultimately the health of many Californians over the next twenty years, the anticipated life time of the Smart Meters now being deployed. This program is being implemented without widespread public knowledge or approval and without the specific informed consent in writing from every household.

Already the most sensitive members of our society, those who are especially vulnerable by being electrically hypersensitive, are registering health complaints such as headaches, sleep disturbances, cognitive difficulties, dizziness, heart palpitations, to name only a few. Most of these symptoms could also be related to other medical conditions making it difficult to ascribe their appearance specifically to the Smart Meters radiation directly. Although not yet recognized in this country as a state of physiological imbalance, hypersensitivity of human subjects to exposure to electric and magnetic fields has been reported for over 20 years by many authors in many industrialized countries. If only 1% of California's population were to report symptoms of electrical hypersensitivity after Smart Meter installation, over 370,000 people might be adversely affected by RFR.

The dissemination of this Smart Meter technology could have been accomplished without using radiofrequency radiation by using much safer power line, fiber optic or telephone communications technology. For example, a Smart Meter power line communications technology was used by Italian utilities in 27 million households using meters designed in California. In the Netherlands, the population concerned about the security and health issues of Smart Meters was given the options to opt out from having the meters installed. Californians were never given this option. Yet this AMI program, costing utility customers over \$2 billion, represents the largest technology roll-out in the history of Pacific Gas and Electric. Ironically, it is being financed by the rate payers without their direct consent.

This program represents an epidemiological experiment involving our unsuspecting population whose outcome will only be fully known after many years exposure. It is being shepherded through the regulatory process by the CPUC who has not seen fit to study the possible adverse health impacts of this technology before approving its usage. It has never shown any willingness to seriously consider the well-documented non-thermal effects of pulsed microwaves on living systems and will undoubtedly use the misleading CCST report to avoid any questions about future health implications of this technology. Because of the uncertainties of adverse long-term health impacts, the CCST ought to have recommended that a Precautionary Principle be invoked that would allow more time to directly study the effect of this pulsed radiation with both in vitro and in vivo testing in realistic settings of the mesh network, especially in high density Smart Meter environments in our cities.

Additionally, in cities the Subterranean Network Deployment System (SUNDS) is now also being installed by PG&E. This will add even higher microwave exposure levels to the general population. Any description of this new system was conspicuously absent from the CCST report. At a minimum, the utilities and CCST ought to have carried out extensive

computer modeling to assess the impact of Smart Meter technology in realistic settings, taking into account the other wireless technologies have already been deployed and which have significantly increased the background microwave exposure of the population over the last 20 years.

In summary, we find that the CCST report is incomplete and misleading giving California State regulators a false sense of security while potentially endangering the future health and well-being of Californians. It is requested that the current Smart Meter deployment be halted pending a more comprehensive scientific investigation of the biological response and health impacts of the non-thermal aspects of this technology. All households should be offered full disclosure about possible exposure levels, modulation patterns, peak power levels and interactions with other parts of the microwave spectrum in their home environments. Additionally, those who are sensitive to this radiation must be given the choice to opt out from having this form of RFR imposed upon their residential dwellings.

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EXHIBIT 20-12-KATO

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Comment on CCST Smart Meter report

I am a journalist and a director of a self-help group for Multiple Chemical Sensitivity (MCS) and Electromagnetic Hyper Sensitivity (EHS) in Japan. I am also a patient of MCS and EHS. So, I have been working to improve the environment for sensitivity people and vulnerable children.

The smart grid program is planning all over the world including Japan. In our country, Smart Meters have installed in some area, and other utilities are planning to install it as demonstratively experiment. So, I have interested in Smart Meter issues in California and CCST report.

Why did not show the major factors?

CCST expressed the RF level was $40 \mu \text{W/cm}^2$ at 3 feet from Smart Meter. But, CCST did not show the important factors related to this calculation, such as a number of meters, an assumed environmental, and reflection of building materials.

FCC limit never provide safety

FCC limits that based on thermal effects never provide safety to general people. Many studies have been described the adverse health effect occurred by non-thermal effects under the limit of International Commission of Non-ionizing Radiation Protection (ICNIRP) that is same to FCC. The Bioinitiative Report mentioned *"the body of evidence at hand suggests that bioeffects and health impacts can and do occur at exquisitely low exposure levels: levels that can be thousands of times below public safety limits"* and recommended the value of $0.1 \mu \text{W/cm}^2$ for RF. This value is ten

thousand times below FCC limits.

Why did not CCST describe about EHS ?

There is an important EHS article by P. Levallois et al. (2002). They estimated the prevalence of self-reported sensitivity to EMF was 3.2%, with 24.4% of those surveyed reporting sensitivity to chemicals, in California. It was necessary to have forecast the adverse health effect at the early stage of the smart grid program. In actually, many people have been already claimed many symptoms by Radio Frequency (RF) emission from PG&E Smart Meters. CCST have to seriously consider these claims.

The rights of person with EHS

I carried out a questionnaire survey in 2009 about health problem, economical, and social issues related to EHS in Japan. The valid responses were only 75, however the total cost to avoid EMF, such as moving to low EMF area, RF shielding reconstruction and replacing to low emission household appliances, reached to about 168 million yen (about 1.8 million US dollars). Fifty-three percent had a job before the EHS onset, but 65% of them lost their work or experienced a decrease in income. Major symptoms were "fatigue/tiredness" (85%), and "headache", "difficulty of concentrating, remembering and thinking" (81%, respectively). Sixty five percent indicated they experienced symptoms attributable to radiation from other passengers' mobile phones aboard public transportation, and 12.0% said they could not use any public transportation due to their serious symptoms. The survey indicated EHS people are significantly limited their daily life due to EMF exposure.

EHS and MCS are publicly recognized as disabilities in U.S.A. under the ADA. Federal Register (Sept. 3, 2002) mentioned *"The (Architectural and Transportation Barriers Compliance) board recognizes that multiple chemical sensitivities and electromagnetic sensitivities may be considered disabilities under the ADA if they are so severely impair the neurological, respiratory or other functions of an individual that it substantially limits one or more the individual's major life activities."*

In 2005, National Institute of Building Science (NIBS) published the report "Indoor Environmental Quality (IEQ)" in according with the request from the Architectural and Transportation Barriers

OTAD - SPOC Training

Compliance Board.

IEQ report mentioned ;

"For people who are electromagnetically sensitive, the presence of cell phones and towers, portable telephones, computers, fluorescent lighting, unshielded transformers and wiring, battery re-chargers, wireless devices, security and scanning equipment, microwave ovens, electric ranges and numerous other electrical appliances can make a buildings inaccessible."

Then, they established the recommendations to increase the access for sensitivity people. It includes;

- Cell Phones Turned off
- Ability to turn off or unplug computers and other electrical equipment by occupant or staff
- Ability to turn off fluorescent lighting by occupant or staff

" The focus of the project was on commercial and public buildings, but many of the issues addressed and recommendations offered in residential settings".

However, the radiation from Smart Meters is making the harmful environmental that EHS people can't access to their house. Moreover, EHS people will increase more and more due to RF radiation from Smart Meters. It might cause economical huge damage of California. The radiation is also affect to vulnerable people, such as children and elderly people. CCST have to stand on precautional principle, and to recommend to replace wired meters from wireless Smart Meters, as soon as possible.

References;

P. Levallois, R.Neutra, G. Lee and L. Histova, Study of self reported hypersensitivity to electromagnetic fields in California, Environ. Health. Perspect. 110(4) (2002) 619-623

Bioinitiative Report: A rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)

Federal Register Vol.67, No. 170/Tuesday, September 3, 2002/ Eiles and Regulations

National Institute of Buildings Sciences, "IEQ Indoor Environmental Quality" (2005)

EXHIBIT-20-13-HIRSCH

Comments on the Draft Report
by the California Council on Science and Technology
"Health Impacts of Radio Frequency from Smart Meters"

by Daniel Hirsch¹
31 January 2011

Abstract

The draft report by the California Council on Science and Technology (CCST) does not appear to answer the questions asked of it by the requesting elected officials. Furthermore, rather than being an independent, science-based study, the CCST largely cuts and pastes estimates from a brochure by the Electric Power Research Institute, an industry group, issued some weeks earlier. The EPRI estimates appear incorrect in a number of regards. When two of the most central errors are corrected – the failure to take into account duty cycles of cell phones and microwave ovens and the failure to utilize the same units (they should compare everything in terms of average whole body exposure) the cumulative whole body exposure from a Smart Meter at 3 feet appears to be approximately two orders of magnitude higher than that of a cell phone, rather than two orders of magnitude lower.

It is strongly recommended that CCST revise its Draft Report and conduct actual measurements of cell phone, microwave oven, and SmartMeter RF cumulative whole body power densities. If measurements aren't made, then rigorous calculations correcting for cell phone and microwave oven duty cycles and whole body exposures should be made.

A summary figure below shows how rough estimates of the effect of those corrections suggest SmartMeters may produce cumulative whole body exposures far higher than that of cell phones or microwave ovens.

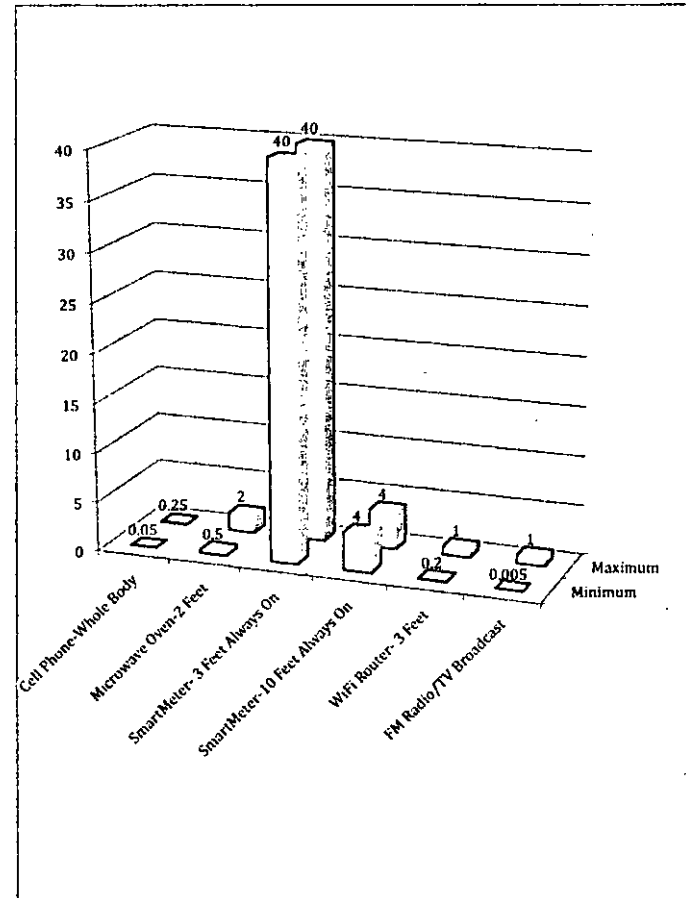


Figure A. Comparison of Radio-Frequency Levels to the Whole Body from Various Sources in $\mu\text{W}/\text{cm}^2$ over time [corrected for assumed duty cycle and whole body exposure extrapolated from assumed cell phone dose at ear].

¹ The assistance of two UCSC student research assistants, Bailey Hall and Catherine Wahlgren, in the preparation of this review is gratefully acknowledged.

402914-81-05-T181NAE

On 30 July 2010 Assemblymember Jared Huffman requested that CCST undertake an "independent, science-based study" of two questions: "whether FCC standards for SmartMeters are sufficiently protective of public health taking into account current exposure levels to radiofrequency and electromagnetic fields, and further to assess whether additional technology specific standards are needed for SmartMeters and other devices that are commonly found in and around homes, to ensure adequate protection from adverse health effects."

Unfortunately, the Council draft report answers neither question.

In September, Assemblymember William Monning and Mill Valley Mayor Stephanie Moulton-Peters joined in the request, asking in particular that CCST review the central issue associated with the current FCC standards, which are decades old and based solely on protecting against prompt thermal effects (heating of tissue)—that they fail to take into consideration long-term and cumulative exposures to these devices and potential non-thermal health impacts (e.g., latent cancers).

Again, the Council's draft report provides little if any useful information or analysis of this matter. There is no mention or analysis of the specific studies that have suggested, for example, a cancer effect from RF exposure such as the large, international study funded by the cell phone industry, the Interphone study, that found a significant increase in brain cancers in people who used cell phones half an hour a day for ten years. Given the long latency period generally for solid cancers, such a finding gives pause as to what might be seen over the long term. Some other studies have suggested an increased risk of brain cancer on the side of the head where the cellphone is normally used. Other studies, however, have not found an effect. Given the nature of the request from the elected officials for a review of this critical scientific issue—whether there is the potential for non-thermal health effects from cumulative, long-term exposure to RF radiation—one would have hoped that there would have been a more detailed analysis of this question in the report.

The report is candid, however, that at present the issue is unresolved. But it goes on to then say there is no basis for changing the FCC standards which are based only on prompt, thermal effects. One could equally well say there is no basis for maintaining the FCC standards, given the uncertainties about latent, non-thermal effects.

What the CCST draft report does focus on, however, is the relative exposure from SmartMeters compared to other RF-emitting devices in common use. Here, again, the draft report disappoints. The elected officials cited claims made by the electric utility industry regarding safety of SmartMeters and purportedly relative low exposures compared to other common devices and requested "an independent, science-based study."

However, the CCST draft report does not appear to include much if any independent work on the subject but rather merely pastes in a table taken from an 8-page pamphlet released a few weeks earlier by the Electric Power Research Institute (EPRI), an advocacy group for the

electric power industry.² This EPRI table and the graph made from it constitute the core of the CCST report, and is reproduced here as Figure 1.

The EPRI pamphlet is not a peer-reviewed scientific study. It is a brief item for an advocacy group that is supported by industry. If the elected officials wanted the industry's views, it would have asked for them. Instead, it wished an independent, science-based study by an entity without the kinds of conflicts of interest EPRI has on this matter. But the CCST draft report is basically simply a cut-and-paste job from the EPRI brochure.

Note also that the estimate for exposure from a single SmartMeter contained in the EPRI item and repeated in the CCST draft is not a measured value but estimated—how is not made clear. EPRI's measurements were for a bank of ten SmartMeters; it didn't measure one alone but somehow estimated for it, despite the difference in how exposure falls off from one versus ten. The latter is inverse of the distance, the former inverse square of the distance. One presumes the electeds wanted actual measured values from an independent source, not a calculated value from the electric industry, without even an explanation of how it was calculated and without independent verification.

CCST does correct one error made in the EPRI brochure whereby it reduced the presumed power density estimates for the SmartMeter by duty cycles of 1 and 5%. CCST rightly indicated that future duty cycles could be much higher as "new applications and functionality are added to the meter's communication module in the future." For this reason, it assumed a 100% duty cycle in its calculations.

HOWEVER, CCST did not correct numerous other apparent errors from the EPRI brochure when it adopted EPRI's values. For example, for cell phone exposures, CCST did not correct for the presumed duty cycle of the cell phone (which CCST indicates on average is 1%). Nor did it convert the EPRI cell phone power density estimate into comparable units. EPRI (and thus CCST) compared a *whole body average* exposure to SmartMeter radiation to *peak exposure to the ear* for the cell phone. One needs to compare apples and apples, or whole body exposures to whole body exposures. Comparing the peak dose to the ear from a cell phone, when the rest of the body gets vastly less radiation, with a whole body exposure where all organs get roughly the same dose from a SmartMeter, doesn't seem appropriate. If there is a cancer effect, it is likely associated with the total RF energy the body receives.

Similar apparent errors were made in the comparison to microwave ovens. Again, the duty cycle of the microwave oven is ignored. It is used perhaps fifteen minutes a day, and it is unlikely people are 2 feet away from the device for the full time it is on. Its "down time" must be included if one is looking, as requested by the elected officials, at potential cumulative, long-term exposures.

² The EPRI brochure was apparently released on November 17, providing little if any time for serious review of it by CCST prior to the release a few weeks later (with the holidays intervening) of the CCST report on which it was based.

[Additionally, the values given for microwave oven exposures by EPRI and adopted without change in the CCST draft report seem questionable. Three references are given in the EPRI report, although for which claim each applies is not made clear. The first reference, the ICNIRP report, does not in fact give measured values for microwave ovens, but instead reports what the legal limit for leakage is, generally reported to be orders of magnitude above what typical exposures from microwave ovens really are. The second reference is to a 1978 paper by PG&E's consultant, RA Tell. That paper CCST has not made available for review, but it is over three decades old, and thus of little relevance to today's microwave ovens. The third reference is merely to a personal communication with Tell, without any information as to the content of that communication. When one checks the values reported by EPRI and uncritically adopted by CCST, it appears that the first value, 5 mW/cm² at 2 inches from the device, is in fact not a measured value of typical exposures but the vastly higher legal limit for leakage. The literature in fact indicates that 50% of microwave ovens produce less than 0.062 mW/cm² at 5 cm, or two orders of magnitude below the value reported by EPRI and reproduced by CCST without question. See, e.g., R. Mathes, "Radiation Emission from Microwave Ovens," *Journal of Radiation Protection*, Vol. 12, No. 3, September 1992. One presumes the leakage rate has been reduced even further since then.]

One recognizes that if one is comparing to FCC existing standards based solely on acute, thermal effects that duty cycle might be treated differently. But if there is a cancer effect, which is what the electrod asked CCST to study, a likely key aspect of the dose-response relationship is the cumulative whole body dose. For ionizing radiation, about which I have spent much of my career, the determining factor is largely how much radiation energy the body has absorbed. [There are of course other factors, such as the relative biological effectiveness (RBE) of different types of ionizing radiation and varying sensitivity of different organs.] So, if the question were how does SmartMeter and cell phone RF radiation compare to FCC limits, duty cycle may be treated in a different fashion. But since the question is what if FCC limits, based solely on thermal effects, may be inadequate to protect against cancer and other non-thermal effects, then the duty cycle—which determines the cumulative total exposure received—and whole body exposure must be factored in. My fundamental recommendation is that the draft report should be revised to correct for these two factors.

I have taken the liberty, with the help of two student assistants, to demonstrate the potential impact of some of these corrections.

Figure 1 is simply the CCST Figure 1, which in turn was largely taken from the estimates in the EPRI pamphlet. Units were simply converted by CCST from mW/cm² to μ W/cm² and it corrected the duty cycle for the SmartMeter, otherwise the data are unchanged from EPRI's estimates. One will note that the estimated exposure from the cell phone is just to the ear, in direct contact with the cell phone, whereas the other comparisons, including the SmartMeter, are for whole body exposures, and that the duty cycle of the cell phone and microwave oven were not corrected. In other words, the chart compares a SmartMeter that is always on with a cell phone or microwave oven when they are being used, even though 99% of the time they are not in use. This overestimates the cumulative exposure by a factor of 100 for the cell phone and microwave oven, and dramatically skews the comparison.

Figure 2 fixes the error regarding duty cycle for the cell phone and microwave oven, markedly altering the comparison. The minimum cumulative exposure over time from the SmartMeter at 3 feet is 80 times the minimum cumulative exposure from the microwave oven and four times the minimum cumulative exposure from the cell phone, for example. This does not involve any correction of the while-on exposure values for either the cell phone or microwave oven, only the duty cycle factor.

Figure 3 provides a very rough approximation of the correction of the cell phone at the ear estimate to a whole body estimate so it is comparable to the whole body estimate for the SmartMeter. *It should be stressed that neither this estimate nor that in Figure 4 using a different approach is intended to be a definitive figure, but is intended to be exemplary of the kind of change to the comparison a detailed analysis may produce. It is my recommendation that CCST carefully measure, or at minimum thoroughly calculate, the average power density over the whole body from a cell phone held at the ear. We here have made two very rough estimates just to make the point what a far more detailed analysis may show.*

The value used for the peak cell phone power density for a cell phone held to the ear in the CCST draft report is taken directly from the EPRI pamphlet, without apparent independent review or correction. According to p. 6 of the EPRI pamphlet, the value it gives apparently is not a measured value but an estimate. How the estimate was arrived at is not detailed in the brochure. All that is said is in footnote 1, "Based on a 3-inch 250mW antenna emitting in a cylindrical wavefront." A quick calculation to try to reproduce what EPRI must have done indicates that if it merely assumed that all of the energy from a 250mW cell phone was transmitted by holding directly against the ear into a circular area with a 3 inch diameter, the power density in that small circular area around the ear would be 5 mW/cm². That is precisely the upper value given by EPRI in its table. We don't know if that is what EPRI did, since it doesn't tell us what it did and CCST does not appear to have tried to confirm the asserted value. But in any case, 5 mW/cm² from a 250mW cell phone would indeed appear to require that that power be deposited solely in that very small circular area.

Averaging over the full potentially exposed surface area of the body (presuming only half the body surface could be exposed to the cell phone from any one angle), the whole body exposure would be approximately on average 0.25 mW/cm² given the maximum value to the ear of 5 mW/cm² put forward by EPRI and the CCST draft report and correcting as well for the duty cycle. **The SmartMeter thus would produce 160 times more cumulative whole body exposure than the cell phone assuming this estimate for whole body exposure.** This is shown in Figure 3.³

³ In these graphs we have used the values for a microwave oven at 2 feet put forward by EPRI and repeated by CCST even though, as discussed above, they appear questionably high. Note that measured values indicate typical measured microwave oven RF fields 5 cm from the oven are in the range of 0.062 mW/cm², whereas the EPRI estimates used by CCST are for comparable values 2 feet away, which, if the exposure were drop by inverse square of the distance, should be very much lower. It is unclear whether EPRI is actually referring to measured values or to the legal limits, the latter being irrelevant in this context.

Since the EPRI estimate for cell phone peak power density at the ear is unexplained as to its derivation, we have also made a very rough estimate of whole body exposure from a cell phone from an independent line of calculation. Taking the values EPRI (and thereby CCST) put forward for exposure at three feet from a 250 mW SmartMeter, and noting that EPRI assumed the cell phone would also be 250mW, one can make a rough estimate of power density for the whole body from a cell phone held at the head. The exposure at one's waist would be approximately three feet from the source, just as in the assumed case of the SmartMeter. Presuming that the dose falls off as the inverse square of the distance, a very rough estimate of power density averaged over half the surface of the whole body, and taking into account duty cycle, yields a cumulative cell phone whole body power density of roughly $0.75 \mu\text{W}/\text{cm}^2$. Using this way of estimating suggests the SmartMeter would produce 50 times the cumulative whole body exposure as a cell phone. The results of this comparison are found in Figure 4.

We are here using the duty cycles proposed by CCST itself in its draft report. We recognize other duty cycles can be considered. Perhaps one should presume maximum duty cycle in the future for SmartMeters, when all additional features are incorporated, might be only 50%, for example. But other factors also need to be considered, including exposures from banks of SmartMeters attached to an apartment building, and the exposure from all the devices within a home that are planned to be constantly communicating by RF with the SmartMeter.⁴

It is strongly recommended that CCST revise the report and perform actual measurements. At minimum, revised calculations that correct for duty cycle and cumulative whole body exposure should be conducted.

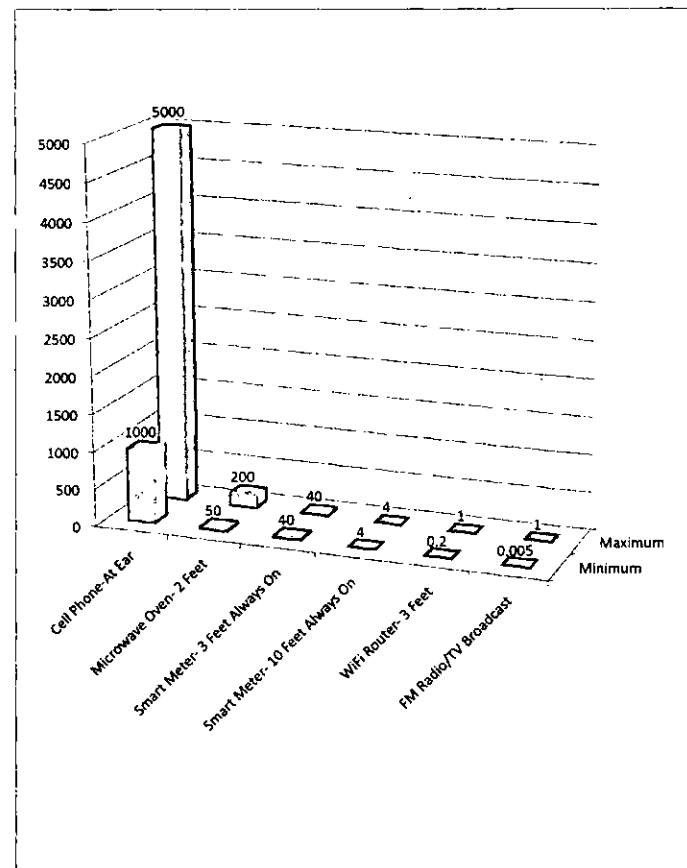


Figure 1: Graph from CCST Report in $\mu\text{W}/\text{cm}^2$ —uncorrected for whole body exposure or duty cycle

⁴ It is noted that EPRI claims a diminished dose in back of a bank of SmartMeters, but it is unclear that that claim can be relied upon. The particulars of the specific test done by EPRI, in connection with the manufacturer of the devices (who has an obvious interest in findings suggesting safety), are not spelled out. Furthermore, it is unclear how the SmartMeter can communicate with devices inside the home—the key purpose—if the back of the device blocks most of the signal from getting through.

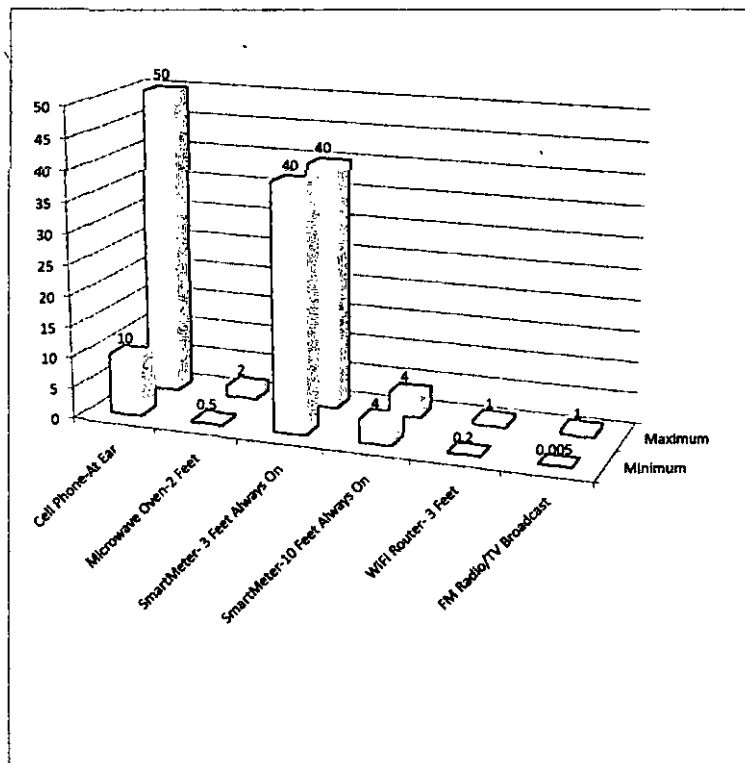


Figure 2. Comparison of Radio-Frequency Levels from Various Sources in $\mu\text{W}/\text{cm}^2$ over time [corrected only for assumed duty cycle].

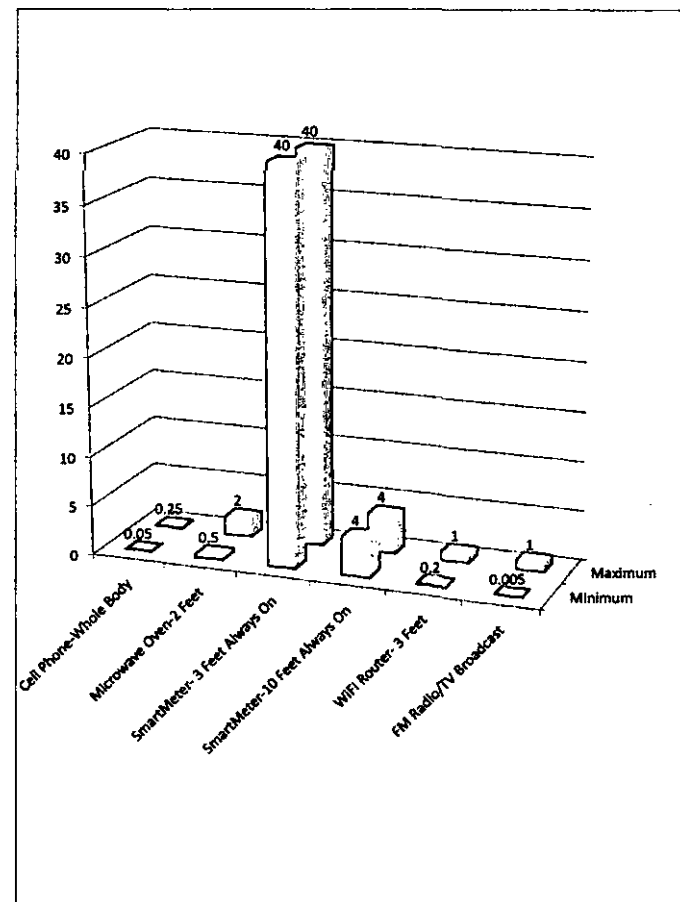


Figure 3. Comparison of Radio-Frequency Levels to the Whole Body from Various Sources in $\mu\text{W}/\text{cm}^2$ over time [corrected for assumed duty cycle and whole body exposure extrapolated from assumed cell phone dose at ear].

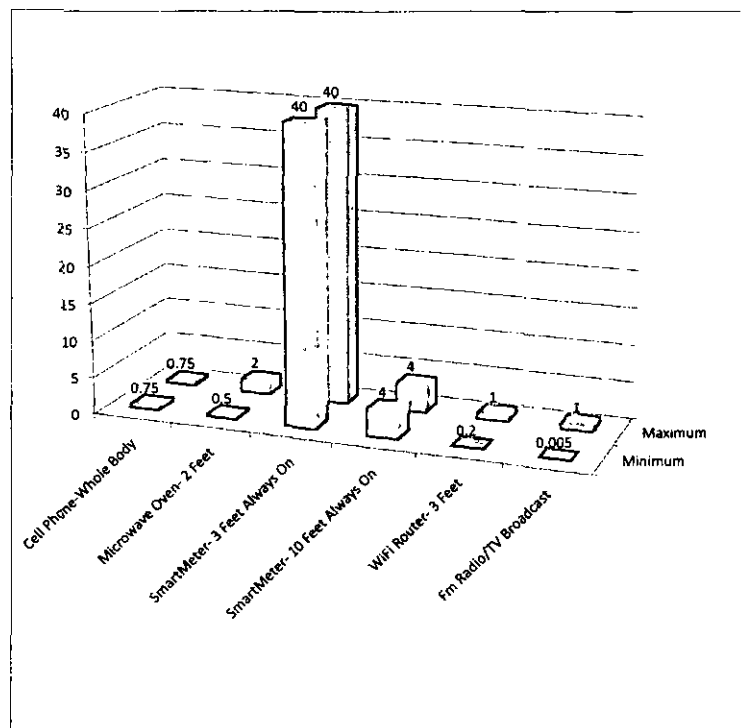


Figure 4. Comparison of Radio-Frequency Levels to the Whole Body from Various Sources in $\mu\text{W}/\text{cm}^2$ over time [corrected for assumed duty cycle and whole body exposure extrapolated from EPRI/CCST SmartMeter estimated levels at 3 feet].

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POCZ.E470764
Meters, Electric Utility[Page Bottom](#)**Meters, Electric Utility**[See General Information for Meters, Electric Utility](#)**ITRON INC**

313 N HIGHWAY 11

WEST UNION, SC 29696-2706 USA

E470764

Type S plug-in meters, "Centron II" Series, Models C, may be followed by N, followed by 2, followed by S, followed by L, O, or R, may be followed by D, may be followed by S or SSN.

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[<http://wjactv.com/news/local/jefferson-county-power-outage-causes-thousands-of-dollars-in-damages>]

Jefferson County power outage causes thousands of dollars in damages

by Bridget McClure

Monday, January 23rd 2017

BROOKVILLE - Nearly 500 people in Brookville Borough were affected by a power outage on last week.

A spokesman from Penelec said the outage occurred shortly after 1 p.m. Friday and was fully restored by 5:05 p.m. Penelec stated 467 people were affected.

Borough manager Dana Shick said Penelec stated the cause of the power outage was human error.

"There's two things that could of occurred; it could have been cross wired or a live wire could have been dropped on another live wire," Shick said. "It sends more power through one line than what should ever go through it, resulting in the power surge that we saw."

Reports of damages ranged from residents losing a refrigerator to losing all appliances in the kitchen or losing everything in the house.

Borough Emergency Management Agency coordinator Kyle Zents said Jefferson County 911 received dozens of calls Friday.

"They received a lot of structure fire and smell of smoke type calls," Zents said. "There were calls for flames showing on the meter boxes themselves."

The county is collecting data about the power surge. Depending on the extent of the damages, the borough might be eligible for some state assistance.

When questions as to who should pay the bill, Penelec said they could not give an answer until claims have been submitted.

Shick said residents should also file claims with their insurance.



Ittron/Centron OpenWay
SK9AMI7 Meters

[<http://www.thereporter.com/business/20170127/tiny-towns-power-surge-fries-computers-appliances-siding>]

January 27, 2017 12:22 PM

Tiny town's power surge fries computers, appliances, siding

By KRISTEN DE GROOT
Associated Press

The 911 calls started pouring in just after noon in the tiny western Pennsylvania town of Brookville. The electrical meter is on fire. The house siding is burning. My power strip is smoking. The computer is fried. The carpeting is singed. Our light bulb exploded.

A power company says a failed power line component was to blame for an electrical surge Jan. 20 in Brookville, population 4,000. When it was over, 500 to 1,000 residents were affected, said Tracy Zents, the director of Jefferson County's Department of Emergency Services.

"I've been doing this a little over 30 years, and this is definitely a first for me," Zents said. "We were fortunate that nobody was hurt."

The volume of calls quickly overwhelmed the local volunteer fire department 70 miles northeast of Pittsburgh, which had to call three other departments for help, Zents said.

Even the police department wasn't spared. The surge tripped the department's main office radio, so the initial emergency calls were missed, said Chief Jason Brown.

"Then all of a sudden I hear fire engines, so I turned on my handheld," Brown said. He quickly learned what happened, as fluorescent lights in the building next door started exploding in their sockets.

He said he doesn't know anyone on the east side of town who wasn't affected in some way.

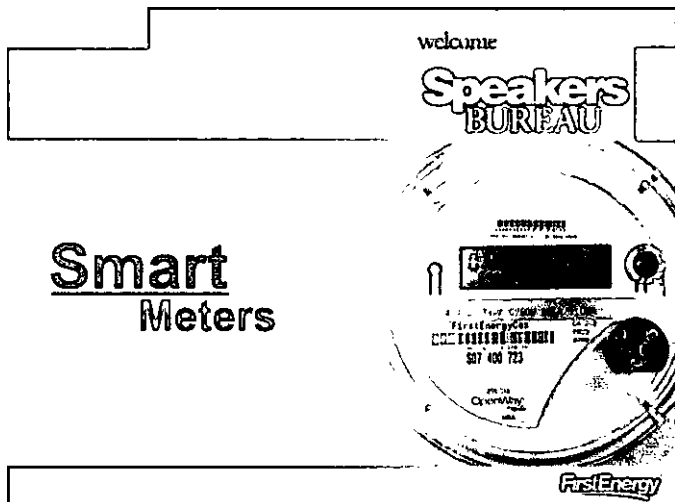
"You go down the street and you see all these blackened meters," he said.

Scott Surgeoner, a spokesman for electric utility FirstEnergy, said Friday the problem started with a failed insulator on a power line. That failure caused a flash that spread to a feeder line to Brookville, and about 475 customers lost power. It was restored by 5 p.m. the same day, he said.

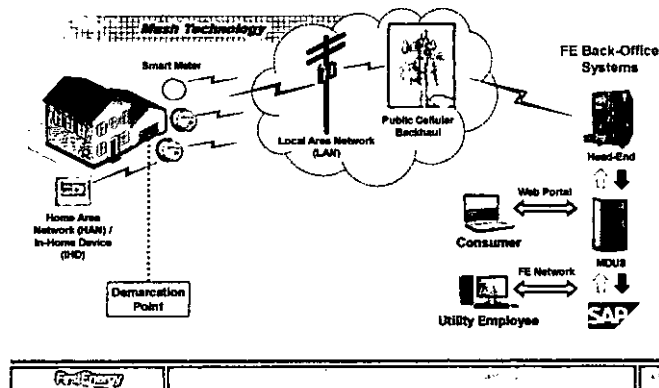
The cause of the failure isn't clear, but Surgeoner said it's not uncommon for insulators to fail after years of weather exposure.

"It's similar to an alternator in a car. Why does it fail after a few years? Mine might last for 10 years, but yours might last for five," he said. "Any equipment that is on a pole in the air and is subjected to weather 365 days a year, 24 hours a day is susceptible to failure."

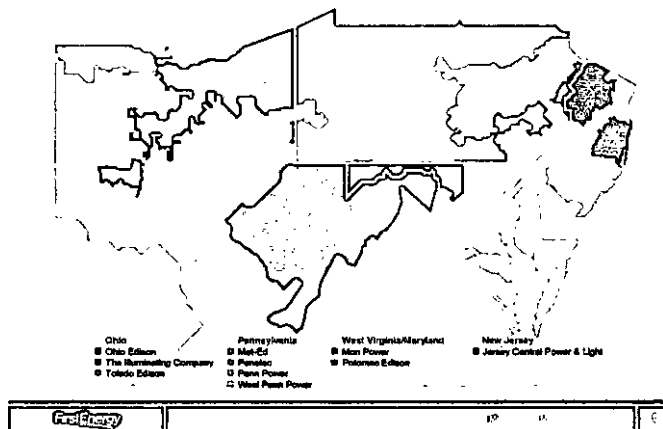
Any customers who feel FirstEnergy's local provider, *Penelec*, was negligent can file a claim with the company, and they will be reviewed on case-by-case basis, Surgeoner said. He's not sure if any have been received.



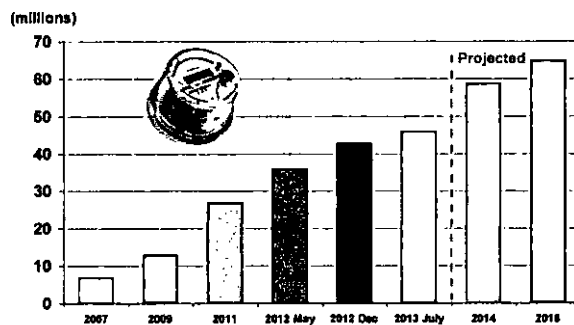
What We Are Doing: FE's Future State Model and Vendor Selection



FirstEnergy Regulated Service Territories



Smart Meter Installations in the U.S.



Source: The Edison Foundation, Institute for Electric Efficiency, Utility-Scale Smart Meter Deployments, Plans & Proposals, August 2013

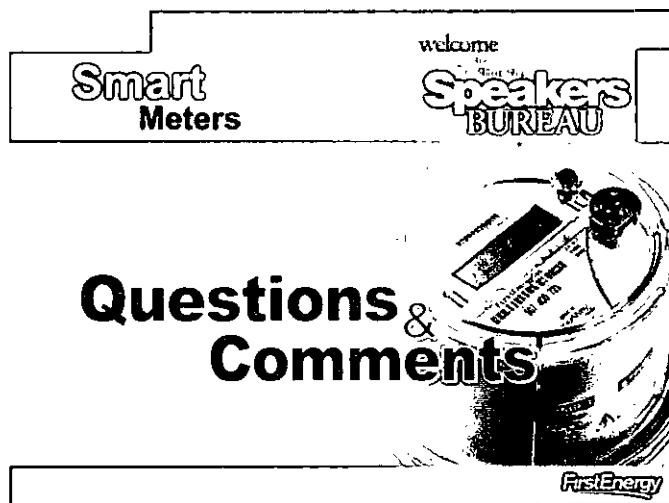


EXHIBIT 23

SMeters Will Be Hacked, Warn Researchers

[<https://www.eweek.europa.co.uk/news/smart-meters-will-be-%E2%80%98successfully-hacked%E2%80%99-warn-researchers-8766>]

The actual meters are a weak point between home networks and smart grid infrastructure that will be exploited, experts warn

By Andrew Donoghue

The technology at the heart of the government's plans to roll out smart meters to every home and small business in the country are fundamentally insecure and will be successfully attacked by hackers, according to researchers.

In a report published this week – Smart Meter Security – clean technology analyst group Pike Research states that governments and industry have rushed to develop smart meter technology but have not considered all the security issues around the technology.

"It would be naïve to think that smart meters will not be successfully attacked. They will be," the report states. "In fact, smart meters represent a worst-case scenario in terms of security: the devices lack sufficient power to execute strong security software; they are placed in physically non-secure locations; and they are installed in volumes large enough that one or two may not be missed."

Specifically, Pike believes that smart meters are an inherent weak point in the various networks which will ultimately form smart power grids, stated Pike industry analyst Bob Lockhart. "Smart meters are one of the weakest links in the smart grid security chain," he said. "Home area networks, commercial building networks, and utility networks all perform well in terms of keeping data encrypted within their domains. However, these domains terminate at the smart meter, and the only way for data to pass from one network to the other is for the smart meter to decrypt the data from one side and re-encrypt it on the other. Consequently, the data are, for a short while, unencrypted on the meter and could be successfully eavesdropped."

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[<http://www.newslocker.com/en-us/region/pittsburgh/smart-meters-pose-ongoing-issues-for-duquesne-light-customers/view/>]

Smart Meters Pose Ongoing Issues For Duquesne Light Customers

May 17, 2016 8:38 PM By Jon Delano

Filed Under: Duquesne Light, Jon Delano, Smart Meters

PITTSBURGH (KDKA) — Do you have one of those smart meters that Duquesne Light is installing all over? Turns out, sometimes customers are experiencing problems with them.

Last January, Karen Mihalic told KDKA-TV about her first bill after the installation of her smart meter.

“That’s when I had my shock,” she told KDKA money editor Jon Delano at the time.

The first month after Duquesne Light installed her smart meter, the Mihalics’ electric bill skyrocketed from \$42 a month to over \$2,500.

She was hardly alone.

Christine Fox’s bill jumped two-and-a-half times during the winter.

“I think there are many people out there who are having problems with it,” Fox said last January.

Fast forward to now and Duquesne Light customer Ernie Leopold of Findlay Township has just the opposite kind of smart meter problem.

“Six months into it we started getting zero bills. Our bill came with a zero dollar amount,” said Leopold, “even though we were using electricity.”

Leopold called Duquesne Light — who replaced the meter and figured out what was owed for electricity actually used — but the problem kept repeating and got worse.

Obviously, these smart meters are not so smart.

This is the third smart meter for the Leopolds and then they got a notice that their electricity was going to be shut off.

Leopold: “Yesterday, we received a disconnect notice from Duquesne Light that we had 10 days to pay our bill or they would shut our power off.”

Delano: “Even though you’ve been paying it?”

Leopold: “Even though we’ve been paying the bill every month.”

Duquesne Light says it’s working to resolve Leopold’s billing problem,

And it says smart meters are like computers and experience technical issues.

But if you have any problems with smart meters, Duquesne Light says to read bills carefully and alert the company immediately, and it will work to arrange payment options.

Jon Delano

Follow Jon Delano: Facebook | Twitter Jon Delano is a familiar face on KDKA-TV, having been the station's political analyst since 1994. In September 2001 Jon joined KDKA full time as the Money & Politics Editor and this region's only...

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EXHIBIT 25

January 17, 2014

Mark D. Marini, Secretary
Department of Public Utilities
One South Station, Fifth Floor
Boston, MA 02110

Re: D.P.U. 12-76-A – Investigation into Modernization of the Electric Grid

Dear Secretary Marini:

Enclosed for filing are the Initial Comments submitted on behalf of NSTAR Electric Company ("NSTAR Electric"), and Western Massachusetts Electric Company ("WMECO") (collectively, "Northeast Utilities" or the "Companies") in response to the straw proposal issued by the Department of Public Utilities (the "Department") in relation to the modernization of the electric distribution grid in Massachusetts. Investigation by the Department of Public Utilities on its own Motion into Modernization of the Electric Grid, D.P.U. 12-76-A (December 23, 2013) ("Straw Proposal"). The Straw Proposal was issued by the Department based on its review of the Massachusetts Grid Modernization Stakeholder Working Group Process: Report to the Department of Public Utilities from the Steering Committee ("Grid Modernization Report").

NSTAR Electric and WMECO were pleased to participate in the Grid Modernization Stakeholder Working Group and appreciate the opportunity to offer these Initial Comments in response to the Department's Straw Proposal. The Companies look forward to continuing to actively participate in the on-going grid modernization proceedings.

Thank you for your attention to this matter.

Sincerely,



Danielle C. Winter

Enclosures

cc: Alison Lackey, Esq., Hearing Officer
Benjamin Davis, Director, Electric Power Division

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Investigation by the Department of Public Utilities)
on its own Motion into Modernization of the)
Electric Grid)

D.P.U. 12-76-A

INITIAL COMMENTS OF NORTHEAST UTILITIES
EXECUTIVE SUMMARY

NSTAR Electric Company ("NSTAR Electric") and Western Massachusetts Electric Company ("WMECO") (collectively, "Northeast Utilities" or the "Companies") are committed to the cost-effective modernization of the electric distribution grid with focus on four specific objectives designated by the Department of Public Utilities ("Department"): (1) to reduce the effects of outages; (2) to optimize demand, including reducing system and customer costs; (3) to integrate distributed resources; and (4) to improve workforce and asset management. These four objectives are beneficial to customers in today's operating environment. With certain modifications, the Department's Grid Modernization Straw Proposal represents a viable starting point for achievement of these objectives and the Companies' look forward to further proceedings in this docket to advance those elements.

The principle outcome of the Straw Proposal, however, is a mandate for the Companies to initiate the accelerated implementation of a particular technology choice, Advanced Metering Infrastructure ("AMI"). The Department's decision to mandate AMI comes without due consideration of key issues such as the immense cost attached to the technology choice; whether customers are willing and able to pay the price of this technology choice; whether the functionality provided by the technology choice will be utilized by customers or is even sought by customers; whether the imposition of significant costs on distribution customers for this

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technology conflicts with other policies encouraging bypass of the distribution system through increased penetration of distributed resources; whether investment in distribution upgrades needed to accommodate distributed energy resources is a better investment of customer dollars given the relatively small incremental benefit afforded by AMI; and whether other issues such as market alternatives, time-varying rates, and cyber-security should be resolved *before* there can be any rational determination that this technology is a good choice for customers. (The technology)

choice is made although there is no evidence that this is a good choice for customers.

Conversely, there is ample evidence that this technology choice will be unduly costly for

customers and that the objectives of grid modernization are achievable with technologies and

strategies that rank substantially higher in terms of cost-effectiveness. For customers who will

pay the price of this system, there is no rational basis for this technology choice.

Rather than furthering grid-modernization objectives, the Department's mandate to
implement AMI creates an intractable obstacle to grid modernization. The mandate precludes

NSTAR Electric and WMECO from designing and implementing grid modernization plans that are best suited to customers and that mitigate the cost that customers will bear for progress. The Straw Proposal also denies the option of targeted cost recovery for any grid modernization initiatives other than AMI. In order to support the accelerated implementation of grid-modernization plans, the Companies require targeted cost recovery to engage in the installation of technologies beyond what can be accommodated by current levels of capital investment fully dedicated to more traditional safety and reliability objectives.

The Department should adopt the Companies' recommendations set forth below. The recommendations will achieve the four objectives of grid modernization in a manner that is cost-effective for customers. There should be no other result for this proceeding.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Investigation by the Department of Public Utilities)
on its own Motion into Modernization of the)
Electric Grid)

D.P.U. 12-76-A

INITIAL COMMENTS OF NORTHEAST UTILITIES

I. Introduction

These initial comments are submitted on behalf of NSTAR Electric and WMECO in response to the straw proposal issued by the Department in relation to the modernization of the electric distribution grid in Massachusetts. Investigation by the Department of Public Utilities on its own Motion into Modernization of the Electric Grid, D.P.U. 12-76-A (December 23, 2013) (hereinafter "Straw Proposal"). The Straw Proposal was developed by the Department on the basis of the Massachusetts Grid Modernization Stakeholder Working Group Process: Report to the Department of Public Utilities from the Steering Committee ("Grid Modernization Report").¹

Northeast Utilities supports the Department's efforts to address the important issue of *grid modernization and generally views the Straw Proposal as a viable start in balancing the range of competing interests brought forth in the Grid Modernization Working Group*

¹ On October 2, 2012, the Department issued its Investigation by the Department of Public Utilities on its own Motion into Modernization of the Electric Grid, D.P.U. 12-76 (the "Notice of Investigation"), commencing an investigation into the modernization of the electric distribution grid. The Department subsequently convened the Grid Modernization Working Group, comprised of the Massachusetts Distribution Companies, the Department of Energy Resources ("DOER"), the Office of the Attorney General ("Attorney General"), the New England Independent System Operator ("ISO-NE") and other stakeholders. NSTAR Electric and WMECO were active participants on the GMWG Steering Committee and other committees and participated in the preparation of the Grid Modernization Report. Northeast Utilities submitted written comments on the Grid Modernization Report on July 24, 2013.

("GMWG"). In the Straw Proposal, the Department identifies four grid-modernization objectives, which are to: (1) reduce the effects of outages; (2) optimize demand, including reducing system and customer costs; (3) integrate distributed resources; and (4) improve workforce and asset management. D.P.U. 12-76-A at 3. All four of these objectives are valid, reasonable and appropriate in light of today's operating environment. In these comments, Northeast Utilities offers certain recommendations as a means to better align the Straw Proposal with the interests of customers, who are the intended beneficiaries of the grid-modernization objectives.

As an initial note, significant time and resources were expended in the GMWG reviewing the costs and benefits of AMI. This dialogue established that there are a host of critical issues to be addressed before it will be possible to determine whether AMI is appropriate for implementation by the Companies, including evaluation of the impact of its sizeable cost and lack of attendant benefits. The six-month technical review conducted off the record for this proceeding cannot be duplicated here in 25 pages. However, there is no rational basis for the implementation of AMI. Among many other considerations, achievement of the Department's four grid-modernization objectives does not require the implementation of AMI, despite the Department's suggestion that it does. Therefore, the Companies' comments below recommend that the Department modify the Straw Proposal to eliminate the requirement to implement AMI as part of the required Grid Modification Plans ("GMPs"), along with a few other changes.

II. Analysis and Recommendations for the Straw Proposal

A. Overall Approach

The Department's decision identifies the goals and objectives of a modern electric grid, while expressly delineating that investment decisions relating to system planning and the

implementation of new technologies will remain within the responsibility of the electric companies. D.P.U. 12-76-A at 10, 12. This construct is vital because it will allow NSTAR Electric and WMECO to develop and implement GMPs that will benefit customers, while leveraging investments in technology previously made to modernize the distribution system. Allowing design flexibility will enable the Companies to deploy resources optimally; to develop and implement GMPs that encompass a workable strategy for achieving measurable progress in relation to the Department's four, overarching grid-modernization objectives; and to meet the core obligation to provide safe and reliable service at a reasonable cost. The flexibility to develop a company-specific plan based on company-specific circumstances is an element of the Department's Straw Proposal, which should not be changed or diminished in the final result.

B. Comprehensive Advanced Metering Plans

1. Advanced Metering Functionality

The Straw Proposal requires NSTAR Electric and WMECO to include a CAMP in the first GMP submitted to the Department following the issuance of a final decision in the Grid Modernization proceedings.² D.P.U. 12-76-A at 3, 18. The Straw Proposal further specifies a list of seven advanced metering functionalities that must be included in the CAMP. *Id.* at 11-12. In explaining its decision to require electric companies to develop and submit a CAMP, the Department asserts that advanced metering functionality is a "basic technology platform for grid modernization that *must be in place* before all of the benefits of grid modernization can be fully realized." *Id.* at 12 (emphasis added). In addition, the Department asserts that electric companies will make "individual choices about technology and systems, *but must meet the objectives and requirements.*" *Id.* (emphasis added). The Department further directs that the

² The Straw Proposal directs that the CAMP should consist of: (1) a technology proposal and implementation plan; (2) a business case with a benefit-cost analysis; (3) a request for pre-authorization of investments; and (4) a request for a mechanism to allow for more timely cost recovery than is typically available. *Id.* at 18.

CAMP submitted by each electric company should be designed to achieve the designated advanced metering functionality within three years of the plan's approval.³ *Id.* Together, these predicates and associated directives, along with other requirements contained in the Straw Proposal, have the effect of mandating the accelerated implementation of AMI on the faulty basis that the benefits of grid modernization cannot be achieved without its implementation. This outcome is flawed and therefore undermines the integrity of the Straw Proposal.

An Advance Metering System is not a "basic technology platform" for grid modernization and is not needed to realize "all of the benefits of grid modernization." The Department identified four objectives for grid modernization, all of which can be achieved without the implementation of an advanced metering system. Meters do not reduce the number of outages; metering systems are not the only option for optimizing demand or reducing system and customer costs; and metering systems are not necessary to integrate distributed resources or to improve workforce and asset management. Therefore, it is not correct that advanced metering functionality is a "basic technology platform" that must be in place before all of the benefits of grid modernization can be fully realized, as the Department suggests. *Id.* at 12.

In fact, there are non-metering technologies that the Companies have implemented, or can implement in the future within a grid-modernization plan, that would tangibly advance the grid-modernization objectives set by the Department. For example, utilizing SCADA-enabled smart switches will both reduce outages and mitigate the effects that outages have on customers. Substation monitoring, remote controls and microprocessor relays can mitigate the impact of widespread outages; manage load constraints; and help to optimize the use of assets in real time. As a means to optimize demand, the installation of automated capacitor banks increases system

³ The Department states that it will consider proposals to implement advanced metering functionality over a longer term so long as an alternative timeline is provided.

efficiency and reduces costs. Direct control of load or generation can be employed to manage system peaks. In order to allow for the integration of distributed resources, sensors and systems for advanced load flow models that allow for more distributed resources on a circuit can be installed. As for improving workforce and asset management, next generation mapping and outage management systems increase the efficiency of response to outages, while communications, sensors and systems provide system level situational awareness and enhanced safety. Therefore, it is clear that the Companies would be able to identify and implement a suite of non-meter technologies and processes, in addition to those already implemented, in order to advance the Department's grid-modernization objectives *without* the implementation of an advanced metering system.

There is also an important dynamic involved in relation to the integration of widespread distributed energy resources to the electric power grid. Industry study conducted by entities such as the Electric Power Research Institute shows that the electric distribution grid will require substantial investment to be positioned for the integration of distributed energy resources.⁴ Therefore, grid-modernization efforts have to be closely coordinated with policies that are encouraging the growth of distributed energy resources. Finite capital resources available for grid modernization should be aimed at this integration effort before any additional monies are expended on metering capabilities that provide limited and/or speculative incremental benefits over current metering technology (following many years of investment in those systems).⁵ Moreover, the growth of distributed generation and current subsidies results in the *bypass* of the electric distribution system by potential electric customers leaving fewer and fewer customers to

⁴ *Value of an Integrated Grid: Utilizing Utility-Scale and Distributed Energy Resources*, at 1 (January 6, 2014).

⁵ NSTAR Electric and WMECO have deployed Automated Meter Reading ("AMR") drive-by meter reading capabilities deployed throughout their service territories.

pay for it. This creates a pricing crisis in practical terms for both residential and business customers remaining on the system. Huge additional investments to the distribution system will only have the effect of exacerbating the issue for customers.

Accordingly, not only is there a flaw in the Department's premise that an advanced metering system is a "basic technology platform" for grid modernization, but also the implementation of a costly, advanced metering system is at odds with policies designed to promote the growth of distributed energy resources. In directing the implementation of AMI, the Department's Straw Proposal does not address or consider this juxtaposition to any degree. However, immense, near-term investments in advanced metering systems should not be mandated without (1) methodical, valid analysis of the associated costs and benefits; and (2) the development of a plan to solve the detrimental impact of cost-shifting driven by the pervasive installation of distributed energy resources.

There Is No Rational Basis for Department-Mandated Implementation of AMI. The Straw Proposal is structured so that, given current technology alternatives, AMI is the only strategy that will satisfy all seven of the advanced metering functionalities required of the CAMP. Two criteria in particular dictate the implementation of AMI to satisfy the complete set of functionalities. Specifically, it is impossible to collect customer interval data in near real-time (i.e. hourly), which could also be usable for settlement in the ISO-NE energy and ancillary service markets, absent the implementation of AMI. The same is true for the required functionality that enables two-way communication between customers and the Companies.⁶ Throughout the GMWG, Northeast Utilities consistently raised the concern that the costs associated with AMI are currently astronomical, while the incremental benefits for customers are

⁶ Two-way communication is feasible on an opt-in basis. From a practical perspective, to deliver the service to all customers on an opt-out basis, the Companies would need to deploy an AMI communications infrastructure.

small in comparison. The Companies will not repeat all of the dialogue that has occurred here due to space constraints; however, the ultimate conclusion has not changed. There are better technologies in which to invest customer funds for the achievement of grid-modernization objectives. The decision to implement AMI goes against the best business judgment of the Companies and cannot be rationally cost justified in terms of a net benefit for the overall customer base that will pay for the investment over the long term. Some of the significant concerns left unaddressed by the Department in the Straw Proposal include the following:

First, the mandated implementation of AMI is not a prerogative within the Department's discretion. The specification of particular technologies or technological platforms is an issue within the management judgment of the Companies and which would only be undertaken on the basis of all relevant investigation and analysis. For this reason alone, mandated AMI implementation is not the correct manner in which to advance the Department's identified grid modernization objectives. Rather than a rush to judgment, the Department should carry through with the acknowledgment that flexibility at this stage is advisable and that the Companies should be allowed to design their GMPs in a manner that provides cost-effective benefits to customers with the seven functionalities serving as long-term guidelines rather than short-term mandates.

Second, the Department has not given any credence to the concern raised in the GMWG that the implementation of AMI is a costly undertaking at this time and (there is no cost justification that can support the implementation of AMI). As identified by Northeast Utilities throughout the GMWG process, an AMI roll-out is problematic due to the extraordinary cost associated with, at best, a modest increase in functionality. The implementation of AMI involves significantly more than the replacement of meters. An AMI roll-out would require either the significant enhancement or replacement of the following systems: Communications

Infrastructure used to transmit communications from the meter to the Companies; Meter Data Management System used to collect, store and process interval data and enable ISO settlement; Meter Asset Systems used to store information about all meter assets; Customer Information System ("CIS") used to calculate and present bills with time varying rates ("TVR");⁷ ISO and Load Research Systems used to interface with internal metering, CIS and ISO processes; the Outage Management System used to utilize meter-level data to support restoration efforts; and any company-owned home technology systems, e.g., usage displays and thermostats. The Companies' media and call center capabilities would also need to be enhanced to address any AMI implementation. Costs would also exist in relation to the meters, associated technologies and related systems that are currently in place and that would have to be retired before the end of their useful life. Northeast Utilities estimates, conservatively, that the price tag for an AMI roll-out, including the recovery of existing investment on the Companies' books would likely approach, and possibly exceed, \$1 billion over the course of the CAMP implementation – all of which is to be borne by customers *who may or may not be interested in interacting with the distribution system at the level implicated by AMI technology*.

Third, even if there is any chance that the cost of implementing AMI can be justified, it cannot be justified without resolution of the Department's investigation into TVR and other issues tied to the cost-benefit analysis. The Department may believe that it can work through the TVR investigation quickly to expedite the development of cost-benefit analyses in time for mid-year filings of the GMPs. However, TVR is a complex concept worthy of in-depth analysis and consideration. A key consideration is whether or not the supply component would be subject to TVR, considering this part of the business is unregulated. If not, it is questionable as to how

⁷ TVRs can include time-of-use rates, critical peak pricing, peak-time rebates, and real time pricing. D.P.U. 12-76-A, at 34.

effective TVR would be if it only affects half of a customer's electric bill. The development of a company-specific TVR proposal, including but not limited to the type and design of a TVR mechanism that best achieves grid-modernization objectives; which rate classes would be affected; whether TVR would be mandatory and, if so, for which rate classes; and how best to educate customers as to the opportunities and mechanics of the proposed TVR mechanism, are issues that are critical to the development of a TVR proposal that will take time to evaluate, present and decide. Without the Department's final determinations regarding TVR, the Companies cannot begin to develop a valid cost-benefit analysis for the required CAMPs.

Similarly, without resolution of the Department's investigation into cyber-security, it is not possible for the Companies to develop a suitable CAMP. AMI introduces a brand new portal into the Companies' information systems, significantly increasing the cyber-security risk. Currently, the only mandatory standard for electric distribution company cyber-security is the North American Electric Reliability Corporation Critical Infrastructure Protection ("NERC-CIP"), which applies only to bulk power systems and not to the electric distribution systems and metering infrastructure subject to the Department's jurisdiction.⁸ D.P.U. 12-76-A at 35-36. In its investigation into cyber-security, the Department stated that it intends to explore whether or not to use existing standards to assess the Companies' cyber-security practices and, if warranted, could expand the investigation to broader cyber-security planning and risk management. *Id.* It is reasonable to assume that such an investigation could lead to the implementation of a series of cyber-security planning and risk management mandates. Implementation of these mandates

⁸ There are voluntary cybersecurity recommendations and guidelines for electric distribution companies including: (1) the National Institute of Standards and Technology ("NIST") Interagency Report ("NISTIR") 7628, entitled, "Guidelines for Smart Grid Cyber Security;" (2) the United States Department of Energy's "Risk Management Process;" and (3) the Electricity Subsector Cyber Security Capability Maturity Model ("ES-C2M2"). *Id.* at 36. Additionally, NIST is developing a critical infrastructure security framework in response to the President's executive order on cybersecurity. *Id.*

would necessarily involve significant costs as they would affect all aspects of the Companies' distribution systems and related IT systems. These costs must be incorporated into the cost-benefit analysis for AMI.

It is also premature to assume that AMI can provide for large-scale conservation voltage reduction ("CVR"). D.P.U. 12-76-A at 11. Unlike many other grid modernization technologies and processes, CVR was not extensively discussed or analyzed during the course of the GMWG. CVR is an intricate and potentially problematic issue that affects, in addition to meters, numerous aspects of a distribution system warranting far more investigation than is contemplated under the Straw Proposal. To date, no major utility in the United States has implemented a large-scale CVR program, nor has such a program been introduced in Massachusetts to enable the Companies to gain either direct or indirect experience with such an initiative. The requirement to include a large-scale deployment in the CAMP without allowing for the proper investigation to determine the appropriateness of such a program is arbitrary and, most likely, will result in the expenditure of significant funds by customers for, at best, minimal benefits. Rather than the premature requirement of CVR, the Department should allow the Companies to exercise their expertise to evaluate CVR to determine if it is appropriate for implementation.

Fourth, there is no evidence that customers are willing to pay for the limited incremental functionality gained through implementation of AMI. In fact, there is evidence to the contrary. For example, industry studies show that only 46 percent of customers are aware of the concept of "smart metering," and of that percentage, 33 percent associate smart metering with complaints of meter inaccuracy, higher customer bills, invasion of privacy and health concerns. In the Companies' experience, even very large customers with sophisticated energy-management capabilities prefer *stabilized, fixed and/or predictable rates* to assist in managing their business

or personal interests rather than time varying rates. Certain customer segments, particularly the commercial and industrial sector, have significant reservations about AMI and TVR. Many customers have a deep aversion to technology that links them to the "grid" in a way that they perceive as an invasion of their privacy and/or detrimental to their health.

In addition to concerns about customer interest, the Department is requiring the implementation of costly infrastructure that would have to be paid for at the very same time that the Department's policies seek to allow customer exits from the distribution system to take advantage of distributed energy resources. No analysis of this dynamic has been undertaken; nor has any quantification whatsoever of customer bill impacts. Customers value price and reliability above all else and the implementation of AMI serves neither of these objectives.

Moreover, the Department should also consider the results and experiences of recent and ongoing pilots before blindly moving forward with an AMI mandate. Smart metering pilot programs across the country have produced similar results in terms of showing a lack of customer interest. Even the most successful residential time-of-use pricing programs have no more than 50 percent participation by the residential customer base. For example, NSTAR's Smart Energy Pilot has seen significant participant degradation relative to the initial number of customers installed. As reported to the GMWG, NSTAR Electric made 53,000 customer contacts in an attempt to enroll customers in its smart grid program; only 3,600 customers enrolled; only 2,700 customers were installed and approximately 40 percent of those 2,700 initial participants were removed or dropped out of the pilot by May 2013. PSE&G's "myPower" pricing pilot saw similar results in which 27 percent of participants were either removed or dropped out (excluding the control group). Roll-outs of AMI require careful consideration of the different implementation challenges, including customer perception about bills, security and

health-related issues. Market research will help to assess what functionalities are important to the different customer classes and whether or not those customers will view the achieved functionalities as worthy of the anticipated costs. Given the level of expenditures associated with AMI, it is prudent for the Companies to determine what the market will bear prior to designing their CAMPs. Failure to do so could result in decreased customer interest in grid modernization and other negative impacts. The success of the Companies' GMPs relies heavily on the participation of those who will ultimately bear the costs of those efforts.

Fifth, in mandating AMI, the Department has failed to consider the role that competitive markets should play in grid modernization and the costs that competitive market providers and other market participants have already invested in grid modernization efforts. For instance, home energy automation solutions like smart thermostats and appliances are advancing at a rapid pace and, in many cases, are leverage existing communications infrastructure such as broadband the internet. Rather than duplicating these expenditures and predetermining that the preferred communication should be enabled through the ill-considered implementation of AMI, the Companies should be afforded the flexibility to design GMPs that leverage the expenditures for the benefit, not to the detriment, of customers.

Last, but not least, there is little confidence that the incremental benefits of moving to an AMI platform will be sufficient to warrant the cost. Customers have already supported the investment associated with the installation of AMR metering technology and the incremental benefit afforded by AMI arises from the communications element, not from the metering element. Operational savings were realized with the implementation of AMR and are not further available with the implementation of AMI. This means that the incremental benefit of AMI is largely limited to the communications element, which can be addressed in other ways without

incurring the cost of the meter. Given that the grid modernization technology sphere is a dynamic, rapidly evolving marketplace, it is also unclear whether the incremental benefits, if any, would begin accruing to customers prior to the implemented AMI platform being rendered obsolete. In any event, the cost remains unjustified by the benefits.

Recommendation: The Companies recommend that the Department modify its mandate regarding implementation of the CAMP to establish the seven functionalities as optional, long-term guidelines for CAMPs, rather than required elements. In addition, the Department should reaffirm that electric companies retain the discretion to structure GMPs to incorporate components identified by the Companies as furthering the four grid-modernization objectives, subject to the approval of the Department. This flexibility will allow the Companies to design GMPs that are cost-effective, beneficial and assist in the continued modernization of the grid thus enabling the Companies to continue to provide safe and reliable service to customers.

2. CAMP Cost-Benefit Analysis

The Straw Proposal requires CAMPs to include a cost-benefit analysis using the business case approach, assessing all costs and benefits, including those that are difficult to quantify, as advocated by the Clean Energy Caucus in the Grid Modernization Report. Id. at 20; Grid Modernization Report at 82. Before it pre-authorizes the CAMP, the Department must find that the benefits, quantified and un-quantified, exceed the costs. D.P.U. 12-76-A at 20. However, the Department states that the Companies should not include any costs incurred for existing meters and associated systems in the CAMP cost-benefit analysis, which would be retired from service prior to the end of their useful lives pursuant to the CAMP. Id. Under the Straw Proposal, the Companies are required to base their CAMP cost estimates on various sources, including vendor quotes. Id.

Earlier in these comments, Northeast Utilities described the need to understand the costs and benefits associated with any mandates resulting from the separate TVR and cyber-security investigations. Additionally, it is necessary to have as much precision and specificity as practicable regarding the quantification of benefits associated with the CAMP, especially since the Department, in subsequent cost recovery proceedings, will evaluate the CAMP expenditures in light of the projections in the cost-benefit analysis. *Id.* at 21. The Companies understand the Department's position regarding the desire to include un-quantified benefits in the CAMP analysis to ensure robust CAMPs designed to help achieve the Department's grid modernization objectives. However, given that the Companies' ability to recover costs will be based in part on comparison to the original cost-benefit analysis, it is critical to quantify as many of the benefits as is practicable in order to avoid reliance on skewed cost-benefit analyses results and the potential for disallowance of cost recovery in subsequent proceedings. Failure to do this could lead to conservative CAMPs to minimize the risk of the disallowance of otherwise prudently incurred costs based on an overgenerous inclusion of un-quantified benefits in the initial CAMP cost-benefit analysis.

Furthermore, in ascribing a weight to un-quantified benefits, it is important to consider the time period over which the CAMP benefits are anticipated to accrue. Given that the Straw Proposal requires each GMP to cover a 10-year period and be updated in the Companies' base distribution rate cases, which must occur no less often than every five years pursuant to G.L. c. 164 §94, benefits that will not accrue until well in the future may not be appropriate for inclusion in the cost-benefit analysis given the likelihood a updating the CAMP due to changing technologies, processes and other related issues.

The Straw Proposal also requires the Companies to include projections about electricity and peak-load savings from the implementation of TVR, along with the underlying assumptions, in the CAMP cost-benefit analysis. *Id.*, at 34. In recognition of the complexities involved with developing TVRs, the Department will open a separate investigation into TVRs in the near future to examine the optimal approach to rate design. *Id.* Northeast Utilities supports the Department's plan to conduct a separate investigation into TVRs and looks forward to actively participating in that investigation. The Companies agree that TVR is a complex concept worthy of in-depth analysis and consideration (see above). In the event that the Department chooses not to accept the Companies' recommendation that the Companies' develop their GMPs and CAMPs following the conclusion of the TVR investigation, the Companies believe that it is premature to include any projections of TVR-induced electricity and peak-load savings in the CAMP cost-benefit analysis prior to the conclusion of the investigation. Such projections would have to be based almost entirely on assumptions, as opposed to measureable facts, rendering them questionable, at best. As noted above, given that future cost recovery is based, in part, on a comparison to the CAMP cost-benefit analysis, any TVR savings projections would likely be very conservative which would tend to skew the results of the cost-benefit analysis. It is more appropriate to forego inclusion of TVR savings in the cost-benefit analysis and rely, in the future, on TVR savings projections that are grounded in experience following the conclusion of the separate TVR investigation, and the Companies' determination of the most appropriate TVR to implement in their respective service territories.

As for the costs to be included in the cost-benefit analysis associated with the CAMPs, it is necessary for the Companies to retain the discretion to select technically qualified vendors from whom the Companies' would seek cost information. Given that future cost recovery of

CAMP expenditures rests, in part, on comparison to the original CAMP cost-benefit analysis, it is critical to only include reliable cost estimates from vendors. Given their relationships with vendors, the Companies are best suited to determine which vendors' cost estimates are to be included in the CAMP cost-benefit analysis.

Lastly, Northeast Utilities strongly disagrees with the Department's determination that the costs associated with any meters and associated systems, such as those enumerated above, that are retired prior to the end of their useful life under the CAMP should not be accounted for in the CAMP cost-benefit analysis. The costs that currently exist on the Companies' books in relation to existing meter plant support existing functionality. The implementation of AMI infrastructure will duplicate this functionality to some, perhaps a significant, extent. Therefore, if the costs existing on a company's books are excluded from the cost-benefit analysis, then the benefit of functionality that is duplicated by AMI infrastructure must also be excluded or the result is a double-counting of benefits. In order to ensure that the Companies are implementing CAMPs where the costs are justified by the benefits (see D.P.U. 12-76-A at 3, 20), all associated costs must be included in the analysis or duplicative benefits must be eliminated from the analysis. Otherwise, the cost-benefit results will be skewed eliminating a rational basis for the investment decision.

Additional study and analysis is needed to assure that there is a solid business case for this colossal investment; yet, the Department is mandating implementation *within three years*, unless an exception is approved. The Department has indicated that it will undertake separate TVR and cyber-security investigations to resolve issues implicated in the implementation of AMI infrastructure; however, these aspects represent only part of the analytical foundation that

would be needed to support this investment decision. Any cost-benefit analysis, developed on the short timeline envisioned by the Straw Proposal, would be seriously deficient.

In addition, Northeast Utilities respectfully requests that the Department's pre-authorization of the Companies' CAMPs, discussed in greater detail below, also constitutes an endorsement of the Companies' decision to retire the meters and associated systems and obviates the need for further review of the Companies' decision in future cost recovery proceedings. The Companies acknowledge that they would bear the burden of demonstrating that the costs associated with the removal were prudently incurred.

C. Cost Recovery

During discussions with the GMWG, Northeast Utilities made it clear that cost recovery would need to be aligned with the objectives of the GMP in order to allow for its implementation, including the installation of technologies that would not otherwise be undertaken without the GMP, or would be undertaken on a time frame different from the timeframes laid out by the Department for the GMP. The Straw Proposal provides that the Companies may request implementation of a capital expenditure tracking mechanism for their proposed CAMP expenditures; however, the cost-recovery opportunity appears to be directly contingent upon the implementation of AMI. D.P.U. 12-76-A at 18. In allowing for this cost-recovery, the Department stated that it was seeking to remove perceived impediments to grid modernization. Id. However, because the Department has linked its cost-recovery option to the implementation of AMI, the Department has in effect created a recovery mechanism for the most expensive grid-modernization technology with the least certain benefits, without any evidence to support that this is the appropriate end-state for the Companies' distribution systems and

customers. The availability of a cost-recovery mechanism for a system that is unwarranted by a business case is not removing any impediments to grid-modernization efforts.

If the Department is truly seeking to accelerate the deployment of cutting-edge grid modernization technologies to achieve the delineated grid-modernization objectives and functionalities in the near term rather than through a traditional capital investment plan cycle, the Department must allow for implementation of a cost-recovery mechanism outside of the traditional rate case arena. Restricting the bulk of grid modernization efforts to traditional ratemaking treatment will limit the scope and breadth of the Companies' GMPs, where targeted cost recovery for these efforts would, instead, foster innovation and lead to more robust GMPs aimed towards more fully achieving the Department's delineated grid modernization objectives. Without targeted cost recovery, the grid-modernization initiatives contained in the Companies' GMPs will be forced to compete for funds with more traditional capital investments necessary to maintain the safety and reliability of the Companies' distribution systems. There is a finite pool of funds for capital projects and efforts such as vegetation management and system hardening⁹ which provide a more immediate improvement to reliability and safety may be prioritized ahead of grid modernization initiatives whose benefits accrue over the longer term. In order to avoid this constraint on GMPs, the Department must extend targeted cost recovery to the grid-modernization initiatives contained in the Companies' GMPs, conditioned on the Companies' adherence to any mandated targeted cost recovery mechanism elements.

Regarding the form and required elements of the targeted cost recovery mechanism, specifically the requirement that the Companies bear the burden of demonstrating that all of the costs they seek to recover through their capital expenditure tracking mechanisms are incremental

⁹ The Straw Proposal states that, while vegetation management and system hardening may improve reliability and prevent outages, these types of initiatives are not grid-modernization functionalities. D.P.U. 12-76-A at 10.

to those recovered in base rates, Northeast Utilities supports the use of the incremental test utilized by Bay State Gas Company d/b/a Columbia Gas of Massachusetts ("Bay State") in its targeted infrastructure recovery factor ("TIRF").

D. Pre-Authorization

In the Straw Proposal, the Department states that, if it approves the CAMP, its pre-authorization "endorses" the Companies' decision to proceed with the investment plan. D.P.U. 12-76-A at 18. The Department states further that the pre-authorization of the CAMP obviates the need for "further review of the Companies' decision or timeline for making the CAMP investments in subsequent cost recovery proceedings, although the Companies must still demonstrate to the Department's satisfaction that the CAMP investments are used and useful and that CAMP costs were prudently incurred. *Id.* at 18-19.

Northeast Utilities supports the direction that the Department has taken in relation to the CAMP preauthorization and the Department's "endorsement" prior to the expenditure of funds and the commitment of resources. The Companies understand this to mean that, following the pre-approval, there will be no subsequent second-guessing as to whether it was reasonable and prudent for the Company to implement the CAMP, while appropriately requiring an after-the-fact demonstration that the actual CAMP expenditures were reasonable in terms of prudent management of construction costs. However, two concerns are raised by this paradigm. First, the Department cannot leave open the determination as to whether the investments are "useful" to customers. Because technologies for grid modernization are evolving quickly and the Department is pushing the electric companies to implement cutting edge technologies on an accelerated basis, the "usefulness" of investments may be called into question after the fact, even though an electric company is executing its Department-approved GMP. Whether investments

are actually in service is a threshold that can only be met after installation and is appropriately deferred to a cost-recovery proceeding, where costs will be reviewed for reasonableness. Second, the Department must extend this treatment to all elements of the GMPs (not just the CAMP) so that the Department's approval of the GMP eliminates the need for further review of the Companies' decisions or timeline for making the GMP investments in any subsequent GMP-related cost-recovery proceeding. Without these two changes, the Companies would be forced to expend funds and commit resources based on a Department approval that might not withstand the test of time.

E. Grid Modernization Metrics

In order to evaluate the Distribution Companies' implementation of their respective GMPs and CAMPs and progress towards the Department's identified grid modernization objectives, the Department intends to develop company-specific implementation metrics and a standard set of targeted, statewide performance metrics for GMPs. *Id.* at 29. At this time, the purpose of the metrics will be to record and report relevant information without a determination of whether it may be appropriate to connect such metrics to financial penalties and rewards in the future. *Id.* Under the Straw Proposal, each electric company must include: (1) infrastructure metrics that track its implementation of grid modernization technologies or systems; and (2) performance metrics that measure progress towards the objectives of grid modernization. *Id.* at 29-30.

Northeast Utilities is supportive of performance-based metrics within the context of the GMPs as a means of providing information regarding progress towards grid modernization objectives. The Companies emphasize that these performance-based metrics must be based on grid modernization functions completely under their control and that the Companies'

performance under the metrics is measured using quantitative and objective, rather than subjective, criteria. It is important that valid performance indicators are created and a discernible correlation between Company efforts and progress towards grid modernization objectives is established. This principle will enable an equitable review of the Companies' progress and will provide a solid basis for determining whether modifications should be made to the GMPs.

F. Separate TVR Investigation

As noted above, the outcome of the TVR investigation is inextricably intertwined with the design of the GMPs and CAMPs. Given this and the Companies' need to develop and implement grid modernization initiatives that are designed to achieve the Department's identified grid modernization objectives, the Companies respectfully request that the Department initiate the separate TVR investigation and allow the Distribution Companies to apply the guidance and benefits of that investigation to their initial GMPs, including CAMPs.

G. Cyber-security

The Department also intends to explore, in the context of grid modernization, issues related to cyber-security, privacy, and access to meter data in a separate proceeding. D.P.U. 12-76-A at 4. The Straw Proposal requires all GMPs to describe the Distribution Companies' strategies for ensuring cyber-security, privacy, and safeguards in the sharing of meter data in conjunction with their grid modernization activities. *Id.* at 31. The Companies are supportive of the Department's determination to address cyber-security, privacy, and access to meter data in a separate proceeding and look forward to actively participating in that proceeding. As noted above, it is critical for the Companies to know the outcome of that investigation and to apply any directives to their GMPs and CAMPs. Northeast Utilities also stresses the critical nature a safeguarding this information and cautions against wide public dissemination of NSTAR Electric and WMECO's specific proposals to ensure that their respective electric distribution systems and related systems are safe from cyber-

attacks. Although the Companies acknowledge that it is important for the Department to be apprised of their plans and procedures, public dissemination of this information weakens the Companies' ability to safeguard their systems and customer information.

H. Research and Development

In its efforts to ensure continued grid modernization and the adoption of new grid modernization technologies, the Department requires the Distribution Companies to provide information about their current research and development ("R&D") activities. *Id.* at 32. Both NSTAR Electric and WMECO have developed robust and beneficial relationships with vendors, academic institutions and research entities to ensure that they are continually apprised of new or improved technologies and processes, including grid modernization technologies and processes, which enable the Companies to continue to provide safe and reliable service to their customers. By leveraging these relationships, the Companies gain the benefit of the vendors' and institutions' expertise and experience with both emerging and newly developed technologies and processes that, in turn, enables NSTAR Electric and WMECO to make informed decisions about which processes and technologies are best suited for short and longer-term safety and reliability needs. Although Northeast Utilities believes that its approach to R&D is the currently the most appropriate method, if the Department were to require the Companies to conduct grid modernization technology R&D in furtherance of grid modernization objectives, then recovery of any R&D costs would be appropriate for recovery from customers.

III. Conclusion

NSTAR Electric and WMECO are committed to fulfilling their obligation to provide safe and reliable service for their customers. Further enhancing the resiliency and safety of the distribution system through grid modernization is an important and complex issue. The

Companies appreciate the opportunity to comment on the Department's Straw Proposal and look forward to continuing to actively participating in the on-going grid modernization proceeding.

Appendix A

Specific Questions from the Department

1. Has the Department provided the correct directives to electric distribution companies on grid objectives?

In the Straw Proposal, the Department identifies four grid-modernization objectives, which are to: (1) reduce the effects of outages; (2) optimize demand, including reducing system and customer costs; (3) integrate distributed resources; and (4) improve workforce and asset management. D.P.U. 12-76-A at 3. All four of these objectives are valid, reasonable and appropriate “directives” in light of today’s operating environment. The Department’s specific directives regarding the requirement to develop and implement a Comprehensive Advanced Metering Plan (“CAMP”) meeting seven pre-designated criteria that can only be met with the implementation of Advanced Metering Infrastructure are not the “correct directives” for electric distribution companies. The Companies have addressed the reasons for this conclusion in their comments on the Straw Proposal.

2. Has the Department established appropriate priorities and timelines for grid modernization?

The Companies have offered several recommendations relating to the requirement and timing of the submission of a CAMP. In sum, the Companies recommend that the Department modify its mandate regarding implementation of the CAMP to establish the seven functionalities as optional, long-term guidelines for CAMPs, rather than required elements. In addition, the Department should reaffirm that electric companies retain the discretion to structure GMPs to incorporate components identified by the Companies as furthering the four grid-modernization objectives, subject to the approval of the Department. This flexibility will allow the Companies to design GMPs that are cost-effective, beneficial and assist in the continued modernization of

the electric grid; thereby creating a regulatory construct consistent with the Companies’ public service obligation to provide safe and reliable service to customers.

In addition, as described in the Companies’ comments, the pending investigations by the Department into TVR and cyber-security should be completed before requiring the submission of a CAMP. This will ensure that assumptions of costs and benefits are aligned with outcomes of those proceedings. The timeline set out by the Department for filing of a CAMP is likely too aggressive to allow for reasonable consideration of these important issues.

3. Is the Department’s requirement to achieve advanced metering functionality appropriate?

The Department’s requirement to achieve advanced metering functionality is not appropriate, particularly where the seven functionalities identified by the Department are made mandatory. The Companies provide extensive comments on this question in Section II.B.1 - Advanced Metering Functionality. In summary, an Advanced Metering System is not a “basic technology platform” for grid modernization and is not needed to realize “all of the benefits of grid modernization.”

4. Which aspects of the benefits cost analysis should include industry-wide figures?

The cost-benefit analysis should incorporate company-specific information wherever practical and feasible. If industry-wide figures are used, emphasis should be placed on using information that represents actual deployments rather than estimated deployments. Care must be taken with industry-wide figures as that data would likely include inherent biases and differences that would skew the results, making it difficult to compare actual results to the initial analysis.

5. Which aspects of the benefits cost analysis should be company-specific?

Please see the response to Question 4.

6. **Has the Department established the correct categories of benefits associated with achieving advanced metering functionality?**

At this point in time, the Companies do not have additional comments regarding the categories proposed by the Department. However, as explained in section II.B.2 - CAMP Cost-Benefit Analysis, the Companies emphasize the need to include all cost impacts created by the technology implementation.

7. **Should the Department establish a targeted cost recovery mechanism for CAMP investments?**

Please see the Companies' comments in section II.C - Cost Recovery.

8. **Should the Department review and approve a cost-tracking accounting system in advance of allowing a targeting cost recovery mechanism?**

Please see the Companies' comments in section II.C - Cost Recovery.

9. **What aspects of a cost recovery mechanism should the Department establish?**

Please see the Companies' comments in section II.C - Cost Recovery.

10. **Should the Department establish an offset to O&M expenses to recognize cost savings from grid modernization technologies?**

Offsets to O&M expenses may or may not be applicable or appropriate and should be evaluated in the context of a company's cost recovery proceeding.

11. **Should the Department adopt metrics in this proceeding?**

Please see the Companies' comments in section II.E - Grid Modernization Metrics.

12. **What information or standards on cyber-security, if any, should apply to GMPs?**

Please see the Companies' comments in section II.G - Cyber-security.

EXHIBIT ~~25~~ 26

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PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

**DUQUESNE LIGHT COMPANY
Smart Meter Procurement and
Installation Plan**

Docket No. M-2009-2123948

August 14, 2009



SS ~~Q~~ T1814/

EXHIBIT C

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

**DUQUESNE LIGHT COMPANY
Petition for Approval of Smart
Meter Procurement and
Installation Plan**

**:
:
:
:
:**

Docket No. M-2009-2123948

**DIRECT TESTIMONY OF
Ruth Ann DeLost**

Dated: August 14, 2009

1 **A.** Yes. Because of the 99.9% actual reads for Customer Billing the EGSs start out
2 with a clean read on switching and are provided with more actual monthly
3 information on the Eligibility List. The Daily reads are utilized to populate the PJM
4 eSchedules so the EGS has a more accurate preliminary bill thus minimizing
5 reconciliation. Because Duquesne has daily reads on the majority of our
6 Residential and Small C & I accounts and we have hourly interval reads on the
7 Large C & I accounts, Duquesne is able to calculate the customer's 1CP and
8 5CP more accurately. Finally the AMR system has played an essential role in
9 supporting Duquesne's shopping environment as approximately 50% of our zonal
10 load is shopped.

11
12 **Q.** Has Duquesne achieved operational benefits by implementing the current
13 AMR system?

14 **A.** Yes. Duquesne eliminated over 90% of our meter reading work force. Our
15 Customer Service Representatives have more timely information to address
16 customer inquiries. Because Pittsburgh is a college town with at least 3 major
17 universities, and several colleges, Duquesne must support an enormous amount
18 of moves. Our AMR system has provided the means to automatically handle
19 service starts and ends. Finally the hourly interval and daily information is utilized
20 for daily forecast and day after PJM settlement and reconciliation.

21
22 **Q.** Does Duquesne expect to achieve significant cost savings with the
23 implementation of Smart Meters?



1 **A.** No. The Company has already realized significant operational savings through
2 implementation of the current AMR system. While the Company does not
3 anticipate any meaningful additional operational savings by replacing the existing
4 AMR system with smart meter technology, as we move through the process of
5 system design, vendor selection and testing, we will be better equipped to
6 identify other cost saving opportunities.
7

8 **Q.** Does any portion of Duquesne's current meter infrastructure meet the
9 minimum legislative requirements of Smart Meter technology?

10 **A.** Yes. The 900 meters on our large C & I customers with demand > 300 kw meet
11 the minimum smart meter requirements of the legislation and the additional
12 capabilities listed in the order with the exception of remote connect disconnect,
13 which cannot be done with a poly phase meter even with the newest smart
14 meters, and, while Duquesne is compliant with the nationally recognized ANSI
15 standards C12.19 and C12.21, our current meters are not C12.22 compliant.
16

17 **Q.** Does the company anticipate benefits from the current AMR environment
18 to support the energy efficiency and conservation and demand response
19 plan?

20 **A.** Partially. Because we procure hourly interval reads on our Large C & I
21 customers they can more easily participate in PJM's DSR.
22

EXHIBIT 27

**BRITISH COLUMBIA UTILITIES COMMISSION
IN THE MATTER OF THE UTILITIES COMMISSION ACT
R.S.B.C. 1996, CHAPTER 473**

And

**Re: FortisBC Energy Inc.
Application for a Certificate of Public Convenience and
Necessity for the Advanced Metering Infrastructure Project**

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PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

**Kelowna, B.C.
March 11, 2013**

PROCEEDINGS

BEFORE:

L. Kelsey,	Commission Chair / Panel Chair
N. MacMurchy,	Panel Member
D. Morton,	Panel Member

VOLUME 7

1 MR. FLYNN: Q: Thank you. On average, how many pulses
2 per day would that transmitter emit?

5 DR. SHKOLNIKOV: A: I think the number was filed as
4 interrogatory, and the average is approx I believe
5 1,286 per bursts of transmission per day.

6 MR. WARREN: A: 1268.

7 DR. SHKOLNIKOV: A: Oh, 1268.

8 MR. FLYNN: Q: Why is that different than in California
9 where it's 14,000 times per day on average?

10 MR. WARREN: A: We don't know. They use a different
11 system at PG&E, which I think was the reference that
12 you gave. So it's not the Itron OpenWay system.

13 MR. FLYNN: Q: Okay. So your then is what, please, for
14 the average meter pulsing per day?

15 MR. WARREN: A: 1268 was provided in IR responses, an
16 average.

17 MR. FLYNN: Q: What's the peak amount, the peak number,
18 the maximum number they'll pulse per day?

19 MR. WARREN: A: We don't have that information that I'm
20 aware of, but we did have the -- we did file the Itron
21 White Paper that shows what the maximum duty cycle is,
22 which would show what the total time of all of those
23 different transmissions would be at maximum. Which is
24 about 0.58 percent duty cycle.

25 **Proceeding Time 11:04 a.m. T25**

26 MR. FLYNN: Q: Were you aware that in a California

1 California Public Utility Commission that their
2 transmitter is going all the time. There was no lag.

5 So I'm trying to determine how active is
4 this LAN. Never mind the customer uses data --

5 THE CHAIRPERSON: Okay, let's just have the question,
6 please.

7 DR. SHKOLNIKOV: A: Not getting into the details of
8 Silver Spring deployment, the numbers for how active
9 the device is a function of -- they were introduced as
10 an exhibit -- is this the correct exhibit? There was
11 an OpenWay exhibit that listed the distribution and
12 the -- we've summarized it in the Exponent Report,
13 where the smart -- the advanced meter is active 0.06
14 percent of the time on average, which is about one-
15 fifth of a second in a six minute period. And then it
16 -- the maximum observed in the field study they have
17 done is 0.06 percent, and the maximum theoretical duty
18 cycle is about 5 percent of the time. So those are
19 the numbers.

20 MR. WARREN: A: So we've referred to that document a
21 few times. It's called "An examination of Itron
22 OpenWay wireless transmissions in a 24-hour duty
23 cycle", and it is in Appendix BCSEA IR 155.5.

24 Proceeding Time 11:19 a.m. T28

25 MR. FLYNN: Mr. Chair, I would like to have the
26 Commission note that there's strong disagreement

1 distance to the house.

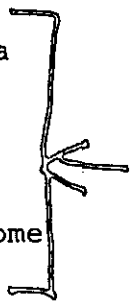
2 MR. WARREN: A: And from a practical perspective, like,
3 we say that like if you're talking about the
4 collectors that have the cellular communications card
5 in them, then they would receive signals wherever you
6 would receive a cell phone signal. So, that's the
7 only place they can be used.

8 MR. FLYNN: Q: Well, no, the gain -- the antenna will
9 have the same gain, like, 2.2 gig, or dB?

10 MR. WARREN: A: I'm not sure if it would have exactly
11 the same gain as a cellular handset.

12 MR. FLYNN: Q: In a typical -- well, let's discuss mod
13 appliances. How many smart appliances do you envision
14 each home having?

15 MR. WARREN: A: So, I think we talked about this on a
16 previous day, that we're estimating that over time
17 that we're hoping that 30 percent of -- or our best
18 guess is that 30 percent of homes will have an in-home
19 display.



20 MR. FLYNN: Q: But in one home, how many appliances do
21 you envisage?

22 MR. WARREN: A: I think we talked about that as well.
23 We haven't made any projections.

24 MR. FLYNN: Q: Well, that's terribly important, Mr.
25 Warren, simply because the more appliances, the more
26 radiation. I'm trying to get a handle on how much



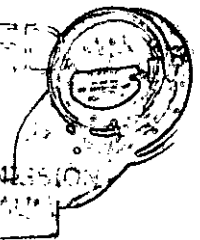
EXHIBIT 28

Smart Meter Q&A

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SECRETARY'S BUREAU



Find out more about Smart Meters and Act 129, and shop for your supplier,
at www.PAPowerSwitch.com

Switch

Pennsylvania Public Utility Commission

ARE SMART METERS REQUIRED IN PENNSYLVANIA?

Yes. Pennsylvania's Act 129 of 2008 requires the state's seven largest electric distribution companies (EDCs) to develop energy efficiency and conservation (EE&C) plans and adopt other methods of reducing electricity used by customers – including the use of smart meters by their customers. The EDCs impacted by Act 129 are Duquesne Light; Met-Ed; Penn Power; PECO Energy; Penelec; PPL Electric Utilities; and West Penn Power.

The Public Utility Commission (PUC) is charged with implementing Act 129 and helping consumers and electric utilities reduce energy consumption, especially at peak times during the day. Smart meters are being installed in new construction and at individual customers' request, with the goal of all customers utilizing smart meters by 2023. ←

WHAT IS A SMART METER?

A smart meter is an advanced meter that measures electric usage more often than conventional meters and sends that information more quickly to the customer and the EDC. Through two-way communication, smart meters also can monitor the electric distribution system to ensure it is functioning properly.

Smart meters have the following basic functions: measure the electricity used; with customer consent, remotely coordinate electricity consumption; and interface with EDCs to identify outages and provide real-time visibility into the operational status of an electrical distribution system.

HOW WILL I BENEFIT FROM THE USE OF A SMART METER?

- Smart meters can help your utility restore your service faster during power outages.
- Smart meters can help you better understand how much electricity you are using throughout the day.
- Smart meters can reduce meter-reading costs and help detect theft of electricity.

HOW COULD A SMART METER HELP ME SAVE ON MY ELECTRIC BILL?

Customers on time-of-use rate plans can use the information from smart meters to shift their usage to different times of the day when electricity costs less to produce. By using electricity more efficiently, customers can realize savings on their electric bills. For example, rather than running the dishwasher right after dinner when electric prices are higher, customers can wait until later in the evening to run the dishwasher.

IS THERE CURRENTLY A SMART METER CHARGE ON MY BILL?

Yes. The charge will be included as a separate line item or in your electric utility's base rate. You can confirm that information by contacting your utility. This charge covers the costs of assessing and deploying smart meter technology in accordance with Act 129. Under the law, utilities may begin assessing the surcharge for the work being done prior to actual installation of the meter. This charge applies to all customers.

HOW LONG WILL I PAY FOR THE SMART METER SURCHARGE THAT APPEARS ON MY BILL?

This surcharge is reviewed and approved by the PUC annually, and is subject to change. While there is no definitive timeframe to date, the surcharge is expected to remain on customers' bills as utilities work to achieve full smart meter deployment by 2023.

CAN I OPT OUT OF THE CHARGE IF I DON'T WANT A SMART METER?

No. State law does not allow a customer to "opt out" of their EDC's smart meter program or surcharge. Installation of a smart meter is a condition of service to more accurately reflect rates and usage, and will ensure no disruption to your service. Questions concerning the process or timetable for the installation of your metering equipment should be directed to your electric utility.

WHEN WILL I HAVE MY SMART METER?

Smart meters must be installed no later than 2023 for customers of the seven EDCs covered under the law. Customers who want the technology sooner may ask the EDC to install it. The customer must pay a fee for the early installation. That fee may be as little as \$17. Contact your electric utility for more information.

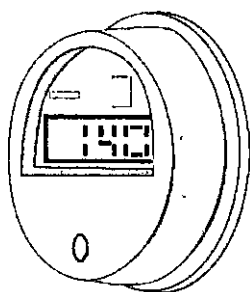
WILL MY SMART METER INFORMATION BE SECURE?

Smart meter communication network is a high-security environment that employs layers of protection from unwanted and unlawful access. Pennsylvania regulations restrict access to customer information, and do not permit an electric company or electric supplier to release private customer information to a third party without customer consent.

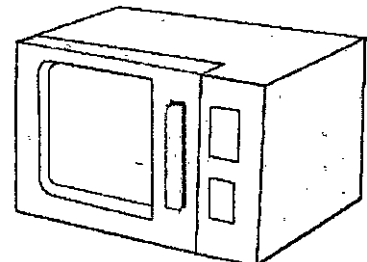
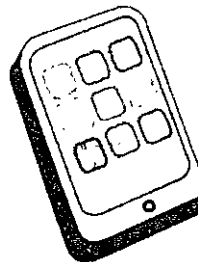
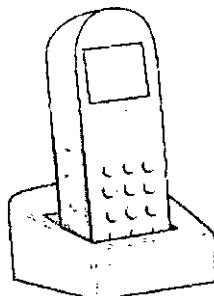
HOW DOES A SMART METER WORK?

Smart meter communications can happen over the power lines or by radio frequency (RF), just like many other devices in your home. According to a study by the California Council of Science and Technology, wireless smart meters, when installed and properly maintained, result in much smaller levels of RF exposure than many existing common household electronic devices.

UNDERSTANDING RADIO FREQUENCIES (RF) AND SMART METERS



<
less than



SMART METER =
0.00037 milliwatt
per square centimeter

CORDLESS PHONE =
0.12 milliwatt
per square centimeter

CELL PHONE =
0.19 milliwatt
per square centimeter

MICROWAVE OVEN =
0.0047 milliwatt
per square centimeter

(Resource FCC's Standard average based on 30 minutes of exposure)

FOR FURTHER INFORMATION, CONTACT YOUR UTILITY OR THE PUC:

Write

PA Public Utility Commission
Bureau of Consumer Services
P.O. Box 3265
Harrisburg, PA 17105-3265

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BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

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JUL -6-2018

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

Michele Hriadil and
Francis Hriadil,

Complainant,

vs.

No: C-2016-2571726

DUQUESNE LIGHT COMPANY,

Respondent.

CERTIFICATE OF SERVICE

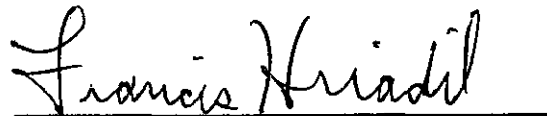
I hereby certify that I have this day served a true copy of the Complainants Response to Respondent's Motion for Summary Judgment the participant listed below in accordance with the requirements of 52 PA. Code § 1.54 (relating to service by a participant):

Via Paper Filing
Judge Jeffrey Watson
PA PUC Pittsburgh Administrative Law Judge Office
301 Fifth Ave, Suite 220
Piatt Place
Pittsburgh, PA 15222

Via Paper Filing
Jeremy V Farrell, Esquire
Paul S Miller, Esquire
1500 One PPG Place
Pittsburgh, PA 15222
(412) 594-5619 (Fax)

Counsels for Respondent, Duquesne Light Company

Dated this 6th day of July 2018



Michele and Francis Hriadil
331 Shady Ridge Drive
Monroeville, PA 15146

(412) 779-3314
hriadil@attglobal.net

DATE OF DELIVERY SPECIFIED*

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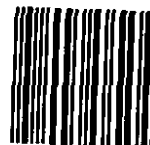
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