

Metropolitan Edison Statement No. 3R

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

Judith Hendin

:

v.

:

Docket No. C-2018-3003324

:

:

Metropolitan Edison Company

:

**Rebuttal Testimony
of
Mark A. Israel, M.D.**

NON-CONFIDENTIAL VERSION

List of Topics Addressed

Medical Evaluation

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TESTIMONY
OF
MARK A. ISRAEL, M.D.

INTRODUCTION

Q. What is your name and business address?

A. My name is Mark A. Israel. My business address is 52 Vanderbilt Avenue, Suite 1510, New York, New York, 10017.

QUALIFICATIONS

Q. Are you a medical doctor?

A. Yes.

Q. Where did you receive your medical education and training?

A. I received my M.D. degree from Albert Einstein College of Medicine. I received medical training as an intern at Harvard Medical School and affiliated hospitals and then as resident in pediatrics at Harvard Medical School and affiliated hospitals, and I received post-graduate medical and research training at the National Institutes of Health.

Q. Are you licensed to practice medicine?

A. Yes, in New Hampshire and California.

Q. What is your present position?

1 A. I am Executive Director of the Israel Cancer Research Fund, an international
2 charitable fund that supports cancer research.

3 **Q. Are you testifying on behalf of those entities or any others with which you are**
4 **affiliated?**

5 A. No, I am testifying in my individual capacity as a medical doctor and medical
6 researcher.

7 **Q. Do you have any medical practice experience?**

8 A. Yes, I have 40 years of medical practice experience. I practiced medicine as an
9 officer in the U.S. Public Health Service for 14 years, where I rose to the rank of
10 Captain. I practiced medicine at the University of California Medical School in
11 San Francisco affiliated hospitals for 11 years. I practiced medicine at Dartmouth-
12 Hitchcock Medical Center and its Norris Cotton Cancer Center for 15 years.
13 Throughout that time, I was the Director of the Cancer Center and responsible for
14 coordinating the treatment of patients provided by medical doctors, surgeons,
15 radiation therapists, and others. I was also responsible and for Center's public
16 health protection program in New England.

17 **Q. Do you have any medical teaching experience?**

18 A. Yes, I have 27 years of medical teaching experience. I was a Professor at the
19 University of California Medical School in San Francisco for 11 years and a
20 Professor at Dartmouth Medical School for 16 years. I have taught classes in a
21 number of medical fields, including endocrinology, immunology, hematology,

1 neurology, cardiology, biochemistry, cell biology, genetics, molecular genetics,
2 medical oncology, and radiation oncology. I have taught medical school students,
3 interns, residents, and practicing physicians.

4 **Q. Do you have medical research experience?**

5 A. Yes, I have 40 years of medical research experience. I did medical research at the
6 National Institutes of Health (National Institute of Allergy and Infectious Diseases
7 and National Cancer Institute) for 14 years; at the University of California Medical
8 School in San Francisco for 11 years; and at Dartmouth Medical School and the
9 Norris Cotton Cancer Center at Dartmouth-Hitchcock Medical Center for 15 years.
10 I am an author of 250 medical research articles published in medical books and
11 scientific journals such as the New England Journal of Medicine, the Proceedings
12 of the National Academy of Sciences, and Nature, among others. I have also
13 written chapters in medical textbooks, such as the widely used Harrison's
14 *Principles of Internal Medicine*, and I am a co-editor of the textbook *The Molecular*
15 *Basis of Cancer*.

16 I have supervised the research of candidates for Ph.D. degrees in Genetics and in
17 Systems and Molecular Biology. I have also supervised advanced training in
18 medical research for over 50 post-doctoral fellows who already had M.D. or Ph.D.
19 degrees.

20 **Q. Do you have experience evaluating medical research articles by other**
21 **researchers?**

1 A. Yes, it is common practice for experienced researchers to evaluate research articles
2 by other researchers. I have evaluated medical research articles submitted by other
3 researchers for publication in scientific journals for over 40 years. I have also
4 served on the editorial staff of various scientific journals for over 25 years. When
5 I worked at the National Institutes of Health and as a physician in the U.S. Public
6 Health Service, as a result of patient questions I evaluated medical research articles
7 by other researchers on power-frequency electric and magnetic fields and radio
8 frequency fields, which address many diseases and conditions and involve many
9 areas in which I have provided or supervised medical care for patients, taught, or
10 done medical research. I have continued to systematically analyze and medically
11 evaluate that research for more than 30 years.

12 **Q. Have you received any professional recognition for you work in medicine?**

13 A. Yes. I was elected a Fellow of the American Association for the Advancement of
14 Science, a member of the Association of American Physicians, a member of the
15 American Society for Clinical Investigation, and a member of the Board of
16 Directors of the Foundation for Advanced Education in the Sciences. Some other
17 examples of professional recognition for my work in medicine include the
18 following appointments and awards: National Cancer Institute Board of Scientific
19 Counselors; Advisory Boards of the Yale Cancer Center and others; Member of the
20 Scientific Advisory Board of the National Brain Tumor Society; The Farber Award
21 of the American Association of Neurological Surgeons for excellence in cancer
22 research; Scientific Advisory Board of Damon Runyon-Walter Winchell

1 Foundation; Swedish Eurocan Platform Scientific Advisory Board; two U. S.
2 Public Health Service Commendation Medals; and the C. Everett Koop Courage
3 Award for the pursuit of evidence-based medicine.

4 **Q. What are your fields of expertise that are relevant to this proceeding?**

5 A. Medicine and medical research, including particularly radio frequency fields and
6 health.

7 **Q. Have you testified as an expert in those fields in prior Pennsylvania Public
8 Utility Commission (“Commission”) proceedings?**

9 A. Yes, I have testified as a medical expert in proceedings before the Commission
10 involving smart meters since 2016.

11 **Q. Are you sponsoring any exhibits in support of this testimony?**

12 A. Yes. I am sponsoring Metropolitan Edison Company (“Met-Ed”) Exhibits No. MI-
13 1, MI-2, MI-3, and MI-4.

14

15 **MEDICAL EVALUATION**

16 **Q. Did you examine Ms. Hendin’s Complaint, Responses to Interrogatories and
17 Requests for Production of Documents, Amended Witness Statement, and the
18 Testimony of William G. Kracht, D. O. on behalf of the Complainant Judith
19 Hendin, and the documents attached to those items?**

1 A. Yes.

2 **Q. Did you conduct a medical examination of Ms. Hendin's health claims related**
3 **to smart meters?**

4 A. Yes.

5 **Q. How did you conduct your medical evaluation?**

6 A. I used the same 5-step methodology I use in the usual course of my medical work.

7 First, I conduct searches of medical and scientific databases to identify all studies
8 published in peer-reviewed scientific journals of the exposure and the reported
9 medical conditions and symptoms.

10 Second, I analyze and evaluate each of the new studies I identify from my searches,
11 whether they report an effect or report no effect. If all of the important elements of
12 a study I have previously analyzed and evaluated do not come to mind, I re-analyze
13 and re-evaluate the study. In evaluating the studies, I take into account what each
14 type of study can and cannot show, the quality of study design and protocol,
15 performance of study in accordance with the protocol, the size of study population,
16 the completeness of the data reporting, the use of standard statistical methods for
17 data analysis, and any other factors that may affect the reliability of the study data.

18 Third, I make an initial determination of what the studies as a whole show for each
19 particular reported medical condition and symptom. The results of a study are not
20 considered scientifically reliable until other researchers have independently

1 confirmed those results with good quality additional studies. There are often
2 contradictory results from different studies and those are taken into account by
3 looking at the overall consistency of the results of the studies to determine what the
4 studies as a whole show.

5 Fourth, I consider independent evaluations of the studies published by public health
6 agencies.

7 Fifth, I make a final medical evaluation of what the studies as a whole show for
8 each particular reported medical condition and symptom.

9 **Q. Are you aware of the radio frequency field levels from the smart meters used**
10 **by Met-Ed?**

11 A. Yes, based on the testimony and exhibits presented by Dr. Davis in this proceeding.

12 **Q. What do the scientific studies show about the capability of radio frequency**
13 **fields to cause adverse health effects?**

14 A. There have been many studies of radio frequency fields and a wide variety of health
15 endpoints done over more than 50 years. Three large groups of controlled
16 laboratory studies of radio frequency fields provide a reliable basis for determining
17 whether radio frequency fields have the capability to cause or contribute to adverse
18 health effects in animals. Those groups of studies are particularly informative
19 because they address fundamental biological functions that are very sensitive to any
20 disruption: genetics, reproduction, and growth and development. Good examples

1 of well-designed and well-conducted studies in these groups that are illustrative are
2 Ogawa 2009, Sommer 2009, and Takahashi 2010.¹

3 In the Ogawa 2009 study, pregnant rats were exposed to radio frequency fields
4 during gestation. No adverse effects of radio frequency field exposure were
5 observed on any reproductive or embryo-toxic parameters or on abnormalities of
6 live fetuses, indicating a lack of detectable genetic damage to the embryos.

7 In the Sommer 2009 study, male and female mice were exposed to radio frequency
8 fields 24 hours a day for their lifetime. Their development and fertility were tracked
9 over four generations by examining histological, physiological, reproductive, and
10 behavioral functions. The result of this 24 hour a day, lifetime exposure over four
11 generations was that the radio frequency fields had no harmful effects on the
12 fertility or development of the animals.

13 In the Takahashi 2010 study, laboratory rats and their offspring were exposed to
14 radio frequency fields for 20 hours a day during gestation and lactation. The study
15 examined the effects of radio frequency fields on growth, gestational condition and
16 organ weights for dams and survival rates, development, physical and functional
17 development, hormonal status, memory function, and reproductive ability of the
18 first-generation offspring along with embryo-toxicity and teratogenicity in the
19 second-generation offspring. The study found that the exposures to radio frequency
20 fields had no effects on growth or development. In sum, these studies of

¹ Ogawa, *Bioelectromagnetics* 30:205-212 (2009); Sommer, *Radiation Research*, 171(1): 89-95 (2009); Takahashi, *Radiation Research*, 173(3): 362-372 (2010).

1 fundamental biological functions that are very sensitive to any disruption do not
2 show that radio frequency fields have the capability to cause or contribute to
3 adverse health effects in animals.

4 Based on the body of scientific research showing no consistent and reproducible
5 effects from radio frequency fields on cancer or other adverse health effects, the
6 World Health Organization (WHO) has concluded that “no adverse health effects
7 have been established as being caused by mobile phone use.” (Based on the
8 information in Dr. Davis’ testimony in this case, the radio frequency field exposures
9 from the meters being used by Metropolitan Edison are far lower than the radio
10 frequency field exposures from cell phones.)

11 A number of public health authorities have examined the studies of radio frequency
12 fields and health and have reached conclusions similar to those of the WHO. These
13 include, for example, Nordic Radiation Authorities (Denmark, Finland, Iceland,
14 Norway, Sweden) 2009; IARC (2011); U.K. Health Protection Agency 2012;
15 Norwegian Institute of Public Health 2012; Public Health England 2013; Royal
16 Society of Canada 2014; New Zealand Ministry of Health 2015; European
17 Commission Scientific Committee on Emerging and Newly Identified Health Risks
18 2015; Swedish Radiation Safety Authority – Scientific Council on Electromagnetic
19 Fields 2016; and Health Council of the Netherlands 2016. Metropolitan Edison
20 Exhibit No. MI-1 provides additional information on the conclusions reached by
21 these and other public health entities about radio frequency fields and health.

1 Several state public health authorities also have concluded that radio frequency
2 fields from smart meters do not pose any health hazard. Maine Center for Disease
3 Control 2010; Vermont Department of Health 2012; Arizona Department of Health
4 2014; and North Carolina Department of Health and Human Services 2015.
5 Metropolitan Edison Exhibit No. MI-2 provides additional information on the
6 conclusions reached by these public health entities and public utility commissions
7 about smart meters and health.

8 It is my expert medical opinion that there is no reliable medical basis to conclude
9 that radio frequency fields from Met-Ed's smart meters cause or contribute to the
10 development of any diseases or illnesses.

11 **Q. In reference to the testimony of Ms. Hendin and her osteopath Dr. Kracht that**
12 **[BEGIN HIGHLY CONFIDENTIAL]** [REDACTED]
13 [REDACTED] **[END HIGHLY**
14 **CONFIDENTIAL]**

15 A. Yes, electromagnetic hypersensitivity is sometimes used to characterize a wide-
16 range of symptoms some people claim are caused by radio frequency fields. The
17 symptoms reported include headaches, dizziness, body aches, -concentration
18 problems, buzzing in ears, eye floaters, discomfort, difficulty concentrating,
19 difficulty breathing, memory loss, insomnia, nausea, stomach distress, palpitations,
20 nervousness, fatigue, weakness, and lethargy, among others. A WHO working
21 group has recommended that these types of symptoms be described as "Idiopathic
22 Environmental Intolerance" ("idiopathic" means "cause unknown"). This is

1 because, as pointed out by Rubin in 2010², the theory of electromagnetic
2 hypersensitivity “is controversial” and “most mainstream medical bodies maintain
3 that there is not sufficient evidence to support this theory and that the symptoms
4 experienced by sufferers are unrelated to the presence of electromagnetic fields.”
5 That is the case today. I use the term “Idiopathic Environmental Intolerance” (IEI)
6 because I believe it is a more medically neutral term to use in a medical evaluation.

7 **Q. What do the studies show about whether IEI is caused by exposure to radio**
8 **frequency fields?**

9 A. Reliable studies dating back to at least 2002 and also recent reviews of the studies
10 by experts and reviews by expert panels of public health authorities have found IEI
11 and the variety of symptoms attributed to it are not caused by exposure to radio
12 frequency fields. Studies to determine whether reporting of symptoms is related to
13 exposure are called “provocation studies.” A good example is a study by Hietanen
14 (2002)³ which examined whether people claiming to be hypersensitive to radio
15 frequency fields could actually sense the presence of fields. The study used a
16 double-blind design in which neither the subjects nor the researchers knew when
17 there was or was not an actual radio frequency field exposure. The study found that
18 the subjects reported more symptoms during non-exposure than during actual radio
19 frequency field exposure, and that none of the test subjects could distinguish actual
20 radio frequency field exposure from non-exposure. The study concluded that
21 subjective adverse symptoms or sensations perceived by the test subjects were not

² Rubin, *Bioelectromagnetics* 31(1): 1-11 (2010).

³ Hietanen, *Bioelectromagnetics* 23(4): 264-270 (2002).

1 the result of radio frequency field exposure. A later study by Rubin (2010)⁴
2 undertook a systematic review of 46 provocation studies involving 1,175
3 individuals who reported IEI. The study found that the results of this body of
4 research show that people claiming IEI symptoms from radio frequency fields could
5 not replicate the claimed effect under controlled laboratory conditions. Rubin
6 concluded that “despite the conviction of IEI-EMF sufferers that their symptoms
7 are triggered by exposure to electromagnetic fields, repeated experiments have been
8 unable to replicate this phenomenon under controlled conditions.” Another study,
9 Eltiti (2015)⁵, was designed to determine if radio frequency fields affected the well-
10 being of individuals who claimed to have electromagnetic hypersensitivity,
11 compared to those who did not. The researchers found that people who claimed
12 electromagnetic hypersensitivity reported lower levels of well-being when they
13 knew they were being exposed to radio frequency fields, but when they did not
14 know if they were being exposed, their reports of symptoms were not associated
15 with RF fields. The researchers concluded that this result “indicates that it is IEI-
16 EMF individuals’ belief that exposure to RF EMFs will cause harm, rather than
17 actual exposure itself, that results in the presence of symptoms in IEI-EMF
18 individuals.” Other recent studies (Eltiti 2018, Verrender 2018)⁶ have found that
19 individuals who believed they were being exposed to radio frequency fields
20 reported increased subjective health symptoms regardless of whether they were
21 actually exposed to radio frequency fields. This relationship between the belief of

⁴ Rubin, *Bioelectromagnetics* 31(1): 1-11 (2010).

⁵ Eltiti, *Bioelectromagnetics* 36(2): 96-107 (2015).

⁶ Eltiti, *Front Psychol* 9: 1563 (2018); Verrender, *Bioelectromagnetics* 39(2): 132-143 (2018).

1 exposure and the reporting of symptoms has been described as a “nocebo effect”.
2 As the Eltiti (2018) study concluded, “a nocebo effect provides a reasonable
3 explanation for the presence of symptoms in IEI-EMF and control participants.”

4 **Q. Is it generally accepted in the medical community that IEI and the variety of**
5 **symptoms attributed to IEI are caused by exposure to radio frequency fields?**

6 A. No, it is not, based on findings by such public health entities and expert panels as
7 the United Kingdom Health Protection Agency (2012), the Royal Society of
8 Canada (2013), the New Zealand Ministry of Health (2015), and the European
9 Commission’s Scientific Committee on Emerging and Newly Identified Health
10 Risks (2015). For example, the New Zealand Ministry of Health (2015) concluded
11 that “Recent reviews of these studies continue to conclude that people who consider
12 themselves unusually sensitive to EMFs are, in fact, unable to detect EMFs, and the
13 occurrence of symptoms appears unrelated to exposures....” Similarly, the
14 European Commission’s Scientific Committee on Emerging and Newly Identified
15 Health Risks (2015) found that “The symptoms that are attributed by people to RF
16 EMF exposure can sometimes cause serious impairments to a person’s wellbeing.
17 However, research conducted since the previous Opinion adds weight to the
18 conclusion that RF EMF exposure is not the cause of these symptoms. This applies
19 to the general public, children and adolescents, and to people with IEI-EMF. Recent
20 meta-analyses of observational and provocation data support this conclusion.” The
21 WHO has concluded that “There is little scientific evidence to support the idea of
22 electromagnetic hypersensitivity.” The findings of these reports from public health

1 entities and expert panels show that the theory of IEI caused by exposure to radio
2 frequency fields has not been generally accepted in the medical community. Met-
3 Ed Exhibit MI-3 provides additional information about the conclusions on IEI by
4 these and other public health agencies.

5 **Q. Are you familiar with the American Academy of Environmental Medicine's**
6 **(AAEM) position paper that Ms. Hendin and Dr. Kracht rely on?**

7 A. Yes, I am familiar with it. It only cites studies that support its position and ignores
8 the great many other studies do not. That reveals a lack of balanced consideration
9 of the relevant scientific studies. In addition, AAEM's position is contradicted by
10 the independent findings of the respected public health agencies cited above, who
11 did not limit their examinations to studies that support one position or another.
12 Therefore, in my view the AAEM position is not reliable for objective medical
13 evaluation.

14 **Q. Are you familiar with the European Academy of Environmental Medicine's**
15 **(EAEM) 2016 position that Ms. Hendin cited in her testimony?**

16 A. Yes, I am familiar with it. It also relies on studies that support its position and
17 ignores the many other studies do not and thereby reveals a lack of balanced
18 consideration of the relevant scientific studies. In addition, EAEM's position is also
19 contradicted by the independent findings of the respected public health agencies
20 cited above, who did not limit their examinations to studies that support one
21 position or another. Therefore, in my view the EAEM position is also not credible
22 and thus cannot be relied on for objective medical evaluation.

1 Q. Did you consider [BEGIN HIGHLY CONFIDENTIAL] [REDACTED]
2 [REDACTED]
3 [REDACTED] [END HIGHLY CONFIDENTIAL]

4 A. Yes. No medical records were provided about those self-reported conditions.
5 [BEGIN HIGHLY CONFIDENTIAL] [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED] [END
11 HIGHLY CONFIDENTIAL]

12 There are no studies that report radio frequency fields from smart meters cause,
13 contribute to, or exacerbate mitral valve disorder or heart murmurs in people. There
14 have been a number of studies that have examined whether radio frequency fields
15 at the frequencies used by cell phones affect heart rates (e.g., Tahvanainen 2004;
16 Nam 2006; Nam 2009; Choi 2014⁷). In the Tahvanainen (2004) study, 32 human
17 volunteers were exposed to radio frequency fields and their heart rates were
18 compared to their rates when they were not exposed to radio frequency fields. The
19 study found no significant changes in heart rates whether the subjects received radio
20 frequency field or sham exposures. In another more recent study, the heart rates of
21 the volunteer subjects were compared after exposure to radio frequency fields and

⁷ Tahvanainen, *Bioelectromagnetics* 25:73-83 (2004); Nam, *Bioelectromagnetics*. 27:509–51 (2006); Nam, *Bioelectromagnetics* 30:641 650 (2009); Choi *BMC Public Health*, 14:438 (2014).

1 after sham exposures (Choi 2014). The researchers found no significant effects on
2 heart rates from the radio frequency field exposures. There are no studies
3 addressing the effect of radio frequency fields from smart meters on heart rate.

4 **[BEGIN HIGHLY CONFIDENTIAL]** [REDACTED]

5 [REDACTED] **[END**

6 **HIGHLY CONFIDENTIAL]** As a physician, I am sympathetic to her expression
7 of concern. I hope it will assuage her concern to know that there is no reliable
8 scientific basis to conclude that exposure to radio frequency fields from smart
9 meters cause, contribute to, or exacerbate mitral valve disorder, heart murmurs, or
10 cardiac arrhythmia.

11 **Q. Ms. Hendin cited IARC and WHO at the end of her testimony. What did they**
12 **conclude about radio frequency fields from mobile phones and radio**
13 **frequency fields from smart meters?**

14 A. IARC (an abbreviation for International Agency for Research on Cancer), is an
15 agency of the WHO (an abbreviation for the World Health Organization). In 2011,
16 IARC convened a group of scientists to examine whether radio frequency fields
17 cause cancer. The evaluation of this group found that radio frequency fields from
18 mobile phones were “possibly carcinogenic” based on what it described as “limited
19 evidence,” but did not find that radio frequency fields from mobile phones were
20 either “carcinogenic” or even “probably carcinogenic” under the IARC
21 classification system. The 2011 IARC review did not classify radio frequency
22 fields from smart meters as being carcinogenic, probably carcinogenic, or even

1 possibly carcinogenic. Instead, IARC concluded that for environmental exposures
2 to radio frequency fields, including those from smart meters, the research was
3 “inadequate” to reach conclusions about cancer causation.⁸ Later in 2011, the
4 WHO acknowledged the IARC finding and issued a statement emphasizing that the
5 scientific research has not established the existence of any adverse effects caused
6 by radio frequency fields used for wireless communications. Thus, the WHO
7 concluded that, “A large number of studies have been performed over the last two
8 decades to assess whether mobile phones pose a potential health risk. To date, no
9 adverse health effects have been established as being caused by mobile phone use.”⁹
10 Neither IARC nor WHO considered radio frequency fields from smart meters to be
11 carcinogenic, probably carcinogenic, or even possibly carcinogenic.

12 **Q. Ms. Hendin cites the BioInitiative Report (2012) with subsequent updates near**
13 **the end of her testimony. Is the BioInitiative Report a scientific study**
14 **published in a peer reviewed scientific journal?**

15 A. No.

16 **Q. Are you aware of any evaluations of the BioInitiative Report?**

17 A. Yes. The lack of scientific objectivity of the BioInitiative Report has been
18 criticized by a number of public health agencies and expert groups, such as the
19 Health Council of the Netherlands (HCN). HCN concluded:

⁸ IARC Press Release No. 208, 31 May 2011; International Agency for Research on Cancer, Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, Vol. 102, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans (2013).

⁹ World Health Organization 2014 Electromagnetic fields and public health: mobile phones – Fact Sheet No. 193.

1 In view of the way the BioInitiative report was compiled, the selective use of
2 scientific data and the other shortcomings mentioned above, the Committee
3 concludes that **the BioInitiative report is not an objective and balanced**
4 **reflection of the current state of scientific knowledge.** Therefore, the
5 BioInitiative report does not provide any grounds for revising the current views
6 as to the risks of exposure to electromagnetic fields.” (emphasis added)

7 The co-editor of the BioInitiative Report (Dr. Carpenter) has admitted that the
8 document is not a consensus scientific review by an expert panel, and that the
9 authors of the various chapters in the document were selected based on their known
10 beliefs about electromagnetic fields and radio frequency fields.

11 Additional criticisms from the HCN and other expert groups are provided in Met-
12 Ed Exhibit MI-4.

13 Based on my review of the BioInitiative Report, the significant inconsistency of its
14 findings with those from independent evaluations of the studies by public health
15 agencies (as described in my testimony above) and my own evaluation of the
16 scientific research, I agree that the BioInitiative Report of 2012 with its subsequent
17 updates is not an objective and balanced reflection of the current state of scientific
18 knowledge. Accordingly, it does not provide a reliable scientific basis for a medical
19 evaluation of radio frequency fields and health.

20 **Q. Have you formed an expert opinion about whether the radio frequency fields**
21 **from Met-Ed’s smart meter at the Complainant’s house will cause, contribute**
22 **to, or exacerbate any medical conditions?**

1 A. Yes.

2 **Q. What is that opinion?**

3 A. Based on my medical education, training, and experience, and my evaluation of the
4 scientific studies, it is my expert opinion there is no reliable medical basis to
5 conclude that radio frequency fields from Met-Ed's smart meters at the
6 Complainant's house will cause, contribute to, or exacerbate, any medical condition
7 of Ms. Hendin.

8 **Q. Do you hold each of the expert opinions you have given in this testimony to a**
9 **reasonable degree of medical certainty?**

10 A. Yes, I do.

11 **Q. Does this conclude your testimony at this time?**

12 A. Yes, but I may supplement my testimony if warranted and given the opportunity.

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

Judith D. Hendin	:	
	:	
v.	:	C-2018-3003324
	:	
Metropolitan Edison Company	:	

VERIFICATION

I, Mark A. Israel, MD, hereby state that the facts above set forth in the Rebuttal Testimony on behalf of Metropolitan Edison Company are true and correct to the best of my knowledge, information and belief, and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities).

Date: 10/21/19



Mark A. Israel

Exhibit MI - 1

Public Health Authorities Reports on Radio Frequency Fields and Claimed Health Effects

World Health Organization 2016

About electromagnetic fields, Summary of health effects

“Despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health.” [p. 2]

“To date, no adverse health effects from low level, long-term exposure to radiofrequency or power frequency fields have been confirmed” [p. 2]

New Zealand Ministry of Health 2015

Interagency Committee on the Health Effects of Non-ionising Fields: Report to Ministers

“While a great deal of research has been carried out to investigate the potential effects of exposures to RF fields on health, particularly exposures associated with cellphone use, there are still no clear indications of health effects caused by exposures that comply with the limits in the New Zealand RF field exposure standard.” [p. 18]

European Commission Scientific Committee SCENIHR 2015

SCENIHR Opinion on Potential health effects of exposure to electromagnetic fields

“Overall, the epidemiological studies on mobile phone RF EMF exposure do not show an increased risk of brain tumours. Furthermore, they do not indicate an increased risk for other cancers of the head and neck region. ... Epidemiological studies do not indicate increased risk for other malignant diseases, including childhood cancer.” [p. 5]

World Health Organization 2014

Electromagnetic fields and public health: mobile phones – Fact Sheet No. 193.

“A large number of studies have been performed over the last two decades to assess whether mobile phones pose a potential health risk. To date, no adverse health effects have been established as being caused by mobile phone use.”

Royal Society of Canada 2014

Expert Panel: A Review of Safety Code 6 (2013): Health Canada’s Safety Limits for Exposure to Radiofrequency Fields

“[T]he Panel has concluded that the balance of evidence at this time does not indicate negative health effects from exposure to RF energy below the limits recommended in the Safety Code.” [p. 10]

Exhibit MI - 1

Public Health Authorities Reports on Radio Frequency Fields and Claimed Health Effects

Public Health England 2013

Guidance: Wi-fi radio waves and health

“There is no consistent evidence to date that exposure to radio signals from wi-fi and WLANs adversely affects the health of the general population.” [p. 1]

Norwegian Institute of Public Health 2012

Low-level radiofrequency electromagnetic fields – an assessment of health risks and evaluation of regulatory practice

“A large number of studies have examined the possible effects of exposure to weak RF fields (i.e., exposure within the ICNIRP’s reference values). The studies have been performed on cells and tissues, and in animals and humans. The effects that have been studied apply to changes in organ systems, functions and other effects. There are also a large number of population studies with an emphasis on studies of cancer risk. The large total number of studies provides no evidence that exposure to weak RF fields causes adverse health effects.” [p. 38]

United Kingdom Health Protection Agency 2012

Report of Independent Advisory Group on Non-Ionising Radiation

“In summary, although a substantial amount of research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes health effects in adults or children.” [p. 4]

Nordic Radiation Authorities (Danish National Board of Health, Finland Radiation and Nuclear Safety Authority, Icelandic Radiation Safety Authority, Norwegian Radiation Protection Authority, Swedish Radiation Safety Authority) 2009

EXPOSURE OF THE GENERAL PUBLIC TO RADIOFREQUENCY ELECTROMAGNETIC FIELDS - A joint statement from the Nordic Radiation Safety Authorities

“The Nordic authorities agree that there is no scientific evidence for adverse health effects caused by radiofrequency field strengths in the normal living environment at present. This conclusion concurs with the opinion of international scientific and advisory bodies listed as references below [ICNIRP, 1998 and 2009; WHO, 2005 and 2006; SCENIHR 2009; SSI’s Independent Expert Group on Electromagnetic Fields, 2007]. The Nordic authorities therefore at present see no need for a common recommendation for further actions to reduce these radiofrequency fields.” [p. 4]

Exhibit MI - 2

State Health Agency & Public Utility Commission Reviews of Smart Meters and Health

State Health Agency Reviews:

North Carolina Department of Health and Human Services, Division of Public Health, Occupational and Environmental Epidemiology Branch 2015

Health Impacts of Advanced Metering Systems (Smart Meters)

“Non-thermal health concerns evaluated included cancer, reproductive effects, cellular effects, neurological behavioral effects, and electromagnetic sensitivity. There is insufficient evidence to link RF exposures to adverse health outcomes. This is consistent with conclusions of other organizations including the National Cancer Institute, the Centers for Disease Control and Prevention, and the World Health Organization. It is also consistent with smart meter reviews performed by other states.” *[Executive Summary]*

Arizona Department of Health, Office of Environmental Health 2014

Public Health Evaluation of Radio Frequency Exposure from Electronic Meters

“Exposure to electric meters (AMI and AMR) is not likely to harm the health of the public. This conclusion was reached because (1) none of the detected power densities exceeded the FCC standard of 6/Wm². This standard was determined based on thermal effects, and was set to prevent whole-body heat stress and excessive localized tissue heating; (2) available government assessments and scientific literature indicated that there is no consistent or convincing evidences to support a cause-and-effect relationship related to the exposures to RF frequency (900-930 MHz) used by the smart meters;” *[p. 26]*

Vermont Department of Health 2012

Radio Frequency Radiation and Health: Smart Meters

“After extensive review of the scientific literature available to date and current FCC regulatory health protection standards, we agree with the opinion of experts:

- The thermal health effects of RFR are well understood, and are the current basis for regulatory exposure limits. These limits are sufficient to prevent thermal health effects.
- Non-thermal health effects have been widely studied, but are still theoretical and have not been recognized by experts as a basis for changing regulatory exposure limits.

The Vermont Department of Health has concluded that the current regulatory standards for RFR from smart meters are sufficient to protect public health.” *[p. 1]*

Exhibit MI - 2

State Health Agency & Public Utility Commission Reviews of Smart Meters and Health

Maine Center for Disease Control 2010

Maine CDC Executive Summary of Review of Health Issues Related to Smart Meters

“In conclusion, our review of these agency assessments and studies do not indicate any consistent or convincing evidence to support a concern for health effects related to the use of radiofrequency in the range of frequencies and power used by smart meters. They also do not indicate an association of EMF exposure and symptoms that have been described as electromagnetic sensitivity.” [p. 4]

Public Utility Commission Reviews:

Massachusetts Department of Public Utilities 2014

Investigation by the Department of Public Utilities on its own Motion into Modernization of the Electric Grid

“The Department takes seriously the testimony and comments that express concern about potential health effects resulting from exposure to RF emitted by certain electric meters. However, after thorough review and consideration of the issue, the Department is unaware of any credible, peer-reviewed scientific studies that demonstrate a direct human health risk from exposure to the low-level RF signals from advanced meters.” [p. 37-38]

“We find that many studies referenced by commenters asserting health impacts from advanced meters do not meet this standard and, therefore, cannot be considered credible. For example, many commenters cite the 2007 BioInitiative Report and its update, the 2012 BioInitiative Report. Neither of these reports has been objectively peer reviewed, as noted by international health agencies criticizing them for not being an objective reflection of the current state of scientific knowledge.” [p. 39-40]

“In assessing arguments and cited studies, we also consider their consistency with the weight of scientific evidence and determinations made by other jurisdictions. Other jurisdictions that have considered potential health impacts of RF, including regulatory bodies and public health organizations, do not find that RF exposure from advanced meters, operating under established U.S. and international exposure limit guidelines, leads to adverse health effects.” [p. 42]

“Some commenters assert that advanced meters pose a particular health threat to individuals with electromagnetic hypersensitivity. We recognize that certain individuals report a heightened sensitivity to RF emissions and attribute illness or other physical symptoms to RF exposure. While we appreciate that their symptoms are serious, based on all of the testimony and the materials we have reviewed we are unable to conclude that RF exposure and, specifically, RF from electric meters, is the cause of those symptoms.” [p. 46]

Exhibit MI - 2

State Health Agency & Public Utility Commission Reviews of Smart Meters and Health

Maine Public Utility Commission 2014

Order, Docket No. 2011-00262, Docket No. 2012-00412

“[W]e find that Advanced Metering Infrastructure (AMI), including the use of "smart meters," as implemented and operated by Central Maine Power Company (CMP or the Company), does not present a credible threat to the health and safety of CMP's customers and, based on the record of this proceeding is, therefore, safe.” [p. 1]

District of Columbia Public Service Commission 2013

Report of an Investigation into Smart Meters

“[T]he Commission has found no credible, scientific evidence to show that the level of RF emissions from the Pepco smart meters is a threat to human health.” [p. 4]

Michigan Public Service Commission 2012

U-17000 Report to the Commission

“After careful review of the available literature and studies, the Staff believes that the health risk from the installation and operation of metering systems using radio transmitters is insignificant. In addition, the appropriate federal health and safety regulations provide assurance that smart meters represent a safe technology.” [p. 12]

Texas Public Utility Commission 2012

Report on Health and Radiofrequency Electromagnetic Fields from Advanced Meters

“Decades of scientific research have not provided any proven or unambiguous biological effects from exposure to low-level radio frequency signals. Further, Staff reviewed all available material and found no credible evidence to suggest that smart meters emit harmful amounts of Electromagnetic Field (EMF) radiation.” [p. 1]

“It is important to note that one must use caution when relying solely on the results of individual research studies because conflicts or inconsistencies may exist among the results of other individual studies. Laymen often may not recognize poorly executed studies, or they can misinterpret the results of properly conducted scientific research. Either circumstance may lead a casual observer to draw errant conclusions. Furthermore, it is impossible to scientifically prove absolute safety (the null hypothesis).” [p. 1]

Exhibit MI - 2

State Health Agency & Public Utility Commission Reviews of Smart Meters and Health

“The ‘BioInitiative Report’ is an example of a report that received notoriety despite being viewed negatively by the research community. Its contributors are described as a group of 14 scientists, researchers, and public health policy professionals. The stated purpose of the report was to document “bioeffects, adverse health effects and public health conclusions about impacts of non-ionizing radiation.” The document was edited by Cindy Sage, an environmental consultant, and Dr. David O. Carpenter, director of the Institute for Health and the Environment at the State University at Albany (New York).

The report is often cited by opponents of wireless technology, but it was widely criticized by government research agencies and subject matter experts in Australia, Belgium, the European Commission (EC), France, Germany, and the Netherlands. It was also criticized by EPRI and the IEEE. The overall opinion of these institutions was that the report had many shortcomings. Some of the stated criticisms were that the report:

- Provided views that were not consistent with the consensus of science;
- Recommended safety limits that were not supported by the weight of scientific evidence;
- Included selection bias in several research areas;
- Lacked objectivity and balance; and
- Suffered from uneven editing quality.

Some researchers have developed a level of notoriety for their assertions regarding the purported dangers of EMF exposure. Opponents of wireless technology have naturally called upon these people to testify as expert witnesses and this tends to raise their profiles to an even greater degree. These efforts have not always been successful. For example, Carpenter attempted to rely on his work on the BioInitiative Report as one of the qualifications to testify as an expert for intervenors opposed to plans by Hydro Québec, a utility in Canada, to install wireless smart meters on homes and businesses. The regulatory authority for the province, The Québec Energy Board (The Board), stated (translated from French):

‘The Board has refused to grant the requested expert status on the grounds that David Carpenter is not a doctor, never had clinical experience with patients and has never personally done any research on the effects of RF health.⁵⁵ The Board does not, however, reject his testimony in the case because of his knowledge on the research done by others in this field. It therefore accepted this testimony, subject to establishing the probative value to be accorded.’

The Board also did not view Carpenter as independent and unbiased, as required by its rules governing the expectations of expert witnesses. The Board stated (translated from French):

Exhibit MI - 2

State Health Agency & Public Utility Commission Reviews of Smart Meters and Health

‘Clearly, the witness Carpenter, expert or not, does not meet the criteria of objectivity which the Board is entitled to expect.’” *[pp. 17-18]*

Exhibit MI - 3

Public Health Reviews RF Fields and Claimed Electromagnetic Hypersensitivity

World Health Organization 2016

About electromagnetic fields, Summary of health effects

“Some members of the public have attributed a diffuse collection of symptoms to low levels of exposure to electromagnetic fields at home. Reported symptoms include headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido. To date, scientific evidence does not support a link between these symptoms and exposure to electromagnetic fields. At least some of these health problems may be caused by noise or other factors in the environment, or by anxiety related to the presence of new technologies.” [p. 2]

“Some individuals report "hypersensitivity" to electric or magnetic fields. They ask whether aches and pains, headaches, depression, lethargy, sleeping disorders, and even convulsions and epileptic seizures could be associated with electromagnetic field exposure.

There is little scientific evidence to support the idea of electromagnetic hypersensitivity. Recent Scandinavian studies found that individuals do not show consistent reactions under properly controlled conditions of electromagnetic field exposure. Nor is there any accepted biological mechanism to explain hypersensitivity. Research on this subject is difficult because many other subjective responses may be involved, apart from direct effects of fields themselves.” [p. 2]

New Zealand Ministry of Health 2015

Interagency Committee on the Health Effects of Non-ionising Fields: Report to Ministers

“Recent reviews of these studies continue to conclude that people who consider themselves unusually sensitive to EMFs are, in fact, unable to detect EMFs, and the occurrence of symptoms appears unrelated to exposures.... There is experimental evidence suggesting a placebo effect (ie, someone believing that they are exposed, even when they are not) could provoke the symptoms.” [p. 14]

European Commission Scientific Committee SCENIHR 2015

SCENIHR Opinion on Potential health effects of exposure to electromagnetic fields

“Symptoms that are attributed by some people to various RF EMF exposure can sometimes cause serious impairments to a person’s quality of life. However, research conducted since the previous SCENIHR Opinion adds weight to the conclusion that RF EMF exposure is not causally linked to these symptoms. This applies to the general public, children and adolescents, and to people with idiopathic environmental intolerance attributed to

Exhibit MI - 3

Public Health Reviews RF Fields and Claimed Electromagnetic Hypersensitivity

electromagnetic fields (IEI-EMF). Recent meta-analyses of observational and provocation data support this conclusion.” [p. 6]

The Royal Society of Canada 2014

Expert Panel: A Review of Safety Code 6 (2013): Health Canada’s Safety Limits for Exposure to Radiofrequency Fields

“Idiopathic Environmental Intolerance Attributed to Electromagnetic Fields (IEI-EMF), or Electrical Hypersensitivity, also remains an issue of serious concern that deserves further investigation. However, there is no firm evidence for the hypotheses that people with IEI-EMF can perceive RF energy at levels below the limits in SC6 or that there is a causal link between exposure to RF energy and their symptoms.” [p. 18]

Norwegian Institute of Public Health 2012

Low-level radiofrequency electromagnetic fields – an assessment of health risks and evaluation of regulatory practice.

“The relatively extensive literature provides no evidence that exposure to electromagnetic fields is the real cause of the health problems that individuals attribute to electromagnetic fields, whether exposure occurs alone or in combination with other factors that may affect the induction of symptoms. There is also no evidence that individuals with health problems that they attribute to electromagnetic fields are able to detect such exposure.” [p. 37]

United Kingdom Health Protection Agency 2012

Report of Independent Advisory Group on Non-Ionising Radiation

“[W]hen taken together the experimental evidence suggests that short-term exposure to RF fields below guideline levels ... does not cause acute symptoms, either in the general public or in people who report being sensitive to electromagnetic fields.” [p. 243]

International Commission on Non-Ionizing Radiation 2009

Exposure to high frequency electromagnetic fields, biological effects and health consequences (100 kHz-300 GHz)

“A wide range of subjective symptoms including headaches and migraine, fatigue, and skin itches have been attributed to various RF sources both at home and at work. However, the evidence from double-blind provocation studies suggests that the reported symptoms are not causally related to EMF exposure.” [p. 272]

Exhibit MI - 4

Lack of Scientific Objectivity and Reliability In BioInitiative Report

Health Council of the Netherlands

Review of BioInitiative Report

“Upfront, therefore, the reason for writing the report was not to give an objective analysis of the current state of science, that would subsequently lead to recommendations. Instead, the aim was to present information to demonstrate why current standards are inadequate.” [p. 3]

“Notably, not all authors are scientists. The methods used to collect literature are not defined. In many cases a selection of the available scientific material has been made, but the selection criterion is not stated.” [p. 2]

“The suggestion that some of the observed biological effects may lead to reduced wellbeing, disease, or even death lacks scientific basis.” [p. 3]

“In view of the way the BioInitiative report was compiled, the selective use of scientific data and the other shortcomings mentioned above, the Committee concludes that the BioInitiative report is not an objective and balanced reflection of the current state of scientific knowledge. Therefore, the report does not provide any grounds for revising the current views as to the risks of exposure to electromagnetic fields.” [p. 4]

Australian Centre for Radiofrequency Bioeffects Research (ACRBR)

ACRBR Position Statement on BioInitiative Report

“The model that most scientific expert bodies in this area (e.g. World Health Organisation (WHO)) employ is to engage independent experts to provide a review and recommendations on an issue. Independent experts are engaged because it is meant to provide an objective evaluation of the issue. This contrasts strongly with the BioInitiative Report, which is the result of the opinions of a self-selected group of individuals who each have a strong belief that does not accord with that of current scientific consensus.” [p. 2]

“Overall we think that the BioInitiative Report does not progress science, and would agree with the Health Council of the Netherlands that the BioInitiative Report is ‘not an objective and balanced reflection of the current state of scientific knowledge’ (page 4). As it stands it merely provides a set of views that are not consistent with the consensus of science, and it does not provide an analysis that is rigorous-enough to raise doubts about the scientific consensus.” [p. 3]

European Commission EMF-NET

Comments on the BioInitiative Working Group Report (BioInitiative Report)

“There is a lack of balance in the report; no mention is made in fact of reports that do not concur with authors’ statements and conclusions. The results and conclusions are very

Exhibit MI - 4

Lack of Scientific Objectivity and Reliability In BioInitiative Report

different from those of recent national and international reviews on this topic... If this report were to be believed, EMF would be the cause of a variety of diseases and subjective effects, including: Sleeplessness, headache, fatigue, skin disorders and changes in skin sensitivity, loss of appetite, tinnitus, impairment of memory and concentration, Alzheimer's and Parkinson's disease, cardiac problems, changes in brain and nervous systems activity, stress reactions, inflammatory and allergic reactions, genotoxic effects, changes in immune system function, and many types of cancers. None of these health effects has been classified as established in any national or international reviews that assessed biological and health effects from exposures below internationally accepted EMF limits when the whole database of scientific literature is reviewed according to well-accepted international risk assessment methods and criteria (see Annex 1 and 2)." [p. 1]

"Table 1.1 (pp. 34-49) gives the overall conclusions of the BioInitiative Report. None of these conclusions is supported by the major national or international reviews as listed in Annexes 1 and 2, that have made use of the internationally accepted weight-of-evidence approach to study results." [p. 1]

IEEE Committee on Man and Radiation (COMAR)

COMAR TECHNICAL INFORMATION STATEMENT: EXPERT REVIEWS ON POTENTIAL HEALTH EFFECTS OF RADIOFREQUENCY ELECTROMAGNETIC FIELDS AND COMMENTS ON THE BIOINITIATIVE REPORT

"[T]he weight of scientific evidence in the RF bioeffects literature does not support the safety limits recommended by the BioInitiative group. For this reason, COMAR recommends that public health officials continue to base their policies on RF safety limits recommended by established and sanctioned international organizations such as the Institute of Electrical and Electronics Engineers International Committee on Electromagnetic Safety and the International Commission on Non-Ionizing Radiation Protection, which is formally related to the World Health Organization." [p. 348]

"The BIR was written by 14 individuals under the direction of a 4-person organizing committee. Most of its 21 sections are authored by single individuals or (in a few cases) pairs or trios of authors; the section "Key Scientific Evidence and Public Health Policy Recommendations" was written by a pair of individuals and appears to reflect their views only. There is no indication of how the members of the committee were chosen or how balance was provided in the group of contributors, a majority of whom have public records of criticism of existing exposure standards and guidelines." [p. 350-51]

"A major weakness of the BIR is a selective, rather than a comprehensive, review of the literature in various topical areas." [p. 351]