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October 30, 2019

Via Electronic Filing

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street
2nd Floor, Room-N201
Harrisburg, PA 17120

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

Dear Secretary Chiavetta:

Enclosed please find Duquesne Light Company's Motion in Limine to Preclude Complainants' Purported Expert Testimony. A copy of this document has been served upon Complainants in accordance with Commission regulations.

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

Sincerely,

Jeremy V. Farrell
Attorney for Duquesne Light Company

Paul Shane Miller
Attorney for Duquesne Light Company

Enclosure

cc: Michele Hriadil and Francis Hriadil (with enclosure)
Administrative Law Judge Jeffrey Watson (with enclosures)

TADMS:5214792-1 014657-158498

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

MICHELE HRIADIL and FRANCIS HRIADIL,	:	
Complainants,	:	
v.	:	No: C-2016-2571726
DUQUESNE LIGHT COMPANY,	:	
Respondent.	:	

MOTION IN LIMINE TO PRECLUDE COMPLAINANTS' PURPORTED EXPERT TESTIMONY

Filed on behalf of Respondent
Duquesne Light Company

Counsel of Record for this Party:

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NOTICE TO PLEAD

TO: COMPLAINANTS MICHELE AND FRANCIS HRIADIL:

YOU ARE HEREBY NOTIFIED TO FILE A WRITTEN RESPONSE TO DUQUESNE LIGHT'S MOTION IN LIMINE WITHIN 20 DAYS OR A JUDGMENT MAY BE ENTERED AGAINST YOU.

TUCKER ARENSBERG, P.C.

Jeremy V. Farrell, Esquire
Paul Shane Miller, Esquire
Counsel for Duquesne Light Company

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

MICHELE HRIADIL and FRANCIS HRIADIL,	:	
Complainants,	:	
v.	:	No: C-2016-2571726
DUQUESNE LIGHT COMPANY,	:	
Respondent.	:	

MOTION IN LIMINE TO PRECLUDE COMPLAINANTS' PURPORTED EXPERT TESTIMONY

Respondent Duquesne Light Company ("Duquesne Light") submits this Motion in Limine to Preclude Complainants' Purported Expert Testimony:

Introduction

Duquesne Light moves to preclude expert testimony from all three of Complainants' purported expert witnesses: Francis Hriadil, Dr. David Carpenter, and Dr. Andrew Michrowski. As discussed in more detail below, Mr. Hriadil should be precluded from testifying as an expert witness because he lacks a reasonable pretension to specialized knowledge about the broad subject matter of his testimony. Dr. Michrowski's proposed testimony suffers from the same flaw; in addition, he plans to testify about matters that are far outside the scope of this case. Finally, Dr. Carpenter's expert testimony should be precluded because this Commission (and many other jurisdictions) have repeatedly held that his opinions and analysis of the alleged health effects of RF and EMF are not generally accepted in the scientific community, which is a threshold requirement for admissibility of expert testimony under Pa. R.E. 702.

Background

This case has a long procedural history, so Duquesne Light will only provide the facts relevant to this Motion. On April 18, 2019, Duquesne Light filed a Motion in Limine to Preclude Complainants' Purported Expert Testimony for Failure to Produce Required Expert Reports. Duquesne Light argued that Complainants' three purported expert witnesses – Complainant Francis Hriadil, Dr. Andrew Michrowski, and Dr. David Carpenter – should be precluded from testifying because Complainants failed to provide Duquesne Light with expert reports or other documents stating the specific facts and opinions to which they will testify, despite being required to do so by Duquesne Light's discovery requests and 52 Pa. Code § 5.324(a)(1)(ii). Complainants opposed Duquesne Light's motion.

On June 6, 2019, the Presiding ALJ issued an Interim Order Granting, in Part, the Motion in Limine to Preclude Complainants' Purported Expert Testimony for Failure to Produce Required Expert Reports and Requiring the Exchange of Expert Reports Between the Parties of All Individuals Who Intend to Present any Expert Testimony ("Interim Order"). The Presiding ALJ ruled that Complainants had to provide Duquesne Light with written reports and a *curriculum vitae* for each purported expert witness on or before July 10, 2019. The Presiding ALJ further stated in the Interim Order that "nothing in this order shall be construed to be ruling on the admissibility or competency of any expert or other witness to testify at the hearing in this proceeding and the Parties will be required to establish the admissibility of the proposed testimony and any proposed evidence at the hearing in this proceeding."

Complainants subsequently served expert reports and *curriculum vitae* for Francis Hriadil, Dr. Michrowski, and Dr. Carpenter. After reviewing these documents, Duquesne Light still contends that none of these witnesses may testify as experts under the applicable rules.

Accordingly, Duquesne Light moves to preclude their expert testimony[1] for the reasons set forth below.

Argument

I. Mr. Hriadil lacks a reasonable pretension to specialized knowledge about the broad subjects on which he wants to offer 'expert' testimony.

Mr. Hriadil's expert report, a copy of which is attached as Exhibit A, states that because he is a "retired engineer, systems analyst, and inventor in the defense and non-defense sectors, and a consultant, etc.," his "expert" testimony will focus on the technical aspects of Duquesne Light's smart meter, its impact and consequences, and compliance with unspecified codes (presumably regulations promulgated by the Federal Communications Commission (FCC)). *See* Additional Expert Report/Statement and Curriculum Vitae of Complainants' Expert Witness, Francis Hriadil, MS, p. 1. In reality, however, Mr. Hriadil's expert report strays far beyond those subjects. All told, Mr. Hriadil's expert report indicates that he plans to testify about the following topics:

- The engineering, technical, technological, and operational characteristics of Duquesne Light's smart meter;
- Whether Duquesne Light's smart meter complies with all relevant "specifications, authorizations, and codes that it must adhere to";
- The health effects of Duquesne Light's smart meter program;
- Whether Duquesne Light's smart meters create a fire risk;
- The economic consequences of Duquesne Light's smart meter program; and
- Whether Duquesne Light's smart meter grid is vulnerable to hacking or cybersecurity threats.

Id. at 6, 24-25.

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[1] Nothing in this Motion seeks to prevent Complainants from offering fact testimony about relevant matters within their personal knowledge. This Motion deals solely with expert testimony and opinion.

But Mr. Hriadil does not qualify as an expert on any of those subject matters. Under Pennsylvania law, a person qualifies as an expert witness if, through *education, occupation, or practical experience*, he or she has a reasonable pretension to *specialized knowledge* on *the matter at issue*. *Ruzzi v. Butler Petroleum Co.*, 588 A.2d 1, 10 (Pa. 1991); *Kursis v. Baldwin-Lima-Hamilton Corp.*, 319 A.2d 914, 924 (Pa. 1974).

A witness does not qualify as an expert merely because he or she possesses general knowledge about a topic or subject matter. As noted, the knowledge must (1) be specialized, (2) come from the witness's own education, occupation, or practical experience, and (3) relate to the subject matter involved in the case. A witness's failure to clear any of those three warrants preclusion of his or her proposed expert testimony. *See Kovalev v. Sowell,* 839 A.2d 359, 364 (Pa. Super. Ct. 2003) (ophthalmologist not qualified to testify about the causes and treatment of heart disease even though he had general knowledge of the human body); *Dierolf v. Slade*, 581 A.2d 649 (Pa. Super. Ct. 1990) (upholding trial court's refusal to qualify orthodontist as an expert witness on oral surgery); *Yacoub v. Lehigh Valley Med. Associates*, 805 A.2d 579 (Pa. Super. Ct. 2002) (neurosurgeon not qualified to give opinion on internal medicine or nursing).

The distinction between a fact (or lay) and expert witness is important here. Duquesne Light does not seek to prevent Mr. Hriadil from testifying altogether, only from testifying as an "expert." An expert witness may testify in the form of an opinion about scientific or technical matters; a lay witness cannot. Pa. R.E. 701, 702. Duquesne Light does not dispute that Mr. Hriadil may offer fact testimony about relevant matters within his personal knowledge and/or describe the reasons why he is concerned about the installation of a smart meter at his residence. But that does not mean that Mr. Hriadil's testimony on all the subject matters above should be credited as "expert" under the applicable standards.

That is because Mr. Hriadil lacks a reasonable pretension to specialized knowledge about each of the topics on which he wants to offer expert testimony. Although Mr. Hriadil may possess some professional engineering experience, there is no evidence in the record that he has any specialized knowledge from his own education, profession, or practical experience about smart meters, how they operate, the impact of their RF transmissions on human health, whether they comply with federal regulations, and the like. His background is not in electrical engineering, he has admitted he is not a certified electrician, and he has no professional experience or educational background relating to RF or LF transmissions. *See* Response to Respondent's Second Set of Discovery Requests Directed to Complainants at ¶ 4, 20, 24 (attached as Exhibit B). Accordingly, Mr. Hriadil lacks any specialized knowledge about how Duquesne Light's smart meters operate, or whether they comply with all relevant specifications, authorizations, and codes.

Without a professional or educational background in the relevant subject matter, Mr. Hriadil's testimony will merely be a recapitulation of material he has read about smart meters or RF exposure that was prepared by other people, which constitutes hearsay that was prepared by an author who Duquesne Light will not be able to cross-examine. Again, Mr. Hriadil may testify– as a fact witness – that his review of the literature is what sparked his concerns about the installation of a smart meter, but that simply does not entitle him to offer that testimony in an "expert" capacity.

Mr. Hriadil has even less of a claim to specialized knowledge about the other topics that he apparently plans to testify about. He has no medical training or professional experience and thus cannot offer an opinion about the alleged adverse health effects of Duquesne Light's smart meters. *See Baum v. Metropolitan Life Ins. Co.*, 19 A.2d 486, 487 (Pa. Super. Ct. 1941) (the existence or non-existence of a disease is only discoverable through the training and

experience of a medical expert); *In re Commitment of Barbour*, 733 A.2d 1286, 1288 (Pa. Super. Ct. 1999) (a layperson may not provide a medical diagnosis). Similarly, he has no educational, professional, or practical experience that provides him with specialized knowledge about the supposed fire risks, economic impact of Duquesne Light's smart meter program, or the Company's cybersecurity measures.

Duquesne Light is not here disputing the credentials in Mr. Hriadil's CV. But those credentials simply do not show that he has *specialized* knowledge on the specific matters at issue here acquired through his own *education, occupation, or practical experience*. For those reasons, Mr. Hriadil should not be treated as an expert witness at the upcoming hearing.

II. Dr. Andrew Michrowski should be precluded from testifying as an expert witness because (a) he lacks a reasonable pretension to specialized knowledge about the topic of his planned testimony, and (b) he plans to testify about topics that are outside the scope of this case.

Dr. Andrew Michrowski – who is not a medical doctor but rather holds a doctoral degree in architecture – also must be precluded from testifying as an expert witness at any hearing in this matter. Dr. Michrowski's expert report indicates that he plans to testify about the following subjects:

- The alleged adverse health effects associated with the proliferation of RF (which he sometimes refers to as an electromagnetic haze), including smart meters;
- Safety concerns associated with smart meters, such as fires and explosions; and
- The economic consequences and insurance coverage concerns relating to smart meters.

See Expert Reports of Andrew Michrowski, PhD, which are attached collectively as Exhibit C. Each of these subjects will be discussed separately.

A. Dr. Michrowski is not a medical professional and so cannot offer expert testimony about health-related subjects.

According to Dr. Michrowski's *curriculum vitae*, he received a doctorate in architecture and urbanism from a university in Italy. Although impressive, this course of study does not qualify Dr. Michrowski to testify about supposed health problems Complainants claim they may experience from Duquesne Light's smart meters. He is not a doctor, did not attend medical school, is not an epidemiologist, and has no reasonable claim to being a professional in the medical industry. Even a cursory review of Dr. Michrowski's report reveals the truth of this fact. For example, the first portion of his expert report summarizes his analysis as follows:

> "In **our** expert opinion, and based on monitoring that **we** have made with occupants with smart meters and their premises for several years, as well as an assessment of the related and relevant medical records of **some** of **these** individuals, the complaint docket is sufficiently credible, with the **potential for proof** of health concern effects, to reserve considerable risk of adverse affectation from the meter being deployed **that merit further judicial review** on behalf of the best interests and well-being of Francis and Michele Hriadil, **of the citizens of Pennsylvania**....

Exhibit C at 2. The flaws in just this short summary of Dr. Michrowski's opinion show that he is not an expert in subjects involving health, which is not surprising since he is not a doctor and has no medical background:

- Dr. Michrowski's analysis is based on more than just his own education, occupation, and practical experience, as demonstrated by his use of phrases like "*our* expert opinion" and that monitoring that "*we*" have made. Id. (emphasis added). The fact that Dr. Michrowksi is attempting to piggyback off the qualifications of other unknown, unidentified individuals shows his own expertise does not cover health-related issues.

- Dr. Michrowki's opinions are couched in speculation and possibility, as demonstrated by his statement there is the "potential for proof" of health effects and that he merely thinks that "further judicial review" is warranted. Similar statements can be found throughout Dr. Michrowski's reports (Exhibit C). Notably, **nowhere in his two reports does Dr. Michrowski issue a single opinion within a reasonable degree of scientific or medical certainty.**

- Dr. Michrowski is broadly advocating for an opt-out for all Pennsylvania citizens, relief which the Commission – and the Presiding ALJ – have repeatedly refused to award in similar smart meter cases. The individuals who were monitored and had their medical

records reviewed by the unnamed "we" in Dr. Michrowski's report were not Complainants. Dr. Michrowski fails to make any detailed, specific analysis with respect to Complainants and, in fact, notes the danger that the "electromagnetic haze" (which by Dr. Michrowski's own admission is composed of many things beyond smart meters) poses to things like "flora and fauna" nearly as often (if not more often) as he mentions the names of Francis or Michele Hriadil.

There simply is no conceivable basis on which Dr. Michrowski can claim a reasonable pretension to specialized knowledge about health-related issues, *Ruzzi*, 588 A.2d at 10; *Kursis*, 319 A.2d at 924, and so he should not be permitted to testify on such matters.

B. Dr. Michrowski has identified no safety concerns posed by Duquesne Light's smart meter practices and so may not offer expert testimony on that area.

Dr. Michrowski does not claim to be a certified fire investigator or have any professional background with respect to fire safety and investigation. Yet he argues in his report that smart meters – generally – are a fire hazard. *See* Michrowski's Second Report (included within Exhibit C) at p. 2. But he has not identified any fire attributable to a smart meter deployed by Duquesne Light, nor does he contend that there is any specific deficiency that makes Duquesne Light's smart meters a fire risk. Rather, Dr. Michrowski instead seems to be arguing that some smart meters in other jurisdictions have been connected with fires and, therefore, all smart meters pose a fire risk. *See* Michrowski's Second Report at 2. Notwithstanding the fact that this is basically a collateral attack on the mandatory implementation of smart meters, Dr. Michrowski does not cite any official authority, like a cause and origin report, to support his broad claims. And, again, he offers no opinions on this subject matter within any degree of certainty.

Thus, Dr. Michrowski's testimony on this issue would be limited to a discussion that he believes some fires in some other places have something to do with smart meters. And it would be offered by an individual who does not claim to have any specialized knowledge or

experience in fire safety issues. Such testimony should not be permitted to be offered into evidence.

C. Economic considerations and insurance coverage issues are outside the scope of this case.

The Presiding ALJ has already ruled that the issue in this hearing is whether Duquesne Light violated the Pennsylvania Public Utility Code (which requires Duquesne Light to install a smart meter at Complainants' residence), the associated regulations, or the Company's tariff. First Supplemental Prehearing Order, Feb. 6, 2018; Prehearing Order, Dec. 15, 2017. This action is *not* a collateral attack on Duquesne Light's smart meter implementation plan, which the Commission approved several years ago following a public proceeding, *see, e.g.,* Docket No. M-2009-2123948 (Pa. P.U.C. Opinion and Order entered May 6, 2014), nor is it a challenge to the scientific merit of Act 129's mandatory universal deployment of smart meters, which is settled law and binding precedent.[2] Dr. Michrowski's planned testimony about the economic consequences and insurance coverage concerns relating to smart meters is far outside the limited scope this hearing, not to mention his purported areas of expertise.

Since Dr. Michrowski should not be allowed to testify to any of the topics identified in his report, his testimony should be precluded in its entirety. Accordingly, Dr. Michrowski should be precluded from testifying as an expert witness at the upcoming hearing.

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[2] See Hoffman-Lorah v. PPL Elec. Util. Corp., Docket No. C-2018-2644957, 2019 WL 2325713, at *28 (Pa. P.U.C. May 23, 2019) (no provision in the Public Utility Code or the Commission's Regulations or Orders allows a customer to "opt out" of receiving a smart meter); Paul v. PECO Energy Co., Docket No. C-2015-2475355, 2018 WL 3093596, at *4-5 (Pa. P.U.C. June 14, 2018) (same); Povacz v. PECO Energy Co., Docket No. C-2012-2317176, 2013 WL 392699, at *6 (Pa. P.U.C. Jan. 24, 2013) (same).

III. Dr. David Carpenter should be precluded from testifying as an expert witness because his methodology has not been generally accepted in his field.

While Duquesne Light does not dispute that Dr. Carpenter qualifies as an expert in public health generally, that does not answer the question of whether his testimony is admissible in this case. As an initial matter, Dr. Carpenter acknowledges in his own report (a copy of which is attached as Exhibit D) that his personal research experience is not devoted to issues involving RF. Exhibit D at 12. More importantly, to testify as an expert, a witness's methodology must be generally accepted in the relevant field. Pa. R.E. 702(c). Dr. Carpenter fails to satisfy this threshold requirement.

Dr. Carpenter's expert report states that he will testify about the alleged adverse health effects of smart meters. In particular, he plans to testify that exposure to Duquesne Light's smart meter will cause harm to Complainants and "the human condition in general." Exhibit D at 1. Dr. Carpenter contends that the public should adopt a "cautionary stance" and employ "prudent avoidance" until the alleged risks of smart meters are more fully understood. Id. at 2. The gist of Dr. Carpenter's position is that the scientific community has ignored studies demonstrating an association between RF exposure and adverse human health effects like cancer (including the Bioinitiatve Report,[3] which he helped bring to life) and that the FCC's maximum permissible exposure standards are not sufficiently protective of human health. Exhibit D.

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[3] The BioInitiative Report itself has already been found to be flawed by the Commission because advocates for a particular result and is not an objective review of the entire body of scientific and medical evidence. Richard N. Myers, No. C-2017-2620710, 2018 WL 4185437, at *14 (Aug. 16, 2018) ("Because the BioInitiative Report is an advocacy document written in order to cast the science of RF exposure in a particular light, the report does not provide a balanced view of the scientific research").

Dr. Carpenter has attempted to offer this testimony in various proceedings in various forums over the past 10 years. His analysis is routinely rejected.

Perhaps the most notable example is the Commission's recent decision in *Myers v. PPL Electric Utilities Corp.*, Docket No. C-2017-2620710, 2018 WL 4185437 (Pa. P.U.C. Aug. 16, 2018) (Barnes, ALJ). In her opinion denying Mr. Myers' smart meter complaint, ALJ Barnes summarized Dr. Carpenter's testimony as follows:

> He opines that excessive exposure to radiofrequency like magnetic fields is associated with adverse health effects, including elevation of cancer of the nervous system. Dr. Carpenter testified that agencies and individuals are in denial of the thousands of publications that report adverse health effects at intensities that do not generate tissue heating. Dr. Carpenter bases his opinion in part upon the BioInitiative Report 2012. Dr. Carpenter admits the AMI meter average emissions are in compliance with the FCC's standards for RF emissions. However, Dr. Carpenter contends the FCC does not have the correct standard measuring the intensity of the impulses. Dr. Carpenter disagrees with the methodology of measurement as the standards do not address the intensity of the pulses, only average exposure over time. Further, Dr. Carpenter testified there are individuals with conflicts of interest and strong ties in the telecommunications industry influencing the FCC who ignore evidence and are under undue influence from the industry.

Id. at *13. That is substantively identical to the Dr. Carpenter intends to offer again at this hearing.

The ALJ rejected Dr. Carpenter's testimony, noting that it had been "found to have been flawed in prior judiciary proceedings." *Id.* at *16. The ALJ's decision in *Myers* was later affirmed by the full Commission who likewise found Dr. Carpenter's testimony to be unreliable:

> Although the ALJ qualified Dr. Carpenter as a medical expert in public health, the ALJ also provided that Dr. Carpenter's opinions have been found to be flawed in prior judicial proceedings. We note that in 2010, in an electric siting line case before the Commission, Dr. Carpenter's opinions about the scientific research showing adverse health effects from EMF were deemed 'flawed' and 'extreme' and were rejected by the Commission as 'unsubstantiated.' (citing *Application of PPL Elec. Utils Corp. Filed Pursuant to 52 Pa. Code Chapter 57, Subchapter 6, for Approval of the Siting and Constr. Of the Pa. Portion of the Proposed*

> *Susquehanna-Roseland 500kV Transmission Line in Portions of Lackawanna, Luzerne, Monroe, Pike, and Wayne Cntys., Pa.*, Docket Nos. A-2009-2082652 et al, 2010 Pa. PUC LEXIS 434, at *172-173 (Order entered Dec. 12, 2010).
>
> Dr. Carpenter testified that the BioInitiative Report was an advocacy document and authors were selected based on their opinion about RF and health effects. Dr. Carpenter did not acknowledge until he was asked about it directly that his paper submitted to the President's Cancer Panel that included a new exposure limit for RF was rejected. Dr. Carpenter ignored the IARC findings that showed inadequate evidence of adverse health effects from smart meter RF because he disagreed with the IARC findings. Based on this record evidence, we find that Dr. Carpenter's testimony is unreliable.

2019 WL 4247028 at *25-26 (some internal punctuation and record cites omitted).

Similar decision have been reached in other jurisdictions. *Lakey v. Puget Sound Energy, Inc.*, 296 P.3d 860, 863-66 (Wash. 2013) (en banc) (excluding Dr. Carpenter's testimony on EMF issues at an evidentiary hearing because his "theories lacked general acceptance in the scientific community and that [he] failed to follow proper epidemiological methodology, rendering [his] conclusions unreliable."); *Barker v. East Kentucky Power Cooperative Inc.* Kentucky Public Service Commission Case No. 2013-00291, 2015 Ky. LEXIS 609 at p. 21 ("Complainants' expert witness, Dr. Carpenter, testified to his belief that EMF levels far below those at Complainants' property are more than likely carcinogenic and otherwise harmful. However, Dr. Carpenter's testimony has been roundly criticized and rejected by many other tribunals in which he has appeared as a witness. Dr. Carpenter has never personal[ly] conducted any studies regarding EMF exposure. Tribunals including the Pennsylvania and Minnesota commissions, Washington Supreme Court and U.S. District Court of the Southern District of Indiana have found that his testimony is far more akin to advocacy.").

The foregoing makes clear that Dr. Carpenter's testimony on the alleged health effects associated with EMF and RF are not generally accepted in the field, which is a threshold

requirement to admissibility of an expert's opinion under Pa. R.E. 702(c). Since that threshold requirement is not met, Dr. Carpenter may not offer his opinions in this case.

Conclusion

Duquesne Light respectfully requests that the Presiding ALJ issue an order that prohibits Complainants from offering expert testimony at any hearing in this matter from Francis Hriadil, Dr. Andrew Michrowski, and Dr. David Carpenter.

Respectfully submitted,

TUCKER ARENSBERG, P.C.

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TADMS:5219152-1 014657-158498

= [EXHIBIT B-1] =

EXPERT REPORT / STATEMENT
OF
FRANCIS HRIADIL, MS (M.I.T)
Engineer, Systems Analyst, Inventor (retired)

331 Shady Ridge Drive
Monroeville, Pennsylvania

(1) General Statement of my Expert Technical Determination:

The views and conclusions stated herein are made with more than a reasonable degree of technical, engineering, and scientific certainty and confidence. They are based upon the reports and studies referred to herein, my general knowledge derived from those materials, my educational and professional background and study as applied to my review of these materials.

As a retired engineer, systems analyst, and inventor in the defense and non-defense sectors, and a consultant, etc., my focus here will be on the engineering, technical, technological, and operational characteristics of the Duquesne Light Company smart meter, its impact and consequences, and its compliance in light of the specifications, authorizations, and codes that it must adhere to. Furthermore, where appropriate, I will make reference to other experts and other expert sources. Discussion of issues related to health, law, etc. will be presented elsewhere.

It is my expert statement that Duquesne Light Company's wireless digital pulsed radiating smart meter, the Itron / Centron OpenWay SK9AMI7 smart meter, with its Switch Mode Power Supply (SMPS) operating in its smart mesh, that Duquesne Light Company (DLC) wishes to deploy at the Hriadil's residences (331 Shady Ridge Drive, Monroeville, Pennsylvania; and 810 Selby Way, Pittsburgh, Pennsylvania), is inappropriate, unreasonable, and unsafe, and is not being operated in the manner that Duquesne Light Company claims that it is.

It is my expert statement that Duquesne Light Company has not been forthright and complete in its description of the use and operation of its smart grid to the Hriadils, the general public, and the PA PUC.

It is my expert statement that the smart grid technology being deployed by Duquesne Light Company, is overly complex, immature, fragile, inaccurate, unsafe, unreliable, expensive, insecure, intrusive, and possesses many risks, dangers, and unknowns.

It is my expert statement that the manner and deployment of Duquesne Light Company's smart meter / smart mesh technology does not provide for the proper accommodation, convenience, and safety of its customers and the public.

As such, it is my expert statement that the Duquesne Light Company smart meter program is in violation of a number specifications, authorizations, and codes including but not limited to 66 Pa. C.S. § 1501, 52 Pa. Code § 57.194 (a), Article I, Section 27 of the Constitution of the Commonwealth of Pennsylvania, and the FCC Grants of Equipment Authorization for the SK9AMI7 900 MHz LAN and the 802.15.4 2.4 GHz ZigBee Module.

(2) My Background

A concise summary of my background includes the following:

- I have an advanced degree (MS) from M.I.T, and have 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.
- I worked in the Defense sector on both advanced strategic and tactical missile programs.
- I 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, I had and continue to have access to various industry publications not available to the general public.

My Curriculum Vitae has been provided to substantiate my qualifications to testify in the capacity of an expert in this proceeding. I am currently retired.

(3) Concerning System Operation and Performance

In its literature and filings, Duquesne Light Company makes the following statement:

> "The Company's smart meters, like its traditional analog meters, utilize low-energy RF waves to transmit electricity, but transmit RF waves for only short periods every day."

This is not an accurate description of how the Duquesne Light / Itron / Centron SK9AMI7 OpenWay Smart Meter operates in the Smart Grid that Duquesne Light is deploying. Customers are not being fully informed and given a complete and accurate description of the technology that is being employed and how it is being operated.

The statement that "the Company's smart meters" operate "like its traditional analog meters" is disingenuous and blatantly untrue. Smart Meters in a Smart Grid are nothing like traditional electro-mechanical Analog Meters in design, construction, safety, reliability, and operation.

In its Discovery responses, Duquesne Light Company has admitted to the fact.

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

(3a) Pulse Transmissions.

The statement that "the Company's smart meters ... transmit RF waves for only short periods every day" is also disingenuous and blatantly untrue. The SK9AMI7 Smart Meter, in fact, pulse radiates high intensity RF waves 100s to 1000s to 10000s to potentially 1000000s of times a day to communicate with the other smart meters in the smart grid, and/or with the cell relay.

Duquesne Light, as do many other EDCs, never make this clear in their literature, or in their remarks. And, it has not been supplied in any of its Exhibits. They typically bury this particular detail, if they even present it at all. Their statements, literature, and presentations are generalizations that are full of misrepresentations and inaccuracies. It is a material fact that it took a Court Order by California PUC ALJ Judge Amy C. Yip-Kikugawa to compel PG&E (a CA EDC) and Itron (the smart meter manufacturer of Duquesne Light Company's SK9AMI7 smart meter) to provide the true data.

Specifically, PG&E, Itron, et al, were forced to reveal that while each of their smart meters broadcasts actual usage data only 6 times a day to the EDC, each meter actually emits a signal on average 1,000s of times a day, and specifically in the case of PG&E 10,000 times a day, and in some cases as often as 132 times per sec. Most of these emissions are for communication with all of the other meters in the network. PG&E also admitted that their Itron smart meter's peak power is 2.5 Watts, which is 10x more powerful than a cellphone, and that it continuously emits a small amount of radiation even when not broadcasting.

Why is California pertinent to this Formal Complaint? It is pertinent because Itron is the manufacturer of the SK9AMI7 OpenWay Centron Smart Meter being deployed by Duquesne Light Company, and the Duquesne Light Company has specifically referred to California in its plans, filings, and responses.

As for the true number of transmissions that occurs in a day with 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" 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 data supplied by Itron and testimony provided by the users of their SK9AMI7 smart meter, I performed an analysis of the true pulse transmission behavior of the SK9AMI7 smart meter being deployed by Duquesne Light Company. (Ref: Discovery Exhibit E-3)

The results of this analysis produces the following correlative results:

	Duty Cycle	Time in 24 hr	Number of Pulse Transmissons 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)

Using additional data on the SK9AMI7 provided under documented testimony of FortisBC Energy Inc. to the British Columbia Utilities Commission, which was confirmed by Duquesne Light Company in Discovery, these results are more accurately determined to be:

	Duty Cycle	Time in 24 hr	Number of Pulse Transmissons 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)

The evidence is clear and incontrovertible here that the SK9MIA7 smart meters broadcast 100s to 1000s to 10000s to potentially 100000s 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 disingenuous Duquesne Light statement that they "transmit for only short periods every day."

Further, since the smart meter is programmable, Duquesne Light Company can increase the Duty Cycle at any time, for any reason, and to as high a level as it wants, unbeknownst to the customer, and to the PA PUC as well. There is no oversight or limitation on this operational capability, which Duquesne Light Company has stated that it views as a proprietary "business process."

Duquesne Light Company makes the assertion that its meters operate at "very low duty cycles." Yet, it neglects to inform that this represents 1,000s - 10,000s of pulsed transmissions occurring unceasingly throughout the day, both day and night, with the potential for pulsed transmissions as high as 100,000s of times a day, as has been calculated. Data presented from Itron by Duquesne Light Company indicates that the Duty Cycle of individual Smart Meters varies widely. And, the data that has been presented reflects only hourly data accumulation rates, not the 15 min or more frequent accumulation rates that their Smart Meters are intended to be operated at in the future. 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. By its own admission, Duquesne Light Company admits that 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 utility. 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., and how they are being used and operated.

The SK9IMA7 Smart Meter, and other meters of its type, use Switch-Mode Power Supplies (SMPS). They contain AC/DC switching circuitry which interrupts current flow, and use current in small, very fast pulses. This causes Voltage Spiking on the home's interior electrical wiring, on the home's 60 Hz interior electrical grid. This turns the home's interior electrical wiring grid into a transmitting antenna which also pulses Low Frequency (LF) Radiation throughout the entire house in sync with the RF transmission bursts.

Smart meters, such as the ITRON SK9MIA7, actually produce 2 types of pulsed emissions:

1. Wireless RF (Radio Frequency) Radiation through the air

   900 MHz (900,000,000 Hz) - the SK9AMI7 900 MHz LAN

   this is how the Smart Meter communicates with other Smart Meters and the utility company

   2.4 GHz (2,400,000,000 Hz) - the 2.4 GHz ZigBee Module

   this is how the Smart Meter communicates with Smart Appliances in the Home

2. LF (Low Frequency) Radiation from the House Wiring due to induced Voltage Transients

   2 kHz - 50 kHz (2,000 Hz - 50,000 Hz)

These emissions are a new, not normal, not natural, intense and frequent, ongoing environmental factor, an unrelenting radio-frequency (RF) contaminant, that is now being introduced into our homes and living environments. They are invisible. You can't see them. They have been shown by numerous reputable, respected, credentialed, unbiased, and independent experts, institutions, associations, and agencies to represent a credible and increasing threat of harm, especially to children and the elderly (of which we are members). The specifics of this health issue will be addressed by Complainants' expert witnesses, Dr Carpenter and Dr Michrowski.

But, it does not take an engineering, scientific, or medical degree to understand that human beings are electrical creatures. Our bodies possess a natural "biological electrical grid", which is the human 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 body depends on the body's natural, internal electrical signals. And, our brains work at different frequencies, at different times and in different states.

The human body is also a "human receiving antenna." As such, our cells cannot stop receiving the signals coming from transmitting devices such as a smart meter. We cannot simply turn this reception off. The only thing that we can do is turn the transmitters off. Current science indicates that our cells are affected and disturbed by these signals. Numerous health and medical experts are now warning that our cells are not compatible with these signals. And, any electrical disruption and failure that the body suffers at the cellular level leads to disease processes. This is the fundamental underlining material fact of the situation.

(3b) Other factors Affecting Emissions / Exposure.

There are many significant unaccounted for factors in the indiscriminate deployment of Smart Meters, such as the SK9AMI7, in a smart grid. There are many conditions that can influence Radiofrequency radiation levels in the home environment.

- there are uncertainties about the existing RF environment at a location
  There is no knowledge or even concern about the current RF baseline at a location, i.e. how much RF exposure already exists at a location
- there is no account taken of what kind of reflective and re-radiation interior and exterior environments exist at a location (the reflection and re-radiation factor).
  Reflections and re-radiation can come from common building materials (tile, concrete, stainless steel, glass, ceramics) and highly reflective appliances and furnishings that are common in kitchens, for example.
- there is no account taken of how interior and exterior space is utilized near walls where the smart meters are mounted,
- there is no account taken of other characteristics of residents
  (age, medical condition, disabilities, medical implants, relative health, reliance on critical care equipment that may be subject to electronic interference, etc)
- there is no account taken of the unrestrained access to areas of the property where the smart meter(s) are located

All of these are serious considerations that cannot simply and logically be ignored. They argue for a reasonable, restrained approach; not an indiscriminate, universal, "across the board without exception" deployment.

(3c) Smart Meter Emissions vs Cellphones, etc.

Duquesne Light Company, and other EDCs, state that the whole body exposure from a Smart Meter is orders of magnitude lower than that from a cellphone, based principally on a report by the California Council of Service and Technology (CCST). The truth of the matter is that the reverse is the case. The whole body exposure from a Smart Meter is actually orders of magnitude greater than that of a cellphone, rather than orders of magnitude lower as is erroneously claimed by Duquesne Light and other EDCs.

In its filings, Duquesne Light Company specifically references the "study" carried out by the California Council of Service and Technology (CCST), which states 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."

This "study" asserts that "smart meters are safe" and "smart meters are safer than cellphones" This "study" and these fallacies have been refuted and discredited by no less than 13 separate and independent expert sources (Ref: Discovery Exhibits E-17-00 - E-17-14), namely:

Elihu Richter, MD, MPH
School of Public Health and Community Medicine
Hebrew University

David O. Carpenter, MD,
Director, Institute for Health and the Environment
University at Albany, New York

Olle Johansson, PhD
Department of Neuroscience,
Experimental Dermatology Unit
Karolinska Institute, Sweden

Lukas Margaritis, PhD,
Professor of Cell Biology and Electron Microscopy
University of Athens, Greece

Samuel Milham, MD, MPH
Epidemiologist (Retired)
Washington State Health Department

Magda Havas, PhD
Environmental and Resource Studies
Trent University, Ontario, Canada

Nancy Evans, BS
Health Science Consultant
San Francisco, CA

Cindy Sage, MA
Sage Associates, Co-Editor, BioInitiative Report
Author – Smart Meter RF Assessment Report
Santa Barbara, CA

Raymond Richard Neutra MD. Dr. PH
Albany, CA

Janet Newton, President
EMR Policy Institute
Marshfield, Vermont

Karl Maret, MD
Dove Health Alliance
Aptos, California

Yasuko Kato, Association Director
VOC-EMF Measures Research
Hokkaido, Japan

Daniel Hirsch, Radiation Expert,
Senior lecturer on nuclear policy,
and UCSC instructor
University of California, Santa Cruz, CA

Quoting just from three of these sources here:

- David Carpenter M.D., Public Health Physician and Former Dean of the School of Public Health at the University at Albany, on the faulty report by the California Council on Science and Technology entitled, "Health Impacts of Radiofrequency from Smart Meters." Dr. Carpenter asserts and has testified that "there is conclusive evidence for adverse health effects in humans."
- Daniel Hirsch, University of California, SC, Lecturer, Director of Program on Environmental and Nuclear Policy, on the same faulty report by the California

Council on Science and Technology, which was based on estimates from the Electric Power Research Institute (EPRI), an industry group. His analysis shows that the whole body exposure from a Smart Meter is actually orders of magnitude higher than that of a cell phone, rather than orders of magnitude lower as is routinely claimed.

- Karl Maret, M.D., BS in EE, MS in BE, President of Dove Health Alliance, a non-profit foundation specializing in the area of Energy Medicine, also asserts that this same CCST report used by many as evidence to validate the safety of smart meters 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

Further corroboration comes from the FCC itself. The FCC Grant of Equipment Authorization (Ref: Discovery Exhibit E-30) for the SK9AMI7 Smart Meter requires at least a 20 cm (8 inch) separation from the Smart Meter. Yet, cell phone manuals warn that people need only stay 1 - 2 cm away from a "supposedly stronger radiating" cell phone. That is, the FCC requires more than an order of magnitude greater separation distance from a Smart Meter, than that needed for a cell phone. These numbers reveal the actual truth of the matter.

(3d) Smart Meter vs Current Meter.

Duquesne Light Company 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. Nevertheless, the most appropriate meter that has been recommended for use with the Hriadils, the one that the Hriadils desire, 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 the Hriadils current electro-mechanical 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.

Furthermore, Duquesne Light Company in Discovery has admitted the following.

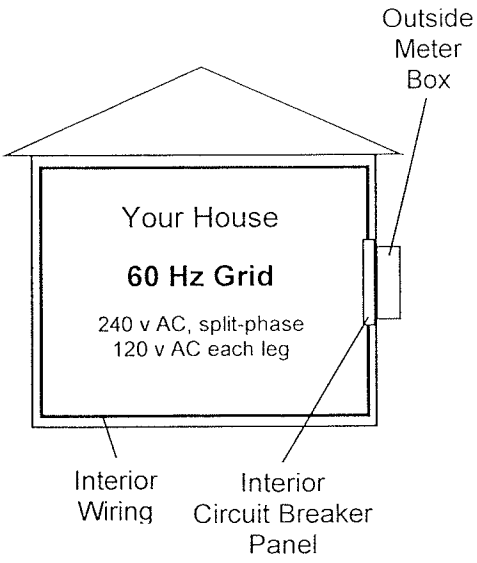
> *"Since smart meters are solid state electronic devices and Ferrous meters are electro-magnetic devices, their behavior is different."*

(3e) Overview of the True Nature and Operational Character of a Smart Meter.

What is the true nature and operational character of a smart meter, such as the Duquesne Light / ITRON SK9AMI7 smart meter, being deployed in a Smart Grid. What is the true comparison of "the BEFORE" and "the AFTER"? A detailed review of all of the available literature, documentation, etc. provides the following (Reference: Discovery Exhibit E-5).

"The BEFORE" - the original, traditional non-emitting Analog Meter:

[EXHIBIT B-1]



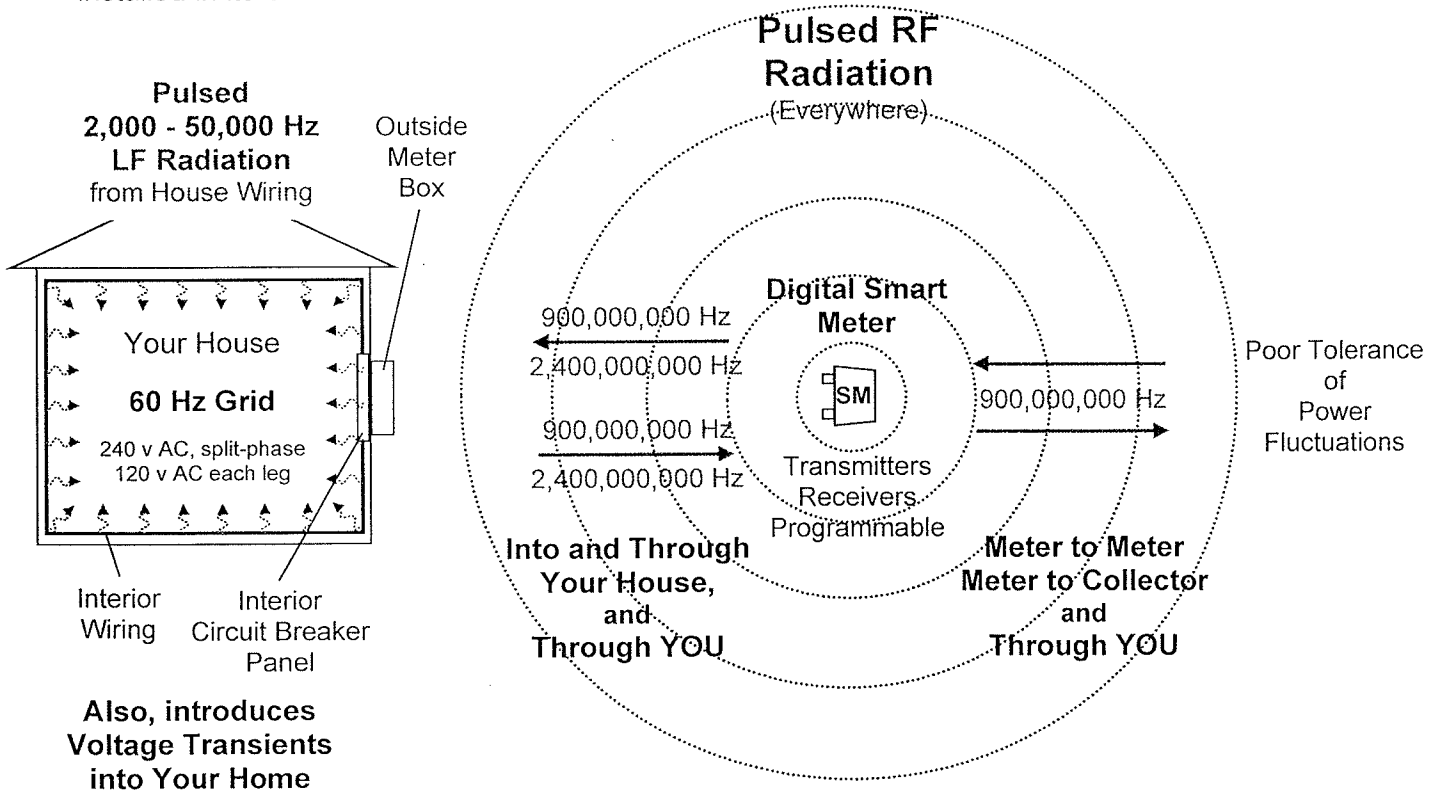
Compatible with Your 60 Hz Grid And with YOU

Non-emitting Analog Meter

Inherently Tolerant of Power Fluctuations

- Simple, Mature, Robust, Accurate
- Safe, Reliable (30 - 40 yr life)
- Inexpensive (~$35), Cost Effective
- Secure, Private: Can't Be Hacked or Monitored
- No Transmissions, No RF and LF Radiation
- Few Inherent Risks and Dangers

"The AFTER" - with the new Duquesne Light / ITRON SK9AMI7 OpenWay Centron Smart Meter installed in its Smart Grid:



Also, introduces Voltage Transients into Your Home Electrical Grid

- Complex, Immature (Recalls), Fragile (5 - 7 yrs life),
- Inaccurate (Overbilling), Unsafe (Fire Potential), Unreliable
- Expensive (~$200 - $300, which we are paying for)
- Not Secure, Not Private: Can Be Hacked and Monitored
- 100s - 1000s - 100000s of RF and LF Pulsed Transmissions per day
- RF and LF Radiation Exposure
- Many Risks, Dangers, and Unknowns

So, is it really true, as Duquesne Light simply states, that

"the Company's smart meters"

1. are "like its traditional analog meters"?
2. just "utilize low-energy RF waves to transmit electricity"?
3. and "transmit RF waves for only short periods every day"?

The answer is emphatically, no.

(4) Contribution of Duquesne Light Company's smart meter to the Hriadils RF environment.

Duquesne Light Company 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 Duquesne Light Company expert Benjamin Cotts, PhD., P.E. This "assessment" is conjecture and pure supposition. Dr. Cotts was given information provided to Duquesne Light Company by the Hriadils in Discovery. This information included a list of the current radiofrequency devices in the Hriadils' residence.

The Hriadils 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 true nature of the new radiation environment being introduced onto the Complainants living environment? The facts with regard to Duquesne Light Company'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.

- The SK9AMI7 smart meter transmits with an

  Equivalent/Effective Isotropically Radiated Power, EIRP = 1,143 mW.

- As has already been stated, established science indicates that 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.

- 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 Duquesne Light Company's answers to Discovery Interrogatories.

And, again, reference is made to testimony given before the PA PUC by Andrew A Marino, PHD Biophysics, JD Law, (Ref: Discovery Exhibit E-26) 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, who are least able to tolerate these exposures.

(5) Relevance of Smart Meter Data.

Duquesne Light Company claims that none of this information, that has been provided in Discovery, relates to its smart meter in its smart mesh, stating

this *"do(es) not relate to Duquesne Light or its smart meter program."*

This assertion is illogical and completely without merit. Upon extensive review of available literature and responses provided by Duquesne Light Company in Discovery, it is my expert view that there is nothing patently unique or exclusive to Duquesne Light Company's SK9AMI7 smart meter, or how it is being operated by Duquesne Light in its smart mesh. To the contrary, there is substantial commonality between the Duquesne Light Company'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. Duquesne Light Company utilizes an Itron / Centron OpenWay smart meter that is being utilized by other EDCs.

Specifically, the material facts are:

- Duquesne Light Company's Itron / Centron OpenWay SK9AMI7 meter is a wireless, digital smart meter with co-located transceivers operating at 900 MHz and 2.4 GHz, respectively, in a smart mesh. Its 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 Duquesne Light Company, who hire temporary workers with unverified and unsubstantiated electrical or professional expertise.

(6) The FCC - What It Has Declared and Not Declared.

Duquesne Light Company "states" that the Federal Communications Commission (FCC) has established "safe limits" for RF exposure and the RF exposure for Duquesne Light's Smart Meters is well below the limits set by the FCC. This is a mischaracterization of the facts. These kinds of statements are always made and they are always taken at face value; but, they do not hold up under close scrutiny and they do not justify the safety of Smart Meters.

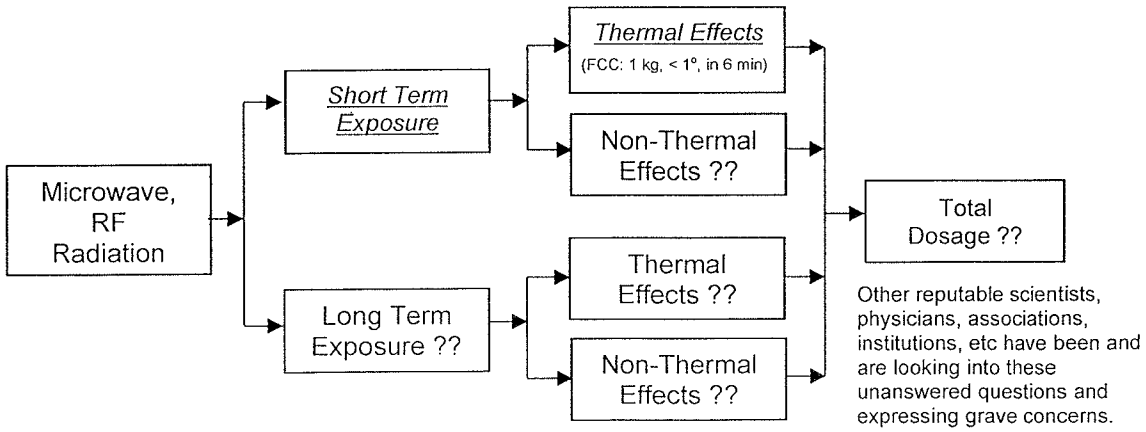
The Federal Communications Commission (FCC) is an independent Federal regulatory that "is charged with regulating interstate and international communications by radio, satellite, and cable." The FCC has five (5) main functions: (https://www.fcc.gov/about-fcc/what-we-do)

- "Promoting competition, innovation and investment in broadband services and facilities
- Supporting the nation's economy by ensuring an appropriate competitive framework for the unfolding of the communications revolution
- Encouraging the highest and best use of spectrum domestically and internationally
- Revising media regulations so that new technologies flourish alongside diversity and localism
- Providing leadership in strengthening the defense of the nation's communications infrastructure"

As such, the focus, responsibility, and expertise of the FCC is NOT public health.

The FCC carried out a limited and incomplete assessment of RF radiation effects and provided an exposure "limit" that can only be characterized as crude and inadequate in light of current science, information, studies, and experimental results.

"*What did the FCC assess*", and "what did it not assess" to set its RF exposure "limit"? (Ref: Discovery Exhibit E-4)



The FCC assessed only the thermal (ionizing) effects of short term exposure.

Specifically, the FCC stated, simply and only, that

a 30 minute exposure to a RF field
with an average Power Density of 600 μW/cm² (0.6 mW/cm²)

does not produce damage by thermal means, which is through a heating mechanism. That is all it said. Many important considerations remain unaddressed by this specification:

How much time should safely pass between 30 minute exposures at that high of a level?

What is the maximum peak level that is safe?

How much total RF exposure is the general public and homeowner already getting from all of the various other RF sources in the environment?

What about the most vulnerable among us?
Pregnant women? Children? Elderly? Chronically ill?

What is the biological effect of low dose exposure over a long period? Over a lifetime?

In my expert view, there is no rational, scientific, or medical basis upon which one can credibly justify or validate this criteria as a standard for safety.

And, it is pertinent to note that this "limit" was established in the early 1990s based primarily on numbers published by the National Council on Radiation Protection (NCRP), a private council, in 1986, 31 years ago! Also, this limit is more than an order of magnitude (10x) larger than currently accepted standards existing in Europe and Asia, including Russia and China. A few of these current standards are summarized below for reference: (Ref: Discovery Exhibits E-1, E-32)

Regulatory:	Italy, Poland, Hungary Bulgaria, China, Russia	10 μW/cm²
Regulatory :	Switzerland	4.5 μW/cm²
Recommendation:	Ecolog Institute	0.3 μW/cm²
Recommendation:	Salzburg Resolution	0.1 μW/cm²
Recommendation:	BioInitiative Report (2008)	< 0.1 μW/cm² outdoor < 0.01 μW/cm² indoor
Recommendation:	STOA, EU Parliament	0.01 μW/cm²

So, in this regard, the FCC is well behind and out of step with much of the rest of the world. (Ref: Discovery Exhibit E-77) And, it is also noted that the Duquesne Light / Itron SK9AMI7 does not meet and could not be deployed under any of those standards.

The FCC did not assess non-thermal (non-ionizing) effects, and it did nothing to assess long term exposure. The PA PUC has received the following expert testimony from witness Dr. Andrew A Marino, Phd and JD in Biophysics (Ref: Discovery Exhibit E-26):

"nowhere does the FCC assert 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 never been made by the FCC."

Low level RF transmitters, utilizing small amounts of power, have definite known effects on the human body. There are now medical treatments and procedures that use low level RF transmitters, with cell phone and Smart Meter like RF strength (less than 1 watt), to attack tumor cells, etc. But, the generally accepted medical protocol is that these methods should not be used for the head or torso area because of the risk of damage to surrounding healthy tissue.

There now exists a preponderance of evidence, from both epidemiologically-based and experimentally-based studies, that RF radiation does, in fact, produce damage by means other than thermal. Dr. Marino presented evidence directly to the PA PUC on this fact *(Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023)* .

So, it is a material fact that the FCC has never declared that Smart Meters are safe with regard to physiological changes caused by non-thermal (non-ionizing) processes. And, as Dr. Marino has testified *(Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023)*, "there is a reasonable basis in established science for the ... concern regarding risks to human health".

And, it is a matter of Commission rulings, and the public record, that the PA PUC has recognized this fact.

In recent complaints before the Commission, the PA PUC has officially recognized that exposure to the emissions of a Smart Meter can and has caused harm. I refer to Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023 and Susan Kreider v. PECO Energy Company, Docket No. C-2015-2469655 as cases of note.

In the first case, 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."

In the 2nd case, it was ruled by the ALJ Heep that Susan Kreider had established a prima facia case of harm caused by smart meters. Unfortunately, Susan passed away shortly thereafter and her complaint was not carried to completion.

(7) The FCC - Maximum Allowable Transmission Power

The FCC has also established that the maximum transmission power allowed for a 900 MHz transmitter is 1 watt (i.e. 1,000 mW). Yet, taking into account the gain of the antenna, Itron's SK9AMI7 Technical Specifications indicates that

the Antenna Gain, G_T = 2.2 dBi = 1.66

the Transmitter Conducted Power, P_T = 688.65 mW.

This produces a power output

Equivalent/Effective Isotropically Radiated Power, EIRP = 1,143 mW

in the direction of maximum antenna gain. This exceeds 1,000 mW.

(7) FCC Grants of Equipment Authorization

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: (Ref: Discovery Exhibit E-30)

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 only. This grant is valid only when the device is installed by the applications 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

The Hriadil's 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. Duquesne Light Company 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.

As has been noted earlier, EDCs, including Duquesne Light, routinely state that Smart Meter RF emissions are orders of magnitude less than that of a cell phone. Yet, 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 own regulations inherently recognize the greater strength of the pulsed Smart Meter emissions, and the greater separation distance that is necessary. The numbers reveal the real truth.

The Hriadils live in a townhouse complex composed of buildings containing 6 connected 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. It is noted that other utilities provide their customers with the option to disable the 2.4 GHz ZigBee transmitter. Duquesne Light Company has stated that it will not do this.

Additionally, Duquesne Light Company 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."*

Duquesne Light Company, 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, 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 the Hriadils 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, (Ref: Discovery Exhibit H-2)

> *"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, Hriadils submitted questions to Duquesne Light Company 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. The Hriadils 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

Duquesne Light Company 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. Duquesne Light Company refused to answer the interrogatories fully. Duquesne Light Company 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. Duquesne Light Company simply refused to answer. The Hriadils filed a Motion to Compel to obtain the answers to these important questions; but, ALJ Watson ruled that Duquesne Light Company did not have to answer.

The FCC Grant of Equipment Authorization for the Respondent's SK9AMI7 smart meter (Ref: Discovery Exhibit E-30) specifically states, "This device must be professionally installed." Since Duquesne Light Company has not validated that its "meter installers" are professionals, such as certified electricians, it can only be surmised that they are not, and that this aspect of the FCC Grant of Equipment Authorization is also not in compliance. In addition, Duquesne Light Company stated that it keeps no records of the meter box conditions its installers find in the field. So, there is no verification that anything other can a quick cursory inspection is being carried out.

Because of this, and the fact that Duquesne Light Company has not provided the appropriate answers, as part of Discovery, regarding the specifics of the deployment program, and ALJ Watson has allowed this to stand, there are many unresolved issues and questions that still remain unanswered, and that is troubling.

The FCC created these Grant of Equipment Authorization requirements 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 clear violation of Pa. Codes such as 66 Pa. C.S. § 1501 and 52 Pa. Code § 57.194.

(8) Concerning Reliability (Ref: Discovery Exhibits F-27 - F-30; F-44; F-45)

On October 21, 2015, in documented testimony in Congress before the Committee on Science, Space, and Technology, (Ref: Discovery Exhibit F-44) 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."*

This alone is sufficient to substantiate that the SK9AMI7 being deployed by Duquesne Light Company, has less lifespan, service life, and reliability than the analog electo-mechanical meters that are being replaced.

(9) Concerning Safety (Ref: Discovery Exhibits F-4 - F-9; F-18 - F-26; F-31; F-46; F-49; F-66)

Duquesne Light Company 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."*

Duquesne Light Company provided evidence that their meters have been certified as UL 2735 compliant. I reviewed UL 2735 and this is what I found.

- UL's official statement on the online certificate 1POCZ.E470764 - Meters, Electric Utility (Ref: UL's Online Certifications Directory)

  > 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.

- UL 2735 is still not part of the Nationally Recognized Testing Laboratory (NRTL) program. (Ref: http://www.metlabs.com/meters UL2735)

Although UL 2735 is one step in the right direction to improve safety; it is not the equivalent of a full UL Mark (Ref: Discovery Exhibit F-17), 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 SK9AMI7 smart meter has already been involved in fires. A recent incident occurred right here in Pennsylvania and was reported in the press (Ref: Discovery Exhibit F-9). On January 20, 2017, a power outage occurred in Brookville Borough in Jefferson County. The cause was a power surge. Significant property damage was caused, and 500 to 1,000 residences were affected, said Tracy Zents, the director of Jefferson County's Department of Emergency Services. This incident was reported as a "first" by the Associated Press and others. 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.

Brookville Borough area is "serviced" by FirstEnergy which utilizes the same Centron/Itron SK9AMI7 digital smart meter 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 a traditional electro-mechanical analog meter. So, it is a material fact that the Itron SK9AMI7, the specific meter being deployed by Duquesne Light Company, has been involved in power surges and fires here in PA.

Concerning Safety, Duquesne Light Company "denies that its smart meters pose a safety hazard." Duquesne Light's denial aside, it cannot be denied that there have been 1000s of fires related to smart meters documented in PA, CA, TX, FL, NV, IL, and across Canada, in which severe injury, fatalities, and significant property damage have occurred (Ref: Discovery Exhibits F-4 - F-9; F-18 - F-26; F-31).

Overheating was found to be a major issue. Causes were traced to the nature and quality of the smart meter design and construction, the quality of the installation, and the condition of the wiring in the residence, which is not even evaluated or considered by Duquesne Light Company before installation.

Digital smart meters, including the Duquesne Light / Itron SK9AMI7, use electronic components and flammable materials which are particularly susceptible to utility-side power / voltage surges. The result is overheating, explosion, and fire. Smart meters are also lacking in adequate surge arrestors to protect a homeowner's electrical circuitry, and provide no circuit breaker protection. (Ref: Discovery Exhibit F-1)

In Discovery interrogatories, the Hriadils submitted direct questions to Duquesne Light Company 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. Duquesne Light Company's repeated response to these multiple specific interrogatories is

> *"...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."*

In many of its filings and responses, Duquesne Light Company attempts to criticize and dismiss arguments made by the Hriadils by incorrectly characterizing them as "circular arguments."

> *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.

Yet, Duquesne Light Company, turns right around and presents a true circular argument stating that its 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. It has relied solely (especially early on) on flawed assurances by the utility industry; but, it has found and ruled in recent cases that smart meters can and 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 Duquesne Light Company asserts. I reviewed Duquesne Light Company's smart meter implementation and procurement plans. There is no information contained therein that in any way validates the safety of the Duquesne Light Company's smart meters in its smart mesh.

Further, and has been raised earlier, the Duquesne Light Company has repeated, and continues to repeat, the falsehood that

> *"...the meters operate within the [safety] limits established by the FCC..."*

- This claim is and remains patently untrue. This is not just my expert opinion. As has been mentioned elsewhere in this report, the PA PUC has received expert testimony from other expert witnesses, such as Andrew Marino, who possesses a PHD in Biophysics and a JD in Law, (*Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023*) (Ref: Discovery Exhibit E-26) that

- "[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."

Duquesne Light Company asserts that its smart meter program has been "approved after a thorough public review process". It has not and cannot substantiate that the "review process" has been fair, unbiased, independent, and "thorough" in any credible way. Duquesne Light Company cannot and has never been able to present any credible, definitive evidence that their smart meter in its smart mesh is inherently safe and not harmful in its use and operation.

My expertise lies primarily in the area of engineering, science, and technology, and that is the focus of this report. But, for completeness, it is necessary to point out, at least in part, relevant published facts from various other reputable and respected sources.

- 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". (Ref: Discovery Exhibit H-8)
- The National Toxicology Program (NTP), a federal interagency group under the National Institutes of Health (NIH) released definitive evidence 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 a significant result by the American Cancer Society (ACS) etc., and has been verified in other studies. (Ref: Discovery Exhibits E-18-1 - E-22; E-69 - E-72; E-93)

- As but one example of many expert reports, the review paper in the Electromagnetic Biology and Medicine journal, Volume 35, 2016 – Issue 2, 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. (Ref: Discovery Exhibit E-23)

- Numerous recognized credentialed independent experts, including but not limited to, such as Ronald M Powell, PHD (retired); Samuel P Milham, MD, MPH (retired); Martin L. Pall, PHD; Andrew A Marino, MD, JD; David O Carpenter, MD; Andrew Michrowski PHD; William S Bathgate EE ME; Sharon Goldberg, MD; Henry Lai, PHD; Federica Lamech MBBS; Cindy Sage, Sage Associates; Liz Barris - documented Electro-HyperSensity (EHS) victim; Patrick Colbeck - Michigan State Senator; Angie Colbeck, MD Epidemiology; and Richard H. Conrad, Ph.D; to name but a few; have issued warnings, expert reports, and testified before government agencies, utility commissions (including the PA PUC), etc. concerning the hazards and harmful effects of pulsed RF radiation exposure, at frequencies, intensities, and modulations emitted from cell phones and smart meters. Specifically, they have officially established that (Ref: Discovery Exhibits E-1 - E-95)
  - the RF transmissions from smart meters are harmful
  - pulsed EMFs, such as those from smart meters, 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

- In direct expert testimony before the PA PUC (*Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023*), 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" established, and the PA PUC accepted, that (Ref: Discovery Exhibit E-26)
  - prior early governmental and agency assessments of Smart Meter technology are no longer credible, are far behind the present state of the science, and are heavily biased in favor of industry positions.
  - "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."
  - there is a reasonable basis in established science for ... 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 pre-existing 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.
- that man-made electromagnetic energy, including that from Smart Meters, causes biological effects involving every essentially physiological process that occurs in living organisms.
- 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.

- As a result of testimony by such experts as Dr Marino, the PA PUC has officially recognized that exposure to the emissions of a Smart Meter has caused and can cause harm. (Reference: *Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023;* for example. This is an established Conclusion of Law.)
- Complainant, Francis Hriadil's physician issued the following official, signed 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 (Ref: Discovery Exhibit E-73)

And, there are almost countless other such established, verifiable references that can be cited. So, any assertion by Duquesne Light Company that a "thorough public review process" has been carried out and that this issue has been settled is disingenuous and factually incorrect, as that purported "thorough" process was based on incomplete, inaccurate, flawed, and industry-biased information.

Furthermore, it is sheer ignorance, and is outright irresponsible, to even suggest that a technology or any technology, whether chemically, biologically, or physically based, is patently safe and remains safe after its initial review and approval. Continued testing, analysis, re-assessment, and re-validation of any technology, especially new technology, is required, and is an ongoing process. It does not simply stop once initial approval is granted.

Automobiles, etc. go through extensive testing, analyses, certifications, and approvals, yet there are recalls. Three Mile Island nuclear plant, the space shuttle, DDT, etc, went through countless reviews, testing, certifications, and approvals, yet there have been disasters incurring injury and the loss of life. Cigarette smoking was initially considered harmless, and even to possess some benefits. It was accepted and approved for human use; yet, continued science has shown the exact opposite to be the case. The assertion by Duquesne Light Company that its smart meters are safe and practical simply because it "received" some measure of "initial approval" is illogical, especially when the latest technological, scientific, and medical studies establish otherwise. Any such approval is conditional on the continued support of new information. This "initial approval" has subsequently been established in my expert opinion to be premature, misguided, and flawed.

(10) Concerning Cost, Effectiveness, and Demand

Numerous official reports, statements, and rulings have been produced refuting the cost, effectiveness, and demand for smart meters. A few of these are summarized in the following:

- Attorneys General of Illinois, Connecticut, and Michigan

  have issued rulings opposing Wireless Smart Meters because the costs outweigh any claimed financial benefits to the customer.

- A Consumers Digest investigative report, for one, (Ref: Discovery Exhibit G-11)
  - 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.

- In a written submission filed with the Massachusetts DPU, Northeast Utilities (Ref: Discovery Exhibit G-2) stated that
  - "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."

  [Commonwealth of Massachusetts, Department of Public Utilities, D.P.U. 12-76-A]

- In testimony given before the PA PUC

  concerning their SK8AMI7 Smart Meter Procurement and Installation Plan,

  [Docket No. M-2009-2123948 Exhibit C]

  Duquesne Light Technology Director Ruth Ann DeLost was asked,

  "Does Duquesne expect to achieve significant cost savings with the implementation of Smart Meters?"

  Her answer was, no.

- In their Final Smart Meter Technology Procurement and Installation Plan

  [Docket Nos. P-2012, M-2009-2123948, June 29, 2012, 2.b. Customer Requests, page 36]

  Duquesne Light Company further admits that

  "Duquesne Light has only received a few requests for a smart meter."

These sources, and more, provide credible, relevant evidence, in my expert view, that the smart meter program being implemented by Duquesne Light Company does not reasonably satisfy its stated and intended purpose, is unjustified, and is not cost effective. And, further, it is not a program that is in demand by the general public.

(11) Concerning Security (Ref: Discovery Exhibits F-10 - F-14; F-32 - F-39; F-47; F-48; F-50 - F-52)

Duquesne Light Company has asserted in its filings and responses that

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

Duquesne Light Company has refused to fully answer security related interrogatories in Discovery, and I have no direct observability into the specifics of the security measures employed by Duquesne Light Company with its smart meters, smart mesh, and its data handling, storage, and processing.

Nevertheless, government, industry, and security experts have raised concerns about the inherent vulnerabilities present in the smart grid technology.

Duquesne Light Company 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." AdultFriendFinder revealed in 2016 that 412 million accounts were hacked. In 2018, Marriott revealed a data breach of 500 million of its guests information. 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, (Ref: Discovery Exhibits F-32) 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..."

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, (Ref: Discovery Exhibits F-47)

> "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 recognize 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 electro-mechanical 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 Hriadils, 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 Hriadils have sounded warnings about this situation. Nothing that Duquesne Light Company provided in Discovery does anything to mitigate this major security vulnerability.

In a July 3, 2019 review of power grid cybersecurity by Forbes Magazine, entitled "US Government Makes Surprise Move To Secure Power Grid From Cyberattacks," it was reported that (Ref: Attached Exhibit F-68, https://www.forbes.com/sites/kateoflahertyuk/2019/07/03/u-s-government-makes-surprise-move-to-secure-power-grid-from-cyber-attacks/#ca1b9f33191d)

> "the U.S. Government has announced a surprising move to secure power grids by using 'retro' technologies. It comes after numerous attempts by foreign actors to launch cyberattacks on so-called critical national infrastructure (CNI). Nations have been trying to secure the industrial control systems that power CNI for years. The challenge lies in the fact that these systems were not built with security in mind, because they were not originally meant to be connected to the internet. It is with this in mind that the U.S. has responded with a new strategy: rather than bringing in new technology and skills, it will use analog and manual technology to isolate the grid's most important control systems. This, the government says, will limit the reach of a catastrophic outage. This approach seeks to thwart even the most sophisticated cyber-adversaries who, if they are intent on accessing the grid, would have to actually physically touch the equipment, thereby making cyberattacks much more difficult..."

So, the federal government is now pursuing a policy of returning to analog manual technology, to ensure the security of the power grid. The original, proven, mature, and secure analog technology that has existed for decades, and which has reliably served as the fundamental component for measuring electrical consumption, is the traditional non-transmitting electro-mechanical electric meter that Duquesne Light Company is rushing to replace.

(12) Concerning the Sophistication of Smart Meter Analytics (Ref: Discovery Exhibits F-15; F-16; F-41; F-42)

What is the nature of smart meter technology? Smart meter technology does not exist simply to determine a person's electric bills, which was the original intended and agreed upon use of the analog electro-mechanical meter. Now, it is there to closely monitor and profile people, and their habits, to control people, and to turn such personal data into a lucrative income stream for the utility company either by using it internally or by selling it to interested third-party marketers and vendors.

Onzo, one of many of the increasing number of lucrative global data analytics companies, in marketing its services to utility companies, states that

> "We take energy consumption data from Smart Meters and Sensors. We analyze it using our patented algorithms and build a highly-personalized profile for each and every utility customer. We then tag this profile with the key behavioral, attitudinal, and lifestyle characteristics that we identify. We even tag the appliances that we see being used in the home."

They go on to state that this gives the utility company

> "... the ability to monetize their customer data, by providing a direct link to appropriate third-party Organizations, based on the customer's identified character."

And, they tout that

> "... from a very thin stream of energy consumption data, Onzo delivers significant business value, for as little as the price of a cup of coffee."

This industry information from Onzo is but one example.

This smart meter data analysis technology is very detailed, sophisticated, and intrusive, and it is only the beginning. Smart meters, including those being deployed by Duquesne Light Company, are an open and intrusive portal / gateway into people's homes, lives, and privacy. This is an undeniable fact.

Duquesne Light Company, when queried in Discovery concerning their plans in this regard, refused to provide full and complete answers with regard to their business processes, and offered no written guarantee that they would not be utilizing this type of analysis technology in the operation of their smart grid.

(13) Concerning the Conversion of Endpoint User to an Element of the Utility Company's Communications Network

The justification given for installation of Duquesne Light Company'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, converting the owner's property into a communication "relay station" for the utility in its mesh, regardless of the property rights and desires of the property owner. So, with this technology, customers are being converted, in principle, from an end-user of a utility service to an relay component / element in the utility company's communications network.

This represents an "imposed use" of private property that is by its very nature provides economic benefit to Duquesne Light Company. It deprives residents of safe access and the use of part of their property, because of the pulsed RF radiation that is emitted. And, it is being imposed against the objections of residents, without any accommodation for their specific circumstances or desires, and without any agreed compensation for the property owner and its residents.

In essence, the imposition of this technology changes the fundamental terms and nature of the electric service contract in a one-sided and inequitable manner.

(14) Concerning the Accelerated Deployment Schedule of Duquesne Light Company

In its "Smart Meter Q&A" document (Ref: Discovery Exhibit G-10), 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."
>
> Reference: [http://www.puc.pa.gov/General/consumer_ed/pdf/13_Smart%20Meters.pdf]

It is only 2019, and 2023 is still years away. The Hriadils have never requested a smart meter.

Duquesne Light Company, 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 2019. So, while Duquesne Light Company "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.

As already stated earlier, in its Installation Plan, Duquesne Light Company 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 Pennsylvanians to get this device, Duquesne Light Company is proceeding rapidly to finish deployment well before the original, more measured and more methodical, program schedule and goal of 2023. In my expert view, such an

accelerated deployment schedule in a program in which serious technical, operational, medical, health, and contractual issues, etc. have been raised is hasty and unwise and imposes unnecessary and uncalled for risks on Duquesne Light Company customers. It is effectively treating its customers as guinea pigs of this technology.

(15) Concerning Perfect vs Adequate, Efficient, Safe, and Reasonable Service

Duquesne Light Company has asserted in its filings and responses that the Hriadils 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, the Hriadils asked what guarantees does the Duquesne Light Company 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 property's use; and the personal data collected by its smart meter system will remain secure and private. The Hriadils also asked what written warranty does Duquesne Light Company provide to that effect. A guarantee and warranty of some kind is normally provided in any purchase in the market place. Duquesne Light Company's response 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 Hriadils also asked how many incidents have occurred, and how many customers have filed concerns and complaints with Duquesne Light Company, 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. Duquesne Light Company refused to answer this question. The Hriadils filed a motion with ALJ Watson to compel Duquesne Light Company to answer as it is an important issue in the Hriadil's Formal Complaint. But, the Motion to Compel was denied and it was ruled that Duquesne Light Company did not have to answer. So, the information related to these questions remains under-answered and unprovided by Duquesne Light Company. None of this information generally becomes public knowledge; but, the Hriadils were able to find Pittsburgh KDKA News reports such as,

> "Smart Meters Pose Ongoing Issues for Duquesne Light Customers."

Contrary to the Duquesne Light Company's assertion that the Hriadils are demanding "perfect" or "flawless" service, it is respectfully submitted that this is not the case. So, it is relevant to seriously raise 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?

As stated earlier, in a written 2014 submission filed with the Massachusetts PUC, Northeast Utilities (Ref: Discovery Exhibit G-2) stated that

- *"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."*

Again, 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. Specifically:

- 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 PA 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 PA PUC:

"Does Duquesne expect to achieve significant cost savings with the implementation of Smart Meters?

Her documented answer was, "No, ..."

In their Installation Plan, the Duquesne Light Company 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.]

= [EXHIBIT B-1] =

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. (Ref: Discovery Exhibit E-48)

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

MR. FLYNN: Q: In a typical -- well, let's discuss mod appliances. How many smart appliances do you envision each home having?

MR. WARREN: A: So, I think we talked about this on a previous day, that we're estimating that over time that we're hoping that 30 percent of -- or our best guess is that 30 percent of homes will have an in-home 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 (Ref: Discovery Exhibit G-11), 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 such as Bennett Gaines, Senior Vice President and CIO of FirstEnergy Service Company(Ref: Discovery Exhibit F-44) , which utilizes the same SK9AMI7 smart meter being deployed by Duquesne Light Company, predict will have a service life of only 5 - 7 yrs?

Is it reasonable to replace an inexpensive, cost effective analog device that costs approximately $35 to replace with one that costs approximately $200 - $300 to replace, and is not in demand by the general public?

Is it reasonable to replace a device that is inherently private and secure with one that industry and government experts, no less than a previous head of the CIA have publicly 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 new RF radiation and induces LF/ELF radiation, that pulses like an invisible strobe 1000s - 10000s - 100,000s of times unendingly and relentlessly throughout the day, that increasing numbers of health and medical experts are warning is harmful, 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 to justify smart meter safety on a limited, narrowly defined FCC criteria that the FCC never proclaimed as an absolute or complete standard for safety?

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

Is any of this reasonable, and in true 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, and shall make all such repairs, changes, alterations, substitutions, extensions, and improvements in or to such service and facilities as shall be necessary or proper for the accommodation, convenience, and safety of its patrons, employees, and the public.

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.

And, it is noted that any act of the Legislature or Order by the PA PUC that introduces a harmful or carcinogenic pollutant into the natural living environment of its residents is also in violation of

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

> § 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)

Is it reasonable to forcibly convert endpoint users of electricity unknowingly into relay elements in Duquesne Light Company's communications network, to the distinct and unequitable advantage of Duquesne Light Company and the disadvantage of electric customers?

Is it reasonable to steam-roll forward on a very accelerated deployment schedule, well ahead of the original stated goal of 2023, with an immature program in which so many serious issues, risks, and serious consequences have been raised?

In my expert opinion, none of this constitutes reasonable service as required by PA Code. Can a program of this nature be logically, scientifically, technically, ethically, morally, or legally, be sanctioned and justified to be truly in the public interest? In my expert view, it cannot. The Hriadils are not seeking perfection here. The Hriadils are simply appealing for common sense, logic, and some measure of justice in our request to obtain accommodation and relief for our own protection, safety, and well-being.

As a point of logic, while Duquesne Light Company claims that the Hriadils are trying to impose an unrealistic and unfair standard of perfection on it, its smart meter, and its program, it in turn argues to impose just such an unattainable standard of perfection when it comes to the Hriadils, our backgrounds and knowledge, our experts, our vetted evidence, etc., all comprising the foundational facts forming a cognizable basis for the Hriadils Formal Complaint and our reasonable request for relief. Finally, after reviewing all of Duquesne Light Company's documentation, filings, and responses, it is evident in my expert view that Duquesne Light Company 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 truly an unrealistic and unfair standard of perfection that is not possible to obtain.

This issue requires that the PA PUC step in, assert its authority, protect the interests and well-being of the people of Pennsylvania, for whom it exists to serve, and inform Duquesne Light Company that it is wrong and that its program is in violation of a number of necessary codes, statutes, and regulations.

Submitted by

Francis Hriadil, MS (M.I.T)
Engineer, Systems Analyst, Inventor (retired)
331 Shady Ridge Drive
Monroeville, Pennsylvania
July 10, 2019

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

MICHELE HRIADIL and FRANCIS HRIADIL,	:	
Complainant,	:	
vs.	:	No: C-2016-2571726
DUQUESNE LIGHT COMPANY,	:	
Respondent.	:	

RESPONSE TO RESPONDENT'S SECOND SET OF DISCOVERY REQUESTS DIRECTED TO COMPLAINANTS

Filed by Michele and Francis Hriadil

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

RESPONSE TO RESPONDENT'S SECOND SET OF DISCOVERY REQUESTS DIRECTED TO COMPLAINANTS

THIS IS COMPLAINANTS RESPONSE TO RESPONDENT'S SECOND SET OF DISCOVERY REQUESTS.

A CERTIFICATE OF SERVICE HAS BEEN FILED WITH THE COMMISSION'S SECRETARY, PER JUDGE WATSON'S OCTOBER 3, 2017 INTERIM ORDER.

Francis Hriadil

Francis Hriadil
January 12, 2018

EXHIBIT B

- Verizon FIOS Router MI424WR
- Dell XPS 15 9560
- Desktop Computer Netgear N300 WNA3100
- Brother MFC-J870DW
- Xbox 360

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

a. The number of times Francis Hriadil has installed such a meter;

b. The address of each location where Francis Hriadil installed such a meter;

c. The date of each instance when Francis Hriadil installed such a meter; and

d. The name, address, and telephone number of any individual who witnessed Francis Hriadil install such a meter.

ANSWER:

No.

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

ANSWER:

None.

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

a. The number of times Michele Hriadil has installed such a meter;

b. The address of each location where Michele Hriadil installed such a meter;

c. The date of each instance when Michele Hriadil installed such a meter; and

d. The name, address, and telephone number of any individual who witnessed Michele Hriadil install such a meter.

Respondent by the Complainants since Complainants filed their Formal Complaint, are incorporated here-in by reference as if fully restated.

Complainants submit the following additional document: :

- **Exhibit F-50**: MSP's Guide to 3 Game-Changing Problems in Security, Redmond Channel Partner, RCPmag.com, Scott Bekker Investigative Report. November/December 2017, [https://rcpmag.com/whitepapers/2017/11/solariwnds-msps-guide-to-3-game-changing-problems.aspx?tc=page0]

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

ANSWER:

None that are not work-product.

19. Outside of the Documents and pleadings produced in connection with this Formal Complaint, produce any Document prepared in whole or in part by Michele Hriadil that relates to the subject of radio frequency or low frequency radiation.

ANSWER:

None.

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

ANSWER:

No.

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

ANSWER:

None.

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

ANSWER:

No.

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

ANSWER:

None.

24. Is Francis Hriadil a certified electrician? If so, state the date of certification.

ANSWER:

No. But, Francis Hriadil has extensive technical expertise and background in the design development, manufacture, programming, installation, and support of highly technical equipment incorporating and integrating, electronic, mechanical, refrigeration, ultrasonic, and fluid/solvent control technology, etc. He has been recognized for his systems analysis expertise, his ability to understand, analyze, and integrate diverse technology, and has been granted a patent on a sophisticated and innovative process technology device incorporating such diverse technologies.

25. Is Michele Hriadil a certified electrician? If so, state the date of certification.

ANSWER:

No. Michele Hriadil's area of expertise has been provided in Complainants Discovery Response #1 (served October 26, 2017).

VERIFICATION

Per 52 Pa. Code S 1.36,

We, Francis Hriadil and Michele Hriadil, hereby state that the facts above set forth are true and correct (or are true and correct to the best of our knowledge, information and belief) and that we expect to be able to prove the same at a hearing held in this matter. We understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities).

Date: 1/12/2018 1/12/2018

Francis Hriadil Michele Hriadil

Respectfully submitted,

Francis Hriadil
(412) 779-3314
331 Shady Ridge Drive
Monroeville, PA 15146
January 12, 2018

Planetary Association for Clean Energy, Inc.
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An international collaborative network of advanced scientific thinking
NGO in Special Consultative status with the Economic and Social Council of the **United Nations** (ECOSOC)

July 9, 2019

Expert Report / Statement Part 1 of 2
of
Andrew Michrowski, PhD

Regarding:

Francis Hriadil and **Michele Hriadil**
Docket # **C-2016-2571726** (Formal complaint with the PA PUC, filed 10/1/2016)
with regards to **Duquesne Light Company** (DLC)
installation of an ***Itron/Centron Openway SK9AMI7*** Smart Meter
in a "Smart Mesh" at 331 Shady Ridge Drive, Monroeville, Pennsylvania 15146,
and 810 Selby Way, Pittsburgh, Pennsylvania 15203
The United States of America

As President of the **Planetary Association for Clean Energy (PACE),** I wish to bring to your considerations stemming from decades of independent scientific research and of multi-disciplinary peer review into electromagnetic and other issues that appertain to this Docket.

Our organization was founded by the Canadian scientist **Senator Chesley W. Carter,** while Chair of the Canadian **Senate's Standing Committee on Health, Welfare and Science** as well as member of the **Senate Special Committee on Science Policy.** He and his colleagues considered electromagnetic field issues to be among the top 3 scientific and technological priority issues of national concern. They arranged for a comprehensive study by the **National Research Council** and **Queens University** on the biological effects of electromagnetic fields, especially microwaves, which were published in official reports between 1971 and 1972. Like research was done by **Medical Research Council** (MRC) - which were replaced since 2000 by **Canadian Institutes of Health Research** (CIHR), and by other facilities.

These results have been recently confirmed and elaborated by **US National Toxicology Program /NTP** (as per the 2004 **US FDA** request).

From the mid-1980s, due to governmental high-level policy concerns, PACE organized specialists' conclaves, at pioneer international conferences, on electromagnetic issues involving scientists, engineers, MDs and agencies. It was the first to facilitate the in-depth examination of medical issues associated with environmental hypersensitivity (EHS) and to help develop realistic exposure guidelines and standards, accepted since in many circles, including the **European Union.**

These initiatives also led to now-mainstream electromagnetic measuring instruments, protocols, procedures for monitoring & tracing technological errors. PACE worked with **Canada Mortgage and Housing Corporation** (CMHC) to examine electromagnetic fields in Canadian housing, including those with advanced SMART systems. PACE conducts surveys premises with advanced metering infrastructure – AMI - (smart meters) since **Hydro Quebec's** experimental run, years before their authorization by the provincial government's regulatory board **(Régie de l'énergie)** in 2011.

On January 19, 2018, we filed a submission to NSUARB - **Nova Scotia Utility and Review Board** with regards to the NSPI - **Nova Scotia Power Incorporated** smart meter – also an Openway model. (See attachment). The public utility commission responded to our position by ordering and outlining principles to NSPI that determine smart meter opt-out (and charging procedures). See Annex 1.

We suggest that, at the administrative level of this Docket, the **Pennsylvania Public Utility Commission** consider a parallel outline in accordance with the State Constitution, providing for an immediate relief for **Francis** and **Michele Hriadil**.

We have provided, and continue to do so, expert testimony with regards to electromagnetic field issues, including those associated with AMI. This includes expert reports and opinions on relevant documents and the introduction of evidence, even "hearsay", as well as testimony via video link.

In our expert opinion, and based on monitoring that we have made with occupants with smart meters and their premises for several years, as well as assessment of the related and relevant medical evidence of some of these individuals, the complaint Docket is sufficiently credible, with the potential for proof of health concern effects, to reserve considerable risk of adverse affectation from the meter being deployed that merit further judicial review on behalf of the best interests and well-being of **Francis** and **Michele Hriadil**, of the citizens of Pennsylvania consistent with the **PA PUC** earlier rulings,[1] and in line with the ***Constitution of the Commonwealth of Pennsylvania***.[2]

Such risk has been observed to be *cumulative* to numerous factors associated with the premises of the occupants, and their surroundings, which is specifically the case of the row-housing nature of the Hriadil premises, the proximity of the HV line and the geography.

[1] Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023 and Susan Kreider v. PECO Energy Company, Docket No. C-2015-2469655.

A L J Heep issued a decision, 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.".

[2] § 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)

There is a possibility of inducing microwave emissions into their indoor wiring – hence affecting all their long-term occupancy – beds, kitchen, recreation - living quarters. This is in addition to the signaling at 900 KHz to and from indoor transceivers, including RFIDs to the smart meter that collect data and allow for the utility's cutoff of circuitry. We have observed injurious and costly affectation to vulnerable individuals from such indoor smart-meter activated signaling.

Note that meter produces extremely significant effects (due to the wavelengths that resonate with human organs) from its switching frequency emissions as induced current of about 130 kHz at 625μA induced into 120/240 volt wiring (Appendix D in the PACE NSUARB filing – top graphics and caption).

The adverse affectations from smart meters, such as the ones at issue in this Docket of Francis and Michele, have been noted, in our surveys, to accrue, furthermore, with those who are more vulnerable to injurious affectation due to age - infants, pregnancy and seniority (both Francis and Michele are elderly), chronic health (Francis has chronic conditions), and duration of occupancy.

There are also other known risks of great concern: safety and fire hazards, including explosions, economic / insurance coverage such as standard exclusion from liability coverage for claims.

We introduce at least two relevant documents in our file as well as some reports. As required, we may submit supporting information for this matter.

We are disposed to participate in the proceedings in a mutually acceptable manner.

Continue to Part 2 of 2 for further details.

A. Michrowski

Dr. Andrew Michrowski
President

Annex 1

SMART METER OPT-OUT MODEL

NSPI - Nova Scotia Power Incorporated

application of principles for Smart Meter Opt-Out ordered by

NSUARB – Nova Scotia Utility and Review Board

• **Opt-out charge based simply on cost recovery** - NS Power's estimated cost of opting out of AMI represents the forecast cost to serve customers who choose the non--4-standard meter option.

• **Minimize opt-out through effective communication** - NS Power's objective is to minimize the number of customers who elect not to take service using AMI through clear and effective communication of the benefits for customers, individually and collectively, of the AMI infrastructure. The Company will undertake this communication in advance of and during the project roll-out, as well as through subsequent follow-up with customers electing to opt-out of AMI service. Please refer to Section 4 for NS Power's draft communications plan.

• **Maintaining Existing Level of Service** - NS Power will maintain existing levels of service for customers choosing to opt-out of AMI service. Customers whose meters are currently read bi-monthly will continue to be read bi-monthly. Customers whose meters are read monthly will continue to be read monthly. To do otherwise would force these customers to accept increased estimated bills, thereby increasing the risk of large balances being owed to the Company or to the customers by the Company and providing less timely information as to electricity consumption, compromising customers' service expectations.

• **Opt-out charges to be refined with experience** - NS Power's proposed opt-out charge is based on forecast assumptions that will be refined with operational experience after AMI has been implemented, and will be subject to change, which the Company will bring forward in a subsequent application or process. Because NS Power has estimated its opt-out charge prior to deployment of AMI, learning through operational experience, as well as experience with the opt-out cost drivers, will, over time, lead to a more refined cost recovery methodology. In all cases, NS Power will provide full transparency on cost recovery.

• **Customers may opt-in at any time** - Customers who opt-out may, at any time, opt-in and adopt standard meter service at no cost and eliminate costs associated with non-standard meter service.

EXHIBIT D-1

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An international collaborative network of advanced scientific thinking
NGO in Special Consultative status with the Economic and Social Council of the **United Nations** (ECOSOC)

July 9, 2019

Expert Report / Statement Part 2 of 2
of
Andrew Michrowski, PhD
in support of
Michele Hriadil and Francis Hriadil
Formal Complaint
Docket # C-2016-2571726

As President of the **Planetary Association for Clean Energy (PACE)**, I wish to bring to the attention of the Pennsylvania Public Utility Commission (PA PUC) considerations stemming from several decades of independent scientific research and of multi-disciplinary peer review into electromagnetic and other issues that appertain to the Formal Complaint of Michele Hriadil and Francis Hriadil, Docket # C-2016-2571726, to prevent the forced installation of an RF pulse radiating Smart Meter on their residences at 331 Shady Ridge Drive, Monroeville, Pennsylvania and 810 Selby Way, Pittsburgh, Pennsylvania. It is specifically noted that FortisBC Energy, Inc., for one here in Canada, is deploying the exact same RF Smart Meter, the Itron/Centron OpenWay SK9AMI7 Smart Meter, as is being deployed by Duquesne Light Company in Pennsylvania.

Our organization was founded by **Senator Chesley W. Carter**, while Chair of the Canadian **Senate's Standing Committee on Health, Welfare and Science** as well as member of the **Senate Special Committee on Science Policy**. He and his colleagues considered electromagnetic field issues to be among the top 3 scientific and technological priority issues of national concern. They arranged for a comprehensive study by the **National Research Council** and **Queens University** on the biological effects of electromagnetic fields, especially microwaves, which were published in official reports between 1971 and 1972. Like research was done by **Medical Research Council** (MRC) -replaced since 2000 by **Canadian Institutes of Health Research (CIHR)**, and by other facilities.

Results are confirmed and elaborated by **US National Toxicology Program /NTP** (per 2004 **US FDA** request)
https://ntp.niehs.nih.gov/ntp/about_ntp/trpanel/2018/march/tr595peerdraft.pdf

From the mid-1980s, due to high level of policy concerns, PACE organized specialists' conclaves, at pioneer international conferences, on electromagnetic issues involving scientists, engineers, MDs and agencies. It was the first to facilitate the in-depth examination of medical issues associated with environmental hypersensitivity (EHS) and to help develop realistic exposure guidelines and standards, accepted since in many circles, including the **European Union.** These initiatives also led to now-mainstream electromagnetic measuring instruments, protocols, procedures for monitoring and tracing errors. PACE worked with **Canada Mortgage and Housing Corporation** (CMHC) to examine electromagnetic fields in Canadian housing, including those with advanced SMART systems. PACE conducts surveys of premises with advanced metering infrastructure since Hydro Quebec's experimental run years before their authorization in 2011.

EXHIBIT D-1

THE PRINCIPAL ISSUES WARRANTING CONSIDERATION IN OUR EXPERT VIEW

Our independent collaborative network submits our expert opinion that there are 3 principal factors that warrant the attention of the Pennsylvania Public Utility Commission (PA PUC):

- **HEALTH CONCERNS** with widespread power-frequency & wireless technology: 'There is extensive scientific evidence of adverse health effects associated with cumulative effects
- **SAFETY & ACCELERATED CORROSION CONCERNS** with wireless technology, including smart meters: Significant problems have been attributed to smart meters, including explosions and fire
- **ECONOMIC/INSURANCE COVERAGE CONCERNS**
  Utilities in Canada and the US are facing class action suits based on health claims, and standard exclusion from any liability coverage for claims (Exclusion 32, **Lloyd's of London**/CFC Underwriting Limited)

The following and attached material provides a summary of the grounds for each of these opinions.

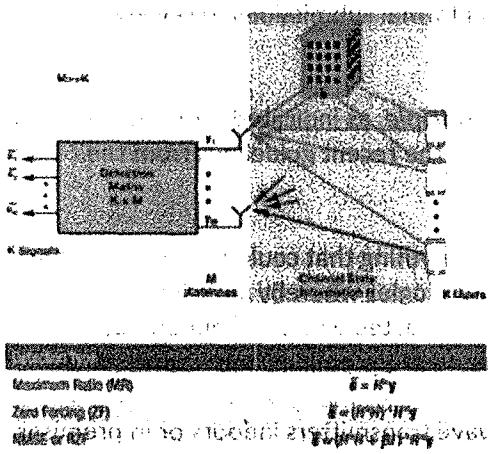
EXHIBIT D-1

THE CUMULATIVE SPREAD OF ELECTROMAGNETIC FIELDS – ELECTROMAGNETIC HASH

These two images compare visible light night-time emissions associated with power-frequency electrical energy supply with those cumulative (in spatial terms) microwave technology band emissions for a similar portion of Eastern United States and Canada. [1]

Note the pervasiveness of current ***electromagnetic hash****. This hash is projected to accrue by quantum leaps, with* ***4G*** *&* ***5G*** *wireless technology use.*

Population centers particularly, such as those in Pennsylvania, *exhibit marked contrast between power-frequency emissions density levels along the coastal & rural parts and those of the blanket coverage of other, microwave technology: Wi-Fi, meters, radar and other infrastructure.*



This hash is so prevalent and uniform that microelectronics scientists are training how to exploit concentrations associated with "massive MIMO" (multiple-input, multiple-output) beam-forming and ricocheting due to multiple reflections in indoor and urban environments can be effectively used to create additional independent channels "that can serve the purposes of diversity and/or spatial multiplexing". In a figurative way, it is like piggy-back cell phones to use them as intermittent transmitting antennas?

The side graph indicates how a group of cell phones, bouncing their beaming both inside and outside a building, build up enough energy that can re-cycled for a matrix-like beam channel for other applications by infrastructure operators.

Is this ever-more intense electromagnetic field power density and more un-regulated beam-forming indoors and outdoors what the Pennsylvania Public Utility Commission wants to see applied for unknown and uncertain effects on the life of the general population, on fauna and on flora throughout the Commonwealth?

What happens if such electromagnetic haze and the engineering of augmenting its potency damage bridges, pipelines, and other critical infrastructure facilities? Who pays? Is it the perpetuator (alone or in concert with others) or the public domain? Can the jurisprudence carry out its right and liberty to impose safety levels higher than those envisaged in guidelines, standards, or even in situations where nonesuch has yet been applied, so that legislators and courts can establish norms that are acceptable to the society-as-a-whole, retrogressively to the time of initiation of the harm's way? There is also the application of the Precautionary Principle, whose European experience is described in Appendix D.

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[1] *Had Neil Armstrong used a cell phone on the moon in 1969, it would be monitored from Earth as* ***the brightest object in the universe*** *in the microwave spectrum! Daytime, the sun would have been brighter, but at night, the* ***cell phone would have outshone every star.*** *There is a reason why cell phones are outlawed in Green Bank, WV: even a single cell phone, from miles away, would blind the radio astronomers there and make it impossible for them to see the stars. Astronomers measure radio waves in janskys units. A typical star shines at 10 to 100 janskys. The Sun shines at about 500,000 janskys. A cell phone held against the head, emits into the brain about 100,000,000,000,000,000 janskys.*

EXHIBIT D-1

OUR ON-THE-GROUND EXPERIENCE WITH ELECTROMAGNETIC HASH AND WIRELESS INSTALLATIONS

These surveys of meters (and their associated infrastructure) also include those conducted by experts across North America, have led to a number of real-life observations. At any given instance, the power density from often hundreds of emitters varies, usually at very fast rates, from many directions, including from above and below ground levels. Sources include portable units, radars, vehicles, towers, lighting fixtures, transmission lines, wiring, pipes, etc. In the case of smart meters, some meters transmit much more frequently, at higher intensity (often at levels higher than those indicated by federal guidelines), across more electromagnetic spectrum bands (including an irritating & troublesome audio range of clicks, rushes, hums and saw-tooth pulsing), introduce access to indoor environments of signals in the microwave band through wires and other conductors – even when no/low power is being consumed.

These circumstances can create combinatory and cumulative electromagnetic field effects with other emissions associated with wireless technology infrastructure, including electrostatics, clusters of charges which can cause interference and (sometimes even explosive) failure of devices such TV, AV and DVD players, battery chargers. We have monitored phenomena of greater microwave power density and electric fields that accrue to the height of AMI (smart meter) infrastructure antenna "collectors" – towards 15 – 20 feet elevation, thus affecting upper floor levels in some communities for entire groups of structures, and potentially even interfering with automobile performance, such as braking and acceleration.

When examining certain cases in detail, we observed that the advanced metering infrastructure can generate deleterious aggravation to fauna (notably pets (dogs and cats), horses, livestock, etc.) – sometimes to the point of ruin of keepers - and to flora, including crops. Such contra-indications are not indicated in formal submissions to review institutions, but can impact on regional welfare as well as ecology.

Their existence also raises the question of the applicability of the ***Precautionary Principle***, as indicated for such decisions as that of the Board, by the **United Nations Environmental Programme (UNEP)** and the recent guidelines from the **European Commission**.

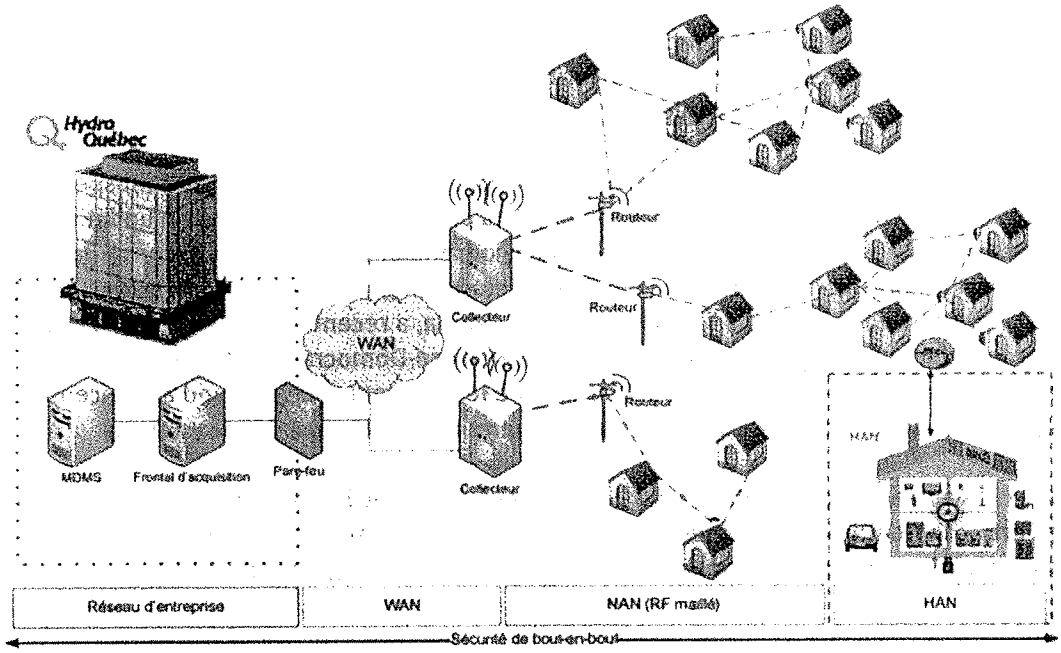
We suggest ***Hazard and Operability Study (HAZOP)*** methodology of considering everything that could possibly go wrong (used in software research). It applies to complex 'processes' such as wireless technologies whereby sufficient predictable and explicitly-identified information is available. This range of data is contrasted with pre-defined objectives and mandate. Prudent decision-making adjusts for foreseeable variations in time and requirements and harmlessness.

No attention is given to the generally involuntary introduction of 24-hour microwave transmitters indoors or in premises whether they are adjacent to zones of long-term occupation, such as bed-sites, working posts, and other places such a play areas for children. Furthermore, no assessment is currently factored by utilities as to actual installation locations of emitters and their **LAN / NAN (Local Area Network, Neighbourhood Area Network)** collectors/transmitters to avoid beaming through living areas. This is an especially significant issue for the linear community layouts, stringed along highways, so common in the United States. Only the basic engineering efficacy and minimal costing is consider in installations of wireless facilities.

Ignored are the combinatory and signal amplificatory effects associated with soil moisture, wetlands, ricocheting, focusing (by way of conductive material frames such as doors, windows, stud walls, and other structures). Ultimately, beaming effects can occur in valleys, dependent on geologic surfaces, for example. Lower frequency facilities radio-frequency – Radio and TV transmitters / microwave / military and commercial radar donates energy to the other faster / higher frequency emitting sources' power density, from 4 to 10-fold, depending of a variety of factors, both of short-term (about a week-at-a-time and long-term duration.

Few smart meters are properly installed in due process – leading to injury of installers (it is one of the most dangerous professions) as well as serious fire & safety issues. Errors can include harmful, invisible ultraviolet radiation. Yet the meters can be wired – as in some countries. Wired smart meters send the usage data via electrical lines or telephone lines. However, most wireless devices use a mesh network system in which the meters relay the energy information

from meter to meter until it arrives at a collector device, which then sends the information on to an antenna, usually mounted on a utility pole. From there, it is transmitted to the utility company. (See graph below, from Hydro Québec.)



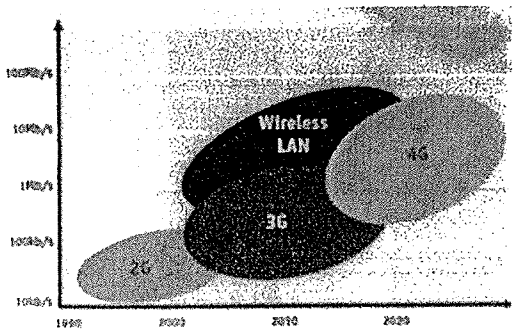
Electric smart meters have a 2nd antenna to "talk" to indoor new smart appliances and devices. This is called the **Home Area Network (HAN)**. These appliances and devices, such as thermostats, air conditioning units, refrigerators, washing machines, dishwashers, and various sensing units are outfitted with 2-way transmitter/receivers which send to and receive information and to potentially control indoor devices and apps from the smart meter throughout the day. The graph below, prepared by Hydro Québec shows the ensemble of the microwave-based wireless version.

The Pennsylvania Public Utility Commission may note that certain antennas may receive up to about 5,000 meters so that lived-in premises process as full time, non-stop, data relays. If collection antenna is out-lying, it powers up to connect – even exceeding federal guidelines. Geology, foliage, other obstacles, reflectivity, etc. leverage more power to critical heating (thermal effect) power density of injurious potential. Without appropriate evaluation and subsequent guidelines, such situations could occur frequently in the Commonwealth of Pennsylvania, due to geography of the AMI's territory and the commonality of linear distribution of users not only in most urban areas.

Non-smart digital meters can have the capacity to be upgraded to smart meters merely by installation of a module which enables the wireless function. The switching mode power supply of digital meters is a major problem, as it is with AMI smart meters.

These dynamics are part of unintended mixing of signals & of their harmonics that were not originally planned to happen. They constitute a new ***electromagnetic hash*** extending over vast territories, onto the hinterland.

Increase in wireless "machine to machine" data demands more and more traffic, and more electric power (consuming, in some cases as much as all of power savings schemes). During a 2010 **Verizon *LTE*** Boston trial) **Research in Motion** (RIM) made it clear that increased bandwidth usage, including from smart meters, strain networks and interrupt calls.



The illustration describes a Canadian analysis of the data usage by the incorporation of several wireless systems into LAN that smart meters also use. Massachusetts Legislators and Public Servants may want to consider how much of the question at hand doesn't become a transformational work order for extensions into something that may outreach the public's ability to regulate as technology for the best interests of Pennsylvania, beyond the Precautionary Principle. Does the PA PUC want to promote

something that once initiated or maintained cannot stop or be modified to impede injurious affectation in the public sphere and territory?

More and more user & stakeholder requirements are being staged. Such upsurges and still emerging trends are combined with such uncertainties as: information insecurity, software development in expertises and attempts at forcing aging population to adapt to the technology.

Ancillary data may be collected from a HAN transceiver, destined, with continuous & significant spending (6.3% - $ 63 million – of Hydro Québec's AMI work estimates presented to its provincial review board) in updating software and informatics applications. Gathering information household by household, with algorithms, consumer preferences and movements can be packaged. Such info may be use even for determining voting profiles through chips located indoors in smart appliances, products, and circuits use & timing. [In 2012 Florida, a recent diaper purchase registered from a smart apps in a home by a meter, would profile for pollsters a confirmed pro-Democrat and thereby unworthy for robotic calls aimed at steering votes election-time. Such info is extra income for the data collector, and a disincentive for a utility in energy-efficiency initiatives and in advanced clean energy generation and transmission systems.]

In the near future this scenario expands into the ***5G – Internet of Things (IoT)***, which is well described by the 2 images below, from the **European Commission**. We see how the smart meter "domotics", in ***5G,*** are linked with LAN to electric grids, directly into hospitals, commerce, Graphene clothing, traffic monitoring, etc. Is this the decision of the Board?

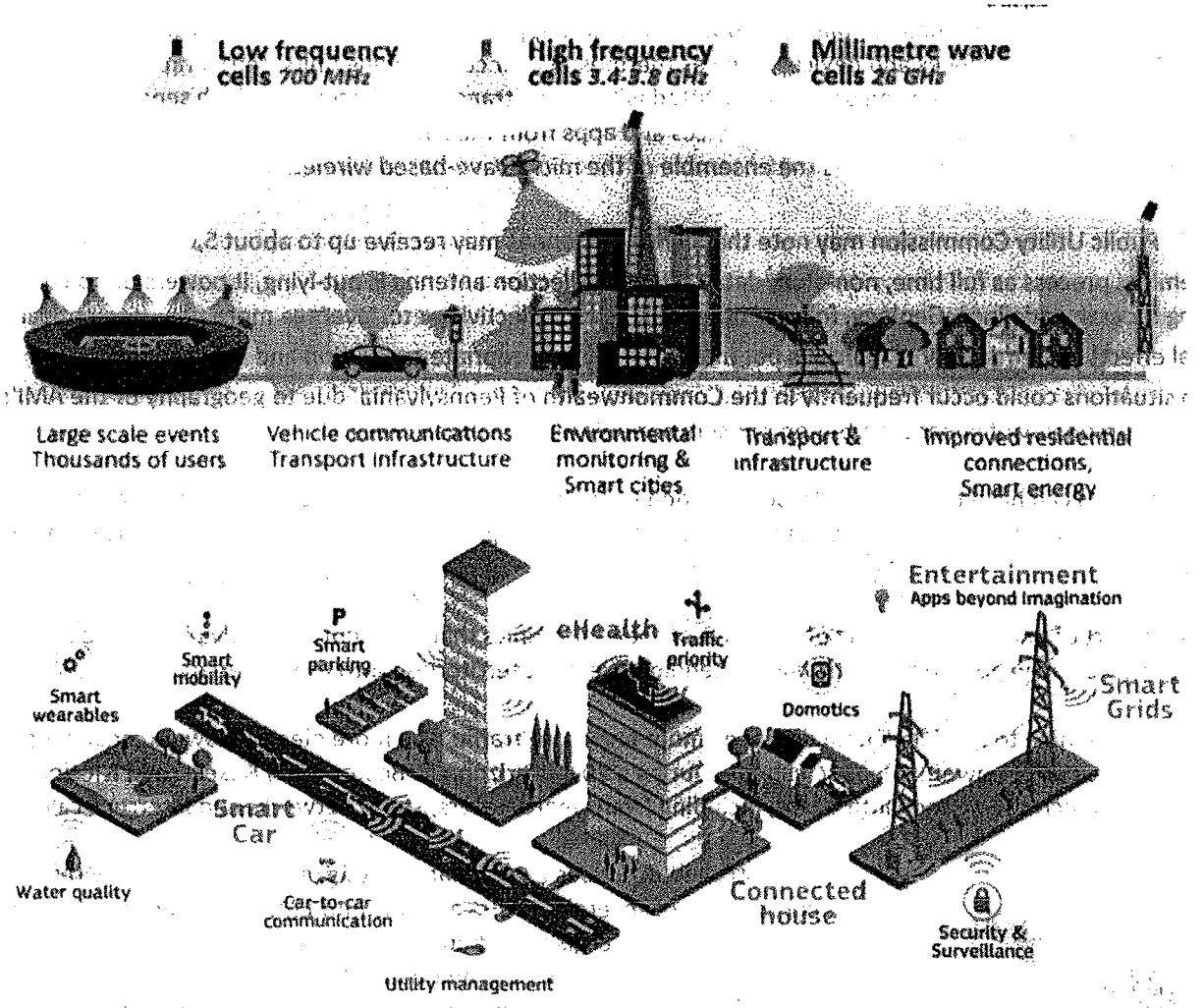


EXHIBIT D-1
HEALTH CONCERNS

Many microwave technology emissions are not a matter of choice for those subjected to them, unlike when one decides or not to use a cellphone, or to purchase cigarettes. They are an imposition that Legislators and Public Servants are to determine for the public consumption of electric power. Most microwave technologies are ultimately telecommunication transceivers operating within premises at the ultrasound / radiofrequency band (80, 130 and 340 kHz – from their switching circuits inside the meters) and at the 2 microwave bands serving the HAN and LAN networks. Also, they may generate annoying audio clicks and noises, and microwave hearing issues.

The biological effects of these electromagnetic bands differ according to their frequency bands, their combinatory and non-linear (randomness) and their intensity/durations. Overall the electromagnetic haze is complex. A study that was performed by the **National Research Council,** before the commercialization of microwave technology outlines the numerous biological effects that can be caused by very low intensity emissions, at levels hundreds of times below the current federal guidelines, termed as "non-thermal", as not heating the body in less than 6 minutes.

A significant proportion of society is consciously sensitive to electromagnetic field emissions, another is not consciously so, but suffers malaise such as memory and attention, impaired motor function, cardiac arrhythmias and arrest, dizziness, irritability, insomnia, fatigue, difficulty in breathing, chest pain, and indigestion, among others. Such groups can consist of up to 30% of the population, according to studies. The **European Council *Resolution 1815 [2011]*** arrived at a 0.1 microWatt/cm2 limit for general population, with an objective of lowering to 0.03 microWatt/cm^2, in contrast with the current federal guideline of the 600.0 -1,000.0 microWatt/cm^2. This ruling is uniquely based on raising body temperature by 1° Celsius within a determined for a healthy young adult male, such as a soldier or fireman.

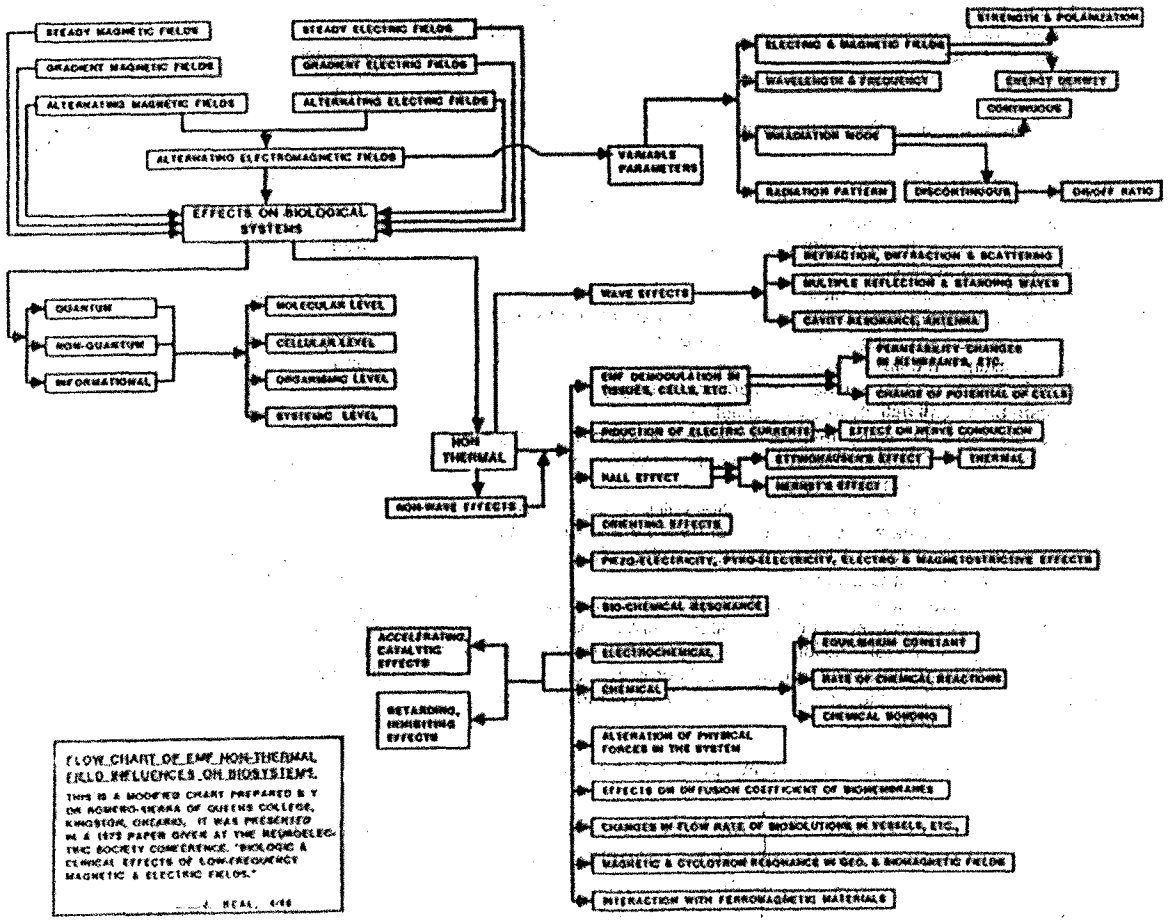


EXHIBIT D-1

Biological effects on humans such as infants, pregnant women, the sick and the elderly are not implicitly considered by the federal guidelines. Consider the proportion of older persons (65+) alone in Pennsylvania is growing to over 15%, based on the latest PA census.

To understand the significance of the intensity-by-intensity impact of the power density of microwave exposure, the **Canadian Human Rights Commission** developed the listing below:

Biological effects of wireless technologies below regulatory limit

Power density ($\mu W/cm^2$)	Reported Biological Effects	References
0.0000000000001	Altered genetic structure in E. Coli	Belyaev 1996
0.0000000001	Threshold of human sensitivity	Kositsky 2001
0.000000001	Altered EEG in human subjects	Bise 1978
0.0000000027	Growth stimulation in *Vicius fabus*	Brauer 1950
0.00000001	Effects on immune system in mice	Bundyuk 1994
0.00000002	Stimulation of ovulation in chickens	Kondra 1970
0.000005	Effect on cell growth in yeast	Grundler 1992
0.00001	Conditioned "avoidance" reflex in rats	Kositsky 2001
0.000027	Premature aging of pine needles	Selga 1996
0.001	**100 Yards / metres from a Cell Phone**	
0.0027	Growth inhibition in *Vicius fabus*	Brauer 1950
0.0027 to 0.065	Smaller tree growth rings	Balodis 1996
0.007	**50 Feet from a Cordless Phone**	
0.01	Human sensation	Kolbun 1987
0.016	**1 Mile from a Cellular Tower**	
0.06	Altered EEG, disturbed carbohydrate metabolism, enlarged adrenals, altered adrenal hormone levels,structural changes in liver, spleen, testes, and brain in white rats and rabbits	Dumanskij 1974
0.06	Slowing of the heart, change in EEG in rabbits	Serkyuk, reported in McRee 1980
0.05	**10 Feet / 3 meters from a Wireless Computer**	
0.1	Increase in melatonin in cows	Stark 1997
0.1 to 1.8	Decreased life span, impaired reproduction, structural and developmental abnormalities in duckweed plants	Magone 1996
0.13	Decreased cell growth (human epithelial amnion cells)	Kwee 1997
0.168	Irreversible sterility in mice	Magras 1997
0.2 to 8.0	Childhood leukemia near transmitters	Hocking 1996
0.3	Impaired motor function, reaction time, memory and attention of school children, and altered sex ratio of children (fewer boys)	Kolodynski 1996
0.6	Change in calcium ion efflux from brain tissue	Dutta 1986
0.6	Cardiac arrhythmias and sometimes cardiac arrest (frogs)	Frey 1968
0–4	Altered white blood cell activity in schoolchildren	Chiang 1989
1.0	Headache, dizziness, irritability, fatigue, weakness, insomnia, chest pain, difficulty breathing, indigestion (humans—occupational exposure)	Simonenko 1998
1.0	Stimulation of white cells in guinea pigs	Shandala 1978
2.5	Breakdown of blood-brain barrier (used a digital cell phone to radiate)	Salford 1997
5.0	Leukemia, skin melanoma and bladder cancer near TV and FM transmitter	Dolk 1997
2.0	(lower "Microwave hearing" - clicking, buzzing, chirping, hissing, or high-pitched threshold not tones known)	Frey 1963, 1969,1971,1973,1988 Justeson1979,Olsen1980,Wieske1963,Lin1978
5.0	Biochemical and histological changes in liver, heart, kidney, and brain tissue	Belokrinitskiy l982
10.0	Damaged mitochondria, nucleus of cells in hippocampus of brain	Belokrinitskiy 1982a
10.0	Impaired memory and visual reaction time in people living near transmitters	Chiang 1989
10.0	Decreased size of litter, increased number of stillborns in mice	Il'Chevich (reported in McRee 1980)
10.0	Redistribution of metals in the lungs, brain, heart, liver, kidney, muscles, spleen, bones, skin, blood	Shutenko 1981
1,000.0	United States **FCC Exposure Limit, Safety Code 6 Canada limit**	

In addition, the **mechanism which explains the non-thermal effects observed as have injurious affectation on humans, fauna and flora is that of oxidative reactions and their associated calcium flux (influx and eflux)** from the full spectrum of electromagnetic fields. These reactions are, in simple terms, associated with the death of cells, whether human or of other biological kingdoms. See also Appendix E for detailed biological effects of microwave technology.

EXHIBIT D-1

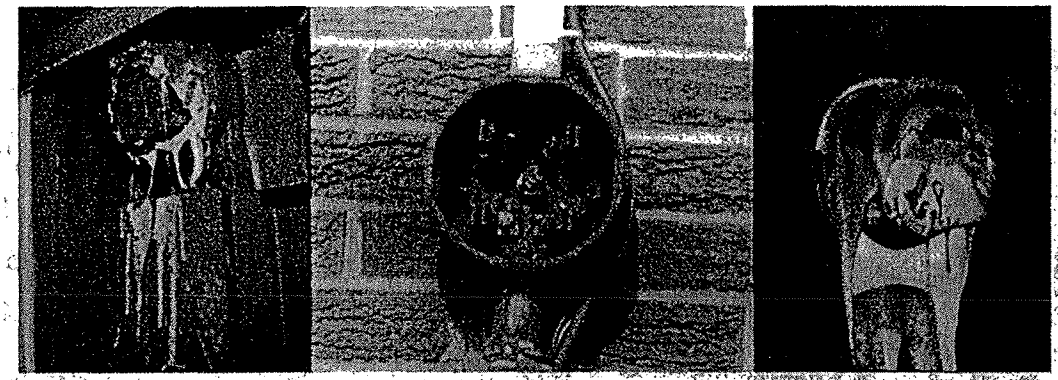
In view of these health concerns, it is my expert position, and the position of PACE, that the Pennsylvania PUC needs to protect the well-being of Francis and Michele Hriadil, take into account the significant evidence that now exists concerning the cumulative harm of exposure to smart meter derived electro-magnetic emission, and uphold the mandated PA Codes to ensure the well-being of the general public.

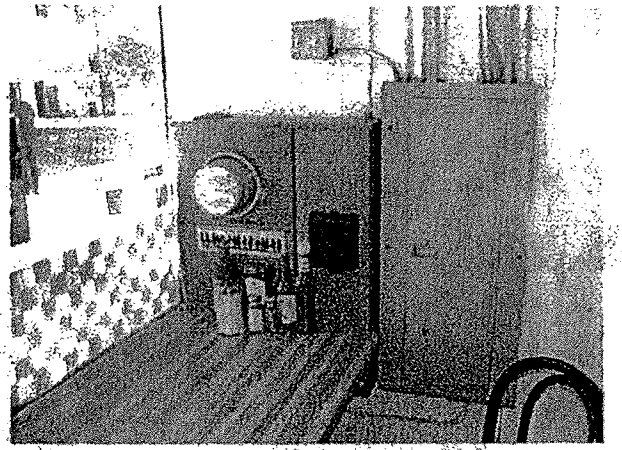
SAFETY AND ACCELERATED CORROSION CONCERNS

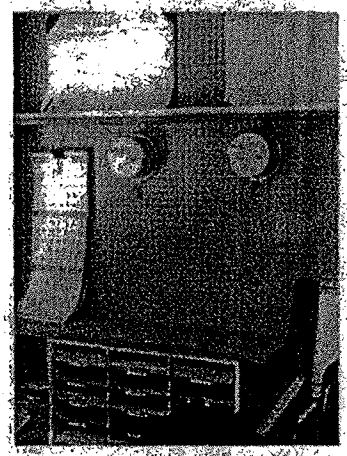
The complexity of safety concerns is described in excerpts from a report of the **Fire Marshall of Ontario**. (Appendix B)

Some safety concerns are described in our earlier statements, such as the manner of installation.

The illustrations below speak for themselves. Why should such haphazard attitude in installation be condoned, considering how these devices beam-form environmentally indoors and outdoors into massive matrices of electromagnetic hash that is constantly dynamic, often very intense and totally un-regulated?







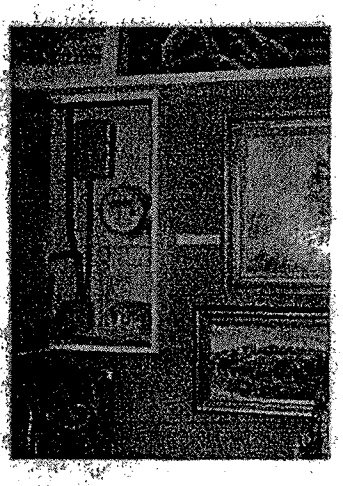
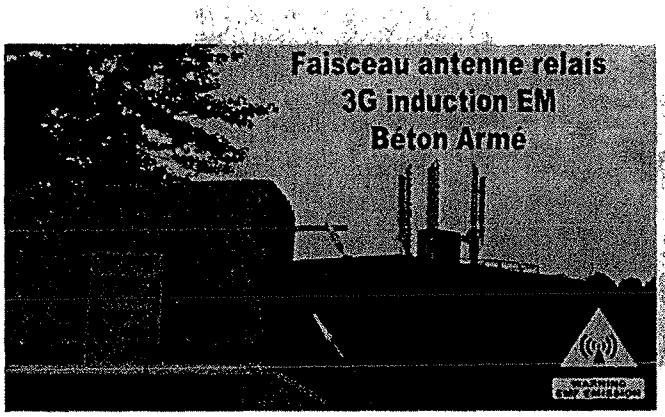


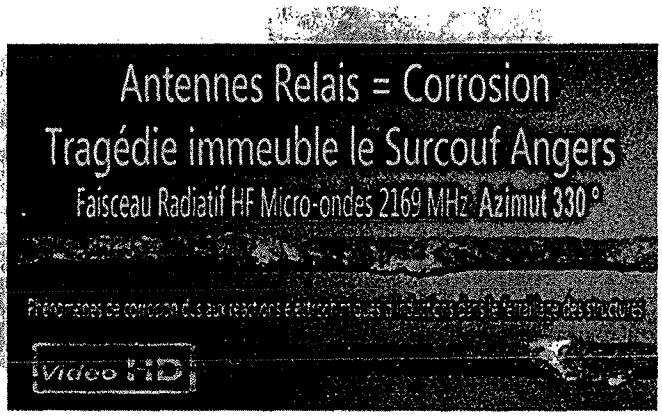
EXHIBIT D-1

The public is generally in the dark about this electromagnetic hash and its problems. The public needs safe and reliable energy and communications service. Smart Meter technology does not provide this.

Accelerated corrosion has been mostly reported in the public domain in France. The image below to the right shows how a 3G tower induces voltage in nearby concrete rebar, which accelerates their corrosion (as well as disintegrating some concrete materials into powder). Such electromagnetic hash, with its ricocheting and near-field emission characteristics has probably affected also the collapse of balconies and even facings of buildings and of several water tours, and a massive downtown Calgary fire which closed down the city's financial district for several days.

Other images show effects on rooftop from tower arrays (**Cégep Laurendeau** collegiate in Montreal, Quebec which suffered mortality of teaching staff below the transmitters, sometimes several deaths in same beam-forming on workstations); typical corrosion of infrastructure fittings; corrosion of **Chicago** train fittings due to electromagnetic emissions; and also corrosion of nuclear rods in **Ohio** (and reported elsewhere) most likely associated with the advent of wireless communication systems.





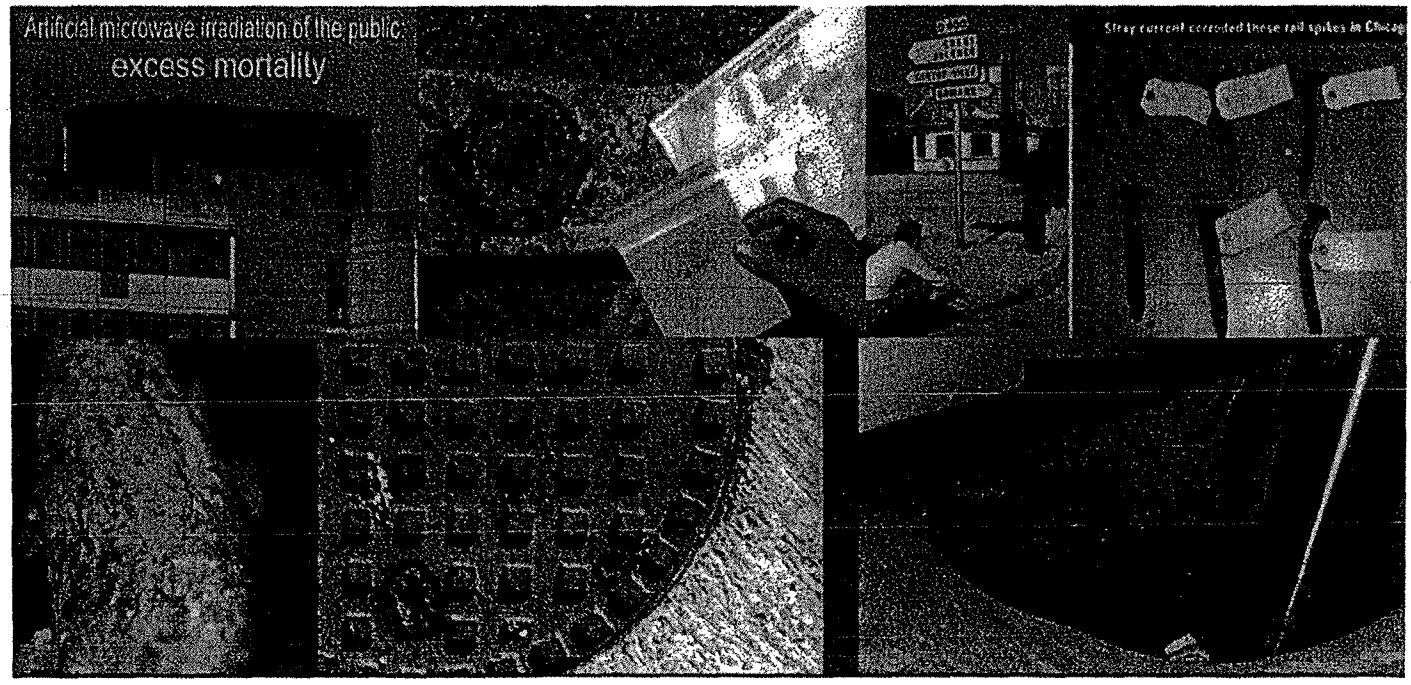


EXHIBIT D-1

ECONOMIC / INSURANCE COVERAGE CONCERNS

There is debate in financial circles whether the wireless infrastructure is economically self-sustaining. The slightest questioning evokes a major concern of what happens if availability of electric power and of communications is so closely subject to markets?

Regarding the insurance, the actual Lloyd's analysis is attached separately as a document. The rating is basically an ultra-high liability risk. This also includes, implicitly, the wireless frequencies induced problems, as we have surveyed through indoor wiring and such conductors as those associated with water and gas supply.

It is likely that even with UL certification, insurance is not a *fait accompli* – as after all, the entire AMI system, meter and the connectors – is composed of wireless transceivers.

Also, de facto acceptance of UL certification may incorporate the impossibility for the public domain to revert decisions at a later date, as well as for the users to disconnect or modify metering modalities. It does not make common sense to "throw away" existing or prior art quality devices for potentially lower quality, short-span duration ones.

Other problems include: Overcharging, accuracy, Reliability questions, Privacy invasion, Switching mode power supply (SMPS), Interference with electronics, Interference with medical devices, Hacking/cyber-security, Remote disconnection of power, Vulnerability to electromagnetic pulses (EMPs), No utility liability for hacked data, Increased burglary risk, Increased metal and infrastructure corrosion, impacts to building integrity, Job loss, Environmental costs, Control of household electrical use, Safety violations, Burdensome and excessive costs, Costs exceed benefits, Fraudulent claims and unavailable information, Strong-arm tactics by utilities, Potential violation of jurisdiction and mandate by utilities, No environmental assessment, Potential violation of Commonwealth and federal laws, Overburdening utility easements, Criminal negligence, Ignoring realities and open process.

The public is generally in the dark about this program and its problems, including economics and insurance concerns. Yet the public needs safe, affordable and reliable services that sustain civilization.

We hope this information and evidence moves the Pennsylvania PUC.

This is our expert view, which is supported by the attached materials. And, it is what I will testify to in the upcoming Hearing. PACE urges and advises the Pennsylvania PUC to rule in favor of Francis and Michele Hriadil's Formal Complaint, and prevent the forced imposition of the harmful, unsafe, and unreliable smart meter technology being deployed by Duquesne Light Company in Pennsylvania.

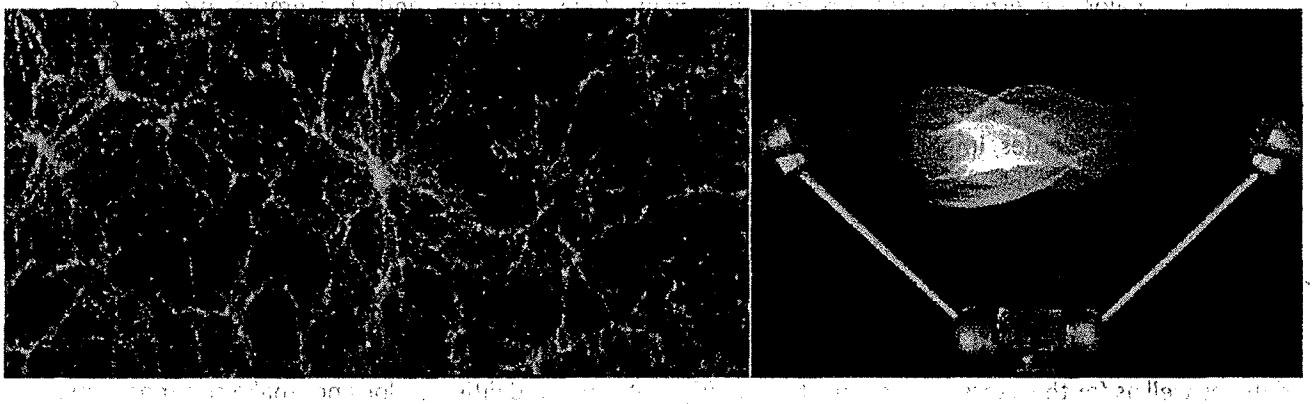
A. Michrowski

Andrew Michrowski
President

July 9, 2019

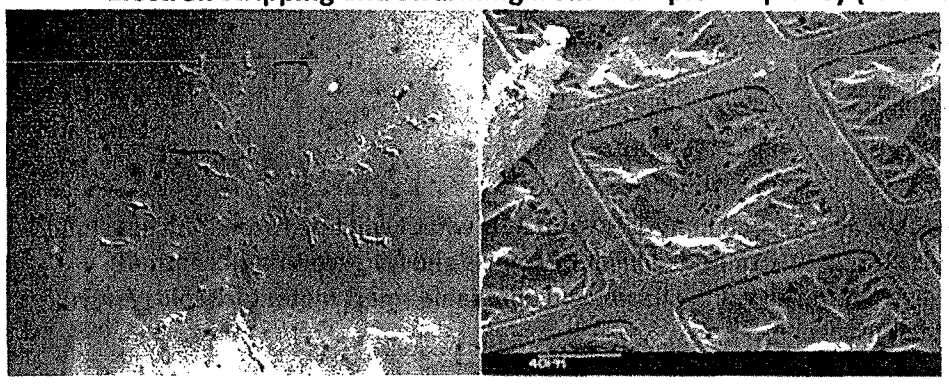
EXHIBIT D-1
APPENDIX A

Visualizing aspects of electromagnetic hash / swarming: *"γ-relaxation"* **clusters and** *"ion resonance"*



The image to the left shows the physical phenomenon recently (2016) analyzed by ***Dasadia Sarthak, University of Alabama in Huntsville (UAH)*** *by using Chandra X-ray Observatory observations captured from un-relaxed [* ***"γ-relaxation"*** *] clusters such as* **Abell 665** *that permit the study of superimposition (or "merger") features such as electromagnetic "shocks" and "turbulence, where undefined boundaries of charge clusters are drawn together. We can consider the prevalence of millions of electromagnetic gadgets in the same volume of space of indoor, structural, urban and rural areas to be quite similarly. This observation is, under peer review already being represented with this observation of weather and other geophysical – "because there is not much difference as far as the physics involved. Technically, we observe the same features in space that we do on Earth." UAH studies tornado and micro-climate disaster, including firestorms. The image to the right objectifies how an ion resonance phenomenon can appear like - above ground level - as an interference type of plasma cloud between overlapping fields of various bandwidths - at least 2 sources of different frequencies - (60Hz, with harmonics & and tones interchanging with RF and microwave bandwidths & their emission sources).*

Electron stripping and swarming from multiple-frequency (low + high energy source) emissions



The image to the left is a SEM micrograph of electron stripping on chromium film target, fractal in formation, during the process of multiple frequency EMF resonance emissions. Note the same fractal drawing together of charges as observed by Chandra observatory and analyzed by ***Dasadia Sarthak*** *(UAH). The optical photo of witness plate taken by* ***Kenneth Shoulders*** *at 1,500X showing electromagnetic swarm connected as bead chain structure.*[2] *Such random charges can evolve into tons of force and evidenced in accelerated nuclear reactor corrosion.*

Challenge of monitoring currently-developing electromagnetic hash

The challenge of measuring and monitoring environments that are subject to so many emitters at so many sources of so many frequency ranges has been reported in peer-reviewed journals from around the world. For example: ***Hot Nano Spots" as an interpretation of so-called*** **Non-Thermal** ***biological mobile phone effects.***[3] to help explain why wireless devices, considered implausible for "non-thermal effect" due to low quantum energy and low specific absorption rate levels, can contain, even hotter "Nano spots" on a molecular level according to well-known mechanisms of γ-relaxation,

[2] Ken R. Shoulders, Steve Shoulders. **Charge clusters**. Planetary Association for Clean Energy Newsletter, Volume 9,1. (February 1997).

[3] Pfützner, H. (2016) **"Hot Nano Spots" as an Interpretation of So-Called Non-Thermal Biological Mobile Phone Effects.** Journal of Electromagnetic Analysis and Applications, 8, 62-69. doi: 10.4236/jemaa.2016.83007.Environ Res. 2016 Apr 27; 148:367-375.doi: 10.1016 / j.envres.2016.04.018. *[Epub ahead of print]*

assuming a heterogeneous system that consists of water molecules as well as larger-sized functional molecules. A consistent interpretation through temperature increase on the level of nanometer sized molecular compounds promises to favor interdisciplinary discussions with respect to safety regulations.

Case study of electromagnetic hash – habitat for EHS individuals built by federal government

When challenged about unusual levels of emissions from a multiple Smart meter installation in habitat built by the Federal government housing (**CMHC-SCHL**) for EHS individuals, **Hydro Ottawa** CEO commissioned a 900 MHz only field survey (notwithstanding other frequencies monitored in PACE surveys). The information, underlinedprofusion of co-emitters, whose presence indicates the complexity of the issue at hand: quantification of injurious affection.

Hydro Ottawa Test Conclusions - The findings of the 60 Hertz at 900 Mhz Elster smart meter study. Conclusions derived from the Smart Meter inspection found that the meters were operating as per the manufacturer's parameters. No defects were identified during of two hour inspection conducted: supply voltage, the radio frequency levels and operation appeared normal and within the tolerances expected in an operating system.

Comments provided by the **Elster Canada** technical resource reported: *Based on my experience the readings you have in the table are typical. The in front of the meter readings can vary slightly depending on proximity of the handheld to the meter, and the readings are expected to be lower as you move further from the meter or obstacles come between the meter and the handheld.*

Hydro Ottawa confirmed on the analysis of the smart meter network in Barrhaven that the building at 3005 Jockvale Rd is in an area of low incidence of smart meter traffic compared to neighbouring areas of tighter density homes. The buffer provided by public buildings like churches, large parking lot, road and rail road right away does buffer the RF traffic from the greater network and results in lower densities. This does not diminish local traffic from the customers own smart meters.

Alternate Sources of Interference
Many sources of radio interference were identified at the customer's site during the course of Hydro Ottawa's investigation that were not related to Hydro Ottawa system. These points are being raised to provide balance to the Hydro Ottawa response as it would not be fair to consider the whole source of the customers physical complaints on a singular technology, the Hydro Ottawa smart meter that broadcasts for a couple of minutes a day – approximately four times a day. Sources of radiation identified during the inspection were:

- **Hydro Ottawa's** 900 MHz smart meters
- Customer owned 60 Hz supply voltage and unit wiring within the customer units and customer owned 60 Hz supply, end wall wiring and metering center and unit service conductors under concrete floor
- **Hydro Ottawa** primary transformer supply approximately 25 feet from the customer unit
- **Bell Canada** telecom infrastructure
- **Bell Canada** telecom VDSL Fibe infrastructure
- **Rogers cablevision** utility termination
- **Via Rail** train line with RF telemetry
- **Ottawa International Airport** flight path and resulting RF telemetry and traffic
- **City of Ottawa** Itron smart meter water meter module with RF broadcast
- Adjacent tenants in area having ***Wi-Fi*** connection for their broadband signal for their internet
- **Cellular towers** for public carriers
- **AM & FM commercial radio and television** broadcasts

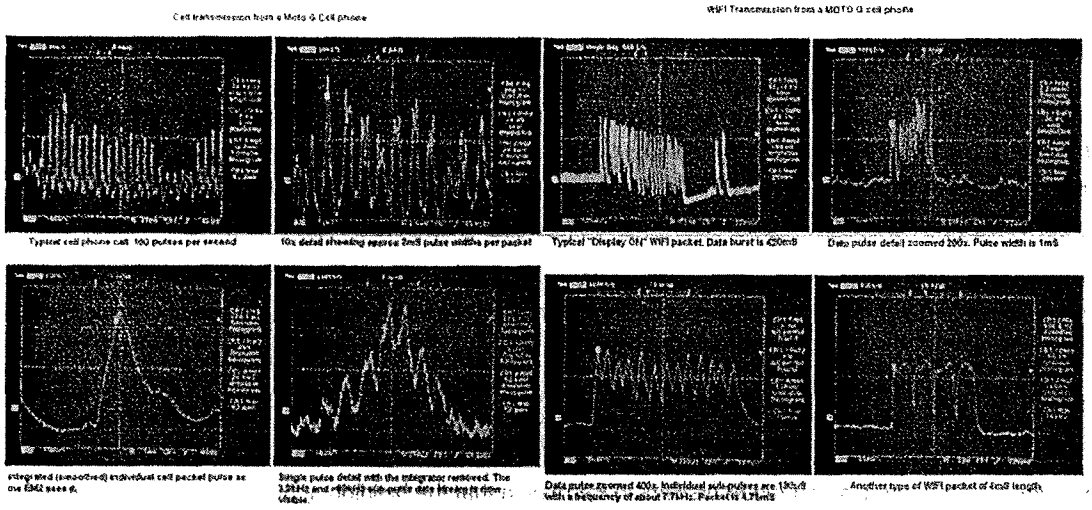
900 MHz Test Table of Findings:
Noté: the less negative a reading was, the stronger the signal, the more negative the reading the weaker the signal.

Editor: In 900MHz, **Ottawa Hydro** measured **0.03 - 0.06** in μWatt/cm² equivalence, **Actual power,** during 3 visits was: for micro-wave range: **7 – 8** μW/cm² ~ **233X higher** and, for the 10Hz-100GHz range: **40 - 80** μW/cm² ~ **1,333X higher** (from data, etc. modulations).

	Observed Signal Itensity (in dBm)				
Badge Number (LAN ID)	In Front of Meters	In Parking Lot (approx. 22m away)	Inside Entrance to Unit #2	Inside Entrance to Unit #4	Inside Entrace to Unit #6
OTT633955 (415230)	-24	-56	-42	-57	-58
OTT633957 (415232)	-23	-61	-49	-41	-54
OTT633967 (415242)	-24	-64	-52	-40	-63
OTT633966 (415241)	-24	-50	-50	-37	-66
OTT633969 (415244)	-24	-61	-50	-39	-57
OTT891577 (3007055)	-26	-50	-40	-40	-58
OTT633956 (415231)	-24	-67	-47	-36	-62

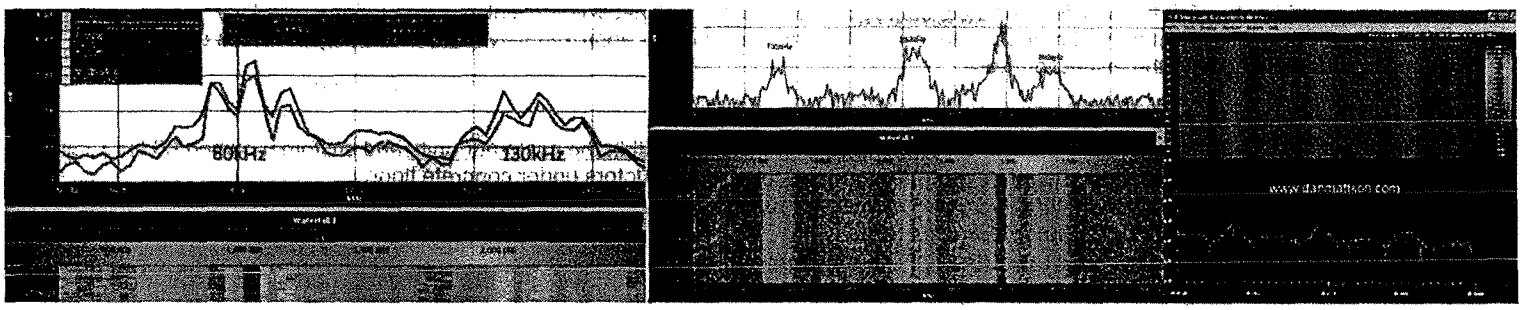
EXHIBIT D-1

Tracings of complex modulation streams, microwave frequencies from cellphone and *Wi-Fi* transmissions



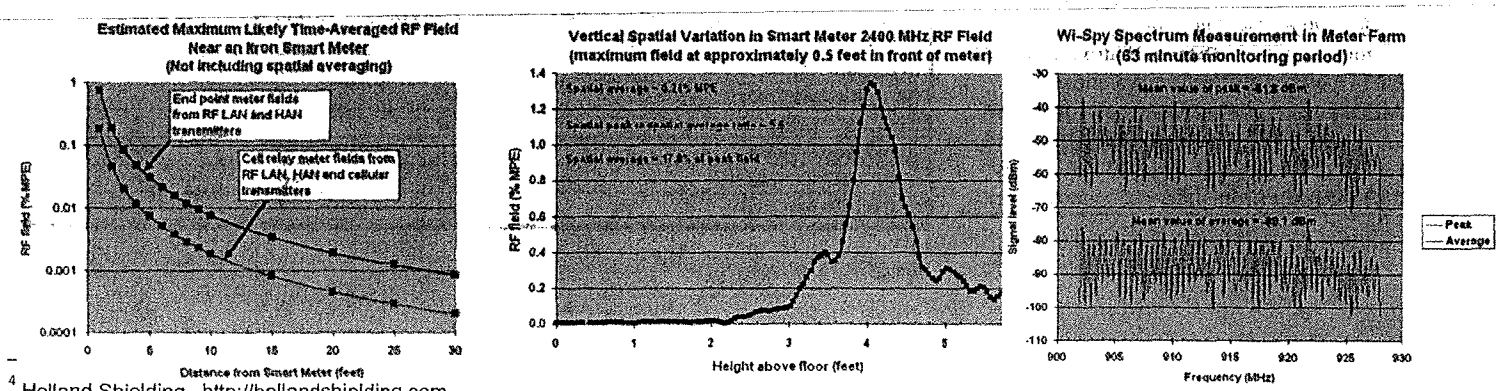
Two series of data streams: from Cell and from Wi-Fi transmissions. *A* ***MotoG*** *cell phone was monitored by* ***Dave Marett,*** *PEng. The detector is* ***Essentia EM2*** *(10Hz – 100 GHz) front-connected to oscilloscope. Probe's integrator removed to show pulse hash detail: some goes to several MHz, VLF, ELF <u>audio</u> range as well. This "higher clock speed" hash forces regulatory agencies to limit interference from "clock" & switching devices that generate "clocks" and switching emissions.* [4]

Other frequencies emitted by typical Smart meter – switching for extra billing, etc.



These 3 images are switching frequency emissions in Smart meter traced as induced current at one hot leg. The 130 kHz signal is computed it at 625µA induced into 120/240 volt wiring. The 80 kHz signal (top left) may be induced or than radiated "noise". Such spike-like interactions can come from phone & cable wires, as noted by ***Hydro Ottawa*** *– <u>and they also leak into waterworks & onto urban / rural infrastructures</u>. 340 kHz (middle) spike is sharable with electromagnetic swarming from some phone and cable lines, ground wires and power lines.*

Position of EPRI (Electric Power Research Institute) [5] and independent on emissions from Smart meters

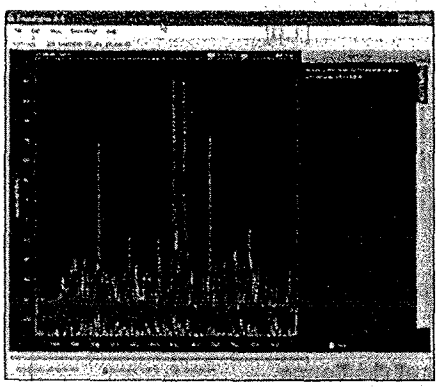


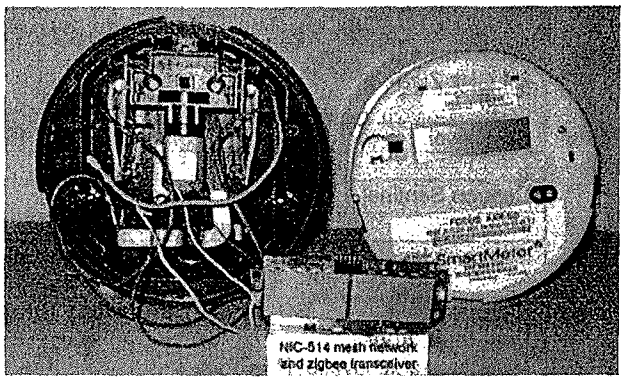
[4] Holland Shielding. http://hollandshielding.com

[5] G.Mezei, Richard Tell Associates, Inc. **An Investigation of Radiofrequency Fields Associated with the Itron Smart Meter.** Final Technical report 1021126. December 2010 www.epri.com. *This report is issued with a <u>disclaimer</u> of the possibility of "damages for any information, apparatus, method, process, or similar item disclosed in this document".*

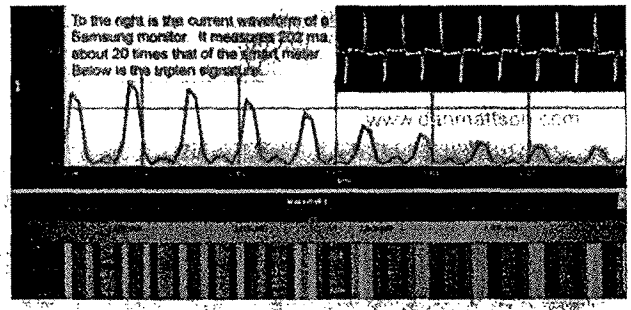
EXHIBIT D-1

*EPRI – **Electric Power Research Institute** at Palo Alto, California, like **Hydro Québec** and other utilities tend to report only pulsed microwave radiation (902-928 MHz) and the ZigBee software transceiver signals for the HAN – Home Area Network to monitor indoor activities including RFIDs, circuits and "signatures", etc. They do not specify how number of meters, local co- factors & other co-utilities, supplier impact on final power density levels for users. Suppliers do not refer to ELF magnetic fields or to switch mode power supply switching frequency radiation (130 kHz) and associated harmonic emissions and distortions associated with installations. The switching mechanism within the circuit board in the bottom right Image converts 240 Volt AC to 12Vs DC and is described in data sheet as introducing "a small amount of frequency jitter, typically 8 kHz peak-to-peak, to minimize EMI emission." Electronics, electric utilities and telecommunication industries engineer try to overcome such transients, which are of primary concern. The switching device raises the issue of power factor which allows Smart meters to "meter" more. [Example for a typical refrigerator with a 0.7 power factor (420 Watts) may register as a 9.5 volt-amps (VA) in terms of random and continuous reactive loads, to be billed for 570 Watts – about 36% more. Furthermore such frequencies and harmonic distortions / noise can cause injurious affection on several fronts. EPRI concedes up to 14.0 microWatt/cm^2 power density versus European guideline of 0.1 microWatt/cm^2 and observations toward 100.0 microWatt/cm^2 and in cases of reflection, up to 8.904.39 microWatt/cm^2 (see: reference Cindy Sage engineering* **Itron** *Smart Meter comparative emission analysis below).*





Example of a Home Area Network "signature" emission – LCD monitor – detectable by Smart meter *ZigBee*



*All non-linear (random, discontinuous) loads, such as switching power supplies, produce such a signature waveform and frequency profile and all are unique. At left is a "signature" from a **Samsung 21"** LCD monitor with analog (VGA) input.*

The interconnectedness objective has the potential for severe systemic upheavals. An early example was an end-of-the-month **IBM New Orleans World Trade Center** facility's inability to perform. After considerable trouble-shooting expertise confirmed integrity of software and hardware, it was observed that **US Navy Coast Guard** vessels were routinely testing – at full power – their radar at the harbour at the end-of-the-month, and thus affecting data and circuitry of **IBM** several miles away. Once the Coast Guard conducted exercises further away, there was no issue. With "smart" home/city / cars - ***"HaLow"*** May 23 2016 **IEEE 802.11ah** specification, we can expect similar "unexplainable" failures at airports, etc.

The compilation below shows how certain factors, such as reflection of signals, grouping of Smart meters, use of ***ZigBee***-type software, duty cycle, the number of meters that a unit is reporting on behalf of - impact the level of power density emissions. There exist situations where the meter's emission levels exceed federal and **ICNIRP** guidelines, even without significant reflective factors. The switching mechanism's 130 kHz and 380 kHz signal's power density are not accounted for in this table, nor the monitored 80 kHz spike, as illustrated previously.

EXHIBIT D-1

Itron *Smart Meter comparative emission levels analysis - sample*

Emission levels of Itron OPENWAY® SMART Meter $\mu W/cm^2$ (900 MHZ Antenna)	**At 20 cm**	**At 1 meter**	**At 3 meters**
Common peak exposure levels of single Itron Smart meter			
Smart meter, front	~ 1 -10	outdoors	
Smart meter, back	~ 0.010 - 0.100	indoors	
Sage Report—CALCULATED for 90% duty cycle			
1000% reflection	8,904.390	556.52	50.09
100% reflection	1,294.360	18.40	1.660
60% reflection	188.390	11.770	1.060
ACS Compliance Testing Laboratory (RSS-210/FCC15.247)—CALCULATED without reflection factor			
900 MHz LAN	227.0	[9.0]	[1.0]
2.4 GHz *ZigBee*	31.0		
Electric Power Research Institute—CALCULATED for upper range of possible RF fields			
Peak level	(30 cm) 168.36	18.727	1.683
Itron, Inc.—CALCULATED			
Centron Sentinel		68.0 – 81.0	
Richard Tell Associates, Inc.—CALCULATED with ground reflection factor 2.56			
Maximum level	adjacent to meter 10.0	1.0	0.10
BC Centre for Disease Control—MEASURED (at British Columbia Hydro Laboratory)			
Peak level, front	≤ 20.0		
Min. detectable level of RF Probe	≤ 20.0		
Safe Living Technologies (Ontario)—MEASURED single SMART meter at residence			
Peak level, front	≥ 2.0		
Indoor peak level, back	0.01 – 0.09		
Electric Power Research Institute—MEASURED single SMART meter at residence			
Peak level, front	(30 cm)	1.134	In bath and bedroom2 0.055
Indoor peak level, back	5.337	Bedroom behind meter 0.061	
ET&T (California)—MEASURED single SMART meter at residence			
Peak level, front		(30 cm) 2.10	
British Columbia Hydro—As quoted in its SMART Meter business case			
< 10.0		0.010	
British Columbia Hydro—CALCULATED AVERAGE based on transmit time per day			
0.6% duty cycle (8 min)	2.0	[0.054]	[0.006]
0.06% duty cycle (1 min)	0.160	[0.006]	[0.007]

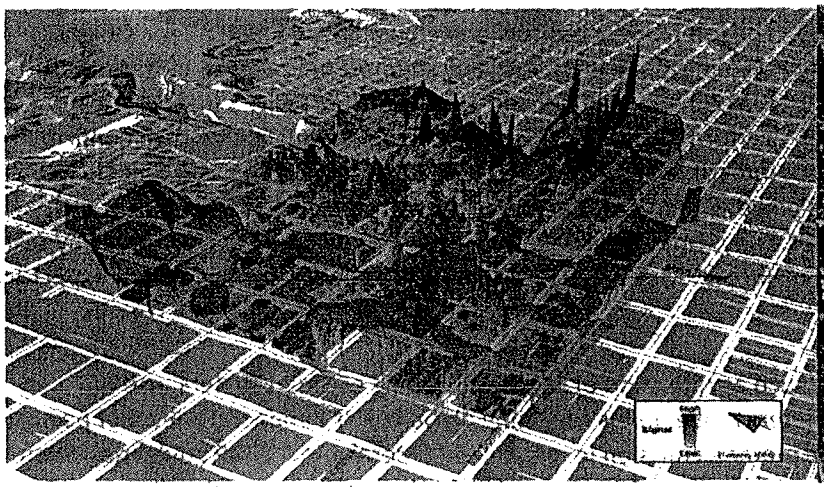


EXHIBIT D-1

Appendix B

EXCERPTS FROM THE REPORT OF THE **FIRE MARSHALL OF ONTARIO**

- The old meter base connections may not have been in a condition for seamless exchange to a new meter
  - This should have been detected by the technician during the change over
  - Would installation guidelines help fix this?

- New meters may have defects that cause electrical failures or misalignment with old meter base
  - The meters are supposedly being designed and tested to specific standards to ensure safety
  - Do we have any policing bodies ensuring (like the CSA with Part II products) that the meters are designed correctly

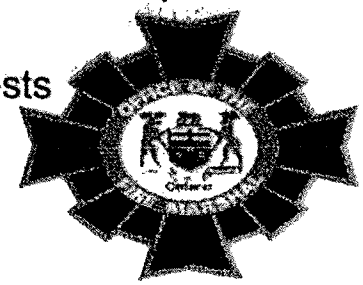
- Careless installation during change over
  - Would installation guidelines help fix this?

- Considering the new smart meters fall under part 3 of the EC their installation has been left up to the utilities to determine. However they are directly plugged/meshing with a single component which falls under Part 2 which has to be installed in accordance with the requirements of part 1

- Therefore, when a utility owned (Part 3) component is directly meshed into a Part 2 component, would it make for more consistent connection, to have both components be scrutinized to the same standards and tested together and fall under the same installation guidelines

- Checking on the UL website we found that **only two** companies were listed which produced meters for the use in Canada
  - Schneider Electric USA Inc.
  - Triacta Power Technologies
  - Where are GE, Sensus etc....?
- On the UL website we found a whole division which is devoted to Global meter testing and performance.
- On their website they state: UL tests for electronic electricity meters and their smart features to the requirements of the United States, Asia, Australia, Europe and South Africa
- While they don't say Canada it would make sense that they are testing ours as well?

- The following comes from the C22.2 No 115-M1989 Meter-Mounting Devices standard
  - Dated 1989
- Enclosures shall completely encase all current-carring parts when meters or other devices of proper types are mounted in position. Enclosures shall be so formed and assembled that they will have the strength and rigidity to resist the normal abuses to which they may be subjected without increasing their fire or accidental hazard due to partial collapse with resultant reduction of spacings, Loosening or displacement of parts, or other serious defects.
- Enclosures shall be of metal or other suitable material which, by investigation, has found to be satisfactory for the conditions of use
- Further states materials thickness. Types of connections. Torques applied to connections
- Additionally there are outlined Mechanical Strength tests
  - Metering connections shall be capable of withstanding the application of torques....
- Humidity, corrosion and weather tests



- Both standards state the components must be able to withstand abuse, have performance requirement tests (accuracy tests), require current carrying parts be separated along with temperature rise tests.
- However the meter base standard has additional simulation tests to ensure the structural integrity of all components
- Why was that missing from the Measurement Canada LMB – EG – 07 specification.
- Well simply it was because the mandate of Measurement Canada was only to ensure accuracy.

APPENDIX C

Issues with wireless technology applications

Who wants our information and why?

Who wants smart meter data?	How could the data be used?
Utilities	To monitor electricity usage and load; to determine bills
Electricity usage advisory companies	To promote energy conservation and awareness
Insurance companies	To determine health care premiums based on unusual behaviors that might indicate illness
Marketers	To profile customers for targeted advertisements
Law enforcers	To identify suspicious or illegal activity
Civil litigators	To identify property boundaries and activities on premises
Landlords	To verify lease compliance
Private investigators	To monitor specific events
The press	To get information about famous people
Creditors	To determine behavior that might indicate creditworthiness
Criminals	To identify the best times for a burglary or to identify high-priced appliances to steal

Source: "Potential Privacy Impacts that Arise from the Collection and Use of Smart Grid Data," National Institute of Standards and Technology, Volume 2, pp. 30–32, Table 5-3. http://spectrum.ieee.org/energy/the-smarter-grid/privacy-on-the-smart-grid
Reprinted in www.burbankaction.com

RELIABILITY

For this section, I will focus on PG&E. PG&E denied there were any technical problems for months until April 2010, when the CPUC forced them to release some records to the public. The records they released (there may be others) showed over 43,000 problems.

Problems with PG&E Smart Meters as of June 2010:

> "Among the problems that PG&E has admitted to are the following:
> • PG&E had to replace nearly 45,000 meters — 23,200 that were installed incorrectly, 12,376 that had data storage issues, and 9,000 that had wireless transmission problems.'
> • PG&E admits that less than 100% of its SmartMeters are accurate. This means that tens of thousands of PG&E customers are getting inaccurate bills.
> • Approximately 4% (13,674) of the Aclara SmartMeters 9 installed by PG&E are expected to have "poor read performance."

• Based on "issues related to Aclara electric meter performance PG&E had to "contain" its deployment of Aclara meters at 145,000.
• Deployment delays due to Silver Spring Network's inability to provide a consistent supply of SmartMeters.
• "production performance problems" with Silver Spring Networks SmartMeters related to "[a]bility to read" the meters.
• PG&E skipped approximately 12,000 meter installations between March 31 and May 20, 2009 based on interference with ground field interrupters ("GFI"). In buildings where a OFI is placed next to a Silver Spring Networks meter panel, PG&E determined that the SmartMeters could trip the GFI.
• Silver Spring Networks found a problem with a component that could cause its meters to stop working. PG&E placed a "hold" on installing 340,000 meters that could be affected by this problem. As of March 2010, only 50,000 meters were removed from "hold" status. "

City And County Of San Francisco's Petition To Modify Decision 09-03-026 To Temporarily Suspend PG&E's Installation Of Smart Meters, A.07-12-009, June 2010, p. 6.7

Criminal negligence is basically analogous to an "I don't care what happens" type of attitude. ...Criminal negligence requires more than merely a mistake in judgment, inattention, or simple carelessness. It only pertains to conduct that is so outrageous and reckless that it marks a clear departure from the way an ordinary careful person would act under similar circumstances.

EXHIBIT D-1

Fiscal impacts

Costs to residents forced out of homes
Property loss -- takings – loss of use of home
Costs to residents who become ill – medical expenses, shielding costs, damage to health, long-term costs
Death
Emotional harm
Fires, electrical wiring, appliance and electronic damage
Loss of wages
Unemployment costs
Cost of Smart appliances and devices
Environmental damage
Loss of bees
Increasing provincial/taxpayer liability for impacts from program not halted
Future costs of downed grid, locally, regionally, throughout the province, or the region
Grid blackout
Costs of Smart Meter/Smart Grid program through rates

The complicated communication and data management systems & new interfaces with the existing billing system are not subject to errors. Similarly, While testing of smart meter generally pass using averaged data, they tend to fail at a manufacturer's specification at 50°C – a potential circumstance – as noted by Ontario Office of the Fire Marshall, and a factor in the conflagration in downtown Calgary due to underground installations that closed the financial hub for several days.

Tolerances can vary between Boards, utilities and manufacturers. In California, for example, the "CPUC tolerances" are 2%, whereas PG&E tolerances for digital meters are .5%, and the manufacturer's tolerances are .2%. Palo Alto (a municipal utility district) decided after 3 years of research not to install Smart Meters because the costs would exceed benefits, and the benefits are minimal. They had also been monitoring the problems and complaints with Smart Meters.

PRIVACY INVASION

Consumer profiling

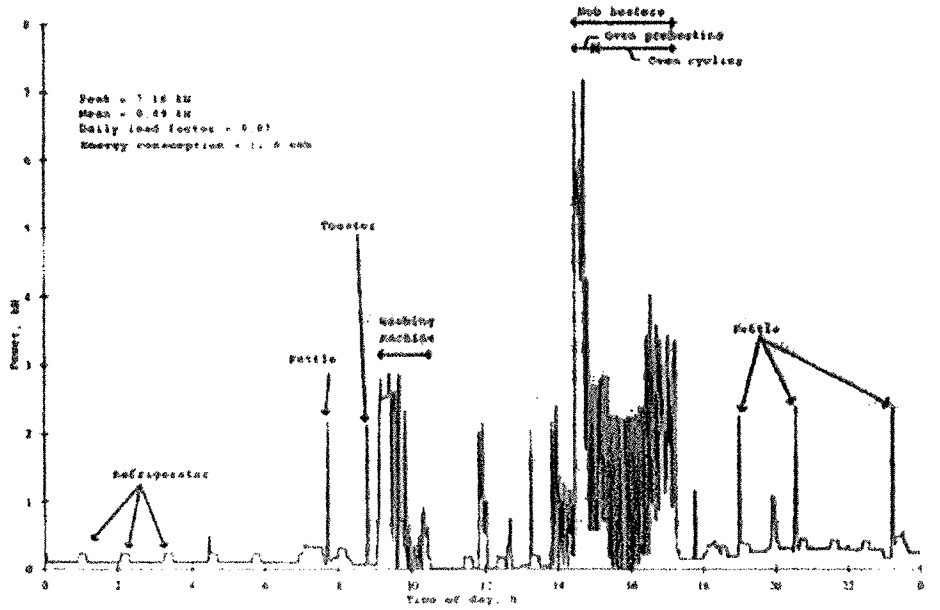


Image: National Institute of Standards and Technology

There is little to no benefit for the consumer, with debatable energy savings; thus the costs exceed any possible benefits.

Connecticut Attorney General George Jepson (February 2011):

> "(Connecticut Light & Power's) proposal would force the company's ratepayers to spend at least $500 million on new meters that are likely to provide few benefits in return,

> "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,"

John Rowe, CEO of Exelon, parent company of Illinois utility company Commonwealth Edison, recently said of the smart grid:

> "... it costs too much, and we're not sure what good it will do. We have looked at most of the elements of smart grid for 20 years and we have never been able to come up with estimates that make it pay." (quoted by AG Madigan)

Illinois Attorney General Lisa Madigan (June 2011):

> "The utilities want to experiment with expensive and unproven smart grid technology, yet all the risk for this experiment will lie with consumers.
>
> The $63 million smart grid pilot program consumers are currently paying for has turned in disappointing results that reinforce what Rowe already knows. On hot summer days, people continue to run their air conditioners no matter how much information they have from their smart meter.
>
> 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?"

Michigan Attorney General Bill Schuette (April 2012)

> ...at least two very substantial issues remain that must be further addressed before the MPSC (Michigan Public Service Commission) authorizes or approves any further deployment of smart meters by Michigan electric utilities and the recovery from ratepayers of the costs of smart meter deployment. First, there must be a sufficient demonstration that implementation of the smart meter programs will actually produce a net economic benefit to customers. Second, customers must be afforded a meaningful and fair opportunity to opt out of smart meter installation without being penalized by unwarranted and excessive costs.
>
> 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. To a significant extent, the asserted potential benefits to utility customers depend upon assumptions that a customer will consider additional "real time" data on electricity usage provided by smart meters, and adjust their electrical consumption to achieve cost savings under variable pricing programs that do not yet exist. (See Edison, Document No. 0146, p 5; and Consumers, Document No. 0148, pp. 6-7). Any assumption that large numbers of residential customers will have the time, ability and motivation to attend to, and act upon daily or even hourly changes in their electrical is questionable.

Comments, Michigan Public Service Commission Case No. U-17000, p. 3-4

What the record does reveal is that AMI is a pilot program that even Robert Ozar, Manager of the Energy Efficiency Section in the Electric Reliability Division of the PSC, concedes "is as yet commercially untested and highly capital intensive, resulting in the potential for significant economic risk and substantial rate impact." At best, the actual evidence presented by Detroit Edison to support the rate increase was aspirational testimony describing the AMI program in optimistic, but speculative terms. *What the record sadly lacks is a discussion of competing considerations regarding the program or the necessity of the program and its costs as related to any net benefit to customers.*

Michigan Court of Appeals Nos. 296374, 296379, slip opinion, pp. 7-9, April 10, 2012
Cited in Attorney General Comments, Case No. U-17000, p. 4-5

Division of Ratepayer Advocates, March 2012:

Executive Summary:
Key Findings presented in Section V of this report include:

- According to SCE's AMI business case, the total cost to customers will be greater than $5 billion, rather than the $1.6 billion cost explicitly approved by the CPUC, which only included nominal deployment costs;

- Many forecasted benefits have been delayed or reduced, which erases the projected margin of net benefits as calculated in SCE's business case [see below];

- SmartConnect-related costs not anticipated in SCE's original business case have already been approved by the CPUC in other proceedings, beyond the over $5 billion cost referenced above. In many cases, these costs were approved without a showing of incremental benefits, and DRA anticipates that more will be requested;

- SmartConnect features such as remote disconnect and SmartConnect-enabled time-varying rates have a high potential for adverse impacts for low-income and other "at-risk" customers... (p. 2)

EXHIBIT D-1

...The failure to address and resolve questions about the benefits of smart metering and dynamic pricing versus the risks noted by consumer advocates has led such organizations to view smart metering propositions with mistrust. (p. 4-6)

Conclusion
The policy solutions developed concerning the issues raised in this RFI will have a profound impact on residential consumers, and low-income and fixed-income seniors in particular. It is unfortunate that many continue to inappropriately lump smart grid and smart meters together in a way that fails to address the consumer protections that are necessary in a transition to smart meters. As outlined in the attached paper, the adoption of smart meters should be carefully examined and considered in light of key concerns and, where implemented, should be accompanied by several essential consumer protections. (p. 10-11)

Comments to Department of Energy Smart Grid RFI: Addressing Policy and Logistical Challenges, November 1, 2010
http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/AARPNCLCPublic_CitizenCommentsDOE1101.pdf
Cited in
https://sites.google.com/site/nocelltowerinourneighborhood/home/wireless-smart-meter-concerns/going-deep-understanding-the-big-picture-and-real-costs-and-concerns

The "attached paper" mentioned above is the report:

The Need For Essential Consumer Protections: Smart Metering Proposals And The Move To Time-Based Pricing, August 2010
www.nclc.org/images/pdf/energy_utility_telecom/additional_resources/adv_meter_protection_report.pdf

SCE was the last electric IOU to file an AMI application (2007). At the time that PG&E and SDG&E submitted their applications (2005), SCE's business case analysis, including multiple scenarios, showed that AMI deployment was not a cost-effective endeavor. Two of its scenario analyses showed a Present Value Revenue Requirement (PVRR), largely due to the added Demand Response from large customers that already had interval meters. SCE stated that "the technology envisioned by the Ruling is unproven and commercially unavailable at this time." (p. 7-8)

...SmartConnect was adopted based on an estimate of $9.2 *million* in net benefits on a PVRR (Present Value Revenue Requirement) basis owing to the time-discounted value of money... (p. 10)

Conclusion:
The CPUC required California's large IOUs to file AMI applications and required a demonstration that AMI systems *could* produce net customer benefits. Initially, SCE found that AMI was *not* cost-effective for its customers, but AMI technological developments in 2005 and 2006 led to the SmartConnect application in 2007, which forecasted a very slim margin of lifetime net benefits on a present value basis. The CPUC authorized SmartConnect deployment costs of $1.634 billion, and SCE customers in aggregate have so far experienced a revenue requirement increase in excess of $193.1 million to cover these costs. This is a real cost increase, one which will certainly rise as more meters are purchased and deployed, and as SCE begins to incur post-deployment costs.

...Total SmartConnect costs paid by customers will actually be more than $5 billion (nominally), accounting for post-deployment costs and the financing costs incurred over the 20 years life of the SmartConnect system. This total cost will be even greater if the cost of future AMI-enabled investments and programs are included. While SCE's incremental cost requests have thus far been relatively conservative, it is important to note that PG&E and SDG&E have so far requested much higher amounts in incremental AMI funding: PG&E has requested and received approval for funding in excess of $500 million, and SDG&E has received funding approval for over $93 million. (p. 50)

Case Study of Smart Meter System Deployment: Recommendations for Ensuring Taxpayer Benefits; Hieta, Kao, Roberts

AARP, National Consumer Law Center, and Public Citizen:

...past experience with time of use rates cautions that initial interest in such rates tapers over time. In addition, the low take-rate in the PG&E service territory over the last two years does not bode well for the popularity of critical peak pricing.

...Studies to date attempting to show that low-income customers will benefit do not demonstrate that such will be the case.

- Many utilities offer Time of Use rate options to residential customers using interval meters; little customer interest
- RESTRUCTURING STATES: Most abandoned mandatory TOU and other rate design structures associated with generation supply management and assumed that the competitive market would provide such products.
- Utilities typically couple smart metering with the functionality of remote connection and disconnection of the meter; CA results document significant increase in volume of disconnections with AMI; elimination of premise visit increases risk of wrongful or disputed disconnection; health and safety risks
- These new meters may give rise to a host of degraded service options, e.g., prepayment (pay in advance and automatically disconnect when meter is not fed); service limiters
- Dynamic pricing does not "empower" customers; it presents a Hobson's Choice to many low use, low income, and elderly customers who must use electricity during peak hours for health and safety reasons (Chicago heat wave; over 700 deaths, mostly seniors living alone)
- A voluntary approach to dynamic pricing or relying on Peak Time Rebates is preferred approach; PTR has been successfully demonstrated to result is peak load reduction without TOU or CPP
- Smart Grid and smart metering must not be used as a means to impose dramatic changes in retail rate design for residential customers
    - Dynamic and time-based price programs must remain optional on an "opt in" basis
    - Rewards in the form of credits for peak usage reduction should be the preferred approach

      Presentation, July 15, 2010, 2010 National Energy and Utility Affordability Conference

      http://www.energyandutilityconference.org/Assets/2010%20Conference/2010%20Presentations/Plenary%201_Alexander.pdf

      As summarized in

https://sites.google.com/site/nocelltowerinourneighborhood/home/wireless-smart-meter-concerns/going-deep-understanding-the-big-picture-and-real-costs-and-concerns

Massachusetts Power Selects Schneider Electric to Implement Integrated Smart Grid Solution

Advanced DMS-Based Outage Management Sets Massachusetts Power on Path to Become Smart Utility

October 08, 2013 --

HALIFAX, NS -- (Marketwired) -- 10/08/13 -- Schneider Electric (PINKSHEETS: SBGSY), the global specialist in energy management, announced today that is has been selected by Massachusetts Power to implement an Advanced Distribution Management System (ADMS) based Outage Management System (OMS) as an integrated smart grid solution to improve operational efficiencies and outage management response and restoration.

Currently in the implementation phase, the project will position Massachusetts Power's vision to meet the challenges of increasing consumer demands for sustainable, reliable energy as well as positioning the utility for future advanced smart grid operations. The new solution utilizes the utility's existing investment in Schneider Electric's GIS technology, offering efficient network data and model management, and provides seamless, embedded OMS and DMS technologies. Using integrated voice response, work order management and crew dispatch capabilities, Massachusetts Power will be able to efficiently monitor, analyze, and manage its network of nearly 500,000 customers for more rapid response to power outages.

According to Laurent Vernerey, executive vice president of Schneider Electric's End User Business: "This project represents a new trend in the smart grid industry, the integration of OMS as a seamless application of smart grid solutions to improve operational efficiencies and safety. We are excited to be on the forefront of offering this advanced technology to utilities around the world."

EXHIBIT D-1
APPENDIX D

Precautionary principle – European Commission observations

Incomplete information, inconclusive evidence and public controversy can make it difficult to achieve consensus over the appropriate response to hazardous substances or activities, but these are precisely the sorts of conditions that often demand hard and fast decisions. The precautionary principle is designed to assist with decision-making under uncertainty and is a core principle of EU environmental law, enshrined in Article 191(2) of the Treaty on the Functioning of the EU. The classic definition of 'a precautionary approach' comes from the 1992 Rio Declaration on Environment and Development, which states that:

"Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (UNEP 1992).

In other words, a precautionary approach captures the idea that regulatory intervention may still be legitimate, even if the supporting evidence is incomplete or speculative and the economic costs of regulation are high. Better safe than sorry. In the Communication on the Precautionary Principle from 2000 the European Commission clarified that:

> "Recourse to the precautionary principle presupposes that potentially dangerous effects deriving from a phenomenon, product or process have been identified, and that scientific evaluation does not allow the risk to be determined with sufficient certainty. The implementation of an approach based on the precautionary principle should start with a scientific evaluation, as complete as possible, and where possible, identifying at each stage the degree of scientific uncertainty"
>
> (European Commission, 2000, COM (2000) 1 final).

The European Commission also refers to the need for 'reasonable grounds for concern' about potential risks. Crucially, this means that the principle ought only to be used if a risk is deemed to be plausible. Any regulatory measures introduced as a result of the precautionary principle should also be subject to review in light of new scientific data, and may have to be modified or abolished as new scientific data become available. In this sense, the Communication provides a step-by-step guide to applying the principle; however, it is not prescriptive and is designed to be flexible, allowing for the variety of circumstances in which the principle might operate. The Commission notes that it is ultimately for decision-makers and the courts to flesh out the details.

We therefore advise against uncritical use of its risk assessments. In many cases, the information in its reports and fact sheets is wrong, because the data are based on a misunderstanding of the precautionary principle. By ruling in the Pfizer case, the Commission has been criticized for their scientific committee had misunderstood the precautionary principle and based its statement on false assumptions. SCENIHR's reports on the health risks of EMF show that this problem persists and occurs more generally.

The Commission has announced internal instructions for its scientific committees, but these are inadequate. The appointed scientists have misinterpreted their mandate and seem to believe that it is up to them to determine what level of risk is acceptable to society. Because this viewpoint is concealed by the incorrect reflection of the degree of scientific uncertainty, the problem is very difficult for the decision-makers who are responsible for risk management to detect. Knowledge of how risk management works is required for a risk assessment to be correct. We therefore propose that the working groups be supplemented with legal expertise. They must also be provided with substantially clearer instructions on the conditions of their mission.

EXHIBIT D-1
APPENDIX E

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
As low as (10^{-15}) or 100 femtowatts/cm2	Super-low intensity RFR effects at MW resonant frequencies resulted in changes in genes; problems with chromatin conformation (DNA)	Belyaev, 1997
5 picowatts/cm2 (10^{-12})	Changed growth rates in yeast cells	Grundler, 1992
0.1 nanowatt/cm2 (10^{-08}) or 100 picowatts/cm2	Super-low intensity RFR effects at MW resonant frequencies resulted in changes in genes; problems with chromatin condensation (DNA) intensities comparable to base stations	Belyaev, 1997
0.00034 uW/cm2	Chronic exposure to mobile phone pulsed RF significantly reduced sperm count.	Behari, 2006
0.0005 uW/cm2	RFR decreased cell proliferation at 960 MHz GSM 217 Hz for 30 min exposure	Velizarov, 1999
0.0006 - 0.0128 uW/cm2	Fatigue, depressive tendency, sleeping disorders, concentration difficulties, cardio-vascular problems reported with exposure to GSM 900/1800 MHz cell phone signal at base station level exposures.	Oberfeld, 2004
0.003 - 0.01 uW/cm2	In children and adolescents (8-17 yrs) short-term exposure caused headache, irritation, concentration difficulties in school	Heinrich, 2010
0.003 to 0.05 uW/cm2	In children and adolescents (8-17 yrs) short-term exposure caused conduct problems in school (behavioral problems)	Thomas, 2010
0.005 uW/cm2	In adults (30-60 yrs) chronic exposure caused sleep disturbances, (but not significantly increased across the entire population)	Hutter, 2010
0.005 - 0.04 uW/cm2	Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated)	Thomas, 2008
0.006 - 0.01 uW/cm2	Chronic exposure to base station RF (whole body) in humans showed increased stress hormones, dopamine levels substantially decreased; higher levels of adrenaline and non-adrenaline; dose-responsive stress-induced chronic physiological stress in cells even after 1.5 years.	Buchner, 2012
0.01 - 0.11 uW/cm2	RFR from cell towers caused fatigue, headaches, sleeping problems	Navarro, 2003

Stress proteins, HSP; disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardio, heart muscle, blood pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
0.01 - 0.05 uW/cm2	Adults (18-91 yrs) with short-term exposure to GSM cell phone radiation reported headache, neurological problems, sleep and concentration problems.	Hutter, 2006
0.005 - 0.04 uW/cm2	Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated)	Thomas, 2008
0.015 - 0.21 uW/cm2	Adults exposed to short-term GSM 900 radiation reported changes in mental state (e.g., calmness) but limitations of study on language descriptors prevented refined word choices (stupified, zoned-out)	Augner, 2009
0.05 - 0.1 uW/cm2	RFR linked to adverse neurological, cardio symptoms and cancer risk	Khurana, 2010
0.05 - 0.1 uW/cm2	RFR related to headache, concentration and sleeping problems, fatigue	Kundi, 2009
0.07 - 0.1 uW/cm2	"Sperm head abnormalities in mice exposed for 6-months to base station level RF/MW. Sperm head abnormalities occurred in 39% to 46% exposed mice (only 2% in controls) abnormalities was also found to be dose dependent. The implications of the pin-head and banana-shaped sperm head. The occurrence of sperm head observed increase occurrence of sperm head abnormalities on the reproductive health of humans living in close proximity to GSM base stations were discussed."	Otitoloju, 2010
0.38 uW/cm2	RFR affected calcium metabolism in heart cells	Schwartz, 1990
0.8 - 10 uW/cm2	RFR caused emotional behavior changes, free-radical damage by super-weak MWs	Akoev, 2002
0.13 uW/cm2	RFR from 3G cell towers decreased cognition, well-being	Zwamborn, 2003
0.16 uW/cm2	Vigor, function, memory and attention of school children affected (Lai-04)	Kolodynski, 1996
0.168 - 3.053 uW/cm2	Irreversible infertility in mice after 5 generations of exposure to RFR from an antenna park	Magras & Xenos, 1997
0.2 - 8 uW/cm2	RFR caused a two-fold increase in leukemia in children	Hocking, 1996
0.2 - 8 uW/cm2	RFR decreased survival in children with leukemia	Hocking, 2000
0.21 - 1.26 uW/cm2	Adolescents and adults exposed only 15 min to UMTS cell phone radiation reported increase in headaches	Riddervold, 2008

Stress proteins, HSP; disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardio, heart muscle, blood pressure, vascular effects

EXHIBIT D-1

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
0.5 uW/cm2	Significant degeneration of seminiferous epithelium in mice at 2.45 GHz, 30-40 min.	Saunders, 1981
0.5 - 1.0 uW/cm2	Wi-Fi level laptop exposure for 4-hr resulted in decrease in sperm viability, DNA fragmentation with sperm samples placed in petri dishes under a laptop connected via WI-FI to the internet.	Avendano, 2012
1.0 uW/cm2	RFR induced pathological leakage of the blood-brain barrier	Persson, 1997
1.0 uW/cm2	RFR caused significant affect on immune function in mice	Fesenko, 1999
1.0 uW/cm2	RFR affected function of the immune system	Novoselova, 1999
1.0 uW/cm2	Short-term (50 min) exposure in electrosensitive patients, caused loss of well-being after GSM and especially UMTS cell phone radiation exposure	Eltiti, 2007
1.3 - 3.7 uW/cm2	RFR associated with a doubling of leukemia in adults	Dolk, 1997
1.25 uW/cm2	RFR exposure affected kidney development in rats (in-utero exposure)	Pyrpasopoulou, 2004
1.5 uW/cm2	RFR reduced memory function in rats	Nittby, 2007
2 uW/cm2	RFR induced double-strand DNA damage in rat brain cells	Kesari, 2008
2.5 uW/cm2	RFR affected calcium concentrations in heart muscle cells	Wolke, 1996
3 - 4 uW/cm2	Altered cell membranes; acetycholine-induced ion channel disruption	D'Inzeo, 1988
4 uW/cm2	RFR caused changes in hippocampus (brain memory and learning)	Tattersall, 2001
4 - 15 uW/cm2	Memory impairment, slowed motor skills and retarded learning in children	Chiang, 1989
5 uW/cm2	RFR caused drop in NK lymphocytes (immune function decreased)	Boscolo, 2001
5.25 uW/cm2	20 minutes of RFR at cell tower frequencies induced cell stress response	Kwee, 2001
5 - 10 uW/cm2	RFR caused impaired nervous system activity	Dumansky, 1974
6 uW/cm2	RFR induced DNA damage in cells	Phillips, 1998

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardiac, heart muscle, blood pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
8.75 uW/cm2	RFR at 900 MHz for 2-12 hours caused DNA breaks in leukemia cells	Marinelli, 2004
10 uW/cm2	Changes in behavior (avoidance) after 0.5 hour exposure to pulsed RFR	Navakatikian, 1994
10 - 100 uW/cm2	Increased risk in radar operators of cancer, very short latency period, dose response to exposure level of RFR reported.	Richter, 2000
12.5 uW/cm2	RFR caused calcium efflux in cells - can affect many critical cell functions	Dutta, 1989
13.5 uW/cm2	RFR affected human lymphocytes - induced stress response in cells	Salmon, 2004
20 uW/cm2	Increase in serum cortisol (a stress hormone)	Mann, 1998
26.2 uW/cm2	RFR increased free radical production in rat cells	Yurekli, 2006
37.5 uW/cm2	Immune system effects - elevation of PFC count (antibody producing cells)	Veyret, 1991
45 uW/cm2	Pulsed RFR affected serum testosterone levels in mice	Forgacs, 2006
50 uW/cm2	Cell phone RFR caused a pathological leakage of the blood brain barrier in 1 hour	Salford, 2003
50 uW/cm2	An 18% reduction in REM sleep (important to memory and learning functions)	Mann, 1996
60 uW/cm2	RFR caused structural changes in cells of mouse embryos	Somosy, 1991
60 uW/cm2	Pulsed RFR affected immune function in white blood cells	Stankiewicz, 2006
60 uW/cm2	Cortex of the brain was activated by 15 minutes of 902 MHz cell phone	Lebedeva, 2000
65 uW/cm2	RFR affected genes related to cancer	Ivaschuk, 1997
92.5 uW/cm2	RFR caused genetic changes in human white blood cells	Belyaev, 2005
100 uW/cm2	Changes in immune function	Ekiex, 1996
100 uW/cm2	A 24.3% drop in testosterone after 6 hours of CW RFR exposure	Navakatikian, 1994
120 uW/cm2	A pathological leakage in the blood-brain barrier with 915 MHz cell RF	Salford, 1994

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardiac, heart muscle, blood pressure, vascular effects

EXHIBIT D-1

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
500 uW/cm2	Intestinal epithelial cells exposed to 2.45 GHz pulsed at 16 Hz showed changes in intercellular calcium.	Somozy, 1993
500 uW/cm2	A 24.6% drop in testosterone and 23.2% drop in insulin after 12 hrs of pulsed RFR exposure.	Navakatikian, 1994

STANDARDS		
530 - 600 uW/cm2	Limit for uncontrolled public exposure to 800-900 MHz	ANSI/IEEE and FCC
1000 uW/cm2	PCS STANDARD for public exposure (as of September 1,1997)	FCC, 1996
5000 uW/cm2	PCS STANDARD for occupational exposure (as of September 1, 1997)	FCC, 1996
BACKGROUND LEVELS		
0.003 uW/cm2	Background RF levels in US cities and suburbs in the 1990s	Mantiply, 1997
0.05 uW/cm2	Median ambient power density in cities in Sweden (30-2000 MHz)	Hamnlerius, 2000
0.1 - 10 uW/cm2	Ambient power density within 100-200' of cell site in US (data from 2000)	Sage, 2000

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardiac, heart muscle, blood pressure, vascular effects

= [EXHIBIT C-1] =

EXPERT REPORT / STATEMENT
OF
DAVID O. CARPENTER, MD

2749 Old State Road
Schenectady, New York 12303

Director, Institute for Health and the Environment
University at Albany

(1) General Statement of my Expert Determination:

The views and conclusions stated herein are made with more than a reasonable degree of scientific and medical certainty and confidence. They are based upon the reports and studies referred to herein, my general knowledge derived from those materials, my educational and professional background and study as applied to my review of these materials.

It is my expert statement that exposure to electromagnetic fields (EMFs) such as those associated with wi-fi, cell phones, and other forms of radiofrequency radiation, including wireless digital pulsed radiating smart meters, such as the Itron/Centron OpenWay SK9AMI7 smart meter, with its Switch Mode Power Supply (SMPS) operating in a smart mesh, that Duquesne Light Company (DLC) wishes to deploy at the Hriadil's residences (331 Shady Ridge Drive, Monroeville, Pennsylvania; and 810 Selby Way, Pittsburgh, Pennsylvania), are harmful to their well-being in particular, and the human condition in general.

Exposure to such radiation has been shown to induce, trigger, and/or cause a constellation of symptoms include headaches, insomnia, anxiety, fatigue, tinnitus, cognitive disturbances, abnormal sensation and dizziness, and even skin effects like rashes and dermatitis. In some individuals these symptoms are accompanied by muscle twitching, abdominal pain and skipped heartbeats.

There is now clear, based on strong scientific evidence, that intensive use of cell phones increases the risk of brain cancer, schwannoma 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 smart meters, such as those being deployed by DLC use similar radiofrequency radiation, exposing the whole body to levels of radiofrequency radiation similar to cell phones. The difference between a cell phone and an electronic smart meter environment is that while the cell phone is used only intermittently a smart meter generates continuous pulses of radiofrequency radiation.

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 smart meters all generate similar radio-frequency (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, and no one is exposed only to the radiation from the electronic meters. Nevertheless, they utilize the same type of radio-frequency radiation that is used in cell phones. Thus, the health effects found among those who have high intensity and duration use of cell phones are relevant to answer the question of what are the health effects of smart meters.

It should be noted that the International Agency for Research on 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.) is classified as a "Group 2B", possible human carcinogen (IARC, 2011). This classification proceeded the National Toxicology Program's demonstration of brain cancer and schwannomas in rats, and therefore it is likely that a higher rating will be made in the future. Since then, evidence of harm has mounted from new and more advanced studies, and numerous scientists who originally voted for the 2B classification are now urging raising the classification or adopting a cautionary stance, including scientists Hardell, Miller, Leszczynski, Samet, Portier, and Belyaev.

While it is true that the average intensity to RF from electronic meters is not much greater than that from many of other wireless devices, there are several crucial differences. While a cell phone is used for a finite period of time, smart meters continually generate radiation, leading to cumulative, aggregate whole body exposure. In addition, the radiation from a smart meter is in the form of very brief but very intense and continuous pulses. There is developing evidence that the sudden on and off of these pulses has a greater biological effect that does the same average intensity of a pure sine wave. As such, it has become a major public health issue that can no longer be ignored. "Prudent avoidance" must be practiced in the public interest, which is to say that it is critical to reduce unnecessary exposure to the degree possible until the magnitude of risk is fully understood and why there are such large individual difference in sensitivity these exposures.

In a recent complaints before the Commission, the PA PUC has officially recognized that exposure to the emissions of a Smart Meter caused harm. I refer to Maria Povacz v. PECO Energy Company, Docket No. C-2015-2475023. In this case, 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."

My specific concerns about electronic meters are as follows:

i. 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.

ii. 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.

iii. 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.

iv. Beyond the adverse health effects, the evidence is that 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.

v. Furthermore, 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.

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 the risk of disease. My expert position, based on the current level of scientific evidence, is that it is grossly negligent to impose such a RF pulse emitting device as a Duquesne Light Company smart meter on people such as Francis and Michele Hriadil, particularly in light of the public health warnings that I and others have issued. In addition both Francis and Michele Hriadil are elderly, and Francis Hriadil's doctor has specifically recommended that he not be exposed to such environmental risks with his chronic conditions.

As a public health physician with specific expertise in the human effects of radiofrequency radiation, I urge you to require Duquesne Light Company to retain or install non-radiating electro-mechanical 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 Pennsytvania residents and will ultimately invite legal action arising from the development of diseases known to be associated with exposure to RF radiation.

(2) Background & Perspective

Even without special circumstances or unusual exposures, I am concerned about regular electromagnetic exposures from ubiquitous wireless transmitters and electronic devices in our society. The Federal Communications Commission (FCC) has failed to set protective guidelines, in particular ignoring risks to children, who are more vulnerable and absorb more EMFs due to height, chemistry, immaturity, and growth processes (Morgan et al, 2014). The Government Accountability Office published a 2012 report on the need for the FCC to update exposure limit guidelines for transmitters such as from mobile phones. The FCC then opened a docket 13-84 to solicit public input, but has never closed this docket nor acted on the 955 recommendations, including letters from reputable organizations such as the American Academy of Pediatrics requesting particular attention to higher exposures of children.

Concerns have also been raised by government agencies: Radiofrequency Interagency Work Group of the National Institute for Occupations Safety & Health (1999); Center for Science & Risk Assessment Radiation Protection Division of the Environmental Protection Agency (2003); and the Office of Environmental Policy & Compliance of the Department of the Interior (2014). Filings by Boston and Philadelphia accused the FCC of negligence for failing to examine ADA implications of cellular infrastructure for person with Electromagnetic Sensitivity (Sinnot et al, 2013).

Serious concerns have also been raised in the international scientific and medical communities. In the July 6, 2018 issue of Environmental Pollution (Belpomme et al., 2018), as but one example, the "*Thermal and non-thermal health effects of low intensity non-ionizing radiation: An international perspective*" was published. A broad consensus of representatives from such esteemed institutions as the European Cancer Environment Research Institute, Brussels, Belgium; the Paris V University Hospital, Paris, France; the Department of Oncology, Orebro University Hospital, Faculty of Medicine, Orebro, Sweden; the Department of Radiobiology, Cancer Research Institute, Biomedical Research Center, Slovak Academy of Science, Bratislava, Slovak Republic; the Laboratory of Radiobiology, Institute of General Physics, Russian Academy of Science, Moscow, Russian Federation; the Instituto Scientifico Biomedico Euro Mediterraneo, Mesagne, Italy; the Institute for Health and the Environment, University at Albany, Albany, NY, USA; and the Child Health Research Centre, The University of Queensland, Faculty of Medicine, Brisbane, Australia concluded that exposure to low frequency and radiofrequency electromagnetic fields at low intensities poses a significant health hazard that has not been adequately addressed by national and international organizations such as the World Health Organization. There is strong evidence that excessive exposure to mobile phone-frequencies, which are the same frequencies that Smart Meters operate at, over long periods of time increases the risk of brain cancer both in humans and animals. The mechanism(s) responsible include induction of reactive oxygen species, gene expression alteration and DNA damage through both epigenetic and genetic processes.

The US Access Board recognized Electromagnetic Sensitivity as a disability requiring accommodation in its 2005 IEQ Indoor Environmental Quality Report and the Department of Labor Job Accommodation Network has published recommendations for accommodation.

The American Academy of Environmental Medicine has several policy papers online which discuss harmful effects from EMFs and Electromagnetic Sensitivity. The California Medical Association has passed a resolution acknowledging FCC guidelines fail to be protective. The US Physicians for Social Responsibility is a signatory of a declaration of EMF concerns with Doctors for the Environment, which includes 21 international medical organizations. The Austrian Medical Society has developed guidelines for clinical diagnosis of Electromagnetic Sensitivity, as has the European Academy for Environmental Medicine. International courts have also extended workman's compensation for Electromagnetic Sensitivity, such as in Spain in both 2011 and 2016, Australia in 2013 and France in 2019.

The FCC has no medical expertise, and FCC guidelines were set in 1991 by a small group within the Institute of Electrical and Electronics Engineers (IEEE) lacking relevant training in medical science and public health. Guidelines were set only for short-term exposure and to prevent heating. There is strong evidence that most of the health effects known to occur are at intensities that do not cause tissue heating.

Failure to act has left the public subject to ubiquitous and chronic exposures despite evidence of risk, and an increasing number of frequencies and rising power levels. In contrast, China,

Russia, Switzerland, and other countries have wireless exposure guidelines 100 to10,000 times less than the USA. Many countries have health agencies that explicitly warn to reduce mobile phone use and wireless exposures. Several set limits on cell phone use by children or limit exposures in sensitive areas such as schools [Belgium, Taiwan, Greece, Chile, Cyprus, and France]. The European Union officially recognized Electromagnetic Sensitivity in 2012, and the Canadian Human Rights Commission did so by 2014 in its Policy on Environmental Sensitivities.

The National Toxicology Program completed a $25 million study and released its findings indicating significantly increased heart and brain cancers in rodents (Wyde et al., 2016; Melnick, 2019). 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. These are same cancer seen in humans after excessive cell phone use (Hardell and Carlberg, 2009) In March of 2018, a peer review panel, composed of 11 pathologists and toxicologists from academia and industry and one statistician, concluded that there is "clear evidence of carcinogenic activity" in those male rats.

The American Cancer Society (ACS) has stated that this NTP study linking radiofrequency radiation (RFR) to two types of cancer marks a paradigm shift in our understanding of radiation and cancer risk. The finding of elevated risk of developing schwannomas and glioma in rodents has been replicated by studies from the Ramazzini Institute (RI) (Falcioni et al., 2018) The Ramazzine study was performed on rodents exposed to much lower intensities of RF, modelled to be similar to what one would get from living near to a cell tower. Yet the same two cancers were elevated in exposed rats. The American Academy of Pediatrics recently issued tips to reduce wireless RF exposures. Even before this, in 2014, the Connecticut Department of Public Health released recommendations to reduce mobile phone exposures. In 2017, upon court order, the California Department of Public Health released tips to reduce exposures from mobile phones, tips originally drafted in 2008 and then redrafted 27 times through 2015. In 2017, the Maryland State Children's Environmental Health and Protection Advisory Council also recommended that the state Department of Education provide wired rather than wireless connections.

(3) Assessment of Work & School Exposures vs. in Society

Although the randomness of exposures, ubiquitous exposures, and increasing power levels and frequency types continues to be a cause for concern for everyone, I believe there are riskier environments that can lead to early onset of illness including Electromagnetic Sensitivity. Employment involving electromagnetic exposure is associated with early and increased risks of disease or illness. Proximity to and constant use of technology and wireless transmitters naturally increases electromagnetic exposure and power levels, in this case being exposure to wireless and fields from electricity, besides reducing opportunities for downtime. Some working conditions encourage a higher than normal amount of technology use and exposure. Finally certain individuals show a greater vulnerability to exposures.

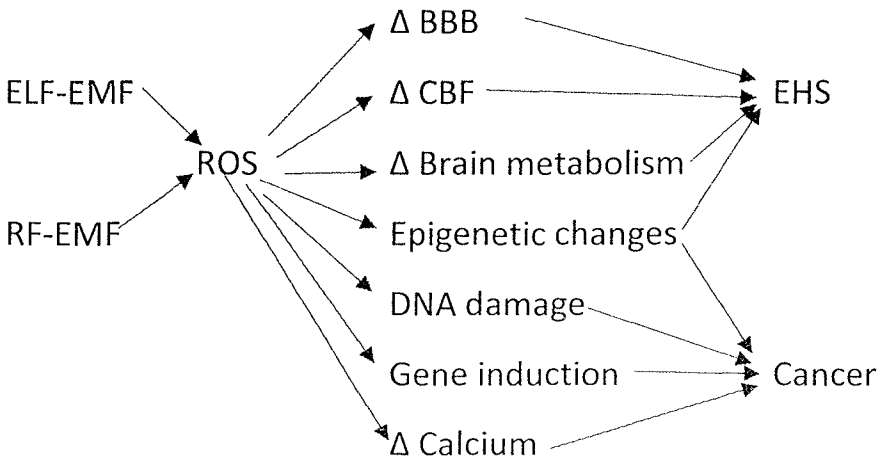
(4) What Constitutes High vs. Dangerous Exposure Levels

It is not possible to identify "safe" vs. "unsafe" levels of RF exposure. Precautionary levels were suggested by the Bioinitiative Group and the EMF working group of the European Academy for Environmental Medicine (EUROPAEM) (Belyaev et al. 2018). The Bioinitiative Report currently proposes a benchmark of 0.3 nanowatts to 0.6 nanowatts per square centimeter for chronic wireless exposure, noting this may need to be changed as research continues.

In spite of scientific evidence indicating non-thermal risks, the FCC set standards based only on the prevention of tissue heating. The FCC standard for 1,500-100,000 MHz RF EMF exposure, the frequency of wifi, is 1.0 mW/cm^2. The FCC has provided no standard related to non-thermal risks. This does not mean that non-thermal risks are of no consequence. In contrast, the precautionary level proposed by The Bioinitiative Report (www.bioinitiative.org) is 0.1 $\mu W/cm^2$, one thousand times less, based on all of the available evidence from human, animal and cellular studies. However Mantiply in 1997 reported radiofrequency or wireless levels near cell towers to be from 0.003 to 0.3 $\mu W/cm^2$ with background ambient exposures in cities and suburbs below 0.003 $\mu W/cm^2$; Sage Associates in 2000 reported ambient exposures away from wireless antenna sites as between 0.001 $\mu W/cm^2$ to 0.000001 $\mu W/cm^2$ and from 0.01 to 3.0 $\mu W/cm^2$ near wireless antenna sites (Sage, 2007).

(5) Laboratory Research Supporting a Plausible Mechanism for Electromagnetic Sensitivity and Associated Symptoms or Illness:

A question often raised is whether a mechanism exists for biological effects to occur from electromagnetic exposures. A majority of studies have shown that wireless RF exposures increase oxidative stress through the generation of reactive oxygen species (ROS) (Consales et al, 2012; Belpomme et al., 2018). The outcome of this oxidation is peroxidation, DNA damage, changes in antioxidant activity and alteration of brain function. Oxidative stress results in both cancer and non-cancer diseases, including systemic inflammation. These mechanisms appear to be common to effects of extra-low frequency electromagnetic fields, such as those produced by electricity, as well. Additional documentation of the various effects resulting from exposure to RF electromagnetic fields, and for the role of generation of ROS in mediating these effects, can be found in the Bioinitiative Report (2007; 2012). The variety of health effects that result is indicated in the diagram below.



(6a) Laboratory Research Indicating Sensitization from Exposure and Development of Electromagnetic Sensitivity & Other Illnesses

Dr. Belpomme and colleagues in 2015 examined patients with Electromagnetic Hypersensitivity EHS) finding associations with autoimmunity, inflammation, neurodegeneration, and heightened risk for women. Many of Dr. Belpomme's patients had a deficiency in vascular perfusion in the limbic center of the brain, 50% showed decreased HSP27 and or HSP70, fifty percent showed elevated rates of stress proteins, 70% had severe vitamin D deficiency, 40% were hyper histaminic, 1 in 3 showed melatonin deficiency in urine, 30% had antibodies and protein rates indicating thermal shock and brain anomalies, 28% showed increase of nitrotyrosine, 22% (EHS) and 24.7% (EHS-MCS) show increase of IgE levels which appears separate from histamine, 20% had increased anti-myelin proteins in the blood, 14.7% and 14.3% showed increase in hs-CRP levels indicating systemic inflammation, 10% had an increase in protein S100P, and many patients had simultaneous multiple chemical sensitivities.

Laboratory investigation has linked genetic markers to EHS. While not necessarily present in every individual with EHS, these markers indicate sensitivity is based on reduced ability to control oxidative stress. For example, research by de Luca et al in 2014 predicts a 9.7 fold risk of developing electrosensitivity with the null allele combination of GSTT1 and GSTM1 (genetic variants). The absence of this allele combination significantly cuts ability to combat oxidation with glutathione, a major antioxidant. De Luca et al (2014) also noted electrosensitivity is associated with other blood metabolic or genetic biomarkers, such as significantly increased CuZnSOD activity, increased plasma coenzyme Q10 oxidation ratio, depletion of E (alpha-tocopherol), "severely" decreased glutathione S-transferase (GST) erythrocyte activity, marked decrease in glutathione (GSH) levels, and "strongly decreased" oxidized (GSSG) glutathione forms . Multiple chemical sensitivity markers were also examined, and some overlap was found. This was not surprising because the markers are indications of greater difficulty processing toxins and thus greater sensitivity to toxic exposures.

(6b) Brain & Neurological Problems:

There have been a number of reports of neurobehavioral effects of RF EMF exposure. Barth et al. (2007) performed a meta-analysis (an attempt to determine consistency of data) of 19 studies and concluded that attention and working memory were altered and that the number of errors in a performance task was increased in the presence of RF EMFs. Eliyahu et al. (2006) in a blinded study (that being where the subjects did not know if the EMFs were on or not on) reported that response time was slowed but only when it was the left brain that was exposed. Landgrebe et al. (2007; 2008) found that 89 ES subjects demonstrated significant cognitive and neurobiological differences as compared to 107 age and gender matched controls, leading them to suggest that ES persons have a greater individual vulnerability to EMFs.

In 1978 it was reported that RF EMF at power densities lower than 10-12 W/cm^2 resulted in temporary changes in the electroencephalogram (EEG) (Bise, 1978). In 1998 it was reported that RF EMFs alter slow brain potentials associated with a visual monitoring task (Freude et al., 1998). A recent publication in one of the distinguished journals of the American Physiological Society found that in a blinded study that RF EMF alters the EEG by causing a statistically significant decrease in power of the alpha wave (Ghosn et al., 2015). This result is consistent with some previous reports (Curcio et al., 2005; Croft et al., 2008; 2010) of effects of RF EMF

on the EEG. Kramarenko and Tan (2003) reported that RF EMF applied to the skull resulted in the appearance of slow waves in the EEG, more prominent in children than adults. In addition WiFi signals have been reported to cause a reduction in the P300 component of an auditory evoked response, and that the reduction was greater in males than in females (Papageorgiou et al., 2011).

Other evidence definitively shows that RF EMF can alter brain metabolism. Glucose metabolism provides the energy the brain needs to function. Both Volkow et al. (2011) in the Journal of the American Medical Association and Kwon et al. (2011) in the Journal of Cerebral Blood Flow and Metabolism have published reports showing that glucose metabolism of the brain is altered upon prolonged exposure to RF EMFs, although the changes they find are not identical. Augner et al (2010) reported that RF EMF whole body exposure resulted in a dose-dependent increase in salivary alpha-amylase and cortisol, but did not alter immunoglobin A.

Modeling studies have found evidence that RF EMF penetrates the brains of children to a much greater degree than that of adults (Gandhi et al., 1996; Rajagopal and Rajasekaran, 2014). The symptoms of EHS are mediated by the nervous system (headaches, insomnia, fatigue, cognitive and behavioral alterations, altered sensations, tinnitus). The evidence that RF EMF penetrates the brain of children more than adults and that even in adults RF EMF exposure alters brain EEG and evoked potentials and changes brain metabolism is consistent with the conclusion that EHS is a direct results of nervous system changes induced by RF-EMFs. The fact that some persons are more sensitive to EMFs than others does not alter that evidence that the symptoms of EHS result from the effects of EMFs on the brain.

There is a very large and extensive literature on study of exposure of animals to EMFs (summarized in the Bioinitiative Report, 2007; 2012, www.bioinitiative.org) which will not be reviewed here. These studies show alterations in critical biological functions in many species and many cell types through generation of oxidative stress with resultant damage to DNA (reviewed by Yakymenko et al., 2015), as well as adverse effects of brain function.

(7) Historical & Epidemiological Evidence Supporting Electromagnetic Sensitivity and Associated Symptoms:

There is definitive evidence in the peer-reviewed literature that radiofrequency electromagnetic fields alter biological responses at intensities low enough that they do not cause measurable tissue heating, such as those utilized in wifi and electronic meters.

It has been scientifically established that people react to EMFs. The reaction can be immediate and strong, or it can develop gradually over time. There is a long history of EHS studies reported from former Soviet countries (summarized by Dodge, 1979 and Silverman, 1973). The syndrome was originally described as the "asthenic syndrome" consisting of fatigue, pain, depression, blood pressure lability and fainting, but later became known as the "microwave syndrome." There was little attention to this syndrome in Western countries until the Soviets irradiated the US Embassy in Moscow with microwaves during the period 1953-1975. The study of embassy employees found significantly elevated rates of depression, irritability, difficulty in concentrating and ~~more~~ memory loss. These data have been summarized by Johnson-Liakouris (1998) and Carpenter (2015). There are multiple reports of previously healthy

individuals who were acutely exposed to excessive RF EMFs, often from radar, and who afterwards suffered from the symptoms of ES, frequently lasting for years.

There have been two careful human studies of ES that have shown clearly that some individuals who report being sensitive to EMFs can correctly report onset of symptoms when exposed in a blinded fashion. Rea et al. (1991) tested 100 individuals who self-reported being electrosensitive. About three quarters of the subjects responded to the presence of the EMFs, while none of the controls did. They then selected 25 persons who reported onset of symptoms when exposed in a blinded fashion for further study. These persons were tested to a range of 21 different frequencies of EMF exposure (from 0.1Hz to 5 MHz) and to blanks. The criteria for a positive response were an increase in number and/or intensity of symptoms to 20% or more over baseline. When studying these 25 individuals compared to 25 normal controls, they found that 16 of the ES subjects showed responses, which included headache, dizziness, pain, palpitations, flushing, pressure in ears, tightness in chest and/or itching or prickling pain, when the fields were on but not when they were not on.

The blinded situation means that the subjects did not know whether the EMF exposure was on or not on, and developed symptoms only when the EMF exposure was on. These results provide clear proof that some individuals respond to EMFs with symptoms, including headaches, and also show that individuals with EHS often respond to a variety of frequencies. It is of note that none of the individuals showed positive responses to every frequency. The investigators concluded that some but not all individuals who report being electrosensitive do indeed develop the symptoms of ES when exposed to some EMF frequencies, but also conclude that not everyone who professes to be electrosensitive actually is.

McCarty et al. (2011) examined a female physician who suffered from ES, tested in a hospital setting with exposure to a 60 Hz EMF field of 300 V/m. In a doubled-blind provocation study this person developed temporal pain, headache, muscle twitching and skipped heartbeats within 100 s after onset of initiation of the EMF field in a statistically reliable fashion. The symptoms were associated primarily with field transitions (on-off or off-on) rather than continuous fields.

There have been relatively few studies specifically of children. Sudan et al. (2012) reported that pre - and post-natal cell phone exposure was associated with increased risk of headache-related symptoms in children [Odds Ratio, OR = 1.32 (95% Confidence Interval, CI = 1.23-1.40)]. The studies of Kramarenko and Tan (2003) showed alterations in the EEG in EMF-exposed children as well as adults. However the results from adult studies are clearly applicable to children, although it would be expected that children would be even more sensitive given that the EMFs penetrate further into the brain than in the brain of an adult.

There is also significant information on self-reported changes in health status by individuals after installation of smart meters on their homes. Lamech (2014) published a peer-reviewed study of 142 Australians who submitted information on a public web site on changes in health status after a smart meter was installed on their home. The most frequent symptoms were insomnia, headaches, tinnitus, fatigue and cognitive disturbances. She suggests that these individuals developed ES as a result of RF EMFs from smart meters. While away from home, a California physician and her husband had a smart meter placed on their home without their knowledge; upon returning home both developed the symptoms of ES, which were only later found to be due to the presence of the smart meter (Carpenter, 2015). The symptoms were markedly reduced after the smart meter was removed, although both persons continue with

elevated sensitivity to EMFs in the present. Smart meter EMFs are somewhat different from most other forms in consisting of brief pulses of very high intensity RF. These high intensity pulses may be more provocative than continuous waves, as suggested by the report of McCarty et al. (2011). It should be noted that wifi is also associated with sharp peaks of RF EMF.

There have been a number of provocation studies have reported that individuals who believe themselves to be electrosensitive are unable to distinguish when EMF fields are on or not on when studied in a laboratory setting (Rubin et al., 2006; Elliti et al. 2007; 2015; Hillert et al. 2008). However these studies were done with short term exposures and a very limited range of frequencies and intensities. While it is clear that not everyone who self-reports being electrosensitive actually is, the weight of the evidence indicates that some people do respond to EMFs of various frequencies with symptoms consistent with EHS.

(8) Evaluating the Evidence of EMF Electro-sensitivity (ES):

The Hill Criteria are commonly used to evaluate the degree to which evidence allows one to establish causation. The consideration of each of these criteria and the qualifications specifically discussed by Hill in his 1965 article as applied to EMF health effects has been discussed by Carpenter and Sage (2008). There is statistically significant evidence of an association between exposure to EMFs and ES in some but not all doubled blind studies. However, there are many reasons why statistically significant results might not be observed, including application of the wrong intensity, wrong frequency and failure to follow the subject for an appropriate latency period. The development of ES has been found to be dependent upon the frequency of the EMFs in the studies of Rea et al. (1991). The large number of studies demonstrating alterations in brain electrical and metabolic activity upon application of EMFs demonstrates that central nervous system-mediated effects such as headache and fatigue are biologically plausible. The study of McCarty et al. (2011) demonstrating in an electrosensitive physician that symptoms of EHS occurred within 100 sec of application of the EMFs demonstrates temporality.

All together these observations indicate coherence even in the absence of positive associations being found in every single human study. While not specifically addressed other than in The Bioinitiative Report and below in the discussion of results from the New York State Powerlines project, studies on animals show alteration of both brain electrical and neurotransmitter functions. I conclude that an adequate number of the Hill Criteria are met establishing an association between exposure to EMFs and the development of ES in a significant number of humans, most notably the strength of the association; temporality; biological plausibility; and coherence with other knowledge. Of these, the most telling are the strength of association and biological plausibility.

(9) Groups of people at especially high risk of harm from exposure to RF radiation:

Substantive literature reviews indicate that there are groups of individuals who are at especially high risk of harm from exposure to RF radiation. Briefly, they are pregnant women and their unborn children, young children, teenagers, men of reproductive age, seniors, and anyone with a chronic health condition.

Both Michele and Francis Hriadil are elderly. In addition, Francis Hriadil has a number of chronic conditions and his doctor has specifically recommended that he not be subjected to such environmental exposure.

(10) Qualifications:

I am a public health physician and professor, and obtained by undergraduate degree from Harvard College and my MD degree from Harvard Medical School. I have held previous positions at the National Institute of Mental Health, the Armed Forces Radiobiology Research Institute, as Director of the Wadsworth Center for Laboratories and Research of the New York State Department of Health and as Dean of the School of Public Health at the University at Albany. My current title is Director of the Institute for Health and the Environment at the University at Albany and Professor of Environmental Health Sciences within the School of Public Health. In addition I am an Honorary Professor, Queensland Children's Medical Research Unit, University of Queensland, Brisbane, Australia.

In the 1980s I served as the Executive Secretary of the New York State Powerlines Project, a state-funded study designed to determine whether there were adverse health effects from living near to power lines. The program of research showed that children living in homes with elevated magnetic fields coming from power lines suffered from an elevated risk of developing leukemia, and that electromagnetic field (EMF) exposure altered a variety of responses studied in animals and in cellular systems (Ahlbom et al., 1987). Of relevance to the current issue is that these research projects demonstrated that EMFs alter the brain electrical activity by attenuation of the somatosensory evoked potential (Wolpaw et al.) and neurotransmitter functions (Seegal et al.) of monkeys. Another study demonstrated changes in behavior in rodents exposed to EMFs (Persinger et al.), and yet another showed altered rodent susceptibility to seizures (Ossenkopp et al.) and alteration in circadian rhythms (Sulzman et al.). Thus this study clearly showed a variety of biological effects on the nervous system at non-thermal intensities of EMF After the Powerlines Project was finished I became the spokesperson for New York State on the issue of health effects of electromagnetic fields.

I have published several reviews and have edited two books on the Biological Effects of Electric and Magnetic Fields. I am also a Co-Editor and a Contributing Author of *The BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)* (www.bioinitative.org). This report was first published in 2007, and has been updated in 2012, 2014, and 2019. The public health chapter from this report was subsequently published in the peer-reviewed journal, *Reviews on Environmental Health*. *The BioInitiative Report* documents bioeffects, adverse health effects and public health conclusions about impacts of electromagnetic radiation (electromagnetic fields including extremely-low frequency ELF-EMF and radiofrequency /microwave or RF-EMF fields). The entire report is a comprehensive and up-to-date review of the scientific information on this subject.

In 2009, I was invited to present to the President's Cancer Panel on the subject of power line and radiofrequency fields and cancer, and have also testified on the subject of adverse health effects of EMFs to humans before the United States House of Representatives.

I am an active researcher and educator. My research activities at present are focused on the general subject of environmental causes of human disease. I have authored over 400 major publications in peer-reviewed scientific journals, have edited five books and have numerous other publications. I participate in many international, national, state and local organizations and committees as listed in my *curriculum vitae* along with the Honors, Awards, and Fellowships I have received. While my personal research has not been directed at study of electromagnetic fields, I have had sufficient administrative and evaluation responsibilities related to human health effects of power line magnetic fields so as to consider myself an expert in this area.

(11) References:

4 Court Cases on Mobile Radiation You Should Know About; report Przemysław Kitowski (Aug 31, 2017). Available online at https://muditalab.com/4-court-cases-on-mobile-radiation-you-should-know-about-8236700e7288, 3 pp.

ACS Responds to New Study Linking Cell Phone Radiation to Cancer; (May 27, 2016). Available online at https://acspressroom.wordpress.com/page/4/. 2 pp.

Ahlbom A, Albert EN, Fraser-Smith AC, Grodzinsky AJ, Marron MT, Martin AO, Persinger MA, Shelanski MI and Wolpow ER (1987) Biological Effects of Power Line Fields: New York State power lines project scientific advisory panel final report. NYS Department of Health, 153 pp.

Augner C, Hacker GW, Oberfeld G, Florian M, Hitzl W, Hutter J and Pauser G (2010) Effects of exposure to GSM mobile phone base station signals on salivary cortisol, alpha-amylase, and immunoglobulin A. Biomed Environ Sci 23: 199-207.

Barth A, winker R, Ponocny-Seliger E, Mayrhofer W, Ponocny I, Sauter C and Vana N (2008) A meta-analysis for neurobehavioural effects due to electromagnetic field exposure emitted by GSM mobile phones. Occup Environ Med 65: 342-346.

Belpomme, D, Campagnac, C, and Irigaray, P. (2015). Reliable disease biomarkers characterizing and identifying electrohypersensitivity and multiple chemical sensitivity as two etiopathogenic aspects of a unique pathological disorder. *Reviews on Environmental Health.* 30(4):251–271. DOI: 10.1515/reveh-2015-0027. Available at http://www.degruyter.com/view/j/reveh.2015.30.issue-4/reveh-2015-0027/reveh-2015-0027.xml

Belpomme D, Hardell L, Belyaev I, Burgio E and Crapenter DO (2018) Thermal and non-thermal health effects of non-ionizing radiation: and international perspective. Environ Poll 353: 643-658.

Belyaev, I, Dean, A, Eger, H, Hubmann, G,Jandrisovits,R, Kern, M, Kund, M,Moshammer, H, Lercher, P,Müller, K, Oberfeld, G, Ohnsorge, P, Pelzmann, P, Scheingraber, C, Thill, R. (2016). EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Reviews on Environmental Health. ISSN (Online) 2191-0308.

Bise W (1978) Low power radio-frequency and microwave effects on human electroencephalogram and behavior. Physiol Chem Physcis 10: 387-391.

Bolte JFB, Baliatsas C, Eikelboom T and van Kamp I (2015) Everyday exposure to power frequency magnetic fields and associations with non-specific physical symptoms. Envrion Poll 196: 224-229.

Carpenter DO (2015) The microwave syndrome or electro-hypersensitivity: historial background. Rev Environ Health 30: 217-222.

Carpenter DO and Sage C (2008) Setting prudent public health policy for electromagnetic field exposures. Rev Environ Health 23: 91-120.

Consales C, Merla C, Marino C, Benassi B (2012) Electromagnetic fields, oxidative stress, and neurodegeneration. Int J Cell Biol 2012:683897.

Connecticut Department Of Public Health Recommends Reducing Cell Phone Exposure; (May 2015). Available online at https://ehtrust.org/connecticut-department-public-health-recommends-reducing-cell-phone-exposure/ 4 pp.

Croft RJ, Hamblin DL, Spong J, Wood AW, McKenzie RJ and Stough C (2008) the effect of mobile phone electromagnetic fields ont eh alpha rhythm of human electroencephalogram. Bioelectromagnetics 29; 1-10.

Croft RJ, Leung S, McKenzie RJ, Loughran SP, Iskra S, Hamblin DL and Cooper NR (2010) Effects of 2G and 3G mobile phones on human alpha rhythms: Resting EEG in adolescents, young adults and the elderly. Bioelectromagnetics 31: 434-444.

Curcio G, Ferrara M, Moroni F, D'Inzeo G, Bertini M and DeGennaro L (2005) Is the brain influenced by a phone call? An EEG study of resting wakefulness. Neurosci Res 53: 265-270.

De Luca, C, Chung Sheun Thai, J., Raskovic, D., Cesareo, E, Caccamo, D. Truckhanov, A, Korkina, L. (2014). Metabolic and genetic screening of electromagnetic hypersensitive subjects as a feasible tool for diagnostics and intervention. *Mediators Inflamm.* doi: 10.1155/2014/924184

Dodge CH (1979) Clinical and hygienic aspects of exposue to electromagnetic fields: a review of the Soviet and Eastern European literatue. In: biological Effects and health Implications of Microwave Radiation. Symposium Proceedings. Richmong, VA BRH/DBE 70-2,

Eliyahu I, Luria R, Hareuveny R, Margaliot M, Meiran N and Shani G (2006) Effects of radiofrequency radiation emitted by cellular telephones on the cogntive functions of humans. Bioelectromagnetics 27: 119-126.

Eltiti S, Wallace D, Ridgewell A, Zougkou K, Russo R, Sepulveda F, Mirshekar-Syahkal D, Rasor P, Deeble R and Fox E. (2007) Does short-term exposure to mobile phone base station signals increase symptoms in individuals who report sensitivity to electromagnetic fields? A double-blind randomized provocation study. Environ Health Perspect 115: 1603-1608.

Eltiti S, Wallace D, Russo R and Fox E (2015) Aggregated data from two double-blind base station provocation studies comparing individuals with idiopathic environmental intolerance with attribution to electromagnetic fields and controls Bioelectromagnetics 36: 96-107.

EMF on trial: Australia and Israel cases may be precedent-setting (March 12, 2013), report by Josh del Sol Beaulieu Available online at https://takebackyourpower.net/emf-on-trial-australia-and-israel-cases-may-be-precedent-setting/ 2 pp.

Falcioni L, Bua I, Tibaldi E et al. (2018) Report of final results regarding brain and heart tumors in Sprague Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission. Environ Res 165: 496-503.

Fire & Life Safety America (2015 July 28) Identifying fire hazards in the workplace. https://flsamerica.com/blog/identifying-fire-hazards-in-the-workplace/

Freude G, Ullsperger PK, Eggert S, and Ruppe I (1998) Effects of microwaves emitted by cellular phones on human slow brain potentials. Bioelectromagnetics 19: 384-387.

Gandhi OP, Lazzi G and Furse CM (1996) Electromagnetic absorption int eh human head and neck for mabile telephones at 835 and 1900 MHz. IEEE Transactions 44: 1884-1897.

Ghosn R, Yahi-Cherif L, Hugueville L, Decorps A, Lemarechal JD, thuroczy G, de Seze R and Selmaoul B (2015) Radiofrequency signal aaffects alpha band in resting electroencephalogram. J Neurophysiol 113: 2753-2759.

Government Accountability Office (2012) Exposure and Testing Requirements for Mobile Phones Should Be Reassessed. GAO-12-771

Hardell L and Carlberg M (2009) Mobile phones, cordless phones and the risk for brain tumors. Int J Oncol 35: 5-17.

Hill AB (1965) The environment and disease: Association or causation? Proc Rey Soc Med 58: 295-300.

Hillert L, Akerstedt T, Lowden A, Wiholm C, Kuster N, Ebert S, Boutry C, Moffat SD, Berg M and Arnetz BB (2008) The effects of 884 MHz GSM wireless communication signals on headache and other symptoms: An experimental provocation study. Bioelectromagnetics 29: 185-196.

IARC (International Agency for Research on Cancer) (2011) Non-ionizing radiation, Part 2: Radiofrequency electromagnetic fields. Vol 102, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon, France. 462 pp.

INTERNATIONAL PRECAUTIONARY ACTIONS by Governments, Authorities and Sch ools reducing RF and cellphone exposure. Available online at http://www.parentsforsafetechnology.org/worldwide-countries-taking-action.html and http://nebula.wsimg.com/7177f8bfa7f01d4582ebf457f0453927?AccessKeyId=045114F8E0676B9465FB&disposition=0&alloworigin=1. 9 pp.

INTERNATIONAL POLICY BRIEFING - Governments, Health Authorities and Schools Enacting Policy to Reduce Radiofrequency Radiation Exposure (7/2018). Available online at https://ehtrust.org/wp-content/uploads/International-Policy-Precautionary-Actions-on-Wireless-Radiation.pdf. 58 pp.

Johnson Kiakouris AG (1008) Radiofrequency (RF) sickness in the Lilienfeld study: An effect of modulated microwaves? Arch Environ Health 53: 226-229.

Kramarenko AV and Tan U (2003) Effects of high-frequency electromagnetic fields on human EEG: A brain mapping study. Intern J neurosci 113: 1007-1019.

Kwon MS, Vovobyev V, Kannala Sm, Laine M, Rinne JO, Toivonen TK Johansson J, Teras M Lindholm H, Alanko T and Hamalainen H (2011) GSM mobile phone radiation suppresses brain glucose metabolism. J Cere Blood Flow Metab 31: 2293-2301.

Lamech F (2014) Self-reporting of symptom development from exposure to radiofrequency fields of wirelss smart meters in Victoria, Australia: A case series. Alt Ther 20: 28-39.

Landgrebe M, Frrick U, Hauser S, Langguth B, Rosner R, Hajak G,and Eichhammer P (2008) Cognitive and neurobiological alterations in electromagnetic hypersensitive patients: results of a case-control study. Psychol Med 38: 1781-1791.

Landgrebe M, Hauser S, Langguth B, Frick U, Hajak G and Eichhammer P (2007) Altered cortical excitability in subjectively electrosensitive patients: Results of a pilot study. J Psycho Res 62: 283-288.

Maryland Children's Environmental Health and Protection Advisory Council - Wifi Radiation in Schools in Maryland Final Report (December 13, 2016). Available online at https://phpa.health.maryland.gov/OEHFP/EH/Shared%20Documents/CEHPAC/MD_CEHPAC_SchoolWiFi_022017_final.pdf 11 pp.

McCarty DE, Carrubba S, Chesson AL, Frilot C, Gonzalezz-Toledo E and Marino AA (2011) electromagnetic hypersensitivity: Evidence for a novel neurological syndrome. Int J Neuroscie 121: 670-676.

Melnick RL (2019) Commentary on the utility of the National Toxicology Program study on cell phone radiofrequency radiation data for assessing human health risk despite unfounded criticisms aimed at minimizing the findings of adverse health effects. Environ Res 168: 1-6.

Morgan LL, Kesarib S, Davis DL (2014) Why children absorb more microwave radiation than adults: The consequences. Journal of Microscopy and Ultrastructure. 2(4): 197-204

Papageorgiou CC, Hountala CD, Magnaioti AE, Kyprianou MA, Rabavilas AD, Papadimitrious GN and Capsalis CN (2011) Effects of WiFi signals on the P300 component of event-related protentials during an auditory hayling task. J Integ Neurosci 10: 189-202.

Povacz v PECO Energy Company, Docket No. C-2015-2475023, INITIAL DECISION of Darlene D. Heep Administrative Law Judge (January 26, 2018). Available on the PA PUC website http://www.puc.pa.gov/pcdocs/1558335.pdf, 33 pp.

Rajagopal B and Rajesekaran L (2014) SAR assessment on three layered spherical human head model irradiated by m9bile phone antenna. Human-cent Comput Inform Sci 4: 10.

Rea WJ, Pan Y, Yenyves EJ, Sujisawa I, Suyama H, Samadi N, and Ross GH (1991) Electromagnetic field sensitivity. J Bioelect 10: 241-256.

Rubin GJ, Haln G, Everitt BS, Cleare AJ and Wessely S (2006) Are some people sensitive to mobile phone signals? Within participant double blind randomized provocation study. BMJ 332: 886-891.

Sinnot, WF, Smith, SR, Athay, MC, Sutton, R, Hobson, JR, and Lederer, GR. (2013, Nov 18). Reply comments of cities of Boston and Philadelphia. Reassessment of Federal Communications Commission Radiofrequency Exposure Limits andPolicies (ET Docket No. 13-84). Proposed Changes in the Commission's Rules Regarding Human Exposure to RadiofrequencyElectromagnetic Fields. (ET Docket No. 03-137).

Silverman C (1973) Nervous and behavioral effects of microwave radiation in humans. Am J Epidemiol 97:219-224.

Sudan M, Kheifets L, Arah O, Olsen J and Zeltzer L (2012) Prenatal and postnatal cell phone exposures and headaches in children. Open Pediatr Med J 6: 46-52.

Volkow ND, Tomasi D, Wang GJ, Vaska P, Fowler JS, Telang F, Alexoff D, Logan J, and Wong C (2011) Effects of cell phone radiofrequency signal exposure on brain glucose metabolism. JAMA 305: 808-814.

Wyde M, Cesta M, Blystone C, Elmore S, Foster P et al. (2016) Report of partial findings from the Ntional Toxicology program Carcinogenesis studies of cell phen radiofrequency radiation in Hsd: Stragué-Dawley SD rats (whole body exosuresP http://doi.org/10.1101/055699): 1-74.

Yakymenko I, Tsybulin O, Sidorik E, Henshel D, Kyrylenko O and Kyrylenko S (2015) oxidative mechanisms of biological activity of low-intensity radiofrequency radiation. Electromagn Biol Med 35: 188-202.

Respectfully Submitted

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10 July 2019

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

MICHELE HRIADIL and FRANCIS HRIADIL,	:	
Complainants,	:	
v.	:	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 foregoing Motion in Limine to Preclude Complainants' Purported Expert Testimony upon the participants listed below in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by a participant):

Michele and Francis Hriadil
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Monroeville, PA 15146

Administrative Law Judge Jeffrey Watson
Pennsylvania Public Utility Commission
Office of Administrative Law Judge
Piatt Place, Suite 220
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Dated this 30th day of October 2019.

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