BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Cynthia Randall and Paul Albrecht	:	
	:	
Complainant,	:	
v.	:	**Docket No. C-2016-2537666**
	:	
PECO Energy Company	:	
	:	
Respondent.	:	

MAIN BRIEF OF COMPLAINANTS CYNTHIA RANDALL AND PAUL ALBRECHT

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Dated: September 25, 2017

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INTRODUCTION

This brief is submitted on behalf of complainants Cynthia Randall, Ph.D., and her husband Paul Albrecht in support of their claim that the installation by PECO Energy Company ("PECO") of an AMI smart meter at their home will adversely affect them and is neither "safe" nor "reasonable" under 66 Pa.C.S. § 1501 as to them.

Dr. Randall and Mr. Albrecht through their counsel submitted certain evidence jointly with complainants in separate cases against PECO. These other complainants are Maria Povacz (#C-2015-2475023) and Laura Sunstein Murphy (#C-2015-2475726) (with Dr. Randall and Mr. Albrecht, collectively "Complainants"). They submitted evidence jointly at hearings on September 15, 16, and 27, 2016; December 5, 6, 7, 8, and 9, 2016; and January 25, 2017 pursuant to the Orders of Administrative Law Judges Darlene Heep and Christopher Pell. All of the Complainants adopt the same argument based on the testimony of Dr. Andrew Marino, Ph.D., as set forth below. Each of the Complainants will address specific facts and procedural history of their cases in separate briefs filed in their cases.

The quality of being safe means the absence of risk or harm. At the individual hearings in their cases, and particularly at the joint hearings where they presented scientific expert testimony, Complainants demonstrated that PECO's smart meters present a risk of harm to them, and that it is neither safe nor reasonable under the circumstances to force them to accept this risk.

Complainants brought their cases against PECO in response to PECO's insistence that the Complainants acquiesce to PECO's demands to install smart meters on their homes or be subject to imminent loss of electricity. The Complainants were informed that prompt filing of formal complaints with the PUC against PECO was the sole method by which each of these Complainants could retain electrical service while refusing to be exposed to the radio frequency ("RF") electromagnetic energy ("EE") emitted by smart meters which they have a credible basis to believe is harmful to them.

PECO takes the extreme and unreasonable position that RF exposure from its smart meters is utterly incapable of causing harm, as if that position had been scientifically proven and generally accepted in the scientific community. To the contrary, reliable scientific evidence shows that RF exposure from smart meters such as PECO's meters, like RF exposure from cell phones, is a possible cause of harm to humans, particularly people like the Complainants who have histories of disease or sensitivity.

The Commission need not resolve the scientific disagreement between the parties to resolve these cases. The evidence at the very least shows potential harm to Complainants from RF exposure such as that emitted from smart meters. Forcing these Complainants to accept exposure to RF from smart meters that they sincerely believe will further harm their health, and forcing them to do so against their doctors' orders, offends fundamental principles of respect for personal

autonomy and constitutes unreasonable and unsafe service to Complainants in violation of 66 Pa. C.S. § 1501.

The evidence is amply sufficient for Complainants to meet their burdens under section 1501. The PUC should order PECO not to install smart meters at Complainants' homes and remove those that have been installed if not already removed.

HISTORY OF THE PROCEEDINGS

A. Cynthia Randall and Paul Albrecht v. PECO Energy Company

Cynthia Randall and Paul Albrecht filed a Formal Complaint on April 1, 2016. In their Complaint, Dr. Randall and Mr. Albrecht requested that the Commission compel PECO to comply with 66 Pa.C.S. § 1501; compel PECO to cease attempting to install a smart meter on their property; compel PECO to provide an accommodation for Dr. Randall and Mr. Albrecht based on their medical histories; compel PECO to allow them to utilize an analog meter at their residence; and order a permanent stay of any current or future termination on the part of PECO. On April 21, 2016, PECO filed an Answer and Preliminary Objection to Dr. Randall and Mr. Albrecht's Complaint.

In a June 14, 2016 ruling on PECO's Preliminary Objections, the Commission noted that future evidentiary hearings will address "whether installation of a smart meter at the complainants' residence, in light of their health concerns, constitutes unsafe and unreasonable service in violation of 66 Pa.C.S. § 1501." *Ruling on Preliminary Objections of PECO Energy Company*, June 14, 2016; (JA007600-007604).

In Dr. Randall and Mr. Albrecht's case, the Commission's August 11, 2016, Order Denying Application for Oral Deposition of Dr. Andrew Marino and Extending Discovery Completion Date contains a detailed procedural history of Dr. Randall and Mr. Albrecht's case through the date of that order. *Order Denying Application for Oral Deposition of Dr. Andrew Marino and Extending Discovery*

Completion Date, August 11, 2016; (JA007605-007607). Dr. Randall and Mr. Albrecht adopt the Commission's procedural history discussion, and will not repeat it here.

B. Common Procedural History

On August 26, 2016, Administrative Law Judges Darlene D. Heep and Christopher P. Pell issued an Order granting a Joint Motion for an Omnibus Schedule Revision. This order consolidated the hearing schedules for the Povacz, Murphy, and Randall-Albrecht cases. *Order Granting Joint Motion for an Omnibus Schedule Revision,* August 26, 2016; (JA7609-007612). Evidentiary hearings occurred on the following days: September 15, 16, and 27, 2016; December 5, 6, 7, 8, and 9, 2016; and January 25, 2017.

Witnesses appeared in accordance with the following schedule: September 15, 2016, Dr. Andrew Marino; September 16, 2016, Dr. Andrew Marino; September 27, 2016, Dr. Ann Honebrink, Cynthia Randall, and Paul Albrecht; December 5, 2016, Laura Sunstein Murphy, Dr. Peter J. Prociuk, and Brenda Eison; December 6, 2016, Brenda Eison, Glenn Pritchard and Dr. Christopher Davis; December 7, 2016, Dr. Christopher Davis; December 8, 2016, Dr. Christopher Davis and Dr. Mark Israel; December 9, 2016, Dr. Mark Israel; January 25, 2017, Dr. Mark Israel and Dr. Andrew Marino (rebuttal).

On February 22, 2017, Administrative Law Judges Heep and Pell ordered briefing on the issues. Briefing Order, February 22, 2017. The briefing schedule was delayed several times due to unforeseen circumstances. Briefing

Order #2, March 29, 2017; Briefing Order #3 June 1, 2017; (JA007715-007716); Briefing Order, August 15, 2017. Final briefs are due on September 25, 2017. Briefing Order, August 15, 2017; (JA007718-007719).

C. Agreement on Separate and Common Record

Complainants and PECO Energy Company have conferred and agreed on a Joint Appendix. A copy of the table of contents for the Joint Appendix is attached. It notes which portions of the Joint Appendix belong in the individual cases or in the common record for all three cases. The actual Joint Appendix is being filed only in the record of Laura Sunstein Murphy's case, (No. C-2015-2475726), but is incorporated by reference in this case (C-2016-3537666).

PROPOSED FINDINGS OF FACT

A. Proposed Findings of Fact for Cynthia Randall and Paul Albrecht v. PECO Energy Company

1. Cynthia Randall and Paul Albrecht have been married for over 25 years. *Testimony of Paul Albrecht*, *September 27, 2016 Hearing Transcript*, at 75:8-9; (JA000952).

2. They currently reside together at 700 Shawmont Avenue, Philadelphia, Pennsylvania 19128. *Id.* at 75:5-6; (JA000952)

3. Dr. Cynthia Randall has a Ph.D. in physical chemistry from the University of Michigan. *Testimony of Cynthia Randall, September 27, 2016 Hearing Transcript*, at 48:9-10; (JA000925).

4. Dr. Randall has worked for several different pharmaceutical companies in the Philadelphia area for approximately 30 years. *Id.* at 48:13-15; (JA000925).

5. In addition to reviewing manuscripts for scientific journals, Dr. Randall has spoken at scientific conferences and offered publications in scientific journals. *Id.* at 48:23-49:3; (JA000925-000926).

6. An AMR meter was installed on the Randall-Albrecht property in 2002, and has remained installed since that time. *Id.* at 49:13-19; (JA000926). On May 14, 2013, Dr. Randall received a letter from PECO informing her that PECO wanted to change her AMR meter to an AMI smart meter (hereafter "smart meter"). *Id.* at 49:20-50:8; (JA000926-000927).

7. Dr. Randall and Mr. Albrecht objected to the installation of the smart meter because PECO has not evaluated a smart meter's effect on human health by performing independent safety tests. *Id.* at 50:9-13; (JA000927).

8. Through their family attorney, Dr. Randall and Mr. Albrecht expressed their concerns regarding the installation of a smart meter to PECO. *Id.* at 62:1-3; (JA000939).

9. However, Dr. Randall and Mr. Albrecht felt that PECO was unwilling and unable to address their concerns regarding the smart meter. *Id.* at 62:6-7; (JA000939).

10. In a letter dated March 21, 2016, Brenda Eison, a PECO employee, told Dr. Randall and her husband that smart meters utilize similar technology to AMR meters, and that as a matter of public policy, PECO planned to move forward with smart meter installation at the Randall Albrecht household. *See Letter to Mark S. Harris, Cynthia Randall, and Paul Albrecht*; (JA007497-007498).

11. Dr. Randall and Mr. Albrecht's objection to the installation of a smart meter in their home is the basis for the complaint in the present action. *Direct Testimony of Cynthia Randall, September 27, 2016 Hearing Transcript* at 50:14-16; (JA000927).

12. They filed a formal complaint with the PUC on April 1, 2016. *See Cynthia Randall v. PECO Energy Company*, Docket No. C-2016-2537666, Formal Complaint (April 1, 2016); (JA007482-007487).

13. Even before discussing it with their doctors, Dr. Randall and Mr. Albrecht attempted to minimize their radiation exposure by not having a microwave, not having a cordless phone, and only using their computers when they are hardwired to the internet. *Direct Testimony of Cynthia Randall, September 27, 2016 Hearing Transcript* at 59:24-60:4; (JA000936-000937).

14. Although Dr. Randall does own a cell phone, she uses it as little as possible. When she is not using her cell phone, she keeps it turned off and away from her body—she never carries it on her person. *Id.* at 60:11-14; (JA000937).

15. Mr. Albrecht has never had a cell phone, and does not own or use any wireless devices. *Id.* at 102:1-7; (JA000979).

16. While Dr. Randall and Mr. Albrecht recognize that they cannot reduce their exposure to radiation away from home, their goal is to control and minimize their radiation exposure while at home because that is where they spend most of their time. *Id.* at 60:15-25; (JA000936)

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37. In April 2016, Dr. Honebrink wrote a letter on Dr. Randall's behalf, opining that it would be prudent for Dr. Randall to avoid any unnecessary radiation exposure. *Id.* at 16:6-13; (JA000893).

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41. Although Dr. Honebrink is not an expert on radiation exposure and meters, she testified that "part of my job as Dr. Randall's physician is to support her in doing the best thing she can for her health." *Id.* at 41:22-23; (JA000918).

42. Since Dr. Randall believes that the installation of a smart meter in her home would be detrimental to her health, Dr. Honebrink supports Dr. Randall's position. *Id.* (JA000918).

B. <u>Proposed Findings of Fact from the Common Record</u>

43. Pursuant to the Order Granting the Joint Motion for an Omnibus Schedule Revision, Glen A. Pritchard's oral testimony is common testimony between and among all Complainants. *Order Granting Joint Motion for an Omnibus Schedule Revision, August 26, 2016.* (JA007609-007611).

44. Mr. Pritchard provided written rebuttal testimony in the cases of both Laura Sunstein Murphy and Maria Povacz. *Rebuttal Testimony of Glenn Pritchard,* Laura Sunstein Murphy v. PECO Energy Company (hereafter "*Murphy Rebuttal Testimony of Glenn Pritchard*"); (JA004255); *Rebuttal Testimony of Glenn Pritchard*, Maria Povacz v. PECO Energy Company (hereafter "*Povacz Rebuttal Testimony of Glenn Pritchard*"); (JA002808).

45. Mr. Pritchard did not provide written testimony in the Albrecht-Randall case, but the Povacz written testimony was orally incorporated by reference as it relates to the Randall Albrecht case. *Direct Testimony of Glenn Pritchard, December 6, 2016 Hearing Transcript*, at 1003:22-1005:6; (JA001262-001264).

46. Glenn Pritchard is an expert in design, operation, and technology of advanced grid installations. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 3:14-16; (JA004257); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 3:14-16; (JA002810).

47. The system that utilized the AMR meters utilized radio frequency communications to transmit meter information from each customer's meter to a network of "cell masters." *Murphy Rebuttal Testimony of Glenn Pritchard*, at 4:8-16; (JA004258); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 4:13-22; (JA002811).

48. The information was then sent to PECO from the "cell masters" over a fiber optic system and phone lines. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 4:8-16; (JA004258); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 4:13-22; (JA002811).

49. The AMR meters send information via radio frequency transmissions from the meter assembly to the utility once every five minutes for a 20 millisecond duration. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 4:18-21; (JA004258); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 5:1-2; (JA002812).

50. This transmission utilizes a maximum of one watt of power. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 4:18-21; (JA004258); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 5:2-3; (JA002812).

51. The new AMI smart meter system also utilizes radio frequency communication. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 5:6-14;

(JA004259); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 5:11-19; (JA002812).

52. With the AMI smart meter system, the wireless communications from the smart meters are received by technology known as "tower gateway basestations." *Murphy Rebuttal Testimony of Glenn Pritchard*, at 5:6-14; (JA004259); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 5:11-19; (JA002812).

53. The "tower gateway basestations" then transfer the information to PECO via a fiber optic network or over phone lines. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 5:6-14; (JA004259); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 5:11-19; (JA002812).

54. The AMI meters also include a second transmitter called a "Zigbee Radio." *Murphy Rebuttal Testimony of Glenn Pritchard*, at 5:15-17; (JA004259); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 5:20-22; (JA002812).

55. The Zigbee radio utilizes radio frequency transmissions to communicate with devices within the home. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 5:15-17; (JA004259); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 5:20-22; (JA002812).

56. The new smart meters utilize two-way wireless RF transmissions, allowing communication from the smart meter to the tower gateway basestations, and from the tower gateway basestations to the smart meter. *Murphy Rebuttal*

Testimony of Glenn Pritchard, at 5:19-20; (JA004259); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 6:1-2; (JA002813).

57. Initially, the smart meters are programmed to transmit information once every ninety minutes for a 70 millisecond duration at a maximum two watts of power. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 5:20-6:1; (JA004259). *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 6:2-6; (JA002813).

58. After installation, PECO readjusts the transmission frequency to the lowest number of transmissions that still allows the smart meter to effectively communicate with the PECO system. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 5:20-6:1; (JA004259-JA004260); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 6:2-6; (JA002813).

59. Currently, in Ms. Murphy's neighborhood, the Flexnet components of the smart meters have been tuned to transmit six to ten times each day. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 6:1-2; (JA004260).

60. In Ms. Povacz' s neighborhood, the Flexnet components of the smart meters have been tuned to transmit six to seven times each day. *Povacz Rebuttal Testimony of Glenn Pritchard*, at 6:6-7; (JA002813).

61. The Zigbee radio component of the smart meter is initially programmed to transmit every 30 seconds until it acquires a connection with a device within the home, and then its transmission frequency is decreased to a level that allows the meter to effectively communicate with the device. *Testimony of Glenn Pritchard, December 6, 2016 Hearing Transcript*, at 942:6-14; (JA001201).

62. The Zigbee radio transmits at approximately 1/10th of a watt, and each transmission is less than one microsecond. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 6:6-8; (JA004260); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 6:11-12; (JA002813).

63. PECO's smart meters communicate on reserved, private frequency bands, allowing the meters to communicate with PECO without using a "mesh" system. *Murphy Rebuttal Testimony of Glenn Pritchard*, at 6:11-7:6; (JA004260); *see also Povacz Rebuttal Testimony of Glenn Pritchard*, at 6:16-7:11; (JA002813).

64. According to Mr. Pritchard, PECO did not perform any tests on humans to evaluate the safety of smart meters. *Cross Examination of Glenn Pritchard, December 6, 2016 Hearing*, at 1031:25-1032:20; (JA001290-001291).

65. Instead, PECO merely ensured that the smart meters were FCC compliant. *Cross Examination of Glenn Pritchard, December 6, 2016 Hearing*, at 1031:25-1032:20; (JA001290-001291).

SUMMARY OF ARGUMENT

Is there a right for those concerned about health risks to be free from forced RF exposure? Complainants ask the Commission to decide this issue in favor of personal autonomy and avoidance of potential risk in matters affecting health and well-being.

PECO has, in numerous customer complaints before the PUC, presented the same arguments it advances here. It claims that there is no conceivable way exposure to RF from its AMR or AMI smart meters could "cause, contribute to, or aggravate any health effects" because the power is just too low and there are many other sources of EE exposure that are greater than that from PECO's smart meters. PECO has relied on the same two expert witnesses in all of the cases about RF exposure from smart meters: an electrical engineer (Dr. Davis) and a pediatrician turned cancer researcher (Dr. Israel). PECO claims through its witness Dr. Davis that no harm can come to anyone from exposure to low power RF such as that emitted by phones and Wi-fi devices like a smart meter. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1190:21-1193:5; (JA001514-001517). Davis even went so far as to opine that a young child could safely be exposed continuously to a cell phone held up to his head all day long, *id.* at 1337:17-25; (JA001661), even though the American Academy of Pediatricians warns against over exposing children to RF. *Cross Examination of Dr. Mark Israel, December 9, 2016 Hearing Transcript*, at 1595:15; (JA001920). Neither Dr. Israel nor Dr. Davis has any scientific basis to take such extreme positions, and as explained below, both of these PECO expert witnesses were exposed at the

Complainants' hearings as utterly unreliable sources for any scientific information on the issues before the Commission.

The Commission instead should adopt the testimony of Andrew Marino, Ph.D. Dr. Marino does not sponsor any wild conjecture or make any bold claims about health effects from exposure to EE. He opines that there is a reliable basis to conclude that there is at least a risk of harm to the vulnerable and sensitive, and that it is unreasonable to expose the Complainants to that risk.

Dr. Marino's position finds support in animal studies, epidemiology, and all the work he has conducted on the issue of health effects from RF exposure throughout his long and distinguished career as a biophysicist, research scientist, and author. Dr. Marino's position also finds support in the classification of RF exposure as a "possible carcinogen" by The International Agency for Research on Cancer ("IARC"), which is part of the World Health Organization, and in the May 2016 Report of the National Toxicology Program ("NTP"). PECO and its witnesses have no credible reason for disregarding IARC, the NTP, or Dr. Marino's opinion based on the empirical evidence.

Turning to the precise issue at hand, the Commission must decide if the smart meters PECO seeks to impose on the Complainants are "safe" and "reasonable" given the Complainants' states of health and given the medical opinions of the Complainants' treating physicians. This Commission's role in deciding the issue is quasi-judicial and quasi-legislative, which means that the issue is part policy decision. The Commission should ask itself: "What is the most

equitable result for the parties based on the fact and expert witness testimony presented here?

As Dr. Marino explained, the possibility of harm means there is a risk, and whether to accept that risk is a matter of perspective. If your perspective is biased toward human health, you might not accept the risk, and if it is biased in favor of economic efficiency, you might accept it.

As the matter stands before the Commission, because of the way PECO interprets Act 129, the Complainants have no choice at all; they must expose themselves to PECO's smart meters and be exposed to the risk of harm in their own homes and on their own property involuntarily.

The Commission need not make a determination based on health risk alone, but instead can decide that, in light of the evidence presented regarding these Complainants and the extent and bases of their concern for their safety, health, and wellbeing, the forced installation of smart meters on their property is unreasonable. The Commission should defer to the judgment of Complainants and their treating physicians. The Commission lacks the authority to override the decision of these medical professionals or to second guess the views held by the Complainants and their physicians about health risks.

PECO's arguments are wrong. In particular, there is no requirement for Complainants to prove medical causation as if this were a toxic tort action seeking damages. The Commission as policy maker must be concerned with risk of

harm, not just actual proven manifested harm in the past. This is inherent in the nature of a regulatory agency like the Commission.

PECO is also wrong to insist that Act 129 mandates RF emitting smart meters for all Pennsylvania utility customers. Nothing in Act 129 supports PECO's mandate theory. PECO can achieve compliance with Act 129 without imposing smart meters on persons like Complainants who have extensive medical documentation, who avoid EE in their lives as much as possible, and are willing to go through considerable administrative hassle and expense to prove it. It would be fairer and more economical for PECO to design a process for managing customer relations on this issue, ensuring that accommodation is made only for those who qualify, and managing the process as cost effectively as possible. It defies reason to think that a huge, profitable, sophisticated utility cannot manage such a process reasonably and cost effectively.

PECO makes various other wrongheaded arguments. It claims the FCC limit is conclusively safe based on reports published 30 years ago that called for periodic updating and yet there has been no updating despite the advent and now omnipresence of cell phones and wireless technology. PECO relies on a cohort of private groups whose members are all connected financially to the power and communications industry, and whose opinions are demonstrably biased and counterweighed by the published views of independent scientists. PECO makes the wildly incorrect argument that the RF from PECO's smart meter is extremely low and dwarfed by other sources of EE, based on unscientific comparison of average

exposures, rather than peak exposures. PECO claims a scientific consensus for its position based on the say so of its experts, while Dr. Marino, with his far greater experience with the health effects of RF exposure, says that PECO has that backwards.

Overall, PECO ignores the empirical evidence showing a risk of harm for medically sensitive and vulnerable people like the Complainants and blithely disregards anything that suggests potential harm. The Commission should order PECO to accommodate the Complainants by not deploying any smart meters on their property that emit RF.

ARGUMENT

I. The Commission Should Adopt the Expert Testimony of Dr. Marino As Correct and Well Supported by Science

At the hearings on September 15, 2016, and again on January 25, 2017, Complainants presented the testimony of Andrew Marino, Ph.D. The Commission should adopt this testimony because it is correct and well supported by science.[1]

[1] Complainants Maria Povacz and Laura Sunstein Murphy also offered the expert testimony of Martin Pall, Ph.D. Dr. Pall testified primarily about the extensive research on mechanism for harm from RF exposure. PECO through its expert witness Christopher Davis, Ph.D., admitted that evidence of causal mechanism is not needed to prove the potential for harm but rather that the focus should be on the empirical evidence showing effects. *Cross Examination of Christopher Davis, December 8, 2016 Hearing Transcript*, at 1446:18-1447:6; (JA001771-001772). Dr. Marino agreed that proof of mechanism is not required to draw a scientifically valid observation and that the proper focus should be on the empirical evidence. *Direct Examination of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 617:5-18; (JA000617); 629:11-23; (JA000629). The Parties agreement on this point is supported by law. *See Daubert v. Merrell Dow Pharmaceuticals*, 43 F.3d 1311, 1314 (9th Cir. 1995).

In light of that area of agreement between the parties, Complainants will lighten the burden of evidentiary review on the Commission and otherwise simplify the issues by not calling attention to the voluminous testimony of Dr. Pall. Along that same line, Complainants will not discuss the factual circumstances pertaining to Paul Albrecht because the medical circumstances of his wife Cynthia Randall are more serious and any relief the Commission grants for Dr. Randall will apply to Mr. Albrecht.

A. Dr. Marino's Expert Opinions

Dr. Marino offered two opinions: (1) that there is a basis in established science to conclude that the Complainants could be exposed to harm from the radiation emitted by PECO AMI or AMR smart meters, *Direct Testimony of Dr. Andrew Marino Hearing Transcript, September 15, 2016*, at 578:13-16; (JA000578); and (2) because the PECO smart meters have not been proved safe it is unreasonable to force the Complainants to accept the exposure to the radiation emitted by the smart meters on their residences. *Id.* at 578:23-579:1; (JA000578-000579). His testimony is based on primary evidence and not on opinions of others. *Id.* at 580:22-581:1; (JA000580-000581).

B. EE in the Background

EE from smart meters is in the microwave frequency range which is part of the Radio Frequency ("RF") range. *Id.* at 588:21-25; (JA000588). Household lights and appliances operate at the power frequency of 60 hertz. *Id.* at 589:1-4; (JA000588). Smart meters have 2-3 times more energy than a cell phone at the source, but they are comparable, i.e., in the same range. *Id.* at 589:17-22; (JA000589).

In order for PECO smart meters to present risk, they would have to produce EE that is materially greater than the background of EE in the Complainants' environment. *Id.* at 637:20-638:5; (JA000637-000638). There is some electromagnetic energy in the background virtually everywhere. *Id.* at 582:5-8; (JA000582). Dr. Marino assumed that each of the Complainants lives in a house

that is electromagnetically quiet, meaning no Wi-Fi, cell phones, or smart meters and only lights and electric appliances. *Id.* at 582:23-583:10; (JA000582-000583). The background level in such a house is between 0.01 and 0.001 microwatts per square centimeter. *Id.* at 583:23-25; (JA000583). That range is typical in a quiet electromagnetic house based on measurements he has done many times. *Id.* at 584:1-5; (JA000584).

A PECO AMR or AMI smart meter emits one or two watts of energy each time it emits, respectively, and at one watt with an AMR meter that means 100 microwatts per square centimeter directly surrounding the meter, as shown on Marino Direct 1 (JA004673). *Id.* at 584:10-14; (JA000584). The AMI smart meter emits at 2 watts of energy, so those numbers on Marino Direct 1 (JA004673) should be doubled for the AMI meter. *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1874:25-1875:15; (JA002199-002200).

EE radiates in all directions and dissipates over distance. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript* at 586:4-9; (JA000586). Marino Direct 1 (JA004673) shows the power density in microwatts per square centimeter ($\mu W/cm^2$) with a power of one watt, at 5 feet (3.5 $\mu W/cm^2$), 10 feet (0.19 $\mu W/cm^2$), 20 feet (0.22 $\mu W/cm^2$), 30 feet (0.10 $\mu W/cm^2$), 40 feet (0.06 $\mu W/cm^2$), and 50 feet (0.03 $\mu W/cm^2$). *Id.* at 586:21-587:12; (JA000586-000587). PECO's electrical engineer expert witness Dr. Davis, agreed that these calculations are correct. *Direct Examination of Dr. Christopher Davis, December 6, 2016 Hearing Transcript*, at 1093:20-1094:4; (JA001352-001353). Dr. Marino testified that at even

at just one watt of power, which the AMR smart meter emits, this presents a material addition of EE to Complainants' environments. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 639:21-640:6; (JA000639-000640). At two watts of power, which the PECO AMI meter emits, this would present double the material addition of EE to Complainants' home environment.

C. Pulsing

In Dr. Marino's opinion, the term "pulse" means turning the EE source on and off. *Id.* at 589:23-590:12. Marino Direct 2 (JA004674) illustrates pulse pattern. *Id.* at 590:13-592:4; (JA000590-000592). A Pulse consists of 3 parts: transition from nothing to something, then the presence of stimulus, and then transition back from something to nothing. *Id.* at 630:9-13; (JA000630). The EHS study he referred to used pulsing in this sense. *Id.* at 633:2-17; (JA000633). There is no more efficient way to get the body to react to EE than to put in a "pulse", as Dr. Marino has used the term. *Id.* at 630:3-6; (JA000630). PECO smart meters are pulsed. *Id.* at 592:14-16; (JA000592). Dr. Davis and Glenn Pritchard were wrong when they said PECO smart meters do not pulse in this sense; they do. They may not pulse in some other way as Dr. Davis or Glenn Pritchard use the term, but they definitely pulse in this sense. *Id.* at 633:18-634:8; (JA000633-000634).

D. Peak vs. Instantaneous Values

For purposes relevant to this case, it is critical to consider the peak or instantaneous value, not the average value. *Id.* at 592:22-593:4; (JA000592-000593).

With respect to the biological impact of an EE signal, use of average value is grossly misleading. *Id.* at 593:16-23; (JA000593).

Dr. Marino criticizes Dr. Davis' testimony about the supposedly low levels of exposure as shown on CD-6 (JA002705-2706) because Davis "frequently asserts absurdly low energy levels by means of a trick. He computes the average over time when no energy is present. The only instance in which he did not utilize this trick is in CD-3 (JA004579-4580),." *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1876:10-14; (JA002201).

E. Bases for Dr. Marino's First Opinion

The bases for Dr. Marino's first opinion are: experimental studies, epidemiological studies, his study on EHS, and studies about possible mechanism. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 594:11-22; (JA00594).

1. Experimental Studies

Marino Direct 3 is a chart he prepared showing recent studies on animals exposed to EE at high frequencies, such as smart meters and cellphones, and at low frequencies such as powerlines and household appliances. *Cross Examination of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 723:20-732:9; (JA000723-000732). The energy level of the EE defined in terms of its physical impact on the body was comparable in both cases, and all the studies show biological effects. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 596:21-597:4; (JA000596-000597). In Dr. Marino's opinion, it

is unreasonable to dispute the fact that the studies shown on Marino Direct 3 (JA004675), as well as other studies not listed, show that energy levels comparable to those produced by PECO smart meters produce biological changes in humans and animals. *Id.* at 601:18-602:1; (JA000601-000602).

2. Epidemiological Studies

Epidemiological studies are non-experimental, meaning that they are not planned in advance. An investigator analyzes data after the fact based on exposure to a factor, which in this case is EE. *Id.* at 602:10-603:15; (JA000602-000603). Epidemiological studies have great value because they involve humans, but they do not allow conclusions regarding causation. At best, they can show statistical association. *Id.* at 603:7-22; (JA000603). Experimental studies and epidemiological studies both have their limitations, but together they permit a much more powerful and decisive basis for a conclusion, like Dr. Marino's conclusion here. *Id.* at 603:23-604:9; (JA000603-000604).

Marino Direct 4 (JA004676) is an illustrative collection of peer reviewed epidemiological studies at both high and low frequencies with energy comparable to PECO's smart meters and they show a range of associations. *Id.* at 604:21-605:1; (JA000604-000605). These epidemiological studies give reason to believe that there is a potential for harm associated with being exposed to EE like that from the PECO smart meter. *Id.* at 606; (JA000606). That point is accepted by those who are independent from industry and not accepted by those who are not

independent also known as those who are "bonded to industry." *Id.* at 606:20-607:2; (JA000606-000607).

3. EHS Study

EHS is a syndrome, a collection of symptoms exhibited by people who self-report that these symptoms are associated with or caused by or triggered by and in some way related to EE. *Id.* at 607:13-16 (JA000607). EHS is an acute response as opposed to a chronic response from long-term exposure. *Id.* at 607:20-608:7; (JA000607-000608).

Dr. Marino performed a research study on EHS and published the results of that research in peer reviewed literature in 2011. *Id.* at 608:13-25; (JA000608). He coauthored this research study with colleagues at LSU. *Id.* at 609:8-9; (JA000609). The purpose of the study was to test whether there is a bona fide neurological condition called EHS. *Id.* at 609:10-19; (JA000609). The subject of the study was a 35-year-old female physician from England. *Id.* at 610:3-6; (JA000610). She was a good test subject because she had a coherent description of the onset of symptoms, she was not a strong sufferer so her the symptoms would abate quickly enough for the experiment to continue, and she was a rational, careful observer. *Id.* at 610:3-6; (JA000610). The study was a double-blinded provocation study. *Id.* at 611:15; (JA000611). The subject was exposed to EE or to sham exposure for 100 seconds and then she was interviewed and asked about her symptoms. *Id.* at 611:15-612:15; (JA000611-000612).

To a statistical certainty, i.e., 95% probability, she was able to detect the presence of EE. *Id.* at 612:12-14; (JA000612). The physicians who worked with Dr. Marino on the study conducted appropriate tests to rule out other causes for her symptoms when exposed to EE. *Id.* at 612:21-613:4; (JA000612-000613). The study cost more than $500,000 to conduct. *Id.* at 613:9-12; (JA000613). There are other published provocation studies but they were not properly designed to prove or disprove EHS. *Id.* at 614:10-14; (JA000614). Ruben's studies, for example, were not designed properly because they only considered a result as positive if it was the same reported result every time. *Id.* at 614:8-615:10; (JA000614-000615). Ruben has acknowledged the importance of Dr. Marino's EHS study. *See Cross Examination of Dr. Mark Israel, January 25, 2017 Hearing Transcript*, at 1815:14-17; (JA002140).

4. Mechanism

After 15 years of documenting the existence of health effects from RF, Dr. Marino started to think about possible mechanism. *Id.* at 616:20-617:18; (JA000616-000617). It is not necessary for these Complainants to prove mechanism, as the empirical proof of EE causing health effects is enough, but it is the next logical question to explore. *Id.* at 617:5-18; (JA000617). Dr. Marino and Dr. Becker published a scientific study paper espousing the idea that the high-level mechanism by which EE could lead to disease is stress on the body as it sheds the effects of EE that it cannot use. *Id.* at 618:23-619:3; (JA000618-000619).

"Sensory transduction" refers to the process by which energy is transformed into the biology of the body. *Id.* at 620:18-621:17; (JA000620-000621).

Sensory transduction is an explanation for how EE gets into the body. *Id.* at 621:18-623:6; (JA000621-000623). Dr. Marino has published 18 papers listed in his report in peer reviewed journals about sensory transduction. *Id.* at 623:18-19; (JA000623).

Dr. Marino has also considered and published on a biophysical explanation for how EE gets into the body. *Id.* at 625:18-626:8; (JA000625-000626). There are different ways of thinking about mechanism for EE entering the body and its effects on the body that are not necessarily inconsistent. *Id.* at 628:5-16; (JA000628). The mechanism he described is a sufficient mechanism—it's theoretically possible, but there could be better explanations that come along as science advances. *Id.* at 628:17-629:8; (JA000628-000629). This explanation of mechanism is unnecessary to the cause and effect relationship that is demonstrated by the empirical evidence described above. *Id.* at 629:9-23; (JA000629).

F. Health Risks

The question of whether EE poses a health risk is not a pure scientific question. It depends on attitude toward health risk and human safety. People have different attitudes and may accept different levels of risk. *Id.* at 635:16-636:7; (JA000635-000636). There is a basis here to conclude that there is a health risk to Complainants if they were exposed to PECO smart meters on their residential property because of numerous peer-reviewed experimental and epidemiological studies. *Id.* at 636:23-637:7; (JA000636-000637).

G. Effects on Complainants

Laura Sunstein Murphy and Maria Povacz both self-report as EHS, diagnoses that have been confirmed by their physicians. Cynthia Randall does not self-report as EHS, but she does express concern about this risk if chronically exposed to a PECO smart meter at her residence, based on her medical history. *Id.* at 641:10-642:17; (JA000641-000642). The Complainants have all taken responsible steps to avoid exposure to EE. *Direct Testimony of Maria Povacz*, at 20:2-8; (JA002424); *Direct Testimony of Laura Sunstein Murphy* at 48:5-20; (JA003996); *Direct Testimony of Cynthia Randall, September 27, 2016 Hearing Transcript*, at 59:24-60:4; (JA000936-000937). EE from the PECO smart meters could cause the symptoms reported by Ms. Murphy and Ms. Povacz, but Dr. Marino could not say it did cause those symptoms without conducting a test that would cost $500,000, as in the case of his published paper on EHS. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript,* at 643:13-644:5; (JA000643-000644).

Dr. Marino is of the opinion that EE from a PECO smart meter could cause harm to the health of Dr. Cynthia Randall, but he could not say whether it will cause harm. *Id.* at 644:9-14; (JA000644). EE from smart meters could cause EHS symptoms in Ms. Murphy and Ms. Povacz and could cause harmful health effects for Dr. Randall because of the experimental and epidemiological studies on EHS, and the studies on mechanism and pulse structure. *Id.* at 645:12-646:6; (JA000645-000646).

H. Role of Physicians

Treating physicians do not make judgments about causation. They diagnose disease, give advice about avoiding worsening of disease, and treat disease. *Id.* at 645:2-6; (JA000645). There is no consensus clinical diagnosis for EHS. Many physician groups are trying to work out a diagnostic algorithm to warrant the diagnosis of EHS. It is a work in progress throughout the world. *Id.* at 646:9-14; (JA000646). The peer-reviewed literature establishes that 5%-10% of the population self-report as EHS. *Id.* at 647:16-21; (JA000647). In the absence of a consensus clinical diagnosis, physicians do the best that they can to address EHS based on what is available in the literature. *Id.* at 648:17-649:3; (JA000648-000649). Physicians are trained to act in the best interest of patients. *Id.* at 651:20-23; (JA000651).

I. No Studies of Safety of Smart Meters

There are no studies on the safety of smart meters. *Id.* at 652:4-13; (JA000652).

J. FCC Limits

The FCC sets emission limits for non-licensed devices like smart meters that emit EE. *Id.* at 653:23-25; (JA000653). The FCC limits do not reflect a level that is safe for humans. *Id.* at 654:6-8; (JA000654). The FCC limits were originally designed in the 1980s, to be the limit at which people did not get shocked or heated. *Id.* at 654:10-16; (JA000654). The FCC limits were set by asking "At what point do animals start to overheat?" and then they reduced that level by a factor of

10, and then half that for occupationally exposed, and then ten times that for all other people. *Id.* at 654:18-655:14; (JA000654-000655). In 1986, the FCC adopted these limits based upon an industry produced document (NCRP Report) and a standard (ANSI) put together by an organization of engineers. *Id.* at 655:20-25; (JA000655). Since the FCC adopted the standards in 1986, there has been a great deal of research, none of which supports safety when exposure is at or below FCC limits. *Id.* at 657:24-658:6; (JA000657-000658).

K. Reports of Various Organizations

In addition to the reports relied upon by the FCC in 1986, there have been numerous other reports, some fostered by industry that report no problem and some by independent groups that report a problem. As Dr. Marino summarized:

> There's a group that's organized by the industry. They're the ones that produce really, really thick reports that purport to say that you don't have to worry about cell phones or smart meters. All industry related individuals and arguments—in the parts that I've read, read like legal briefs. They don't read like scientific analyses. I've never seen one that did. On the other side, there are reports by medical groups, American Academy of Environmental Medicine, Europan [sic] which is the European version and other groups. There are private groups which do not provide detailed analysis of the primary literature, but certainly argue against the idea that FCC rules guard against health effects. They are advocates for their position in the same way that these alphabet agencies from the industry are advocates for their position. So you got these two polls and they argue incisively with internet positions going back and forth.

Id. at 659:2-18; (JA000659).

These organization reports are not peer-reviewed scientific literature. *Id.* at 660:7-12; (JA000660). Dr. Marino does not rely on these reports because the conflicts of interest of the authors are not disclosed and the reasoning is never explained. *Id.* at 661:5-6; (JA000661).

L. The World Health Organization

Dr. Marino has tried to analyze the opinions expressed by the EMF Project of the World Health Organization ("WHO"), but cannot get it to respond to his inquiries. *Id.* at 661:24-662:3; (JA000661-000662). The IARC is another part of the WHO and it expresses the view that EE is a possible carcinogen. *Id.* at 662:11-16; (JA000662).

M. Bases for Dr. Marino's Second Opinion

Dr. Marino's second opinion is that it would be unreasonable to expose the Complainants to EE because it would be tantamount to involuntary testing. *Id.* at 663:7-23; (JA000663). If any research institution in the U.S. were to test EE on people, that institution would have to obtain informed consent from each person. PECO wants to expose the Complainants to EE without their consent and against their wills. These actions violate the basic principle of human autonomy. *Id.* at 663:13-23; (JA000663). Experimentation on humans with EE would not pass any Institutional Review Board ("IRB") without complete disclosure and informed consent. *Id.* at 664:16-665:2; (JA000664-000665). PECO seeks to do what no IRB would permit.

II. Dr. Marino's Background of Scientific Education, Experience, and Authorship Uniquely Qualifies Him to Testify Credibly on the Issues Before the Commission

Dr. Marino is retired from the faculty of Louisiana State University ("LSU") Medical Center in Shreveport, Louisiana, and today runs a software development company. *Id.* at 564:14-18; (JA000564). He served on the faculty at LSU for 33 years. *Id.* at 564:19-20; (JA000564).

His particular area of focus for his whole career has been the biological effects of electromagnetic energy and the electrical properties of tissue as they are influenced by that energy. *Id.* at 565:25-566:3; (JA000565-000566). That includes health effects. *Id.* at 566:4-5; (JA000566). By "biological effects" Dr. Marino means physiological effects that occur in an animal or human being in response to some stimulus. *Id.* 566:21-25; (JA000566). By "health risks" he means a condition that suggests danger that's inferred from the primary scientific evidence. *Id.* at 567:2-3; (JA000567). By "primary scientific evidence" he means the results of peer reviewed scientific studies. *Id.* at 567:4-10; (JA000567).

Dr. Marino has a B.S. in physics from St. Joseph's University and a Ph.D. in physics from Syracuse University. *Id.* at 568:5-569:3; (JA000568-000569). While pursuing his Ph.D., Dr. Marino began to work on research on the biological effects of electromagnetic energy in the laboratory of Dr. Robert Becker at the Veteran's Administrative Hospital in Syracuse. *Id.* at 569:4-11; (JA000569). That research continued until 1981, when Dr. Marino moved to LSU, and continued the

entire time he was at LSU. *Id.* at 570:10-15; (JA000570). While at LSU, he had his own lab. *Id.* at 573; (JA000573).

Dr. Marino has published more than 100 articles in peer-reviewed journals on electromagnetic energy and its biological effects and/or health risks. *Id.* at 572; (JA000572). He has testified in approximately 20 cases involving the biological effects and health risks of electromagnetic energy. *Id.* at 573:1-3; (JA000573).

He has published three books about his career studying and dealing with the biological effects and health risks of electromagnetic energy. *Id.* at 574:18-575:16; (JA000574-000575). He also edited a book containing 25 articles written by scientists who worked in the field. *Id.* at 575:3-6; (JA000575). He is about to publish a book about Dr. Robert Becker's seminal contributions to the field of research of biological effects and health risks from electromagnetic energy. *Id.* at 572:12-16; (JA000572).

III. PECO's Response to Dr. Marino is Wrong

PECO through its expert witnesses makes a variety of incorrect arguments in response to Dr. Marino's testimony. PECO uses a trick of calculating exposure levels based on the average and not the instantaneous value. This enables PECO to claim incorrectly that exposure from PECO meters is low in comparison to other sources of EE.

PECO relies exclusively on negative studies without giving any credence to the even greater number of positive studies. PECO makes an

unsupported claim about a supposed scientific consensus that unlimited RF exposure would not be harmful for anyone–including small children or people with health complications.

PECO incorrectly relies on hearsay reports from various panels without considering the possibility that those panels may be biased. It ignores the heart of Dr. Marino's testimony that empirical evidence demonstrates that EE poses a risk of harm, that Dr. Marino's published study on electromagnetic hypersensitivity ("EHS") proves that EHS is a real syndrome, and that forced exposure amounts to involuntary experimentation on humans.

For all the reasons explained above and below, the Commission should conclude that PECO has not offered any credible evidence to the contrary, so that the Commission should adopt Dr. Marino's testimony proving that exposure to PECO's smart meters would either be unsafe or at the very lease unreasonable as to Complainants.

A. PECO Uses an Averaging Trick to Claim that the Power from Smart Meters is "Incredibly Low" and Dwarfed by Other Sources

Through its Ph.D. electrical engineer expert witness, Dr. Davis, PECO claims that RF exposure from PECO smart meters is "incredibly low" and too low to cause any harm. *Direct Testimony of Dr. Chris Davis, December 6, 2016 Hearing Transcript*, at 1108:21-1109:7; (JA001367-001368); *Cross Examination of Dr. Christopher Davis, December 8, 2016 Hearing Transcript*, at 1439:19-20; (JA001764). Dr. Davis used exhibits to buttress a lot of impressive sounding claims

about the orders of magnitude in difference between power from smart meters and other common sources of EE. *Rebuttal Testimony of Dr. Andrew Marino*, *January 25, 2017 Hearing Transcript* at 1876:6-1877:11; (JA002201-002202).

These claims are all false because Dr. Davis calculated the RF exposure from smart meters based not on the instantaneous value, which is a key premise of Complainants' case, but instead based on the average value over an entire day, including the more than 99% of the time that there is no RF exposure from the meter at all. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1230:13-19; (JA001554). All of the comparisons in Dr. Davis' testimony suffer from this flaw. *Rebuttal Testimony of Dr. Andrew Marino*, *January 25, 2017 Hearing Transcript* at 1876:6-1877:11; (JA002201-002202). Dr. Marino called it a "trick" to use averages in this way. *Id.* at 1876:10-11; (JA002201). Dr. Davis agreed that if he used comparisons of instantaneous values "we would see the transmissions from the AMI smart meter was actually considerably higher than that." *Id.* at 1241:2-4; (JA001565).

Because of this use of an averaging trick, the exhibits used by Davis are highly misleading. CD-2 (JA004577-4578) is simply a comparison of the FCC exposure limit calculated as an average over 30 minutes as required by the FCC to the exposure from the FlexNet Radio on a PECO AMI smart meter calculated as an average over a whole day. It is an inflated and irrelevant number because Complainants' argument presented by Dr. Marino is based on peak exposures and a pulse pattern.

This is true, with one exception, on all the figures on all of Davis' exhibits. None of them shows peak values. They are all averages calculated as an average over a whole day. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript* at 1229:16-24; (JA001553); 1234:22-24; (JA001558).

The one exception is on CD-3 (JA004579-4580), which shows the peak value from an AMI smart meter, which translates into a single pulse of 16 microwatts per square centimeter at two watts of power at a distance of one meter. *Id.* at 1223:19-1225:12; (JA001547-001549). This is consistent with the numbers that Dr. Marino put before the Commission in Marino Direct 1 (JA004656-4661). *Id.* at 1225:13-16; (JA001549). Davis agrees with Dr. Marino's power density calculations that are an important part of Complainants' evidence. *Direct Examination of Dr. Christopher Davis, December 6, 2016 Hearing Transcript*, at 1093:20-1094:4; (JA001417-001418). Let the point not be missed: Davis said the emissions from PECO's smart meters are incredibly low in relation to the FCC limit. But, on a microwatt per square meter basis, which is the yardstick used by Dr. Marino to create an apples to apples comparison, comparing instantaneous values, they are relatively close—the FCC limit is 60 and the exposure at a distance of one meter is 16.

CD-4 (JA004581-4582) shows a comparison between something called the ICNIRP guidelines, without bothering to provide details about how they are calculated, with the FlexNet smart meter component exposure averaged over a

whole day. Complainants' counsel did not waste any time at the hearing on the subject of the ICNIRP guidelines because it is patently irrelevant.

Dr. Davis used CD-5 (JA004583-84) to illustrate PECO's assertion that the energy from a smart meter is very small in comparison to the emissions of EE from other sources. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1236:19-22; (JA001560). These are all meaningless figures and calculations because Davis admits they are all comparisons of averages. *Id.* at 1229:16-24; (JA001553); 1238:22-1239:5; (JA001562-001563). So, for example, if the number that Davis showed as the exposure 2 miles from a 400-watt cell tower, which is .0000013 milliwatts per square centimeter, were converted into microwatts per centimeter squared (by moving the decimal point three spaces, or, as Davis admitted, multiplying it by a fraction of a thousand, *id.* 1225:5-10; (JA001549)), the comparison would be .00013. *Id.* at 1243:3-1244:7; (JA001567-001568). Compare that figure of .00013 microwatts at 2 miles from a 400-watt tower to 16 microwatts at one meter away from a PECO AMI meter using peak value and you can see, to the contrary, that the RF exposure from a PECO AMI meter does not seem small at all in comparison to other sources of exposure. This proves that Davis is wrong to suggest that Marino Direct 1 failed to include other sources of EE, since none of those other sources of EE are comparable to the RF from a PECO smart meter when the RF from a PECO smart meter is properly calculated based on instantaneous and not average values.

CD-6 (JA002705-2706) compares the RF exposure from the UHF TV Farm in Roxborough approximately one mile from the Randall Albrecht residence to the PECO AMI all day average. *Id.* at 1245; (JA001569). Davis admitted that if translated into microwatts per square centimeter, the metric used by Dr. Marino would be 10 microwatts from the UHF TV tower, compared to 16 microwatts one meter away from the PECO AMI smart meter. *Id.* at 1245:17-1252:14; (JA001569-001576). This is the only source of background EE that PECO has identified for any of the Complainants' homes that is even remotely comparable to the peak exposure from an AMI smart meter.[2] Dr. Marino's testimony regarding significant increases in EE exposure to Complainants if PECO were permitted to deploy smart meters on Complainants' homes, also negates the testimony of PECO's engineer Pritchard, who testified in the Povacz and Murphy complaints, that the addition of smart meters at the Povacz and Murphy residences would not materially add to the RF in their residences, and it would be useless for the Complainants to resist smart meters on their homes, because all the homes in their neighborhoods have been

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[2] UHF TV exposure is on all the time except when the station is turned off at night, which is unlike the pulse of the PECO smart meter. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1250-51; (JA001574-001575). Dr. Marino testified that even considering the UHF TV exposure at the Randall Albrecht residence, the FlexNet Radio would contribute a significant and material addition of EE to the background level in the Randall Albrecht home. *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1876; (JA002201). He also criticized PECO for "the suggestion that because Randall and Albrecht have accepted that UHG signal by living where they live and not moving someplace farther away, PECO somehow became entitled to involuntarily expose them to smart meters." *Id.* at 1876-77; (JA002202).

fitted with smart meters. *Pritchard Murphy Rebuttal Testimony May 20, 2016*, at 12:12-18; (JA004266); *Pritchard Povacz Rebuttal Testimony May 18, 2016*, at 17:7-13; (JA002814).

This discussion of instantaneous versus peak values proves that Dr. Davis' testimony is wrong when: (1) he claims that the exposure from PECO smart meters is incredibly low; and (2) he claims that the exposure from PECO smart meters is low in comparison to other sources. This same bug infects his conclusions that Complainants' exposure from an AMI smart meter will be much lower than the AMR smart meter. This assertion would be true only if the comparison used time averaged exposure, not peak exposure. Dr. Davis admitted that comparison of peak values shows that the AMI exposure is twice as high as AMR exposure. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1387:8-1388:7; (JA001711-001712). Likewise, Dr. Davis' insistence that cell phones are "very, very different" from smart meters in terms of their potential to cause harm, is based on comparison of averages. *Id.* at 1209:6-1210:7; (JA001533-001534). He admitted that the peak value of the emission from a smart meter is higher than the peak value of emission from a cell phone at the same distance. *Id.* at 1341:12-15; (JA001665).

Davis' claims he uses averages because the FCC limits utilize an average. That makes no sense. First, if the health risk issue at hand is the adequacy of the FCC limits, it makes no sense to require calculation of the exposure in the manner required by the FCC. The FCC's use of averages is not a rule of science and

Dr. Marino testified that the potential for harm results from the instantaneous value and the pulse pattern. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript* at 598:23-599:2; (JA000598-000599). Second, the FCC requires a 30-minute average, but Davis uses a whole day average for all his exhibits. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1234:13-15; (JA001558).

Dr. Davis' insistence on looking only at averages is nonsensical. He admitted that the human body could be affected by RF only when exposed. *Id.* at 1230:6-12; (JA001554). He also admitted that to use averages is to consider the more than 99% of the time when the human body is not exposed. *Id.* at 1230:13-19; (JA001554). For example, Dr. Davis admits that 1,000 watts of radiation in the eye could do very serious harm but if you averaged that 1,000 watts of radiation exposure over 30 minutes, it would be less than the power from a PECO smart meter. *Id*. at 1347:12-14; (JA001671); 1348:14-25; (JA001672).

If Davis based his calculations on the instantaneous value, as Dr. Marino did, he would agree that the PECO smart meter makes a material addition to the EE in a home that is otherwise electromagnetically quiet. As Dr. Marino explained, an electromagnetically quiet home is one that has lights and electric appliances, but no cell phones, wireless, or other emitters or high frequency electromagnetic energy. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 582:23-583:10; (JA000582-000583). All of the Complainants live in electromagnetically quiet homes, as much as they can without

moving. *Direct Testimony of Cynthia Randall, September 27, 2016 Hearing Transcript* at 59:24-60:4; (JA000936-000937); *Direct Testimony of Laura Sunstein Murphy* at 48:5-20; ((JA003996); *Direct Testimony of Maria Povacz*, at 20:2-8; (JA002424). This flaw negates the evidentiary value of all the points Davis attempted to make with his exhibits. It is all irrelevant. This proves that he is just trying to find a way to create irrelevant exposure statistics which were as low as possible.

B. PECO Offered No Substantive Response to the Heart of Dr. Marino's Testimony

Marino Direct 3 and 4 are (1) a collection of studies reporting positive results from animal experiments with exposure to RF and (2) a collection of additional epidemiological studies reporting associations of health effects and RF exposure. As Dr. Marino testified, the studies are at high frequency and low frequency, but comparable to one another in terms of how the effects are produced from exposure to EE. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 601:4-21; (JA000601); 605:23-606:17; (JA000605-000606); *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1889:17-1890:12; (JA002214-002215); 1894:14-1895:19; (JA002219-002220). This is a powerful source of evidence in these proceedings. Unlike the other evidence sponsored by PECO, this is primary science. Dr. Marino is a true expert in this area, having conducted many of these experiments himself. The Commission should accept his testimony that these studies, all of which are reported in peer-reviewed

literature, provide a solid basis to conclude that RF exposure can cause health effects in humans, but that it will not necessarily cause such effects.

PECO's only response to this powerful scientific evidence is to claim through Davis, without any specific information provided, that the studies in Marino Direct 3 and 4 (JA004675-76) are too dissimilar, with high and low frequencies and varying powers not comparable to the energy from a smart meter. *Direct Testimony of Christopher Davis, December 6, 2016 Hearing Transcript* at 1110:15-1111:22; (JA001434-001435) 1114:11-25; (JA001438).

As Dr. Marino responded on rebuttal, all of the studies cited in Marino Direct 3 and 4 are comparable to RF from PECO smart meters and all are scientifically relevant. *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript,* at 1889:17-1890:12; (JA002214-002215); 1894:14-1895:19; (JA002219-002220). PECO's argument on this point is incredibly weak. Dr. Marino in his expert report provided specific cites to all of the studies cited in Marino Direct 3 and 4 (JA004676-4677), PECO had a chance to depose him, and yet PECO can offer no response other than Davis' simplistic rationale for rejecting all of the evidence in one sweeping wave of the hand. The contrasting testimony from David and from Dr. Marino also shows why the Commission's consideration of the credentials and credibility of the witnesses is so important.

C. Dr. Israel's Testimony Based Exclusively on Negative Studies Is Irrelevant

Dr. Israel testified in his pre-filed testimony and live at the hearing that he reviewed the medical literature regarding each of the Complainants'

reported symptoms and concerns, and he determined that there is no reliable basis to conclude that PECO's smart meters cause, contribute, or exacerbate any of these symptoms. *Povacz Rebuttal Testimony of Dr. Mark Israel* at 25:22-26:6; (JA002806-002807); *Murphy Rebuttal Testimony of Dr. Mark Israel* at 12:24-13:20: (JA004234-004235); *see also Direct Examination of Dr. Mark Israel, December 8, 2016 Hearing Transcript*, at 1478:7-1480:8; (JA001803-001805); 1488:15-20; (JA001813).

Israel claimed that he considered both positive and negative studies, but admits that in his pre-filed testimony or disclosure he did not cite one single positive study. *Cross Examination of Dr. Mark Israel, December 8, 2016 Hearing Transcript*, at 1641:24-1642:4; (JA001966-001967). A positive study is simply one that reports an effect from EE exposure and a negative study is one that reports no effect, as Dr. Davis admitted. *Direct Examination of Dr. Christopher Davis, December 6, 2016 Hearing Transcript*, at 1084:8-25; (JA001343). Dr. Israel confirmed that he did not try to identify studies that went the opposite way so that he could distinguish them, but instead only looked to see whether studies were "a helpful study or a not helpful study and then depending on the quality of the study, and the reliability of the date, I give it weight and include it in my opinion." *Cross Examination of Dr. Mark Israel, December 8, 2016 Hearing Transcript*, at 1715:16-20; (JA002040). In other words, Dr. Israel cherry-picked studies that supported his conclusions.

Cross examination demonstrated that the studies Dr. Israel picked to make his points all had significant flaws. For example, he claimed that "studies as a

whole show radio frequency fields do not affect adrenal gland function," but he cited only three studies, all of which were negative studies, and since almost any study can be designed to show no effect, Dr. Israel admitted that he did not mean to suggest that it has been proved that RF fields do not affect adrenal gland function. *Id.* at 1643:15-1644:13; (JA001968-001969).

As to one of the studies he cited (CX-39; JA006808-006815), Dr. Israel had no idea if it was funded by industry even though it says it was funded by the Research Center of France Telecom. *Id.* at 1648:9-1649:1; (JA001973-001974). Also, in CX-39 the authors reported a statistically significant decrease in the pituitary stimulating hormone TSH during the exposure period. *Id.* at 1650:18-1652:21; (JA001975-001976; JA006808-6815). Dr. Israel cited this study for the proposition that there are no effects, even though the study itself reports an effect and calls for a replicate study. *Id.* at 1656:17-1657:6; (JA001981-001982). Another study he cited (CX-38; JA006800-6807) was funded by Motorola. *Id.* at 1657:8-1658:3; (JA001982-001983). He cited this study as proof that there are no effects, but in fact that study reports a statistically significant decrease in cortisol hormone levels. *Id.* at 1658:12-1659:18; (JA001983-001984). The third paper he cited (CX-40; JA006816-6823) discloses that it was funded by the Korea communications division. *Id.* at 1660:21-1661:3; (JA001985-001986).

Apart from the obvious flaws in Dr. Israel's methodology, his testimony is irrelevant because as explained *supra* at 70, there is no requirement in these proceedings that Complainants prove medical causation. It is of no moment that

there are some negative studies on the effects of RF. The question is whether smart meters present a risk of harm for vulnerable and sensitive people like the Complainants, and the answer to that question must be based on review of the empirical evidence, as summarized by Dr. Marino, the observations of the Complainants themselves, and the testimony of their treating physicians.

D. Dr. Davis' Testimony About a Supposed Scientific Consensus is a Gross Mischaracterization of Reality

Dr. Davis said, "there have been thousands of studies done over the last several decades, and the general consensus among scientists who have looked at these studies and have a pretty good idea of what safe levels are, and that's why the FCC sets its safe levels of exposure to certain value." *Direct Testimony of Dr. Chris Davis, December 6, 2016 Hearing Transcript*, at 1120:1-6; (JA001444).

Dr. Marino testified that this statement by Davis is wrong:

> I do not agree because he is extraordinarily wrong. There are more than about 500 studies. I can't say for sure more. I can certainly say about 500 positive studies, over 100 of which I cited on Marino Direct Exhibit 2. By my count, there are about 70 negative studies, and I'm talking about studies dealing with animals and human beings and electromagnetic energy levels comparable to smart meters and cell phones.
>
> Dr. Davis' claim that there are thousands of studies that support his position is just fictional in my opinion. He's also wrong about the consensus he claims. I have personally known almost every investigator in this area and I am familiar with all of the relevant publications. I can say with considerable confidence that the knowledgeable community in this area is split between the investigators who are funded by the industry and those who are not, and that the general consensus Dr. Davis described consists entirely of the former, those funded by industry.

Id. at 1898:7-1899:2; (JA002223-002224).

Here is Davis' basis for claiming that the consensus of scientists agree with him: "I go to scientific meetings and I talk to my colleagues. You know the scientific community does talk to each other. You know when you get the buzz of what people are thinking, and in that sense, you become aware of the consensus." *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1364:21-25; (JA001688). This is a purely subjective, non-scientific statement.

Davis recognizes there is a disagreement on this point among scientists around the world. *Id.* at 1216:4-1217:4; (JA001540). He believes some scientists want to keep this controversy alive so they can get more money for research. *Id.* at 1334:8-13; (JA001658). He admits that there is "a minority of scientists including Dr. Marino who worry about lower levels of RF than the standards say are safe, but nobody has been able to conclusively show that their opinions are correct." *Id.* at 1357:15-19; (JA001681).

Davis referred to these scientists as an "advocacy group":

> There is a small minority of scientists. I would call them an advocacy group, who constantly say that exposure to RF energy as lower levels than the standards is a health hazard, but that is not generally accepted by the bulk of the people who look at these issues, but—you know I can't address people who are in a minority, who are, in my opinion, don't have a balanced view of the literature.

Id. at 1301:2-9; (JA001625).

Dr. Marino offered this specific response to Davis:

> I disagree strongly. In my opinion, the answer indicates Dr. Davis' thorough lack of familiarity with the area of biology. The truth is exactly the opposite of what he said.

Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript, at 1902:23-1903:6; (JA002227-002228).

E. PECO Offers No Credible Response to Dr. Marino's EHS Study

Dr. Marino relies upon a study he conducted to prove that EHS is a real syndrome, meaning that some people really can detect the presence of low levels of EE. *Direct Testimony of Dr. Andrew Marino*, *September 15, 2016 Hearing Transcript*, at 612:4-15; (JA000612). For its response, PECO claimed through Davis that the pulses from PECO's meter are different in terms of duration and pattern than in Dr. Marino's EHS experiment. *Direct Testimony of Dr. Christopher Davis, December 6, 2016 Hearing Transcript*, at 1107:16-1108:10; (JA001431-001432).

As Dr. Marino pointed out in rebuttal, Davis' testimony is "essentially misleading. The EHS study was done to test the hypothesis that EHS, electromagnetic hypersensitivity, is a real syndrome. The question of the relationship to a particular exposure—the relationship of symptoms to a particular exposure level was not considered. A biological study provides an answer to one question, not all questions." *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1887:13-20; (JA002212).

Dr. Israel claimed that it is generally accepted based on the people in the medical community that he has spoken to that RF exposure does not cause

EHS. *Cross Examination of Dr. Mark Israel, January 25, 2017 Hearing Transcript*, at 1789:6-10; (JA002114). He testified that he has spoken to somewhere between ten and twenty people on this subject but can only remember two of their names. *Id.* at 1789:25-1791:20; (JA002114-002116). He claims that one of these meetings was a formal interview, but the doctor he spoke to was not an expert in the area and he (Dr. Israel) does not know if the other doctor had reviewed the literature on EHS. *Id.* at 1791:23-1792:6; (JA002116-002117). This is a very weak basis to claim general acceptance in the medical community of anything whatsoever.

Dr. Israel also based his claim on a 2010 review paper by Ruben and a 2006 study reported by Ruben. *Id.* at 1792:7-1793:6; (JA002117-002118). Dr. Marino criticized other provocation studies including Ruben's 2006 work because the investigators did not count a positive effect on a subject exposed to RF unless the subject reported the specific effect that was the subject of the study. *Direct Examination of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 614:14-615:10; (JA000614-000615).

Dr. Israel said this was untrue of the Ruben 2006 paper. *Cross Examination of Dr. Mark Israel, January 25, 2017* at 1800:11-1801:9; (JA002125-002126). He specifically denied "that the only thing they were counting . . . was whether they had a headache or not." *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript* at 1801:5-9; (JA002126).

This was simply wrong, as Dr. Marino explained in rebuttal. *Id.* at 1869:20-1874:10; (JA002194-002199). The 2006 Ruben paper clearly indicated that

the "principal outcome measure was headache severity assessed with a zero to 100 visual analog scale." *Id*. at 1872:16-19; (JA002197).

Dr. Israel's knowledge of the literature on EHS obviously pales in comparison to Dr. Marino's knowledge on the subject, in small part because Dr. Marino having himself been an investigator on the 2011 peer reviewed published study that proved that EHS is real. At least Dr. Israel was aware of Ruben's written comment that the results of Dr. Marino's coauthored 2011 EHS study are "intriguing" and that "more research is necessary." *Cross Examination of Dr. Mark Israel, January 25, 2017 Hearing Transcript*, at 1815:14-17; (JA002140).

The only other basis that Dr. Israel cites as support for his views on EHS are reports of various agencies. *Id*. at 1789:11-24; (JA002114); *Povacz Rebuttal Testimony of Dr. Mark Israel*, May 18 2016, at 13:18-15:14; (JA002794-002796); *Murphy Rebuttal Testimony of Mark Israel*, May 20, 2016, at 14:3-15:17; (JA004236-004237). He is aware of the September 2016 report in the *New York Times* that in the 1960s the sugar industry paid Harvard scientists to publish a review of sugar, fat, and heart disease in the *New England Journal of Medicine*. *Id*. at 1817:23-1818:6; (JA002142-002143). He is "aware that there is a concern that industry can affect the results that are reported and thereby have an effect on public health which may not be good" for the public. *Id*. at 1818:15-18; (JA002143). Nonetheless, as he did his work testifying for PECO in these cases, he did not "think carefully to ensure that [his] conclusions and [his] opinions were not unwittingly being affected by industry." *Id*. at 1818:20-24; (JA002143). Not surprisingly, he had no basis on

which to determine whether the reports he cited were unbiased, *id*. at 1818:20-1826:19; (JA002143-002151), and he acknowledged there are reports published by other groups of scientists that disagree with the reports he cited. *Id*. at 1826:20-1828:16; (JA002151-002153).

PECO has offered no credible reason why the Commission should doubt Dr. Marino's testimony about EHS based on his 2011 EHS research published with other scientists in a peer-reviewed journal. He opined that RF exposure from PECO mart meters could cause the symptoms reported by Laura Murphy and Maria Povacz, but he could not say it did cause those symptoms without conducting a very expensive experiment. *Cross Examination of Dr. Andrew Marino, September 15, 2016 Hearing Transcript* at 643:17-644:5; (JA000643-000644). Given this testimony, and the testimony of Ms. Murphy and Ms. Povacz and their treating physicians about their extremely sensitive reactions to what they believe is RF exposure from PECO's RF emitting meters and other sources of RF, the Commission should recognize that there is a reliable scientific basis for concern and therefore a violation of section 1501 if they were forced to accept smart meters on their residences or do without electricity.

F. PECO's Experts Hold Complainants to an Unreasonably High Burden of Proof

PECO's witness Dr. Davis admitted that experiments must be conducted on animals and not humans, for obvious reasons, and that because of that necessary limitation, the most those animal studies will ever support is a conclusion about the potential for harm to humans. *Cross Examination of Dr.*

Christopher Davis, December 7, 2016 Hearing Transcript, at 1208:8-18; (JA001532). This is the standard the Commission must consider, because safety regulators cannot wait to act until the possibility of harm is conclusively proven.

Yet that is what PECO's witnesses consistently argued in their testimony. Davis, for example, said that "[if]f any of these people who think the exposure should be set at a factor two lower or three lower or whatever, can produce *conclusive evidence* that those are actually powerful, then maybe the FCC would lower the standard, but nobody has produced *conclusive evidence* that requires the standard to be any lower than it is." *Id.* at 1343:24-1344:4 (emphasis added); (JA001667-001668).

The most egregious example of PECO setting the bar so high it can never be met is exemplified by Davis' testimony about a paper published by Dr. Marino in 2016. Davis testified that in that paper Dr. Marino reported that "the only established mechanism for interaction was heating." *Direct Examination of Dr. Christopher Davis, December 6, 2016 Hearing Transcript*, at 1123:18-20; (JA001447). But in the paper, Dr. Marino actually said that heating is the only "*conclusively established* physical process by which cell phone radiation can interact with the body." *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1296:20-24 (emphasis added); (JA001620).

As Dr. Marino commented in rebuttal, "[f]or any other process to be conclusively established, those in the industry would have to agree with the independent investigators. And human nature being what it is, that seems unlikely

to happen regardless of the scientific evidence." *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1901:8-13; (JA002226).

There is no better example of the deadlock between industry and independent scientists than the 2010 Innerphone Study. This was an epidemiological study conducted by 50 investigators from 13 countries to investigate whether EE from cell phones was associated with brain cancer. *Cross Examination of Dr. Christopher Davis*, *December 7, 2016 Hearing Transcript* at 1330:16-20; (JA001654). The study was controlled by IRAC (part of WHO) and funded 75% by industry. *Id.* at 1330:21-24; (JA001654). As of 2010, the investigators never came to a final conclusion. *Id.* at 1331:21-23; (JA001655). Davis claimed not to know if it ever came to a final conclusion. *Id.* at 1331:21-1333:5; (JA001655-001657). Davis said that "there's still a little bit of a controversy in 2010 about the heaviest levels of a cell phone might have increased the risk at brain tumors . . . and it's never conclusively been shown to be a problem." *Id.* at 1333:13-19; (JA001657). What Davis omits to say is that it has also never conclusively been shown not to be a problem, either. There is no proof of safety. PECO tries to put the burden on Complainants to prove RF has conclusively been proven to cause harm, when the reality is that PECO should shoulder the burden of proving safety. PECO cannot meet that burden, which is why it relies so heavily on the FCC limits.

The FCC Limits, came out before the dawn of the cell phone. Over 30 years later, those limits have never been modified, despite the absence of evidence proving safety of low levels of RF exposure, such as from cell phones or Wi-Fi

devices. The most that PECO could hope to prove in these proceedings regarding the safety of smart meters is that the answer to this important question is currently undecided—neither proved nor disproved, with evidence on both sides of the issue. With human safety in the balance, why should the Commission shift the burden of proof, and require Complainants to provide conclusive evidence that RF exposure can cause harm? The Commission should decline to follow PECO's suggestion regarding the ultimate burden of proof.

G. PECO's Reliance on Reports of Various Agencies is Misplaced

Davis relies on conclusions stated in a number of reports of various international agencies that there are no health effects from RF below the FCC limits. *See Povacz Rebuttal Testimony of Dr. Christopher Davis*, May 18, 2016 at 15:1-16:6 (JA002684-002685); *Murphy Rebuttal Testimony of Dr. Christopher Davis*, May 20, 2016, at 14:7-15:17; (JA004153-004154). Israel claims that he "considered" but did not "rely on" the conclusions stated by these agencies. *Direct Examination of Dr. Mark Israel, December 8, 2016 Hearing Transcript*, at 1529:13-1530:3; (JA001864). "I like to look at such reports from other reliable sources of information to see if they provide any insights that I might have missed, and whether they reach any conclusions that were either inconsistent or that I had missed in my initial evaluation." *Id.* at 1529:23-1530:3; (JA001854-001855). This is pure hogwash as can be seen from Israel's pre-filed testimony in which he merely quotes the broad conclusions stated in the reports as support for his position. *See Povacz Rebuttal Testimony of Dr. Mark Israel,* May 18, 2016, at 9:11-10:5 (JA002790); *Murphy*

Rebuttal Testimony of Dr. Mark Israel, May 20, 2016 at 9:13-10:7 (JA004231-004232). Contrast this to Dr. Marino's explanation of the primary scientific evidence, and it is apparent that the Commission should give no weight to the hearsay statements relied upon by these two PECO experts.

The problem is not just that it adds little to an argument by a scientist to say that "others agree with me"[3], but also that these are or may be infected with industry bias. As Dr. Marino explained, there are reports from agencies that favor

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[3] For this reason, the hearsay rule in Pennsylvania prohibits expert witnesses from quoting learned treatises.

> Under the current state of the law in this Commonwealth, it was entirely proper for the trial court to refuse to admit into evidence the treatises and patents offered by Majdic. Because these materials were being offered to prove the truth of the matters asserted therein (i.e., that safety guards could have been added to the press in 1949), they were hearsay, and were inadmissible as substantive evidence. It was also proper for the trial court to refuse Majdic's offer to allow his expert witness to read the contents of the documents aloud in court. *Excerpts from a publication which are read into evidence for the purpose of proving the truth of the statements contained therein are still hearsay and, therefore, inadmissible. This fact is not changed merely because the document is read into evidence by the witness instead of being received as an exhibit for inspection by the jury.* It is the purpose for which the information is offered, not the manner in which is introduced, which makes it objectionable.

Majdic v. Cincinnati Mach. Co., 537 A.2d 334, 339-40 (Pa. Super. 1988) (emphasis added). PECO violated the hearsay rule by the citations and quotations of the various reports that agree with its position in the pre-filed testimony of both Dr. Israel and Dr. Davis. *Povacz Rebuttal Testimony of Dr. Israel*, May 18, 2016, at 13-15; (JA002794-002796); *Murphy Rebuttal Testimony of Dr. Israel*, May 20, 2016, at 13-15; (JA004235-004237); *Randall-Albrecht Expert Report of Dr. Christopher Davis*, at 6-7; (JA004572-004573)

industry, and there are reports from agencies that favor independent science, and they do not agree about health effects from low-level exposure to RF. *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript* at 1898:7-1899:2; (JA002223-002224). It is unreasonable for Davis and Israel to espouse the conclusions of the reports that favor PECO's position without considering whether these reports have been prepared by unbiased scientists, as opposed to those who are "bonded to industry," meaning someone in the pay of industry as an employee or consultant. *See Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1302:8-17; (JA001626).

Davis testified that he did not make any efforts to consider whether those reports are possibly biased "because I have a trust in fellow scientists who I know and if I believe that the people who sit on these panels do very careful work and I see no reason why they should be biased." *Id.* at 1310:6-12; (JA001634). Yet Davis acknowledged that there are scientists on the other side of the issue and for those scientists he does not have the same "trust" that he spoke of for those on the panels he cites.

> For various reasons, some people like to keep this controversy alive and I'm afraid that's the problem. You know scientists everywhere need to get funding for their research and some people can get funding by keeping the controversy alive and wanting to get more positive results and I think that's still the tendency that occurs.

Id. at 1334:8-13; (JA001658).

The 2010 Innerphone Study, discussed *supra* at 55, shows the reality that there are two groups of scientists, as Davis admits, and for PECO to claim its

view as the scientifically favored and accepted view is just wrong. Certainly, the FCC's limits show that industry was able to convince government in 1986 that the FCC limits were appropriate then, before the advent of cell phones and wifi, and subject to the explicit caveat by the FCC in adopting these limits that more research was needed. There has been no research supporting safety since then, with the vast majority of the studies of RF exposure comparable to cell phones or smart meters showing positive effects, and a large recent government study supporting the independent research positive effects position, as explained in the next section. In the midst of this controversy, there is no reason for this Commission to blindly accept industry reports that do nothing more than state conclusions that agree with PECO, with no evidence of how these conclusions were reached and no evidence of impartiality.

H. The 2016 Report from the National Toxicology Program Provides Additional Evidence of Potential for Harm

Dr. Pall first introduced the May 2016 Report of the National Toxicology Program. *Direct Examination of Dr. Martin Pall, September 14, 2016 Hearing Transcript*, at 370:2-374:25; (JA0000370-0000374). The NTP is the National Toxicology Program, a government agency that studies toxicological effects in the general public due to environmental factors. *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1854:4-8 (JA002179). The NTP report concludes that the radio frequency energy that was studied caused cancer in rats, even at RF levels which were below the FCC limits. *Id.* at 1856:7-9 (JA002181).

Dr. Davis acknowledged familiarity with the NTP Study, claimed that it is a non-peer-reviewed draft that may never be published, and admitted that the authors reported tumors that occurred in rats that were exposed to RF. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1274:14-1278:11; (JA001598-001602). He said, "we can basically discount it." *Id*. at 1090:16 (JA001349). Also, "it's a study that's been done at a relatively high-power density that's not relevant." *Cross Examination of Dr. Christopher Davis, December 6, 2016 Hearing Transcript*, at 1090:22-24 (JA001349). Dr. Israel was unaware of the NTP Study results. *Cross Examination of Dr. Mark Israel, December 9, 2016 Hearing Transcript*, at 1601:20-25 (JA001926).

This is another area of stark disagreement between PECO's experts and Dr. Marino. Dr. Marino testified that report is still in draft because it has not yet been published in an archival scientific journal. *Rebuttal Testimony of Dr. Andrew Marino, January 25, 2017 Hearing Transcript*, at 1855:22-1856:6; (JA002180-002179). He said that the report is crucially important because it is a federal government agency that provides the evidence that the recognized basis of the present federal safety regulatory scheme of the FCC is not protective of health. *Id.* at 1856:23-1857:5 (JA002181-002182).

Dr. Marino also testified that the report has direct bearing on the IARC classification of low levels of EE as a possible carcinogen.

> The NTP findings indicate directly with hard biological evidence that our federal exposure limits are not protective of human health. If those exposure limits ensured that the public would be completely safe, then the rats would not

> have developed cancer. But we know that the energy is not just a possible carcinogen, which is the IARC designation. We now have evidence that it is an actual carcinogen.

Id. 1859:18-1860:2; (JA002184-002185).

He disagreed with Davis' characterization and subsequent rejection of the report as merely a draft. "The report has been more intensively peer reviewed than any other report in the history of experimental biology that I know about," Marino testified. *Id.* at 1860:22-1861:5 (JA002185-002186). Dr. Marino explained that the report is now being put out for traditional peer review and publication because that is the normal process by which a draft becomes an archival scientific document, available in the libraries that contain journal articles. *Id.* at 1861:6-14; (JA002186).

The Commission must decide what weight to give to the NTP report. PECO would have the Commission ignore it and decide there is no risk whatsoever. Complainants suggest that the NTP report strongly supports their position and cinches the case for potential harm to them as vulnerable and sensitive PECO customers.

I. The FCC Limits Are Outdated and Insufficiently Protective

PECO through Dr. Davis claims that PECO smart meters are safe because they emit RF below the limits established by the FCC. The determination that there can be no effects other than possibly heating below the FCC limits is based on a 1986 report of the National Council on Radiation Protection (NCRP). *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*,

at 1354:2-10; (JA001678). Davis admitted that the NCRP Report stated that the understanding of biological effects "is still evolving . . . and it's to be expected that the exposure criteria set out in this report will be evaluated periodically in the future and possibly reversed as new information becomes available." *Id.* at 1355:24-1356:14; (JA001679-001680). Davis claims that the FCC mentions the issue and would revise the limits "if someone ever produces some conclusive evidence it was a problem . . . ." *Id.* at 1349:1-8 (emphasis added); (JA001673). *See* discussion *infra* 70 at 70 regarding PECO's incorrect attempt to shift the burden of proof to Complainants to provide "conclusive evidence" of harm caused by PECO's smart meters."

In the 31 years since 1986 we have witnessed the rise of the Internet and Wi-Fi and cell phone technology in a way that few foresaw in 1986—it is reasonable to ask what has the science reported since then. As explained by Dr. Marino, there have been hundreds of studies reporting biological effects from exposure to RF at powers and frequencies comparable to smart meters, not to mention epidemiological studies, studies on mechanism, and most recently the NTP Report. Under the circumstances, PECO places far too much reliance on meeting FCC limits for safety as to everyone, even the medically vulnerable Complainants; the FCC limits reflect badly out of date irrelevant science in the context of these cases.

IV. PECO's Witnesses Mark Israel, M.D., and Electrical Engineer Chris Davis, Ph.D., Are Not Credible

The Commission should not accept the opinions of Dr. Davis and Dr. Israel for three reasons apart from any consideration of the substantive merits of their testimonies. First, their credentials are weak in comparison to Dr. Marino's credentials. Second, they take extreme and unreasonable positions. Third, they contradicted themselves in important ways that suggest their testimony cannot be trusted.

A. Dr. Davis and Dr. Israel Have a Limited Basis of Relevant Knowledge and Experience

In contrast with Dr. Marino's extensive knowledge and experience on the specific issues before the Commission, explained in detail *supra* at 35, Dr. Davis and Dr. Israel have limited knowledge and experience regarding the specific issues that are the focus of these proceedings.

Davis is an electrical engineer, not a biologist. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1138:19-1139:21; (JA001462-001463). His core expertise is electrical engineering and physics. *Id.* at 1138:21-23; (JA001462). He worked on a number of studies of EE, but his primary role in all those studies was to design the exposure system and set up the experiment. *Cross Examination of Dr. Christopher Davis, December 6, 2016 Hearing Transcript*, at 1089:17-23; (JA001413). He admits that he might have said at a taped presentation that this is a subject on which he has been "peripherally

involved." *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1143:10-14; (JA001467).

Unlike Dr. Davis, who at least worked on some studies in this field, Dr. Israel has never published any research on EE and has never done any research on the effects of EE. *Cross Examination of Dr. Mark Israel, December 9, 2016 Hearing Transcript*, at 1580:7-9; (JA001905). This, taken with his unfamiliarity with the NTP Report and the IARC classification as discussed *infra* at 78 demonstrate that Israel's knowledge and his understanding of the issues before the Commission are limited and that he is not a reliable source of scientific information about any of the issues before the Commission in these cases.

B. The Commission Should Be Disinclined to Believe Davis and Israel Because They Take Extreme and Unreasonable Positions

This is an important legal and policy matter for the Commission, the parties, and the public. It concerns a matter of public health for medically sensitive and vulnerable people. It concerns a complex area of science and raises an issue that many have contemplated: does EE from my cell phone or wifi device present a health risk? Apart from the primary evidence presented by Dr. Marino, the IARC classification, the NTP Report, and the statement of the American Academy of Pediatricians, to name just a few sources, all suggest a basis for caution. Just as it would be irresponsible for Complainants to overstate their case, so too it is wrong for PECO to overstate its case.

An example of unreasonable overstatement is provided by Dr. Davis, who assures the Commission that he is "absolutely certain" that the Complainants would be in no danger whatsoever if PECO is permitted to chronically expose them to RF. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript,* at 1217:24-1218:15; (JA001541-001542). His opinion would be the same if Complainants were small children. *Id.* at 1218:6-8 (JA001542). Moms and dads everywhere can rest assured that they need not heed their pediatricians' caution, because Dr. Davis is convinced that "kids can hold cell phones against their head all day long and there's absolutely nothing to worry about." *Id.* at 1337; (JA001661).

Dr. Davis also takes the unreasonable position that he can ignore the May 2016 NTP report because it is only a draft, *id.* at 1277:2-4; (JA001601), even though it is clearly final enough for the federal government to publish its main conclusion that RF caused cancer in rats. *Rebuttal Testimony of Dr. Andrew Marino. January 25, 2017 Hearing Transcript*, at 1882:21-1883:12; (JA002207-002208).

Dr. Davis sloughs off the IARC classification of cell phones as a possible cause of cancer "when in fact, all of the evidence they looked at suggested to me, and to some other people, they should have given it a Class 3 or 4 rating saying it's not a risk." *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1334:2-7; (JA001658). This is pure hearsay and conjecture.

Dr. Israel's testimony was also troubling. He did not—and could not—take into consideration the results of the recent NTP study because he is not even aware of the results. *Cross Examination of Dr. Mark Israel, December 9, 2016 Hearing Transcript*, at 1601:20-25; (JA001926).

More troubling still was Dr. Israel's testimony about the IARC classification. IARC, which is part of WHO, clearly identifies RF exposure as a "possible cause" of cancer. *Id.* at 1629:23-1631:14; (JA001954-001956). In *Kreider*, Dr. Israel told the PUC judges that IARC gave RF exposure a "clean bill of health" and he sticks with that in the cases at hand. *Id.* at 1632:11-21; (JA001957). In *Kreider*, he told the PUC judges that the IARC classification means "essentially there's no evidence." *Id.* at 1633:2-6; (JA001958). The IARC defines "possible carcinogen" as "limited evidence of carcinogenicity in humans." *Id.* at 1636:20-1637:10; (JA001961-001962). His view is that there is no evidence. *Id.*; (JA001961-001962). He has "no idea how IARC uses it." *Id.* at 1637:21-1638:7; (JA001962-001963). This is pure sophistry. IARC essentially says it could go either way. Dr. Israel treats that as a clean bill of health because in the absence of evidence either way, he thinks there is no problem. He is confused. There is no evidence of safety and the evidence at best is a state of equipoise.

C. The Commission Should Also Be Disinclined to Believe Dr. Davis and Dr. Israel Because There Were Salient Inconsistencies in Their Testimony

Dr. Davis testified on direct examination that he based his opinion that RF cannot cause, contribute to, or aggravate any health conditions on reports

of various international agencies, plus lots of papers he had read. *Cross Examination of Dr. Christopher Davis, December 7, 2016 Hearing Transcript*, at 1162:9-12; (JA001493).

Then, when asked about a position he had taken in a speech and in another case, he admitted that there is another primary basis for his opinion that he did not disclose to the Commission: the lack of a causal mechanism. *Id.* at 1167:18-21; (JA001491); 1177:14-17; (JA001501). He explained that he has a long held the view that RF exposure cannot cause health effects because there is no accepted scientific explanation of how RF could be translated into health effects beyond heating, and without that explanation it's "game, set, match" on the scientific issue, he claims. *Id.* at 1170:10-12; (JA001494). He held this view long before most of the reports he cited to the Commission were published and expressed this view testifying as an expert witness in a prior court case. *Id.* at 1174:1-1176:14; (JA001498-001500).

To confuse matters even more, later in his testimony he reversed himself and said that he would *not* require proof of mechanism if the empirical data showing biological effects from exposure to RF. *Id.* at 1298:9-13; (JA001622). At this point, Dr. Davis is so hopelessly conflicted it is impossible to give any credence to his explanation for his refusal to accept the empirical data presented by Dr. Marino.

Dr. Israel's problem is even worse. He presented himself to the Commission at the hearing on December 8, 2016, as the director of the Norris Cotton Cancer Center at the Dartmouth-Hitchcock Medical Center. *Cross*

Examination of Dr. Mark Israel, January 25, 2017 Hearing Transcript, at 1748:19-24; (JA002073). He referred to himself on that date as "the director of the cancer center." *Direct Examination of Dr. Mark Israel, December 8, 2016 Hearing Transcript*, at 1487:19; (JA001812).

Dr. Israel was no longer the director of the Norris Cotton Cancer Center at the Dartmouth-Hitchcock Medical Center at the time of his testimony in December 2016. *Cross Examination of Dr. Mark Israel, January 25, 2017*, at 1748:19-1749:2; (JA002073-002075). He was the director emeritus. *Id.* at 1749:4; (JA002074). He admitted that on December 8, 2016, in his testimony he referred to himself as the director, when he was not the director at that point. *Id.* at 1749:24-1751:18; (JA002074-002076). He testified in January 2017 that he had told Mr. Watson as of the date he came to testify in December 2016 that he was no longer director. *Id.* at 1751:19-23; (JA002076). He had actually resigned as director in September 2016. *Id.* at 1752:6-9; (JA002077).

He made matters worse for himself from a credibility perspective when he claimed he could have stayed on as director. *Id.* at 1752:14-17; (JA002077). He brought a lawsuit against the Dartmouth-Hitchcock Medical Center on October 26, 2016. *Id.* at 1752:18-1754:10; (JA002077-002079). His filed complaint says he felt forced to resign but Dr. Israel testified before the PUC that he was not actually forced to resign. *Id.* at 1755:21-24; (JA002080).

Dr. Israel also failed to be straight with the Commission when he testified in December 2016 that he had an active clinical practice. When confronted

the following month on cross examination, he denied that he testified in December that he had an active clinical practice: "I tried to be very clear that I consulted and didn't have an active day-to-day practice." *Id.* at 1758:22-1759:25; (JA002083-002084).

Dr. Israel admitted that in December he had testified that he had a clinical practice. Perhaps to render his testimony regarding his clinical practice more plausible, he went on to state that he believes he did have a clinical practice at that time *Id.* at 1759:22-25; (JA002084). But he admitted that his authority and responsibility from clinical care was stripped from him. *Id.* at 1761:10-13; (JA002086). Dr. Israel admitted that as of the last day of September 2016, he no longer had any authority or responsibility for clinical care. *Id.* at 1762:6-10; (JA002087).

Dr. Israel failed to be forthright with the Commission about his status at Dartmouth. If he had simply disclosed that he had been forced to resign and stripped of all clinical responsibilities, the Commission would have to weigh whether that change in circumstances would have made any difference in these cases before the Commission. But Dr. Israel and PECO did not take that route, and the Commission should consider very carefully the approaches that Dr. Israel took when holding his credentials out to the Commission, and when testifying about his professional responsibilities. The Commission should conclude for this reason, and the other reasons set forth above, that the testimony of Dr. Marino is far more credible than that offered by either Dr. Israel or Dr. Davis.

V. There is No Requirement for Complainants to Prove Medical Causation as if This Were a Toxic Tort Case

PECO proceeds from the absolutely incorrect premise that in order to prevail in these proceedings, the Complainants must prove medical causation, i.e., that PECO's AMR or AMI smart meter caused health conditions for them or will interfere with their health. To be sure, as the Commission recognized in the *Kreider* case, Complainants bear the burden of proving "by a preponderance of the evidence, that PECO is responsible or accountable for the problem described in the complaint," and this includes proof "that the complainant was adversely affected by the smart meter" and that PECO's use of a smart meter "will constitute unsafe or unreasonable services in violation of Section 1501 under the circumstances in this case." *Susan Kreider v. PECO Energy Company*, No. P-2015-2495064, Opinion and Order (September 3, 2015) (JA007462-7481).

This does not require proof of medical causation, a burden so high it would eviscerate PECO's duty to provide safe and reasonable service. In enforcing section 1501, the Commission and PECO must be concerned with the *potential for harm*. If something is potentially harmful to the Complainants, it is both unsafe and unreasonable as to the Complainants. For the Complainants, this means that proving PECO's use of smart meters adversely affects them, and is unsafe and unreasonable under the circumstances for PECO to deploy smart meters on their residences in each of their cases.

This is evident not only from the words the Commission used in *Kreider* to frame the issues to be resolved, but also by the nature of the Commission

and the grant of authority to it under section 1501. As former PA PUC Commissioner Terence Fitzpatrick wrote in a 2003 law review article based on his long years of government service including as a PUC Commissioner, the role of the Commission in adjudicative proceedings is at least in part a policy making role, particularly when the Commission is applying broad legislative grants of authority, such as the safe and reasonable standards of section 1501. *See* T. Fitzpatrick, *The Tension between Policy and Principle in the Adjudications of the Pennsylvania Public Utility Commission*, 13 WIDENER L.J. 101, 108-11 (2003).

It is a generally recognized principle of administrative law that agencies like the Commission charged with ensuring safety "do not shoulder the burden borne by plaintiffs. They use [weight of the evidence methodology] to alert the public to *possible* hazards." *Challenging Weight of the Evidence Methodology*, In-House Defense Quarterly, Defense Research Institute (Winter 2017) (emphasis in original) (copy attached as Exhibit A). This requires review of the testimony of the witnesses, deciding which witnesses to believe where the evidence is in conflict, and deciding if Complainants have met their burden based on the evidence and all reasonable inferences.

The role of a regulatory agency like the PUC in this regard is very different from the role of a court in a lawsuit for damages:

> Regulatory and advisory bodies such as IARC, OSHA and EPA utilize a "weight of the evidence" method to assess the carcinogenicity of various substances in human beings and suggest or make prophylactic rules governing human exposure. This methodology results from the preventive perspective that the agencies adopt in order to reduce

> public exposure to harmful substances. *The agencies' threshold of proof is reasonably lower than that appropriate in tort law; which traditionally makes more particularized inquiries into cause and effect and requires a plaintiff to prove that it is more likely than not that another individual has caused him or her harm.*

Wright v. Willamette Industries. Inc., 91 F.3d 1105, 1107 (8th Cir. 1996) (internal quotations and citations omitted) (emphasis added).

VI. Forced Exposure of Complainants to RF from PECO's Meters on the Complainants Residential Properties Would, Under These Circumstances, Violate Due Process

Complainants counsel is aware of no case anywhere that considers this issue: whether a government actor has authority to expose a person to electromagnetic energy against their wishes and against the recommendation of their physician. But it is obvious that this would violate the due process clause of the 14th Amendment of the Federal Constitution as well as the due process protections in Article 1, Section 11 of the Pennsylvania State Constitution.

This is evident from the discussion of broccoli in the legal debate about the Affordable Care Act that culminated in *National Federation of Independent Businesses v. Sebelius*, 567 U.S. 519 (2012). During the argument in that case, Justice Scalia asked whether Congress could require citizens to buy broccoli. *Id.* at 660. While the issue in that case was determining the extent of Congress' power under Article I, commentators noted that requiring a consumer to buy broccoli would violate fundamental notions of Due Process, and forcing a consumer to eat broccoli (not just purchase it) would certainly violate due process. As noted Constitutional law scholar Michael C. Dorf has stated:

> A law that required the ingestion of Broccoli would infringe the substantive due process right to bodily integrity. The right to bodily integrity is chiefly a right to keep the government from forcing us to use our bodies in ways that we do not want to use them, rather than a right to do particular things with our bodies. Accordingly, a successful substantive due process challenge could very likely be mounted against a law compelling the consumption of broccoli.[4]

Yet, PECO is attempting to do just that—instead of asking its customers for permission to expose them to RF radiation (purchasing broccoli with option to eat), it is forcing RF exposure on them without consent (force feeding broccoli). This raises a serious constitutional issue. *See Phillips v. County of Allegheny*, 515 F.3d 224, 235 (3d Cir. 2008) ("[I]ndividuals have a constitutional liberty interest in personal bodily integrity that is protected by the Due Process Clause of the Fourteenth Amendment."); *see also In re Cincinnati Radiation Litig.*, 874 F. Supp. 796, 810-11 (S.D. Oh. 1995) ("The right to be free of state-sponsored invasion of a person's bodily integrity is protected by the Fourteenth Amendment guarantee of due process."). As explained *infra* at 70, any Commission interpretation of statutes or regulations that would infringe constitutionally protected rights for Complainants should be avoided.

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[4] *See* Michael C. Dorf, *Commerce, Death Panels, and Broccoli: Or Why the Activity/Inactivity Distinction in the Health Care Case was Really About the Right to Bodily Integrity*, 29 GA. ST. U.L. REV. 897, 917 (2013).

VII. The Complainants Have Met Their Burden of Proving that PECO's Use of Smart Meters Has Adversely Affected Them and Will Constitute Unsafe or Unreasonable Service in Violation of Section 1501 Under the Circumstances of These Cases

As Dr. Marino explained in testimony, there is a reliable scientific basis to conclude that RF exposure can cause harm to the Complainants, but at present it is impossible to test and determine whether it has affected or will affect any particular person, at least not without spending many tens of thousands of dollars to set up an experiment to test the theory of each of the Complainants. *Direct Testimony of Dr. Andrew Marino, September 15, 2016 Hearing Transcript,* at 643:13-644:5; (JA000643-000644). That should not mean that the Complainants have not carried their burdens of proof, because that would be impossible as a practical matter and would subject them to potential harm in the meantime.

The more logical conclusion is that, in the absence of a consensus clinical diagnosis, the Commission should defer to the judgment and recommendation of the Complainants' treating physicians. *Direct Examination of Dr. Andrew Marino, September 15, 2016 Hearing Transcript*, at 649:10-14; (JA000649). Each of the Complainants consulted with their physicians who advised the Complainants and testified in these proceedings that these patients should avoid RF exposure. *Direct Testimony of Dr. Anne Honebrink, September 27, 2016 Hearing Transcript*, at 16:6-13; (JA000893); *Redirect Testimony of Peter J. Prociuk*, *December 5, 2016 Hearing Transcript* at 116:16-22; (JA001096); *Direct Testimony of Dr. Hanoch Talmor, M.D.*, at 5:10-13; (JA002656).

It does not matter whether the Complainants' physicians had read up on RF exposure or whether they were just exercising common sense clinical judgment. The PUC has no authority or special competence to second-guess the medical judgment of treating physicians.

The Complainants are more than just people who have medical histories and doctors' notes. Each of them presents a sincere, compelling story illustrating their concern about RF exposure and why it is unreasonable for PECO to force them to accept RF exposure.

CONFIDENTIAL INFORMATION REMOVED

All four Complainants have at this point endured several years of dealings with PECO and the PUC, and have been forced to spend large sums of money to retain legal counsel and scientific expert witnesses. Some people might think the Complainants are kooks, but all four of them are educated, respectable citizens who obviously hold very sincere beliefs about RF exposure. Given the state of the scientific record, it would be cruel to subject the Complainants to RF exposure absent some compelling justification, and as explained *supra* at 63, there is no such justification.

VIII. PECO Mistakenly Relies on Orders from PUCs in Other States that Do Not Support Its Position Because All of These States Have Opt Out Provisions

In the other cases before the Commission in which safety and reasonableness of a PECO smart meter was at issue, PECO urged the Commission to adopt its position based on the actions of PUCs in eleven other jurisdictions.[5] What PECO failed to disclose, however, is that all or virtually all of those jurisdictions provide customers the opportunity to opt out of smart meter

[5] *See Susan Kreider v. PECO Energy Company*, Docket No. C-2015-2469655, *Main Brief of PECO Energy Company*, at 37-39; (JA007557-007560); *see also Catherine Frompovich v. PECO Energy Company*, Docket No. C-2015-2474602, *Main Brief of PECO Energy Company*, at 37-39; (JA007663-007665); *Mary Paul v. PECO Energy Company*, Docket No. C-2015-2475355, at 36-38; (JA007670-007714).

deployment.[6] Although each of these PUC references city by PECO did say somewhere, often without any formal hearings, that the smart meters were safe, those PUCs only stamped this "safety approval" on smart meters because those states did offer opt outs from installations, so that those customers who had health or other issues with the smart meters were not forced to endure smart meters on their homes.

PECO is also wrong to suggest that the Commission should adopt the reasoning of any other PUC about the safety and reasonableness of PECO smart meters, because the proceedings in those foreign jurisdictions are hearsay. Further, it would be impossible for the Commission to exercise its authority under section 1501 by simply adopting what has been done in other states. To the contrary, the Commission would need to examine the record evidence in all of those foreign

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6 PECO failed to provide the commission with any support for its statements about the eleven other PUCs, so it was hard to verify PECOs statements. Internet research shows that in ten of the eleven jurisdictions there is clearly an opt out right. *See* Arizona, http://docket.images.azcc.gov/0000159381.pdf; California, http://docs.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/164434.htm, http://docs.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/158621.htm; Florida, https://www.fpl.com/rates/meter-options.html; Maine, https://www.cmpco.com/smartmeter/smartmeteroptions.html; Massachusetts, http://www.raabassociates.org/Articles/MA%20DPU%2012-76-B.pdf; Michigan, http://efile.mpsc.state.mi.us/efile/docs/17000/0455.pdf; Nevada, http://puc.nv.gov/FAQ/Smart_Meters_Residential/#8; Texas, https://www.puc.texas.gov/agency/rulesnlaws/subrules/electric/25.133/25.133.pdf; Vermont, http://publicservice.vermont.gov/electric/smart_grid. New Hampshire has an opt in provision for smart meters, which is effectively the same thing as an opt out. https://www.puc.nh.gov/Regulatory/Docketbk/2012/12-245/LETTERS-MEMOS-TARIFFS/12-245%202012-08-09%20NHEC%20SMART%20METERS%20V.%20SMART%20GATEWAY%20DEVICES-WITH%20ATTACHMENTS.PDF. Counsel has been unable to determine what the District of Columbia provides for an opt out provision.

proceedings, and it is too late to do that. PECO should have opened this up through testimony if it had any valid point to make.

IX. Section 1501 Authorizes the Commission to Order PECO to Provide Service that is Safe and Reasonable

Complainants have proven that forced exposure to RF from PECO smart meters would be unsafe or at least unreasonable, given their medical histories, the extent of their concerns, and the medical advice and testimony of their treating physicians. It would seem only right that the Complainants should not have to endure forced exposure to smart meters absent some compelling justification for 100% uniform smart meter coverage.

There is no such justification. Certainly, Act 129 does not require it. The General Assembly may have approved the concept of a smart meter roll out that would encompass all customers, with no generalized opt out. But it did not indicate that it intended to force exposure on persons like complainants. If it did, that would almost certainly violate the Due Process Clause of the 14th Amendment, as explained *supra* at 72.

There is a cardinal presumption of statutory interpretation in Pennsylvania that "the General Assembly does not intend to violate the Constitution of the United States or of this Commonwealth." *See* Pa. C.S. § 1922(3); *see also Bricklayers of W. Pa. Combined Funds, Inc. v. Scott's Dev. Co.*, 90 A.3d 682, 692 (Pa. 2014) ("The legislature is presumed not to intentionally pass unconstitutional laws, and courts give statutes a constitutional interpretation if that is reasonably possible.").

Guided by these principles and presumptions, the conclusion the Commission should reach becomes clear—that Act 129 and section 1501 are completely consistent, and authorize, if not require, PECO to accommodate customers with concerns based on their physicians' medical recommendations.

PROPOSED CONCLUSIONS OF LAW

1. Pennsylvania law requires PECO as an electric utility to provide service that is safe and reasonable. 66 PA C.S. § 1501.

2. The Commission is authorized to enforce section 1501.

3. Complainants have borne the burden of proving that "installation of smart meters at their residences, in light of their health concerns, constitutes unsafe and unreasonable service in violation of 66 Pa.C.S. § 1501." Opinion and Order, *May 20, 2016 in Laura Sunstein Murphy v. PECO Energy.*, No. C-2015-2475726; (JA007585-007591); Interim Order, *May 26, 2016 in Maria Povacz v. PECO Energy Company*, No. C-2015-2475023; (JA007592-007599); Ruling on Preliminary Objections, *June 14, 2016* in *Cynthia Randall and Paul Albrecht v. PECO Energy Company*, No. C-2015-2475726; (JA007600-007603).

4. In meeting their burdens, the Complainants are not required to prove medical harm as if this were a tort case in a court of law, but rather are entitled to relief based on a showing that there is an unreasonable risk of harm to Complainants from PECO's smart meters under the circumstances of these case. *See Wright v. Willamette Industries. Inc.*, 91 F.3d 1105, 1107 (8th Cir. 1996).

5. In the alternative, the Complainants are entitled to their requested relief based on a showing that PECO's installation of smart meters would be unreasonable under the circumstances of these cases.

6. While Act 129 does not provide for a general opt out from smart meters, nothing in Act 129 requires the installation of a smart meter on a customer's home if such installation would be unsafe or unreasonable.

7. 66 Pa. C.S. § 1501 and Act 129 should be read harmoniously together to permit the Commission to order Pennsylvania utilities to accommodate medical requests such as those made here by Complainants to PECO, supported by their treating physicians, to not have smart meters or other RF-emitting devices installed on their residential properties.

8. Complainants have properly addressed to the Commission their concern that PECO's installation of smart meters on their homes violates their right to be free of state-sponsored invasion of their personal bodily integrity under the 14th Amendment of the Federal Constitution and under Article 1, Section 11 of the Constitution of the Commonwealth of Pennsylvania.

9. Reading 66 Pa. C.S. § 1501 and Act 129 harmoniously also avoids a conflict with the 14th Amendment of the Federal Constitution as well as the due process protections in Article 1, Section 11 of the Constitution of the Commonwealth of Pennsylvania.

10. The Complainants have demonstrated that each of them has a sincere concern about RF exposure from PECO smart meters, and that their treating physicians have recommended that they not be exposed to RF against their wills.

11. The scientific evidence presented by Complainants through Andrew Marino, Ph.D., along with the medical evidence presented by Complainants themselves and the medical recommendations of the Complainants' treating physicians convinces the Commission that, whether or not RF exposure has been proven to cause harm to humans, RF exposure to these Complainants does have

potential to cause harm to Complainants and, it would at the very least be unreasonable to force Complainants to accept RF exposure on their own properties against their expressed wishes, given each of their circumstances.

12. The Commission lacks authority to regulate medical treatment or medicine in any way or to override the recommendations of the Complainants' treating physicians.

13. Complainants have met their burden of proving by a preponderance of the evidence, that PECO is responsible or accountable for the problem described in their complaints, that the Complainants either were or would be adversely affected by a PECO smart meter, and that PECO's use of a smart meter on their property will constitute unsafe or unreasonable services in violation of 66 Pa. C.S. § 1501 under the circumstances in these cases.

PROPOSED ORDERING PARAGRAPHS

For the reasons set forth above, complainant Cynthia Randall and Paul Albrecht ask the Commission to issue an order in this proceeding that states:

1. That the Commission requires and directs PECO to provide accommodations for them pursuant to 66 Pa. C.S. § 1501;

2. That such accommodation means that PECO shall provide electrical service to their home without requiring the installation of any device that emits radio frequency electromagnetic energy.

Respectfully submitted,

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Dated: September 25, 2017

JOINT APPENDIX INDEX

JOINT APPENDIX PAGE #	DOCUMENT DESCRIPTION	HEARING EXHIBIT #	RECORD DESIGNATION
	Hearing Testimony		
JA00001-170	6/7/2016 Hearing Testimony of Maria Povacz		Povacz
JA000170-351	6/7/2016 Hearing Testimony of Dr. Palomar		Povacz
JA000352-553	6/8/2016 Hearing Testimony of Dr. Martin Pall		Common
JA000554-878	9/15/2016-9/16/16 Hearing Testimony of Dr. Andrew Marino		Common
JA000878-924	9/27/2016 Hearing Testimony of Dr. Honebrink		Albrecht Randall
JA000924-951	9/27/2016 Hearing Testimony of Cynthia Randall		Albrecht Randall
JA000951-994	9/27/2016 Hearing Testimony of Paul Albrecht		Albrecht Randall
JA000995-1057	12/5/16 Hearing Testimony of Laura Sunstein Murphy		Murphy
JA001057-1111	12/5/2016 Hearing Testimony of Dr. Prociuk		Murphy
JA001111-1194	12/5/2016 -12/6/16 Hearing Testimony of Brenda Eisen		Common
JA001195-1392	12/6/2016 Hearing Testimony of Glen Pritchard		Common
JA001392-1470	12/6/2016 - 12/8/17 Hearing Testimony of Dr. Christopher Davis		Common
JA001470-2178	12/8/2016 -12/9/16, 1/25/17 Hearing Testimony of Dr. Marc Israel		Common
JA002178-2235	1/25/17 Hearing Testimony of Dr. Andrew Marino		Common
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JA002236-2403	4/18/2016 Direct Testimony of Dr. Martin Pall on behalf of Maria Povacz		Povacz
JA002404-2651	4/27/2016 Direct Testimony of Maria Povacz		Povacz
JA002652-2669	4/27/2016 Direct Testimony of Hannoch Talomar on behalf of Maria Povacz		Povacz
JA002670-2710	5/18/2016 Rebuttal Testimony of Christopher Davis (Povacz)		Povacz
JA002711-2781	5/18/2016 Rebuttal Testimony of Brenda Eisen (Povacz)		Povacz
JA002782-2807	5/18/2016 Rebuttal Testimony of Dr. Marc Israel (Povacz)		Povacz
JA002808-2841	5/18/2016 Rebuttal Testimony of Glenn Pritchard (Povacz)		Povacz
JA002842-3128	5/31/2016 Surrebuttal Testimony of Dr. Martin Pall on behalf of Maria Povacz		Povacz
JA003129-3906	5/31/2016 Surrebuttal Testimony of Maria Povacz		Povacz
JA003907-3948	4/22/2016 Direct Testimony of Dr. Martin Pall on behalf of Laura Sunstein Murphy		Murphy
JA003949-4051	04/29/2016 Direct Testimony of Laura Sunstein Murphy		Murphy
JA004052-4139	04/29/2016 Direct Testimony of Peter J. Prociuk, M.D. on behalf of Laura Sunstein Murphy		Murphy
JA004140-4183	5/20/2016 Rebuttal Testimony of Christopher Davis (Murphy)		Murphy
JA004184-4222	5/20/2016 Rebuttal Testimony of Brenda Eisen (Murphy)		Murphy
JA004223-4254	5/20/2016 Rebuttal Testimony of Dr. Marc Israel (Murphy)		Murphy
JA004255-4277	5/20/2016 Rebuttal Testimony of Glenn Pritchard (Murphy)		Murphy
JA004278-4346	5/31/2016 Surrebuttal Testimony of Dr. Martin Pall on behalf of Laura S. Murphy		Murphy
JA004347-	6/03/2016 Surrebuttal Testimony of Laura Sunstein Murphy		Murphy
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JA004587-4591	8/8/2016 Report of Marc Israel		Randall Albrecht
JA004592-4758	8/8/2016 Report of Andrew Marino		Randall Albrecht
JA004759-4773	8/8/2016 Report of Glenn Pritchard		Randall Albrecht
	PECO Exhibits		
JA004774-4841	Hearing Examiner Report	PECO-1	Povacz
JA004842-4923	Maine Commission Order	PECO-2	Povacz
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JA004934-4937	Kreider Transcript pages	PECO-4	Povacz

JOINT APPENDIX PAGE #	DOCUMENT DESCRIPTION	HEARING EXHIBIT #	RECORD DESIGNATION
JA004938-4941	Povacz Medical Authorization	PECO-5	Povacz
JA004942-4949	Answers to Requests for Admission I-1	PECO-6	Povacz
JA004950-4960	Answers to Requests for Admission I-2	PECO-7	Povacz
JA004961-4968	Email or Answers to Requests for Admission I-3	PECO-8	Povacz
JA004969-4986	Answers to Requests for Admission I-4	PECO-9	Povacz
JA004987-4995	Printout from Website	PECO-10	Povacz
JA004996	47 CFR Ch. 1, Section 1.1310	PECO-11	Povacz
JA004997 (vol 12)	NCRP Report No. 86	PECO-12	Povacz
JA004998-5069	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz	PECO-13	Povacz
JA005070-5072	Allergy Research Group Antioxidant Information	PECO-14	Povacz
JA005073-5079	NutriCology Website Supplement Information	PECO-15	Povacz
JA005080-5084	ProHealth Website Article	PECO-16	Povacz
JA005085	Global Medical Discovery Key Scientific Article	PECO-17	Povacz
JA005086-5373	SCENIHR Opinion on Potential Health Effects of Exposure to Electromangetic Fields	PECO-18	Povacz
JA005374-5376	Retraction of: EUROPEAM EMF Guideline 2015 for the Prevetion, Diagnosis, and Treatment of EMF-related Health Problems and Illnesses	PECO-19	Povacz
JA005377-5722	Health effects from radiofrequency electromagnetic fields	PECO CX-20	Povacz
JA005723-5727	Electromagnetic fields and public health: mobile phones	PECO CX-21	Povacz
JA005728-5730	Exposure from mobile phones, base stations and wireless	PECO CX-22	Povacz
JA005731-5740	Cell Phones and Cancer Risk	PECO CX-23	Povacz
JA005741-5742	Health issues Do Cell Phones Pose a Health Hazard - USDA	PECO CX-24	Povacz
JA005743-5745	Current Research Results - USDA	PECO CX-25	Povacz
JA005746-5807	Interagency committee on health effects of non-ionising fields: report to ministers 2015	PECO CX-26	Povacz
JA005808-5909	Recent Research on EMF and health risk - tenth report from SSM's scientific council on electromagnetic fields, 2015	PECO CX-27	Povacz
JA005910-5949	Public Health Evaulation of Radio Frequency Exposure form Electronic Meters, 10/31/14	PECO CX-28	Povacz
JA005950-5956	Maine CDC Executive Summary of Review of Health Issues Related to Smart Meters, 11/8/2010	PECO CX-29	Povacz
JA005957-5963	National Institue of Building Sciences Web Page	PECO CX-30	Povacz
	Deposition Transcript of Marino	PECO CX-31	Povacz
JA005964-5985	FCC RF Safety FAQs	PECO CX-32	Povacz
JA005986-5995	Portion of Kreider Transcript	GP-8	Povacz
JA005996-6000	PECO FCC Licenses	GP-9	Povacz
JA006001	Graph - Mesh vs. Point to Point	GP-10	Povacz
JA006002-6012	Answer and New Matter	PECO CX-1	Murphy
JA006013-6022	Initial Consultation Summary of Dr. Francomano	PECO CX-2	Murphy
JA006023-6029	LSM Medical Records from Dr. Herbert	PECO CX-3	Murphy
JA006030-6031	Dr. Briones Report	PECO CX-4	Murphy
JA006032-6036	Main Line Gastroenterology records	PECO CX-5	Murphy
JA006037-6041	Email from Dr. Prociuk to W. Smith	PECO CX-6	Murphy
	Complainants Exhibits		
JA006042	9/1/89 Letter to Honebrink	C-1a	Albrecht Randall
JA006043	9/25/89 Letter, Glick to Cooper	C-1b	Albrecht Randall
JA006044-6046	4/27/1999 Dr. Bandera report re C. Randall GYN health issues.	C-2	Albrecht Randall
JA006047-6049	9/28/2006 Main Line Health Medical Record for C. Randall	C-3	Albrecht Randall

JOINT APPENDIX PAGE #	DOCUMENT DESCRIPTION	HEARING EXHIBIT #	RECORD DESIGNATION
JA006050	5/4/13 Letter from PECO Meter Installation Team to Cynthia Randall re scheduling appointment to have new meter installed.	C-4	Albrecht Randall
JA006052	5/14/13 Letter form PECO Meter Installation Team to Cynthia Randall apologizing for 5/4/13 letter sent in error and advising of the installation of new meters in the area.	C-5	Albrecht Randall
JA006053	5/17/13 Letter from L. Lamberson (PECO Meter Installation Team) to Cynthia Randall confirming concerns expressed to PECO re AMI meter.	C-6	Albrecht Randall
JA006054	6/4/13 Letter from M. Harris, Esq. to L. Lamberson (PECO) re concerns expressed to PECO and Grid One re AMI meters and healthcare concerns.	C-7	Albrecht Randall
JA006056-6079	6/10/13 Letter from S. Lee (PECO) to M. Harris enclosing decisions by PUC that there is no "opt out" for smart meter installation.	C-8	Albrecht Randall
JA006070-6082	7/31/13 Letter form M. Harris to S. Lee re receipt of 6/10/13 letter from PECO	C-9	Albrecht Randall
JA006086-6088	8/2/13 Letter to Haver	C-10	Albrecht Randall
JA006086-6088	8/2/13 Letter from M. Harris, Esq. to PA Attorney General, Bureau of Consumer Protection, re dialogue with PECO and position that they do not want a SMART meter.	C-11	Albrecht Randall
JA006083-6085	8/2/13 Letter from M. Harris, Esq. to Mayor's Ofice of Consumer Affairs re dialogue with PECO and position that they do not want a SMART meter.	C-12	Albrecht Randall
JA006095-6097	8/2/13 letter from M. Harris to Senatory Shirley Kitchen re re dialogue with PECO and position that they do not want a SMART meter.	C-13	Albrecht Randall
JA006092-6094	8/2/13 letter from M. Harris to Senator Cherele Parker Kitchen re re dialogue with PECO and position that they do not want a SMART meter.	C-14	Albrecht Randall
JA006098	8/12/13 Letter from L. Scott-McKillop (Utility Complaint Investigator) to M. Harris advising to file a formal complaint with PUC re opt-in provision re smart meters	C-15	Albrecht Randall
JA006099-6101	8/20/13 Letter from M. Harris to Councilman Curtis Jones re dialogue with PECO and position that they do not want a SMART meter.	C-16	Albrecht Randall
JA006102	9/4/13 Letter from Office of PA Attorney General to M. Harris forwarding complaint to Ofice of Consumer Advocate	C-17	Albrecht Randall
JA006103	1/21/16 Letter from PECO to C. Randall re plans to install smart meter.	C-18	Albrecht Randall
JA006104-6105	3/3/16 Letter from M. Harris to PECO Meter Installation Team objecting to installation of smart meter.	C-19	Albrecht Randall
JA006110-6111	3/14/16 Letter from B. Eisen (PECO) to Harris / Albrecht & Randall re additional information regarding AMI meters.	C-20	Albrecht Randall
JA006106	3/21/2016 Letter from B. Eisen (PECO) to Harris / Albrecht & Randall re additional information regarding AMI meters.	C-21	Albrecht Randall
JA006108	4/14/16 Letter from Dr. Damiano to P. Albrecht re avoiding exposure to radiation due to history of skin cancer.	C-22	Albrecht Randall
JA006109	4/20/16 Letter from Dr. Honebrink re avoiding increase in exposure to radiation due to heath problems, including multiple cancers.	C-23	Albrecht Randall
JA006112-6244	3/1/02 Newman Hearing Transcript	C-CX-1	Albrecht Randall

JOINT APPENDIX PAGE #	DOCUMENT DESCRIPTION	HEARING EXHIBIT #	RECORD DESIGNATION
JA006245-6461	Kreider Transcript	C-CX-3	Albrecht Randall
JA006462-006499	PECO's Answers to Discovery in *Murphy*	C-CX-4	Murphy
JA006564	The Interaction Sequence	CX-6	Common
JA006565-6567	6/23/16 Draft NTP Report	CX-7	Common
JA006568	8/13/15 Sailli Study	CX-8	Common
JA006569	2009 ICNRP Statement	CX-9	Common
JA006570	2015 Tang Study	CX-10	Common
JA006571	2015 Roggeveen Study	CX-11	Common
JA006572-6573	2011 Volkow Study	CX-12	Common
JA006950-	4/2/86 NCRP Report No. 86	CX-15	Common
JA006600-6601	1/27/15 SCENHIR Opinion on Potential health effects of exposure to electromagnetic fields (EMF)	CX-18	Common
JA006605-6607	Netherlands Study	CX-20	Common
JA006611	AGNIR Report	CX-22	Common
JA006612	Interphone Study	CX-23	Common
JA006614-6615	2010 Marino Study	CX-25	Common
JA006624-6634	2016 Starkey Study	CX-30	Common
JA006635-6646	2009 Ziemann Study	CX-31	Common
JA006647-6648	12/12/02 Americaqn Academy of Pediatrics Letter	CX-32	Common
JA006649-6676	1992 Chou (USAF) Study	CX-33	Common
JA006677	1979 Wertheimer Study	CX-34	Common
JA006678-6687	2014 Carlberg Study	CX-35	Common
JA006808-6815	1998 de Seze Study	CX-39	Common
JA006824-6835	2016 de Klein Study	CX-41	Common
JA006836-6837	1997 Marino Study	CX-42	Common
JA006837-6845	Bio One Study	CX-43	Common
JA006846	August 2016 Kerimoglu Study	CX-44	Common
JA006847	November 2016 Kerimoglu Study	CX-45	
JA006848	2016 Luo Study	CX-46	Common
JA006849	2016 Benassi Study	CX-47	Common
JA006850	2016 Ghoniem Study	CX-48	Common
JA006851	2016 Shehu Study	CX-49	
JA006852	March 2016 Kerimoglu Study	CX-50	
JA006853	2016 Kunt Study	CX-51	
JA006854-6855	2016 Kubulu Study	CX-52	
JA006856	2015 Kazemi Study	CX-53	
JA006857	2015 Sagun Study	CX-54	
JA006858	2015 Odaci Study	CX-55	
JA006859	2015 Lewicka Study	CX-56	
JA006860	2015 Hanci Study	CX-57	
JA006861	2015 Ragy Study	CX-58	
JA006862	2015 Tiwari Study	CX-59	
JA006862-6870	2007 Parazinni Study	CX-60	
JA006871-6879	2015 Choi Study	CX-61	
JA006880-6881	2015 Turedi Study	CX-62	
JA006882	2015 Saili Study	CX-63	
JA006883-6884	August 2016 Kerimoglu Study	CX-64	
JA006885-6886	2016 Eciki Study	CX-65	
JA006887	2005 Study re Reflusx	CX-66	
JA006889-6898	2010 Moehler Study	CX-67	
JA006899-6908	2012 Moehler Study	CX-68	
JA006909	2016 Nordin Study	C X-69	
JA006910-6911	5/27/16 AAP responds to study showing link between cell 0phone radiation, tumors in rats	CX-71	Common
JA006912-6918	2002 Hietanen Study	CX-72	
JA006919	2006 Rubin article	CX-73	Common

JOINT APPENDIX PAGE #	DOCUMENT DESCRIPTION	HEARING EXHIBIT #	RECORD DESIGNATION
JA006920-6925	2006 Rubin Study	CX-74	Common
JA006926-6927	2014 Liu Study	CX-75	
JA006928-6934	2011 McCarty Study	CX-76	Common
JA006935-6936	2012 Rubin Study	CX-77	
JA006937-6938	2012 Marino Study	CX-78	
JA006839-6940	2013 Marino Study	CX-79	
JA006941	PECO New Metering Technology	CX-80	Common
JA006942	2011 Lowden Study	CX-81	Common
JA007163	"What is an unrefereed preprint?"	CX-94	Common
JA007154-7250	6/23/16 NTP Report	CX-95	Common
JA007251-7252	Article on NIH website re NPT report	CX-96	Common
JA007253-7279	2006 IARC Study	CX-97	Common
JA007322-7353	PECO Expert Reports for Albrecht Randall	CX-102	Common
JA007354-7369	Complaint in *Israel v/ Dartmouth-Hitchcock Medicaql Center, et al.*	CX-103	Common
JA0073787-7452	5-19-16 NPT Report	CX-106	Common
JA007454-7456	6/17/14 Article: Mark Israel named to the Preston T. and Virginia R. Kelseyt Diustringuished Chair in Cancer	CX-108	Common
	Other Documents		
JA007457-7458	1989.09.01 Hayward Letter to Honebrink		Albrecht Randall
JA007459-7361	1999.04.27 letter to weil		Albrecht Randall
JA007462-7481	2015.09.03 Order (Kreider)		Common
JA007482-7498	2016.04.01 Randall Formal Complaint (final)		Albrecht Randall
JA007499-7512	2016.04.08 Povacz - Amended Complaint (as filed)		Povacz
JA007513-7532	2016.04.28 PECO's P.O.s in Povacz		Povacz
JA007533-7580	2016.05.02 peco brief in kreider		Common
JA007581-7584	2016.05.03 kreider docket		Common
JA007585-7591	2016.05.20 Murphy Order		Murphy
JA007592-7599	2016.05.26 Interim Order in Povacz		Povacz
JA007600-7604	2016.06.14 Order Denying P.O.s in Randall Albrecht		Albrecht Randall
JA007605-7608	2016.08.11 Order re Deposition in Randall Albrecht		Common
JA007609-7613	2016.08.26 Order Granting Revised Schedule		Common
JA007614-7621	2016.09.09 Order denying ADA Motion		Murphy Povacz
JA007622-7669	2017.01.25 PECO Brief Povich		Common
JA007670-7714	2017.03.06 PECO Brief in Paul		Common
JA007715-7717	2017.06.01 briefing Order 3		Common
JA007718-7720	2017.08.15 Briefing Order		Common
JA007721	2017.09.24 Dr. Honebrink profile from Website		Albrecht Randall

Exhibit A

By Andrew Kantra, Jessica Rickabaugh, and Rebecca Reed

Challenging Weight of the Evidence Methodology

"Because I say so" is not a reliable scientific methodology. But plaintiffs' counsel have, with some success, invoked "weight of the evidence" (WOE) methodology—a process used by some regulatory bodies to classify theoretical hazards—in an effort to mask their experts' "say so" approach. And some courts have gone along. But WOE methodology has no legitimate place in the courtroom.

Regulators do not shoulder the burden borne by plaintiffs. They use WOE to alert the public to *possible* hazards. Legal fact-finders, on the other hand, impose liability in cases where the evidence establishes that a product *more likely than not caused* an injury. Given these different goals, the fact that regulators may use WOE methodology to evaluate scientific data does not earn it admission in civil litigation.

We believe that decisions admitting expert testimony based on WOE are wrong, but do not repeat the reasons why here, as they have been discussed extensively by others. *See*, *e.g.,* David E. Bernstein,

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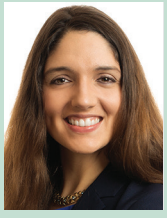

The Misbegotten Judicial Resistance to the Daubert Revolution, 89 Notre Dame L. Rev. 27 (2013) (criticizing the First Circuit's endorsement of the WOE approach as an example of "judicial noncompliance" with Federal Rule of Evidence 702 and *Daubert*); *see also* Jennifer L. Mnookin, Atomism, Holism, and the Judicial Assessment of Evidence, 60 UCLA L. Rev. 1524, 1580 (2013) ("To be sure, methods for aggregation in science, even relatively informal, weight-of-the-evidence approaches certainly ought not to be based on the expert's mere say so."). Instead, after reviewing the conflicting case law, we offer practical approaches for challenging experts who use WOE to offer *ipse dixit* testimony.

WOE Methodology: Conflicting Definitions

"Weight of the evidence" is a common phrase without a clear meaning. The phrase has been defined as "a process or method in which all scientific evidence that is relevant to the status of a causal hypothesis is taken into account." Sheldon Krimsky, *The Weight of Scientific Evidence in Policy and Law*, 95 Am. J. Public Health (Supp. 1) S129 (2005). In practice, WOE is most often used as a metaphorical term for a subjective assessment of "relevant" data examined for some risk or hypothesis, without reference to any interpretive methodology. Douglas L. Weed, *Weight of Evidence: A Review of Concept and Methods*, 25 Risk Analysis 1545, 1546–47 (2005); *see also* Krimsky, *supra*, at S129. But it may also be used to describe a methodological approach that could include systematic reviews, quality criteria for toxicology studies, causal criteria in epidemiology, meta-analysis, mixed epidemiologic-toxicology models and quantitative weighting schemes. Weed, *supra*, at 1547–52; *see also* Krimsky, *supra*, at S129.

The variability in WOE characterizations leads to wide variability in how scientists and regulatory agencies exercise judgment under WOE. "Metaphorically, judgment is a kind of intellectual glue, cementing together the evidence and the methods." Weed, *supra*, at 1553. "Without an explication of how evidence is 'weighed' or 'weighted,' the claim WOE seems to be coming out of a 'black box' of scientific judgment." Krimsky, *supra*, at S131 (*quoting* M.A. Ibrahim, *et al.*, *Weight of the Evidence on the Human Carcinogenicity of 2,4-D*, 96 Envtl. Health Perspectives 213 (1991)).

WOE Regulatory Methods Are Problematic in a Courtroom

Use of a WOE methodology may be appropriate for government regulation, but it should not establish legal liability. As the *Reference Manual* explains:

> The agency assessing risk may decide to bar a substance or product if the potential benefits are outweighed by the possibility of risks that are largely unquantifiable because of presently unknown contingencies. Consequently, risk assessors may pay heed to any evidence that points to a need for caution, rather than assess the likelihood that a causal relationship in a specific case is more likely than not.

Reference Manual on Scientific Evidence, Fed. Jud. Ctr., at 33 (2d ed. 2000).

Use of a WOE methodology may be appropriate for government regulation, but it should not establish legal liability.

Following this logic, courts have appropriately recognized that the U.S. Food and Drug Administration (FDA) utilizes a much lower standard of proof for taking regulatory action than that applied by a court to determine causation. *See, e.g., Allen v. Pennsylvania Engr'g Corp.*, 102 F.3d 194, 198 (5th Cir. 1996) (rejecting experts' reliance on the methodology employed by regulatory agencies because "[t]he agencies' threshold of proof is reasonably lower than that appropriate in tort law, which 'traditionally make[s] more particularized inquiries into cause and effect' and requires a plaintiff to prove 'that it is more likely than not that another individual has caused him or her harm'"). Similarly, WOE regulatory risk assessments used by federal, state, and international agencies to evaluate potential health risks have also been rejected by courts as proof of causation. *See*, *e.g., Abarca v. Franklin Cnty. Water Dist.*, 761 F. Supp. 2d 1007, 1040-41 (E.D. Cal. 2011) (granting defendants' motion for partial summary judgment where plaintiffs relied on an EPA Risk Assessment to establish causation); *Rhodes v. E.I. DuPont de Nemours & Co.*, 253 F.R.D. 365, 377–78 (S.D.W.Va. 2008) ("Because a risk assessment overstates the risk to a population to achieve its protective and generalized goals, it is impossible to conclude with reasonable certainty that any one person exposed to a substance above the criterion established by the risk assessment has suffered a significantly increased risk").

Nonetheless, given the many definitions of WOE and different uses of WOE in the regulatory public health context, courts have reached conflicting results in deciding the admissibility of opinions based on WOE.

WOE Methodology in the Courtroom

WOE Cases: Conflicting Decisions

Federal Courts

Some federal courts have found that, when "properly applied, the weight-of-the-evidence methodology is not an unreliable methodology." *Magistrini v. One Hour Martinizing Dry Cleaning*, 180 F. Supp. 2d 584, 602 (D.N.J. 2002), *aff'd*, 2003 U.S. App. LEXIS 12972 (3d Cir. June 25, 2003) (expert excluded). *See also Milward v. Acuity Specialty Prods. Group*, 639 F.3d 11 (1st Cir. 2011) (reversing exclusion of expert testimony based on WOE methodology); *Allen*, 102 F.3d at 197 (excluding experts who used a WOE methodology); *Waite v. AII Acquisition Corp.*, No. 15-cv-62359, 2016 U.S. Dist. LEXIS 107820, *35 (S.D. Fl. July 11, 2016) (finding WOE methodology employed was "sound"); *In re Chantix*, 889 F. Supp. 2d 1272, 1293 (N.D. Ala. 2012) (permitting expert testimony relying on WOE methodology).

In *Magistrini*, the court excluded the plaintiffs' general causation expert testimony because the expert's application of WOE methodology did not explain his rejection of studies that failed to support his conclusions. *Id. at* 603. There, the plain-

tiff claimed that her occupational exposure to a dry cleaning chemical known as perchloroethylene caused her to develop acute myelomonocytic leukemia. *Id.* at 589. The plaintiff's general causation expert, Dr. David Ozonoff, cited the studies that he considered, but he did not explain "the methodology he used in weighing them against contra scientific evidence." *Id.* at 600. He had not presented "good grounds" for his assumptions as to what studies should be included in the analysis; as a result, the "body of evidence… was not shown to be reliably composed." *Id.* at 603. Furthermore, Dr. Ozonoff did not "explain which studies were more or less reliable based upon statistical methods," and he did not identify or factor in the confidence interval from each study. *Id.* at 605.

Magistrini concluded that Dr. Ozonoff had "not set forth the methodology he used to weigh the evidence." *Id.* at 606. "In order to ensure that the 'weight-of-the-evidence' methodology is truly a methodology, rather than a mere conclusion-oriented selection process[,]… there must be a scientific method of weighting that is used and explained." *Id.* at 607. Because the expert did not explain his methodology, the court found "'simply too great an analytical gap'" between the data that the expert relied on and the opinion that he proffered. *Id.* at 608 (citing *Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997)).

Perhaps the most well-known and controversial federal case to discuss a WOE methodology is *Milward v. Acuity Specialty Products Group*, 639 F.3d 11 (1st Cir. 2011). There, the First Circuit reversed a district court's exclusion of Dr. Martyn Smith's expert opinions based on a WOE methodology. Dr. Smith opined that there was a causal link between exposure to benzene and acute promyelocytic leukemia (APL), a rare subtype of acute myeloid leukemia (AML). The First Circuit cited two primary factors to justify its acceptance of Dr. Smith's WOE approach. First, it described Dr. Smith's WOE methodology as an interpretive approach that he applied after following the widely accepted Bradford Hill guidelines for assessing causation. *Id.* at 16-17. Second, the court found that Dr. Smith's WOE application was also consistent with the "near consensus among government agencies, experts and active researchers in the field that benzene can cause AML as a class." *Id.* at 19. This purported independent corroboration of the expert's underlying opinions muddled the court's evaluation of whether WOE methodology itself is valid.

In *Milward*, the defendants' experts also agreed that some of Dr. Smith's opinions were reasonable, including one of the defendants' experts who agreed "there are a group of reasonable scientists who reasonably believe that all forms of AML arise from the same progenitor cell." The defense experts further conceded that Dr. Smith's opinion was "consistent with most of the evidence." *Id.* at 20, n.10.

Frye Courts

WOE methodology has also received a mixed reception in *Frye* courts. Under *Frye*, novel scientific evidence "is admissible if the methodology that underlies the evidence has general acceptance in the relevant scientific community as a method for arriving at the conclusion the expert will testify to at trial." *Frye v. United States*, 293 F. 1013, 1014 (D.C. Ct. App. 1923).

In *Jacoby v. Rite Aid Corp.*, 93 A.3d 503 (Pa. Super. Ct. 2013), the Pennsylvania Superior Court rejected WOE methodology, concluding: "[W]eight of the evidence and totality of the evidence are not scientific methodologies. They are not verifiable or replicable, but rather are based on subjective judgment." *Jacoby* was a personal injury case in which the plaintiff, among others, alleged that Fixodent, a denture adhesive cream, causes a neurological condition called myeloneuropathy. The plaintiffs' experts, including *Milward*'s Dr. Smith, opined that the zinc in Fixodent led to a copper deficiency that caused myeloneuropathy.

Dr. Smith claimed that he followed a Bradford Hill framework and WOE approach. But Dr. Smith could not define association under Bradford Hill. He admitted that no studies demonstrated a statistically greater risk of myeloneuropathy for Fixodent users compared to nonusers. *Id.* Another of Jacoby's experts, Dr. Frederick K. Askari, claimed that he used a "totality of the evidence" methodology. The court rejected Dr. Askari's opinions as well because he, too, failed to define his methodology or undertake a "systematic weighing of factors." *Id.*

The court supported its exclusion of the plaintiffs' experts in *Jacoby* by citing the absence of evidence showing how much zinc was absorbed in the body from Fixodent. The experts had no basis to opine that the amount of zinc absorbed in the body from Fixodent could result in a copper deficiency. Furthermore, the experts lacked evidence regarding "'how low a person's copper must be or for how long a duration before it potentially results in myeloneuropathy.'" *Id.* Two years later, for similar reasons, another court rejected testimony from Drs. Smith and Askari in another Fixodent case. *In re Denture Adhesive*, 134 A.3d 488 (Pa. Super. Ct. Nov. 12, 2015).

Jacoby contrasts with the decision in *Murray v. Motorola, Inc.*, No. 2001 CA 008479 B, 2014 D.C. Super. LEXIS 16, *48 (D.C. Super. Aug. 8, 2014), where the court found that "in certain scientific circles [WOE] is generally accepted." The *Murray* court recognized that WOE is "amorphous" compared to such other methodologies as Bradford Hill, and, therefore, "an expert asserting that she used the WOE method needs to supply more detail as to what her methodology entails." *Id.* at *50 (citing Krimsky and Weed, *supra*). The court excluded one expert who claimed to use WOE, but then failed to apply it. *Id.* at *61. The court, however, permitted another expert to testify to opinions formed through a WOE methodology because his methodology required a review of "all relevant information and studies on a potential carcinogen, including epidemiological studies, whole animal experimental studies, mechanistic (in vivo and in vitro) studies, incidence data, and any other evidence." *Id.* at *90 n.53, *96.

Confronting a WOE Methodology in Litigation

Given that the WOE methodology has been accepted by several courts, and plaintiffs' attorneys' desire to give their experts the appearance of scientific legitimacy, some experts continue to rely on WOE methodology. In addition to the critical task of explaining to the court why regulatory standards are not reliable measures of legal

causation, there are multiple ways to challenge an expert's WOE methodology.

What Does Weight of the Evidence Mean to the Expert?

Given the many definitions of WOE, how the expert defines WOE methodology is important. What steps are required in the WOE methodology? How does the WOE methodology differ from other scientific methodologies (*e.g.*, Bradford Hill)? What steps were taken to ensure that the WOE methodology produces replicable results? Has the expert's WOE methodology been previously accepted in litigation? These questions will reveal whether the expert is only subjectively weighing evidence or whether the methodology used is a repeatable analytical process for reviewing various types of evidence. This inquiry was critical to the court's decision in *Magistrini*, where the expert's inability to describe an analytical process behind his conclusions revealed that the expert had not employed a scientifically valid methodology. 180 F. Supp. 2d at 607.

Did the Expert Consistently Apply an Analytical Methodology?

It is not enough for an expert to claim that the methodology employed is a true analytical framework—the expert must have actually employed an analytical framework. *Murray v. Motorola, Inc.*, 2014 D.C. Super. LEXIS 16, at *48 ("Before the court may determine whether a methodology is generally accepted [under *Frye*], an expert must identify her methodology and establish that she actually did what she said she did.").

An expert should demonstrate the use of defined criteria in forming an opinion. For instance, Bradford Hill requires an expert to weigh the following: (1) temporal relationship; (2) strength of the association; (3) dose-response relationship; (4) replication of the findings; (5) biological plausibility (coherence with existing knowledge); (6) consideration of alternative explanations; (7) cessation of exposure; (8) specificity of the association; and (9) consistency with other knowledge. If an expert claims to have used a methodology based on Bradford Hill, the expert must use the nine Bradford Hill guidelines. *Magistrini*, 180 F. Supp. 2d at 606. How does the expert evaluate the strength of an association? What criteria are used to weigh the studies that support an association against those that do not? What data allows the expert to evaluate whether a dose-response relationship exists?

The expert's methodology also must be consistently followed. Experts have been excluded where they have not applied the same methodology to different datasets and failed to offer a reasonable explanation for the deviation. In *In re Zoloft (Sertraline Hydrochloride) Products Liability Litigation*, MDL No. 2342 12-md-2342, 2015 U.S. Dist. LEXIS 161355, *57 (E.D. Pa. Dec. 2, 2015), the court excluded an expert who "failed to consistently apply the scientific methods he articulates, has deviated from or downplayed certain well-established principles of his field, and has inconsistently applied methods and standards to the data so as to support his *a priori* opinion." The same expert had previously been excluded for such reasons in *In re Lipitor (Atorvastatin Calcium) Marketing, Sales Practices and Products Liability Litigation*, MDL No. 2:14-mm-02502-RMG, 2015 U.S. Dist. LEXIS 157593, *13 (D. S.C. Nov. 20, 2015) (excluding expert testimony where statistician used one method to analyze a set of data, but then chose another method, without explanation, to analyze other data).

> There are multiple ways to challenge an expert's WOE methodology.

How Did the Expert Select Evidence?

An expert's methodology is no better than the quality of the information being analyzed. Has the expert relied on the same type of data used in his or her peer-reviewed publications? If not, why not? Outside of litigation, have others relied on the same type of data to support similar conclusions? To what extent has the expert relied on scientific information from peer-reviewed, publicly available sources?

If peer-reviewed data are used, they should not be manipulated. Courts prohibit an expert's unjustified re-analysis of published data: "[A]n expert cannot simply, *without any explanation* for rejecting a published, peer-reviewed analysis, conduct his own 're-analysis' solely for the purposes of litigation and testify that the data support a conclusion opposite that of the studies' authors in a peer-reviewed publication." *In re Lipitor (Atorvastatin Calcium) Mktg., Sales Practices & Prods. Liab. Litig.*, 2015 U.S. Dist. LEXIS 157593, *57 (emphasis in original); *see also In re Zoloft (Sertraline Hydrochloride) Prods. Liab. Litig.*, 2015 U.S. Dist. LEXIS 161355, *51 ("results-oriented, post-hoc re-analyses of existing epidemiological studies are disfavored by scientists and often deemed unreliable by courts, unless the expert can validate the need for re-analysis in some way").

Understanding how the expert searched for information will help a court weigh whether the expert's evidence is reliable. A purported WOE methodology is inadequate if an expert cannot explain how the data evaluated were selected in the first instance, or if the bases on which the data were selected are inappropriate. *Magistrini*, 180 F. Supp. 2d at 603. Experts must explain their search criteria, such as identifying search terms and date parameters. Experts must then explain why publications that met their search terms were included or excluded.

Is the Expert's Analysis Capable of Being Tested?

An expert's methodology cannot be generally accepted or scientifically reliable if it cannot be scrutinized and replicated.

For example, *In re Denture Adhesive* rejected a WOE methodology because the experts relied on purported causation assessments of other physicians treating patients with myeloneuropathy. The experts had no ability to evaluate the other physicians' qualifications for making myeloneuropathy causation assessments, nor an ability to evaluate the accuracy of the other physicians' myeloneuropathy diagnoses. Therefore, the court was unable to rule that the proffered expert tes-

timony was based on "generally accepted methodologies."

In re Denture Adhesive is a logical extension of other decisions that have excluded expert opinions that are not based on sufficient facts or data. For instance, a treating physician's causation assessment may not meet Rule 702 admissibility requirements. *See, e.g., Tamraz v. Lincoln Elec. Co.*, 620 F.3d 665, 670 (6th Cir. 2010) (holding that treating physician's causation testimony should be excluded under Rule 702 because it was based on speculation); *Kruszka v. Novartis Pharms. Corp.*, No. 07-2793, 2014 U.S. Dist. LEXIS 68439, *27–30 (D. Minn. May 19, 2014) (excluding specific causation testimony of plaintiff's treating physicians under Rule 702 because it had no evidentiary basis). Relying on the opinions of treating physicians is also problematic because they "must make care decisions even in the face of uncertainty." Reference Manual on Scientific Evidence, 714 (3d ed. 2011).

Has the "Regulatory" Standard Been Previously Accepted as a Reliable Measure of More Likely than Not Causation?

No expert should be permitted to survive a *Daubert* or *Frye* challenge on the mere assertion that regulators have used the same methodology. If the expert is following a regulatory methodology, the expert must explain why that regulatory framework is adequate to determine legal causation under a more likely than not standard. Which regulatory agencies use the expert's version of WOE? What are the goals of the regulatory analysis where the method has been used? Has the method been used outside of the regulatory context in litigation? Would the expert reach the same result if Bradford Hill were applied?

An expert without a justifiable basis for using WOE over a universally accepted scientific methodology is using regulatory agency methods as a smokescreen for his or her "say so."

Conclusion

Regulators use WOE methodology to safeguard health, not to determine causation and liability. Courts must demand more rigorous and exacting methods of experts to achieve justice.