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10-22-16

Kentucky Board of Public Utilities
Attn Consumer Complaints
211 Sower Blvd
Frankfort KY 40601

CASE# 2016-00187

NOV 23 2016

Public Service
Commission

Nancy A Stadlander
1306 Gobler Ford Rd
Lewisport KY 42351

My Fellow Humans (Commissioners of the Kentucky Public Service Commission)

First let me say that I am very grateful for your consideration in extending my deadline to give me the necessary time to compile my evidence. When the last deadline was approaching I realized that the results of my own studies would not be done in time. Thank you for the extension you gave me that allowed me to complete my studies.

I would like to take the time to explain all the physical impacts this Smart Grid System has had on me personally but feel that I would be wasting the Commissions time. It is apparent that there has been no consideration to what this system does to biological life including humans. I have spoken to many people suffering from the ill effects and have wept over those who have lost their 4 legged friends from the effects of this dangerous, irresponsible technology.

I have compiled a body of my own studies to show some of the reality of the situation. The biggest stumbling block for me was picking the presentations and studies of others out of the available data to present to you. There are literally thousands of scientific studies supporting the health ramifications and security risks of the Smart Grid system. How do you choose what to present from so much available data? How do the industry studies compare? Trusting the industry studies regarding this topic is much like trusting Monsanto to expose the dangers of GMO's or the pharmaceutical industry to offer you information about the additives in vaccines like Mercury.

After much exploring of these topics and studies I have compiled a body of evidence that when read with the intent of finding the truth is quite disturbing to anyone whose heart is really beating as a human. I find it very disheartening that "The Powers that soon WERE" have been able to manipulate humanity on a path to self-destruction. They need us. We don't need them. There is really only one law that needs to be followed: Do No Harm.

My compilation of evidence is as follows:

Exhibit one: My medical evaluation

Exhibit two: Naval Medical Research Institute on the biological phenomena and clinical manifestations
Attributed to Microwave and Radio-Frequency Radiation (declassified)

Exhibit three: Comprehensive list of Scientific Studies linking low-level Microwave Radiation and
Electromagnetic fields (EMF) with Health Impacts

Exhibit four: American Academy of Environmental Medicine Press Advisory dated 4-12-2012

Exhibit five: American Academy of Environmental Medicine letter to the Federal Communications
Commission dated 8-30-2013

What I hear-

Exhibit six: Noise Pollution study from Acoustic Engineer of infrasound Noise Pollution dated 7-25-2016

Exhibit seven: Noise Pollution study from Acoustic Engineer of infrasound Noise Pollution 10-17&18-16

Exhibit eight: Noise & Health-A Bimonthly Inter-disciplinary International Journal

- Exhibit nine: Power Quality Investigation using a Dranetz device. My Electric Failed for Supply Voltage Variations and Flicker
- Exhibit 10: Health Effects of light Flicker
- Exhibit 11: Smart Grid study by Victor Nixon
- Exhibit 12: Smart Grid expose by the National Institute for Science, Law & Public Policy
- Exhibit 13: Analysis: Smart Meter and Smart Grid Problems- Legislative Proposal December 2012 Sonoma County California
- Exhibit 14: Utube videos: Demonstration of the nerve disrupting frequencies emitted

It is essential to my physical and psychological health that my Smart Meter be replaced with a non-communicating analog meter. Kenergy installed the Smart Meter using deceit and has ignored by requests to remove it.

I appreciate your consideration and assistance in this matter

Nancy A Stadlander

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Naila M Goldenberg, MD

October 9, 2016

Nancy Stadlander
1306 Gobbler Ford Road
Lewisport KY 42351

To Whom It May Concern,


I saw Nancy Stadlander, 8/17/1953 on 9/15/2016 for evaluation of her fatigue and other symptoms in connection to electro-magnetic field(EMF) radiation. Her blood work is within normal limits for thyroid, adrenal function, her red and white blood cells, liver, kidney and blood glucose are all normal.

Her symptoms get better, when she is in the area that is free of smart meters and EMF; It is likely that she has sensitivity to EMF.

In my medical opinion, she needs to have her Smart Meter or such devices that emit EMF radiation off of her property.

In July, 2016, French governmental agency ANSES issued recommendations for limiting exposure to radiofrequencies. We hope, that the same will be done by US government at some point, sooner than later.

If you have any questions or concerns, please don't hesitate to call.

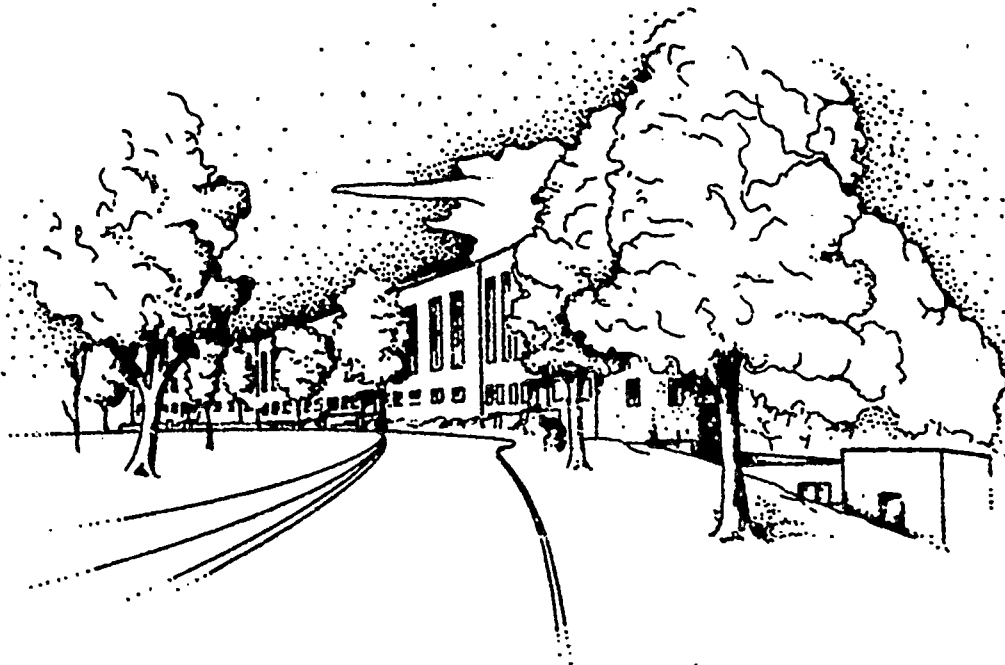
Sincerely,

Naila M Goldenberg, MD

Ohio Medical Licence 35-79737, ext 1/1/2017

AD 750271

NMRI

NAVAL MEDICAL RESEARCH INSTITUTE



**BIBLIOGRAPHY OF REPORTED BIOLOGICAL PHENOMENA ('EFFECTS') AND CLINICAL
MANIFESTATIONS ATTRIBUTED TO MICROWAVE AND RADIO-FREQUENCY RADIATION**

RESEARCH REPORT

MF12.524.015-0004B

**REPORT NO. 2
REVISED**

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**BIBLIOGRAPHY OF REPORTED BIOLOGICAL PHENOMENA ('EFFECTS') AND CLINICAL
MANIFESTATIONS ATTRIBUTED TO MICROWAVE AND RADIO-FREQUENCY RADIATION**

**Zorach R. Glaser, Ph.D.
LT, MSC, USNR**

Research Report

Project MF12.524.015-0004B, Report No. 2

**Naval Medical Research Institute
National Naval Medical Center
Bethesda, Maryland 20014, U.S.A.**

4 October 1971

**Second Printing, with Revisions,
Corrections, and Additions: 20 April 1972
(Supersedes AD No. 734391)**

ABSTRACT

More than 2000 references on the biological responses to radio frequency and microwave radiation, published up to June 1971, are included in the bibliography.* Particular attention has been paid to the effects on man of non-ionizing radiation at these frequencies. The citations are arranged alphabetically by author, and contain as much information as possible so as to assure effective retrieval of the original documents. An outline of the effects which have been attributed to radio frequency and microwave radiation is also part of the report.

*Three supplementary listings bring the number of citations to more than 2300.

Key Words

Biological Effects
Non-Ionizing Radiation
Radar Hazards
Radio Frequency Radiation
Microwave Radiation
Health Hazards
Bibliography
Electromagnetic Radiation Injury

The comments upon and criticisms of the literature made in this report, and the recommendations and inferences suggested, are those of the author, and do not necessarily reflect the views of the Navy Department or of the Naval Service.

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13. ABSTRACT

More than 2300 references on the biological responses to radio frequency and microwave radiation, published up to April 1972, are included in this bibliography of the world literature. Particular attention has been paid to the effects on man of non-ionizing radiation at these frequencies. The citations are arranged alphabetically by author, and contain as much information as possible so as to assure effective retrieval of the original documents. Soviet and East European literature is included in detail. An outline of the effects which have been attributed to radio frequency and microwave radiation is included as Chapter 1. The revised report (which supersedes DDC report AD#734391) is updated with the inclusion of three supplementary listings, and has incorporated many corrections and additions to the original 2100 citations.

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Foreword

It is the hope of the author that this bibliography will provide guidance to the diffuse and conflicting literature on the biological responses to electromagnetic radiation at radio- and microwave-frequencies, with particular reference to the effects of concern to man. Such guidance is needed in the formulation and appraisal of criteria and limits of human exposure to "non-ionizing" radiation, and in the planning and conduct of future research.

The original plans were to categorize and key the literature citations to the "outline of biological and clinical effects" (Chapter 1). This proved to be a much more difficult and time-consuming task than anticipated, and was actually completed only for about 400 papers. Thus, the letter-number combinations given in square brackets for some of the "A" through "C" citations refer to the outline. [NV] indicates the citation was "not verified".

The standard format used throughout the bibliography is: author, (date), journal, volume, (issue): page, "title". The authors are alphabetized, and in chronological order. Multiple authors are also alphabetically ordered according to the second, third, etc., author. Inclusive pagination is given where possible, as is the original language of the citation. Report accession and translation numbers (some of which are cited in Appendix A), and alternate sources are listed when known. The title of books is underlined. When the title of the report was not available (or not given), a short (one line) description of the paper is listed whenever possible. Reports in which the name of the author was not given are listed chronologically using the format, "title", reference, source, (date). In many cases the citation was obtained from secondary (and tertiary) sources. For this reason it was impossible to put every citation into a consistent format.

In a few cases, papers have been cited which were presented at symposia or meetings devoted to the present topic, even when the report title suggests that it does not pertain directly to the topic. This has been done to show the wide range of items considered relevant (at least at the time of the meeting, and by the organizing chairman) in past years. An example is "electroanesthesia".

A few citations of marginal and/or peripheral relationship have also been included so that the reader may judge the applicability to his individual research needs. Examples are reports dealing with the biological effects of static and alternating magnetic fields, experimental techniques using radio frequency and microwave radiation (e.g., electron spin resonance, and nuclear magnetic resonance spectroscopy), and microwave exposure limits, regulations, and standards.

References for a few limited-distribution government reports are available upon request.

The author welcomes information which will correct errors and omissions (both of which no doubt exist). Copies of new papers would be greatly appreciated, and would encourage updating and revising the bibliography periodically.

ACKNOWLEDGMENTS

The assistance and support received during the preparation of this bibliography have been considerable, and I am happy to acknowledge my indebtedness and gratitude. Drs. John Keesey and Dennis Heffner, former and present Heads of the Biophysics Division, and Dr. Seymour Friess, Director of the Environmental Biosciences Department of the Naval Medical Research Institute, permitted me the opportunity to work on the bibliography, and offered frequent encouragement.

Acknowledgment is also due to many friends and associates for their helpful suggestions, comments, and loans and/or gifts of reports or other material, which have been invaluable in the course of the work. Mr. Glenn Heimer of the Naval Ship Engineering Center contributed an extensive collection of government reports and documents, many of which had not previously been cited in the open literature.

Special help in tracing and in the acquisition of relevant papers has been received from the librarians and staff members of the NMRI library: Mrs. Thelma Robinson, Mrs. Ernestine Gendlemen, Mrs. Eleanor Capps, and Miss Deborah Grove. Their diligence and resourcefulness in tracing and obtaining copies of a large number of papers and reports, often in spite of incomplete and/or inaccurate citations given in other sources, enabled me to include many relevant items in the bibliography.

Mr. Christopher Dodge of the Scientific and Technical Center, Department of the Navy, provided much of the Soviet Bloc literature, linguistic and other technical assistance, and in addition offered valuable comments and encouragement throughout the preparation of this report. Especially noteworthy were the corrections and improvements suggested by Chris following his reading of the entire manuscript.

Helpful also in locating some of the Soviet literature was Mr. E. S. Serebrennikov, of the Science and Technology Division, The Library of Congress.

Credit is due Mrs. Anna Woke (of this Institute) for translating many of the German papers; to Dr. Emilio Weiss, who translated from the Italian, and to Mrs. Edith Pugh who typed many "first drafts"; also to Mrs. Rhoda Glaser for her help in many aspects of the work.

Mrs. Fannie Epstein deserves special mention for her outstanding editorial assistance, and especially for the heroic typing, organization, and checking of the entire report.

The Outline of Reported Biological Phenomena ('Effects') and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation, is patterned after that given by R. Murray, et al., in an article entitled, "How safe are microwaves", which appeared in Non-Ionizing Radiation 1(1):7-8 (1969). Some of the "effects" were listed in the report by S. F. Cleary and W. T. Ham, Jr., entitled, "Considerations in the evaluation of the biological effects on exposure to microwave radiation", (Background document, Part I, 1969, for the Task Force on Research Planning in Environmental Health, Subtask Force on Physical Factors in the Environment). The discussion and suggestions offered by Byron McLees, Edward Finch, Lewis Gershman, and Christopher Dodge relating to the Outline are also gratefully acknowledged.

Preparation of the bibliography was supported by the Bureau of Medicine and Surgery, Department of the Navy, under work unit MF12.524. 015-0094B.

Note: These effects are listed without comment or endorsement since the literature abounds with conflicting reports. In some cases the basis for reporting an "effect" was a single or a non-statistical observation which may have been drawn from a poorly conceived (and poorly executed) experiment.

* It is also reported that low levels of irradiation produce a cooling effect - "hypercompensation".

- Reported Biological Phenomena ("Effects") and Some Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation (See Note)
- A. Heating of Organs: (Applications: Diathermy, Electrosurgery, Electro-coagulation, Electrodesiccation, Electrolysis, Electrolysis)
1. Whole Body (temperature regulation defects), hyperpyrexia
 2. Skin
 3. Bone and Bone Marrow
 4. (a) Lens of Eye (cataractous lesions - due to the avascular nature of the lens which prevents adequate heat dissipation.)
(b) Corneal damage also possible at extremely high frequencies.
 5. Genitalia (tubular degeneration of testicles)
 6. Brain
 7. Sinuses
 8. (etal) Implants (burns near hip pins, etc.)
- The effects are generally reversibly except for 4a.
- B. Changes in Physiologic Function
1. Striated Muscle Contraction
 2. Alteration of Diameter of Blood Vessels (increased vascular elasticity), dilation
 3. Changes in the Oxidative Processes in Tissues and Organs
 4. Liver Enlargement
 5. Altered Sensitivity to Drug Stimuli
 6. Decreased Spermatogenesis (decreased fertility, to sterility)
 7. Altered Sex Ratio of Births (more girls)
 8. Altered Menstrual Activity
 9. Altered Fetal Development
 10. Increased Lactation in Nursing Mothers
 11. Reduction in Inurests (via excretion, via urine output)
 12. Altered Renal Function (decreased filtration in tubules)
 13. Changes in Conditioned Reflexes
 14. Increased Electrical Resistance of Skin
 15. Changes in the Structure of Skin Receptors of the (a) Dermal, and (b) Blood-Carrying Systems
 16. Altered Blood Flow Rate

17. Alterations in the Biocurrents (EEG?) of the Cerebral Cortex (in animals)
18. Changes in the Rate of Clearance of Tagged Ions from Tissue
19. Reversible Structural Changes in the Cerebral Cortex and the Diencephalon
20. Electrocardiographic (EKG) Changes
21. Alterations in Sensitivity to Light, Sound, and Olfactory Stimuli
22. Functional (a) and Pathological (b) Changes in the Eyes:
 (a) decrease in size of blind spot, altered color recognition, changes in intraocular pressure, lacrimation, trembling of eyelids; (b) lens opacity and coagulation, altered tissue respiration, and altered reduction-oxidation processes
23. Myocardial Necrosis
24. Hemorrhage in Lungs, Liver, Gut, and Brain
25. Generalized Degeneration of all Body Tissue
26. Loss of Anatomical Parts
27. Death
28. Dehydration
29. Altered Rate of Calcification of Certain Tissue

} At Fatal Levels
 } of Radiation

C. Central Nervous System Effects

1. Headaches
2. Insomnia
3. Restlessness (Awake and During Sleep)
4. Electroencephalographic (EEG) Changes
5. Cranial Nerve Disorders
6. Pyramidal Tract Lesions
7. Conditioned Reflex Disorders
8. Vagomimetic Action of the Heart; Sympaticomimetic Action
9. Seizures, Convulsions

D. Autonomic Nervous System Effects

1. Neuro-vegetative Disorders (e.g., alteration of heart rhythm)
2. Fatigue
3. Structural Alterations in the Synapses of the Vagus Nerve
4. Stimulation of Parasympathetic Nervous System (Bradycardia), and Inhibition of the Sympathetic Nervous System

E. Peripheral Nervous System Effects

Effects on Locomotor Nerves

F. Psychological Disorders ("Human Behavioral Studies") - the so-called "Psychophysiological (and Psychosomatic) Responses"

1. Neurasthenia - (general "bad" feeling)
2. Depression
3. Impotence
4. Anxiety
5. Lack of Concentration
6. Hypochondria
7. Dizziness
8. Hallucinations
9. Sleepiness
10. Insomnia
11. Increased Irritability
12. Decreased Appetite
13. Loss of Memory
14. Scalp Sensations
15. Increased Fatigability
16. Chest Pain
17. Tremor of the Hands

G. Behavioral Changes (Animal Studies)

Reflexive, Operant, Avoidance, and Discrimination Behaviors

ii. Blood Disorders

(V = in vivo)
(v = in vitro)

Changes in:

1. Blood and Bone Marrow
2. Phagocytic (polymorphs) and Bactericidal Functions of Blood (v,v)
3. Hemolysis Rate (increase), (a shortened lifespan of cells)
4. Sedimentation Rate (increase), (due to changes in serum protein levels or amount of fibrinogen. (?))
5. Number of Erythrocytes (decrease), also number of lymphocytes
6. Blood Glucose Concentration (increase)
7. Blood Histamine Content
8. Cholesterol and Lipids
9. Gamma (also α and β) Globulin, and Total Protein Concentration
10. Number of Eosinophils
11. Albumin/Globulin Ratio (decrease)
12. Hemopoiesis (rate of formation of blood corpuscles)
13. Leukopenia (increase in number of white cells), and Leukocytosis
14. Reticulocytosis

I. Vascular Disorders

1. Thrombosis
2. Hypertension

J. Enzyme and Other Biochemical Changes

Changes in activity of:

1. Cholinesterase (V,v)
2. Phosphatase (v)
3. Transaminase (v)
4. Amylase (v)
5. Carboxydismutase

6. Protein Denaturation
7. Toxin, Fungus, and Virus Inactivation (at high radiation dose levels), Bacteriostatic Effect
8. Tissue Cultures Killed
9. Alteration in Rate of Cell Division
10. Increased Concentration of RNA in Lymphocytes, and Decreased Concentration in Brain, Liver, and Spleen
11. Changes in Pyruvic Acid, Lactic Acid, and Creatinine Excretions
12. Change in Concentration of Glycogen in Liver (Hyperglycemia)
13. Alteration in Concentration of 17- Ketosteroids in Urine

K. Metabolic Disorders

1. Glycosuria (sugar in urine; related with blood sugar?)
2. Increase in Urinary Phenol (derivatives? DOPA?)
3. Alteration of Rate of Metabolic Enzymatic Processes
4. Altered Carbohydrate Metabolism

L. Gastro-Intestinal Disorders

1. Anorexia (loss of appetite)
2. Epigastric Pain
3. Constipation
4. Altered Secretion of Stomach "Digestive Juices"

M. Endocrine Gland Changes

1. Altered Pituitary Function
2. Hyperthyroidism
3. Thyroid Enlargement
4. Increased Uptake of Radioactive Iodine by Thyroid Gland
5. Altered Adrenal Cortex Activity
6. Decreased Corticosteroids in Blood
7. Decreased Glucocorticoidal Activity
8. Hypogonadism (usually decreased testosterone production)

N. Histological Changes

1. Changes in Tubular Epithelium of Testicles
2. Cross Changes

O. Genetic and Chromosomal Changes

1. Chromosome Aberrations (e.g., linear shortening, pseudochiasm, diploid structures, amitotic division, bridging, "sticky" chromosomes, irregularities in chromosomal envelope)
2. Mutations
3. Mongolism
4. Somatic Alterations (changes in cell not involving nucleus or chromosomes, cellular transformation)
5. Neoplastic Diseases (e.g., tumors)

P. Pearl Chain Effect (Intracellular orientation of subcellular particles, and orientation of cellular and other (non-biologic) particles)

Also, orientation of animals, birds, and fish in electromagnetic fields

Q. Miscellaneous Effects

1. Sparking between dental fillings
2. Peculiar metallic taste in mouth
3. Changes in Optical Activity of Colloidal Solutions
4. Treatment for Syphilis, Poliomyelitis, Skin Diseases
5. Loss of Hair
6. Brittleness of Hair
7. Sensations of Buzzing Vibrations, Pulsations, and Tickling About the Head and Ears
8. Copious Perspiration, Salivation, and Protrusion of Tongue
9. Changes in the Operation of Implanted Cardiac Pacemakers
10. Changes in Circadian Rhythms

EXHIBIT 3

C:\Users\User\Documents\EMF Exposure\EMF Research Studies.html

Scientific Studies Linking Low-level Microwave Radiation and Electromagnetic Fields (EMF) with Health Impacts

<u>Disease/ Symptoms/Bioeffects</u>	<u>System</u>	<u>Authors</u>	<u>Date</u>	<u>Study Type</u>	<u>Technology</u>	<u>Study</u>	<u>Publication</u>
ALS (Lou Gehrig's)	Neurological	Deapen, D. and Henderson, B.	1993	Human		"A Case-control Study of Amyotrophic Lateral Sclerosis"	
ALS (Lou Gehrig's)	Neurological	Savitz, Loomis & Tse, 1998	1998	Human	EMFs	Electrical occupations and neurodegenerative disease: Analysis of US Mortality Data	
Alzheimer's	Neurological	Savitz, Loomis & Tse, 1998	1998	Human	EMFs	Electrical occupations and neurodegenerative disease: Analysis of US Mortality Data	
Alzheimer's	Neurological	Sobel E, Davanipour, Z.	1987	Human	EMF	"Electromagnetic Field Exposure May Cause Increased Production of Amyloid Beta and Eventually Lead to Alzheimer's Disease"	
Alzheimer's	Neurological	Sobel E, Davanipour, Z.	1973	Human	EMF	"Occupations with Exposure to Electromagnetic Fields: A Possible Risk Factor for Alzheimer's Disease"	
Alzheimer's	Neurological	Sobel E, Dunn M, et al.	1974	Human	EMF	"Elevated Risk of Alzheimer's Disease Among Workers with Likely Electromagnetic Field Exposure"	
Alzheimer's	Neurological	Carpenter, David O.	1982	Human	EMFs	"Possible Effects of Electromagnetic Fields on the Nervous System and Development"	
Attention Deficit	Neurological	Papageorgiou, Nanou, Tsiafakis, Kapareliotis, et al.	1991	Human	Mobile Phone	"Acute Mobile Phone Effects on Pre-Attentive Operation"	

Attention Deficit	Neurological	Petrides, M.	2000	Human	Cell Phones	"Use of Cellular Telephones and Performance on Tests of Attention"	
Attention Deficit	Neurological	Russo, Fox, Cinel, Boldini, et al.	1990	Human	Mobile Phones	"Does Acute Exposure to Mobile Phones Affect Human Attention?"	
Attention Deficit	Neurological	Edelstyn, N., Oldershaw, A.	2006	Human	Cell Phones	"The Acute Effects of Exposure to the Electromagnetic Field Emitted by Mobile Phones on Human Attention"	
Attention Deficit	Neurological	Lee, T, Ho, S., Tsang, L., Yanf, S. et al.	1978	Human	EMFs	"Effect on Human Attention of Exposure to the Electromagnetic Field Emitted by Mobile Phones"	
Attention Deficit	Neurological	Lee, T, Lam, P., Lee, L., Chan, C.	1978	Human	EMFs	"The Effect of the Duration of Exposure to the Electromagnetic Field Emitted by Mobile Phones on Human Attention"	
Autism	Neurological	Carpenter, David O.	1982	Human	EMFs	"Possible Effects of Electromagnetic Fields on the Nervous System and Development"	
Autism	Neurological	Bertrand, J, Mars, A, Boyle, C, et al.	1990	Human	RF Radiation	"Prevalence of Autism in a United States Population: The Brick Township, New Jersey Investigation"	
Autism	Neurological	Byrd, R, Sigman, M, Bono, M, et al.	1994	Human	RF Radiation	"Report to the Legislature on the Principal Findings From The Epidemiology of Autism in California: A Comprehensive Pilot Study"	
Autism	Neurological	Chakrabarti, S., and Fombonne, E.	1999	Human	RF Radiation	"Pervasive Developmental Disorders in Preschool Children"	CRC Handbook of Atmospheric, CRC Press 111-177
Autism	Neurological	Kane, Robert C.	2000	Human	RF Radiation	"A Possible Association Between Fetal/Neonatal Exposure to Radiofrequency Electromagnetic	

						Radiation and the Increased Incidence of Autism Spectrum Disorders"	
Bioeffect:	Hormonal/Genotoxic	Mattel et al.	1982				
Bioeffect:	Hormonal/Genotoxic	Tice, Hook and McRee	1993	In Vitro	Cell Phone Radiation	"Genetic Damage From Cell Phone Radiation"	
Bioeffect:	Hormonal/Genotoxic	Carlo and Schram	2001				
Bioeffect:	Hormonal/Genotoxic	Vignati, M. and Giuliani, L.	1997	Human	High Voltage Power Lines	"Radiofrequency exposure near high- voltage power lines"	Environmental Health Perspectives 105 (Suppl 6): 1569-1573
Bioeffect: abnormalities in human lymphocytes	Hormonal/Genotoxic	Stodolnik-Baranska, W. et al.	1996	In Vitro	EMFs	"Diurnal Patterns in Brain Biogenic Amines of Rats Exposed to 60-Hz Electric Fields"	
Bioeffect: allergies	Neurological	Kimata, H.	2004	Human	Microwave Radiation	"Microwave Radiation from Cellular Phones Increases Allergen-Specific IgE Production"	
Bioeffect: alpha-lymphotoxin enhanced	Hormonal/Genotoxic	Fletcher, W. et al.	1986	In Vitro	Microwave Fields	"A Modulated Microwave Field and Tumor Promoters Similarly Enhance the Action of Alpha-Lymphotoxin (aLT)"	
Bioeffect: auditory functions negative effect	Neurological	Sievert, U., Eggert, S., Pau, H.W.	1997	Human	Cell Phones	"Can Mobile Phone Emissions Affect Auditory Functions of Cochlea or Brain Stem?"	
Bioeffect: auditory system damage	Neurological	Janssen, Boege, vonMikusch-Buchberg, Raczek	1980	Human	Cell Phones	"Investigation of Potential Effects of Cellular Phones on Human Auditory Function by Means of Distortion Product Otoacoustic Emissions"	
Bioeffect: auditory system damage	Neurological	Kellenyi, Thuroczy, Faludy, Lenard	1974	Human	GSM mobile phones	"Effects of Mobile GSM Radiotelephone Exposure on the Auditory BrainStem Response"	

Bioeffect: auditory system damage	Neurological	Maby, LeBouquin, Jeannes, Faucon	1996	Human	GSM Fields	"Scalp Localization of Human Auditory Cortical Activity Modified by GSM Electromagnetic Fields"
Bioeffect: auditory system damage	Neurological	Maby, LeBouquin, Jeannes, Faucon, Liegeois-Chauvel, et al.	1998	Human	GSM Fields	"Effects of GSM Signals on Auditory Evoked Responses"
Bioeffect: auditory system damage	Neurological	Mora, Crippa, Mora, Dellepiane	1984	Human	Cell Phone Radiation	"A Study of the Effects of Cellular Telephone Microwave Radiation on the Auditory System in Healthy Men"
Bioeffect: auditory system damage	Neurological	Oktay, M., Dasdog, S.	2004	Human	Cell Phones	"Effects of Intensive and Moderate Cellular Telephone Use on Hearing Function"
Bioeffect: auditory system damage	Neurological	Oysu, Topak, Celik, Yilmaz, et al.	2005	Human	Mobile Phones	"Effects of the Acute Exposure to the Electromagnetic Field of Mobile Phones on Human Auditory Brainstem Responses."
Bioeffect: auditory system damage	Neurological	Ozturan, Erdem, Miman, Kalcioğlu, et al.	1989	Human	Mobile Phones	"Effects of the Electromagnetic Field of Mobile Telephones On Hearing"
Bioeffect: AVTD changes	Genotoxic	Belyaev et al	2005	Human	Microwaves	"Significant condensation of chromatin shown as AVTD changes"
Bioeffect: behavior	Neurological	Wilen, Johannson, Kalezic, Lyskov et al.	2001	Human	Cell Phones	"Psychological Tests and Provocation of Subjects with Mobile Phone Related Symptoms"
Bioeffect: behavior alteration	Neurological	Loscher and Kas	2000	In Vivo	TV and Radio Transmitting Antenna	"Conspicuous Behavioral Abnormalities in a Dairy Cow Herd near a TV and Radio Transmitting Antenna"
Bioeffect: behavior changes	Neurological	Adey, W.F. et al.	1980	In Vivo	EMFs	"Frequency and Power Windowing in Tissue Interaction with Weak Electromagnetic Fields"

Bioeffect: behavior: physiological and behavior changes	Neurological	D'Andrea, Gandhi, Lords, Dumey, Astle, Stensaas, Schoenberg	2000	In Vivo	Microwaves	"Physiological and Behavioral Effects of Prolonged Exposure to 915 MHz Microwaves"	
Bioeffect: Behavior: physiological and behavior changes	Neurological	D'Andrea, Gandhi, Lords, Dumey, Astle, Stensaas, Schoenberg	1999	In Vivo	Microwaves	"Pysiological and Behavioral Effects of Chronic Exposure to 2450-MHz Microwaves"	
Bioeffect: behavioral changes	Neurological	Konig, H.L.	1991	Human	ELF Electric Fields	"Behavioural Changes in Human Subjects Associated with ELF Electric Fields"	
Bioeffect: behavioral changes	Neurological	Navakatikian and Tomashevskaya	1977	In Vivo	Low Intensisty RFR	"RFR at Low Intensities (0.01-0.1mW/cm2; 0.0027-0.027W/kg) Induced Behavioral and Endocrine Changes in Rats"	
Bioeffect: behavioral changes	Neurological	Shandala, M.G., et al.	1985	In Vivo	Microwave Radiation	"Study of Non-ionizing Microwave Radiation Effects on the Central Nervous System and Behavior Reactions"	
Bioeffect: biological and behavior changes	Neurological	Kaplan, Polson, Rebert, Lunan, Gage	1996	In Vivo	EMFs	"Biological and Behavioral Effects of Prenatal and Postnatal Exposure to 2450 MHz Electromagnetic Radiation in the Squirrel Monkey"	
Bioeffect: biological stresses	Neurological	Marino, A.A., and R.O. Becker	1991	In Vivo		"Childhood Leukemia and Exposure to Electricity"	
Bioeffect: blood abberations	Hormonal/Genotoxic	Tonascia, J.A. and Tonascia, S.	1969	In Virto	EMFs	"Hematological Study:progress report on SCC 31732"	
Bioeffect: blood abberations	Hormonal/Genotoxic	Wang, S.G.	1989	Human	High Freq EMFs	"5-HT contents change in peripheral blood of workers exposed to microwave and high frequency radiation"	
Bioeffect: blood flow (cerebral) changes and EEG	Neurological	Huber, Treyer, Borbely, Schuderer, et al.	1999	Human	Mobile Phone EMFs	"Electromagnetic Fields, Such as those from Mobile Phones, Alter	BiolInitiative

						Regional Cerebral Blood Flow and Sleep and Waking EEG"	
Bioeffect: blood lymphocytes abberations	Hormonal/Genotoxic	Verschave et al.	1994	In Vitro/In Vivo	cell phone microwaves	"In vitro and in vivo genetic effects of microwaves from mobile phone frequencies in human and rat peripheral blood lymphocytes"	Plenum Press, New York
Bioeffect: blood: cytogenetic effects on lymphocytes	Hormonal/Genotoxic	Maes, Verschaaeve, Arroyo, DeWagter	1993	In Vitro	Microwaves	"In Virto Cytogenetic Effects of 2450 MHz waves on Human Peripheral Blood Lymphocytes"	
Bioeffect: Blood: interleukin in blood cells increase	Hormonal/Genotoxic	Cossarizza, A. et al.	1993	In Vitro	Pulsed ELF	"Exposure to Low-Frequency Pulsed Electromagnetic Fields Increases Interleukin-1 and Interleukin-6 Production by Human Peripheral Blood Mononuclear Cells"	
Bioeffect: blood: T-lymphocytes (decreased ability) to attack cancer cells	Cancer	Lyle, V.V. et al.	1997	In Vitro	ELF - powerlines	"Adult Cancer Related to Electrical Wire Near the Home"	
Bioeffect: brain - EEG changes (sleep and waking	Neurological	Huber, Treyer, Borbely, Schuderer, et al.	1999	Human	Mobile Phone EMFs	"Electromagnetic Fields, Such as those from Mobile Phones, Alter Regional Cerebral Blood Flow and Sleep and Waking EEG"	
Bioeffect: brain activity and sleep varaibles	Neurological	Hamblin, D., Wood, A.	2000	Human	Mobile Phone	"Effects of Mobile Phone Emissions on Human Brain Activity and Sleep Variables"	George Washington University, Dept of Obgyn
Bioeffect: brain activity changes	Neurological	Von Kiltzing	1979	Human	Pulsed EMFs	"Low Frequency Pulsed Electromagnetic Fields Influence EEG of Men"	Chung Hua Yu Fanf I Hsueh Tsa Chih 23(4): 207-210
Bioeffect: brain activity changes	Neurological	Motluk, A.	1997	Human	Radiofrequency	"Radio Head: The brain has it's own FM receiver"	Bioelectromagnetic Research. Ed, D, Simunic, pp.74-83
Bioeffect: brain activity altered	Neurological	Kolomytkin, O., et.al.	1995		EMFs	"Response of brain receptor systems to microwave energy exposure"	

Bioeffect: brain cell damage	Neurological	Albert, E.N. et al.	1994	In Vivo	EMFs	"Molecular Biology of the Cell"	
Bioeffect: brain cells firing rate changes, changes in EEG's, changes in behavior	Neurological	Adey, W.F. et al.	1980	In Vivo	EMFs	"Frequency and Power Windowing in Tissue Interaction with Weak Electromagnetic Fields"	R.G. Landes Co.
Bioeffect: brain electric reponse alterations	Neurological	Eulitz et al.	1995	Human	Cell Phones	"Mobile Phones Modulated Response Patterns of Human Brain Activity"	
Bioeffect: brain excitability	Neurological	Ferri, Curcio, Pasqualetti, DeGennaro, Et. Al.	1998	Human	Mobile Phone	"Mobile Phone Emissions and Human Brain Excitability"	
Bioeffect: brain function Interference	Neurological	Khiat, Boulanger, Breton	1994	Human	Mobile Phone	"Monitoring the Effect of Mobile Phone Use on the Brain by Proton Magnetic Resonance Spectroscopy"	
Bioeffect: brain function Interference	Neurological	Maier, M.	1999	Human	Mobile Phones	"Brains and Mobile Phones"	
Bioeffect: brain function Interference	Neurological	Petrides, M.	1993	Human	Cell Phones	"Exposure to Electromagnetic Fields by Using Cellular Telephones and Its Influence on the Brain"	
Bioeffect: brain function Interference	Neurological	Reiser H., Dimpfel, W., Schober, F.	1980	Human	EMFs	"The Influence of Electromagnetic Fields on Human Brain Activity"	
Bioeffect: brain temperature changes	Neurological	Van Leeuwen, Lagendijk, Van Leersum	1997	Human	Cell Phones	"Calculation of Change in Brain Temperatures Due to Exposure to a Mobile Phone"	
Bioeffect: brain: degenerative diseases of the brain	Cancer	Reiter	1968	Human	Radio Transmitter	"Cancer Morbidity Among Workers in the Telecommunications Industry"	
Bioeffect: calcium channels in cells	Immune Diseases	Grinstein, S. and Klip, A.	2003	In Vivo		"Calcium Homeostasis and the Activation of Calcium Channels in Cells of the Immune System"	

Bioeffect: Calcium efflux increases	Hormonal/Genotoxic	Dutta, S.K. et al.	1993	In Vitro		"Microwave Radiation -Induced Calcium Ion Efflux from Human Neuroblastoma Cells in Culture"	
Bioeffect: Calcium flow increase	Hormonal/Genotoxic	Blackman, C.F.	1999	In Vitro			
Bioeffect: Calcium ion Efflux	Hormonal/Genotoxic	Blackman et al.	1991	In Vitro	EMFs	"Influence of Electromagnetic Fields on the Efflux of Calcium Ions from Brain Tissue In Vitro"	
Bioeffect: Calcium ion Efflux	Hormonal/Genotoxic	Blackman et al.	1979	In Vitro	RF Radiation	"Multiple Power-Density Windows and Their Possible Origin"	
Bioeffect: Calcium ion Efflux	Hormonal/Genotoxic	Blackman et al.	1998	In Vitro	EMFs	"The Influence of Temperature During Electric and Magnetic Field Induced Alteration of Calcium Ion Release from In Vitro Brain Tissue"	
Bioeffect: Calcium ion efflux	Hormonal/Genotoxic	Blackman et al.	1982	In Vivo	RF Radiation	"Induction of Calcium-ion Efflux From Brain Tissue by Radiofrequency Radiation: Effects of Modulated Frequency and Field Strength"	Proc. Natl. Acad. Sci. USA, 73: 1999-2003
Bioeffect: Calcium ion efflux and cell damage	Hormonal/Genotoxic	Faneli et al.	1998	In Vitro		"Magnetic Fields Increase Cell Survival by Inhibiting Apoptosis via Modulation of Ca ²⁺ influx"	Am Journal of Epidemiology 149(2): 135-142
Bioeffect: Calcium ion homeostasis/efulx	Hormonal/Genotoxic	Blackman	1989	In Vivo	ELF	"ELF Effects on Calcium Homeostasis"	Blood Pressure Monitor 3(6): 323-330
Bioeffect: calcium production alterations	Hormonal/Genotoxic	Goodman, R. and A. Henderson	1989	In Vitro			Bioelectromagnetics 18(3): 223-229
Bioeffect: calcium release changes in the brain	Hormonal/Genotoxic	Bawin, S.M. and W.R. Adey	1976	In Vivo	EMFs	"Sensitivity in Calcium Binding in Cerebral Tissue to Weak Electric Fields Oscillating at Low Frequency"	Bioelectromagnetics 13: 131-146
Bioeffect: cell abberations	Hormonal/Genotoxic	Ivaschuk, et al.	1997	In Vitro	Radiation	"Exposure of nerve growth factor treated PC12 rat pheochromsctyoma cells to a modualted radiofrequency	Annual Review of Research WL Associates Ltd. Frederick, MD

						field of 836.55 MHz effects on c-jun and c-fos expression"	
Bioeffect: cell aberrations	Hormonal/Genotoxic	Phelan, A.M., et al.	1992	In Vitro	Radiation	"Modification of membrane fluidity in Melanin-containing cells by low-level microwave radiation"	Cancer Biochem Biophys 13(3): 187-193
Bioeffect: cell aberrations	Hormonal/Genotoxic	Philips, J.L., et al.	1998	In Vitro	Cell Phone fields	"Exposure of molt-4 lymphoblastoid cells exposed to cellular telephone radiofrequency fields in vitro"	Journal of Cellular Biochemistry 63(3): 385-365
Bioeffect: cell aberrations	Hormonal/Genotoxic	Philips, J.L., et al.	1993	In Vitro	Magnetic Fields	"Effect of 72 Hz pulsed magnetic field exposure on ras p21 expression in CCRF-CEM cells"	Plenum Press, New York
Bioeffect: cell aberrations	Hormonal/Genotoxic	Rao, S. and Henderson, A.	1996	In Vitro	EMFs	"Regulation of c-fos is affected by electromagnetic fields"	Psychopharmacology Series Jul-Aug (7-8): 37-39
Bioeffect: cell aberrations	Hormonal/Genotoxic	Schwan, H.P.	1985	In Vitro	ELF Fields	"Biophysical principles of the interaction of ELF fields with living matter"	Bioelectromagnetics 11(4): 269-272
Bioeffect: cell aberrations	Hormonal/Genotoxic	Timchenko and Ianchevskaia	1995	In Vitro	EMFs	"The cytogenetic action of electromagnetic fields in the short-wave range"	Mutation Research 243: 87-93
Bioeffect: cell aberrations	Hormonal/Genotoxic	Wei et al.	1990	In Vitro	Low Frequency EMFs	"Changes in levels of c-myc and histone H2B following exposure of cells to low-frequency sinusoidal electromagnetic fields: evidence for a window effect"	
Bioeffect: cell aberrations	Hormonal/Genotoxic	Garaj-Vrhovac et al.	1990	In Vitro	Microwaves	"The Effect of Microwave Radiation on the cell genome"	
Bioeffect: cell aberrations	Hormonal/Genotoxic	Nahas, EI	2006	In Vitro	High EMF	"Cancer Mortality in Males"	Mol Cell Biochem 189(1-2): 107-111
Bioeffect: cell changes: molecular and structural	Hormonal/Genotoxic	Somosy, et al.	1998	In Vivo	RFR	"RFR at 0.024 W/kg Caused Molecular and Structural Changes in Cells of Mouse"	Physiological Reviews 72(4): S15-S48

						Embryos"	
Bioeffect: cell damage	Hormonal/Genotoxic	Berridge, M.	1986	In Vitro		"The Molecular Basis of Communication Within The Cell"	
Bioeffect: cell damage	Hormonal/Genotoxic	Blackman, C.F.	2002	Human	EMF Exposure	"Electromagnetic Radiation Acts Like Chemicals"	
Bioeffect: cell damage	Hormonal/Genotoxic	Campbell-Beachler et al.	1998	In Vitro		"Effect of 60-Hz Magnetic Field Exposure on c-fos Expression in Stimulated PC12 Cells"	
Bioeffect: cell damage	Hormonal/Genotoxic	Catterall, W.A.	1992		EMFs	"Cellular and molecular biology of voltage-gated sodium channels"	
Bioeffect: cell damage	Hormonal/Genotoxic	Conti, P. et al.	1976	In Vitro	ELFs	"Reduced Mitogenic Stimulation of Human Lymphocytes by Extremely-Low Frequency Electromagnetic Fields"	
Bioeffect: cell damage and free radicals	Hormonal/Genotoxic	Collins, Poehler and Bryden	2004	Human		"EPR Persistence Measurements of UV-induced Melanin Free Radicals in Whole Skin"	
Bioeffect: cell membrane damage	Cancer	Adey	1988	Human	EMFs	"Cell Membranes: The Electromagnetic Environment and Cancer Promotion"	
Bioeffect: cell membrane damage	Hormonal/Genotoxic	Adey, W.F.	1990	In Vitro	Microwaves	"Nonlinear Electrodynamics in Cell Membranes Transductive Coupling"	
Bioeffect: cell proliferation decrease	Hormonal/Genotoxic	Velizarov, et al.	1998	In Vitro	RF Radiation	"Decrease in Cell Proliferation After Exposure to RFR of 0.000021-0.0021W/kg"	
Bioeffect: cell response reduced to PTH, changes in blood plasma functions	Immune Diseases	Luben, R.A. et al.	1988	In Vitro		"Electrical Wiring Configurations and Childhood Cancer"	
Bioeffect: cells' ability to synthesize DNA	Hormonal/Genotoxic	Barnothy, M.F. et al.	1969	In Vivo			

Bioeffect: cells' ability to synthesize DNA	Hormonal/Genotoxic	Dyshlovoi, V.D. et al.	1999	In Vivo	Low Frequency EMFs	"Overview of Health Effects of Extremely Low Frequency Electromagnetic Fields"
Bioeffect: cells' ability to synthesize DNA	Hormonal/Genotoxic	Mastrykova, V.M. et al.	1998	In Vivo	home electrics	"Archives of Environmental Health"
Bioeffect: central nervous disorders	Neurological	Baranski S, Edelwejn Z.	1974	In Vivo	Microwaves	"Biological Effects and Health Hazards of Microwave Radiation: Proceedings of an International Symposium"
Bioeffect: central nervous system disorders	Neurological	Bawin, Kaczmarek, Adey	1975	In Vitro	VHF Fields	"Effects of Modulated VHF Fields on the Central Nervous System"
Bioeffect: chromosomal abberations	Hormonal/Genotoxic	Nordenson, I. et al.	1994	In Vitro	Magnetic Fields	"Chromosomal abberations in human amniotic cells after intermittent exposure to 50 Hz magnetic fields"
Bioeffect: chromosomal abberations	Hormonal/Genotoxic	Valjus, J., et al.	1993	In vitro	EMFs	"Analysis of chromosomal abberations, sister chromatid exchanges and micronuclei among power linesman with long-term exposure to 50 Hz electromagnetic fields"
Bioeffect: Chromosomal breaks in lymphocytes	Hormonal/Genotoxic	Nordenson, I. et al.	1984	Human	Electric Field Exposure	"Clastogenic Effects in human lymphocytes of power frequency electric fields"
Bioeffect: Chromosomal breaks in lymphocytes	Hormonal/Genotoxic	Nordenson, I. et al.	1988	Human	Electric Field Exposure	"Chromosome effects in lymphocytes of 400 kV-substation workers"
Bioeffect: chromosome abberations	Hormonal/Genotoxic	Rosenthal and Obe	1989	In Vitro	EMFs	"Effects of 50 Hz electromagnetic fields on proliferation and on chromosomal alterations in human peripheral lymphocytes untreated and pretreated with chemical mutagens"

Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Skyberg, K. et al.	1993	In Vitro	EMFs	"Chromosome aberrations in lymphocytes of high-voltage laboratory cable splicers exposed to electromagnetic fields"	
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Balode	1996	In Vivo	Radio Freq EMF	"Assessment of Radio-frequency Electromagnetic Radiation by the Micronucleus Test in Bovine Peripheral Erythrocytes"	
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Garaj-Vrhovac et al.	1990	In Vitro	Microwaves	"Comparison of Chromosome Aberration and Micronucleus Induction in Human Lymphocytes After Occupational Exposure to Vinyl Chloride Monomer and Microwave Radiation"	
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Garaj-Vrhovac et al.	1991	In Vitro	Microwaves	"The Relationship Between Colony-forming Ability, Chromosome Aberrations and Incidence of Micronuclei in V79 Chinese Hamster Cells Exposed to Microwave Radiation"	Bioelectromagnetics 15(4): 293-301
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Garaj-Vrhovac et al.	1992	In Vitro	Microwaves	"The Correlation Between the Frequency of Micronuclei and Specific Aberrations in Human Lymphocytes Exposed to Microwave Radiation In Vitro"	Radiation and Environmental Biophysics 32(4): 325-336
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Garaj-Vrhovac et al.	1993	In Vitro	Microwaves	"The Rate of Elimination of Chromosomal Aberrations after Accidental Exposure to Microwave Radiation"	Mutation Research 210(2): 329-335
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Goldsmith, J.R.	1997	Human	Microwaves	"Epidemiological Evidence Relevant to Radar (Microwave) Effects"	Scandinavian Journal of Work, Environment & Health 19(1): 29-34

Bioeffect: chromosome aberrations	Cancer	Goswami, P.C., et.al,	1999	In Vitro	Cell phones	"Proto-oncogene mRNA levels and activities of multiple transcription factors in C3H 10T 1/2 murine embryonic fibroblasts exposed to 835.62 and 847.74 MHz cellular telephone communication frequency radiation"	The Science of the Total Environment, 180: 81-86
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Haider et al.	1994	In Vitro	Radiofrequency	"Clastogenic Effects of Radiofrequency Radiation on Chromosomes of Tradescantia"	Periodicum Biologorum, Vol 92, No.4, pp. 411-416
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Timchenko and lanchevskaia	1999	Human	EMF exposure	"Electric Power Use and Breast Cancer: A Hypothesis"	Mutation Research 263: 143-149
Bioeffect: chromosome aberrations	Hormonal/Genotoxic	Vijayalaxmi et al.	1983	Human	Ham Radios	"Silent Keys: Leukemia Mortality in Amateur Radio Operators"	Mutation Research 281: 181-186
Bioeffect: chromosome aberrations in corneal cells	Hormonal/Genotoxic	Yao, K.T.S.	2001	In Vivo	Cell Phones	"Brain Tumors and Salivary Gland Cancers Among Cellular Telephone Users"	Bioelectrochemistry and Bioenergetics, 30: 319-325
Bioeffect: chromosome aberrations in human lymphocytes	Hormonal/Genotoxic	Garcia-Sagredo and Monteagudo	1991	In Vitro	Low Level Pulsed EMFs	"Effect of Low-Level Pulsed Electromagnetic Fields on Human Chromosomes In Vitro: Analysis of Chromosome Aberrations"	Environmental Health Perspectives 105 (Suppl 6): 1579-1587
Bioeffect: chromosome aberrations in human lymphocytes	Hormonal/Genotoxic	Khaili and Qassem	1991	In Vitro	Pulsing EMFs	"Cytogenetic Effects of Pulsing Electromagnetic Field on Human Lymphocytes In Vitro: Chromosome Aberrations, Sister-chromatid Exchanges and Cell Kinetics"	Radiation Research, 151(3): 300-309
Bioeffect: chromosome aberrations in human lymphocytes	Hormonal/Genotoxic	Skyberg et al.	1980	Human	45-Hz-60-Hz EMF's	"The Effect of ELF Magnetic Fields on Human Performance: A Preliminary Study"	Mutation Research 324: 65-68
Bioeffect: chromosome aberrations in human lymphocytes	Hormonal/Genotoxic	Tsoneva, M.G. et al.	1984	In Vitro	EMFs	"Micronuclei Formation in Somatic Cells of Mice Exposed to 50-Hz Electric Fields"	

Bioeffect: chromosome aberrations in human lymphocytes	Hormonal/Genotoxic	Valjus et al.	1997	Human	Microwaves	"Inhibition of DNA Synthesis by Microwave Radiation in L1210 Leukemia Cells"	
Bioeffect: chromosome aberrations in peripheral human lymphocytes	Hormonal/Genotoxic	Nordstrom et al.	2002	Human	High EMF	"Cancer Mortality in Males"	
Bioeffect: chromosome breaks	Hormonal/Genotoxic	Eberle, P. and C.May	1996	In Vitro			Hereditas 115(1): 9-11
Bioeffect: chromosome Breaks	Hormonal/Genotoxic	Nordstrom, S. et al.	2004	Human	High EMF	"Cancer Mortality in Males"	Mutation Research 247: 141-146
Bioeffect: chromosome breaks (complex)	Hormonal/Genotoxic	Heller and Teixeira-Pinto	1959	In Vitro	Microwaves; RF	"A New Physical Method of Creating Chromosome Aberrations"	
Bioeffect: Chromosome breaks in lymphocytes	Hormonal/Genotoxic	Nordenson, I. et al.	2000	Human	High EMF	"Cancer Mortality in Males"	
Bioeffect: chromosome damage in bone marrow and blood	Cancer	Vijayalaxmi et al.	1993	In Vivo	Microwaves	"Immunological and Cancer-Related Effects of Exposure to Low-Level Microwave and RF Fields"	
Bioeffect: circadian rhythms altered	Neurological	Adey	1975	Human	EMFs	"Effects of Electromagnetic Radiation on the Nervous System"	
Bioeffect: c-jon and c-fos oncoproteins	Hormonal/Genotoxic	Lagroye, I., and Poncy, J.	1998	In Vitro	EMFs	"Influences of 50-Hz Magnetic Fields and Ionizing Radiation on c-jon and c-fos Oncoproteins"	
Bioeffect: cognitive impairment	Neurological	Haarala, Bjornberg, Ek, Laine, et al.	2004	Human		"Effect of 902 MHz Electromagnetic Field Emitted by Mobile Phones on Human Cognitive Function"	
Bioeffect: cognitive impairment	Neurological	Lamble et al.	1999	Human	Cell Phone	"	
Bioeffect: cognitive impairment	Neurological	Zwamborn, Vossen, vanLeersum, Ouwens, Makel	2000	Human	RF Radiation	"Effects of Global Communication System Radio-Frequency Fields on Well Being and Cognitive Functions of Human Subjects With and Without Subjective Complaints"	Bioelectromagnetics 19(2): 112-116

Bioeffect: cognitive impairment - CNS disruption	Neurological	Hammett and Edison Inc.	1997	Human	Radiofrequency	"Engineering analysis of radio frequency exposure conditions with addition of digital TV channels"	Prepared for Sutro Tower Inc. San Francisco, CA
Bioeffect: cognitive performance decrease	Neurological	Preece et al.	1997	Human	Microwaves	"Effect of a 915-MHz Simulated Mobile Phone Signal on Cognitive Function in Man"	
Bioeffect: cognitive performance decrease	Neurological	Regel, Negovetic, Roosli, Berdinas, et al.	1980	Human	EMFs	"UMTS Base Station-Like Exposure, Well-being, and Cognitive Performance"	
Bioeffect: depression	Neurological	Verkasalo P, et al.	1997	Human	ELF - transmission lines	"Magnetic Fields of transmission lines and depression"	
Bioeffect: depression and suicide	Neurological	Baris and Armstrong	1990	Human	EMFs	"Suicide Among Electric Utility Workers in England and Wales"	Nature, Vol.183, No.4665, pp.905-906
Bioeffect: depression and suicide	Neurological	Perry, F.S. et al.	1981	Human	ELF - magnetic field	"Environmental power-frequency magnetic fields and suicide"	Bioelectromagnetics 14: 495-501
Bioeffect: depression and suicide	Neurological	Van Wijngaarden et al.	2002	Human	EMFs	"Exposure to Electromagnetic Fields and Suicide Among Electric Utility Workers: A nested case-control study"	3rd edition, New York, Garland Publishing, 1994
Bioeffect: disruption of brain waves	Neurological	Polk, C.	1982	Human	EMFs	"Schumann Resonances"	
Bioeffect: DNA abnormalities	Hormonal/Genotoxic	Sarkar S, Ali S, Behari J	1993	In Vivo	Microwaves	"Effect of Low Power Microwave on the Mouse Genome: A Direct DNA Analysis"	
Bioeffect: DNA changes in brains and testes	Hormonal/Genotoxic	Soma-Sakar	2005	In Vivo	EMFs	"Interaction with Biological Systems with Static and ELF Electric and Magnetic Fields"	
Bioeffect: DNA damage	Hormonal/Genotoxic	Kondo, T. et al.	1996	In Vitro	RF Radiation	"Damage in DNA Irradiated with 1.2 MHz Ultrasound and its Effect on Template Activity of DNA for RNA Synthesis"	

Bioeffect: DNA damage	Hormonal/Genotoxic	Malyapa, Ahem, Bi, Straube, LaRegina, Pickard, RotiRoti	1998	In Vitro		"DNA Damage in Rat Brain Cells After In Vivo Exposure to 2450 MHz Electromagnetic Radiation and Various Methods of Euthanasia"	
Bioeffect: DNA damage	Hormonal/Genotoxic	Malyapa, Ahem, Bi, Straube, LaRegina, Pickard, RotiRoti	1983	In Vivo		"Measurement of DNA Damage After Exposure to Electromagnetic Radiation in the Cellular Phone Communication Frequency Band"	
Bioeffect: DNA damage	Hormonal/Genotoxic	McNamee, J.P., et al.	2000	In Vitro		"DNA Damage in Human Leukocytes After Acute In Vitro Exposure to 1.9 GHz Pulse-Modulated Radiofrequency Field"	
Bioeffect: DNA damage	Hormonal/Genotoxic	Meltz	1995	Human	EF Fields	"Biological Effects Versus Health Effects: An Investigation of the Genotoxicity of Microwave Radiation"	
Bioeffect: DNA single strand breaks	Hormonal/Genotoxic	Williams, G.M.	1992	In Vivo	Microwaves	"Effects of Microwaves on Human Lymphocyte Cultures"	
Bioeffect: DNA strand breakage and melatonin reduction	Hormonal/Genotoxic	Lai and Singh	1997	In Vivo	Magnetic Fields	"Melatonin and N-tert-butyl-a-p henylnitron Block 60 Hz Magnetic Field Induced DNA Single and Double Strand Breaks in Rat Brain Cells"	
Bioeffect: DNA strand breaks	Hormonal/Genotoxic	Philips et al.	1998	In Vitro	Cellular Phones	"DNA Damage in molt-4 Lymphoblastoid Cells Exposed to Cellular Telephone Radiofrequency Fields In Vitro"	
Bioeffect: DNA strand breaks	Hormonal/Genotoxic	Sagripanti and Swicord	1988	Human	EMFs	"Evidence of Stress in Rats Exposed to 60-Hz Electric Fields"	
Bioeffect: DNA strand breaks	Hormonal/Genotoxic	Singh et al.	1994	In Vivo	EMFs	"Modification of alkaline microgel electrophoresis for sensitive detection of DNA damage"	Am Journal of Epidemiology 146(12): 1037-1045

Bioeffect: DNA strand breaks	Hormonal/Genotoxic	Verschave et al.	2003	Human	EMFs	"In Vitro Exposure to EMFs: Changes in Tumor Cell Properties"	Journal of Industrial Medicine 47: 788-789
Bioeffect: DNA strand damage	Hormonal/Genotoxic	Ahuja et al.	1997	Human	Magnetic Fields	"Comet Essay to Evaluate DNA Damage Caused By Magnetic Fields"	Health Phys 41(2): 267-277
Bioeffect: DNA strand damage	Hormonal/Genotoxic	Lai and Singh	1996	In Vivo	Electromagnetic Radiation	"Single and Double Strand DNA Breaks in Rat Brain Cells After Acute Exposure to Radiofrequency Electromagnetic Radiation"	
Bioeffect: DNA strand damage	Hormonal/Genotoxic	Lai and Singh	1997	In Vivo	EMR	"Melatonin and spin-trap compound Block Radiofrequency Electromagnetic Radiation - induced DNA Strands Breaks in Rat Brain Cells"	
Bioeffect: DNA strand damage	Hormonal/Genotoxic	Svedenstal et al.	1987	Human	EMFs	"Abnormalities in Organs of Mice Induced by Magnetic Fields"	
Bioeffect: DNA structural changes	Hormonal/Genotoxic	Sagripanti and Swicord	1976	In Vitro	Microwave radiation	"DNA structural changes caused by microwave radiation"	
Bioeffect: DNA synthesis increase	Hormonal/Genotoxic	Liboff, A.R. et al.	1986	In Vitro		"Calcium-45 Cyclotron Resonance in Human Lymphocytes"	Mutation Research 320: 141-147
Bioeffect: DNA/Chromosome	Hormonal/Genotoxic	Adey, W.F.	1993	In Vitro	EMFs	"Biological Effects of Electromagnetic Fields"	
Bioeffect: DNA/Chromosome	Hormonal/Genotoxic	Adey, W.F.	1993	In Vitro	EMFs	"Electromagnetics in Biology and Medicine"	Radiation Research 149(6): 637-645
Bioeffect: Down's Syndrome	Reproductive	Cohen et al.	1993	Human		"Parental Factors in Down's Syndrome: results of the second Baltimore case control study"	
Bioeffect: EEG activity of the brain altered	Neurological	Hietanen, D, Kovala, T., Hamalainen, A., et al.	1983	Human	Cell Phones	"EEG Activity of the Human Brain During Exposure to Cellular Phones"	

Bioeffect: EEG activity of the brain altered	Neurological	Kramarenko, A., Ran, U.	1999	Human	High Freq EMFs	"Effects of High-Frequency Electromagnetic Fields on Human EEG: a Brain-Mapping Study"	Plenum Press, New York pp.235-241
Bioeffect: EEG activity of the brain altered	Neurological	Krause et al.	1975	Human	EMFs	"Effects of Electromagnetic Fields Emitted by Cellular Phones on the EEG During A Memory Task"	Bioelectromagnetics 17: 165
Bioeffect: EEG activity of the brain altered	Neurological	Papageorgiou, Nanou, Tsiafakis, Capsalis, et al.	1985	Human	Mobile Phone	"Gender Related Differences on the EEG During a Simulated Mobile Phone Signal"	Journal of Pineal Research 22: 152-162
Bioeffect: EEG changes	Neurological	Hinrikus, Parts, Lass, Tuulik	1983	Human	Microwaves	"Changes in Human EEG caused by Low Level Modulated Microwave Stimulation"	Journal of Pineal Research 22: 152-162
Bioeffect: EEG changes	Neurological	Takashima, S. et al.	2001	In Vivo	EMFs	"The Effects of Low-Energy 60-Hz EMF Upon the Growth Related Enzyme ODC"	Bioelectrochemistry Bioengineering 45: 103-110
Bioeffect: EEG changes	Neurological	Adey, W.F. et al.	1980	In Vivo	EMFs	"Frequency and Power Windowing in Tissue Interaction with Weak Electromagnetic Fields"	
Bioeffect: electromagnetic hypersensitivity	Neurological	Rubin, Das Munshi, Wessely	1995	Human	EMFs	"Electromagnetic Hypersensitivity: A Systematic Review of Provocation Studies"	International Journal of Rad. Biolo. 66: 23-28
Bioeffect: electromagnetic hypersensitivity	Neurological	Hillert, Berglind, Ametz, Bellander	1983	Human	Cell Phones	"Prevalence of Self-Reported Hypersensitivity to Electric or Magnetic Fields in a Population-Based Questionnaire Survey"	
Bioeffect: fatigue	Neurological	Archimbaud et al.	1989	Human	Microwaves	"Acute Myelogenous Leukemia Following Exposure to Microwaves"	
Bioeffect: free radical damage - DNA strands:	Hormonal/Genotoxic	Lai and Singh	1995	In Vivo	Low Microwave Exposure	"Acute Low-Intensity Microwave Exposure Increases DNA Single Strand	International Journal of Radiation Biology, 69(4): 513-521

						Breaks in Rat Brain Cells"	
Bioeffect: free radicals generated in brain, spleen, and liver	Hormonal/Genotoxic	Lai, E.K., et al.	1988	In Vivo	Radiofrequency Radiation	"In Vivo Spin Trapping of Free Radicals Generated in Brain, Spleen, and Liver During Irradiation of Mice"	Bioelectromagnetics 18: 446-454
Bioeffect: free radicals in cell membranes	Hormonal/Genotoxic	Phelan et al.	1982	Human	EMFs	"Brain Cancer and Leukemia Mortality Among Electrical Workers"	
Bioeffect: gene expression effects	Genotoxic	Belyaev et al.		In Vivo	Microwaves	"Affected expression of genes in rat brain cells"	International Journal of Radiation Biology 50(1): pp.47-50
Bioeffect: gene mutations	Hormonal/Genotoxic	Phillips, J.L., et al.	1992	In Vitro	EMFs	"Magnetic field induced changes in specific gene transcription"	
Bioeffect: gene stimulation	Hormonal/Genotoxic	Goodman, R. and A. Henderson	1989	In Vitro			
Bioeffect: genetic changes	Hormonal/Genotoxic	Capone et al.	1998	In Vitro	AMP	"Regulation of the Prepromsomatostatin Gene by Cyclic-AMP in Cerebrocortical Neurons"	
Bioeffect: genetic damage	Hormonal/Genotoxic	Arlett et al.	1993	Human			
Bioeffect: genetic damage	Hormonal/Genotoxic	Baxter	1995	Human		"Carcinogenesis"	
Bioeffect: genetic damage	Hormonal/Genotoxic	Goodman et al.	1987	In Vivo		"Exposure of Human Cells to Low-Frequency Electromagnetic Fields Results in Quantitative Changes in Transcripts"	
Bioeffect: genetic damage	Cancer	Jurkiewicz and Buettner	1998	In Vivo	EMFs	"EPR Detection of Free Radicals in UV-irradiated Skin: Mouse Verses Human"	
Bioeffect: genetic damage	Hormonal/Genotoxic	Lin et al.	1994	Human	EMFs	"Specific Region of the c-myc Promoter is Responsible for Electric and Magnetic Fields"	
Bioeffect: genetic damage in lymphocytes	Hormonal/Genotoxic	d'Ambrosio et al.	1980	In Vitro	Microwave	"Cytogenetic Damage in Human Lymphocytes Following GMSK"	

						Phase Modulated Microwave Exposure"	
Bioeffect: genetic mutations	Hormonal/Genotoxic	Maes, et al.	1996	Human	Microwaves	"954 MHz Microwaves enhance the mutagenic properties of Mitomycin C"	Radiation Environmental Biophys 23(3): 191-201
Bioeffect: headaches	Neurological	Chia, S.E., Chia, H.P., Tan, J.S.	1966	Human	Cell Phones	"Prevalence of Headaches Among Handheld Cellular Telephone Users in Singapore: A Community Study"	Radiation Environmental Biophys 27(1): 39-47
Bioeffect: headaches	Neurological	Frey, A.H.	1998	Human	Cell Phones	"Headaches From Cellular Telephones: Are They Real and What Are The Impacts?"	
Bioeffect: headaches	Neurological	Hocking, B.	2002	Human	Cell Phones	"Preliminary Report: Systems Associated with Mobile Phone Use"	
Bioeffect: headaches	Neurological	Archimbaud et al.	1989	Human	Microwaves	"Acute Myelogenous Leukemia Following Exposure to Microwaves"	
Bioeffect: headaches, fatigue, sleep disturbance, low libido	Neurological	Gordon	2002	Human	Super High EMFs	"Problems of Industrial Hygiene and the Biological Effects of Electromagnetic Super-High Frequency Fields"	
Bioeffect: hearing Loss	Neurological	Uloziene, Uloza, Gradauskiene, Saferis	1994	Human	Cell Phones	"Assesment of Potential Effects of Electromagnetic Fields of Mobile Phones on Hearing"	
Bioeffect: heart rate disturbances	Neurological	Huber, Schuderer, Graf, Jutz, et al.	2001	Human	EMFs	"Radio Frequency Electromagnetic Field Exposure in Humans: Estimation of SAR Distribution in the Brain, Effects on Sleep and Heart Rate"	Bioelectromagnetics 16: 207-210
Bioeffect: Hormonal/ Genotoxic	Hormonal/Genotoxic	Fletcher, W. et al.	1998	In Vitro		"Resistance to the Cytolytic Action of Lymphotoxin and Tumor Necrosis Factor Coincides With the Presence of Gap Junctions Uniting Target Cells"	

Bioeffect: Hormonal: mediation of hormones-luteinizing, testosterone, prolactin, growth	Immune Diseases	Ilondo et al.	1999	In Vitro		"Human Growth Hormone Releases Cytosolic Free Calcium in Cultured Human IM-9 Lymphocytes: a novel mechanism of growth hormone transmembrane signalling"	
Bioeffect: Hormonal: mediation of hormones-luteinizing, testosterone, prolactin, growth	Immune Diseases	Kotwicka and Warchol	1986				BioInitiative
Bioeffect: Hormonal: mediation of hormones-luteinizing, testosterone, prolactin, growth	Immune Diseases	Ray and Wallis	1980	In Vitro	EMF	"Involvement of Calcium Ions in Dopamine Inhibition of Prolactin From Sheep Pituitary Cells"	Biochem Biophys Acta 1132(2): 140-144
Bioeffect: Hormonal: mediation of hormones-luteinizing, testosterone, prolactin, growth	Immune Diseases	Rillema	2000			"Incidence of Leukemia in Occupations with Potential EMF Exposure in U.S. Navy Personnel"	Bran Res Mol Brain Res 60(2): 247-258
Bioeffect: Hormonal: mediation of hormones-luteinizing, testosterone, prolactin, growth	Immune Diseases	Vacher et al.	1991		EMF's	"Pulsing EMFs Induce Cellular Transcription"	
Bioeffect: Hormonal: mediation of hormones-luteinizing, testosterone, prolactin, growth	Immune Diseases	Veldhuis et al.	2006		EMF's	"Effect of Pulsed EMF on Tumor Growth in Mice"	
Bioeffect: hyperactivity	Neurological	Mitchell D, Switzer W, Bronaugh, E.	2003	In Vivo	Microwave Radiation	"Hyperactivity and Disruption of Operant Behavior in Rats after Multiple Exposure to Microwave Radiation"	
Bioeffect: hypertension	Neurological	Forman et al.	1982	Human	Microwaves	"Physiological Symptoms and Interittent Hypertension Following Acute Microwave Exposure"	
Bioeffect: immune system diseases	Hormonal/Genotoxic	Boscol, et al.	1998	Human	RFR	"RFR From Radio Transmission Stations Affects Immune System in Women"	Journal of Cellular Biochemistry 54 30: 281-288
Bioeffect: immune system diseases	Immune Diseases	Charpentier and Kado	1983	In Vitro	EMFs	"Induction of Na+ Channel Voltage	

						Sensitivity in Xenopus Oocytes Depends on Ca ²⁺ Mobilization"	
Bioeffect: immune system diseases	Hormonal/Genotoxic	Fesenko, et al.	1994	In Vivo	RFR	"Change in Immunological Functions in Mice After Exposure to RFR at a Power Density of 0.001 mW/cm ² "	Environmental and Molecular Mutagenesis 28: 26-30
Bioeffect: immune system diseases	Hormonal/Genotoxic	Marinelli, et al.	1993	In Vitro		"Exposure to 900-MHz RFR Affected Cell's Self-Defense Responses"	
Bioeffect: immune system diseases	Hormonal/Genotoxic	Moszczynski, P., et.al.	1999	Human	Microwave Radiation	"The effect of various occupational exposures to microwave radiation on the concentrations of immunoglobulins and T lymphocyte subsets"	Environmental Health Perspective 106(3):101-103
Bioeffect: immune system diseases	Hormonal/Genotoxic	Nakamura, H., et.al.	1997	In Vivo	Microwaves	"Effects of exposure to microwaves on cellular immunity and placental steroids in pregnant rats"	
Bioeffect: immune system diseases	Hormonal/Genotoxic	Novoselova, et al.	2006	In Vivo	Low Intensity RFR	"Low Intensity RFR Affects Functions of the Immune System"	
Bioeffect: immune system diseases	Hormonal/Genotoxic	Veyret, et al.	1990	In Vitro	RF Radiation	"Low Intensity RFR at SAR pf 0.015 W/kg Affects Functions of the Immune System"	
Bioeffect: immune system diseases	Hormonal/Genotoxic	Walleczek, J.	1992	Human	Electromagnetic Fields	"Electromagnetic Field effects on cells of the immune system: the role of calcium signaling:	
Bioeffect: immune system diseases	Cancer	Walleczek	2005	Human	Broadcast Towers	"Report: Environmental Epidemiology Program, State of Hawaii Department of Health"	
Bioeffect: Immune System Suppression	Immune Diseases	Quan, R. et al.	1992	Human	Microwave EMR	"Microwave Heating of Human Breast Mile Significantly Suppressed the Specific Immune System Factors for E. Coli Compared	

						to Conventional Heating"	
Bioeffect: impaired brain activity	Neurological	Hietanen, D, Kovala, T., Hamalainen, A.	1994	Human	Cell Phones	"Human Brain Activity During Exposure to Radiofrequency Fields Emitted by Cellular Phones"	
Bioeffect: increased skin temperature	Cardiovascular	Straume, Oftedal, Johnsson	1986	Human	Cell Phones	"Skin Temperature Increase Caused by a Mobile Phone: A Methodological Infrared Camera Study"	
Bioeffect: ionic changes and transmitter fluxes in cortex	Hormonal/Genotoxic	Kaczmarek and Adey	2005	In Vitro	EMFs	"Weak Electric Gradients Change the Ionic and Transmitter Fluxes in Cortex"	Journal of Occupational Medicine 24(11): 932-934
Bioeffect: Learning ability and performance	Neurological	Salzinger	1987	In Vivo	EMF	"Time Varying Magnetic Fields Cause Cell Transformations"	
Bioeffect: learning and memory deficits	Neurological	Tattersall, et al	1998	Human	Low Intensity RFR	"Low Intensity RFR Can Modulate the Function of the Hippocampus, Which is Involved with Learning and Memory"	
Bioeffect: Mast cells altered	Hormonal/Genotoxic	Johansson, Olle, et al.	2001	Human	TVs / PCs	"Cutaneous Mast Cells are Altered in Normal Healthy Volunteers Sitting in Front of Ordinary TVs/PCs"	
Bioeffect: MEG effects	Neurological	Hinrichs, H., Heinze, H.	1983	Human	Microwaves - GSM	"Effects of GSM Electromagnetic Field on the MEG During an Encoding-Retrieval Task"	
Bioeffect: melatonin	Hormonal/Genotoxic	Stark, K.D.C., et al.	1997	In Vivo	Short wave radio broadcast	"Absence of chronic effect of exposure to shortwave radio signal on salivary melatonin concentrations in dairy cattle"	Wiad Lek 52(1-2): 30-34
Bioeffect: melatonin (pineal) suppression	Hormonal/Genotoxic	Rose, Barber and Lyle	1996	In Vivo	VDT's		Occupational Environmental Medicine 54(9): 676-680
Bioeffect: melatonin (pineal) suppression	Hormonal/Genotoxic	Wilson, B.W. et al	1990	Human	ELF Fields	"Evidence of an effect of ELF electromagnetic fields on human	

						pineal gland function"	
Bioeffect: melatonin and serotonin production decrease	Hormonal/Genotoxic	Wilson, B.W. et al	1962	In Vivo	Cell Phones	"Use of Cellular Phones and the Risk of Brain Tumours: A Case Control Study"	
Bioeffect: melatonin changes and other hormonal changes	Hormonal/Genotoxic	Arnetz et al.	1996	Human	VDTs	"Melatonin and Andrenocorticotropic Hormone Levels in Video Display Unit Workers During Work and Leisure"	FASEB Journal 6: 3176-3185
Bioeffect: melatonin disturbances and sleep disorders		Burch et al.	1999	Human	EMFs	"Geomagnetic disturbances are Associated with reduced nocturnal excretion of melatonin metabolite in humans"	
Bioeffect: melatonin disturbances and sleep disorders	Hormonal/Genotoxic	Burch et al.	1999	Human	EMFs	"Reduced Excretion of a Melatonin Metabolite Among Workers Exposed to 60-Hz Magnetic Fields"	
Bioeffect: melatonin disturbances and sleep disorders	Hormonal/Genotoxic	Burch et al.	2000	Human	Substation Conductors	"Melatonin Metabolite Levels in Workers Exposed to 60-Hz Magnetic Fields: Work in Substations and with 3-phase Conductors"	
Bioeffect: melatonin loss	Hormonal/Genotoxic	Burch et al.	1997	Human	Cell Phone	"Cellular Telephone Use and Excretion of a Urinary Melatonin Metabolite"	
Bioeffect: melatonin loss	Hormonal/Genotoxic	Burch et al.	1998	Human		"Nocturnal Excretion of Urinary Melatonin Metabolite Among Utility Workers"	
Bioeffect: melatonin production decrease	Hormonal/Genotoxic	Wood, Loughran, Stough	1995	Human	Mobile Phone Radiation	"Does Evening Exposure to Mobile Phone Radiation Affect Subsequent Melatonin Production?"	
Bioeffect: melatonin production decreases	Hormonal/Genotoxic	Welker, H.E. et al.	1988	In Vivo	TV Towers		Exp Cell Res 204(2): 385-387
Bioeffect: melatonin production, damaged immune system	Hormonal/Genotoxic	Byus	1986	In Vitro	ELF	"Alterations in Ornithine Decarbox Activity: a cellular	

						response to Low-Energy Electromagnetic Field Exposure"
Bioeffect: melatonin production, damaged immune system	Immune Diseases	Luben	2006			"Electical Wiring Configurations and Childhood Cancer"
Bioeffect: Melatonin reduction	Hormonal/Genotoxic	Lai and Singh	1997	In Vivo	Magnetic Fields	"Melatonin and N-tert-butyl-a-p henylnitron Block 60 Hz Magnetic Field Induced DNA Single and Double Strand Breaks in Rat Brain Cells"
Bioeffect: melatonin reduction	Cardiovascular	de Seze, Ayoub, Peray, Miro, et al.	2001	Human	Cell Phones	"Evaluation of Humans of the Effects of Radiocellular Phones on the Circadian Patterns of Melatonin Secretion, a Chronological Rhythm Marker"
Bioeffect: melatonin reduction	Hormonal/Genotoxic	Stark et al.	1996	In Vivo	EMFs	"Reduced Nocturnal Morphine Analgesia in Mice Following a Magnetic Disturbance"
Bioeffect: melatonin reduction	Hormonal/Genotoxic	Davis, S.	1985	Human	Weak Magnetic Fields	"Weak Residential Magnetic Fields Affect Melatonin in Humans"
Bioeffect: melatonin reduction; calcium ion homeostasis	Hormonal/Genotoxic	Reiter	1998			"Cancer in the Electric Power Industry"
Bioeffect: melatonin secretion reduction	Hormonal/Genotoxic	Jarupat, Kawabata, Tokura, Borkiewicz	1996	Human		"Effects of the 1900 MHz Electromagnetic Field Emitted from Cellular Phone on Nocturnal Melatonin Secretion"
Bioeffect: melatonin suppression	Neurological	Phillips, R.D., L. Anderson, and Kaune	1994	In Vivo	EMFs	"Results of an Epidemiological Cancer Study Among Electrical Workers in Finland"
Bioeffect: melatonin suppression	Hormonal/Genotoxic	Rosen, Barber, Lyle	1998	In Vitro	Magnetic Fields	"A 0.5 G, 60 Hz magnetic field suppresses melatonin production in pinealocytes"

Bioeffect: Melatonin: 6-Hydroxymelatonin excretion	Hormonal/Genotoxic	Bortkeiwicz, Pilacik, Gadzicka, Szymczak	1988	Human	EMFs	"The Excretion of 6-Hydroxymelatonin in Sulfate in Healthy Young Men Exposed to Electromagnetic Fields Emitted by Cellular Phones"	
Bioeffect: memory - impaired short term memory	Neurological	Gibson, R.S. and W.F. Maroney	1995	Human			
Bioeffect: memory loss	Neurological	Koivisto et al.	1998	Human	GSM Phones	"The Effects of Electromagnetic Field Emitted by GSM Phones on Working Memory"	
Bioeffect: memory loss	Neurological	Vrijheid, Cardis, Armstrong, Auvinen, et al.	1982	Human	Mobile Phone	"Validation of Short-term Recall of Mobile Phone Use for the Interphone Study"	
Bioeffect: memory:short-term memory deficit	Neurological	Chiang, et al.	1994	Human	Radio Antennae	"People Who Live and Work Near Radio Antennae and Radar Installations Showed Deficits in Psychological and Short-term Memory Tests"	
Bioeffect: micronuclei increase in somatic cells	Hormonal/Genotoxic	El Nahas and Oraby	1989	In Vivo	ELF	"Micronuclei Formation in Somatic Cells of Mice Exposed to 50-Hz Electric Fields"	
Bioeffect: micronucleus formation	Hormonal/Genotoxic	Scarfi, Lioi, d'Ambrosio et al.	1993	In Vitro	EMFs	"Effects of 50 Hz EMF exposure on micronucleus formation and apoptosis in transformed and nontransformed human cell lines"	Journal of Occupational Medicine 38(11): 1108-1110
Bioeffect: neural function effects	Neurological	Croft, Chandler, Burgess, Barry, et al.	1993	Human	Mobile Phone	"Acute Mobile Phone Operation Affects Neural Function in Humans"	Neuroscience Letter 266(3): 209-212
Bioeffect: neuroblastoma	Neurological	DeRoos, Teschke, Savitz, Poole, et al.	1999	Human	EMFs	"Parental Occupation Exposures to Electromagnetic Fields and Radiation and the Incidence of Neuroblastoma in Offspring"	AM J Epidemiology 150(1): 27-36

Bioeffect: neurochemical production	Neurological	Seegal, R.F.	1991	In Vivo	EMF Exposure	"Effects of Weak Amplitude Modified Microwave Fields on Calcium Efflux"	Journal of Occupational and Environmental Medicine 42(2): 136-142
Bioeffect: neurodegenerative diseases	Neurological	Savitz D, Checkoway H, Loomis D.	1989	Human	Magnetic Fields	"Magnetic Field Exposure and Neurodegenerative Disease Mortality Among Electric Utility Workers"	Annual Review of Research in Biological Effects of electric and magnetic fields from the generation, delivery, and use of electricity, San Diego, CA Nov 9-13, pp.52
Bioeffect: neurological, ocular defects	Neurological	Cleary and Pasternack	1995	Human	Microwaves	"Lenticular Changes in Microwave Workers"	Scand J Work Environmental Health 24(3): 183-189
Bioeffect: neurological, tiredness and headaches	Neurological	Archimbaud et al.	1989	Human	Microwaves	"Acute Myelogenous Leukemia Following Exposure to Microwaves"	
Bioeffect: neuron excitability in the brain increase	Neurological	Jaffe, L.F. and M. Poo	1998	In Vivo		"Relations between amoeboid movement and membrane-controlled electrical currents"	
Bioeffect: neurotransmitter declines	Neurological	Wolpaw, J.R. et al.	1990	In Vivo	Microwaves - Cell Phone	"The Anatomical Distribution of Cerebral Gliomas in Mobile Phone Users"	
Bioeffect: neurotransmitter secretion in the brain	Neurological	Vasquez, Anderson, Lowery, Adey	2006	In Vivo	ELF Fields	"Time-Varying Magnetic Fields: Effect on DNA Synthesis"	
Bioeffect: ODC activity doubles in normal human fibroblasts	Neurological	Cain, C., R. Jones, and R. Adey	1998	In Vitro			
Bioeffect: ODC activity increase: human lymphoma cells	Hormonal/Genotoxic	Byrus, C.V. et al.	1996	In Vitro			
Bioeffect: Performance	Neurological	Calabrese, Spittler, Gehlen	1995	Human	Low Frequency Pulsed RF	"Neuropsychological Performance of Healthy Subjects Under Low Frequency Pulsed RF Fields"	
Bioeffect: performance (human)	Neurological	Hamblin, Wood, Croft, Stough	1990	Human	GSM mobile phones	"Examining the Effects of Electromagnetic Fields Emitted by GSM Phones on Human Event-	

						Related Potentials and Performance During and Auditory Task"	
Bioeffect: performance alterations	Neurological	Graham, C. et al	1999	Human			
Bioeffect: performance alterations	Neurological	Stollery, B.T.	1987	Human	EMFs	"Chronic Effects of 60-Hz Electric and Magnetic Fields on Primate Central Nervous System Function"	
Bioeffect: performance and tympanic temperature effect	Neurological	Curcio, Ferrara, deGennaro, Cristiani, et al.	1997	Human	EMF	"Time-Course of Electromagnetic Field Effects on Human Performance and Tympanic Temperature"	Environmental Molecular Mutation 13(2): 107-111
Bioeffect: Performance changes	Neurological	Salzinger	1987	In Vivo	EMF	"Time Varying Magnetic Fields Cause Cell Transformations"	Bioelectromagnetics Society Annual Meeting, Florida
Bioeffect: performance in visual memory tasks	Neurological	Lass, Tuulik, Ferenets, Riisalo, et al.	1993	Human	Microwaves/ ELF	"Effects of 7Hz-Modulated 450 MHz Electromagnetic Radiation on Human Performance in Visual Memory Tasks"	
Bioeffect: performance of biological systems	Neurological	Anderson, L.E. et al	1987	Human	VDT's	Occupational Study	
Bioeffect: Performance: lowered reaction time	Neurological	Hamblin, Wood, Croft, Stough, et al.	1959	Human	Mobile Phones	"The Sensitivity of Human Event-Related Potentials and Reaction Time to Mobile Phone Emitted Electromagnetic Fields"	Arch Environ Health 53(3): 236-238
Bioeffect: performance: motor and psychological functions	Neurological	Kolodynski, A., and Kolodynska, V.	1997	Human	RF Radiation	"Motor and Psychological Functions of School Children Living in the Area of the Skrunda Radio Location Station in Latvia"	
Bioeffect: Performance: negative effect on biological function	Hormonal/Genotoxic	Frey, A.H.	1996	In Vivo	Modulated RF Energy	"Biological Function as Influenced by Low Power Modulated RF Energy"	
Bioeffect: Performance: negative effect on biological function	Hormonal/Genotoxic	Frey, A.H.	1993	In Vivo	EMFs	"Electromagnetic Field Interactions with Biological Systems"	FASEB Journal 7: 272-281

Bioeffect: Performance: negative effect on biological function	Hormonal/Genotoxic	Frey, A.H.	1991	In Vivo	Low Intensity Nonionizing Radiation	"Evolution and Results of Biological Research with Low Intensity Nonionizing Radiation"
Bioeffect: performance: response time decrease	Neurological	Koivisto, Revonsuo, Krause, et al.	2005	Human		"Effects of 902 MHz Electromagnetic Field Emitted by Cellular Telephones on Response Time in Humans"
Bioeffect: physiological and behavior changes	Neurological	de Lorge J, Ezell C.	1991	In Vivo	Microwaves	"Observing Responses of Rats Exposed to 1.28- and 5.62-GHz Microwaves"
Bioeffect: physiological and behavior changes	Neurological	D'Inzeo, et al.	1984	Human	Low RFR	"Very Low Intensity (0.002-0.004 mW/cm ²) Affects the Operation of Acetylcholine-Related Ion-Channels in Cells"
Bioeffect: pineal gland activity interference	Neurological	Ossenkopp, K.P. et al.	1988	In Vivo		"Review of Epidemiological Studies of the Health Effects of Living Near or Working with Electricity Generation or Transmission Equipment"
Bioeffect: protein synthesis altered	Hormonal/Genotoxic	Goodman, E.E., et al.	1996	In Vivo	Sinusoidal Magnetic Field	"Altered Protein Synthesis in a Cell-free System Exposed to a Sinusoidal Magnetic Field"
Bioeffect: protein synthesis rate dependent	Hormonal/Genotoxic	Aarholt, E. et al.	1982	In Vitro	Magnetic Fields	"Effect of Extremely Low Frequency Pulsed Magnetic Fields on the Mitogenic Response of Peripheral Blood Mononuclear Cells"
Bioeffect: psychological problems	Neurological	Beale et al.	1997	Human	ELF	"Psychological Effects of Chronic Exposure to 50-Hz Magnetic Fields in Humans Living Near Extra- High Voltage Transmission Lines"

Bioeffect: RNA transcription enhanced; RNA synthesis	Hormonal/Genotoxic	Goodman, R. and A. Henderson	1996	In Vitro			
Bioeffect: serotonin production decrease	Hormonal/Genotoxic	Wilson, B.W. et al	1962	In Vivo	Cell Phones	"Use of Cellular Phones and the Risk of Brain Tumours: A Case Control Study"	
Bioeffect: sleep and heart rate disturbances	Neurological	Huber, Schuderer, Graf, Jutz, et al.	2001	Human	EMFs	"Radio Frequency Electromagnetic Field Exposure in Humans: Estimation of SAR Distribution in the Brain, Effects on Sleep and Heart Rate"	
Bioeffect: sleep disorders	Neurological	Abelin, T	1999	Human	Shortwave Transmitters	"Seminar at CRC"	
Bioeffect: sleep disorders and sleep encephalogram	Neurological	Borbely A.A., et al.	1997	Human	Pulsed High Freq EMFs	"Pulsed High-Frequency Electromagnetic Field Effects Human Sleep and Sleep Encephalogram"	
Bioeffect: sleep disturbance	Neurological	Altpeter et al.	1995	Human	Shortwave Transmitters	"Study of Health Effects of Shortwave Transmitter Station of Schwarzenburg, Berne, Switzerland"	Journal of Pineal Research 9(4): 259-269
Bioeffect: sleep disturbances	Neurological	Reite M, Higgs L, Lebet J, Barbault A, et al.	2007	Human	Low energy emissions	"Sleep Inducing Effect of Low Energy Emission Therapy"	Bioelectromagnetics, 18(8): 584-594
Bioeffect: sleep disturbances	Hormonal/Genotoxic	Reiter, R.J. and Robinson, J.	1995	Human		"Melatonin: Your body's natural wonder drug"	
Bioeffect: sleep disturbances	Neurological	Wagner, Roschke, Mann, et al.	1996	Human	EMFs	"Human Sleep Under the Influence of Pulsed Radiofrequency Electromagnetic Fields: A Polysomnographic Study Using Standardized Conditions"	
Bioeffect: sleep disturbances	Neurological	Wood, A.W., et al.	1998	In Vitro	EMFs	"Changes in human plasma melatonin profiles in response to 50 Hz magnetic field exposure"	Journal of Pineal Research 22: 171-176

Bioeffect: sleep disturbances, increased free radical damage	Neurological	Graham et al.	1994	Human	EMFs	"A Dose Response Study of Human Exposure to 60-Hz Electric and Magnetic Fields"	University of Berne, Institute for Social and Preventative Medicine, August, 1995
Bioeffect: sleep disturbances, increased free radical damage	Neurological	Graham et al.	2000	Human	EMFs	"Multi-night Exposure to 60-Hz Magnetic Fields: Effects on Melatonin and its Enzymatic Metabolite"	
Bioeffect: sleep disturbances, increased free radical damage	Neurological	Juutilainen, J. et al.	2000	Human	EMFs	"Nocturnal 6-Hydroxymelatonin in Sulphate Excretion in Female Workers Exposed to Magnetic Fields"	
Bioeffect: sleep disturbances, heart attacks, increased free radical damage	Neurological	Pfluger et al.	1992	Human	Cable Splicers	"Leukemia in Telephone Company Employees"	
Bioeffect: sleep disturbances, heart attacks, increased free radical damage	Neurological	Wilson et al.	2003	Human	EMFs	"Effect of Low-Power Microwave on the Mouse Genome: a Direct DNA Analysis"	
Bioeffect: sleep disturbances, heart attacks, increased free radical damage	Neurological	Wood et al.	2002	Human	Low Frequency	"Childhood Leukemia and Residential Exposure to Weak, Extremely-Low Frequency Magnetic Fields"	Bantam Books, New York
Bioeffect: sleep disturbances, increased free radical damage, reduction of Melatonin	Neurological	Karasek et al.	1998	Human	EMFs	"Chronic Exposure to 2.9mT, 40 Hz Magnetic Field Reduces Melatonin Concentrations in Humans"	
Bioeffect: sleep interference	Neurological	Mann and Roschke	1995	Human	High EMF	"Effects of Pulsed High-Frequency Electromagnetic Fields on Human Sleep"	Journal of Pineal Research 25(2): 116-127
Bioeffect: sleep variables	Neurological	Hamblin, D., Wood, A.	2000	Human	Mobile Phone	"Effects of Mobile Phone Emissions on Human Brain Activity and Sleep Variables"	Bioelectromagnetics 15: 447-463
Bioeffect: sleep: insomnia	Neurological	Pasche, Erman, Hayduk, Mitler, et al.	1992	Human	Low energy emissions	"Effects of Low Energy Emission Therapy in Chronic Psychophysiological Insomnia"	Journal of Pineal Research 28(1): 1-8

Bioeffect: sleep: negative influence on the human circadian rhythms	Neurological	Wever, R.	1974	Human	ELF Fields	"ELF effects on Human Circadian Rhythms	Journal of Pineal Research 28(2): 97-104
Bioeffect: sleep: negative influence on the human circadian rhythms	Neurological	Wever	1999	Human	Microwaves	"Studies of Human Circadian Rhythms Under the Influence of Weak Electric Fields"	
Bioeffect: sleep; affects human sleep EEG	Neurological	Huber, R., Graf, T., Cote, K., Wittman, L., et al.	2005	Human	Pulsed High Freq EMFs	"Exposure to Pulsed High-Frequency Electromagnetic Field During Waking Affects Human Sleep EEG"	
Bioeffect: sleeping and cognitive problems	Neurological	Hutter, Moshammer, Wallner, Kundi	2003	Human	Mobile Phone Base Stations	"Subjective Symptoms, Sleeping Problems, and Cognitive Performance in Subjects Living Near Mobile Phone Base Stations"	
Bioeffect: sodium ion activity neurological-mediation in the brain	Neurological	Charpentier and Kado	2001	In Vitro	EMFs	"Induction of Na ⁺ Channel Voltage Sensitivity in Xenopus Oocytes Depends on Ca ²⁺ Mobilization"	Journal of Pineal Research 25(4): 240-244
Bioeffect: stress hormone increase	Hormonal/Genotoxic	Vangelova, et al.	1995	Human	RFR	"Operators of Satellite Station Exposed to Low Dose RF Radiation Over a 24-Hour Shift Showed an Increase Excretion of Stress Hormones"	Neurophyschobiology 33: 41-47
Bioeffect: Stress Protein increase in Human Cells	Hormonal/Genotoxic	Kwee, et al.	2001	In Vitro	Cell Phone	"Twenty Minutes of Cell Phone RFR Exposure at 0.0021W/kg Increased Stress Protein In Human Cells"	
Bioeffect: stress response: molecular	Hormonal/Genotoxic	de Pomerai, et al.	1971	In Vitro	RFR	"Increase in a Molecular Stress Response in Cells after Exposure to a RFR at a SAR of 0.001W/kg"	
Bioeffect: thermophysiological effects	Neurological	Adair, Kelleher, Mack, Morocco	1998	Human	EMFs	"Thermophysiological Responses of Human Volunteers During Controlled Whole-body Radio Frequency Exposure at 450 MHz"	

Bioeffect: thyroid problems	Immune Diseases	Szmiegielski	1987	Human	various frequencies	"Effects of Electromagnetic Stimuli Inhibition of Responses to PTH by Low-Energy Low-Frequency Fields"	
Bioeffect: tissue heating	Immune Diseases	Saunders, Kowalczuk and Sienkiewicz	1997	Human	EMF		Bioelectromagnetics 19: 123-127
Bioeffect: tissue heating	Immune Diseases	Sienkiewicz, Saunders and Kowalczuk	2001	Human	EMF Exposure	"Effects of Modulated RF Energy on the EEGs of Mammalian Brains"	Pediatrics 89(4): 667-669
Bioeffect: urinary aberrations	Hormonal/Genotoxic	Pfluger, D.M. and Minder, C.E.	1996	Human	Magnetic Fields	"Effects of 16.7 Hz magnetic fields on urinary 6-hydroxymelatonin sulfate excretion of Swiss railway workers"	
Bioeffect: vasodilator response	Neurological	Paraedi, Kharitonov, Hanazawa, Barnes	1997	Human	Mobile Phones	"Local Vasodilator Response to Mobile Phones"	
Bioeffect: Vestibular Organ stimulation	Neurological	Pau, Sievert, Eggert, Wild	1998	Human	EMFs	"Can Electromagnetic Fields Emitted by Mobile Phones Stimulate the Vestibular Organ?"	
Bioeffect: vision: eye function problems	Neurological	Inskip, P.D.	2001	Human	Radiation Exposure	"Frequent Radiation Exposure and Frequency-Dependent Effects: The Eyes Have It"	
Bioeffect: visual response	Neurological	Jech, Sonka, Ruzicka, Nebuzelsky, et al.	1994	Human	Mobile Phones	"Electromagnetic Field of Mobile Phones Affects Visual Event Related Potential in Patients with Narcolepsy"	
Bioeffect: chromosome and g+A258 genome Effects	Genotoxic	Belyaev et al	1992	In Vitro	Microwaves	"Suppression of radiation-induced repair of the genome conformational state of E. coli cells"	Journal of Pineal Research 21(2): 91-100
Bioeffect: chromosome and genome	Genotoxic	Belyaev et al	1996	In Vitro	51.64-51.85 GHz	"Electron-Conformational Interactions on the genome conformational state of E coli AB 1157"	

Birth Defects	Reproductive	Phillips, R.D.	1994	In Vivo	Electric Field Exposure		
Birth Defects: abnormal Development in Human Fetuses	Reproductive	Nordstrom et al.	2005	Human	High EMF	"Cancer Mortality in Males"	National Institute for Working Life 23, Umea, Sweden, pp.84
Birth Defects: abnormalities in developing embryos	Reproductive	Martin, A.H.	1995	In Vivo		"The Risk of Childhood Leukemia from Home Exposure to Resonance from Static and Power Frequency Magnetic Fields."	BioInitiative
Birth Defects: changes in chicken embryo fibroblast cells	Reproductive	Parola, A.H. et al.	2000	In Vivo	High EMF	"Leukemia in Electrical Workers in New Zealand"	BioInitiative
Birth Defects: congenital fetal malformations	Reproductive	Paullson, B.	1992	In Vivo		"Background Radiation, Electrical Work, and Some Other Exposures Associated with Acute Myeloid Leukemia"	
Birth Defects: deformities in embryos and fetuses	Reproductive	Chazan et al.	2000	In Vivo	RF Radiation	"Development of Murine Embryos and Fetuses After Irradiation with 2450 MHz Microwaves"	
Birth Defects: deformities, stunted growth, increased infant mortality	Reproductive	Marino, A.A., and R.O. Becker	2002	In Vivo		"Childhood Leukemia and Exposure to Electricity"	
Birth Defects: diminished growth	Reproductive	Balodis et al	1996	In Vitro	EMFs	"Does The Skrunka Radio Location Station Diminish the Radial Growth of Pine Trees?"	
Birth Defects: dysfunctional gonads	Reproductive	Lancranjan, I. et al.	1997	Human	Microwaves	"Gonadic Function of Workmen with Long-term Exposure to Microwaves"	
Birth Defects: fetal deformities	Hormonal/Genotoxic	Delgado, J.N., and J. Leal et al.	1998	In Vivo	Low Freq EMF	"Embryonic Changes Induced by Weak Extremely Low Frequency Electromagnetic Fields"	
Birth Defects: fetal growth affected and miscarriages	Reproductive	Wertheimer and Leeper	1981	Human	Electric Blankets	"Possible Effects of Electric Blankets and Heated Water Beds on Fetal Development"	

Birth Defects: Infertility	Reproductive	Evans, Savitz, Kanal, and Gillen	1997	Human	Magnetic Resonance Imaging	"Infertility and Pregnancy Outcome Among Magnetic Resonance Imaging Workers"
Birth Defects: low birth weights	Reproductive	Kallen et al.	2007	Human	Microwave	"Nested Case-control Study in US Cohort of Female Physiotherapists Reproductive Outcomes"
Birth Defects: lowered sperm counts	Reproductive	Hjollund, et al.	1983	Human	RFR Radar Systems	"Sperm Counts of Danish Military Personnel, Who Operated Mobile Ground-to-Air Missile Units the use Several RFR Emitting Radar Systems, Were Significantly Lower Compared to References"
Birth Defects: lowered sperm counts	Reproductive	Weyandt et al.	1982	Human	EMFs	"Semen Analysis of Military Personnel Associated with Military Duty Assignments"
Birth Defects: miscarriage	Reproductive	Magras and Xenos	1997	In Vivo	RF Radiation	"RF radiation-induced changes in the prenatal development of mice"
Birth Defects: miscarriage	Reproductive	Belanger et al.	2006	Human	Electric blankets	"Spntaneous Abortion and Exposure to Electric Blankets and Heated Water Beds"
Birth Defects: miscarriage	Reproductive	Chou et al.	2006	Human		
Birth Defects: miscarriage	Reproductive	Goldhaber	1989	Human	VDTs	"The Risk of Miscarriage and Birth Defects Among Who Use Visual Display Terminals During Pregnancy"
Birth Defects: miscarriage	Reproductive	Goldsmith, J.R.	1996	Human	Cell phone	"Epidemiological Studies of Radiofrequency Radiation: Current Status and Areas of Concern"
Birth Defects: miscarriage	Reproductive	Hocking, B., and Joyner, K.	2005	Human	EMFs	"Miscarriages Among Physical Therapists Who Report Using Radio

						and Microwave Frequency Electromagnetic Radiation"	
Birth Defects: miscarriage	Reproductive	Juutilainen, J. et al.	1999	Human		"Early Pregnancy Loss and Exposure to 50-Hz Magnetic Fields"	
Birth Defects: miscarriage	Reproductive	Lindbohm, M. et al.	1992	Human	VDTs	"Magnetic Fields of Video Display Terminals and Spontaneous Abortion"	The Science of the Total Environment, 180: 3-8
Birth Defects: miscarriage	Reproductive	Nawrot, McRee and Galvin	1993	In Vivo	Microwave Radiation	"Teratogenic, Biochemical, and Histological Studies with Mice Prenatally Exposed to 2.45 GHz Microwave Radiation"	
Birth Defects: miscarriage	Reproductive	Ouellet-Hellstrom and Stewart	1993	Human	Radiation	"Miscarriages Among Physical Therapists Who Report Using Radio and Microwave Frequency Electromagnetic Radiation"	
Birth Defects: miscarriage	Reproductive	Robert, E.	1996	Human	EMFs	"Intrauterine Effects of Electromagnetic Fields - Low Frequency, Mid-Frequency RF, and Microwave"	Am Journal of Epidemiology 136:1041-1051
Birth Defects: miscarriage	Reproductive	Vijayalaxmi et al.	1979	Human	EMFs	"Suppression of T-Lymphocyte Cytotoxicity Following Exposure to 60-Hz Sinusoidal Electric Fields"	
Birth Defects: miscarriage	Reproductive	Magras and Xenos	1978	In Vivo	Elecblankets	"Magnetic Field Exposure from Electrical Appliances and Childhood Cancer"	Am Journal of Epidemiology 138(10):775-786
Birth Defects: reduced weight in newborns	Reproductive	Berman et al.	2001	In Vivo		"Reduced Weight in Mice Offspring After in Utero Exposure to 2450 MHz (CW) Microwaves"	
Birth Defects: reproductive problems	Reproductive	Rosenthal and Beerling	2004	Human	EMFs		
Birth Defects: reproductive problems	Reproductive	Mild et al.	2000	Human	Elecblankets	"Possible Effects of Electric Blankets and Heated Waterbeds on Fetal	

						Development"	
Birth Defects: S.I.D.S.	Neurological	O'Connor and Persinger	2001	Human	High EMF	"Occupational Exposure to EMF's and the Occurrence of Brain Tumors"	
Birth Defects: S.I.D.S. and behavioral disorders	Neurological	Cognill	2001	Human		Moscow Embassy Study	
Birth Defects: severe structural deformities in the brain	Hormonal/Genotoxic	Hansson, H.A.	2006	In Vivo		Occupational Study	
Brain	Cancer	Cherry, Neil	1992	Human	Cell Phones	"Cell Phone Radiation Poses a Serious Biological and Health Risk"	
Brain	Cancer	Cherry, Neil	2005	Human	GSM base stations	"Health Effects Associated with Mobile Base Stations in Communities: The Need for Health Studies"	New Scientist Oct 25, 1997, p.17
Brain and Breast	Cancer	Cherry, Neil	1992	Human	EMR	"The Electromagnetic Radiation Health Threat"	
Brain:	Neurological	Maier, Blakemore, Koivisto	1988	Human	Mobile Phones	"The Health Hazards of Mobile Phones"	
Brain:	Neurological	Nam, K, Kim, SW, Kim, SC, Kim, DW	1998	Human	Cell Phones	"Effects of RF Exposure of Teenagers and Adults by CDMA Cellular Phones"	
Brain:	Neurological	Navarro, Segura, Portoles, de Mateo	1983	Human	Microwave	"The Microwave Syndrome: A Preliminary Study in Spain"	
Brain:	Neurological	Wilen, Sandstrom, Mild	1977	Human	Radiofrequency	"Subjective Symptoms Among Mobile Phone Users-A Consequence of Absorption of Radiofrequency Fields?"	
Brain: altered blood brain barrier	Neurological	Albert, E. N.	1985	In Vitro	Mircrowave Irradiation	"Light and Electrom Microscopic Observations on the Blood-Brain-Barrier after Mircrowave Irradiation"	

Brain: altering blood brain barrier	Neurological	Oscar and Hawkins	1990	In Vivo	Microwave Radiation	"Microwave Alteration of the Blood-Brain Barrier System of Rats"
Brain: blood brain barrier	Neurological	Frey, A.H. et al.	1992	In Vivo	EMFs	"Neural Function and Behavior: Defining the Relationship"
Brain: blood brain barrier affected	Neurological	Chang, B.K. et al.	1999	In Vitro	Microwave Radiation	"The Effect of Microwave Radiation (1.0 GHz) on the Blood-Brain-Barrier"
Brain: blood brain barrier affected	Hormonal/Genotoxic	Leszczynski, Joenvaara, Reivinen, Kuokka	1992	In Vitro	Mobile Phone Radiation	"Non-thermal Activation of the hsp27/p38MAPK Stress Pathway by Mobile Phone Radiation in Human Endothelial Cells"
Brain: cerebral gliomas	Hormonal/Genotoxic	Ali Khan, O'Brien, Kelly, Phillips, et al.	2003	Human	Mobile Phones	"The Anatomical Distribution of Cerebral Gliomas in Mobile Phone Users"
Brain: neurological	Neurological	Adair, Cobb, Mylacraine, Kelleher	1999	Human	Radio Freq EMF	"Human Exposure at Two Radio Frequencies (450 and 2450 MHz): Similarities and Differences in Physiological Responses"
Brain: neurological	Neurological	Ahissar, Haidariu, Zacksenhouse	1997	In Vivo	Microwaves	"Decoding Temporally Encoded Sensory Input by Cortical Oscillations and Thalamic Phase Comparators"
Brain: neurological	Neurological	Becker and Seldon	1985	Human	EMFs	"The Body-Electric-Electromagnetism and the Foundation of Life"
Brain: neurological	Neurological	Chia, S.E., Chia, H.P., Tan, J.S.	1966	Human	Cell Phones	"Health Hazards of Mobile Phones"
Brain: neurological	Neurological	Coggon, D.	2003	Human	Mobile Phones	"Health Risks from Mobile Phone Base Stations"
Brain: neurological	Neurological	Dec, S., Cieslak, E., Miszczak, J.	1988	Human	Cell Phones	"Electroencephalographic Frequency Mapping in Healthy Subjects During Cellular Head Telephone"

						Stimulation"	
Brain: neurological	Neurological	Hladky et al.	2003				". Proc Nat Acad Sci USA 94:11633-11638
Brain: neurological	Neurological	Lebedeva et al.	1993	Human	EMFs	"Investigation of Brain Potentials in Sleeping Humans Exposed to the Electromagnetic Field of Mobile Phones"	
Brain: neurological	Neurological	Lilienfeld et al.	2005	Human	EMFs	"Foreign Service Health Status Study-Evaluation of Health Status of Foreign Service and Other Employees from Selected Eastern European Posts"	
Brain: neurological	Neurological	Mann, Wagner, Brunn, Hassan, Hiemke, Roschke	1953	Human	High EMFs	"Effects of Pulsed High-Frequency Electromagnetic Fields on the Neuroendocrine System""	
Brain: neurological	Neurological	McLaughlin, J.R.	1990	Human	Power lines	"A Survey of Possible Health Hazards from Exposure to Microwave Radiation"	
Brain: neurological	Neurological	Oftedal, Wilen, Sandstrom, Mild	2007	Human	Mobile Phone	"Symptoms Experienced in Connection with Mobile Phone Use"	
Brain: neurological	Neurological	Owen, R.D.	1996	Human	Mobile Phones	"Possible Health Risks of Radiofrequency Exposure from Mobile Telephones"	
Brain: neurological	Neurological	Preece, A.W.	1987	Human	Cell Phones	"Mobile Phones and Human Heads"	
Brain: neurological	Neurological	Robinette et al.	2006	Human	VDT's	"Embryonic Changes Induced by Weak Extra-Low Frequency EMF's"	
Brain: neurological	Neurological	Rubin, Hahn, Everitt, Cleare, et al.	1998	Human	Mobile Phones	"Are Some Participants Sensitive to Mobile Phone Signals? Within Participants Double Blind Randomised Provocation Study"	

Brain: neurological	Neurological	Samkange-Zeeb, Berg, Blettner	1996	Human	Cell Phones	"Validation of Self-Reported Cellular Phone Use"
Brain: neurological	Neurological	Santini, R, Santini, P, LeRuz, P, Danze, J	2005	Human	Cell Phone Base Stations	"Survey Study of People Living in the Vicinity of Cellular Phone Base Stations"
Brain: neurological	Neurological	Szmigielski	1995	Human	RF Radiation	"Effects of Chronic Microwave Irradiation on Mice"
Brain: permeability of the blood brain barrier	Hormonal/Genotoxic	Persson, Salford, Brun	1983	In Vivo	EMFs	"Blood-brain Barrier Permeability in Rats Exposed to Electromagnetic Fields Used in Wireless Communication"
Brain: permeability of the blood brain barrier	Neurological	Salford et al.	2001	In Vivo	Radiation	"Permeability of the Blood Brain Radiation on Cytolytic T Lymphocytes"
Calcium efflux decrease	Hormonal/Genotoxic	Bawin, S.M. and W.R. Adey	1976	In Vitro	Microwaves	"Effects of Weak Amplitude Modulated Microwave Fields on Calcium Efflux on Awake Cat Cerebral Cortex"
Calcium Ion Efflux	Hormonal/Genotoxic	Joines, W.T, and Blackman, C.F.	1982	In Vitro		"Power Density, Field Density and Carrier Frequency Determinants of RF Energy-Induced Calcium Ion Efflux from Brain Tissue"
Calcium ion efflux	Hormonal/Genotoxic	Albert, Bray, Lewis, Raff, Roberts, Watson	1987	In Vivo	Radio Freq EMF	"Effect of Amplitude Modulated 147 MHz Radiofrequency on Calcium Ion Efflux from Avian Brain Tissue"
Calcium ion efflux	Hormonal/Genotoxic	Adey	1979	In Vivo	Microwaves	"Neurophysiologic Effects of Radiofrequency and Microwave Radiation"
Calcium ion efflux	Hormonal/Genotoxic	Bawin et al.	1978	In Vitro	EMFs	"Ionic Factors in Release of $^{45}\text{Ca}^{2+}$ from Chicken Cerebral Tissue by Electromagnetic Fields"

Calcium ion efflux	Hormonal/Genotoxic	Bawin, Sheppard and Adey	1978	In Vivo	Low EMFs	"Possible Mechanisms of Weak Electromagnetic Field Coupling with Brain Tissue"	
Calcium ion efflux	Hormonal/Genotoxic	Ghosh and Greenburg	1992	In Vitro	Cellular	"Calcium Signaling in Neurons: Molecular Mechanisms and Cellular Consequences"	
Calcium ion efflux	Hormonal/Genotoxic	Hadden	1983	Human		Occupational Study	
Calcium ion efflux	Hormonal/Genotoxic	Metcalf et al.	1999	In Vitro	EMF's	"Wild Type p53 Protein Shows Calcium-dependent Binding of F-actin"	
Calcium ion efflux	Hormonal/Genotoxic	Schwartz et al.	1990	In Vitro	VHF fields	"Exposure of frog hearts to CW or amplitude modulated VHF fields: selective efflux of calcium ions at 16 Hz"	
Calcium ion efflux	Hormonal/Genotoxic	Schwartz et al.	1992	In Vivo	EMFs	"Electron Microscope Observation on Rat Cerebellum and Hippocampus After Exposure to 60-Hz Electric Fields"	
Calcium ion efflux and cell damage	Hormonal/Genotoxic	Li et al.	1999	In Vitro	EMF	"Effects of 50 Hz Magnetic Fields on Gap Junction Intercellular Communication"	
Calcium ion efflux and cell damage	Hormonal/Genotoxic	Zurawska and Nowak	2000	Human	EMFs	"Testicular Cancer and Electromagnetic Fields in the Workplace: results of a population based case-control study in Germany"	
Calcium ion efflux/influx	Hormonal/Genotoxic	Bawin and Adey	1976	In Vitro	Low EMFs	"In Vitro Study of Microwave Effects on Calcium Efflux in Rat Brain Tissue"	
Calcium ion efflux/influx	Hormonal/Genotoxic	Kaczmarek and Adey	2006	In Vivo		"The Efflux of $^{45}\text{Ca}^{2+}$ and ^3H -Gamma-Aminobutyric Acid From Cat Cerebral Cortex"	Bioelectromagnetics 11: 349-358
Calcium ion efflux/influx	Hormonal/Genotoxic	Liburdy, R.P., et al.	1993	Human	EMF	"Experimental Evidence for 60 Hz Magnetic Fields"	

						Operating Athrough the Signal Transduction Cascade-effects on calcium ion influx and c-MYC mRNA Induction"	
Calcium ion eflux/influx	Hormonal/Genotoxic	Lin-Liu, S. and Adey, W.R.	2006	In Vitro	Microwave Fields	"Low Frequency Amplitude Modulated Microwave Fields Change Calcium Efflux Rates from Synaptomes"	Bioelectromagnetics 20(5): 290-294
Calcium ion eflux/influx	Hormonal/Genotoxic	Litovitz et al.	1990	Human	Cell & VDT's	"Amplitude Windows and Transiently Augmented Transcription from Exposure to Electromagnetic Fields"	
Calcium ion eflux/influx	Hormonal/Genotoxic	Wei et al.	2006	Human	Radar Beams	"Airport Radar and Incidence of Cancer in Wichita"	
Calcium ion influx	Hormonal/Genotoxic	Davis et al.	1986	In Vitro		"Actions of Calcium Ions and Calcium Influx Blocker on Basal TRH- and GnRH-stimulated Hormone Release In Patients With Pituitary Adenomas"	
Cancer	Cancer	Ahlbom, Cardis, Green, et al.	2001	Human	EMFs	"Review of the Epidemiological Literature on EMF and Health"	FEBS Letter 334(3): 301-308
Cancer	Cancer	Armstrong, Theriault, Guenel et al.	1994	Human	Pulsed Electromagnetic Fields	"Association Between Exposure to Pulsed Electromagnetic Fields and Cancer in Electrical Workers in Quebec, Canada, and France"	
Cancer	Cancer	Balcer-Kubiczek and Harrison	1985		Microwaves	"Evidence for Microwave Carcinogenesis"	Bioelectromagnetics 11(4): 297-312
Cancer	Cancer	Band et al.	1990	Human	Radio Towers	"Mortality and Cancer Incidence in a Cohort of Commercial Airline Pilots"	
Cancer	Neurological	Baranski and Czerski	1976		EMFs	"Biological Effects of Microwaves"	
Cancer	Cancer	Baxter	1995	Human		"Carcinogenesis"	

Cancer	Cancer	Bini et al.	1988	Human	EMFs	"Exposure of Workers to Intense RF Electric Fields That Leak From Plastic Sealers"	
Cancer	Cancer	Blackman, C.F.	1990	Human	ELF	"ELF Effects on Calcium Homeostasis"	
Cancer	Cancer	Boice, J.D., McLaughlin, J.K.	1995	Human	Cell Phones	"Epidemiological Studies of Cellular Telephones and Cancer Risk-a Review"	
Cancer	Cancer	Bullman et al.	2000				Dowden, Hutchinson and Ross, Inc. Stroudsburg, Pennsylvania
Cancer	Cancer	Cherry, N.	2000	Human	Radio/TV Transmitters	"Cancer Incidence Near Radio and Television Transmitters in Great Britain"	
Cancer	Cancer	Cooper, Hemmings, Saunders	1979	Human	Radio/TV Transmitters	"Cancer Incidence Near Radio and Television Transmitters in Great Britain"	
Cancer	Cancer	Del Regato, Spjut and Cox	1998	Human		"Cancer-Diagnosis, Treatment and Prognosis"	"Extremely low frequency electromagnetic fields: The question of cancer", BW Wilson, RG Stevens, LE Anderson Eds, Publ. Battelle Press Columbus: 1990; 187-208
Cancer	Cancer	DeVita, Hellman and Rosenberg	1999	Human	EMF	"Important Advances in Oncology"	
Cancer	Cancer	Dosemeci, M. and Blair, A.	1989	Human	Telephone Industry	"Occupational Cancer Mortality Among Women Employed in the Telephone Industry"	
Cancer	Cancer	Dreyer, Loughlin, Rothman	2001	Human	Cell Phones	"Cause-Specific Mortality in Cellular Telephone Users"	
Cancer	Cancer	Dreyer, Loughlin, Rothman	1998	Human	Cell Phones	"Epidemiological Safety Surveillance of Cellular Telephones in the US"	

Cancer	Cancer	Finklestein, M., et al.	1990	Human	Hand-held Radar	"Cancer Incidence Among Ontario Police Officers"	
Cancer	Cancer	Florig H, Hoburg J.	1995	Human	Electric Blankets	"Power-Frequency Magnetics Fields from Electric Blankets"	
Cancer	Neurological	Freude et al.	2001	Human	Microwaves	"Effects of Microwaves Emitted by Cellular Phones on Human Slow Brain Potentials"	
Cancer	Cancer	Frey, A.H.	1995	Human		"An Integration of the Data on Mechanisms with Particular Reference to Cancer"	
Cancer	Cancer	Funch, Rothman, Loughlin, Dreyer	1991	Human	Cell Phones	"Utility of Telephone Company Records for Epidemiological Studies of Cellular Telephones"	
Cancer	Cancer	Goldsmith, J.R.	1966	Human	Microwaves	"Incorporation of Epidemiological Findings into Radiation Protection Standards Public"	
Cancer	Cancer	Goldsmith, J.R.	1995	Human	Microwaves	"Epidemiological Evidence of Radiofrequency Radiation (Microwave) Effects on Health in Military, Broadcasting, and Occupational Studies"	
Cancer	Cancer	Goldsmith, J.R.	1997	Human	TV Broadcast Towers	"TV Broadcast Towers and Cancer: The End of Innocence for Radiofrequency Exposures"	
Cancer	Cancer	Grayson, J.K., and Lyons, T.J.	1985	Human		"Cancer Incidence in the United States Air Force"	R.G. Landes Company Medical Intelligence Unit, Austin Texas
Cancer	Cancer	Groves, Page, Gridley, Lisimaque, et al.	2003	Human	EMFs	"Cancer in Korean War Navy Technicians: Mortality Survey After Forty Years"	

Cancer	Cancer	Hallberg, O.	2005	Human	EMFs	"Adverse Health Indicators Correlating with Sparsely Populated Areas in Sweden"	
Cancer	Cancer	Hallberg, O., Johansson, O.	2002	Human	Mobile Handsets	"Mobile Handset Output Power and Health"	International Journal of Occupational and Environmental Health 1, pp. 47-57
Cancer	Cancer	Hardell, Holmberg, Walker, Paulsson	1995	Human	Low EMFs	"Exposure to Extremely Low Frequency Electromagnetic Fields and the Risk of Malignant Diseases-an evaluation of epidemiological and experimental findings"	American Journal of Industrial Medicine 32: 689-692
Cancer	Cancer	Henderson, A. et al.	1998	Human			
Cancer	Neurological	Hermann, D., Hossmann, K.	1996	Human	Mobile Phones	"Neurological Effects of Microwave Exposure Related to Mobile Communication"	
Cancer	Cancer	Ivaschuk, et al.	1989	In Vitro	Cell Phone RFR	"Short Term Exposure to Cellular Phone RFR of Very Low SAR (26mW/kg) Affected a Gene Related to Cancer"	
Cancer	Cancer	Johansen, Boice, McLaughlin, Olsen	2000	Human	Cell Phones	"Cellular Telephones and Cancer - A Nationwide Cohort Study in Denmark"	
Cancer	Cancer	Johanson, C., and Olsen, J.H.	1974	Human	Utilities	"Risk of Cancer Among Danish Utility Workers-A Nationwide Cohort Study"	European J. of Cancer, Suppl 1: 3-107
Cancer	Cancer	Kundi, Mild, Hardell, Mattson	2002	Human	Cell Phones	"Mobile Telephones and Cancer: A Review of Epidemiological Evidence"	
Cancer	Cancer	Lagorio, Rossi, Vecchia, DeSantis, et al.	2001	Human	Radiofrequencies	"Mortality of Plastic-Ware Workers Exposed to Radiofrequencies"	

Cancer	Cancer	Lester, J. R.	1985	Human	EMFs	"Reply to: Cancer Mortality and Air Force Bases"	
Cancer	Cancer	Lester, J.R. and D.F. Moore	1994	Human	Electromagnetic Radiation	"Cancer Incidence and Electromagnetic Radiation"	
Cancer	Cancer	Lilienfeld et al.	1978	Human	EMFs	"Foreign Service Health Status Study-Evaluation of Health Status of Foreign Service and Other Employees from Selected Eastern European Posts"	
Cancer	Cancer	Mader D, Peralta S.	1976	Human	Magnetic Fields	"Residential Exposure to 60-Hz Magnetic Fields from Appliances"	
Cancer	Cancer	Moulder, Erdreich, Malyapa, et al.	1983	Human	Cell Phones	"Cell Phones and Cancer: What is the evidence for a connection?"	
Cancer	Cancer	Muhm, J.M.	1999	Human	EMFs	"Mortality Investigation of Workers in an Electromagnetic Pulse Test Program"	
Cancer	Cancer	Park, R.L.	1991	Human	Cell Phones	"Cellular Telephones and Cancer: How Should Science Respond?"	
Cancer	Cancer	Parslow, Hepworth, McKinney	1996	Human	Cell Phones	"Recall of Past Use of Mobile Phone Handsets"	Final Report to the US Dept of State (Contract #6025-619073)
Cancer	Cancer	Reiter, R.J.	1994	In Vitro	ELF EMFs	"Melatonin suppression by static and extremely low frequency electromagnetic fields:relationship to the reported increased incidence of cancer"	
Cancer	Cancer	Robinette	2005	Human	EMFs	"Electrical Workers: An Analysis of Cancer Registration in England"	
Cancer	Cancer	Robinette et al.	2006	Human	VDT's	"Working with Visual Display Units"	

Cancer	Cancer	Rothman, Chou, et al.	2003	Human	Cell Phones	"Assesment of Cellular Telephone and Other Radio Frequency Exposure for Epideiological Research"	
Cancer	Cancer	Rothman, K. J.	1991	Human	Cell Phones	"Epidemiological Evidence on Health Risks of Cellular Telephones"	
Cancer	Cancer	Savitz, D.A. et al.	1988	Human	Magnetic Fields	"Case-control study of childhood cancer and exposure to 60 Hz magnetic fields"	Reviews on Environmental Health 10(3-4)" 171-186
Cancer	Cancer	Savitz et al.	1991	Human	EMFs	"Power Frequency Electric Field Induced Biological Changes in Successive Generations of Mice"	
Cancer	Cancer	Savitz, D.A.	2005	Human	EMFs	"Environmental Exposures and Childhood Cancer: Our Best May Not Be Good Enough"	
Cancer	Cancer	Schreiber, Swaen, Geijers, et al.	1996	Human	Electrical Transmission Equipment	"Cancer Mortality and Residence Near Electricity Transmission Equipment: A Retrospective Cohort Study"	
Cancer	Cancer	Selvin, S. et al.	1992	Human	EMFs	"Distance and risk measures for the analysis of spatial data: a study of childhood cancers"	
Cancer	Cancer	Selvin et al.	1988	Human	EMF Exposure	"The Effect of Continuous Exposure of Low Frequency Electric Fields on Three Generations of Mice"	Am Journal of Epidemiology 128: 21-28
Cancer	Cancer	Szmigielski, S.	1996	Human	Radiofrequency & Microwave	"Cancer morbidity in subjects occupationally exposed to high frequency (radiofrequency and microwave) electromagnetic radiation"	
Cancer	Cancer	Szmigielski, S. et al.	1986	Human	ELF exposure	"Sensitivity of Calcium Binding in Cerebral Tissue to Weak	

						Environmental Electric Fields"	
Cancer	Cancer	Tornqvist, S. et al.	2002	Human	Static Magnetic Fields	"SCE-Frequencies Following Exposure to Magnetic Fields"	
Cancer	Cancer	Vagero, D. et al.	1997	Human	EMF's	"Transcriptional Patterns in X Chromosome of Sciera Following Exposure to Magnetic Fields"	Soc.Sci. Med. 34(7): 769-777
Cancer	Cancer	Valberg, P.A.	1998	Human	Radio Freq Radiation	"Radio Frequency Radiation (RFR): The Nature of Exposure and Carcinogenic Potential"	
Cancer	Cancer	Verkasalo P, Pukkala E, Kapiro J, et al.	1992	Human	High Voltage Power Lines	"Magnetic Fields of High Power Voltage Lines and Risk of Cancer in Finnish Adults"	"Science of the Total Environment Vol, 180 pp.9-17
Cancer	Cancer	Vijayalaxmi et al.	1997	In Vivo	Radiofrequency	"Frequency of micronuclei in the peripheral blood and bone marrow of cancer-prone mice chronically exposed to 2450 MHz radiofrequency radiation"	
Cancer	Cancer	Vrijheid, Deltour, Krewski, Sanchez, et al.	1974	Human	Mobile Phone	"The Effects of Recall Errors and of Selection Bias in Epidemiological Studies of Mobile Phone Use and Cancer Risk"	
Cancer	Cancer	Wertheimer and Leeper	2006	Human	Electrical Wires	"Adult Cancer Related to Electrical Wire Near the Home"	
Cancer	Cancer	Wiedemann, P., Schutz, H.	1978	Human	EMFs	"The Precautionary Principle and Risk Perception: Experimental Studies in the EMF Area"	
Cancer/Cardio	Cancer/Cardiovascular	Gey, K.F.	1993	Human		"Prospects for the prevention of free radical disease, regarding cancer and cardiovascular disease"	
Cancer:	Cancer	Floderus, Tornqvist, Stenlund	1971	Human	Railways	"Incidence of Selected Cancers in Swedish Railway Workers,	Radiation Research 147: 495-500

						1961-1979"	
Cancer:	Malignant Neoplasm	Howe and Lindsay	1999	Human			
Cancer: In childhood	Cancer	Maes, et al.	1980	Human	Power lines	"Case Caontrol Study of Childhood Cancer and Exposure to 60-Hz Magnetic Fields	
Cancer: accelerates malignant growth of cancer cells	Cancer	Phillips, J.L. and W.D. Winters	1995	In Vitro	Electric and Magnetic Field	"In Vitro Exposure to EMFs: Changes in Tumor Cell Properties"	
Cancer: Acoustic Neuroma	Cancer	Christensen, Schuz, Kosteljanetz, et al.	1996	Human	Cell Phones	"Cellular Telephone Use and the Risk of Acoustic Neuroma"	British Medical Bulletin 49(3): 679-699
Cancer: Acoustic Neuroma	Neurological	Lonn, Ahlbom, Hall, Fetching, et al.	1996	Human	Cell Phones	"Mobile Phone Use and the Risk of Acoustic Neuroma"	
Cancer: Acoustic Neuroma	Neurological	Schoemaker, M.J., et al.	1985	Human	Cell Phones	"Mobile Phone Use and the Risk of Acoustic Neuroma: Results of the Interphone Case-control Study in Five North European Countries"	
Cancer: Acoustic Neuroma	Cancer	Takebayashi, Akiba, Kikuchi, Taki, et al.	1985	Human	Mobile Phone	"Mobile Phone Use and Acoustic Neuroma Risk in Japan"	
Cancer: Acoustic Neuroma and Meningioma	Cancer	Hardell et al.	1997	Human	Cell Phones	"Case-Control Study in Cellular and Cordless Telephones and the Risk for Acoustic Neuroma or Meningioma in Patients"	
Cancer: benign tumors and malignant tumors	Cancer	Chou et al.	1999	In Vivo		"Long Term, Low-Level Microwave Irradiation of Rats"	
Cancer: Brain	Cancer	Berg, Schuz, Samkange-Zeeb, Blettner	1982	Human	Cell Phones	"Assesment of Radiofrequency Exposure from Cellular Telephone Daily Use in an Epidemiological Study: German Validation Study of the International Case-Control Study of Cancers of the Brain-Interphone -Study"	

Cancer: Brain	Cancer	Gurney J., Van Wijngaarden, E.	2007	Human	EMFs	"Extremely Low Frequency Electromagnetic Fields (EMF) and Brain Cancer in Adults and Children: Review and Comment"
Cancer: Brain	Cancer	Kheifets, L.	2000	Human	EMFs	"Electric and Magnetic Field Exposure and Brain Cancer: A Review"
Cancer: Brain	Cancer	Lissonin, P., et al.	2005	Human		"A Clinical Study of the Pineal Gland Activity in Oncologic Patients"
Cancer: Brain	Cancer	Muscat, Malkin, Thompson, Shore, et al.	1997	Human	Cell Phone	"Handheld Cellular Telephone Use and the Risk of Brain Cancer"
Cancer: Brain	Cancer	Muscat, Stellman, Malkin, Thompson, et al.	2000	Human	Cell Phones	"Handheld Cellular Telephones and Brain Cancer Risk"
Cancer: Brain	Cancer	Park, R.M., et al.	2001	Human		"Brain Cancer Mortality at a Manufacture of Aerospace Electrochemical Systems"
Cancer: Brain	Cancer	Peters	1987	Human	RF/ELF / duration	"Brain Tumor Mortality Risk Among Men with Electrical and Electronic Jobs"
Cancer: Brain	Cancer	Preston-Martin et al.	1980	Human	EMFs	"Effects in Human Lymphocytes of Power Frequency Electric Fields"
Cancer: Brain	Cancer	Reif, J.S., et al.	1980	Human	EMF	"Immunological and Cancer-Related Effects of Exposure to Low-Level Microwave and RF Fields"
Cancer: Brain	Cancer	Villeneuve P, Agnew D, Johnson K, et al.	1979	Human	Magnetic Fields	"Brain Cancer and Occupational Exposure to Magnetic Fields Among Men: Results from a Canadian Population-based Case-control Study"

Cancer: Brain	Cancer	Wilkins et al.	2001	Human	GSM mobile phones	"Lymphomas in Transgenic Mice Exposed to Pulsed 900-mHz EMFs"
Cancer: Brain	Cancer	Zheng, T., et al.	2001	Human	EMFs	"Occupational Risk Factors for Brain Cancer: A Population-based Case-Control Study in Loaw"
Cancer: Brain	Cancer	Zimmerman, S.M., Zimmerman, R.W.	1997	Human	Cell Phones	"Handheld Cellular Telephones and Brain Cancer Risk"
Cancer: Brain and Breast	Cancer	Savitz	1990	Human	EMFs	"Animal Studies on the Role of 50/60-Hertz Magnetic Fields in Carcinogenesis"
Cancer: Brain and Central Nervous System	Cancer	Thomas, Stolley, Stemhagan, et al.	1994	Human	Magnetic Fields	"Brain Tumor Mortality Risk Among Men with Electrical and Electronic Jobs: A Case-control Study"
Cancer: Brain and Leukemia	Cancer	Fear, et al.	1994	Human		"Cancer in Electrical Workers: An Analysis of Cancer Registrations in England, 1981-1987"
Cancer: Brain and Leukemia	Cancer	Loomis, D.P. and D.A. Savitz	1996	Human		"Mortality From Brain Cancer and Leukemia Among Electrical Workers"
Cancer: Brain and Leukemia	Cancer	Theriault	2005	Human	EMFs	"Agar-Bridge System for Exposing Cell Cultures to Electric Fields"
Cancer: Brain and Lymphatic/Hemato poietic	Cancer	Morgan, Kelsh, Zhao, et al.	1983	Human	Radiofrequency	"Radiofrequency Exposure and Mortality from Cancer of the Brain and Lymphatic/Hemato poietic Systems"
Cancer: Brain and Neuroblastoma	Cancer	Spitz and Johnson	1998	Human	EMFs	"Chronic Exposure of Primates to 60-Hz Electric and Magnetic Fields"
Cancer: Brain Tumors	Cancer	Adey, Byus, Cain, Haggren, Higgins, Jones, Kean, Kuster, MacMurray, Phillips, Stagg,	1996	In Vivo	Cellular Phone Fields	"Brain Tumor Incidence in Rats Chronically Exposed to Digital Cellular Telephone Fields in an

		Zimmerman				Initiation-promotion Model"	
Cancer: Brain Tumors	Cancer	Ahlbom, A. and M. Feychting	1999	Human	Cell Phone	"Use of Cell Phones and the Risk of Brain Tumors: A Case Control Study"	
Cancer: Brain Tumors	Cancer	Beall, Delzell, Cole, and Brill	1996	Human		"Brain Tumors Among Electronics Industry Workers"	
Cancer: Brain Tumors	Cancer	Berg, Spallek, Schuz, Schlefor, et al.	1985	Human	Cell Phones	"Occupational Exposure to Radio Frequency/Microwave Radiation and the Risk of Brain Tumors"	
Cancer: Brain Tumors	Cancer	Christensen, Schuz, Kosteljanetz, et al.	1977	Human	Cell Phones	"Cellular Telephones and Risk for Brain Tumors: A Population-based, Incident Case-control Study"	
Cancer: Brain Tumors	Cancer	Erman, M, et al.	1993	Human	Cell Phones	"Cellular Telephones and Brain Tumors"	
Cancer: Brain Tumors	Cancer	Frumkin H, Jacobson A, Gansler T, Thun M	1993	Human	Cell Phones	"Environmental Carcinogens - Cellular Phones and Risk of Brain Tumors"	
Cancer: Brain Tumors	Cancer	Grayson, J.K.	1985	Human	Radiation	"Radiation Exposure, Socioeconomic Status, and Brain Tumor Risk in the US Air Force"	Epidermiology, 7(2): 125-130
Cancer: Brain Tumors	Cancer	Hardell et al.	2000	Human	Cell Phones	"Case-Control Study on the Use of Cellular and Cordless Phones and the Risk for Malignant Brain Tumors"	
Cancer: Brain Tumors	Cancer	Hardell, Nasman, Pahlson, et al.	2002	Human	Cell Phones	"Use of Cellular Phones and the Risk of Brain Tumours: A Case Control Study"	
Cancer: Brain Tumors	Cancer	Hardell, Nasman Pahlson, Hallquist	2004	Human	Cell Phones	"Case-control Study on Radiology Work, Medical X-ray Investigations, and Use of Cellular Telephones as Risk Factors for Brain	

						Tumors"
Cancer: Brain Tumors	Cancer	Inskip, P.D., et al.	1999	Human	Cell Phones	"A Case- Control Investigation of Cellular Telephones and Other Risk Factors for Brain Tumors in Adults"
Cancer: Brain Tumors	Cancer	Inskip, P.D., et al.	1998	Human	Cell Phones	"Cellular Telephone Use and Brain Tumors"
Cancer: Brain Tumors	Cancer	Johansen C., Olsen, J.H.	1990	Human	Cell Phones	"Cellular Telephones, Magnetic Field Exposure, Risk of Brain Tumors and Cancer at Other Sites: A Cohort Study"
Cancer: Brain Tumors	Cancer	Kane, R.C.	2000	Human	Cell Phones	"Cellular Telephones and Brain Tumors"
Cancer: Brain Tumors	Cancer	Kaplan, S. et al.	1999	Human		"Occupational Risks for the Development of Brain Tumors"
Cancer: Brain Tumors	Cancer	Klaeboe, Blaasaas, Tynes	2001	Human	Mobile Phones	"Use of Mobile Phones in Norway and Risk of Intracranial Tumors"
Cancer: Brain Tumors	Cancer	Lahkola, Salminen, Auvinen	2000	Human	Mobile Phones	"Selection Bias Due to Differential Participation in a Case-control Study of Mobile Phone Use and Brain Tumors"
Cancer: Brain Tumors	Cancer	Lonn, Ahlbom, Hall, Fetching, et al.	1993	Human	Cell Phones	"Long-term Mobile Phone Use and Brain Tumor Risk"
Cancer: Brain Tumors	Cancer	McCredie M, Maisonneuve P, Boyle, P	1985	Human	EMFs	"Perinatal and Early Postnatal Risk Factors for Malignant Brain Tumors in New South Wales"
Cancer: Brain Tumors	Cancer	Roosli, Michel, Keuhni, Spoerri	1986	Human	Cell Phones	"Cellular Telephone Use and Time Trends in Brain Tumor Mortality from 1969 to 2002"
Cancer: Brain Tumors	Cancer	Rothman, K. J.	1994	Human	Cell Phones	"Cellular Telephones and Risk for Brain Tumors"

Cancer: Brain Tumors	Cancer	Rothman, Loughlin, Funch, Dreyer	1997	Human	Cell Phones	"Overall Mortality of Cellular Telephone Customers"
Cancer: Brain Tumors	Cancer	Ryan P, Lee M, North J, et al.	1990	Human	EMFs	"Risk Factors for Tumors of the Brain and Meninges: Results from the Adelaide Adult Brain Tumor Study"
Cancer: Brain Tumors	Cancer	Savitz et al.	1979	In Vivo	EMFs	"Biological Effects of Electric Fields on Miniature Pigs"
Cancer: Brain Tumors	Cancer	Speers, M.A., et al.	1996	Human	EMFs	"A Double-Blind Evaluation of 60-Hz Field Effects on Human Performance, Physiology, and Subjective States"
Cancer: Brain Tumors	Cancer	Trichopoulos, D. and Adami, H.	1988	Human	Cell Phones	"Cellular Telephone Use and Brain Tumors"
Cancer: Brain Tumors	Cancer	Wertheimer and Leeper	1990	Human	RF Radiation	"Effects of Long Term Low-Level RF Radiation Exposure on Rats"
Cancer: Brain Tumors and Chronic Myeloid Leukemia	Cancer	Mack, C. et al	2004	Human		"50-Hz Electromagnetic Environment and the Incidence of Childhood Cancers in Stockholm County"
Cancer: Brain Tumors and Colon	Cancer	Guenel, et al.	1987	Human	Electric Utility	"Exposure to Electric Field and Incidence of Leukemia, Brain Tumors, and Other Cancers Among French Electric Utility Workers"
Cancer: Brain Tumors and Leukemia	Cancer	Lin et al.	1994	Human	EMFs	"Occupational Exposure to Electromagnetic Fields and the Occurrence of Brain Tumors"
Cancer: Brain Tumors and Salivary Gland	Cancer	Auvinen, Hietanen, Luukkonen, Koskela	2002	Human	Cell Phones	"Brain Tumors and Salivary Gland Cancers Among Cellular Telephone Users"
Cancer: Brain Tumors in childhood	Cancer	Gurney J, Mueller B, Davis S, et al.	1994	Human	Power lines	"Childhood Brain Tumor Occurrence in Relation to Residential Power"

						Line Configurations, electric Heating Sources, and Electric Appliance Use"
Cancer: Brain Tumors, Leukemia, Male Breast Cancer	Cancer	Matanowski, G. et al.	1998	Human		"Childhood Leukemia in Relation to Residential Magnetic Fields"
Cancer: Brain, Head, and Neck Tumors	Cancer	Cook, Woodward, Pearce, Marshall	1980	Human	Cell Phones	"Cellular Telephone Use and Time Trend for Brain, Head, and Neck Tumors"
Cancer: Breast	Cancer	Cantor et al.	1999	Human		"Occupational Exposures and Female Breast Cancer Mortality in the United States"
Cancer: Breast	Cancer	Coogan, Dr. Patricia, et al.	1995	Human		"Occupational Exposures to 60-Hz Magnetic Fields and Risk of Breast Cancer in Women"
Cancer: Breast	Cancer	Feychting, Forssen, Rutqvist, Ahlbom	1994	Human	Power Lines	"Magnetic Fields and Breast Cancer in Swedish Adults Residing Near High-Voltage Power Lines"
Cancer: Breast	Cancer	Gammon, M. et al.	1995	Human	Electric blankets	"Electric Blanket Use and Breast Cancer Among Younger Women"
Cancer: Breast	Cancer	Kheifets, Dr. Leeka, and Matkin, C	2003	Human	EMFs	"Industrialization, Electromagnetic Fields and Breast Cancer Risk"
Cancer: Breast	Cancer	Liburdy, R.P., et al.	1997	In Vitro	ELF	"ELF Magnetic Fields, Breast Cancer, and Melatonin: 60Hz Fields Block Melatonin's Oncostatic Action on ER+ Breast Cancer Cell Proliferation"
Cancer: Breast	Cancer	Loomis, D.P., et al.	1997	Human	EMFs	"Breast Cancer Mortality Among Female Electrical Workers in the United States."
Cancer: Breast	Cancer	Stevens, R.G.	1996	In Vitro	EMFs	"Chronic Exposure to 60-Hz Electric Field Effects in

						Pineal Functioning in Rats"
Cancer: Breast	Cancer	Tynes et al.	1999	Human	Radio & Telegraph	"Incidence of Breast Cancer in Norewegian Female Radio Telegraph Operators"
Cancer: Breast Cancer in Men	Cancer	Demers et al.	1997	Human		"Occupational Exposure to Electromagnetic Fields and Breast Cancer in Men"
Cancer: carcinogenic (athermal), teratogenic effects	Neurological	Repacholi et al.	1968	In Vivo		"Occupational Risks for Brain Cancer"
Cancer: Central Nervous System	Cancer	Cocco et al.	1995	Human		"Occupational Risk Factors for Cancer of the Central Nervous System (CNS) Among US Women"
Cancer: Childhood	Cancer	Cherry, Neil	2004	Human	Radiofrequency/microwave	"Childhood Cancer Incidence in the Vacinity of the Sutro Tower, San Francisco"
Cancer: CNS tumors	Neurological	Johnson, C.C., and Spitz, C.C.	2006	Human	Electric & Electronics	"Childhood Nervous System Tumors: An Assessment of Risk Associated with Parental Operations Involving Use, Repair or Manufacture of Electrical and Electronic Equipment"
Cancer: CNS tumors	Neurological	Kleihues P. Cavence W.	1997	Human	EMFs	"Pathology and Genetics of Tumors of the Nervous System"
Cancer: Colon	Cancer	Phillips, J.L. and W.D. Winters	1994	In Vitro	High EMF	"Transferrin Binding to Two Human Colon Carcinoma Cell Lines: Characteristics and Effect of 60-Hz Electromagnetic Fields"
Cancer: Colorectal	Cancer	Szmigielski	1987	Human	Microwaves	"Microwave Radiation Induced Chromosome Aberrations in Corneal Epithelium of Chinese Hamsters"

Cancer: Facial Nerve Tumors	Cancer	Warren, H.G., et al.	2003	Human	Cell Phones	"Cellular Telephone Use and the Risk of Intratemporal Facial Nerve Tumor"	
Cancer: Glioma	Cancer	Wrench M, Yost M, Miike, R, et al.	2004	Human	Residential EMF	"Adult Glioma in Relation to Residential Power Frequency Electromagnetic Field Exposures in the San Francisco Bay area"	
Cancer: Glioma	Cancer	Hepworth, Schoemaker, Muir, Swerdlow, et al	1995	Human	Cell Phones	"Mobile Phone Use and Risk of Glioma in Adults"	
Cancer: Glioma and Meningioma	Cancer	Schuz, J. et al.	1996	Human	Cell Phones	"Cellular Phones, Cordless Phones, and the Risks of Glioma and Meningioma"	
Cancer: In childhood	Cancer	Feychting et al.	1987	Human	EMFs	"Magnetic Fields and Childhood Cancer - Pooled Analysis of Two Scandinavian Studies"	
Cancer: In Childhood	Cancer	Kraut, A., et al.	1991	Human	Home Electrics	"Residential Electric Consumption and Childhood Cancer in Canada"	
Cancer: In Childhood	Cancer	Savitz D, John E, Kleckner R	1992	Human	Magnetic Fields	"Magnetic Field Exposure from Electrical Appliances and Childhood Cancer"	
Cancer: Intestinal	Cancer	Howe and Lindsay	1978	Human			European J. of Cancer, 31A (12): 2035-2039
Cancer: Leukemia	Cancer	Band et al.	1996	Human	Radio Towers	"Cohort Study of Air Canada Pilots: Mortality Incidence and Leukemia Risk"	
Cancer: Leukemia	Cancer	Bowman et al.	1989	Human		Occupational Study	
Cancer: Leukemia	Cancer	Cleary and Pasternack	1988	Human		Moscow Embassy Study	
Cancer: Leukemia	Cancer	Coleman, M. and V. Berel	2002	Human		Moscow Embassy Study	
Cancer: Leukemia	Cancer	Feychting, Floderus and Forssen	1994	Human	Magnetic Fields	"Occupational and Residential Magnetic Field Exposure and	

						Leukemia and Central Nervous System Tumors"	
Cancer: Leukemia	Cancer	Feychting, M. and A. Ahlbom	1986	Human	High Voltage Power Lines	"Magnetic Fields and Cancer in People Residing Near Swedish High Voltage Power Lines"	
Cancer: Leukemia	Cancer	Forman et al.	1975	Human			
Cancer: Leukemia	Cancer	Galvanovskis, J. et al.	1990	In Vitro	Magnetic Fields	"The Influence of 50-Hz Magnetic Fields on Cytoplasmic Ca ²⁺ Oscillations in Human Leukemia T-cells"	
Cancer: Leukemia	Cancer	Garland, E., et al.	1996	Human	EMFs	"Incidence of Leukemia in Occupations with Potential Electromagnetic Field Exposure in United States Navy Personnel"	
Cancer: Leukemia	Cancer	Gilman, P.L.	1997	Human			
Cancer: Leukemia	Cancer	Hocking, Gordon, Grain, Hatfield	1996	Human	TV Towers	"Cancer Incidence and Mortality and Proximity to TV Towers"	
Cancer: Leukemia	Cancer	Li, Gilles, Theriault and Lin	1982	Human			
Cancer: Leukemia	Cancer	Maskarinec et al.	1999	Human	Radio Towers	"Investigations of a Childhood Leukemia Cluster Near Low-Frequency Radio Towers in Hawaii"	
Cancer: Leukemia	Cancer	McDowell et al.	1988	Human	High EMF	"Neuroblastoma and Paternal Occupation"	Medical Journal of Australia 165: 601-605
Cancer: Leukemia	Cancer	McKenzie, Yin and Morrell	1996	Human	High EMF	"Paternal Occupation and Brain Cancer of Offspring: A Mortality-Based Case-Control Study"	
Cancer: Leukemia	Cancer	McLaughlin, J.R.	1977	Human	dose/response link	"A Survey of Possible Health Hazards from Exposure to Microwave Radiation"	

Cancer: Leukemia	Cancer	Michelozzi et al.	1998	Human	Radio Transmitter	"Risk of Leukemia and Residence Near a Radio Transmitter in Italy"	
Cancer: Leukemia	Cancer	Milham, S.	2001	Human		"Mortality From Leukemia in Workers Exposed to Electric and Magnetic Fields"	
Cancer: Leukemia	Cancer	Milham, S.	1985	Human	Power lines	"Mortality in Workers Exposed to Electromagnetic Fields"	
Cancer: Leukemia	Cancer	Miller, A., et al.	1994	Human	EMF's	"Leukemia Following Occupational Exposure to 60-Hz Electric and Magnetic Fields Among Ontario Electric Utility Workers"	ISEE/ISEA Conference, Boston, MA Paper 354
Cancer: Leukemia	Cancer	Park, et al.	1991	Human	AM Radio Broadcasting Towers	"Higher Mortality Rates for All Cancers and Leukemia in Some Age Groups in the Area Near the AM Radio Broadcasting Towers"	
Cancer: Leukemia	Cancer	Pearce, N.E., et al.	1986	Human		"A Case-Control Study of Leukemia at a Naval Shipyard"	Environmental Health Perspectives 62: 297-300
Cancer: Leukemia	Cancer	Peters	1962	Human		"Occupational Exposures and Brain Cancer Mortality"	
Cancer: Leukemia	Cancer	Peters and Bowan	1999	Human		"Leukemia and Occupation in Sweden"	
Cancer: Leukemia	Cancer	Prausnitz, S. and C. Susskind	1997	In Vivo	EMFs	"Effects of Paternal EMF Exposure on Offspring"	
Cancer: Leukemia	Cancer	Rosenthal and Beering		Human	EMFs		
Cancer: Leukemia	Cancer	Savitz, D.A. and E.E. Calle	1995	Human	ELF Fields	"Magnetic Fields and Time Dependent Effects on Development"	
Cancer: Leukemia	Cancer	Schuz and Michaelis	1995	Human	EMF's	"Purkinje Nerve Cell Changes Caused by Electric Fields"	

Cancer: Leukemia	Cancer	Steneck et al.	1996	Human	EMFs	"Biological Effects of High-Strength Electric Fields on Small Laboratory Animals"	
Cancer: Leukemia	Cancer	Tarone et al.	1996	Human	EMFs	"Residential Exposure to Magnetic Fields and Acute Lymphoblastic Leukemia in Children"	
Cancer: Leukemia	Cancer	Wertheimer and Leeper	1987	Human	EMFs	"Electrical Wiring Configurations and Childhood Cancer"	
Cancer: Leukemia	Cancer	Archimbaud et al.	1989	Human	Microwaves	"Acute Myelogenous Leukemia Following Exposure to Microwaves"	
Cancer: Leukemia (Acute Lymphoblastic)	Cancer	Linnet, M.S., et al.	1982	Human	Magnetic Fields	"Residential Exposure to Magnetic Fields and Acute Lymphoblastic Leukemia in Children"	
Cancer: Leukemia (childhood)	Cancer	Londa, S.J., et al.	1991	Human	Residential EMFs	"Exposure to residential electric and magnetic fields and risk of childhood leukemia"	Am Journal of Epidemiology 109: 273-284
Cancer: Leukemia / Acute Myelogenous	Cancer	Stern, F.B.	1996	Human	EMFs	"Effects of Artificial Magnetic Fields on the Rat Pineal Gland"	
Cancer: Leukemia / Acute Myeloid	Cancer	Flodin, U. et al.	1993	Human			
Cancer: Leukemia / Acute Myeloid	Cancer	Wright et al.	2005	Human	EMFs	"Association Between Exposure to Pulsed Electromagnetic Fields and Cancer in Electrical Workers in Quebec, Canada, and France"	
Cancer: Leukemia and Brain	Cancer	Philips et al.	1989	Human	EMF	"Magnetic Field Exposure in Relation to Leukemia and Brain Cancer Mortality Among Electrical Utility Workers"	

Cancer: Leukemia and Brain Tumors	Cancer	Floderus, Tomqvist, Stenlund	1998	Human	EMFs	"Occupational Exposure to Electromagnetic Fields in Relation to Leukemia and Brain Tumors: A Case-Control Study in Sweden"	
Cancer: Leukemia and Brain Tumors	Cancer	Juutilainen, J. et al.	1991	Human	ELF Magnetic Fields	"Incidence of Leukemia and Brain Tumors in Finnish Workers Exposed to ELF Magnetic Fields"	
Cancer: Leukemia and Lymphoma	Cancer	Ahlbom and Feychting	1995	Human	Magnetic Fields	"Magnetic Fields, Leukemia, and Central Nervous System Tumors in Swedish Adults"	
Cancer: Leukemia in childhood	Cancer	Dockerty et al.	1982	Human	EMFs	"Electromagnetic Field Exposures and Childhood Cancers in New Zealand"	
Cancer: Leukemia in childhood	Cancer	Feychting and Ahlbom	1986	Human	Power Lines	"Magnetic Fields and Cancer in Children Residing Near Swedish High-Voltage Power Lines"	
Cancer: Leukemia in childhood	Cancer	Howe and Lindsay	1994	Human	Ionizing Radiation	"Cancer in the Offspring of Radiation Workers: A Record Linkage Study"	
Cancer: Leukemia in childhood	Cancer	Infante-Rivard, C.	2002	Human	Diagnostic irradiation	"Risk of Childhood Leukemia Associated with Diagnostic Irradiation and Polymorphisms in DNA Repair Gene"	
Cancer: Leukemia, Lymphoma, Hodgkin's Disease	Cancers	Milham, S.	1998	Human	Magnetic Fields	"Increased Mortality in Amateur Radio Operators Due to Lymphatic and Hematopoietic Malignancies"	
Cancer: Leukemia, Skin Melanoma	Cancer	Dolk, H., Shaddick, et al. et al.	1997	Human	Transmitters	"Cancer Incidence Near Radio and Television Transmitters in Great Britain"	
Cancer: Leukemia: deregulation of proto oncogene	Cancer	Montminy et al.	1985	Human	ELF - powerlines	"Leukemia in Workers Exposed to Electric and Magnetic Fields"	Am Journal of Epidemiology 127(1):50-54

Cancer: Leukemia: deregulation of proto oncogene	Cancer	Thompson et al.	1985	In Vitro	EMF exposure	"Transferrin Binding to Two Human Colon Carcinoma Cell Lines"	American Journal of Epidemiology 145(1): 1-17
Cancer: Leukemia: deregulation of proto oncogene	Cancer	Werlen et al.	1996	In Vivo	Microwaves	"Accelerated Development of Skin Cancer in Mice Exposed to Microwave Radiation"	
Cancer: Liver	Cancer	Barabiroli		In Vivo		Residential Study	
Cancer: Liver	Cancer	Szmiegieski	1979	Human	EMFs	"Reproductive Hazards Among Workers at High-Voltage Substations"	
Cancer: Lung	Cancer	Szmiegieski	2006	Human	Microwaves	"Natural Function and Behavior"	
Cancer: Lymphoma	Cancer	Repacholi, M.H., et al.	1996	In Vivo	EMFs	"Lymphomas in E mu-Pim1 Transgenic Mice Exposed to Pulsed 900 MHz Electromagnetic Fields"	Am Journal of Epidemiology 109: 273-284
Cancer: Lymphoma	Cancer	Wertheimer and Leeper	1998	Human	Cell Phones	"Electrical Wiring Configurations and Childhood Cancer"	
Cancer: Lymphoma in Childhood	Cancer	Howe and Lindsay	2000	Human	Ionizing Radiation	"Cancer in the Offspring of Radiation Workers: A Record Linkage Study"	
Cancer: Malignant Melanoma of the Eye	Cancer	Johansen, Boice, McLaughlin, Olsen	1993	Human	Mobile Phones	"Mobile Phones and Malignant Melanoma of the Eye"	
Cancer: Mammary Tumors	Cancer	Leung, F.C. et al.	1997	In Vivo			
Cancer: Medulla tumors, endocrine and ectocrine tumors, increase in carcinomas	Cancer	Guy, A.W. et al.	2002	In Vivo			
Cancer: Melanoma	Cancer	Leffell	1978	Human		"The Scientific Basis of Skin Cancer"	
Cancer: Melanoma	Cancer	Hallberg, Orjan, and Johansson, Olle	2006	Human	FM Broadcasting	"FM Broadcasting Exposure Time and Malignant Melanoma Incidence"	

Cancer: Melanoma	Cancer	Hallberg, Orjan, and Johansson, Olle	1995	Human	FM Main Towers	"Melanoma Incidence and Frequency Modulation (FM) Broadcasting"
Cancer: Melanoma of the skin	Cancer	De Guire, L. et al.	1982	Human	Telecommunications Industry	"Increased Incidence of Malignant Melanoma of the Skin in Workers in a Telecommunications Industry"
Cancer: Non-Hodgkin Lymphoma	Cancer	Linnet, Taggart, Severson, Cerham, et al.	1986	Human	Cell Phones	"Cellular Telephones and non-Hodgkin Lymphoma"
Cancer: Parotid Gland Tumor	Cancer	Lonn, Ahlbom, Christensen, Johansen, et al.	1992	Human	Mobile Phone	"Mobile Phone Use and Risk of Parotid Gland Tumor"
Cancer: Pharynx	Cancer	Szmigielski	1991	Human	EMF's	"Effect of a Strong Magnetostatic Field on Proliferation of Duodenal Epithelial Cells in Mice"
Cancer: Primary malignant tumors	Cancer	Guy et al.	2004	In Vivo		
Cancer: Proliferation in human brain tumor cells	Cancer	Cleary, Du, Cao, Liu, McCrady	1983	In Vivo		"Effect of Isothermal Radiofrequency Barrier Induced by 915 MHz Electromagnetic Radiation, Continuous Wave and Modulated at 8, 16, 50, and 200 Hz"
Cancer: Skin	Cancer	Jurkiewicz and Buettner	1999	In Vitro	EMFs	"Ultraviolet Light-induced Free Radical Formation in Skin: An Electron Paramagnetic Resonance Study"
Cancer: Skin	Cancer	Szmigielski	2001	Human	Low Frequency	"Exposure of Man to Magnetic Fields Alternating at Extremely Low Frequencies"
Cancer: Skin	Cancer	Szmigielski, S. et al.	1999	Human	ELF exposure	"Sensitivity of Calcium Binding in Cerebral Tissue to Weak Environmental Electric Fields"

Cancer: Skin	Cancer	Szmigielski, S. et al.	1995	In Vivo	Transmission line	"A Role for the Magnetic Field in the Radiation-Induced Efflux of Calcium Ions from Brain Tissue in Vitro"	
Cancer: Stomach	Cancer	Howe and Lindsay	2001	Human			
Cancer: Stomach	Cancer	Szmigielski	1994	Human	EMF's	"Effect of EMF on Growth Pattern and Mitotic Activity of Cultured Human Fibroblastoid Cells"	
Cancer: Testicular	Cancer	Baumgart-Elms, Ahrens, Bromen, Boikat	2002	Human	EMFs	"Testicular Cancer and Electromagnetic Fields in the Workplace: Results of a Population Based Case-Control Study in Germany"	
Cancer: Testicular	Cancer	Davis, R.L., and Mostoff, F.K.	1997	Human	Hand-held Radar	"Cluster of Testicular Cancer in Police Officers Exposed to Hand-held Radar"	
Cancer: Testicular	Cancer	Hardell, Carlberg, Ohlson, Westberg et al	2004	Human	Cell Phones	"Use of Cellular and Cordless Telephones and Risk of Testicular Cancer"	
Cancer: Testicular	Cancer	Hayes, R., Brown, L., Pottern, L., et al.	1997	Human	Microwaves and Radiowaves	"Occupational and Risk for Testicular Cancer: A Case Control Study"	
Cancer: Tumor growth	Cancer	Byus, Craig	1997	In Vivo			
Cancer: Tumor growth	Cancer	McLean and Stuchly	2006	In Vivo	dose/response link	Epidemiological Study	
Cancer: Tumor growth	Cancer	Smith, S.	1986	In Vivo	EMFs	"Human Exposure to 50-Hz Electric Currents"	Radiation Research, 125: 65-72
Cancer: Tumors	Cancer	Balcer-Kubiczek and Harrison	1991	In Vivo	EMFs	"Neoplastic Transformation of C3H/10T1/2 Cells Following Exposure to 120Hz Modulated 2.45GHz Microwaves and Phorbol Ester Tumor Promoter"	
Cancer: Tumors	Cancer	Cardis, E., Kilkenny, M.	2001	Human	Cell Phones	"International Case-Control Study of Adult Brain, Head, and Neck	

						Tumors: Results of the Feasibility Study"	
Cancer: Tumors	Cancer	Tomenius	2000	Human	EMFs	"50 Hz Electromagnetic Environment and the Incidence of Childhood Tumors in Stockholm County"	
Cancer: Tumors	Cancer	Vijayalaxmi et al.	1986	In Vivo	RF/MW & ELF	"Immunological and Cancer-Related Effects of Exposure to Low-Level Microwave and RF Fields"	
Cancer: Tumors	Cancer	Zaret, M	2000	In Vitro	Radiation	"Potential Hazards of Hertzian Radiation and Tumors"	
Cancer: Tumors	Cancer	Holmberg	2006	In Vivo			
Cancer: Uveal Melanoma	Cancer	Stang et al.	1996	Human	Radiofrequency Radiation	"The Possible Role of Radiofrequency Radiation in the Development of Uveal Melanoma"	
Cardiac Disease	Cardiac Disease	Moscovici et al.	1988	Human	EMF's	"Leukemia Mortality in Electrical Workers in England and Wales"	Bioelectromagnetics 19: 98-106
Cardiac Disease	Cardiovascular	Sastre, A. et al.	1998	Human	Magnetic Fields	"Nocturnal exposure to intermittent 60 Hz magnetic fields alters human cardiac rhythm"	
Cardio: affects regional blood flow	Cardiovascular	Huber, Treyer, Schuderer, Berthold et al.	1979	Human	Pulsed EMFs	"Exposure to Pulse-Modulated Radio Frequency Electromagnetic Fields Affects Regional Blood Flow"	
Cardio: cerebral blood flow disruption	Cardiovascular	Aalto, Haarala, Bruck, Sipila, et al.	2006	Human	Mobile Phones	"Mobile Phone Affects Cerebral Blood Flow in Humans"	
Cardio: cerebral blood flow disruption	Cardiovascular	Haarala, Aalto, Hautzel, Julkunen, et al.	2006	Human		"Effects of a 902 MHz Mobile Phone on Cerebral Blood Flow in Humans"	
Cardio: cerebral blood flow disruption	Cardiovascular	Thuroczy, Kuninyi, Sinay, Bakos, et al.	1996	Human	RF	"Human Studies on Potential Influence of RF Exposure Emitted by GSM"	

						Cellular Phones on Cerebral Circulation and EEG"	
Cardio: changes in peripheral blood	Cardiovascular	Goldini, J.	1993	Human	Microwave Radiations	"Hematological Changes in Peripheral Blood of Workers in Occupationally Exposed to Microwave Radiation"	
Cardio: chest pains, bradychardia	Cardiovascular	Deroche	1994	Human	Cell phone		Electro- and Magnetobiology 14(3): 177-191
Cardio: dysregulation of cardiac function	Cardiovascular	Bortkeiwicz et al.	1995	Human	Broadcasting stations	"Dysregulation of Autonomic Control of Cardiac Function in Workers at AM Broadcasting Stations"	
Cardio: haematiopoietic	Cardiovascular	Szmiegielski	1992	Human	ELF exposure	"Sensitivity of Calcium Binding in Cerebral Tissue to Weak Environmental Electric Fields"	
Cardio: heart attack	Cardiac Disease	Lilienfeld et al.	2004	Human	EMFs	"Foreign Service Health Status Study-Evaluation of Health Status of Foreign Service and Other Employees from Selected Eastern European Posts"	
Cardio: heart attack	Cardiac Disease	Oraevskii et al.	2001	Human	EMFs	"Leukemia and Occupational Exposure to EMF's"	Am Journal of Epidemiology 112(1): 39-53
Cardio: heart attack	Cardiovascular	Robinette, Siverman, Jablon	1980	Human	Radar Beams	"Effects Upon Health of Occupational Exposure to Microwave Radiation"	
Cardio: heart attack	Cardiovascular	Steneck et al.	1996	Human	EMFs	"Neurites Grow Faster Toward the Cathode Than the Anode in a Steady Field"	Journal Med Eng and Tech 21(2): 41-46
Cardio: heart disease	Cardiovascular	Bortkeiwicz et al.	1997	Human	EMFs	"Ambulatory ECG Monitoring in Workers Exposed to Electromagnetic Fields"	
Cardio: heart disease	Cardiovascular	Hamburger, Logue and Silverman	1986	Human		"Occupational Exposure to Non-ionizing	

						Radiation and an Association With Heart Disease"	
Cardio: heart rate variability	Cardiovascular	Parazzini, Parazzini, Tognola, Thuroczy, et al.	1991	Human	GSM mobile phones	"Electromagnetic Fields Produced by GSM Cellular Phones and Heart Rate Variability"	
Cardio: Increase in Blood Pressure	Cardiovascular	Braune et al.	1998		Radio Freq EMF	"Resting Blood Pressure Increase During Exposure to a Radio-frequency Electromagnetic Field"	The Lancet, 351, June 20, 1988, 1857-1858
Cardio: increased heart rates	Cardiovascular	Bortkeiwicz et al.	1996	Human	EMFs	"Heart Rate in Workers Exposed to Medium-Frequency Electromagnetic Fields"	Journal Auto Nerv Sys 59: 91-97
Cardio: interference with pace makers	Cardiovascular	Carillo	1997	Human			
Cardiovascular	Cardiovascular	Reuter	2001	Human	High EMF	"Astrocytoma Risk Related to Job Exposure to Electric and Magnetic Fields"	ELF and VLF Electromagnetic Field Effects, New York, Plenum Press, p.101-144
Cardiovascular	Cardiovascular	Takahashi et al.	1986	In Vitro	EMF exposure	"Radiation-Induced Calcium Ion Efflux from Human Neuroblastoma Cells in Culture"	
Cardiovascular	Cardiovascular	Ugarte et al.	1996	In Vitro	Magnetic Fields	"Effects of Magnetic Fields on Chromosome Set and Cell Division"	
Cardiovascular disease	Cardiovascular	Savitz, D.A. et al.	1999	Human	Magnetic Fields	"Magnetic field exposure and cardiovascular disease mortality among electri utility workers"	
Cardiovascular disease	Cardiovascular	Szmiegieski, S. et al.	1998	Human	Radiofrequency	"Alteration of Diurnal rhythms of blood pressure and heart rate to workers exposed to radiofrequency electromagnetic fields"	
Electrohypersensitivity	Multiple Systems	Johansson, Olle	1982	Human	Mobile Phones	"Electrohypersensitivity and Sensitivity to Mobile Telephones: Results from a double-blind Provocation Study of Pilot Character"	Am Journal of Epidemiology 134(9):923-937

Electrohypersensitivity	Multiple Systems	Mild, K.H., et. Al.	1998	Human	analog/digital phones	"Comparison of Symptoms by users of analogue and digital mobile phones-A Swedish-Norwegian epidemiological study"	
Epileptic Seizures	Neurological	Ilipaev	2001	Human		"Effect of Heliogeophysical Factors on the Course of Epilepsy"	
Immune System	Immune Diseases	Bruvere et al.	1998	Human	Pulse radio-frequency	"Several Immune System Functions of the Residents From Territories Exposed to Pulsed Radio-Frequency Radiation"	
Immune System	Immune Diseases	Dmoch and Moszczyński	1998	In Vitro	Microwaves	"Levels of Immunoglobulin and sub-populations of T Lymphocytes and NK Cells in Men Occupationally Exposed to Microwave Radiation in Frequencies of 6-12GHz"	Annual Conference of the ISEE and ISEA, Boston, MA July 1998
Melatonin Reduction	Hormonal/Genotoxic	Cherry, Neil	1989	Human	EMR	"EMR Reduces Melatonin in Animals and People"	Med Pr 49(1): 45-49
Microwave Syndrome	Neurological	Johnson-Liakouris	1998	Human	Modulated Microwaves	"Radiofrequency (RF) Sickness in the Lilienfeld Study: An Effect of Modulated Microwaves"	
Microwave Syndrome	Cancer	Hallberg, Orjan, and Johansson, Olle	1999	Human	Mobile Phones	"Long-term Sickness and Mobile Phone Use"	Neurology 52: 1279-1282
Microwave Syndrome: high Blood Pressure, headaches, memory loss, brain damage	Multiple Systems	Szmigielski, S. et al.	1997	Human	ELF exposure	"Sensitivity of Calcium Binding in Cerebral Tissue to Weak Environmental Electric Fields"	
Multiple Sclerosis	Neurological	Johanson, C. et al.	1999	Human	Utility	"Multiple Sclerosis Among Utility Workers"	
Reproductive	Reproductive	Brown-Woodman et al.	1994	In Vivo		"Evaluation of Reproductive Function of Female Rats Exposed to Radiofrequency Fields (27.12MHz)"	

						Near a Short Wave Diathermy Device"	
Reproductive	Reproductive	Flaherty	1982	Human		"The Effect of on-ionizing Electromagnetic Radiation on RAAF Personnel During World War II"	
Reproductive	Reproductive	Larsen et al.	1987				
Reproductive	Reproductive	Magone	1994	In Vitro	EMFs	"The Effect of Electromagnetic Radiation from the Skruna Radio Location Station on Spirodela Polyrhiza Schleiden Cultures"	
Reproductive: miscarriages	Hormonal/Genotoxic	Yubicier-Simo, B.J. et al.	1999	In Vivo	Cell Phones	"Mortality of chicken embryos exposed to EMFs from mobile phones"	Bioelectromagnetics 18: 455-461
Reproductive: Uterine wall - thermal effects	Reproductive	Daels, J	1988	In Vivo	Microwaves	"Microwave Heating of Uterine Wall During Parturition"	
Tumor Growth	Neurological	Becker, Robert O, M.D.	1998	Human	EMFs	"Generation of Electric Potentials by Bone in Response to Mechanical Stress"	
	Neurological	Becker, Robert O, M.D.	2004	Human	EMFs	"Cross Currents: The Perils of Electropollution /The Promise of Electromedicine"	Little & Company, Boston, MA
		Burke, K.	1985	Human		"The Day the Universe Changed"	



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The American Academy of Environmental Medicine Calls for Immediate Caution regarding Smart Meter Installation

Wichita, KS- The American Academy of Environmental Medicine today released its position paper on electromagnetic field (EMF) and radiofrequency (RF) health effects calling for immediate caution regarding smart meter installations. Citing several peer-reviewed scientific studies, the AAEM concludes that "significant harmful biological effects occur from non-thermal RF exposure" showing causality. The AAEM also expresses concern regarding significant, but poorly understood quantum field effects of EMF and RF fields on human health.

"More independent research is needed to assess the safety of 'Smart Meter' technology," said Dr. Amy Dean, board certified internist and President-Elect of the AAEM. "Patients are reporting to physicians the development of symptoms and adverse health effects after 'Smart Meters' are installed on their homes. Immediate action is necessary to protect the public's health."

Dr. William J. Rea, past president of AAEM says, "Technological advances must be assessed for harmful effects in order to protect society from the ravages of end-stage disease like cancer, heart disease, brain dysfunction, respiratory distress, and fibromyalgia. EMF and wireless technology are the latest innovations to challenge the physician whose goal is to help patients and prevent disease." Rea, a thoracic and cardiovascular surgeon and environmental physician adds, "A more thorough review of technological options to achieve society's worthwhile communications objectives must be conducted to protect human health."

The AAEM calls for:

- Immediate caution regarding "Smart Meter" installation due to potentially harmful RF exposure
- Accommodation for health considerations regarding EMF and RF exposure, including exposure to wireless "Smart Meter" technology
- Independent studies to further understand health effects from EMF and RF exposure

- Use of safer technology, including for “Smart Meters”, such as hard-wiring, fiber optics or other non-harmful methods of data transmission
- Independent studies to further understand the health effects from EMF and RF exposures
- Recognition that electromagnetic hypersensitivity is a growing problem worldwide
- Consideration and independent research regarding the quantum effects of EMF and RF on human health
- Understanding and control of this electrical environmental bombardment for the protection of society

The AAEM’s position paper on electromagnetic and radiofrequency fields can be found at:

http://aaemonline.org/emf_rf_position.html

AAEM is an international association of physicians and other professionals dedicated to addressing the clinical aspects of environmental health. More information is available at www.aaemonline.org.

About AAEM: The American Academy of Environmental Medicine was founded in 1965, and is an international association of physicians and other professionals interested in the clinical aspects of humans and their environment. The Academy is interested in expanding the knowledge of interactions between human individuals and their environment, as these may be demonstrated to be reflected in their total health. The AAEM provides research and education in the recognition, treatment and prevention of illnesses induced by exposures to biological and chemical agents encountered in air, food and water.

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American Academy of Environmental Medicine

Electromagnetic and Radiofrequency Fields Effect on Human Health

For over 50 years, the American Academy of Environmental Medicine (AAEM) has been studying and treating the effects of the environment on human health. In the last 20 years, our physicians began seeing patients who reported that electric power lines, televisions and other electrical devices caused a wide variety of symptoms. By the mid 1990's, it became clear that patients were adversely affected by electromagnetic fields and becoming more electrically sensitive. In the last five years with the advent of wireless devices, there has been a massive increase in radiofrequency (RF) exposure from wireless devices as well as reports of hypersensitivity and diseases related to electromagnetic field and RF exposure. Multiple studies correlate RF exposure with diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity.

The electromagnetic wave spectrum is divided into ionizing radiation such as ultraviolet and X-rays and non-ionizing radiation such as ultrasound and radiofrequency (RF), which includes WiFi, cell phones, and Smart Meter wireless communication. It has long been recognized that ionizing radiation can have a negative impact on health. However, the effects of non-ionizing radiation on human health recently have been seen. Discussions and research of non-ionizing radiation effects centers around thermal and non-thermal effects. According to the FCC and other regulatory agencies, only thermal effects are relevant regarding health implications and consequently, exposure limits are based on thermal effects only.¹

While it was practical to regulate thermal bioeffects, it was also stated that non-thermal effects are not well understood and no conclusive scientific evidence points to non-thermal based negative health effects.¹ Further arguments are made with respect to RF exposure from WiFi, cell towers and smart meters that due to distance, exposure to these wavelengths are negligible.² However, many *in vitro*, *in vivo* and epidemiological studies demonstrate that significant harmful biological effects occur from non-thermal RF exposure and satisfy Hill's criteria of causality.³ Genetic damage, reproductive defects, cancer, neurological degeneration and nervous system dysfunction, immune system

dysfunction, cognitive effects, protein and peptide damage, kidney damage, and developmental effects have all been reported in the peer-reviewed scientific literature.

Genotoxic effects from RF exposure, including studies of non-thermal levels of exposure, consistently and specifically show chromosomal instability, altered gene expression, gene mutations, DNA fragmentation and DNA structural breaks.⁴⁻¹¹ A statistically significant dose response effect was demonstrated by Mashevich *et al.*, who reported a linear increase in aneuploidy as a function of the Specific Absorption Rate(SAR) of RF exposure.¹¹ Genotoxic effects are documented to occur in neurons, blood lymphocytes, sperm, red blood cells, epithelial cells, hematopoietic tissue, lung cells and bone marrow. Adverse developmental effects due to non-thermal RF exposure have been shown with decreased litter size in mice from RF exposure well below safety standards.¹² The World Health Organization has classified RF emissions as a group 2 B carcinogen.¹³ Cellular telephone use in rural areas was also shown to be associated with an increased risk for malignant brain tumors.¹⁴

The fact that RF exposure causes neurological damage has been documented repeatedly. Increased blood-brain barrier permeability and oxidative damage, which are associated with brain cancer and neurodegenerative diseases, have been found.^{4,7,15-17} Nittby *et al.* demonstrated a statistically significant dose-response effect between non-thermal RF exposure and occurrence of albumin leak across the blood-brain barrier.¹⁵ Changes associated with degenerative neurological diseases such as Alzheimer's, Parkinson's and Amyotrophic Lateral Sclerosis (ALS) have been reported.^{4,10} Other neurological and cognitive disorders such as headaches, dizziness, tremors, decreased m sleep disturbances and visual disruption have been reported to be statistically significant in multiple epidemiological studies with RF exposure occurring non-locally.¹⁸⁻²¹

Nephrotoxic effects from RF exposure also have been reported. A dose response effect was observed by Ingole and Ghosh in which RF exposure resulted in mild to extensive degenerative changes in chick embryo kidneys based on duration of RF exposure.²⁴ RF emissions have also been shown to cause isomeric changes in amino acids that can result in nephrotoxicity as well as hepatotoxicity.²⁵

Electromagnetic field (EMF) hypersensitivity has been documented in controlled and double blind studies with exposure to various EMF frequencies. Rea *et al.* demonstrated that under double blind placebo controlled conditions, 100% of subjects showed reproducible reactions to that frequency

to which they were most sensitive.²² Pulsed electromagnetic frequencies were shown to consistently provoke neurological symptoms in a blinded subject while exposure to continuous frequencies did not.²³

Although these studies clearly show causality and disprove the claim that health effects from RF exposure are uncertain, there is another mechanism that proves electromagnetic frequencies, including radiofrequencies, can negatively impact human health. Government agencies and industry set safety standards based on the narrow scope of Newtonian or “classical” physics reasoning that the effects of atoms and molecules are confined in space and time. This model supports the theory that a mechanical force acts on a physical object and thus, long-range exposure to EMF and RF cannot have an impact on health if no significant heating occurs. However, this is an incomplete model. A quantum physics model is necessary to fully understand and appreciate how and why EMF and RF fields are harmful to humans.^{26,27} In quantum physics and quantum field theory, matter can behave as a particle or as a wave with wave-like properties. Matter and electromagnetic fields encompass quantum fields that fluctuate in space and time. These interactions can have long-range effects which cannot be shielded, are non-linear and by their quantum nature have uncertainty. Living systems, including the human body, interact with the magnetic vector potential component of an electromagnetic field such as the field near a toroidal coil.^{26,28,29} The magnetic vector potential is the coupling pathway between biological systems and electromagnetic fields.^{26,27} Once a patient’s specific threshold of intensity has been exceeded, it is the frequency which triggers the patient’s reactions.

Long range EMF or RF forces can act over large distances setting a biological system oscillating in phase systems. This also may produce an electromagnetic frequency imprint into the living system that can be long lasting.^{26,27,30} Research using objective instrumentation has shown that even passive resonant circuits can imprint a frequency into water and biological systems.³¹ These quantum electrodynamic effects do exist and may explain the adverse health effects seen with EMF and RF exposure. These EMF and RF quantum field effects have not been adequately studied and are not fully understood regarding human health.

Because of the well documented studies showing adverse effects on health and the not fully understood quantum field effect, AAEM calls for exercising precaution with regard to EMF, RF and general frequency exposure. In an era when all society relies on the benefits of electronics, we must find ideas and technologies that do not disturb bodily function. It is clear that the human body uses electricity from the chemical bond to the nerve impulse and obviously this orderly sequence can be

disturbed by an individual-specific electromagnetic frequency environment. Neighbors and whole communities are already exercising precaution, demanding abstention from wireless in their homes and businesses.

Furthermore, the AAEM asks for:

- An immediate caution on Smart Meter installation due to potentially harmful RF exposure.
- Accommodation for health considerations regarding EMF and RF exposure, including exposure to wireless Smart Meter technology.
- Independent studies to further understand the health effects from EMF and RF exposure.
- Recognition that electromagnetic hypersensitivity is a growing problem worldwide.
- Understanding and control of this electrical environmental bombardment for the protection of society.
- Consideration and independent research regarding the quantum effects of EMF and RF on human health.
- Use of safer technology, including for Smart Meters, such as hard-wiring, fiber optics or other non-harmful methods of data transmission

Bibliography: Electromagnetic and Radiofrequency Fields Effect on Human Health

1. California Council on Science and Technology. (Internet). (2011). Health Impacts of Radiofrequency Exposure from Smart Meters. Available from:
<http://www.ccst.us/publications/2011/2011smartA.pdf>
2. Electric Power Research Institute. (Internet). (2011). Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model. Available from:
https://www.nvenergy.com/NVEnergize/documents/EPRI_1022270_caseStudy.pdf
3. Hill, AB. The Environment and Disease: Association or Causation? *Proceedings of the Royal Society of Medicine*. 1965; 58: 295-300.
4. Xu S, Zhou Z, Zhang L, et al. Exposure to 1800 MHz radiofrequency radiation induces oxidative damage to mitochondrial DNA in primary cultured neurons. *Brain Research*. 2010; 1311: 189-196.
5. Phillips JL, Singh NP, Lai H. Electromagnetic fields and DNA damage. *Pathophysiology*. 2009; 16: 79-88.
6. Ruediger HW. Genotoxic effects of radiofrequency electromagnetic fields. *Pathophysiology*. 2009; 16(2): 89-102.
7. Zhao T, Zou S, Knapp P. Exposure to cell phone radiation up-regulates apoptosis genes in primary cultures of neurons and astrocytes. *Neurosci Lett*. 2007; 412(1): 34-38.
8. Lee S, Johnson D, Dunbar K. 2.45 GHz radiofrequency fields alter gene expression on cultured human cells. *FEBS Letters*. 2005; 579: 4829-4836.
9. De
marrow. *The Scientific World Journal*. 2004; 4(S2): 48-54.
10. Lai H, Singh NP. Magnetic-field-induced DNA strand breaks in brain cells of the rat. *Environmental Health Perspectives*. 2004; 112(6): 687-694. Available from:
<http://ehp03.niehs.nih.gov/article/info:doi/10.1289/ehp.6355>
11. Mashevich M, Foldman D, Kesar, et al. Exposure of human peripheral blood lymphocytes to electromagnetic fields associated with cellular phones leads to chromosomal instability. *Bioelectromagnetics*. 2003; 24: 82-90.
12. Magras IN, Xenos TD. RF radiation-induced changes in the prenatal development of mice. *Bioelectromagnetics*. 1997; 18:455-461.
13. Ban R, Grosse Y, Lauby-Secretan B, et al. Carcinogenicity of radiofrequency electromagnetic fields. *The Lancet Oncology*. 2011; 12(7): 624-626. Available from:

[http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045\(11\)70147-4/fulltext?_eventId=login](http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(11)70147-4/fulltext?_eventId=login)

14. Hardell L, Carlberg M, Hansson Mild K. Use of cellular telephones and brain tumour risk in urban and rural areas. *Occup. Environ. Med.* 2005; 62: 390-394.
15. Nittby H, Brun A, Eberhardt J, et al. Increased blood-brain barrier permeability in mammalian brain 7 days after exposure to the radiation from a GSM-900 mobile phone. *Pathophysiology.* 2009; 16: 103-112.
16. Awad SM, Hassan NS. Health Risks of electromagnetic radiation from mobile phone on brain of rats. *J. Appl. Sci. Res.* 2008; 4(12): 1994-2000.
17. Leszczynski D, Joenvaara S. Non-thermal activation of the hsp27/p38MAPK stress pathway by mobile phone radiation in human endothelial cells: Molecular mechanism for cancer - and blood-brain barrier – related effects. *Differentiation.* 2002; 70: 120-129.
18. Santini R, Santini P, Danze JM, et al. Study of the health of people living in the vicinity of mobile phone base stations: 1. Influences of distance and sex. *Pathol Biol.* 2002; 50: 369-373.
19. Abdel-Rassoul G, Abou El-Fateh O, Abou Salem M, et al. Neurobehavioral effects among inhabitants around mobile phone base stations. *Neurotox.* 2007; 28(2): 434-440.
20. Hutter HP, Moshammer H, Wallner P, Kundi M. Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations. *Occup. Environ. Med.* 2006; 63: 307-313.
21. Kolodynski AA, Kolodynska VV. Motor and psychological functions of school children living in the area of the Skrunda Radio Location Station in Latvia. *Sci. Total Environ.* 1996; 180: 87-93.
22. Rea WJ, Pan Y, Fenyves EJ, et al. Electromagnetic field sensitivity. *Journal of Bioelectricity.* 1991; 10(1 &2): 243-256.
23. McCarty DE, Carrubba S, Chesson AL, et al. Electromagnetic hypersensitivity: Evidence for a novel neurological syndrome. *Int. J. Neurosci.* 2011; 121(12): 670-676.
24. Ingole IV, Ghosh SK. Cell phone radiation and developing tissues in chick embryo – a light microscopic study of kidneys. *J. Anat. Soc. India.* 2006; 55(2): 19-23.
25. Lubec G, Wolf C, Bartosch B. Amino acid isomerisation and microwave exposure. *Lancet.* 1989; 334: 1392-1393.
26. Smith CW. Quanta and coherence effects in water and living systems. *Journal of Alternative and Complimentary Medicine.* 2004; 10(1): 69-78.

27. Smith CW (2008) Fröhlich's Interpretation of Biology through Theoretical Physics. In: Hyland GJ and Rowlands P (Eds.) Herbert Fröhlich FRS: A physicist ahead of his time. Liverpool: University of Liverpool, 2nd edition, pp 107-154.
28. Del Giudice E, Doglia S, Milani M, et al. Magnetic flux quantization and Josephson behavior in living systems. *Physica Scripta*. 1989; 40: 786-791.
29. Tonomura A, Osakabe N, Matsuda T, et al. Evidence for Aharonov-Bohm effect with magnetic field completely shielded from electron wave. *Phys. Rev. Lett.* 1986; 56(8):792-75.
30. Del Giudice E, De Ninno A, Fleischmann, et al. Coherent quantum electrodynamics in living matter. *Electromagn. Biol. Med.* 2005; 24: 199-210.
31. Cardella C, de Magistris L, Florio E, Smith C. Permanent changes in the physic-chemical properties of water following exposure to resonant circuits. *Journal of Scientific Exploration*. 2001; 15(4): 501-518.



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August 30, 2013

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Office of the Secretary
 Federal Communications Commission
 445 12th Street, SW
 Washington, D.C. 20554

Re: ET Docket No. 13-84

Dear Federal Communications Commission Commissioners:

The American Academy of Environmental Medicine is writing to request that the FCC review radiofrequency (RF) exposure limits (reference is made to the FCC's NOI sections 48, 51, 52, 53, 56, 60, 65 and 69), recognize non-thermal effects of RF exposure (NOI sections 66 and 69), and lower limits of RF exposure to protect the public from the adverse health effects of radiofrequency emissions (NOI sections 48, 52, 54, 65 and 71).

Founded in 1965 as a non-profit medical association, the AAEM is an international association of physicians and scientists who study and treat the effects of the environment on human health. With an elite membership of highly trained physicians and clinicians, AAEM is committed to education, public awareness and research regarding Environmental Medicine.

It became clear to AAEM physicians that by the mid 1990's patients were experiencing adverse health reactions and disease as a result of exposure to electromagnetic fields. In the last five years with the advent of wireless devices, there has been an exponential increase in the number of patients with radiofrequency induced disease and hypersensitivity.

Numerous peer reviewed, published studies correlate radiofrequency exposure with a wide range of health conditions and diseases. (NOI sections 54, 59, 60 and 65) These include neurological and neurodegenerative diseases such as Parkinson's Disease, ALS, paresthesias, dizziness, headaches and sleep disruption as well as cardiac, gastrointestinal and immune disease, cancer, developmental and reproductive disorders, and electromagnetic sensitivity. The World Health Organization has classified RF emissions as a group 2 B carcinogen. This research is reviewed and cited in the following attached documents: *AAEM Electromagnetic and Radiofrequency Fields Effect on Human Health* and *AAEM Recommendations Regarding Electromagnetic and Radiofrequency Exposure*.

The scientific literature proves that non-thermal adverse effects of RF exposure exist and negatively impact health and physiology. New guidelines based on measurements of non-thermal effects and lowering limits of exposure are needed and critical to protect public health.

In fact, electromagnetic sensitivity and the health effects of low level RF exposure have already been acknowledged by the federal government. In 2002, the Architectural and Transportation Barriers Compliance Board stated:

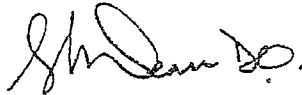
"The Board recognizes...electromagnetic sensitivities may be considered disabilities under the ADA if they so severely impair the neurological, respiratory or other functions on an individual that it substantially limits one or more of the individual's major life activities"

Additionally, in 2005, the National Institute of Building Sciences, an organization established by the U.S. Congress in 1974, issued an Indoor Environmental Quality Report which concluded:

"For people who are electromagnetically sensitive, the presence of cell phones and towers, portable telephones, computers,... wireless devices, security and scanning equipment, microwave ovens, electric ranges and numerous other electrical appliances can make a building inaccessible."

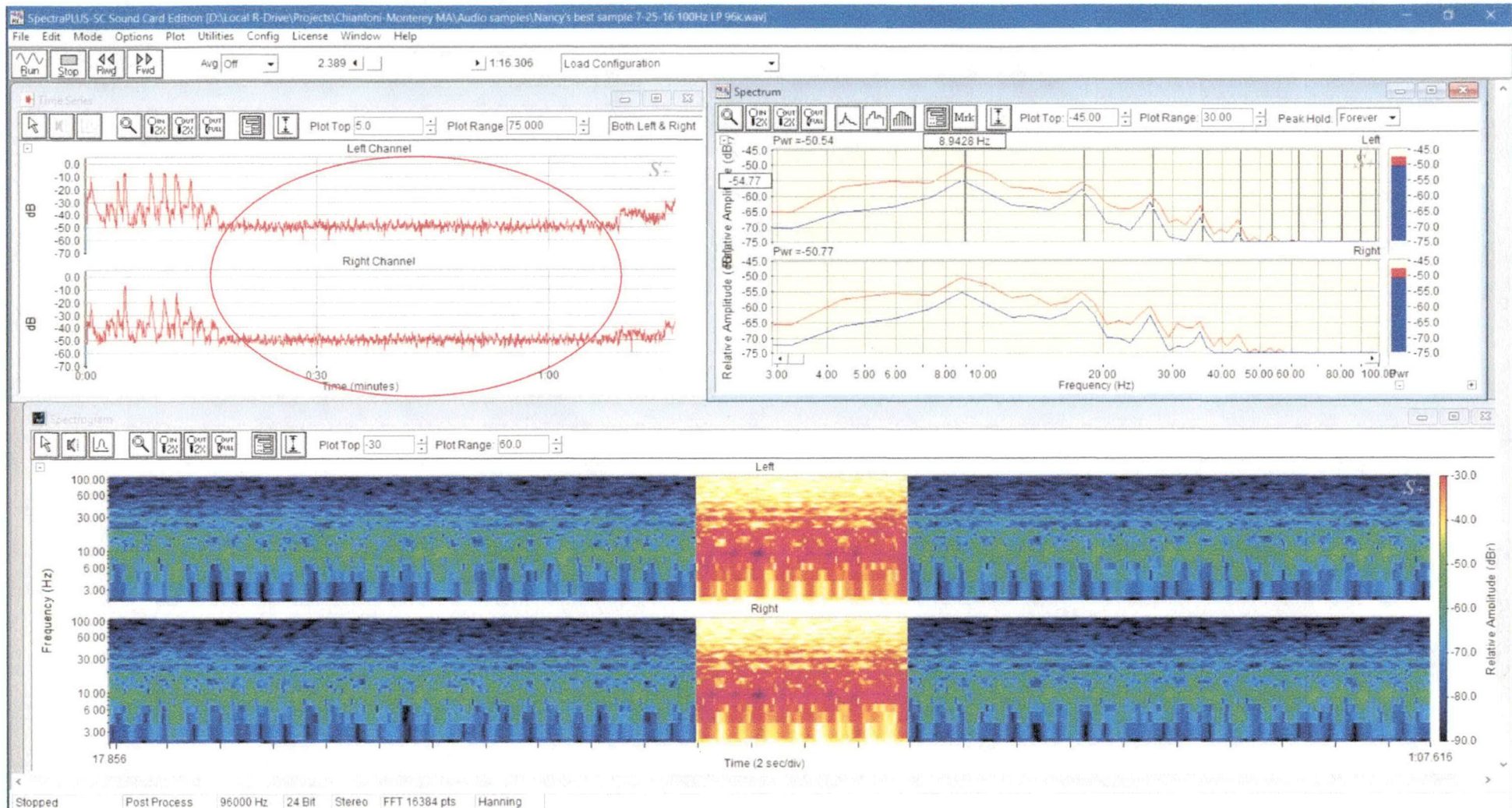
By recognizing electromagnetic sensitivity, the federal government and affiliated organizations are clearly acknowledging the existence of non-thermal effects. The AAEM urges the FCC to recognize that non-thermal effects of RF exposure exist and cause symptoms and disease. (NOI sections 66 and 69) The AAEM also requests that the FCC base guidelines of RF exposure on measurements of non-thermal effects and lower the limits of RF exposure to protect the health of the public. (NOI sections 48, 52, 54, 65 and 71)

Sincerely ,

A handwritten signature in black ink, appearing to read "Amy L. Dean, DO.", written in a cursive style.

Amy L. Dean, DO, FAAEM, DABEM, DAOBIM
President

Nancy's best sample 7-25-16 100Hz LP 96k.wav

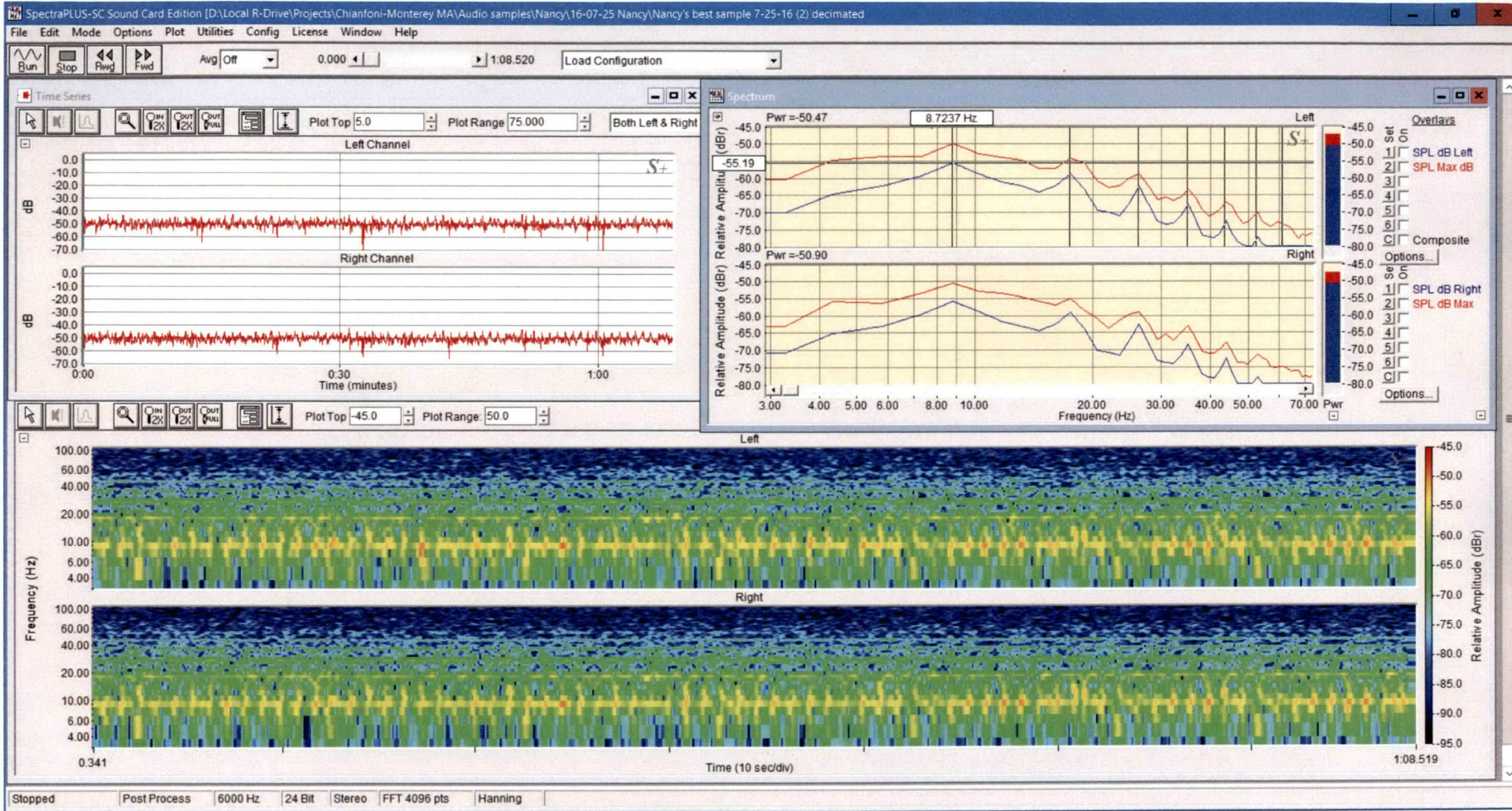


Fundamental of tones is at about 8.8 Hz with harmonics at frequencies up to at least 43.7 Hz as shown in the upper right spectrum. That is from the part of the sample highlighted in reverse color in the spectrogram bottom chart). Sound appears to occur in 11 pulses per five seconds. This is approximately 0.45 Hz or half of the fundamental frequency.

The time display in the upper left quad shows the region of the audio sample depicted on the spectrogram (bottom chart). This region was relatively free of sounds of movement (rustle of clothing) and breathing. The full audio sample was filtered to exclude the frequencies above 100 Hz. It focuses only on the infra and low frequency range.

EXHIBIT 7

Zoom0001: October 17th, 2016-Audio Sample, 96k sample rate, Filtered to 100Hz Low Pass



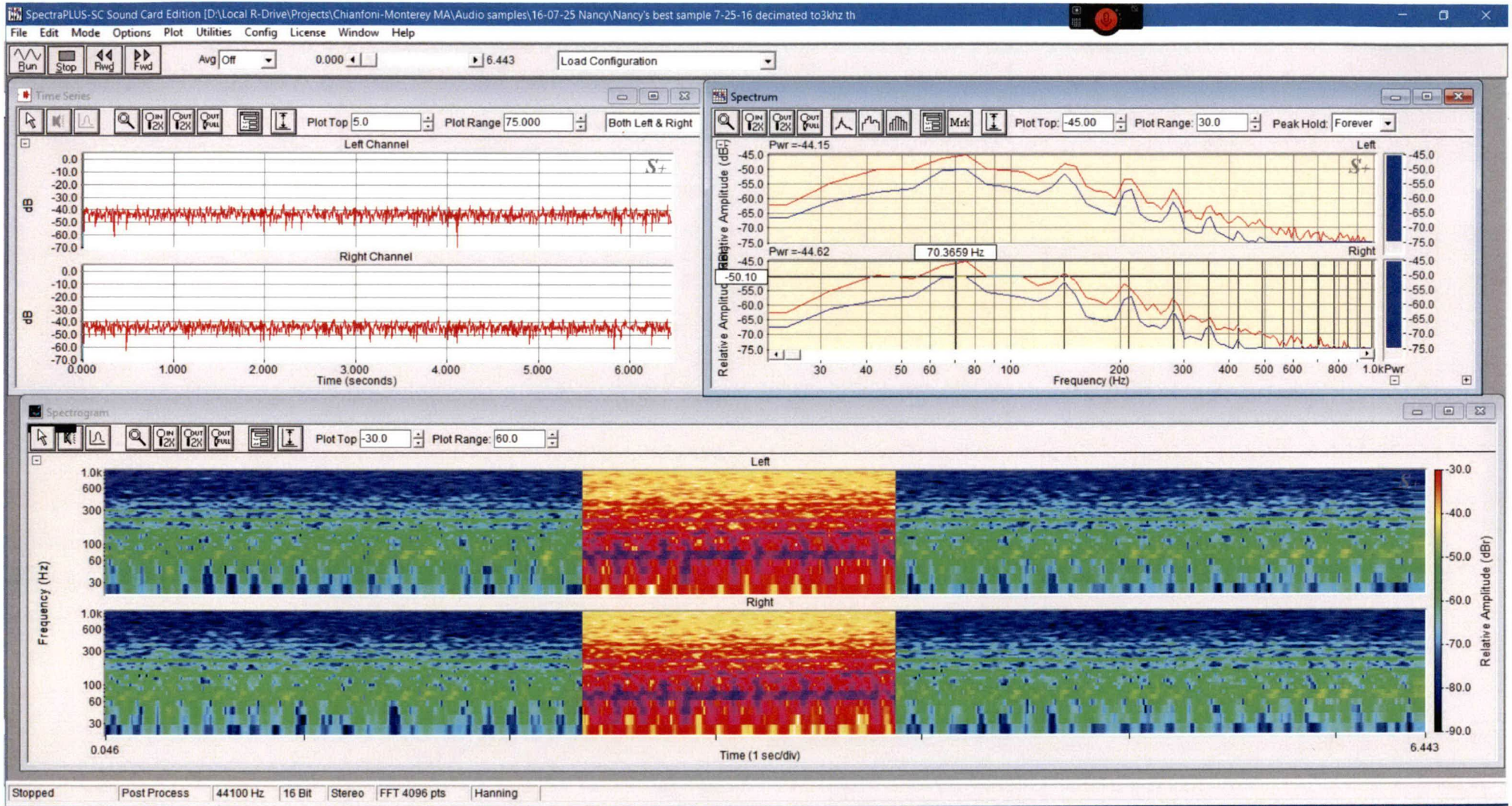
Tones are found at approximately 8.7 Hz with harmonics at frequencies up to at least 43.7 Hz as shown in the upper right spectrum. (Seen as horizontal bands of yellow and green The spectrum represents the average over the duration of the full sample shown in the upper left and lower graphs. Pulses appear to occur at a rate of about 11 pulses per five seconds. This is approximately 0.45 Hz or half of the lowest identified tonal frequency 8.7Hz. The digital recorder used to collect the audio sample is accurate +/- 1 dB for frequencies 20 Hz and above. Below that frequency the recorded sounds will be lower. Thus the spectral and spectrogram charts are conservative. Actual sound pressure levels will be higher than shown for frequencies below 20 Hz.

The time display in the upper left quad shows the overall sound pressure level of the audio sample depicted on the spectrogram (bottom chart) and seen as average sound pressure level in the upper right chart. This region was free of detectible sounds of movement (rustle of clothing) or breathing. The AC main power supply for the home was disconnected. The full audio sample was filtered to exclude the frequencies above 100 Hz. It focuses only on the infra and low frequency range of 0-100Hz.

EXHIBIT 7

7-4

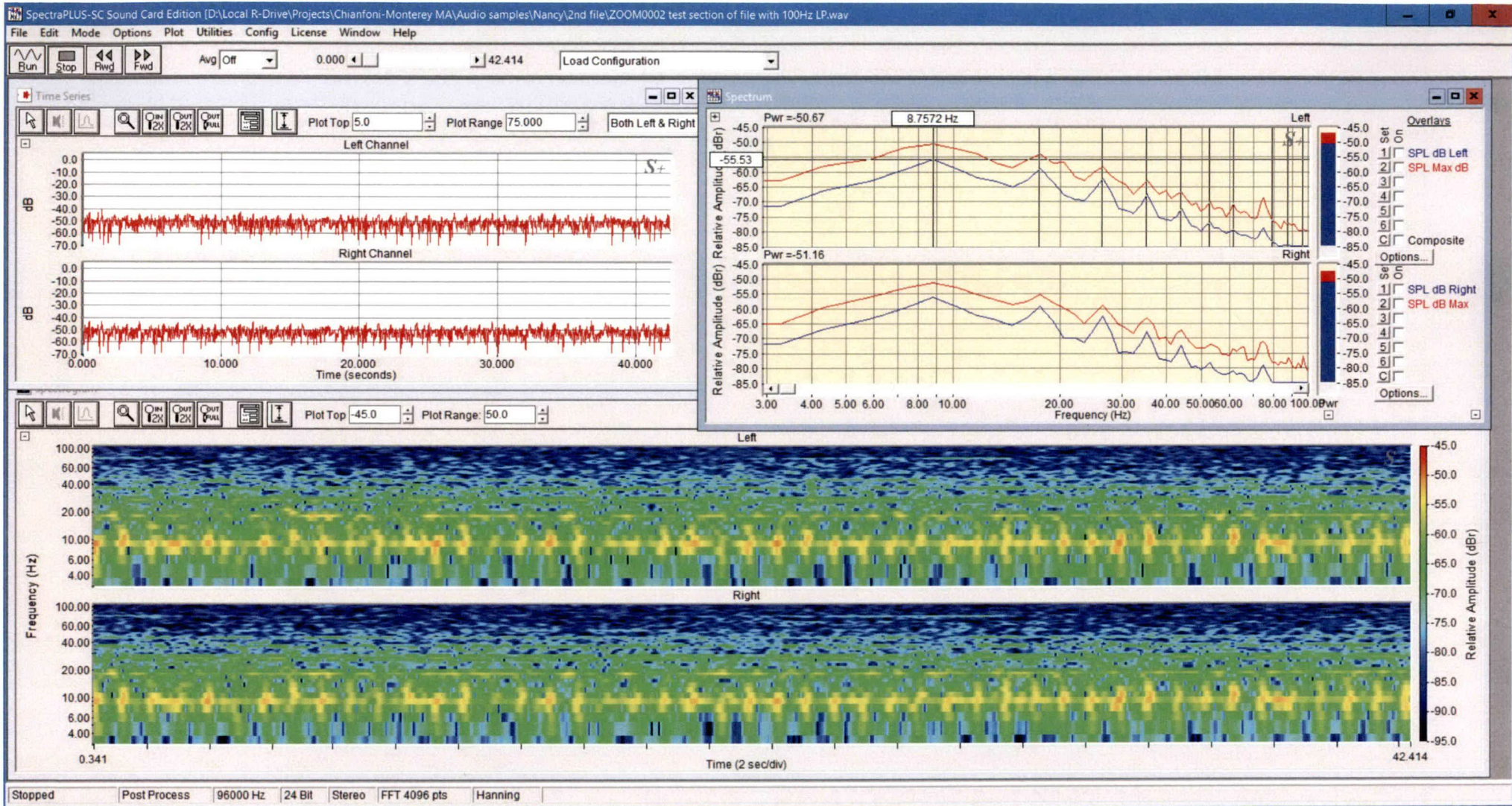
Zoom0001: October 17th, 2016-96k sample rate, Filtered to 100Hz Low Pass, 4 times playback rate



Analysis of audio reproduction using Nancy's best sample 16-07-25, at 4X normal speed. This shifted the pulses and tones up to range of audibility for average person. This page is to demonstrate that the modified audio file retains the pulsation characteristic of the original audio file seen on the previous page. Amplitude is lower in this chart than on the original chart. Sounds audible in this sample were present in original but at frequencies that many people do not hear. The pulses in the original are slow enough that they would be heard as a pulse. At 4x playback speed they will sound like a deep rumbly hum.

7-4

Zoom0002: October 18th, 2016-96k sample rate, Filtered to 100Hz Low Pass



Tones are found in the second audio sample. Again they start at approximately 8.7 Hz with harmonics at frequencies up to at least 43.7 Hz as shown in the upper right spectrum. (Seen as horizontal bands of yellow and green The spectrum represents the average over the duration of the full sample shown in the upper left and lower graphs. Pulses appear to occur at a rate of about 11 pulses per five seconds. This is approximately 0.45 Hz or half of the lowest identified tonal frequency 8.7Hz. The charts are conservative for the same reasons noted on the first page. Actual sound pressure levels will be higher than shown for frequencies below 20 Hz.

The time display in the upper left quad shows the overall sound pressure level of the audio sample depicted on the spectrogram (bottom chart) and seen as average sound pressure level in the upper right chart. This region was free of detectible sounds of movement (rustle of clothing) or breathing. The AC main power supply for the home was disconnected. The full audio sample was filtered to exclude the frequencies above 100 Hz. It focuses only on the infra and low frequency range of 0-100Hz.

Zoom0002 audio file processed by Richard R. James, INCE, Principal Acoustician, E-Coustic Solutions, LLC, Okemos, MI, contact: rickjames@e-coustic.com

7-4

60 seconds in a minute

60 minutes in an hour

24 hours in a day

Pulsing 11 times every 5 seconds=

$60 \times 60 \times 24$ divided by 5 and $\times 11 = 190,080$ pulses
a day on the distribution lines

CONSISTENT WITH 7-25-16 STUDY

EXHIBIT 8

Noise & Health



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ARTICLES

Year : 2004 | Volume : 6 | Issue : 23 | Page : 29--35

Disturbing effects of low frequency sound immissions and vibrations in residential buildings

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Germany

Abstract

Noise immissions with predominant low frequency sound components may exert considerably disturbing effects in dwellings. This applies in particular to sounds which are excited by transmission of structure-borne noise, and to low frequency sounds emitted by ventilators. Exposed persons usually declare such immissions as being «DQ»intolerable«DQ» even at very low Aweighted sound levels. If mechanical vibrations in the frequency range below 20 Hz (ground-borne vibrations) affect dwelling rooms, the annoying effects are perceived only by a small portion of exposed individuals as a physical effect. For the most part the immissions are observed as vibratory effects on the building and on objects inside the dwelling. The disturbing effects of vibration frequencies above 20 Hz (structure-borne sound) are determined by the airborne sound field generated inside a particular room and its given surface and extension.

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Available from: <http://www.noiseandhealth.org/text.asp?2004/6/23/29/31665>

Full Text

Introduction

As early as in the seventies, sound level measurements carried out to verify complaints about annoying noises in dwellings have shown the following: Noises which in many cases induced vehement complaints were to a large extent of rather low sound levels, whereas the effects of simultaneous other noise immissions of higher sound levels like the ticking of a clock or intermittent traffic noise did not cause annoyance (Findeis and Thielebeule, 1979).

These findings gave rise to investigations designed to answer the following questions:

(1) Are the differences in the perception of different noises just accidental occurrences, or do they follow a systematical pattern?

(2) Which noise characteristics are responsible for differences in noise perception?

In order to clarify these questions the complaints were therefore analysed, on the one hand by evaluating spontaneous statements on the effects of noise immissions by the persons involved, and on the other hand by taking measurements of Aweighted noise levels and additionally carrying out acoustical measurements. The same method was used in cases of vibrations.

Method

As a first step in answering question (1) quoted above, the measured values obtained from the initial input evaluation were categorised according to their sources:

- * Measured values of road traffic noise
- * Measured values of ventilator noise
- Measured values of other airborne transmitted sounds
- * Measured values of airborne sounds emanating from structure-borne sound immissions.

In most cases, structure-borne sound sources were circulator pumps in heating systems and other technical building equipment, refrigerators and ventilators in commercially used premises of dwelling buildings.

Secondly, the distribution functions of the measuring data regarding the various noises were taken under consideration. Discussion of the results included statements of the affected persons on the respective effects of the immissions.

To clarify question (2) quoted above, linweighted noise levels were initially assessed in addition to A-weighted levels. The technique of the measuring devices ensured that frequency components distinctly below 20 Hz (infrasound) did not interfere with the measuring results. In addition, third octave sound levels and, in the case of structure-borne sound immissions, also the vibration velocity levels of the indoor wall surfaces were frequently measured.

Parallel to measurements of floor vibrations connected with vibration immissions of frequencies below 20 Hz, not only the statements of the exposed persons regarding the immissions, but also observations made by the persons performing the measurements with regard to the immissions were documented and correlated with the measurement results.

Study results

Airborne sound immissions

Results of measurements and evaluations

The results given in the following are based on the evaluation of measurements gathered in response to 204 complaints about noise disturbance in the city of Potsdam and the western districts of the Federal State of Brandenburg in Germany. [Table 1] gives the distribution of the statements made in the complaints over the different kinds of airborne sound immissions. Complaints containing several overlapping immissions were not included.

It may be noted that the quota of complaints regarding road traffic noise immissions is relatively small with respect to the large number of persons complaining about the noise immissions under concern. In contrast, the number of complaints about structure-borne sound immissions is surprisingly high.

The sound pressure levels measured for the noise immissions showed, as a rule, a normal distribution of sufficient approximation. The assessed distributions were evaluated following the exemption of that sound level which either exceeded or fell short of 50% of the measurement values (50%-level). Further, that sound level was determined which fell short of 5% of the measurement values (5%-level), and which may be considered as the immission threshold of complaints regarding the noise in question. The results of these evaluations are listed in [Table 2]. The traffic noise data are daytime values; night-time values are expected to be lower. The effects of the other noises were of a permanent or intermittent nature day and night.

A t-test with a given error rate of 5% (Sachs, 1984) yielded highly significant differences between outside 50%-levels of road traffic immissions and 50%-levels of other noises. This is also true for 50%-levels of the respective indoor noise. Equally significant, though less distinct, are the differences between mean values of noise levels generated indoors and those from outside. No differences were, however, found between the distributions over daytime and night-time measurement values and the noise of ventilators which only run indoors during the daytime. This also applies to noise initiated by structure-borne noise.

In 58% of exposures to structure-borne sound immission at day and night, the complainants stated sleep disturbances among other reasons. The distribution functions of the respective measuring values did not differ from the remaining measuring values of this kind of noise.

In summing up, the answer to question (1) quoted above is that particularly indoor ventilator noise as well as noises generated by structure-borne sound transmission exert distinctly higher disturbing effects than road traffic noise.

First causative indicators of increased annoyance due to these noises are considerable differences in levels L_{in} - L_A which prove to be distinctly higher with regard to indoor levels compared with outdoor levels. They suggest rather strong effects of noise components of frequencies below 100 Hz.

Out of 33 frequency analyses carried out for indoor noise, 31 exhibited predominating octave and third octave band levels between 20 and 100 Hz. Ten out of twenty third octave band level measurements additionally showed tonal components because there appeared third octave band levels which surpassed adjoining third octave band levels by at least 5 dB (DIN 45680, 1997). In parallel, and to a similar extent, spatial level fluctuations were assessed in the rooms, indicating the presence of stationary waves.

Vibration measurements taken in relation perpendicular to the wall in cases of structureborne sound immissions had the following results: In the majority of cases the vibration velocity levels L_v as related to $v_0 = 5 \cdot 10^{-8}$ m/s were near to identical with the airborne sound level assessed inside the room. In several cases airborne sound levels exceeded the structureborne sound levels by up to 10 dB.

If vibrations of the wall surfaces inside a room are, according to (Cremer and Heckl, 1967), assumed to be

bending waves, then this mechanism principally suggests a tangential radiation of airborne sound is from the vibrating walls. This again enhances the development of stationary waves in closed rooms.

The close association between vibrations and airborne sound immissions in dwelling rooms and their respective effects may be illustrated by the following case report:

A compressor unit was causing extreme annoyance to the occupants of a flat within a distance of 50 m, complaining about "vibrations". Vibration measurements of the floor and the walls exhibited a vibration velocity of 0.1 mm/s, or other a vibration velocity level of 66 dB with a frequency of 33 Hz. Vertical vibrations of this magnitude are as a rule not perceptible as ground-borne vibrations. For this reason, the strong vibrations of the window panes remained inexplicable at first. Then the problem was then solved by measuring the airborne sound levels in the same room which yielded the following results:

In the centre of the room 26 dB(A) resp. 66 dB(lin), and near to the wall surfaces 44 dB(A) resp. 84 dB(lin).

The exposed persons stated that the vibrations near to the walls left an uneasy feeling in their stomachs which very quickly increased to the point of feeling sick. The measuring staff experienced similar symptoms. The highly exceeding level values near the walls were in all probability promoted by the fact that the distance between the window and the opposite wall was 5 m which was equal to exactly half the wave length of the airborne sound, or resonance.

The severe effects of these low frequency stationary airborne sound waves could, according to the statements of the measuring team, not be explained by auditory sensations alone.

Question (2), quoted above as to specific characteristics of the most disturbing noise immissions in dwelling rooms, can according to the given results be answered as follows: The main cause of increased disturbances due to the quoted noises obviously consists in the high unweighted sound pressure levels of low frequency noise components. In A-weighted measurements these components remain widely disregarded. An additional characteristic increasing the annoyance seem to be narrow banded noise components which in closed rooms are often associated with the development of stationary waves. The effect of airborne soundinduced stationary waves on the exposed persons seems to represent a specific factor of the annoyance effect.

Disturbing effects of noise immissions

In the preceding paragraphs it has been pointed out that as regards noise immissions with a considerable proportion of low frequency sounds in private dwellings, more than half of the complaints were made on the grounds of sleep disturbance. Quite often symptoms like "a roaring in the head, especially when lying down" were brought forward. Time and again, "a feeling of riding a lift" was reported, and over and again the measuring team had the impression that the reported immissions meant a nerveracking experience for the exposed persons. Several complainants even got into a state of being aggressive. There were reports by a number of trustworthy persons on how they at first - for instance when moving into the flat - did not even notice any immissions. But in the course of a few weeks they began to perceive them distinctly and became intolerable after continued exposure. It was obvious that in these cases a sensibility of specific noise components had developed. Thus, it is understandable that non-exposed persons were at a difficulty to even acknowledge such noise immissions.

Excitation of vibrations by airborne sound

Apart from sound emissions of vibrating building elements, secondary phenomena were induced in some cases by very strong low frequency airborne sound immissions which are typical of ground-borne vibration immissions (see section on 'Ground-borne vibration immissions'). We may point out the clattering of glass panes in cupboards and of doors in their locks. In an dwelling situated above a discotheque not only the airborne sound immission was assessed but in addition the floor vibrations which were clearly detectable as they created an awkward feeling in the feet.

Recommendations on immission assessment

In conclusion of the results mentioned above, when estimating noise immissions from noise sources with a high proportion of strong low frequency sound components, as for instance exhausters, it is advised to take measurements not only from the outside but also the inside of exposed rooms. As a rule it is not sufficient, though, to measure from a random measuring site in a room because, as has been demonstrated, considerable sound level fluctuations due to stationary waves are to be expected. In this context, the respective normative regulations of the German standard DIN 45680 (1997) will be heeded.

Ground-borne vibration immissions: Definition and propagation of ground-borne vibrations

According to the German standard DIN 4150 (1999) ground-borne vibrations are defined as mechanical vibrations of corporeal substances in the frequency range 1 to 80 Hz, with potentially detrimental or annoying effects.

In the paragraph 'Results of measurements and evaluations' it has been demonstrated that according to present experience the essential cause of annoyance, in association with an exposure of the outer walls of a room to mechanical vibrations with frequencies above 20 Hz (structure-borne sounds), is the build-up of an airborne sound field generated by sound emissions into the premises. In the following paragraph, the effects of vibration immissions with frequencies below 20 Hz (ground-borne vibrations in a proper sense) will be discussed.

If from very low-revving machinery very low frequency vibrations are transmitted into the ground, these are known to propagate over rather great distances along the upper layers of the ground.

Such vibrations may induce inclining or shearing vibrations in buildings which as a main effect induce horizontal vibrations of walls and ceilings. The dominating frequencies of such vibrations are generally found in the interval of 3 to 8 Hz. In the case of vertical ceiling vibrations, the frequency range was from 8 to 22 Hz. The immission circumstances were in most cases influenced by resonance phenomena.

Horizontal ceiling vibrations at steady timeperiods

The data given in this paragraph are mainly obtained from vibration immissions caused by running frame saws. As a rule, the immissions affected the dwellings only at certain periods of time during the day, with nearly constant amplitudes.

Based on the statements of the exposed persons and on observations made by the measuring team, together with the results of stationary vibrations of frequencies from 4.5 to 5.5 Hz, [Table 3] shows the correlations between the magnitude of the vibrations and the disturbing effects exerted by them.

[Table 3] shows that annoyance due to horizontal vibrations is realised as a body reaction only by a small percentage of exposed persons. A highly disturbing effect is that of the observed effects on the building and household equipment. The same holds for feelings of frightfulness. In some cases, vibrations aroused alarm as soon as ripples appeared on the otherwise smooth surface of fluids or when indoor plants started trembling.

Traffic induced vibrations

Road traffic induced ground-borne vibrations are likely to cause extreme annoyance, especially in parts of Northern Germany which are geologically marked by the glacial epoch. Ground-borne vibrations excited by road traffic are equally assessed and evaluated according to DIN 4150 (1999). There is some difficulty because the normative regulations do not specifically include the estimation of stochastically occurring vibrations. In addition, road traffic induced ground-borne vibrations are established between "singular vibrations" (by bus traffic regarding low traffic residential sidestreets) and approximately "constant groundborne vibrations" (from near-by highway) (Peters, 2001).

In the Federal State of Brandenburg, more than 100 measurements were carried out during the last 10 years. In most cases, vertically oriented vibrations were predominant. The maximum values obtained were of a weighted vibration severity KB_{Fmax} ranging between 0.04 and 4.1, or tact maximum r.m.s. values of the evaluated vibration severity KB_{Ftm} (DIN 4150, 1999) ranging between 0 and 1.23. There is a fixed relation between the two quantities KB_{Ftm} and KB_{Fmax} (Peters, 2001). A spasmodic increase of complaints occurs between $KB_{Ftm} = 0.10$ and 0.13 . As regards road traffic, the values are $KB_{Fmax} = 0.4 \dots 0.6 \cdot v_{max}$

Road traffic induced ground-borne vibrations are generally associated with road traffic noise. At present, the general state of knowledge about combined effects of ground-borne vibrations, direct airborne sound and structure-borne sound radiated by the wall or floor, low frequency sound and noticeable vibrations of objects or their audible noises and other effects (as for instance shadow phenomena of passing-by heavy-load lorries) is small. But it is the combined effects of the quoted disturbing factors which makes up the grade of total disturbance in a residential area. Only with these factors in mind complaints lodged for ground-borne immissions with measuring values below the threshold of perception $KB = 0.1$ can be explained.

In addition, complaints about road traffic induced ground-borne vibrations are quite often influenced by concerns about possible damage to one's own dwelling due to road traffic. In the majority of inspected damages such as ruptures or enlarging ruptures there were, however, other causes such as an acute lowering of the groundwater level or deficiencies in building construction had to be made responsible.

Delimitation of vibration perceptions in rooms

According to the observations quoted above, [Figure 1] gives the following grades of differently perceived vibrations in rooms, depending upon their frequency and magnitude.

It is emphasised that in the frequency range above approximately 20 Hz there may occur, due to sound radiation from the inner wall surfaces of a room, highly disturbing effects even if the magnitude of the vibrations is distinctly below the perceptive threshold of humans. According to the observations as demonstrated, these immissions ought to be given special attention in the future.[7]

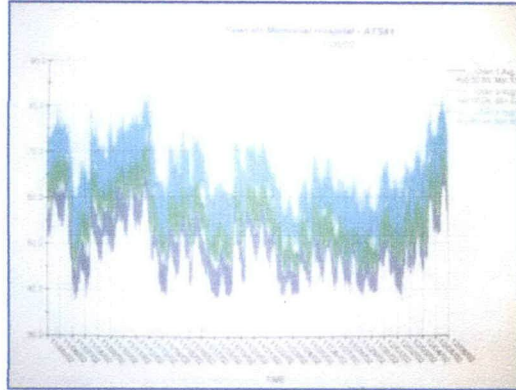
References

- 1 Cremer, L., Heckl, M. (1967): Körperschall. Springer Verlag, Berlin, Heidelberg, New York
- 2 DIN 45680 (March 1997): Messung und Bewertung tieffrequenter Geräuschimmissionen in der Nachbarschaft. Beuth Verlag Berlin
- 3 DIN 4150, part 2 (June 1999): Erschütterungen im Bauwesen - Einwirkungen auf Menschen in Gebäuden. Beuth Verlag Berlin
- 4 Findeis, H., Thielebeule, U. (1979): Zur Lastigkeit spezieller Geräusche. Z. d. gesamten Hygiene 25, 180-185
- 5 Findeis, H., Peters, E. (1997): Erschütterungsimmissionen in Wohnungen - Ein Erfahrungsbericht mit Schlussfolgerungen für die Normung. VDI Berichte 1345, VDI Verlag Düsseldorf
- 6 Peters, E. (2001): Besonderheiten bei der Beurteilung von Straßenverkehrserschütterungen. Z. f. Lärmbekämpfung 48 Nr. 5, 159-165
- 7 Sachs, L. (1984): Angewandte Statistik. Springer Verlag, Berlin, Heidelberg, New York, Tokyo

Friday, November 18, 2016

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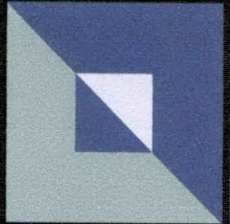
Nancy A Stadlander
1306 Gobler Ford Rd
Lewisport, KY 42351



Power Quality Investigation

Main Service 240/120 Volt

10/04/16



Nancy A Stadlander
1306 Gobler Ford Rd
Lewisport, KY 42351

Summary:

Nancy Stadlander requested PQ Testing to review the power quality data recorded from the residence at 1306 Gobler Ford Rd in Lewisport, and write the summary report base on this data.

A Dranetz disturbance analyzer was installed on the 240v split phase service provided by the local utility. The voltage was recorded phase to phase and phase to neutral. This data is compared to the IEEE power quality standards to evaluate the stability of the power source and how it might effect the customer loads.

From the worst case summary, during the monitoring period , the main service had only four voltage sags, no voltage swells, one voltage interruption, and 51 voltage transients during the eight days.

The voltage sags all were short duration events ie. on 9/28/16 15:00:16 magnitude 105 volts for 17 mili seconds. (One cycle is 16mili seconds) most devices will ride through this duration of event. The voltage interruption was for 10 seconds, this will effect most electronic loads. The 51 voltage transients are of concern. The largest magnitude events were 273 volts. This circuit requires SPD or transient voltage surge suppression to help with this type of event.

The over all voltage stability seems acceptable, however the average voltage is slightly over the nominal values. The 240/120 nominal voltage compares to the measured 248/124 volts. The average voltage is 251/126 volts. Power company typically are allowed 7.5 + or - of nominal. This means the 240 volt nominal can be up or down by 18volts or 258-222 volts. This 251 voltage is within 7.5 %tolerance., but on the higher side.

The overall circuit is acceptable with voltage harmonics, voltage balance, and voltage frequency.

From the magnitude/duration diagram there were four events outside the tolerance curves. This means that these events could cause a device to have an issue with power quality. The diagram is based on the magnitude up or down of the voltage and how many cycles or length of time it lasted. This explains the probability of the device not riding through this event.

In conclusion the voltage is slightly high but within tolerance. The voltage sags could be an issue for some sensitive loads. The voltage transients need to be controlled with the installation of SPD or surge protection device. This will clamp the unwanted voltage to ground and protect the loads.

It would be suggested to protect all sensitive loads with a UPS backup power system for voltage stability during the sags and outages. It is the utility customers responsibility to protect their sensitive loads if need- ed from outside power abnormally that happen from time to time.

Respectfully summitted

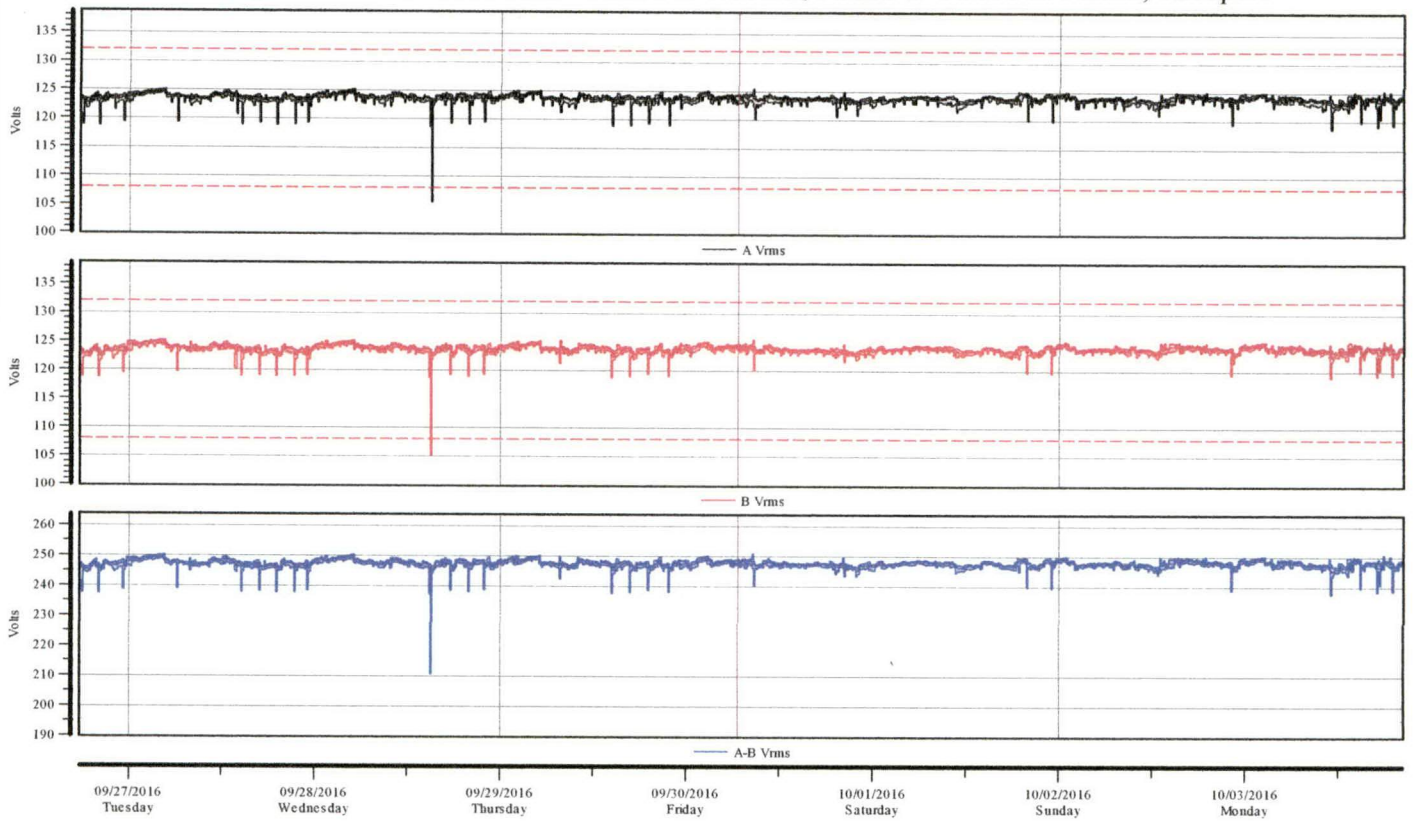
David Diehl, CPQ IR II
Application Engineer PQ Testing



Nacy A. Stadlander
1306 Goble Ford Rd
Lewisport, KY 42351
Main 240volt Service

Date
10/15/2016 Page 1
Issued by
David Diehl 866-715-4333
Filename
Main Service 240volt

Voltage 240/120v, Phase A&B =Phase to Neutral, Phase C=Phase to Phase, Timeplot



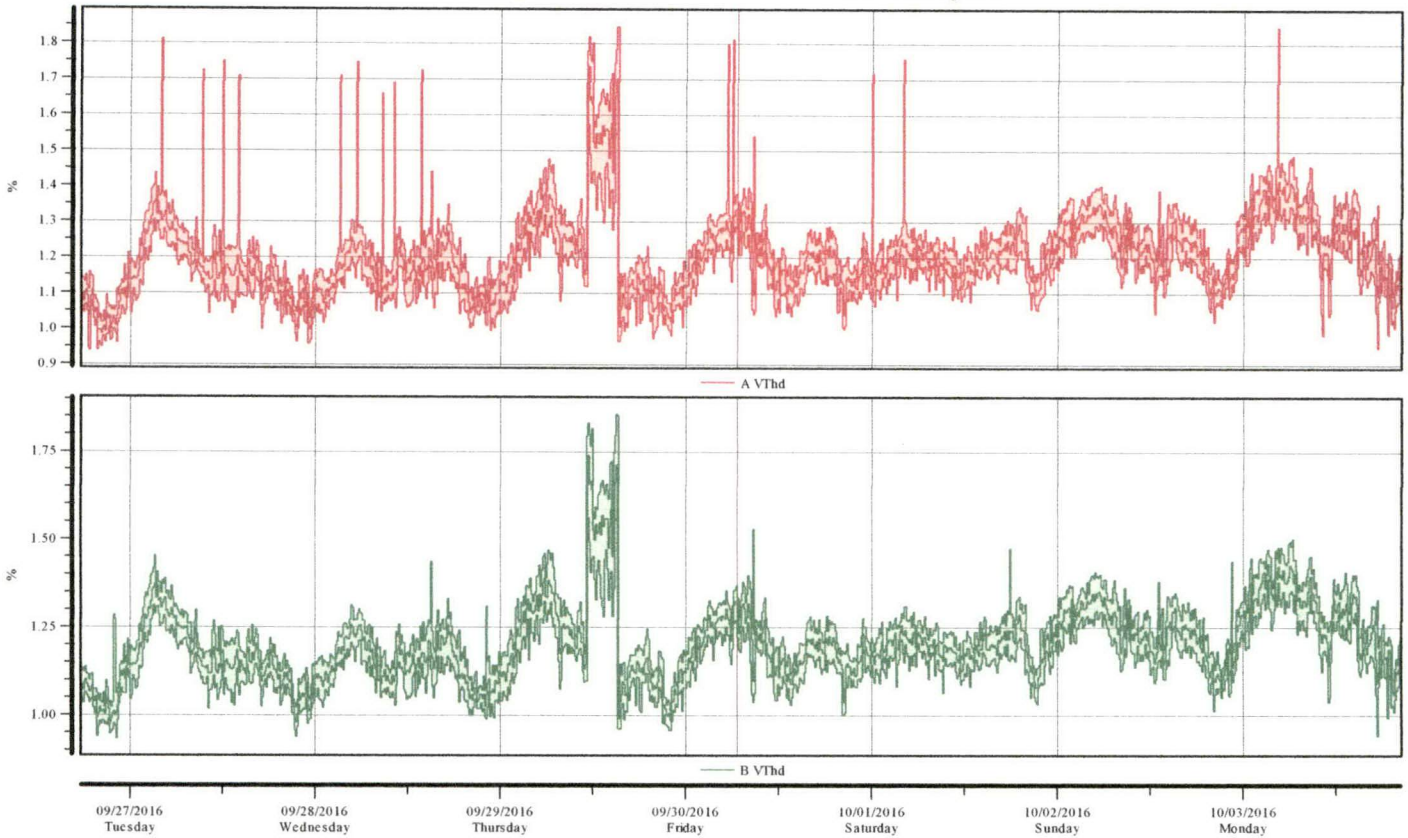
	Min	Max	Avg
AVrms	105.5	125.5	123.8
BVrms	105.2	125.5	123.8
A-BVrms	210.6	250.9	247.7



Nacy A. Stadlander
1306 Gobler Ford Rd
Lewisport, KY 42351
Main 240volt Service

Date
10/15/2016 Page 1
Issued by
David Diehl 866-715-4333
Filename
Main Service 240volt

Voltage Total Harmonic Distortion Timeplot



	Min	Max	Avg
AVThd	0.9382	1.847	1.203
BVThd	0.9333	1.857	1.203



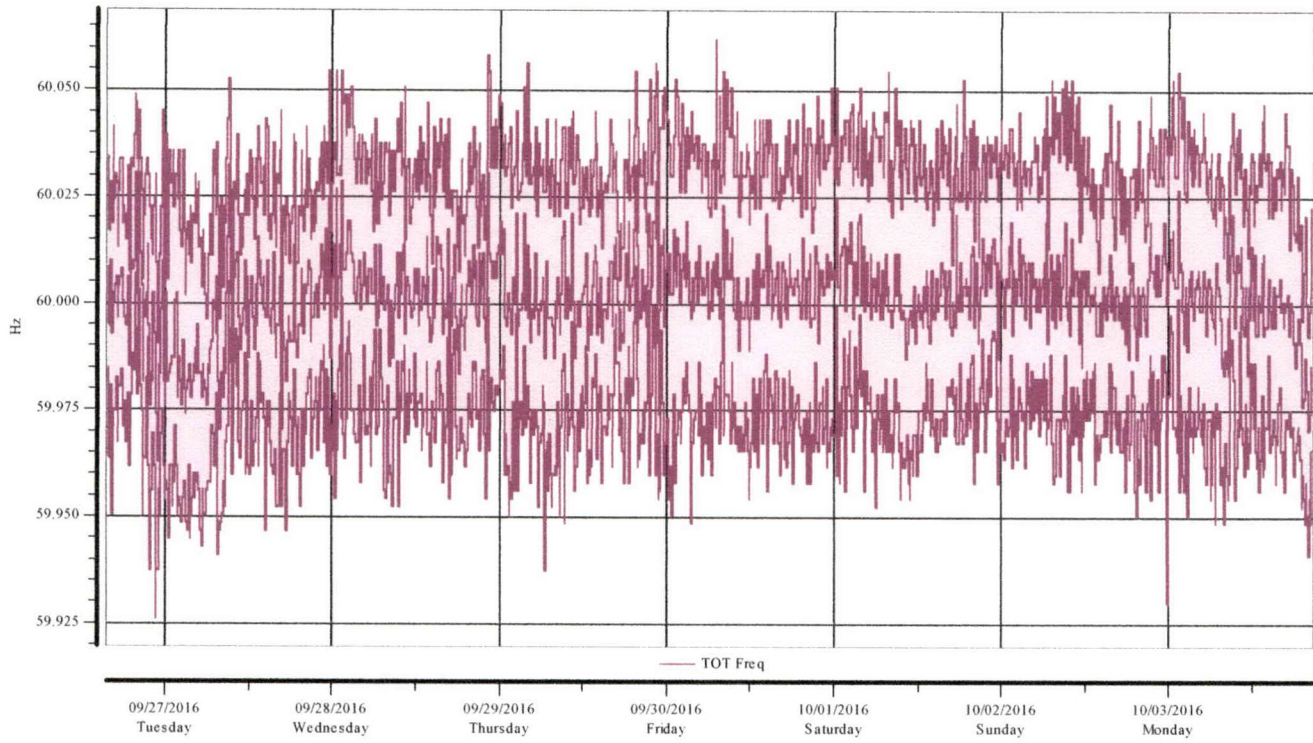
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1306 Gobler Ford Rd
Lewisport, KY 42351
Main 240volt Service

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VOLTAGE FREQUENCY TIMEPLOTS

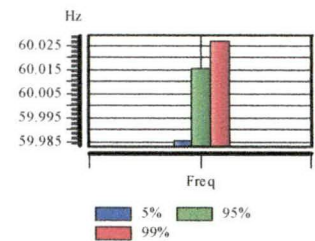
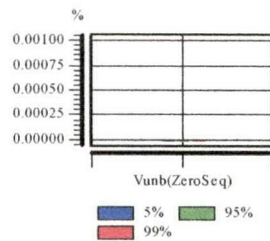
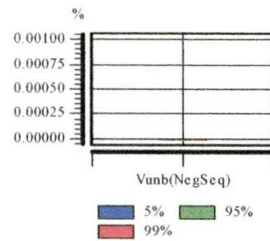
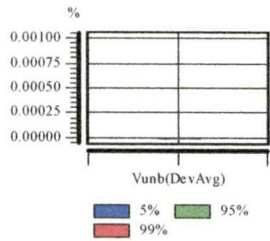
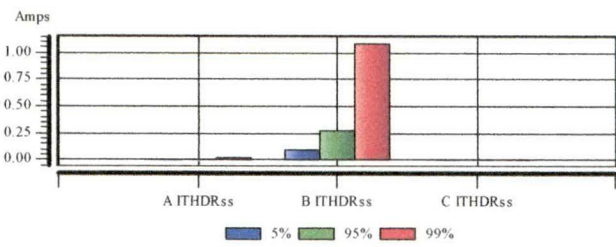
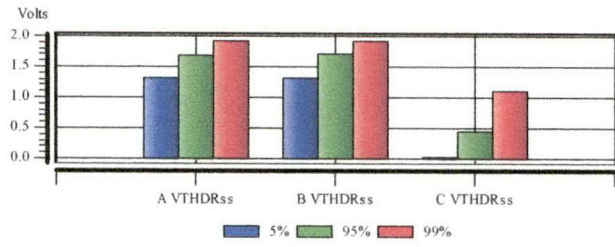
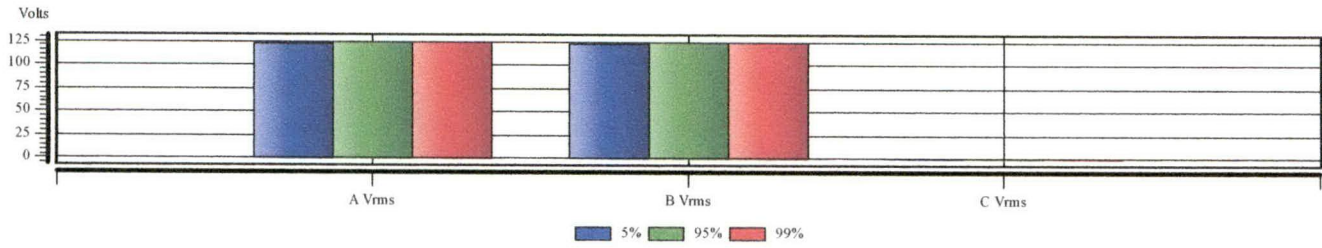
Site: Power Xplorer Site

Measured from 09/26/2016 15:29:33.0 to 10/03/2016 20:40:00.0



QUALITY OF SUPPLY

Site: Power Xplorer Site
Measured from 09/26/2016 15:29:33.0 to 10/03/2016 20:40:00.0





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Main 240volt Service

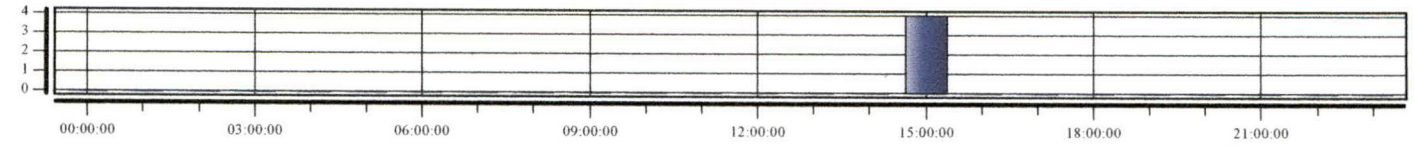
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ACTIVITY PLOTS

Site: Power Xplorer Site

Measured from 09/26/2016 15:29:33.0 to 10/03/2016 20:40:00.0

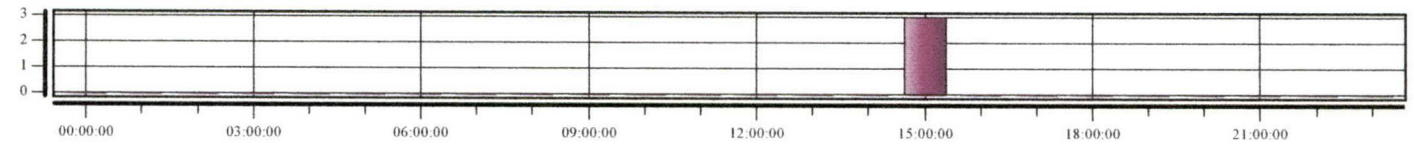
VOLTAGE SAGS



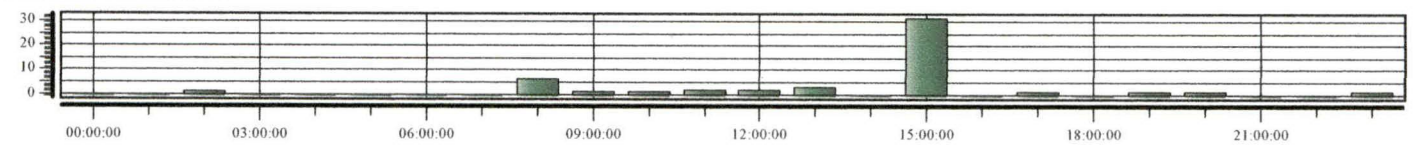
VOLTAGE SWELLS

NO EVENTS WERE FOUND IN THIS CATEGORY

VOLTAGE INTERRUPTIONS



VOLTAGE TRANSIENTS





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WORST CASE SUMMARY

Site: Power Xplorer Site
Measured from 09/26/2016 15:29:33.0 to 10/03/2016 20:40:00.0

Of 4 total VOLTAGE SAGS

CRITERIA	PHASE	CATEGORY	DATA	DATE/TIME
Lowest Magnitude	A	INSTANTANEOUS	0.2V, 0.008 Sec.	09/26/2016 15:29:48.28
	A	INSTANTANEOUS	1.3V, 0.008 Sec.	09/26/2016 15:29:47.19
	B	INSTANTANEOUS	3.3V, 0.008 Sec.	09/26/2016 15:29:33.56
	B	INSTANTANEOUS	105.2V, 0.017 Sec.	09/28/2016 15:00:16.93
Longest Duration	A	INSTANTANEOUS	105.2V, 0.017 Sec.	09/28/2016 15:00:16.93
	A	INSTANTANEOUS	0.2V, 0.008 Sec.	09/26/2016 15:29:48.28
	A	INSTANTANEOUS	1.3V, 0.008 Sec.	09/26/2016 15:29:47.19
	A	INSTANTANEOUS	3.3V, 0.008 Sec.	09/26/2016 15:29:33.56
Most Energy Missing	A	INSTANTANEOUS	105.2V, 0.017 Sec.	09/28/2016 15:00:16.93
	A	INSTANTANEOUS	3.3V, 0.008 Sec.	09/26/2016 15:29:33.56
	A	INSTANTANEOUS	1.3V, 0.008 Sec.	09/26/2016 15:29:47.19
	A	INSTANTANEOUS	0.2V, 0.008 Sec.	09/26/2016 15:29:48.28

Of 0 total VOLTAGE SWELLS

CRITERIA	PHASE	CATEGORY	DATA	DATE/TIME
----------	-------	----------	------	-----------

Of 3 total VOLTAGE INTERRUPTIONS

CRITERIA	PHASE	CATEGORY	DATA	DATE/TIME
Longest Duration	A	TEMPORARY	0.0V, 10.375 Sec.	09/26/2016 15:29:33.57
	A	MOMENTARY	0.4V, 0.625 Sec.	09/26/2016 15:29:47.20
	A	MOMENTARY	0.6V, 0.058 Sec.	09/26/2016 15:29:48.29

Of 51 total VOLTAGE TRANSIENTS

CRITERIA	PHASE	DATA	DATE/TIME
Largest Magnitude	A	273.9V, 0.000 Sec.	09/26/2016 15:29:48.29
	A	224.7V, 0.000 Sec.	09/26/2016 15:29:47.18
	A	216.1V, 0.002 Sec.	09/26/2016 15:29:33.60
	A	212.7V, 0.003 Sec.	09/26/2016 15:29:33.61



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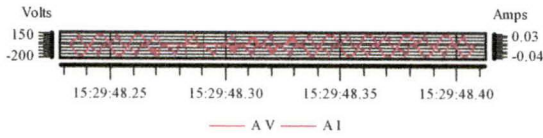
WORST CASE SUMMARY WAVEFORMS

Site: Power Xplorer Site

Measured from 09/26/2016 15:29:33.0 to 10/03/2016 20:40:00.0

Lowest Magnitude Voltage Sag: Phase A

Instantaneous 0.2V,0.008 Sec., on 09/26/2016 15:29:48.28

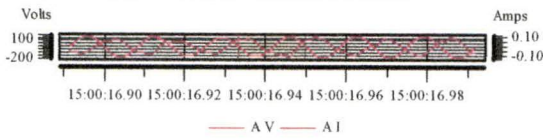


Highest Magnitude Voltage Swell: No event

NO WAVEFORM AVAILABLE

Longest Duration Voltage Sag: Phase A

Instantaneous 105.2V,0.017 Sec., on 09/28/2016 15:00:16.93

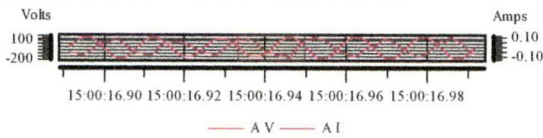


Longest Duration Voltage Swell: No event

NO WAVEFORM AVAILABLE

Most Energy Missing Voltage Sag: Phase A

Instantaneous 105.2V,0.017 Sec., on 09/28/2016 15:00:16.93

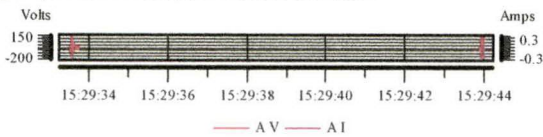


Most Energy Added Voltage Swell: No event

NO WAVEFORM AVAILABLE

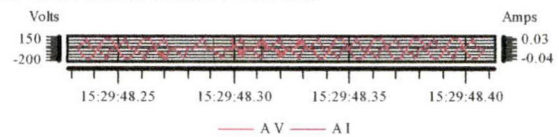
Longest Duration Voltage Interruption: Phase A

Temporary 0.0V,10.375 Sec., on 09/26/2016 15:29:33.57



Largest Magnitude Voltage Transients: Phase A

273.9V,0.000 Sec., on 09/26/2016 15:29:48.29

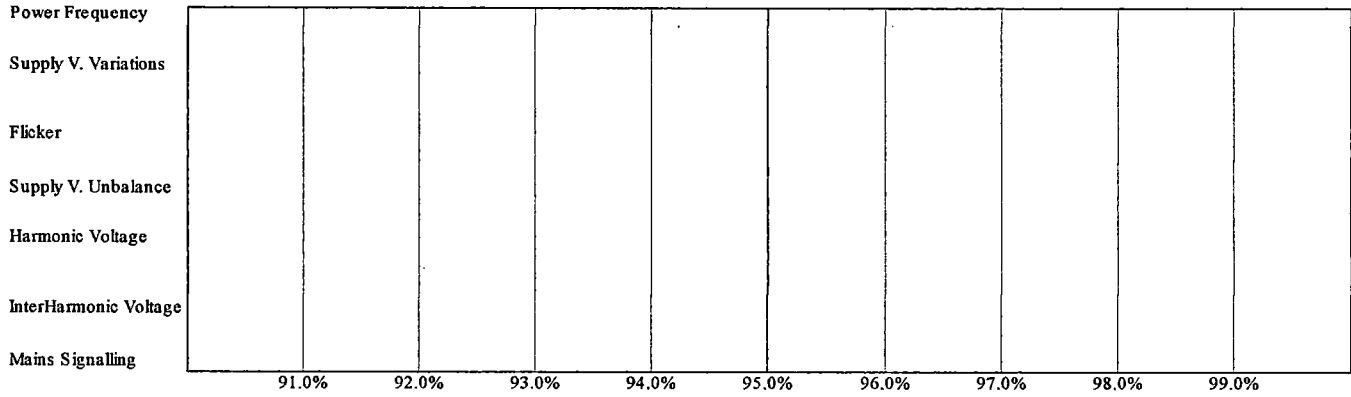




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Event #3237 10/03/2016 00:00:00.000
 EN50160 Uncompleted - Pass



EN50160 DIPS/STATISTICS									
Depth (%)		Duration							
		msec	Sec.	Sec.	Sec.	Sec.	Sec.	min	min
From	to <	10<100	.1<.5	0.5<1	1<3	3<20	20<60	1<3	>3
Dips									
0	10	0	0	0	0	0	0	0	0
10	15	0	0	0	0	0	0	0	0
15	30	0	0	0	0	0	0	0	0
30	60	1	0	0	0	0	0	0	0
60	99	5	0	1	0	1	0	0	0
Interruptions									
99	100	0	0	0	0	0	0	0	0
Temporary Overvoltages:									
110	120	0	0	0	0	0	0	0	0
120	140	0	0	0	0	0	0	0	0
140	160	0	0	0	0	0	0	0	0
160	200	0	0	0	0	0	0	0	0
200		0	0	0	0	0	0	0	0

Transient Overvoltage	Counts
110	0
120	0
140	0
160	0
200	0



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EN50160 COMPLIANCE REPORT

Site: Power Xplorer Site, Week #1 (09/26/2016 15:29:33.0 to 10/03/2016 15:29:33.0)
 Nominal Voltage (Un) = 120 V

Power Frequency

Range	Threshold	Compliance	
60 Hz +1%/-1%	99.5%	100.0%	PASSED
60 Hz +4%/-6%	100.0%	100.0%	PASSED

Supply Voltage Variations

Range	Threshold	Compliance:			
		CHA	CHB	CHC	
120 V +10%/-10%	95.0%	100.0%	100.0%	0.0%	FAILED
120 V +10%/-15%	100.0%	100.0%	100.0%	0.0%	FAILED

Rapid Voltage Changes

Not available

Flicker

Range	Threshold	Compliance:			
		CHA	CHB	CHC	
<1	95.0%	100.0%	100.0%	0.0%	FAILED

Supply Voltage Unbalance

Range	Threshold	Compliance	
0-2%	95.0%	100.0%	PASSED

Harmonics

All shown figures are 95% values

	Limit(% of Un)	A	B	C	Status
THD	<8.00%	1.36%	1.38%	N/A	PASSED
H02	<2.00%	0.03%	0.03%	N/A	PASSED
H03	<5.00%	0.40%	0.38%	N/A	PASSED
H04	<1.00%	0.02%	0.03%	N/A	PASSED
H05	<6.00%	0.81%	0.81%	N/A	PASSED
H06	<0.50%	0.03%	0.02%	N/A	PASSED
H07	<5.00%	0.59%	0.62%	N/A	PASSED
H08	<0.50%	0.02%	0.02%	N/A	PASSED
H09	<1.50%	0.41%	0.37%	N/A	PASSED
H10	<0.50%	0.02%	0.03%	N/A	PASSED
H11	<3.50%	0.73%	0.71%	N/A	PASSED
H12	<0.50%	0.03%	0.02%	N/A	PASSED
H13	<3.00%	0.18%	0.17%	N/A	PASSED
H14	<0.50%	0.03%	0.02%	N/A	PASSED
H15	<0.50%	0.15%	0.13%	N/A	PASSED
H16	<0.50%	0.03%	0.03%	N/A	PASSED



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H17	<2.00%	0.09%	0.08%	N/A	PASSED
H18	<0.50%	0.02%	0.02%	N/A	PASSED
H19	<1.50%	0.08%	0.07%	N/A	PASSED
H20	<0.50%	0.02%	0.02%	N/A	PASSED
H21	<0.50%	0.10%	0.11%	N/A	PASSED
H22	<0.50%	0.02%	0.02%	N/A	PASSED
H23	<1.50%	0.18%	0.18%	N/A	PASSED
H24	<0.50%	0.03%	0.03%	N/A	PASSED
H25	<1.50%	0.13%	0.13%	N/A	PASSED

Supply Voltage Mains Signalling
90Hz - 120Hz PASSED
120Hz - 100kHz Unavailable from this instrument.



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EN50160 COMPLIANCE REPORT - ADDITIONAL INFORMATION

Site: Power Xplorer Site, Week #1 (09/26/2016 15:29:33.0 to 10/03/2016 15:29:33.0)

Supply Voltage Sags, Interruptions and Overvoltages

(EN50160 does not specify limits for this category, these are informative figures)

Magnitude	10-100	0.1-0.5	0.5-1	1-3	3-20	20-60	1-3	>3
	msec	Sec.	Sec.	Sec.	Sec.	Sec.	Min	Min

Sags:

0% - 10%	-	-	-	-	-	-	-	-
10% - 15%	-	-	-	-	-	-	-	-
15% - 30%	-	-	-	-	-	-	-	-
30% - 60%	-	-	-	-	-	-	-	-
60% - 99%	-	-	-	-	-	-	-	-

Interruptions:

99% - 100%	-	-	-	-	-	-	-	-
------------	---	---	---	---	---	---	---	---

Swells:

0% - 110%	-	-	-	-	-	-	-	-
110% - 120%	-	-	-	-	-	-	-	-
120% - 140%	-	-	-	-	-	-	-	-
140% - 160%	-	-	-	-	-	-	-	-
160% - 200%	-	-	-	-	-	-	-	-
200% -	-	-	-	-	-	-	-	-

Transient Overvoltages

(EN50160 does not specify limits for this category, these are informative figures)

Magnitude	Counts
0% - 110%	-
110% - 120%	-
120% - 140%	-
140% - 160%	-
160% - 200%	51
200% -	-

Interharmonic Voltage

(EN50160 does not specify limits for this category. All shown figures are 95% values)

	A	B	C
TID	0.16%	0.07%	N/A
IH00	0.03%	0.02%	N/A
IH01	0.03%	0.02%	N/A
IH02	0.02%	0.01%	N/A
IH03	0.02%	0.01%	N/A
IH04	0.02%	0.01%	N/A
IH05	0.02%	0.01%	N/A
IH06	0.02%	0.00%	N/A
IH07	0.02%	0.01%	N/A
IH08	0.02%	0.01%	N/A
IH09	0.04%	0.02%	N/A
IH10	0.02%	0.01%	N/A
IH11	0.02%	0.02%	N/A



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HH12	0.02%	0.02%	N/A
HH13	0.02%	0.01%	N/A
HH14	0.04%	0.00%	N/A
HH15	0.02%	0.00%	N/A
HH16	0.04%	0.01%	N/A
HH17	0.02%	0.00%	N/A
HH18	0.02%	0.01%	N/A
HH19	0.02%	0.00%	N/A
HH20	0.02%	0.00%	N/A
HH21	0.02%	0.00%	N/A
HH22	0.02%	0.01%	N/A
HH23	0.02%	0.01%	N/A
HH24	0.02%	0.00%	N/A
HH25	0.02%	0.00%	N/A



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EN50160 COMPLIANCE REPORT

Site: Power Xplorer Site, Week #2 (10/03/2016 15:29:33.0 to 10/03/2016 20:40:00.0)

WARNING: THIS TIME PERIOD IS LESS THAN A WEEK

Nominal Voltage (Un) = 120 V

Power Frequency

Range	Threshold	Compliance	
60 Hz +1%/-1%	99.5%	100.0%	PASSED
60 Hz +4%/-6%	100.0%	100.0%	PASSED

Supply Voltage Variations

Range	Threshold	Compliance:			
		CHA	CHB	CHC	
120 V +10%/-10%	95.0%	100.0%	100.0%	0.0%	FAILED
120 V +10%/-15%	100.0%	100.0%	100.0%	0.0%	FAILED

Rapid Voltage Changes

Not available

Flicker

Range	Threshold	Compliance:			
		CHA	CHB	CHC	
<1	95.0%	100.0%	100.0%	0.0%	FAILED

Supply Voltage Unbalance

Range	Threshold	Compliance	
0-2%	95.0%	100.0%	PASSED

Harmonics

All shown figures are 95% values

	Limit(% of Un)	A	B	C	Status
THD	<8.00%	1.24%	1.24%	N/A	PASSED
H02	<2.00%	0.03%	0.03%	N/A	PASSED
H03	<5.00%	0.37%	0.32%	N/A	PASSED
H04	<1.00%	0.02%	0.03%	N/A	PASSED
H05	<6.00%	0.74%	0.78%	N/A	PASSED
H06	<0.50%	0.02%	0.02%	N/A	PASSED
H07	<5.00%	0.41%	0.39%	N/A	PASSED
H08	<0.50%	0.02%	0.01%	N/A	PASSED
H09	<1.50%	0.30%	0.29%	N/A	PASSED
H10	<0.50%	0.03%	0.02%	N/A	PASSED
H11	<3.50%	0.75%	0.77%	N/A	PASSED
H12	<0.50%	0.03%	0.02%	N/A	PASSED
H13	<3.00%	0.13%	0.10%	N/A	PASSED
H14	<0.50%	0.03%	0.02%	N/A	PASSED
H15	<0.50%	0.19%	0.11%	N/A	PASSED



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H16	<0.50%	0.03%	0.03%	N/A	PASSED
H17	<2.00%	0.08%	0.07%	N/A	PASSED
H18	<0.50%	0.02%	0.02%	N/A	PASSED
H19	<1.50%	0.14%	0.12%	N/A	PASSED
H20	<0.50%	0.01%	0.00%	N/A	PASSED
H21	<0.50%	0.09%	0.11%	N/A	PASSED
H22	<0.50%	0.01%	0.01%	N/A	PASSED
H23	<1.50%	0.23%	0.24%	N/A	PASSED
H24	<0.50%	0.02%	0.01%	N/A	PASSED
H25	<1.50%	0.17%	0.15%	N/A	PASSED

Supply Voltage Mains Signalling

90Hz - 120Hz PASSED

120Hz - 100kHz Unavailable from this instrument.



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EN50160 COMPLIANCE REPORT - ADDITIONAL INFORMATION

Site: Power Xplorer Site, Week #2 (10/03/2016 15:29:33.0 to 10/03/2016 20:40:00.0)

WARNING: THIS TIME PERIOD IS LESS THAN A WEEK

Supply Voltage Sags, Interruptions and Overvoltages

(EN50160 does not specify limits for this category, these are informative figures)

Magnitude	10-100	0.1-0.5	0.5-1	1-3	3-20	20-60	1-3	>3
	msec	Sec.	Sec.	Sec.	Sec.	Sec.	Min	Min

Sags:								
0% - 10%	-	-	-	-	-	-	-	-
10% - 15%	-	-	-	-	-	-	-	-
15% - 30%	-	-	-	-	-	-	-	-
30% - 60%	-	-	-	-	-	-	-	-
60% - 99%	-	-	-	-	-	-	-	-

Interruptions:								
99% - 100%	-	-	-	-	-	-	-	-

Swells:								
0% - 110%	-	-	-	-	-	-	-	-
110% - 120%	-	-	-	-	-	-	-	-
120% - 140%	-	-	-	-	-	-	-	-
140% - 160%	-	-	-	-	-	-	-	-
160% - 200%	-	-	-	-	-	-	-	-
200% -	-	-	-	-	-	-	-	-

Transient Overvoltages

(EN50160 does not specify limits for this category, these are informative figures)

Magnitude	Counts
0% - 110%	-
110% - 120%	-
120% - 140%	-
140% - 160%	-
160% - 200%	-
200% -	-

Interharmonic Voltage

(EN50160 does not specify limits for this category, All shown figures are 95% values)

	A	B	C
TID	0.15%	0.05%	N/A
TH00	N/A	0.02%	N/A
TH01	N/A	0.02%	N/A
TH02	N/A	0.01%	N/A
TH03	N/A	0.00%	N/A
TH04	N/A	0.00%	N/A
TH05	N/A	0.00%	N/A
TH06	N/A	0.00%	N/A
TH07	N/A	0.00%	N/A
TH08	N/A	0.00%	N/A
TH09	N/A	0.01%	N/A



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IH10	N/A	0.01%	N/A
IH11	N/A	0.02%	N/A
IH12	N/A	0.01%	N/A
IH13	N/A	0.01%	N/A
IH14	N/A	0.00%	N/A
IH15	N/A	0.00%	N/A
IH16	N/A	0.00%	N/A
IH17	N/A	0.00%	N/A
IH18	N/A	0.00%	N/A
IH19	N/A	0.00%	N/A
IH20	N/A	0.00%	N/A
IH21	N/A	0.00%	N/A
IH22	N/A	0.00%	N/A
IH23	N/A	0.00%	N/A
IH24	N/A	0.00%	N/A
IH25	N/A	0.00%	N/A

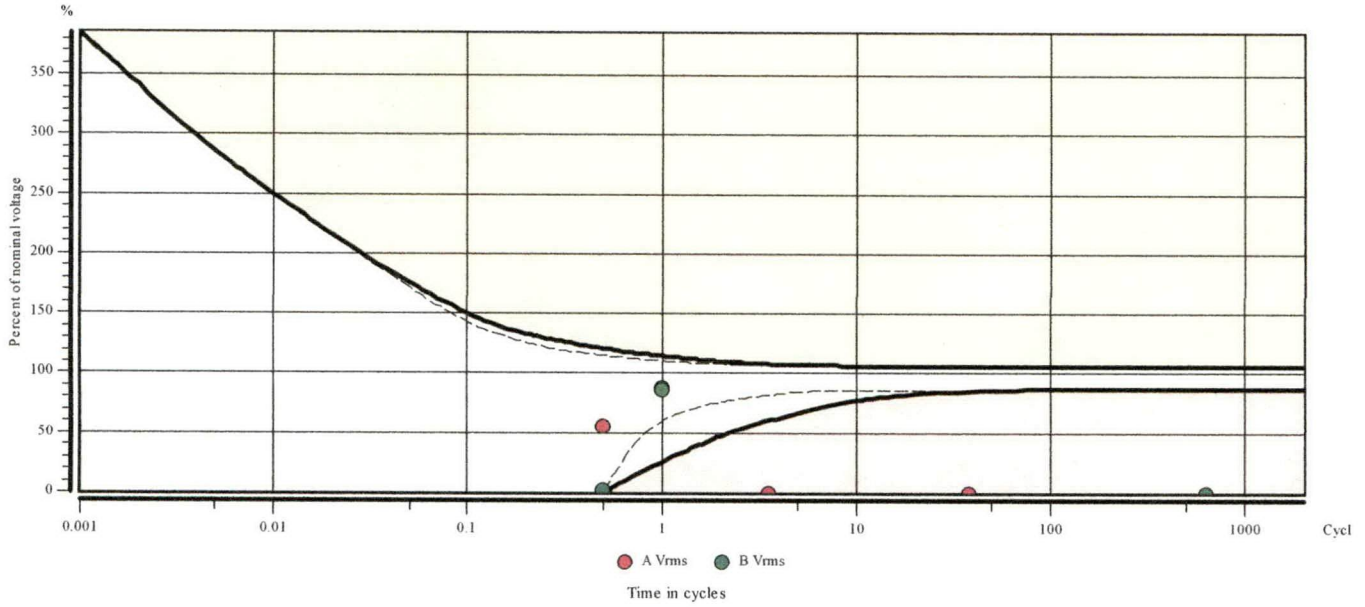


Nacy A. Stadtlander
1306 Gobler Ford Rd
Lewisport, KY 42351
Main 240volt Service

Date
10/15/2016 Page 18
Issued by
David Diehl 866-715-4333
Filename
Main Service 240volt

MAGNITUDE/DURATION DIAGRAM

Site: Power Xplorer Site
Measured from 09/26/2016 15:29:33.0 to 10/03/2016 20:40:00.0



TOLERANCE CURVE: CBEMA
Nominal voltage (100%) = 120 V
Variations ABOVE tolerance curve 0
Variations BELOW tolerance curve 4
Variations ABOVE recommendation curve 0
Variations BELOW recommendation curve 4

EXHIBIT 9-A
DRANETZ STUDY

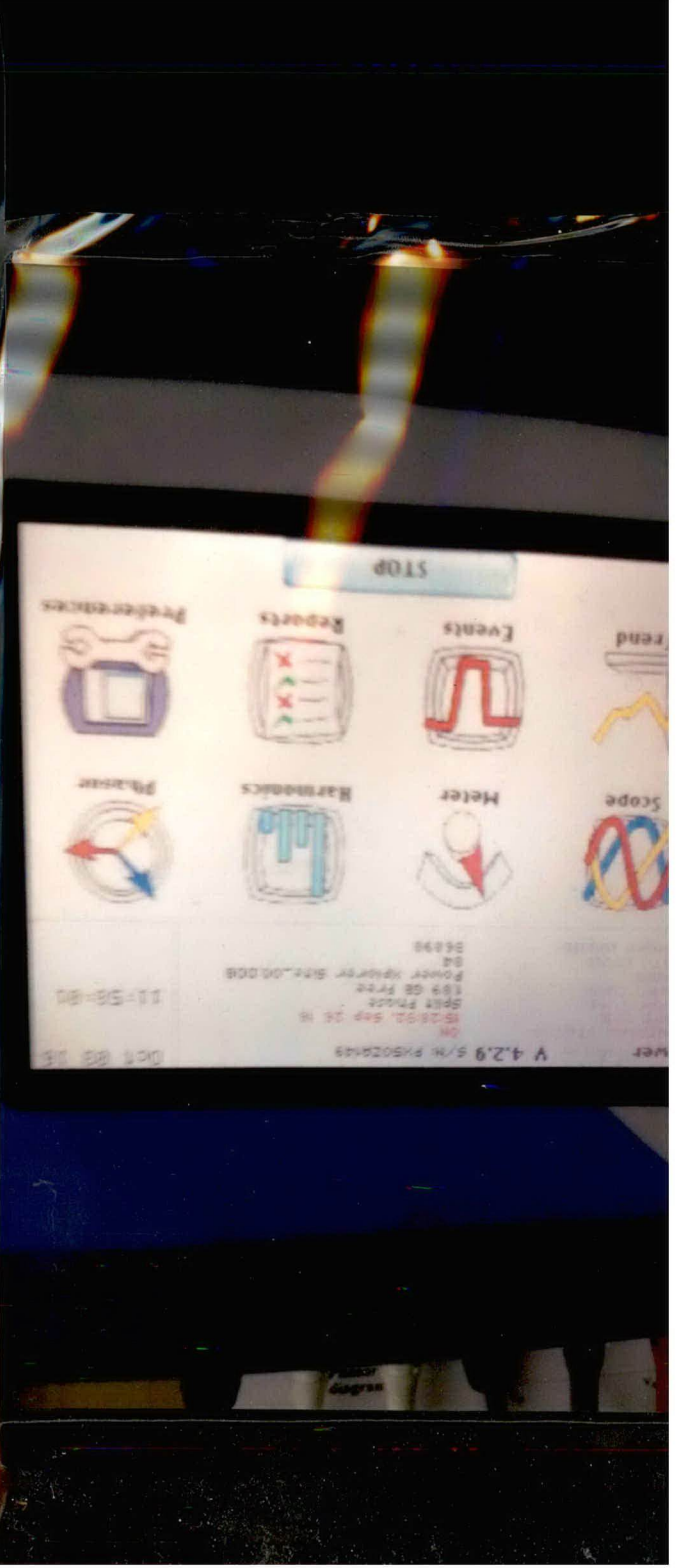
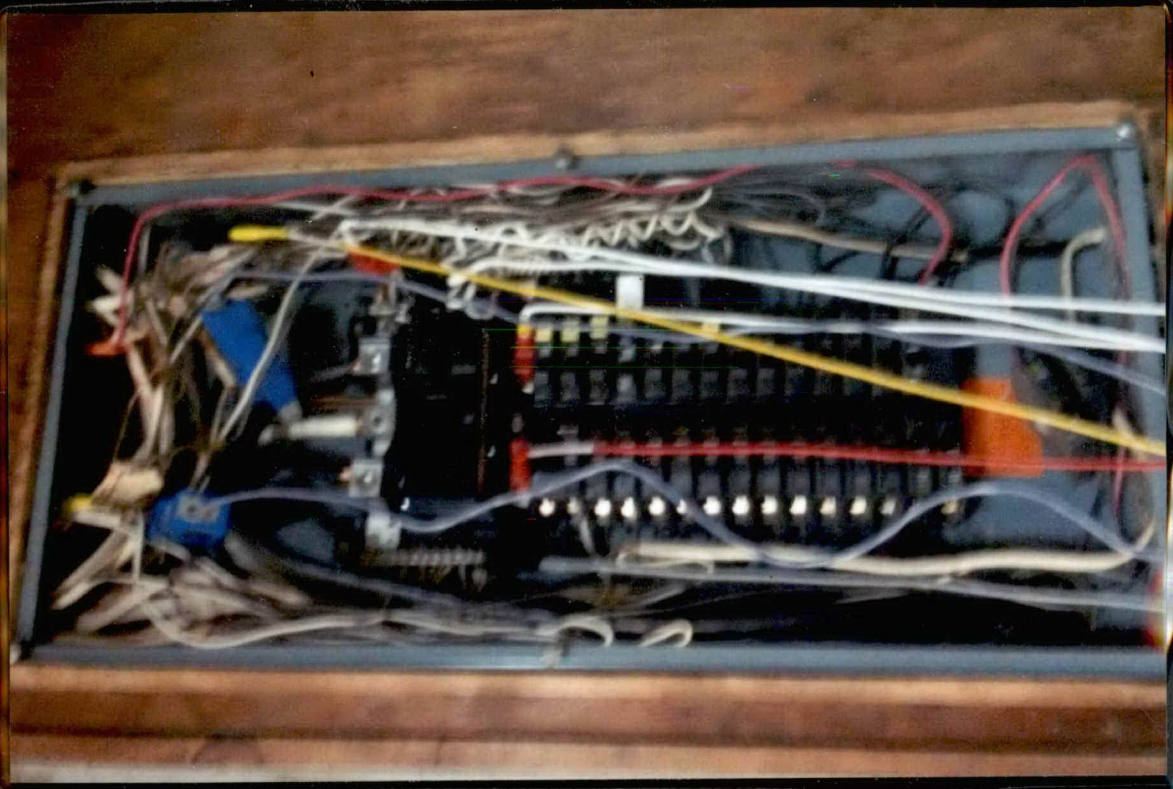


EXHIBIT 10
RECEIVED

NOV 23 2016

Public Service
Commission

The health effects of invisible light flicker

16th March 2016

Research has shown that imperceptible light flicker can cause headaches, eyestrain, general body weakness and a decrease in productivity.

While we all know the health hazards of exposure to lights with visible flickering – particularly for people prone to seizures – what many of us don't know is that long-term exposure to lights with imperceptible flicker can also be detrimental to our health.

Depending on the individual, flicker becomes invisible at around 100-160Hz. This is because the flashes in the light are so frequent that our retina resolves the modulation and the light is perceived as smooth and continuous.

To avoid lights with invisible flicker and the negative impact they can have on your health, we recommend testing your lights instore before purchasing them.

To test the flicker rate of the light, simply hold your phone's video camera up to the light while it's on. If the light has a high flicker rate, you will see bars, stripes or flickering through the camera.

NOV 23 2016

Public Service
Commission

Smart Grid
An Explanation For The Layman
or
How Smart Grid Will Affect Your Life

This document is pseudo-technical in presentation. It attempts to convey the intended purpose of the Smart Grid Initiative's pros and cons using an understandable and comprehensible language and style.

As with all technical documents, each subject is numbered as main topic and sub-topic line items for easy reference and corroboration.

Each section contains a number of URL links to Internet articles that explain in greater detail each line item's specific subject. These are mainly links to Wikipedia articles and are meant simply to provide further insight.

There is also a reference listing of each line item's subject at the end of the document proper. This reference listing provides links to further, in-depth information.

Part 1: What is Smart Grid anyway?

1.1 The term Smart Grid refers to a global, all-encompassing communications system infrastructure being surreptitiously and secretly installed right now on the electrical power transmission and distribution grid. As a result of this technology the cost of your electricity will increase by a factor of 6. Your metering charges will increase by a factor of 10. You will have "snoopware" installed on all of your appliances talking to an indoor meter that you will pay \$1300 for. You will have microwave streams emitting from all of your electrical outlets 24/7. "They" know what's best for you and decided that you did not need to be informed of all this.

1.1.1 *"A **smart grid** is a digitally enabled electrical grid that gathers, distributes, and acts on information about the behavior of all participants (suppliers and consumers) in order to improve the efficiency, importance, reliability, economics, and sustainability of electricity services.*

http://en.wikipedia.org/wiki/Smart_grid

Smart grid policy is organized in Europe as Smart Grid European Technology Platform. Policy in the United States is described in 42 U.S.C ch. 152 subch. IX § 17381"

[42 U.S.C. ch.152 subch.IX](http://www.federalregister.gov/?page=1&title=42+U.S.C.+ch.152+subch.IX)

1.1.2 The present state of Smart Grid installation in the USA can be found by following the URL link.

<http://www.sgiclearinghouse.org/>

- 1.1.3 The spectrum scans and data evidence that are included in this document are taken from spectrum analysis scans in several cities in several States in the USA, Denmark, Australia, Canada, and the United Kingdom. Some of these spectrum analysis scans are as shown, with first-hand accounts, in Exhibit 23.
- 1.1.4 The spectrum scans and data evidence that are included in this document can be reproduced and verified anywhere and everywhere on Earth where BPL is operational.
- 1.1.5 The spectrum scans and data evidence in this document were produced over the period July, 2011 through February, 2012. Total number of different computers used was eleven (11); each computer ran Windows 7 and as such had CPU speeds in excess of 4GHz and 2GB of RAM minimum. Three (3) highly-sophisticated Fast Fourier Transform-based software spectrum analysis software suites were utilized, arbitrarily chosen by the author at the time of testing. Cloud computing technology was utilized throughout this investigatory process. Less than 20 years ago the amount of computing and data processing power and capabilities used to complete this global effort would have filled the entire volume of an auditorium with no room remaining in the aisles.

Part 2: So how does it affect me?

2.0 BPL Explained

- 2.1 This document explains the origin of a global phenomenon known as “The Hum” in terms that can be understood by a non-technical individual. It examines and explains the Smart Grid backbone communications system; Broadband over Power Lines (BPL); its impact on the individual person from a physiological perspective. That is, the effects of BPL-derived emissions on a person’s physical and mental state.

The electrical power industry has, for more than 40 years, attempted to increase the overall throughput or transfer speeds of data signals on the overhead power lines. In the 1970’s it was Bristol, England that was the focus of attention regarding the ominous “Hum”, it is a classic example: Then followed Taos, New Mexico; Kokomo, Michigan; and a slew of other locations worldwide. Every one of these projects was ultimately terminated as the emissions were unpredictable and widespread. The equipment was de-energized, and removed; the emissions disappeared and the “Mysterious Worldwide Hum” remained mysterious. One of the latest cases is Windsor, Ontario, just across the Rouge River from Detroit, Michigan. Their emissions and noise were blamed on railroad cars on Zug Island which have been in operation for over 100 years. Between Zug Island and Windsor is a large Smart Grid/BPL control center.

This time around, on a global scale, it appears that the copious amounts of money that can and are being made from BPL/B-PLC implementation is worth the risk of massive damage to populations (human and otherwise), the food chain, and entire ecosystems worldwide.

BPL is sometimes referred to as Broadband Power Line Communication (B-PLC), or its USA FCC (Federal Communications Commission) roll-out moniker: Access BPL.

http://en.wikipedia.org/wiki/Broadband_over_Power_Lines

- 2.1.2 Since 2006 reported incidences have been steadily growing worldwide of a persistent, unstoppable, diesel engine-type noise suddenly appearing in people’s lives. Reports

from individuals around the world indicate that, at times, these emissions appear to be sufficiently powerful to shake the ground.

- 2.1.3 To add to these individual's distress this noise appears to be coming from everywhere at once 24/7 with no particular direction of origin, always louder indoors. Exhaustion and many other symptoms follow seemingly endless sleepless nights.
- 2.1.4 The second factor causing anguish is that individuals hearing this noise find that they seem to be alone with their problem. Everyone that they ask cannot hear it.
- 2.1.5 Many of these people, in their frustration, contact government agencies and are told that they probably have Tinnitus and should see a medical doctor. A visit to an MD usually does not diagnose Tinnitus
- 2.1.6 This noise ranges in volume from a background hum through to a running truck outside your window. Many people also report symptoms of abdominal and/or chest pain accompanying this noise's presence. There are those that also suffer from severe emotional distress manifesting itself as trepidation, revulsion, nervousness, and dread, among others. People around the globe tell of suddenly feeling exhausted when exposed to these emissions.
- 2.1.7 There is a correlation between sub-items 2.1.2 and 2.1.6 and human reaction to infrasound:

“Infrasonic 17 Hz tone experiment

On May 31, 2003, a team of UK researchers held a mass experiment where they exposed some 700 people to music laced with soft 17 Hz sine waves played at a level described as "near the edge of hearing", produced by an extra-long-stroke subwoofer mounted two-thirds of the way from the end of a seven-meter-long plastic sewer pipe. The experimental concert (entitled Infrasonic) took place in the Purcell Room over the course of two performances, each consisting of four musical pieces. Two of the pieces in each concert had 17 Hz tones played underneath. In the second concert, the pieces that were to carry a 17 Hz undertone were swapped so that test results would not focus on any specific musical piece. The participants were not told which pieces included the low-level 17 Hz near-infrasonic tone. The presence of the tone resulted in a significant number (22%) of respondents reporting anxiety, uneasiness, extreme sorrow, nervous feelings of revulsion or fear, chills down the spine and feelings of pressure on the chest. In presenting the evidence to the British Association for the Advancement of Science, Professor Richard Wiseman said, "These results suggest that low frequency sound can cause people to have unusual experiences even though they cannot consciously detect infrasound."

http://en.wikipedia.org/wiki/Infrasound#Human_reactions_to_infrasound

Nowadays tech-savvy teenage pranksters know that if they use a readily-available freeware signal generator (i.e. SigJenny), playing a low-frequency (LF) sine wave centered on 17Hz through a sub-woofer, they can “trick” their friends and parents into feeling frightened and “freaked out”. Dependent on the volume of the speaker, these teens observe dramatic increases in people’s reactions even though virtually no one can actually hear the “noise”.

With Smart Grid BPL-generated LF, Power Companies are “freaking out” entire populations.

- 2.1.8 Occurrences of this hum noise from individuals and small geo-physically localized groups have become relatively common during the last 2 years worldwide, particularly in the USA and Canada. Those that have been investigated on an individual basis are not correlated to other similar occurrences. All cases have been given a different reason for the causation or no explanation at all.
- 2.1.9 In the following text a full explanation is given. Irrefutable documented proof and data, in labeled sections, can be downloaded as Exhibits from the author’s Cloud address:

Due to the sensitivity of content, Cloud database access will be supplied on an individual “as required and necessary” basis. Contact the originator of this document for access or email your access request to: smartgridexhibits@live.com

Part 3: So what’s happening here?

(Sorry about this, but we need to get technical for a couple of paragraphs)

3.0 Overview

3.1 Smart Grid technology is based on digital communication using the electrical power transmission line grid as the backbone communication system. Utilities have been, for decades, communicating with their equipment that is attached to the grid at very-slow data transmission rates when compared to the transmission speeds that computers are capable of communicating today. The successful implementation of the entire Smart Grid initiative meant that the speed of the data transmission through/over the electricity transmission line grid had to increase by many orders of magnitude – It needed to operate hundreds of millions of times faster than it was/is presently operating.

3.1.1 *“Broadband over power lines (BPL) is a method of power line communication that allows relatively high speed digital data transmission over the public electric power distribution wiring. BPL uses different technologies from other forms of power-line communications to provide high-rate communication over long distances. BPL uses parts of the radio spectrum allocated to other over-the-air communication services. Interference to, and from, these services is a limiting factor in the introduction of BPL systems.*

While some have been in widespread use for a decade, integrated circuits implementing one standard were introduced in May 2011.”

[http://en.wikipedia.org/wiki/Broadband over Power Lines](http://en.wikipedia.org/wiki/Broadband_over_Power_Lines)

3.2 The present deployment of Broadband over Power Lines (BPL), also termed Broadband Power Line Communications (B-PLC) or Access BPL is based on a form of **Frequency-Shift Keying (FSK)**.

http://en.wikipedia.org/wiki/Frequency-shift_keying

3.2.1 The particular type of FSK used in this BPL/B-PLC deployment is termed **Digitally-Encoded Phase-Shift Keying**.

<http://www.broadbandindiamagazine.com/2010/01/the-common-digital-modulation-techniques-phase-shift-keying>

3.2.2 Access BPL appears from research to use at least 10-bits to generate a digitally-encoded phase-shift keying signal utilizing the frequencies of 11.719Hz through 23988Hz in 11.719Hz increments; 10-bits provide 2048 separate and overlaid frequency "dots". By adding a single bit this frequency "dot" count doubles to 4096, in this BPL mode the "dot" frequency "start point" is 5.8594Hz, increasing to 23988Hz in increments of that frequency. The signal waveform shown in Figure 1 is produced.

3.2.3 Using the algorithm that generated the waveform in Figure 1 and extending the bit count by just 4 bits to 16 bits, an additional 61,440 frequency "dots" would be generated. This would make this waveform persistently capable of passing through any and all inductive and capacitive element utilized on the electricity transmission grid.

3.2.4 The harmonics, interharmonics and consequent subharmonics generated increase linearly with each increase in this waveform's frequency "dot" overlay. The subharmonics, for instance, would all appear in the <50Hz range, overlay one another, and be very powerful indeed.

3.3 Access-BPL is based on 40MHz transmission of the signal in 3.2.2. In practice transmission speeds of 40MHz are not realized due to actual physical properties of the power lines and signal reflection, loss, and attenuation (scattering). More often than not 30MHz is BPL's real transmission speed.

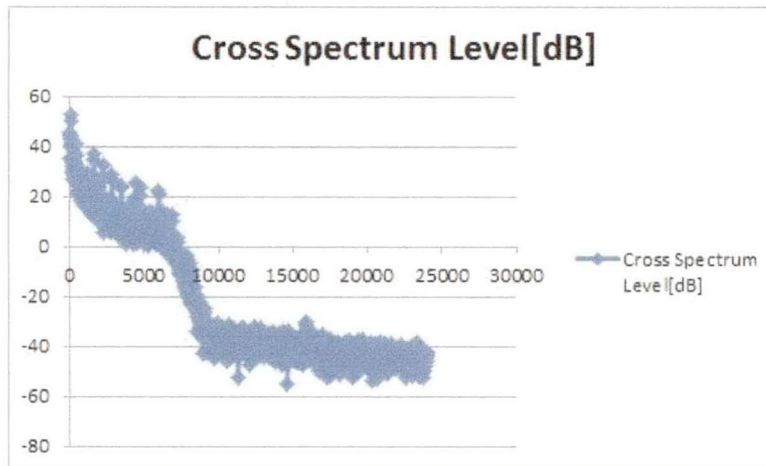


Figure 1: X-Y Plot of BPL Signal Frequencies

- 3.3.1 Fact: Generally BPL and DSL-labeled power line derived Internet access is offered by BPL ISP's at 500kbs (kilobits/sec). Rule of thumb – Actual data speeds are the transmission speed divided by 60.
- 3.4 There are 2 main applications, or methods, that are used to get this signal to where it needs to be. Generally speaking the choice of method used is based on population density in a given area.
- 3.4.1 Let's say that for each installation of BPL requires a paying customer base of 100 for it to be economically viable. Let's assume that 1% of a population in a BPL installation area signs up for Internet access. Given that math, there would need to be 10,000 homes/businesses within a BPL transmission area.
- 3.4.2 In a city suburb where there are thousands of potential customers in a relatively small area with overhead power lines following the roadways, the above figure is easily achievable. In this case the signal is "injected" into the overhead power lines at the local substation.
- 3.4.3 In a rural area where 10,000 potential customers are scattered over, perhaps, 100's of square miles the method used is hybrid wireless/wired. A purpose-built mast with purpose-built transmitter dishes, usually in an existing cell-phone tower/mast installation, sends the BPL signal to wireless receivers (network gateways) which are mounted on power line poles or existing buildings. These wireless receivers are wire connected to the nearest power line.

The size (power) of the transmission dishes depends on the distance that the signal has to cover to reach the required number of potential customers. Many of these installations can be seen on top of a hill with up to 10 double-transmitter dish masts arranged in circular fashion. The transmitter dishes are black, inside-out dishes – Boob Dishes. If you are one of those people unlucky enough to be able to hear these transmissions, you can hear these Boob Dishes from 10 miles away.

3.5 So the Access BPL signal is in the power line, how does it get into my house?

It's called "The Last Mile". There are demodulator boxes that reverse the procedure explained in 3.4.3. A connection is made onto the power line local to an Access BPL customer's property and taken into a demodulator box. You've seen them on power line poles and ignored them as just another "something on the pole". In the States they are generally beige 15 inch cubes with red and green lights on their right side. The electronics inside these boxes wirelessly transmit 956MHz Access BPL signals, using a protocol (language) called ZigBee, to a receiver box on/in your home that is connected to your electrical wiring.

"To solve the problem of providing enhanced services over the last mile, some firms have been mixing networks for decades. One example is Fixed Wireless Access, where a wireless network is used instead of wires to connect a stationary terminal to the wireline network. Various solutions are being developed which are seen as an alternative to the "last mile" of standard incumbent local exchange carriers: these include WiMAX and BPL (Broadband over Power Line) applications."

http://en.wikipedia.org/wiki/Last_mile

Part 4: Internet access? Is that it?

4.0 The Whole Story

4.1 You guessed it. There is more to this “thing” than just Internet access. Access BPL is small change; a “something” to partly and temporarily fund the on-going Smart Grid effort. Here we take a look at all of the aspects of Smart Grid application.

4.1.1 **Automatic Meter Reading (AMR):** You may have heard of “smart” meters. Their mandatory installation is causing entire communities to take out lawsuits against their respective Power Companies. But that’s all the attention it’s getting, local complaints regarding a global, and in the USA, nationwide, matter. Why aren’t national newspapers and TV stations taking up the issue? More importantly, why is it that government agencies appear to be ignoring the probable health concerns entirely?

The reason is because the present “smart” meters serve as a diversion from the real issues - More on that later.

The present digital meters that people are discovering on their homes are a “test run” for the real thing. They are cheap \$3 pieces of junk, made in China, and not tested to meet any standards specifications; as such these meters frequently overheat and burst into flames. These digital meters are arranged along a BPL-carrying power line in “test” configuration. A few thousand installed at designed intervals along, perhaps, a two hundred mile stretch of power line. You may have heard that electrical utility companies are experiencing problems getting these, meshWiFi configured, “smart” meters to work as they should - All part of the overall Smart Grid plan.

The real “Smart Meters” are on their way, and, as the BTO song goes, “You Ain’t Seen Nothin’ Yet.”

“Automatic meter reading, or AMR, is the technology of automatically collecting consumption, diagnostic, and status data from water metering or energy metering devices (gas, electric) and transferring that data to a central database for billing, troubleshooting, and analyzing. This technology mainly saves utility providers the expense of periodic trips to each physical location to read a meter.”

http://en.wikipedia.org/wiki/Automatic_meter_reading

4.1.2 **“Smart” technology in “smart” appliances:** Now we’re getting down to it. Remember when Records disappeared from music stores overnight and Compact Cassette Tapes took their place? (BTW – You’re old if you do!) Remember when cassette tapes disappeared in the same fashion and music CD’s took their place? VHS tapes to DVD’s?

The next big disappearance items are “dumb” appliances.

Your fridge wants to start up – It asks the living-area, wall-mounted “Smart Meter” if it can turn on now or wait 5 minutes and get electricity 0.02 cents per Kilowatt/Hour cheaper. The “smart” meter checks with the Power Company computers and is told to wait. Turns out this saves you 2/10 of one cent.

You decide to get a new fridge. You are surprised to discover that the price has tripled since you last looked. The store assistant informs you that your new fridge is “Smart

Appliance” equipped. A 2 cent silicon chip added to the circuitry that also adds \$1200 to the price tag. Does this sound dumb to you? Not if you’re an appliance manufacturer it doesn’t. Think this is pie-in-the-sky? Take a look at this URL:

<http://www.bbc.co.uk/news/technology-17345934>

4.1.3 If you scrolled through the Smart Grid Wikipedia article you’ll know that:

“Smart energy demand describes the energy user component of the smart grid. It goes beyond and means much more than even energy efficiency and demand response combined. Smart energy demand is what delivers the majority of smart meter and smart grid benefits.

Smart energy demand is a broad concept. It includes any energy-user actions to:

- *Enhancement of reliability*
- *reduce peak demand*
- *shift usage to off-peak hours*
- *lower total energy consumption*
- *actively manage electric vehicle charging*
- *actively manage other usage to respond to solar, wind, and other renewable resources*
- *buy more efficient appliances and equipment over time based on a better understanding of how energy is used by each appliance or item of equipment.*

All of these actions minimize adverse impacts on electricity grids and maximize utility and, as a result, consumer savings. Smart Energy Demand mechanisms and tactics include:

- *smart meters*
- *dynamic pricing*
- *smart thermostats and smart appliances*
- *automated control of equipment*
- *real-time and next day energy information feedback to electricity users*
- *usage by appliance data*
- *scheduling and control of loads such as electric vehicle chargers, home area networks (HANs), and others.”*

Now, if you scrutinize each point you will immediately notice that all are pretty flimsy excuses for spending a couple of Trillion dollars in the USA alone on untried and untested equipment on an old and dilapidated machine (the electricity transmission and distribution grid).

There is no real return on Smart Grid. At the end of the day it will be the consumer that foots the bill – As usual.

This entire Smart Grid installation is about nothing more than money in the pockets of “them” – The major corporations. This will occur while the rest of us have to deal with the fallout of this poorly engineered and deadly experimental monstrosity.

Ultimately, Smart Grid and its BPL backbone communication system will get shut down and the equipment removed. Meanwhile it is killing people and animals around the globe; ruining millions of lives, and devastating ecosystems. But “they” will get to keep the money.

Part 5: So what are these emissions?

5.0 BPL-Derived Emissions Explained

Power lines and their associated distribution equipment (substations, etc.) were designed to deliver Alternating Current (AC) electricity from the generating station to the end user. They were first installed during the 1930's under the Electricity Act in many countries. Much of the original equipment is still in use; most (85%) is at least 60 years old. All electrical power distribution and transmission equipment consists of non-insulated, bare metal conductors.

Signal and/or communication transmission cables are purpose built, insulated, dielectric-shielded, and grounded twisted-pair cables. They may be single pair or multi-pair (i.e. 19 pairs in one overall insulated cable is common).

Twisted pair: This is intended to stop cross-talk between the wires of each signal-carrying pair.

Grounded: This is a single, uninsulated wire that is twisted around and along each signal twisted pair. Its purpose is to drain any cross-talk signal that is generated. It is connected at one end only, usually to the ground point (chassis) on the master device.

Dielectric Shield: This is an aluminium or Mylar/aluminium hybrid material and covers each signal pair along its length. It has 2 purposes in Transverse Magnetic (TM) Mode – The transfer mode of all data signals. This shield stops the data leaking/radiating away from the signal cable. It also functions as a “get back in there” medium to return “escaped” signal energy back to where it came from.

Insulated: Each wire of each twisted pair is insulated. There is an overall insulating sheath. This stops shorting between each wire and on anything metal the cable may touch.

Most data cables also include a **ferrite core** near the “receiver” end of the cable. This serves 2 purposes: To stop errant and unintended RF signals and to “catch” and dissipate signal energy reflections due to impedance mismatch.

Purpose-built data transmission/signal carrying cables are designed to stop any leakage of signal energy that may occur. Bare metal, electricity transmission and distribution cables and equipment were not intended or designed to carry data transmissions/signal energy. Doing so results in large signal energy leakage (emissions) and other unwanted, but apparently collaterally acceptable, occurrences.

To cut a long story short; AC electricity is magnet generated and is comprised of electrons that are forced to move along the conductive elements of the electricity grid (overhead cables, transformer substations, etc.). These AC electron “clumps” travel along the outside of the conductor in sine wave configuration at (theoretically) the speed of light in a vacuum – 186,000 miles per second. Therefore, at 60Hz a single AC sine wave on the power line is just over 3083 miles long and would travel around the Earth 8 times in one second. Taking this a step further, if you wired a light bulb in San Francisco to a switch in Manhattan (2582 miles); flick the switch in NY for light in CA around 8 milliseconds (8/1000sec) later.

http://en.wikipedia.org/wiki/Speed_of_light

The above paragraph was simply to demonstrate what we are dealing with. Everything that we discuss from here on in is occurring at the speed of light. The only exceptions to that statement are audible sonic waves, which occur as a direct result of energy releases/emissions from electricity grid equipment.

Sonic, or sound, wave energy pushes air in the atmosphere, increasing the pressure slightly where this energy release is taking place. These pressure waves travel at the speed of sound; in dry air at 68°F (20°C), the speed of sound is 768mph (1,236km/hr); Air pressure reaches your ears and vibrates your eardrums, causing you to hear a sound associated with the frequency of the sonic/sound waves.

http://en.wikipedia.org/wiki/Speed_of_sound

The air pressure changes caused by energy releases can be measured; is termed Sound Pressure Level (SPL), and is measured in units called Decibels (dB). The loudness (volume) of a sound is "weighted" to give a closer association to human hearing capabilities. There are only 2 weighting factors used nowadays, the "A" and "C" weighting factors. A-weighting is generally used for the "normal" range of hearing. C-weighting is used for the low-end of hearing-range frequency spectrum, the deep-bass frequencies. Hearing response in the C-range is flat, that is, over the C-range of frequencies the sound that you would hear stays the same even though the frequency changes. It is for this very reason that BPL emissions "noise" appears to be the same worldwide – A running diesel engine.

Decibels are a measurement unit of energy, a given decibel measurement sample can therefore be mathematically calculated back to the amount of energy that was required to make the decibel measurement sample in question.

dBm is power relative to 1mW (milliwatt) 1 Watt or 30 dBm. $10 \cdot \log(1/0.001)$

Therefore: 100W = 20dB = 50dBm 10W = 10 dB = 40dBm 4W = 6dB = 36dBm

The decibel scale is logarithmic; for a 3dB increase energy/power would need to double. For every 10dB increase, power has to be increased by a factor of 10. By the same token; when a communications signal is said to have reached its -3dB point it has lost half of its original transmission power.

For a dB-Power crash course: <http://www.sengpielaudio.com/dB-chart.htm>

Figure 2 shows a Power Spectrum Scan taken on January 11, 2012 in the USA. We will be referring to its content throughout this section. This scan is typical of power spectrum scans wherever BPL is installed and operational worldwide. This 60Hz mains scan shows dB level, and is measured using Fast Fourier Transform techniques over the officially recognized 10 second period at a sampling rate of 44,100Hz. What this means is that the graph shows the average dB levels of a set of 441,000 samples across the power spectrum during an arbitrarily chosen 10 second time period. The base line of the plot is 10dB, plotted against its relevant frequency in Hertz. With a 50Hz mains supply the mains peak would be at 50Hz and the remaining peaks frequency-shifted left slightly. Notice the peaks, the spikes; they are all in relevant positions compared to the BPL signal waveform in Figure 1.

5.1 There are at least six (6) emissions attributable to BPL/B-PLC:

- 5.1.1 BPL/B-PLC overhead power line signal leakage
- 5.1.2 BPL/B-PLC overhead power line signal reflection audible Standing Waves
- 5.1.3 BPL/B-PLC overhead power line signal audible low-frequency subharmonics
- 5.1.4 High-power BPL/B-PLC signal transmitter dish audible low frequency subharmonics
- 5.1.5 Fast-Switching Capacitor Bank (FSCB) reactance
- 5.1.6 The "Last Mile" BPL signal attenuation

- 5.1.1 **BPL/B-PLC overhead power line signal leakage:** Electrical Utility Companies have been able to communicate with their Grid equipment via the power lines for decades. This communication was rudimentary and relatively slow; simply a pulse, or set of pulses, to, for instance, a circuit breaker (switch) at a substation. A simple, "Are you there?" pulse along the power line and a, "Yes," pulse response 3 times a second via a dedicated phone line hooked up to a modem. There is negligible signal loss at this communication speed, which is approximately 300 Baud (bps = bits per second).

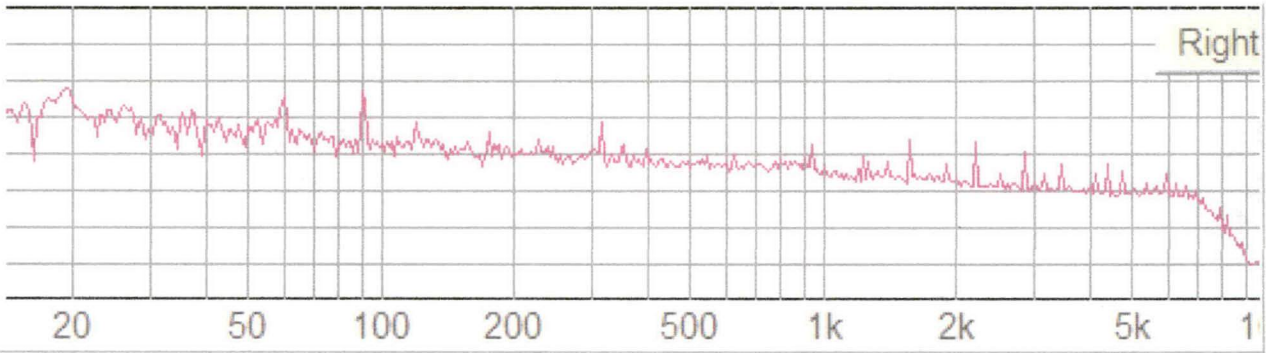


Figure 2: Power Spectrum Scan – BPL power line emissions dB vs. frequency (Hz) plot

The implementation of 40MHz BPL/B-PLC allows for 2-way communication via the power line. No dedicated telephone line is necessary. The "Are you there?" signal cycle repetition is increased to 10 times per second.

There exists, however, many drawbacks when the carrier wave signal reaches and/or exceeds 1MHz. These include losses mainly from signal reflection, but also include losses due to line attenuation, saddle Insulators, splices, tap lines, sag and bends in the overhead cable, and even birds perching on the cables. Each incidence of signal loss is cumulative to those occurring before it.

The above is fully explained in Exhibit 1 – Power Line Carrier Channel & Application Considerations for Transmission Line Relaying. This technical document is available for download here: <http://www.pulsartech.com/pulsartech/docs/C045-P0597.pdf>

40MHz BPL, or any BPL achieved transmission speed, is well inside of the radio frequency (RF) domain. As such, when radiating away, emitting, from the power lines it is a RF transmission. Taking the highest and lowest peaks in Figure 2 we have 68db at 18Hz and 45dB at 6 KHz; their Mean average is 56.5dB. To convert dB to dBm (milliwatts) the mathematical formula is used: $10\log_{10}(P*(1/0.001))=(nn)\text{dBm}$.

Tell-it-like-it-is: Wherever there is an overhead power line with BPL/B-PLC installed and operational an average of 318Watts of energy are constantly emitted at the RF range of

30-40MHz along its length. Generally, at frequencies <48Hz on 60Hz mains power lines these emissions constantly peak between 65dB and 80dB, up to 95dB in many cases (observed). These peaks equate to between a minimum of 2KW through to more than 40KW continuous emissions.

There are no references to the above as you are not supposed to have come to this realization.

The total permitted energy at ground level allowed by law from a cell phone mast is 4 watts.

5.1.2 **BPL/B-PLC overhead power line signal reflection audible Standing Waves:**

Standing waves are a common occurrence in electrical power transmission lines, they occur when the power sine wave hits an area of high impedance (to continuing in the direction it was going) and reflects/bounces back the way it came (because it's the easiest way to go). Traveling in the wrong direction will ultimately lead to a collision with the incoming sine waves. If the sine wave reflects/bounces back with sufficient energy (throw a ball harder and it will bounce higher) it will produce a Walking Standing Wave, a Standing Wave that moves along the power line.

“Special Considerations

When two waves, traveling in opposite directions on a transmission line pass, they create a standing wave.

An improperly terminated line will have a standing wave due to the signal being transmitted out and the reflected wave coming back. The effect of this phenomenon can be detrimental, depending on the length of the line and the relative value of the termination. At the very least, it will create signal attenuation due to the reflection.” – Pulsar Technologies Inc., Exhibit 1.

RF emissions due to BPL signal reflection and consequent standing wave attenuation are widespread. Up to 30dB of attenuation is possible according to Exhibit 1.

5.1.3 **BPL/B-PLC overhead power line signal audible low-frequency subharmonics:**

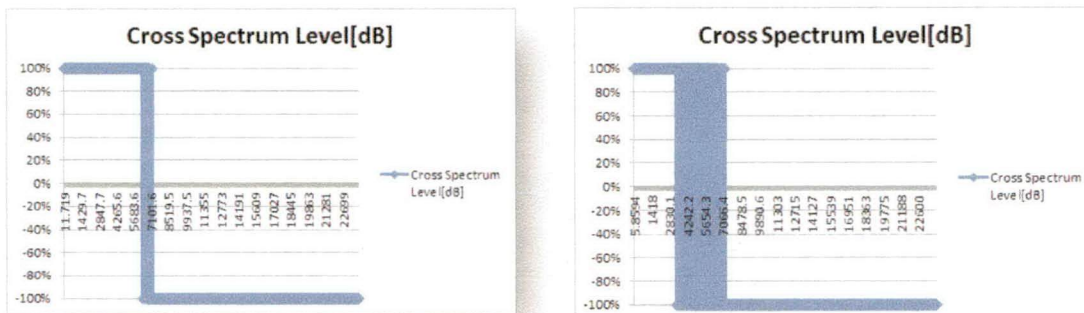
These particular component emissions are caused by the frequency “dot” overlays discussed in 3.2.2. In this example, we assume that the signal “string” comprises of 16 (hexadecimal 10) separate frequency “dots” or pulses in the waveform shape in Figure 1. Being that there are 2048 “dot” pulses this would give a total signal “string” count of 128 one after the other – A very “thick” (wide) signal waveform is produced. Adding just one more bit, 4096 “dots”, and there are 256 signal “strings”.

This waveform is a very persistent signal. Even if half of the signal were lost, -3dB point, there would still be sufficient “dots” remaining to reassemble the original waveform at the demodulation point.

Transmitting each waveform in the real-time domain at singly different ANGULAR modulation; 15°, 30°, 45°, 60°, etc. out of phase to the preceding waveform and this waveform is digitally encoded. 15 degrees out of phase = 00, 30 = 10, 45 = 01, 60 = 11, etc. You can set up a whole slew of signal “types” doing this, right up to video streams – IF YOU CAN GET IT TO GO FAST ENOUGH. That's the key – SPEED.

But what happens when these frequencies are introduced into the power lines? The signal pulses “dots” themselves are interharmonics. An interharmonic will generate a

harmonic next to it. Both collide; cancel out the difference in the frequencies EXCEPT the DIFFERENCE in their respective frequencies. This DIFFERENCE is a subharmonic and because all of the "dot" frequencies are divisors/multiples of the original frequency, 11.719Hz, there are seven (7) subharmonics that are all the SAME. 128 or 256 subharmonics overlaid on top of one another at EXACTLY the same time at 7 different LOW FREQUENCIES - 11.719, 17.578, 23.438, 29.297, 35.156, 40.016, and 46.875Hz at 60Hz mains frequency, at 50Hz it's simply an integer division calculation of these frequencies. An already highly persistent waveform subharmonic overlaid on itself 128 or 256 times.



BPL Signal Waveform - 10 bits
2048 pulses, 128 lines @ 16 pulses/line

BPL Signal Waveform – 11 bits
4096 pulses – 256 lines @ 16 pulses/line

Figure 3: BPL Signal Waveforms – Time Domain Inserted

There is one more subharmonic that needs to be taken into consideration: Taking any BPL pulse/"dot" frequency, subtracting it from the nearest possibly occurring harmonic of the mains frequency, then subtracting the nearest of the seven (7) LF subharmonics from the result ALWAYS produces a 1.406Hz subharmonic.

Multiplying 1.406Hz by 60 (seconds) results in a pulse per minute (ppm) count, in this case 84.36. So, there is a massively powerful 2KW to >40KW pulse train occurring at 84.36 pulses per minute wherever BPL/B-PLC is operational in the overhead power lines. Human and other animals' heartbeat rate is between 72 and 90ppm; it is a logically-derived consideration that these extremely powerful subharmonic pulses could well be the causation of Ventricular Fibrillation, a common diagnosis in Sudden Adult Death Syndrome, also referred to as Sudden Arrhythmia Death Syndrome (SADS).

First-hand reports from people around the globe tell of an omnipresent, all-pervading, and consistent-tone "White Noise" wherever BPL is operational. Referring back to the Power Spectrum Scan in Figure 2, there is a massive interharmonic spike present at approximately 91Hz. This spike would generate a subharmonic at 31Hz at 60Hz with 23% more energy than the mean average power of total BPL emissions and is the cause of this "White Noise". There would be a comparable frequency subharmonic at 50Hz mains frequency.

All of the subharmonics between 20 and 50Hz are being generated at comparable power levels, on this particular scan, 60dB or 1 kilowatt. All of these subharmonics are regularly scanned at 80dB ~10⁴W (observed) and above, to as high as 95dB ~40KW (observed) and above emissions levels. These power levels are as evidenced in Exhibit 23 and Figures 4 and 5.

Below 20Hz there is a massive, wide spike between 17 and 19Hz, the Infrasonic "Ghost Frequency" as detailed in line item 2.1.7. These frequencies are the largest spikes in the BPL emissions across the spectrum, around 30% above the mean average of the total BPL emissions. These are the frequencies that cause intense emotional and mental reactions in humans, leading to a plethora of physiological derogatory effects. Some of these effects are as listed in line item 2.1.7, there are many more.

The above listed spectrum disruptions break every rule, regulation, and law that exists, particularly as defined in IEEE 519, and as covered in Exhibit 21 documentation.

http://en.wikipedia.org/wiki/Power_quality

There are hundreds of millions of people worldwide that hear these emissions 24/7. Sleep deprivation is the leading cause of mental and physical distress demonstrated in humans. A human being can be questioned regarding his problems as associated with these BPL emissions, an animal cannot. It would take years of medical research to prove that these emissions have and are affecting domestic and wild animal populations.

However, the evidence is there and on a global scale; whole areas virtually devoid of animal wildlife; farm livestock dying in their thousands for no apparent reason. Bird populations disappearing; flocks of birds falling to the ground while in flight. Dogs, in particular, among pet animals and kennels losing the use of their back legs and dying shortly afterwards. All can be correlated to BPL equipment installation and operation.

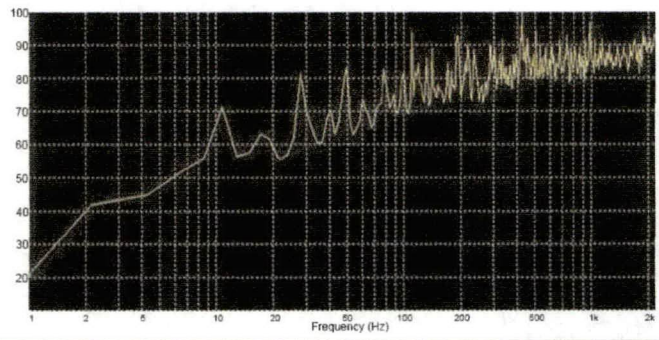
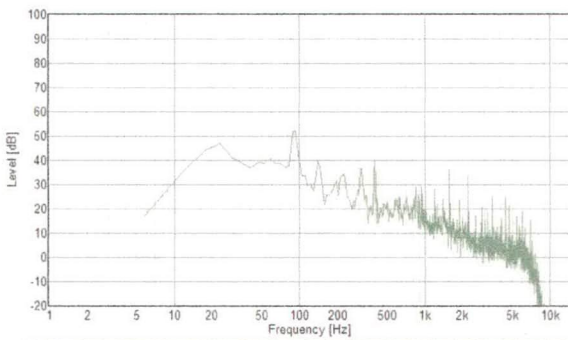
- 5.1.4 **High-power BPL/B-PLC signal transmitter dish audible low frequency subharmonics:** Should you live in a rural area and your electrical utility decides to install BPL/B-PLC you are very unfortunate indeed. For a BPL installation to be economically viable it has to reach a pre-calculated number of people. In a rural area to reach the same number of people that there are in a square mile of a city suburb an area with a radius of, perhaps, 25 miles would need to be covered by a comparable single BPL installation.

This is achieved, for the most part, wirelessly, utilizing BPL transmitter dish antenna(e) mounted on purpose-built masts. Generally speaking, cell phone masts are not home to BPL transmitter dishes, cell phone mast real estate enclosures, however, are. These transmitter dishes deliver their signals to wireless BPL gateways where the signal is then injected onto the power lines using a BPL/B-PLC Coupler as described in 5.1.3.

The Power Cross Spectrum scans in Figure 4 compare the BPL emission power levels across the low frequency spectrum. The scan on the left shows power line only emissions, whereas the scan on the right shows wireless transmissions adding to the power line emissions. The scan on the right shows the 10dB point at the base line of the scan; scan frequencies of both are similar. Hanning was used on the right, Blackman the left.

In a rural area where transmitter dishes are used to deliver the BPL signal to wireless gateways the resulting power line emissions levels are far higher. The scan on the left tops out at 50dB, the scan on the right tops out at >90dB. Incidences of interharmonics are similar in number, frequency position, and shape.

The reason for this increase is due to the fact that the power lines act as dipoles. The Institute of Electrical and Electronic Engineers (IEEE) describe any straight conductor as an antenna, a dipole. Here the power lines act as receiving antennae for the BPL wireless transmissions and add to the BPL power levels already in the power lines. Thus, more power = more emissions. The scan on the right, taken in Monterey, Massachusetts, shows an emission level of >40KW in the <48Hz spectrum, with massive spikes at 11.719, 17.0, 28.0, and ~40.0Hz.



Power Line Emissions Only

Wireless + Power Line Emissions

Power Cross Spectrum Scans

Figure 4: BPL Power Line Emissions vs. BPL Wireless Transmissions + Power Line Emissions

5.1.5 **Fast-Switching Capacitor Bank (FSCB) reactance:** Generally speaking, BPL/B-PLC vendors offer data redundancy. That is, two (2) of the three (3) phases present in the overhead electricity transmission lines are used to transmit the same data, thus guaranteeing data integrity.

- i. According to its vendors, BPL/B-PLC is able to be employed on overhead power lines carrying from 7.2 kilovolts (KV) to 138KV. A 3-Phase power line comprises of six (6) cables, three pairs at different heights at the top of the pole. Each pair at the same height carries a single phase or sine wave. Usually, the copper cable is the live, outbound power; the aluminum cable the return or neutral.
- ii. Historically, electrical utilities have had no success in reducing Phase Imbalance in more than 50 years. Back at the generating station or directly after the transformer at a tap-line substation the phase balance is near perfect. That is, all three (3) phases are "level" with one another in time as they travel along the power line. But get a couple of miles away from these points and the phases start

to get out of synch, the phase sine waves are all at different (angular) places on the power lines.

- iii. Having two (2) phase data redundancy is a good idea. But when one phase is leading or lagging the other the data packets arrive at the demodulator at different times. If you wait for both packets to be there before sending data on its way you waste time, you waste bandwidth, which is undesirable.
- iv. Fast-Switching Capacitor Banks (FSCB) are used in an attempt to overcome this phase imbalance and lead/lag of data packets. But this equipment introduces problems of its own, and it's called commutation.
- v. FSCB are stand-alone devices, mounted pole-top, they take their power from the power line at the pole where they are mounted. Since the electronics control circuitry both in the box on the pole and in the FSCB itself requires direct current (DC) to operate there is a requirement for a rectifier or rectifiers.

"Since there is a pair of rectifiers (one for positive half cycle of sine wave, one for negative half cycle) for each of the three phases, this is referred to as a six-pulse or six-pole converter. When the control circuitry of the converter turns off one SCR (or thyristor or whatever type of rectifier is used) and turns on the other, there is an overlap period where both devices are turned on. This is because such devices don't really stop the current flow until the current waveform goes to zero.

Having two devices turned on at once is effectively a short circuit between the phases, which results in a very large current flow for a very short time, until the first device goes off completely. This is the commutation period, and is a synchronous process to the power frequency. As you can picture, these notches occur six times in each power frequency cycle. The "rule" on the resulting harmonic currents is $H = n \times p \pm 1$, where "n" is integers 1, 2, 3, etc., and "p" is the number of poles (six, in this case). Hence, the dominate harmonics would be 5, 7, 11, 13, 17, 19, and so on." - Richard P. Bingham; [Power Quality Engineer and Author: "Why Only Harmonics": Exhibit 10](#)

- vi. These FSCB units Thyristor switching short circuit commutation also produces Reactance in the 60Hz mains power as shown in Figure 2, as evidenced in Exhibit 12, and as discussed in Exhibit 27. Exhibit 12 shows this reactance to be evident at 58.2705Hz and 63.7354Hz at 60Hz. At 50Hz mains power the reactance frequencies are a simple percentage calculation conversion, the resulting subharmonic frequency would remain the same. This reactance is also evidenced by light flicker or "jitter" in the electrical power supplied to consumers, also known as "Dirty Power". It is also suspected, and as noted in Exhibit 27, that this could be a cause of Ventricular Fibrillation attributable to SADS (mentioned earlier).
- vii. Referring once again to Figure 4 and the left power cross spectrum scan it can be seen that there is a spike at exactly 400Hz. This is an ISO calibration frequency for the FSCB units that are in use throughout the USA in particular. This specific BPL installation has been in operation for over 2 years, since 2009, and attempts are still being made to calibrate the pole-top FCSB's. This is indicative that BPL/B-PLC installations in general do not work as advertised by BPL/B-PLC vendors.

- viii. There has been only a feeble attempt made by electrical utilities globally to rectify this reactance. In the UK, for instance, 1st and 2nd Order Delta Sigma Modulators have been installed on some BPL/B-PLC FCSB sites. This simply introduces further reactance at the mains frequency and harmonics at frequencies in the 3KHz to 5KHz range as shown in Figure 5.

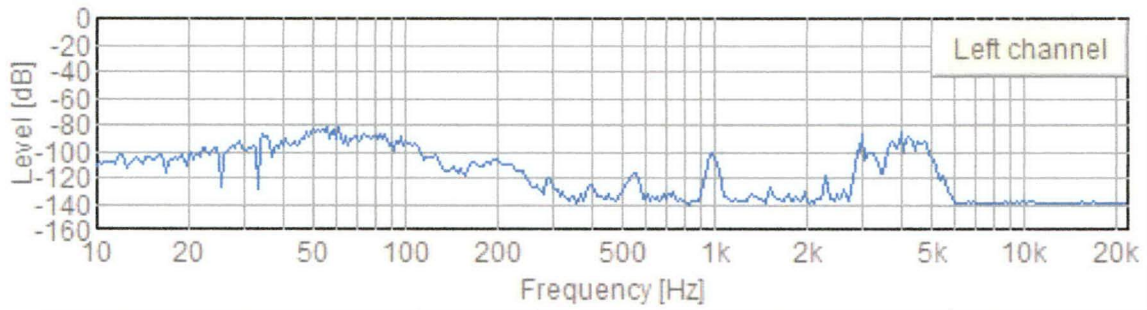


Figure 5: 1st and 2nd Order Delta Sigma Modulator Induced Harmonic Reactance at 3-5KHz

- 5.1.6 **The “Last Mile” signals:** There are several unlicensed frequencies used in the “Last Mile” scenario worldwide. There is also one, 956MHz, using ZigBee communications protocol, in the licensed band that is utilized exclusively in the USA and Japan.

http://en.wikipedia.org/wiki/Last_mile

- i. Zigbee networks are self-forming, each node can also act as a router, so no setup or configuration is required. When a new house is built the additional node simply connects itself to the network and starts reporting usage. ZigBee, operating at 956MHz, will attempt to attach itself to any computer operating at that frequency, a very useful characteristic in the right situation.
- ii. 956MHz is the operating frequency of the on-board computers utilized in Toyota vehicles. Toyota vehicles have had a slew of unexplained problems in the last 2 years, including sudden unexplained acceleration. Many people have died in the ensuing collisions; many others faced criminal charges and are doing jail time for causing them, the authorities citing driver error. Toyota vehicles are sold and are common on the roads worldwide. Toyota vehicles experienced unexplained problems, particularly sudden unexplained acceleration, only in the USA and Japan.
- iii. BPL/B-PLC Last Mile uses 900MHz, 915MHz, WiFi, meshWiFi, WiMAX, and 956MHz ZigBee frequencies; all class as “serious” microwave frequencies. Only the latter is in the licensed band, meaning that its use requires a license, and that costs money.
- iv. All Smart Grid equipment is (supposed to be) designed to “sleep” when not in use, thus saving power. However, only the ZigBee protocol is designed to “wake

up” when queried while “asleep”, it is, after all, designed for Smart Grid at the fastest possible data transmission speeds.

- v. If there is a corner that can be cut, it will be, it is human nature and accountants are running the show in this new millennia. Many countries have installed ZigBee on unlicensed frequency bands. Others have done without the “sleep” function; “Smart” equipment is permanently ON, thus defeating the main requirement of Smart Grid philosophy.
- vi. After the BPL signal is “decoupled” from the power lines it is fed into a demodulator. This can be either pole mounted or attached and connected to fiber optic cables also on the poles. In both cases the demodulator also functions as a transmitting antenna. Exhibit 24 is an FCC/ARRL investigative document regarding the above described transmitters in Allentown, Pennsylvania that was released under the Freedom of Information Act. In it FCC investigators claim that although the fiber-optic mounted transmitters were emitting microwave RF in excess of FCC regulatory law requirements; this emissions “overage” was “just 3dB more”. As previously stated, a 3dB increase in power levels requires a 100% increase (doubling) in the transmissions (emissions) levels.
- vii. The FCC defines Power Density tolerance as the amount of time that someone can spend in an RF transmission without suffering adverse health effects: Similar to putting your head in a bucket of water. Many of these Access BPL transmitters are less than 10 feet from people’s bedroom windows in city suburbs. FCC regulatory law requires that anyone with a RF transmitter must carry out regular Power Density testing on their equipment as part of a scheduled test routine. These test schedules are also defined by the FCC and appear in FCC ET Docket # 93-62 and OET Bulletin # 65 among other places.
- viii. These pole or fiber optic mounted demodulator/transmitters reassemble the BPL, or in this case, the Access BPL signal and transmit it. As evidenced in the above paragraph, these transmissions are not measured by their owners, the electrical utilities, to ensure regulatory safety law compliance. But where is it being transmitted *to*?
- ix. Generally, these transmissions are aimed toward an area containing the maximum number of potential customers; remember there are presently very few Access BPL customers in most countries; the electrical utilities are still trying to get their equipment working properly. These potential customers are also the electrical utility’s present customer base for power supply and will ultimately have “smart” metering and appliances. Access BPL and “smart” metering are one and the same.
- x. Between these transmitters and people’s home-mounted receivers are overhead power cables. Overhead power cables are transmit/receive dipole antennas, as classified by the IEEE. Much of the transmitted BPL signal is lost to these receiving dipoles. The BPL signal travels along the power lines looking for a ground (earth) point. Evidence shows that in every case the BPL microwave RF “Last Mile” signal is literally dragged from the overhead power lines by the, so-called 40MHz, BPL emissions and from there into the electrical wiring of every building in its path.

- 5.1.7 **Microwave Auditory Effect (MAE):** One of the major physical reactions to these microwave emissions is the “Microwave Auditory Effect”. A much studied phenomena for over 40 years by the military, NASA, and various universities worldwide; many whitepapers exist covering this topic.

http://en.wikipedia.org/wiki/Microwave_auditory_effect

- i. Again worldwide, people have accounted of a noise that ranges from a high-pitched Banshee Wail to a mid-frequency range “disgusting gargle”. Individual accounts of the “interpretation” of this “sound” vary. However, that it accompanies, and is a result of, BPL emissions is without doubt.
- ii. Here’s what Dr. Allen Frey had to say about his experiments:

“The intent of this paper is to bring a new phenomenon to the attention of physiologists. Using extremely low average power densities of electromagnetic energy, the perception of sounds was induced in normal and deaf humans. The effect was induced several hundred feet from the antenna the instant the transmitter was turned on, and is a function of carrier frequency and modulation. Attempts were made to match the sounds induced by electromagnetic energy and acoustic energy. The closest match occurred when the acoustic amplifier was driven by the rf transmitter’s modulator. Peak power density is a critical factor and, with acoustic noise of approximately 80 dB, a peak power density of approximately 275 mw/cm² is needed to induce the perception at carrier frequencies of 425 mc and 1,310 mc. The average power density can be at least as low as 400 uw/cm². The evidence for the various possible sites of electromagnetic energy sensor are discussed and locations peripheral to the cochlea are ruled out.”

*Frey, Allan H.: Human auditory systems response to modulated electromagnetic energy
Cornell University, Ithaca, New York: J. Appl. Physiol. 17(4):689-692. 1962-*

- iii. In a nutshell, here’s what researchers discovered: The MAE occurs when microwave frequencies pass through the brain and surrounding tissue. These microwaves excite hydrogen atoms contained in protein-bound (living cells) water, excitation leads to movement of the subatomic particles of which atoms consist, leading to friction and thus heat. Sound familiar? This is exactly what happens in a microwave oven, and everyone knows what they are.
- iv. Heating leads to expansion of intra-cranial cells. Due to the fact that BPL microwave frequencies are on/off pulses; exactly the same as in Allen Frey’s Cornell University experiments; the water contained in these cells heats and cools rapidly. This causes the intra-cranial cells to expand and contract, heat/cool, along with the microwave pulses.
- v. What Allen Frey and many other researchers concluded was that this expanding and contracting tissue “hit” the inner-ear cochlea thus inducing a “sound”. The “sound” experienced was relative to the microwave pulse train frequency. The BPL microwave emissions induced “sound” that people are experiencing is similar worldwide. It must, therefore, be at a similar frequency worldwide – BPL “Last Mile” frequency.
- vi. Researchers of this effect have accepted it as fact. But, as the subjects of these experiments began to show extremely derogatory mental and emotional effects

within a short time of their exposure to these microwave frequencies all further experimentation was halted. The military's dream of utilizing the effect as a communications method to individual military personnel ended.

- vii. Neither the legal system nor the FCC recognizes this physical effect. If microwaves heat your skin, then there are microwaves present; otherwise it's a "case dismissed".

6.0 Summary:

- i. There are six (6) major emissions issues; eight (8) major entire population and eco-system detrimental and destructive reactions that will result in enormous consequences. Smart Grid, Access BPL, and B-PLC may have their up-side. They may benefit the few in major corporations around the globe that are and continue to profit enormously from their installation and operation for as long as it is allowed to continue.
- ii. A far more technologically effective and economically viable solution utilizing the electricity transmission line grid topology is available which would be upgradeable as technology advances. This solution is 100% safe and data secure. Smart Grid, as it right now, is not upgradeable or data secure i.e. once it is installed as supplied, it stays that way forever, or until such time that it is ripped out and started over from scratch.
- iii. All of the signs are there; all of the pieces are in place for an unprecedented global catastrophe to imminently occur. There will be a large price to pay when accountability arrives, and it will. This whole "thing" is about energy leaking from places that it was never intended to be. The responsible thing to do would be to put it in its place, a place from where it can't escape. All it would take is a purpose-built data cable on the Grid. Now that's what you would call a "Smart" Grid.

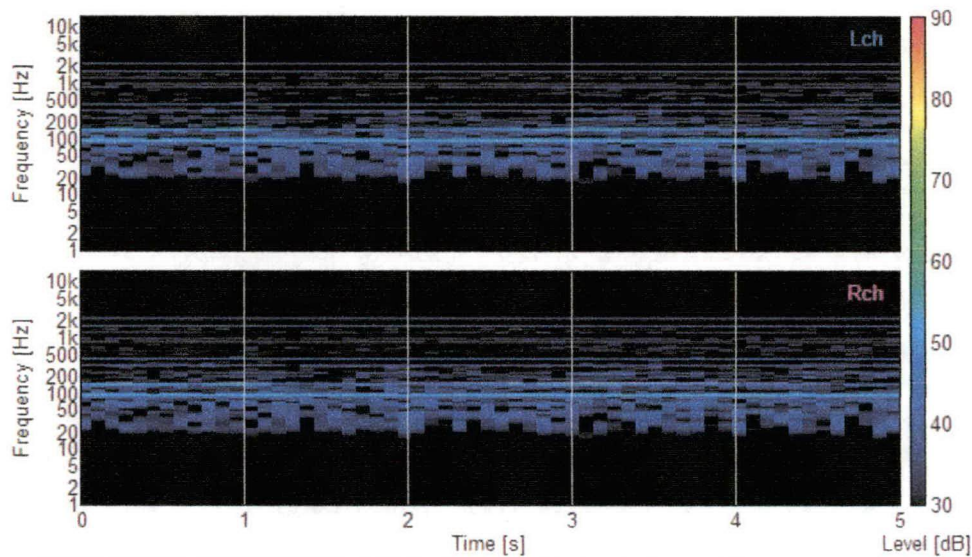


Figure 6: Power Spectrogram showing BPL/B-PLC emissions levels

Part 7: References:

These references to additional material are presented in Line Item order.

Part 1:

1.1.1 Smart Grid:

- i. [IEEE SmartGrid Portal](#) IEEE's collection of Smart Grid resources
- ii. [Smart Grids \(European Commission\)](#)
- iii. [The NIST Smart Grid Collaboration Site](#) NIST's public wiki for Smart Grid
- iv. [Video Lecture: Computer System Security: Technical and Social Challenges in Creating a Trustworthy Power Grid, University of Illinois at Urbana-Champaign](#)
- v. [Video Lecture: Smart Grid: Key to a Sustainable Energy Infrastructure, University of Illinois at Urbana-Champaign](#)
- vi. [The IDEAS project \(University of Southampton project developing agent-based mechanisms for the Smart Grid\)](#)
- vii. [Institute for Computational Sustainability](#)
- viii. [Perspectives and priorities on RuggedCom Smart Grid Research IEC 61850 Technologies](#)
- ix. [Projects with Smart Substation Solution](#)
- x. [Smart High Voltage Substation Based on IEC 61850 Process Bus and IEEE 1588 Time Synchronization](#)
- xi. [Test and evaluation system for multi-protocol sampled value protection schemes by Dave Ingram](#)

42 U.S.C ch. 152 subch. IX § 17381

- i. [§ 17381. Statement of policy on modernization of electricity grid](#)
- ii. [§ 17382. Smart grid system report](#)
- iii. [§ 17383. Smart Grid Advisory Committee and Smart Grid Task Force](#)
- iv. [§ 17384. Smart grid technology research, development, and demonstration](#)
- v. [§ 17385. Smart grid interoperability framework](#)
- vi. [§ 17386. Federal matching fund for smart grid investment costs](#)

Part 2:

2.1: Broadband over Power Lines (BPL/B-PLC)

- i. ["Broadband over Powerlines \(BPL\) in a Nutshell"](#)
- ii. http://energypriorities.com/entries/2004/12/broadband_over_1.php
- iii. [HomePlug & ARRL Joint Test Report"](#)
- iv. http://web.archive.org/web/20030509112527/http://www.arrl.org/tis/info/HTML/plc/files/HomePlug_ARRL_Dec_2000.pdf
- v. <http://www.smallnetbuilder.com/lanwan/lanwan-reviews/30888-a-work-in-progress-belkin-gigabit-powerline-hd-starter-kit-reviewed?start=4>
- vi. ["Understanding the information rate of BPL and other last-mile pipes"](#)
- vii. ["FCC Adopts Memorandum Opinion and Order on Broadband over Power Lines to Promote Broadband Service to all Americans"](#)
- viii. ["Statement of Chairman Kevin J. Martin"](#)
- ix. http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266773A2.pdf
- x. ["FCC dealt setback in broadband-over-power-lines push | Tech news blog - CNET"](#)
- xi. http://www.news.com/8301-10784_3-9930223-7.html?tag=nefd.ledc
- xii. ["ARRL Strengthens the Case for Mandatory BPL Notching"](#)
- xiii. <http://www.arrl.org/news/arrl-strengthens-the-case-for-mandatory-bpl-notching>
- xiv. ["Electromagnetic Compatibility"](#)
- xv. http://ec.europa.eu/enterprise/policies/european-standards/documents/harmonised-standards-legislation/list-references/electromagnetic-compatibility/index_en.htm
- xvi. ["Electromagnetic Compatibility \(EMC\) Legislation: Directive 2004/108/EC"](#)

- xvii. <http://ec.europa.eu/enterprise/sectors/electrical/documents/emc/legislation>
- xviii. <http://stakeholders.ofcom.org.uk/binaries/research/technology-research/pltreport.pdf>
- xix. ["Power Line Telecommunications \(PLT\)"](#)
- xx. ["The Likelihood and Extent of Radio Frequency Interference from In-Home PLT Devices"](#)
- xxi. <http://stakeholders.ofcom.org.uk/enforcement/spectrum-enforcement/plt>
- xxii. http://www.parliament.the-stationery-office.co.uk/pa/cm200809/cmselect/cmbis/memo/broadband/ucm1402.htm#_Toc242503387

2.1.2 through 2.1.6: The Hum

- i. ["Bondi's mystery noise maker"](#)
- ii. <http://www.news.com.au/dailytelegraph/story/0,,25528487-5001021,00.html>
- iii. ["Unexplained Sounds". http://paranormal.about.com/library/weekly/aa031599.htm](http://paranormal.about.com/library/weekly/aa031599.htm)
- iv. ["Auckland North Shore Hum"](#)
- v. <http://www.speechresearch.co.nz/hum.html>
- vi. ["Mystery humming sound captured"](#)
- vii. <http://www.smh.com.au/articles/2006/11/17/1163266756133.html>
- viii. ["Mystery noise is a real humdinger"](#)
- ix. ["Have you heard 'the Hum'?"](#)
- x. <http://news.bbc.co.uk/1/hi/uk/8056284.stm>
- xi. ["Tiny village is latest victim of the 'The hum'"](#)
- xii. <http://www.telegraph.co.uk/news/uknews/8566281/Tiny-village-is-latest-victim-of-the-The-hum.html>
- xiii. ["Rumblings may prompt lawsuit"](#)
- xiv. <http://www2.canada.com/windsorstar/news/story.html?id=87a6186f-d849-4656-825f-8482ae91da99>
- xv. ["The Hum keeps people awake at night"](#)
- xvi. <http://www2.canada.com/windsorstar/news/story.html?id=4c155c73-e94f-44e2-84d2-a163de9cc745>
- xvii. ["The Hum' leaves village ears ringing"](#)
- xviii. <http://www.irishexaminer.com/ireland/the-hum-leaves-village-ears-ringing-185609.html>
- xix. [The Kokomo Hum Investigation](#)
- xx. <http://www.milieuziektes.nl/ELF/KokomoHumFinalReport.pdf>
- xxi. ["Possible Source Found For Kokomo Hum: Hum Traced To Local Factory"](#)
- xxii. <http://www.theindychannel.com/news/2498604/detail.html>
- xxiii. [The Taos Hum](#)
- xxiv. ["The Hearers"](#)

2.1.7 Infrasound

- i. ["Probing the Atmosphere with Infrasound : Infrasound as a tool"](#)
<http://web.archive.org/web/20070702200640/http://www.ctbto.org/reference/symposiums/2006/haak/0901probingtheatmosphere.pdf>
- ii. ["Microbaroms"](#)
- iii. <http://www.gi.alaska.edu/infrasound/Infrasound254.htm>
- iv. [ISBN 0-8493-5091-3.](#)
- v. [Infrasonic signals in the environment](#)
- vi. ["Infrasound linked to spooky effects"](#)
- vii. <http://www.msnbc.msn.com/id/3077192>
- viii. [Infrasonic concert, Purcell Room, London](#)
- ix. <http://www.psy.herts.ac.uk/ghost/ghost-in-machine.pdf>
- x. <http://www.psy.herts.ac.uk/ghost/Something-in-the-Cellar.pdf>
- xi. ["Ghost buster"](#)
- xii. [Who ya gonna call? Vic Tandy! - Coventry Telegraph](#)
- xiii. <http://www.xreferplus.com/entry/2657949>

Part 3:

3.2 Frequency Shift Keying

- i. Kennedy, G. and Davis, B. (1992). *Electronic Communication Systems (4th ed.)*. McGraw-Hill International. pp. 509. [ISBN 0-07-112672-4](#).
- ii. Kennedy, G. and Davis, B. (1992). *Electronic Communication Systems (4th ed.)*. McGraw-Hill International. pp. 549–550. [ISBN 0-07-112672-4](#).

3.2.1 Phase Shift Keying

- i. [IEEE Std 802.11b-1999 \(R2003\)](#) — the IEEE 802.11b specification.
- ii. [IEEE Std 802.11g-2003](#) — the IEEE 802.11g specification.
- iii. [Understanding the Requirements of ISO/IEC 14443 for Type B Proximity Contactless Identification Cards, Application Note, Rev. 2056B–RFID–11/05, 2005, ATMEL](#)
- iv. *Communications Systems*, H. Stern & S. Mahmoud, Pearson Prentice Hall, 2004, p283
- v. Proakis, John G. (1995). *Digital Communications*. Singapore: McGraw Hill. [ISBN 0-07-113814-5](#).
- vi. Couch, Leon W. II (1997). *Digital and Analog Communications*. Upper Saddle River, NJ: Prentice-Hall. [ISBN 0-13-081223-4](#).
- vii. Haykin, Simon (1988). *Digital Communications*. Toronto, Canada: John Wiley & Sons. [ISBN 0-471-62947-2](#).

3.5 The Last Mile

- i. http://www.nxtbook.com/nxtbooks/natoa/journal_2009spring/index.php#/14
- ii. http://www.nxtbook.com/nxtbooks/natoa/journal_2009spring/index.php#/14
- iii. http://www22.verizon.com/Content/ExecutiveCenter/Richard_Lynch/ftth_conference_expo/ftth_conference_exp_o.htm
- iv. <http://uk.sharedband.com/solutions>
- v. <http://uk.reuters.com/article/pressRelease/idUS92087+05-Jan-2009+BW20090105?symbol=INAP.O>

Part 4:

4.1.1 Automatic Meter Reading (AMR)

- i. [Forget municipal Wi-Fi, welcome to Zigbee City](#)
- ii. [EarthLink Dedicates Wi-Fi Network In Corpus Christi](#)
- iii. [U.S. Patent 3,842,208 \(Sensor Monitoring Device\)](#)
- iv. [U.S. Patent 4,241,237 and U.S. Patent 4,455,453 and Canadian Patent # 1,155,243 \(Apparatus and Method for Remote Sensor Monitoring, Metering and Control\)](#)
- v. [\[1\] US Congress, Energy Policy Act of 2005](#)
- vi. [Resolution to Remove Regulatory Barriers To the Broad Implementation of Advanced Metering Infrastructure \(from NARUC Committee on Energy Resources and the Environment Resolutions of 2007-02-21\)](#)
- vii. [Privacy on the Smart Grid](#)
- viii. [\[2\] PPL 1.3 million residential and commercial electric meters](#)
- ix. [\[3\] Sweden, \(Vattenfall\) 850k meters](#)
- x. http://www.itnews.com.au/News/160398_auditor-general-slams-victorian-smart-meters.aspx
- xi. <http://www.premier.vic.gov.au/newsroom/9853.html>

Part 5:

Signal Cables

- i. ["Crosstalk dependence on number of turns/inch for twisted pair versions of the endcap umbilical cable"](http://www.hep.ph.ic.ac.uk/~dmray/pdf/TP_umbilical_studies.pdf). http://www.hep.ph.ic.ac.uk/~dmray/pdf/TP_umbilical_studies.pdf.
- ii. [US 244426](#), Bell, Alexander Graham, "Telephone-circuit", issued 1881. See also TIFF format scans for [USPTO 00244426](#)
- iii. [Anitech Systems MP 4000 Manual](#)
- iv. [Grounding for Screened and Shielded Network Cabling - Siemon](#)
- v. ["CCNA: Network Media Types"](#). <http://www.ciscopress.com/articles/article.asp?p=31276>.
- vi. ["Comparison between CAT5, CAT5e, CAT6, CAT7 Cables"](#). <http://discountcablesusa.com/ethernet-cables100.html>.
- vii. ["Twisted Pair Testing"](#). http://www.cirris.com/testing/twisted_pair/twist.html.

Transmission Line Cables

- i. Ernst Weber and Frederik Nebeker, *The Evolution of Electrical Engineering*, IEEE Press, Piscataway, New Jersey USA, 1994 [ISBN 0-7803-1066-7](#)
- ii. Syed V. Ahamed, Victor B. Lawrence, *Design and engineering of intelligent communication systems*, pp.130-131, Springer, 1997 [ISBN 079239870X](#).
- iii. McCammon, Roy, *SPICE Simulation of Transmission Lines by the Telegrapher's Method*, <http://i.cmpnet.com/rfdesignline/2010/06/C0580Pt1edited.pdf>, retrieved 22 Oct 2010
- iv. William H. Hayt (1971). *Engineering Circuit Analysis* (second ed.). New York, NY: McGraw-Hill. [ISBN 070273820](#), pp. 73-77
- v. John J. Karakash (1950). *Transmission Lines and Filter Networks* (First ed.). New York, NY: Macmillan., p. 44
- vi. Steinmetz, Charles Proteus (August 27, 1898), "The Natural Period of a Transmission Line and the Frequency of lightning Discharge Therefrom", *The Electrical World*: 203–205
- vii. Grant, I. S.; Phillips, W. R., *Electromagnetism* (2nd ed.), John Wiley, [ISBN 0-471-92712-0](#)
- viii. Ulaby, F. T., *Fundamentals of Applied Electromagnetics* (2004 media ed.), Prentice Hall, [ISBN 0-13-185089-X](#)
- ix. "Chapter 17", *Radio communication handbook*, *Radio Society of Great Britain*, 1982, pp. 20, [ISBN 0-900612-58-4](#)
- x. Naredo, J. L.; Soudack, A. C.; Marti, J. R. (Jan 1995), "Simulation of transients on transmission lines with corona via the method of characteristics", *IEE Proceedings. Generation, Transmission and Distribution. (Morelos: Institution of Electrical Engineers)* **142** (1), [ISSN 1350-2360](#)

Decibels – Power

- i. [Taylor 1995, Guide for the Use of the International System of Units \(SI\), NIST Special Publication SP811](#)
- ii. [Encyclopedia of Laser Physics and Technology](#)

5.1.1 Power Line Carrier

- i. ["ARRL Strengthens the Case for Mandatory BPL Notching"](#). News release (*American Amateur Radio League*). 2 December 2010. <http://www.arrl.org/news/arrl-strengthens-the-case-for-mandatory-bpl-notching>. Retrieved 24 November 2011.
- ii. Stanley H. Horowitz, Arun G. Phadke *Power system relaying* third edition, John Wiley and Sons, 2008 [ISBN 0470057122](#) pages 64-65
- iii. Edward B. Driscoll, Jr.. ["The history of X10"](#). http://home.planet.nl/~lhendrix/x10_history.htm. Retrieved 22 July 2011.
- iv. ["What is Universal Powerline Bus?"](#). Powerline Control Systems, Inc. http://pulseworx.com/UPB_.htm. Retrieved 22 July 2011.
- v. ["Echelon Announces ISO/IEC Standardization of LonWorks® Control Networks"](#). News release (Echelon Corporation). 3 December 2008. <http://www.echelon.com/company/press/2008/lonworksISO.htm>. Retrieved 22 July 2011.
- vi. K Dostert, 1997, *Telecommunications over the Power Distribution Grid- Possibilities and Limitations Proc 1997 Internat. Symp. on Power Line Comms and its Applications* pp1-9

- vii. R Broadridge 'Power line modems and networks' 4th International Conference on Metering Applications and Tariffs for Electricity Supply IEE conf. Publ 300 1984 pp 294-296 (London UK: IEE)
- viii. M Hosono et al., Improved Automatic meter reading and load control system and its operational achievement, 4th international conference on metering, apparatus and tariffs for electricity supply pp 90-94, 26-28 October 1982, IEE
- ix. D Cooper, T Jeans, Narrowband, Low Data Rate Communications on the Low-Voltage Mains in the CENELEC Frequencies- Part I: Noise and Attenuation, IEEE Trans on Power Delivery, vol 17 no 3 July 2002 pp 718-723
- x. J Newbury, Communication requirements and standards for low voltage mains signalling, IEEE trans. on Power Delivery, Vol 13 no 1, Jan 1998, pp 46-49
- xi. T J Sheppard 'Mains Communications- a practical metering system' 7th International Conference on Metering Applications and Tariffs for Electricity Supply pp 223-227 17-19 November 1992 (London UK: IEE 1992)
- xii. G Duval, Applications of power line carrier at Electricite de France Proc 1997 Internat. Symp. on Power Line Comms and its Applications pp76-80
- xiii. ["Distribution Line Carrier System"](http://web.archive.org/web/20090520004013/http://www.powerq.com.my/telecommunication/distribution-line-carrier-system). Power-Q Sendirian Bhd. Archived from [the original](#) on 20 May 2009. <http://web.archive.org/web/20090520004013/http://www.powerq.com.my/telecommunication/distribution-line-carrier-system>. Retrieved 22 July 2011.
- xiv. ["Real-time Energy Management via Powerlines and Internet"](#). official

5.1.3 Power Quality – IEEE 519

- i. Dugan, Roger C.; Mark McGranaghan, Surya Santoso, H. Wayne Beaty (2003). *Electrical Power Systems Quality*. McGraw-Hill Companies, Inc.. ISBN 0-07-138622-X
- ii. Meier, Alexandra von (2006). *Electric Power Systems: A Conceptual Introduction*. John Wiley & Sons, Inc.. ISBN 978-0-471-17859.
- iii. Heydt, G.T. (1991)). *Electric Power Quality*. Stars in a Circle Publications. Library Of Congress 621.3191.
- iv. Bollen, Math H.J. (2000). *Understanding Power Quality Problems: Voltage Sags and Interruptions*. New York: IEEE Press. ISBN 0-7803-4713-7.
- v. Sankaran, C. (2002). *Power Quality*. CRC Press LLC. ISBN 0-8493-1040-7.
- vi. Baggini, A. (2008). *Handbook of Power Quality*. Wiley. ISBN 978-0470065617.
- vii. Kusko, Alex; Marc Thompson (2007). *Power Quality in Electrical Systems*. McGraw Hill. ISBN 978-0071470759.
- viii. IEEE Standard 519 Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems section 10.5 Flicker

5.1.5 FCSB – Electrical Transients

- i. http://ecmweb.com/mag/electric_effects_harmonics_power_2
- ii. *Electrical Transients in Power Systems*, Allan N. Greenwood, John Wiley & Sons, 1991.
- iii. *Power System Harmonic Analysis*, Jos Arrillaga, Et al., John Wiley & Sons, 1997.
- iv. IEEE Standard 519

5.1.6 The Last Mile

- i. http://www.nxtbook.com/nxtbooks/natoa/journal_2009spring/index.php#/14
- ii. http://www.nxtbook.com/nxtbooks/natoa/journal_2009spring/index.php#/14
- iii. http://www22.verizon.com/Content/ExecutiveCenter/Richard_Lynch/fith_conference_expo/fith_conference_expo.htm
- iv. <http://uk.sharedband.com/solutions>

5.1.6 ZigBee

- i. ["Smart energy apps making the move to ZigBee"](#), Øyvind Strøm (via Emebedded Computing Design)
- ii. ["ZigBee Wireless Networking"](#), Drew Gislason (via EETimes)
- iii. <http://www.commsdesign.com/showArticle.jhtml?articleID=192200323> ZigBee: Wireless Technology for Low-Power Sensor Networks
- iv. <http://www.zigbee.org/About/AboutAlliance/TheAlliance.aspx>

- v. <http://sensor-networks.org/index.php?page=0823123150>
- vi. "[ZigBee Cluster Library Specification Download Request](http://www.zigbee.org/Specifications/ZigBee/download.aspx)". zigbee.org.
- vii. "<http://www.zigbee.org/Specifications/ZigBee/download.aspx>". Retrieved 2010-04-10.
- viii. "[ZigBee is only royalty-free if not used for commercial purposes...](#)", FAQ for BEN WPAN

5.1.7 Microwave Auditory Effect

- i. FDA. 1997. *Information for manufacturers seeking marketing clearance of diagnostic ultrasound systems and transducers*. Rockville, MD: Food and Drug Administration (FDA) (20850, September 30, 1997).
- ii. Foster KR, Finch ED. 1974. Microwave hearing: Evidence for thermoacoustic auditory stimulation by pulsed microwaves. *Science* 185:256–258. Frey AH. 1961. Auditory system response to radio frequency energy. *Aerospace Med* 32:1140–1142.
- iii. Frey AH. 1962. Human auditory system response to modulated electromagnetic energy. *J Appl Physiol* 17:689–692.
- iv. Frey AH. 1963. Some effects on human subjects of ultra-high frequency radiation. *Am J Med Electron* 2:28–31.
- v. Frey AH. 1967. Brain stem evoked responses associated with low intensity pulsed UHF energy. *J Appl Physiol* 23:984–988.
- vi. Frey AH. 1988. Evolution and results of biological research with low-intensity nonionizing radiation. In: Marino AA, editor. *Modern bioelectricity*. New York, NY: Marcel Dekker, Inc. Chapter 23. pp 785–837.
- vii. Frey AH, Messenger R. 1973. Human perception of illumination with pulsed ultrahigh-frequency electromagnetic energy. *Science* 181:356–358.
- viii. Frey AW, Coren E. 1979. Holographic assessment of hypothesized microwave hearing mechanism. *Science* 206:232–234.
- ix. Frey AH, Eichert ES. 1985. Psychophysical analysis of microwave sound perception. *J Bioelectricity* 4:1–14.
- x. Gandhi OP, Riazi A. 1986. Absorption of millimeter waves by human beings and its biological implications. *IEEE Trans Microwave Theory Tech MTT* 34:228–235.
- xi. Gournay LS. 1966. Conversion of electromagnetic to acoustic energy by surface heating. *J Acous Soc Am* 40:1322–1330.
- xii. Guy AW, Chou CK. 1982. Effects of high-intensity microwave pulse exposure of rat brain. *Radio Science* 17(5S):169S–178S.
- xiii. Guy AW, Chou CK, Lin JC, Christensen D. 1975. Microwave-induced acoustic effects in mammalian auditory systems and physical materials. *Ann NY Acad Sci* 247:194–215.
- xiv. IEEE. 1999. *IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz. IEEE Standard C95.1, 1999 Edition*. New York, NY: Institute of Electrical and Electronics Engineers, Inc.
- xv. (IEEE), 345 East 47th Street, 10017. Ingalls CE. 1967. Sensation of hearing in electromagnetic fields. *NY State J Med* 67:2992–2997.
- xvi. Joines WT, Wilson BS. 1981. Field-induced forces at dielectric interfaces as a possible mechanism of RF hearing effects. *Bull Math Biol* 43:401–413.
- xviii. Khizhnyak EP, Tyazhelov VV, Shorokhov VV. 1979. Some peculiarities and possible mechanisms of auditory sensation evoked by pulsed electromagnetic irradiation. *Activitas Nervosa Superior* 21:247–251.

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- Exhibit 2: Spectrum Analysis Data
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- Exhibit 4: Emails to West Penn Power
- Exhibit 5: References to 40MHz emissions
- Exhibit 6: Amperion 40MHz BPL generating equipment
- Exhibit 7: Sample letters from 40MHz health affected people
- Exhibit 8: Progress to date update document.
- Exhibit 9: Power Quality Application Guide – Harmonics and Interharmonics
- Exhibit 10: Why Only Harmonics? by Richard P. Bingham

- Exhibit 11: *Power Spectrum analysis samples*
 - Exhibit 12: *Frequency tuner reception video and image files*
 - Exhibit 13: *Impairment Type Loss*
 - Exhibit 14: *S & C IntelliCAP PLUS Automatic Capacitor Controls brochure*
 - Exhibit 15: *Infrasound article*
 - Exhibit 16: *Photographs: South Fayette Substation – East side*
 - Exhibit 17: *Update 02 document*
 - Exhibit 18: *Updated Smart Grid document*
 - Exhibit 20: *FCC Part 15 and ETSI requirements documentation*
 - Exhibit 21: *IEEE 519 compliance specifications and regulations*
 - Exhibit 22: *Spectrum analysis measurement data*
 - Exhibit 23: *Contact Texts and Power Spectrum Scans*
 - Exhibit 24: *Allentown, PA FCC/ARRL field measurements reports April 28, 2009*
 - Exhibit 25: *Letters of complaint from people in the USA regarding BPL emissions*
 - Exhibit 26: *NASA research document – Mechanical Resonant Frequency of the Human Eye In Vivo*
 - Exhibit 27: *Sudden Adult Death Syndrome (SADS) and BPL/B-PLC-Induced Reactance Correlation*
 - Exhibit 28: *This document together with CSV files containing emissions frequency details*
-

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Victor Nixon, a decorated Army veteran, holds a M.Sc. Computer Systems (Automation) Engineering and has over 30 years global experience in SCADA systems design and installation relating to electrical power generation, distribution, and industrial use. Presently he lives in Pittsburgh, Pennsylvania, USA.

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Getting Smarter About the Smart Grid

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Why are federal government stimulus programs underwriting billions of dollars of 'dumb' smart meters for utility companies—with taxpayer dollars—meters that will soon be obsolete and not integrate with, or enable, the 'smart grid' of the future on which U.S. energy sustainability depends?

Public Service
Commission

Authored by a veteran communications technology expert, in collaboration with the National Institute for Science, Law & Public Policy, "Getting Smarter About the Smart Grid" offers a roadmap to a truly "smart" decentralized electricity grid capable of integrating "distributed" power generation and renewable energy sources without the privacy, security, reliability, economic, or potential public health impacts of our present 20th century centralized and wasteful utility infrastructure investment approach.

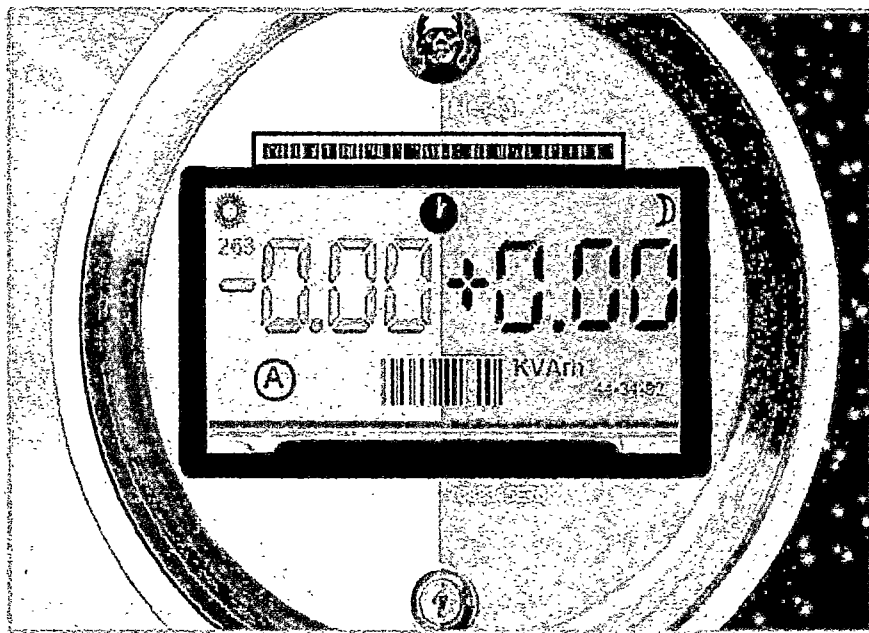
National Institute for Science,
Law & Public Policy

August 2012

“ If discussion surrounding energy strategies and policies can move beyond shallow thinking— such as the notion that a new utility meter represents a foundational element on the path to sustainability—and move toward comprehensive and clear thinking about the objectives and means available, transforming the electricity system can be only the first step in a greater transformation to a new energy future that is sustainable, secure, and a source of economic wealth. We are in a critical historical moment when the stakes are high and the opportunities are great—as are the hazards. The only option not realistically on the table is continuation of the status quo. ”

Getting Smarter About the Smart Grid

Why are federal government stimulus programs underwriting billions of dollars of “dumb” smart meters for utility companies—with taxpayer dollars—meters that will soon be obsolete and not integrate with, or enable, the “smart grid” of the future on which U.S. energy sustainability depends?



Authored by a veteran communications technology expert, in collaboration with the National Institute for Science, Law and Public Policy, *Getting Smarter About the Smart Grid* offers a roadmap to a truly “smart” decentralized electricity grid capable of integrating distributed power generation and renewable energy sources without the privacy, security, reliability, economic, or potential public health impacts of our present 20th century centralized and wasteful utility infrastructure investment approach.

**National Institute for Science,
Law & Public Policy**

November 2012

“ The so called ‘smart grid’ that is as vulnerable as what we’ve got is not smart at all. It’s a really, really stupid grid. ”

—Former CIA Director, James Woolsey

Author

Timothy Schoechle, Ph.D.

Dr. Schoechle is an international consultant in computer and communications engineering and in technical standards development. He presently serves as Secretary of ISO/IEC SC25 Working Group 1, the international standards committee for Home Electronic System and is a technical co-editor of several new international standards related to the smart grid. He also serves as Secretariat of ISO/IEC SC32 Data Management and Interchange, and he currently participates in a range of national and international standards bodies related to smart grid technology and policy issues.

As an entrepreneur, he has engineered the development of electric utility gateways and energy management systems for over 25 years and has played a role in the development of standards for home networks and for advanced metering infrastructure (AMI). He is a former faculty member of the University of Colorado College of Engineering and Applied Science. He is considered an expert on the international standards system, the topic of his 2009 book, *Standardization and Digital Enclosure*. Dr. Schoechle was a co-founder of BI Incorporated, a pioneer developer of RFID technology. He holds an M.S. in telecommunications engineering (1995) and a Ph.D. in communication policy (2004) from the University of Colorado, Boulder.

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Website

www.GettingSmarterAbouttheSmartGrid.org

Abstract

In recent years, the notion of the “smart grid” has emerged—first using information technology as a means of improving electricity reliability—then more recently to improve efficiency, reduce pollution, and to incorporate more renewable generation. But the public face of this smart grid has too often become the deployment of vast networks of remotely readable electric meters by utilities, often with large government subsidies. In the name of the smart grid, billions of taxpayer and ratepayer dollars are being spent on these so-called “smart meters.” But now the utilities and their smart meters are experiencing increasing public pushback.

In reality, these meters and their dedicated networks are primarily for the benefit of utilities, reducing their operating costs and increasing profits by firing meter readers—ironically with federal stimulus funds—while doing essentially nothing to advance what should be the real goal of the smart grid: balancing supply and demand and integrating more renewable sources. Instead, the meter networks squander vast sums of money, create enormous risks to privacy and security, introduce known and still unknown possible risks to public health, and sour the public on the true promise of the smart grid.

This paper examines the technical shortcomings of the smart meter strategy along with its related economic, privacy, security, and potential health risks—explaining why this approach cannot lead to energy sustainability. It analyzes the failures of both federal grid policy and state regulation. It further explores and explains the technical challenges and economic potential of a *true* smart grid. Finally, it proposes a roadmap for a transformation to a renewable, sustainable electricity economy that could lead the way to a clean energy future.

“ Much early rhetoric about the smart grid and its potential was visionary and grandiose, but what has been delivered has been less impressive, offering little or no public benefit but much public expense. ”

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“ In the face of popular hopes and imagination, moving the U.S. electricity grid to renewable energy faces formidable barriers— technological, institutional, social, political, and economic. Among the most formidable of these barriers is the misfit between the characteristics of renewable technologies (i.e., primarily wind and solar), on the one hand, and industry practices, business models, and their institutional forms, on the other hand— particularly the organization of

distribution paradigm, and the associated regulatory and financial relationships. For example, wind and solar are inherently distributed sources for which economic efficiency is maximized at much smaller scales than for conventional generation.”

Foreword

By Duncan Campbell, Esq.

Dr. Timothy Schoechle has been a friend and colleague for nearly twenty-five years. I served as corporate legal counsel when he founded a company whose primary focus was on designing home automation systems and specifically on developing communication gateways and energy management systems employing demand response. He was also involved in the early development of standards for, and testing of, smart meters including Advanced Metering Infrastructure (AMI). He became a pioneer of such energy management systems—and gateways—with his early cutting edge SMARTHOME 1™ product. His extensive knowledge and wisdom in systems thinking in this area has been garnered in large part from his deep involvement in smart grid technology and in taking a leading role in the development and writing of formal national and international standards for close to thirty years. As such, he is uniquely qualified to have formulated this exceptional and game-changing critical analysis, *Getting Smarter About the Smart Grid*.

This paper is a current, thoroughly researched, and extensively documented work that is clearly-expressed and presented in an easily-understood framework. The paper ventures further than many landmark studies in that it lays out both the problems with *and* offers solutions for a lasting “fix” regarding the inaptly named “smart grid” in its centralized form and the currently accepted energy policies surrounding it. Dr. Schoechle examines and explains the prevailing confusion about the “smart grid” and offers a clear path forward, lucidly showing an alternative to patching up our overly-complex, vulnerable, and increasingly expensive energy system—thus creating a truly smart and genuinely sustainable electricity system.

In his 2011 landmark book *Reinventing Fire*, Amory Lovins, considered by many to be one of the world’s leading energy visionaries, observes that “...as we rebuild our dirty, insecure, obsolete-in-many-ways-electricity system, which we have to do anyway over the next 40 years, it’s going to cost about \$6 trillion net present value, no matter what we build...” Lovins concludes that building a distributed renewable-based system is the clear choice for minimizing risk and maximizing sustainability. Lovins contends th

renewables (the same price required in attempting to prop up the insecure and increasingly dangerous centralized “business as usual” electricity industry that is inherently incapable of widespread integration of renewables). So why not make the truly smart and wise choice before time runs out?

Dr. Schoechle’s *Getting Smarter About the Smart Grid* takes Lovins’ work a step further, not only expanding on the specific questions and problems with current energy technology and policy but also offering timely, affordable, practical, and economically viable technical and policy solutions to the current problem of the centralized “smart grid” and how such solutions could help fulfill Lovins’ proposition. The present “smart meter”—which itself benefits only the centralized utilities at the expense of the consumer—has thus become the symbol and focus of rapidly-amplifying public pushback. This pushback is now opening the door to growing public support for the necessary re-thinking of the entire electricity and energy system while a truly wise, affordable, and economically and environmentally sustainable solution is still possible.

At the end—or beginning—of the day, what it comes down to is simply this: In order to establish an abundant and hospitable world for ourselves and a sustainable and empowering future for all

generations, we cannot—and need not—wait for our formally elected politicians to find the right energy policy. It is time for each of us to stand up for our home, our family, and our planet—and to make an end run around the failing archaic centralized grid policy and the disempowering intrusion of the smart meter. It is time for all of us to take the next wise empowering steps together, as Dr. Schoechle suggests at the conclusion of *Getting Smarter About the Smart Grid*.

—Boulder, Colorado, September 2012

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Getting smarter about the smart grid

Prologue

Scenes of protesters being arrested in the streets might be expected in association with demonstrations related to wars, human rights, or economic crises—but not often in opposition to the activities of utility companies and their seemingly mundane electric meters. However, such scenes of protest occurred recently in California when demonstrators blocked PG&E trucks installing “smart meters” in Marin County. Subsequently, the Marin County Board of Supervisors unanimously passed an ordinance that deemed the installation of smart meters to be a public nuisance (Kahin, 2011). Similar occurrences of rebellion against smart meters are occurring across the continent. Are these situations anomalies, or could they be harbingers of a broad and spreading grassroots rebellion against the utility industry that may herald an epochal transformation of the political economy of energy?



Credit: Tim Porter Photography - www.photography.timporter.com/

“ The demarcation between monopoly utility space and customer market space was clarified over two decades ago

in the case of wire-line telephone monopolies with the decisions and policy changes culminating in the divestiture of AT&T.

One result was enormous market growth in new markets for premises equipment and services. The electricity grid today is facing the same demarcation inflection point as the telephone network experienced. The gateway belongs to the consumer, not to the electric utility. ”

Executive summary

The promise of the smart grid

In recent years, the notion of the “smart grid” has emerged—first using information technology as a means of improving electricity reliability—and then more recently—to improve efficiency, reduce pollution, and to incorporate more renewable and sustainable sources of generation.

Congress, state and local governments, as well as ratepayers, have been misled about the potential energy and cost saving benefits of the new “smart” meters, paid for in large part with taxpayer dollars, as well as ratepayer dollars. This report makes the case that the smart meters have become confused and conflated with the much broader concept of the smart grid, and that the undue emphasis on meters diverts resources badly needed to develop and bring forward the key elements of a true smart grid technology that can integrate distributed renewable energy.

Public pushback

A growing grass roots rebellion against smart meters now happening in 18 states, such as CA, VT, AZ, TX, FL, PA, ME, IL, OR and the District of Columbia, is only the “tip of the iceberg”—one that conceals a deeply dysfunctional energy economy needing urgent federal, state and local attention. Ratepayers’ desire to “opt-out” of the new meters on privacy, security, reliability, cost, and potential public health grounds could signify rebellion against the electric utility industry that may herald an epochal transformation of the political economy of energy.

Conventional utility business model

The 100 year-old monopoly utility business model contains inherent conflicts and is de-incentivized from taking the necessary steps toward renewable energy and sustainability. Regulated utilities sell electricity as a commodity at profitable regulated rates and, more importantly, can charge back their capital assets to ratepayers at a guaranteed 10-13% annual rate of return. Thus they have no incentive to sell less electricity, yet a strong incentive to build excessive and inappropriate infrastructure (e.g., generation, transmission, meter networks, etc.).

Renewables vs. baseload

Coal plants must run at near capacity to achieve necessary economies of scale, known as “baseload” generation. Adding wind or solar to the power mix may in fact be cost-additive for utilities and ratepayers, because the renewables, if overproducing on top of the baseload, are “curtailed” or wasted (i.e., must turn off the wind to burn more coal). Thus, there is an inherent conflict between baseload generation, the dominant means of electricity generation in the United States, and a transition to renewable energy. Baseload dependency must be decreased or entirely eliminated.

New utility business model needed

Regulators tend inevitably to be “captured” by the utility interests they regulate. In a deregulated and renewable-powered world, utilities must become service companies—maintaining wires and poles—no longer producers or asset builders. Every electricity user could also be a producer.

The smart meter canard

The meter networks squander vast sums of money, create enormous risks to privacy and security, introduce known and still unknown possible risks to public health, and sour the public on the true promise of the smart grid. Data to be collected by the smart meters, including intimate personal

details of citizens' lives, is not necessary to the basic purpose of the smart grid—supply/demand balancing, demand response (DR), dynamic pricing, renewable integration, or local generation and storage—as promoters of the meters, and uninformed parties, routinely claim. Instead, the meter data is serving to create an extraneous market for consumer data mining and advertising (i.e., “big data” analytics). Even those critical of smart meter deployments often seem to uncritically accept the myth that the meters somehow help manage electricity supply and demand.

The allocation of stimulus dollars to subsidize smart meters has also been a net job destroyer, eliminating meter readers and creating manufacturing jobs overseas, while being an egregious waste of federal resources that only supports corporate interests and delays the needed transformation of the electricity grid. In fact, efforts to further develop and standardize those technologies that could achieve those basic purposes have languished, while investments with stimulus funding have instead been made in technologies that merely serve the short-term economic interests of the utility industry and its suppliers instead of the interests of a true smart grid which could economically integrate renewable technologies and distributed, or decentralized, power generation.

Federal policy failure

Although some federal laboratories have pioneered key advanced smart grid technologies, the highest levels of federal leadership reflect the mistaken belief that the basic solutions involve fixing or modernizing the existing electricity grid, rather than complete structural transformation of electricity service—going beyond any particular “smart” technology. In reality, shaving peak energy usage by shifting loads may actually increase energy bills as well as CO² emissions by increasing dependency on coal baseload generation, especially as electric vehicles emerge.

Power to the people

Leadership in the energy sector is unlikely to come from the top, due to “regulatory capture” and an entrenched “electricity-industrial complex.” At present, there appears to be little evidence that utilities and their regulators want to or know how to make the needed changes to the utility business model, leaving it to the American public, through community-based initiatives and municipalization efforts, to drive the needed change toward renewable technologies and distributed, non-centralized power generation.

Blueprint for new energy economy

Key technologies must be further developed, including renewable generation and storage. This report recommends a national move away from dependency on baseload generation, particularly coal, as quickly as possible to facilitate renewable integration and to reach our potential for energy independence. This can be aided by a move to flexible generation and storage, and to advanced (non-baseload) demand response and transactional energy smart grid technologies.

Key policy initiatives include those that foster localization and distributed generation—and especially—establishing a clear “demarcation” between monopoly utility space and competitive customer premises market space—as occurred decades ago with the deregulation of the telephone industry.

Electricity grids have become too big and too complex to fail. Yet they will inevitably fail—as recent extreme weather or other events have shown—putting society increasingly at risk.

I. Introduction: the present U.S. energy challenge

The backlash against smart meters (Barringer, 2011) in Marin County, in other parts of California—as well as in Connecticut, Florida, Hawaii, Illinois, Maine, Maryland, Oregon, Texas, Vermont, and other parts of the United States and Canada—seem on the surface to be attributable to at least three issues: health concerns¹, personal privacy, and cost (Jepsen, 2011). But it is likely that the roots of the backlash go much deeper. Meters have become the “tip of an iceberg”—the public face of an increasingly dysfunctional energy economy characterized by an out-of-date electricity grid and repeated and persistent failures of public policy. The elements of this dysfunction that are most evident to the public are oft-reported health, privacy, and cost concerns.²

This paper will explore the nature and roots of today’s energy economy dysfunction, focusing on the electricity grid, a dysfunction symbolized in large part by the smart meter, and will identify an alternative path to a new sustainable energy future based on strategic and rational investment of the nation’s resources. The problems of electricity grid dysfunction include aging infrastructure, unmanageable complexity, rising costs, increasing pollution, accelerating climate change, increasing grid vulnerability, uncertain electricity reliability, loss of consumer control, institutional dependency, declining middle class incomes, and economic unsustainability. These problems are increasingly urgent but solvable. The path to sustainable and renewable energy becomes obvious if mapped by rational and scientific analysis, but the present smart meter approach is a diversion from that path. However, there is an approach that leads to a sustainable path. A grassroots rebellion against meters is indeed taking place, and it is beginning to morph into a bottom-up, community-based revolution in electricity and energy that could re-shape society.

Such a bottom-up revolution may be what has been characterized by economist and author Jeremy Rifkin as “lateral power,” a force that is bringing about a “third industrial revolution” (Rifkin, 2011).³ Rifkin argues that the implications of the shift to renewable energy are as profound as those associated with the introduction of coal-based steam power and subsequent

The ailing U.S. electricity grid

Today’s grid is an over-100 year-old system based on centralized power generation and long distance downstream transport of electricity from generator to user. In recent years, it has been increasingly plagued by blackouts and other reliability problems (Amin, 2011). Most recently, pressures and concerns associated with climate change, environmental pollution, diminishing water resources, economic crisis, national security, and international conflicts over fossil fuel resources have come together with the increasing improvement and availability of wind and solar generation technology to create increased public expectation and demand for renewable energy.⁴ But, the old grid is not well suited to the incorporation of renewable energy. The sun and the wind are inherently distributed and not subject to supply-side economies of scale as are coal and nuclear. Thus they do not fit well with the business models, regulatory regimes, and broader paradigm associated with centralized utility architectures (Farrell, 2011; Fox-Penner, 2009).⁵

Several years ago, the term “smart grid” entered the public lexicon, as a proposed solution to concerns about transmission reliability. The term has become increasingly prominent through lavish promotion by utilities and government, feeding public expectations of improved

efficiency, balancing of supply and demand, and integration of renewable energy sources. One generic functional definition of the smart grid describes “an intelligent, auto-balancing, self-monitoring power grid that accepts any source of fuel (coal, sun, wind) and transforms it into a consumer's end use (heat, light, warm water) with minimal human intervention” (Xcel, 2008).

Smart meters have become the poster child for the smart grid, but the poster is no longer as pretty as it was.⁶ A key question has emerged concerning the relationship of these meters to the overall purposes of the smart grid concept and asks, what are those purposes? Is the smart meter controversy a proxy for deeper social, economic, and political problems? If so, how can we solve and move beyond these problems?

Much early rhetoric about the smart grid and its potential was visionary and grandiose, but what has been delivered has been less impressive, offering little or no public benefit but much public expense (Fehrenbacher, 2010). The meter has come to symbolize a “bait-and-switch” situation, mainly to the benefit the utility industry and its vendors as well as to politicians and bureaucrats. In their present form, smart meters offer few or no benefits to consumers, but pose significant risks and costs to them and to society.

This paper finds that the underlying reasons for public disenchantment with smart meters, and by association, with the smart grid, fall into the following categories, ranked by overall national policy significance:

1. Economic reasons – Billions have been expended in public funds and in consumer payments buried in utility rate structures, with little or no benefits from such investment to consumers and ratepayers. The utility industry cuts jobs and improves its bottom line (with the complicity of regulators and the federal underwriting of smart meter deployments) while the potential for benefits to the public from smart grid-managed integration of renewable energy is squandered.⁷
2. Privacy reasons – Privacy and progress collide as the smart grid comes to be perceived as a surveillance tool—invading personal space only to the benefit of third party data miners, promoters, intrusive law enforcement, and tangential commercial interests. Smart meter data can reveal intimate details of personal life such as what and when appliances are used and how many people are in the household.
3. Public health reasons – Some meter networks are radio-based and emit electromagnetic fields. The biological effects of electromagnetic fields (EMFs) are poorly understood. With the pervasive deployment of electromagnetic radiation sources, the potential for “collateral damage” is high, while the meter networks offer little or no benefit to the public. No pre-market health testing was required or performed prior to the wide-scale introduction of these radiation-emitting technologies, and increasing concern about the risks of EMFs are being voiced by citizens, international scientists, physicians groups, governments, and the World Health Organization’s International Agency for Research on Cancer (IARC).

Because it so clearly exemplifies the failure of industry and of public policy to meet the challenge of a new energy future, the case of the smart meter serves as a means of addressing the following questions:

- Where are the failures of government?
- Where are the failures of industry?
- What should the *true* smart grid look like?
- How can we move the right technologies forward to a sustainable energy future?

Although poor investment choices have been made by utilities and by government, it is time to move forward expeditiously. Consumer and national interests must be served, keeping the end goal in mind not simply by short-term stimulus tactics—investment for its own sake—but rather by developing long-term strategic technology investment plans and policies that assure the nation’s energy independence and economic sustainability, as well as security for its people, individually and on a national level.

The promise of renewable energy technologies

In recent years, public concern over climate change and the environmental consequences of global warming have added to anxieties surrounding issues of pollution, oil addiction, national security, war, water resources, trade competitiveness, the economy, and jobs. At the center of all of these issues is the global energy economy and its present dependence on carbon-based sources of energy. Since its genesis over a century ago, the U.S. electric power system has been based primarily on the burning of coal.⁸ Calls for reassessment and transformation of the U.S. electricity system have taken on added urgency in response to degradation and pollution of air and water from the mining and burning of coal, increasing demand for U.S. coal from the developing world, depletion of domestic supplies, and rising prices and costs (Glustrom, 2009).

The promise

In the face of these rising concerns, the successful development and mass deployment of wind and solar technologies in other parts of the world (e.g., Denmark, Germany) have raised public interest in moving electricity generation to renewable sources in pursuit of a sustainable energy future. Citizen initiatives in 30 states have led to the adoption of Renewable Portfolio Standards (RPS) mandating the percentage of renewable energy that utilities must utilize. The promise of a new energy economy based on renewable and sustainable resources offers the key to addressing the national and global problems cited above. Energy sustainability also offers an appealing sense of right livelihood and integrity to our relationship with the environment,⁹ which has long been missing with industrialization. Today, the possibility of clean renewable energy presents a bright spot in an otherwise bleak economic and environmental picture.

The barriers

In the face of popular hopes and imagination, moving the U.S. electricity grid to renewable energy faces formidable barriers—technological, institutional, social, political, and economic. Among the most formidable of these barriers is the misfit between the characteristics of renewable technologies (i.e., primarily wind and solar), on the one hand, and industry practices, business models, and their institutional forms, on the other—particularly the organization of the current utility industry around “baseload” generation within a centralized generation-transmission-distribution paradigm, and the associated regulatory and financial relationships. For example, wind and solar are inherently distributed sources for which economic efficiency is maximized at much smaller scales than for conventional generation.¹⁰ Efforts to build wind and solar at “utility scale” (e.g., large wind farms, concentrating solar plants, etc.) create problems

related to the need for more transmission lines, efficiency losses, land and water issues, and increasing capital costs and risks. Compelling arguments and analyses have been put forth that these renewable technologies make more sense if they are “democratized” or distributed, contrary to the model espoused by the traditional centralized industry paradigm (Farrell, 2011). But utilities will never make the change to renewable energy if it kills their core business model. This is the fundamental barrier to making the infrastructural changes required to move toward a smart grid architecture that serves a broad public interest. There is simply no feasible way to fulfill the promise of a new energy economy within the present “baseload” electricity system.

Localization

A new terminology of “localization” and “distributed energy resources” (DER) has recently emerged around the idea of generating electricity close to where it is used and shifting control to the local or community level. The proposed benefits of electric power localization include jobs (Brookings, 2011), the 3.5 x multiplier effect of keeping the money in a community (GAO, 2004)¹¹, reduced transmission losses, economic feasibility at a smaller scale (Farrell, 2011), enhanced grid reliability, regulatory and policy responsiveness, and local and national security in the face of natural or other disasters (Woolsey and Korin, 2007).

Another benefit of localization is improving the stability and security of electricity supply. A localized and distributed electricity supply would risk less vulnerability to securities traders, investment bankers, and exploitive resellers who would find it more difficult to manipulate and misuse electricity markets. The bitter experience of California consumers, industry, shareholders, and governments during the infamous 2001 Enron scandal, when many \$ billions were lost, showed the risks of a centralized and capital-intensive electricity system. If deregulation of generation were accompanied by decentralization, no utility industry player would be in the position of such price manipulation or of being “too big to fail.”

The conventional utility business model

One of the biggest obstacles to renewable energy is a utility industry business model structured around revenues based on the sale of kilowatt-hours (kWh) as a commodity and on a double-digit rate-of-return (ROR) on assets —both guaranteed by state regulators and paid for by ratepayers. This half-century-old system was established in the early days of electrification as an incentive to spur the growth of the needed infrastructure for generation, transmission, and distribution without relying on general tax revenues. Electrification was viewed as a public good and ROR on assets created a mechanism for its subsidization through a regulated rate base.¹² In effect, it made electricity a *commodity* rather than a *service*, and it moved the financial risk of infrastructure construction from the utility to the ratepayer. This distinction means that the more electricity that can be sold and the more infrastructure that can be constructed, the more profit the utility can make. Perversely, in today’s environment, increasing efficiency or reducing demand reduces profits. Unfortunately, the present system essentially guarantees utility profits and removes incentives for energy efficiency and for the incorporation of renewable energy.

States and regulators have attempted to meet public calls for better energy efficiency and cleaner sources by creating various incentives and mandates for utilities (e.g., to accept some level of renewable power and provide efficient light bulbs, appliance rebates, solar rebates, demand response products, smart grids, etc.). However, these measures attempt to “swim upstream”

against a basic utility business model that remains based on the sale of electricity kWh as a commodity and on guaranteed ROR on assets.

The commodity sale of electricity and double-digit ROR on assets has resulted in a system historically dependent on “baseload” generation¹³ within a big-grid and big-transmission centralized structure. This means that to be economical, large centralized generating plants (primarily coal, nuclear or some types of natural gas fired plants) must run at a fixed optimum output level known as the baseload. Because the supply and demand for energy on the grid must be instantaneously matched, second by second, hourly variation in demand above the baseload supply curve is met by “peaking plants” (usually natural gas) that are more expensive to operate but can be quickly turned on or off.

Another method of dealing with variation in supply is known as demand-side management or “demand response” (DR). Demand response includes various techniques to manage demand to better match supply. DR offers ways to quickly shift peak demand by sending control signals that turn off or limit specific industrial or residential load devices (e.g., air conditioners, water heaters, etc.). However DR systems require communication pathways and special premises equipment in order to be implemented—products and services that are not yet standardized, fully developed, or readily available.¹⁴ Unfortunately, DR employed in a baseload system, while shaving peaks and improving system efficiency, may perversely serve to increase dependency on relatively dirtier baseload sources (e.g., coal, nuclear, etc.) and thus can actually result in higher pollution and CO₂ emissions.¹⁵ However, properly implemented, new forms of DR (e.g., “transactive energy”) can play a crucial role in renewable integration if the resulting system is cheap, ubiquitous, and easy to use.

Renewables—characteristics and impediments

Renewable energy sources are inherently incompatible with a conventional baseload generation-based electricity system. When variable and unpredictable power from wind and/or solar is fed into a baseload-supplied grid, occasionally too much electricity may be produced relative to demand. The electricity system requires that supply and demand be perfectly balanced second-by-second. If supply and demand become mismatched, even momenta unstable and could quickly and completely fail. For both technical and economic reasons, baseload plant operators prefer to operate at a fixed optimal output level. Rather than turn down the baseload plants, operators prefer instead to “curtail” the renewable energy (Regelson, 2011; Farrell, 2011, p. 26).¹⁶ In such situations, ratepayers end up paying for both the baseload *and* the curtailed (i.e., wasted) renewable power. The higher the proportion of renewable energy available to the system, the bigger this problem becomes.¹⁷ Conventional baseload-oriented utilities are cautious about adding too much renewable energy because beyond a certain level, doing so raises total costs, which wastes energy and/or threatens to de-stabilize their grid.

Baseload

Figure 1 compares baseload vs. renewable characteristic supply/demand on a typical daily cycle, illustrating the paradigm shift in electricity supply. Demand for electricity changes throughout the day, beginning low in the early morning and often reaching a peak in the late afternoon. In a baseload supply system such as depicted in Figure 1a, demand is met by a conventional combination of continuous level baseload power (e.g., coal or nuclear) and, as required,

additional peaking supply from other sources that can respond quickly (e.g., natural gas combined cycle plants, fast peaking hydro plants or natural gas turbines).

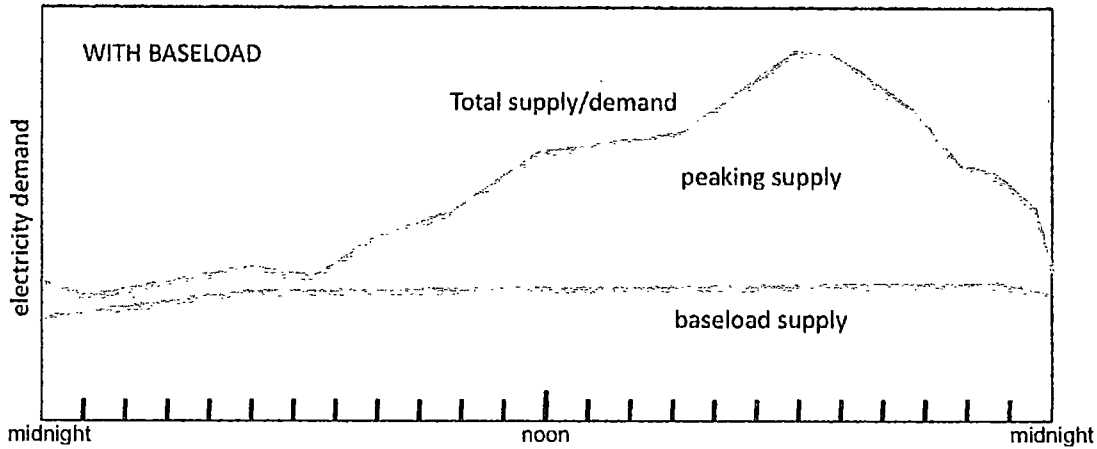


Figure 1a—Conventional baseload electricity supply system

But baseload is not essential for meeting demand. In Figure 1b the same total supply/demand profile is met by a combination of renewable (variable) supply and peaking supply. This figure is oversimplified to merely show how variable renewable generation might replace baseload generation and still match the same total supply/demand profile.

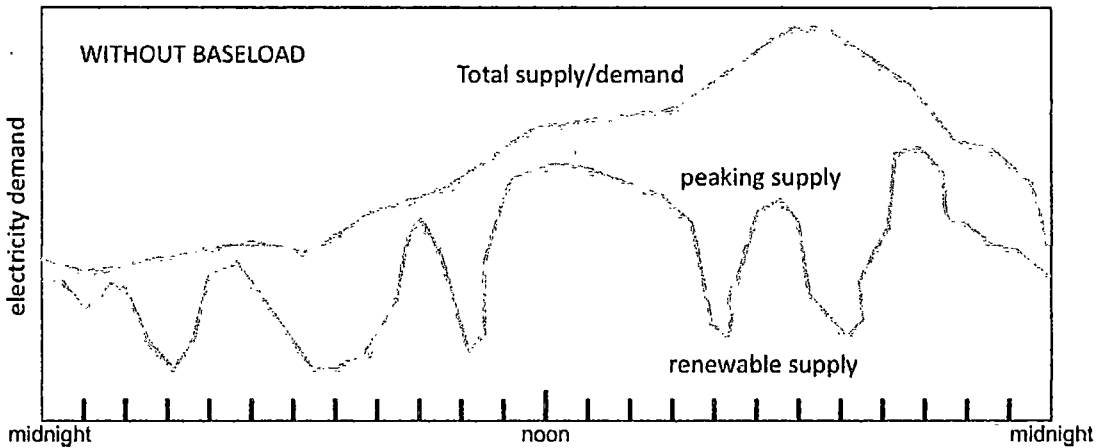


Figure 1b—Renewable non-baseload electricity supply system

In the baseload system (figure 1a), the unpredictable nature of some renewable sources (e.g., wind and solar) will sometimes overload the system with too much power when added on top of the fixed baseload. This means that power may be wasted (or “curtailed”). The renewable non-baseload supply system depicted in Figure 1b does not waste power but does, however, present significant technical challenges requiring careful and rapid rebalancing by quick response to changes in supply and demand—either by quickly adding fast peaking sources (e.g., hydro, storage sources, natural gas turbines) when needed or by quickly reducing or shifting demand

(e.g., demand response). This rapid rebalancing represents the essential promise, and challenge, of smart grid technology.¹⁸

Technology leadership—funding the right future

It does not appear that utilities and their regulators can or want to make basic changes to the utility industry business model, so prospects for change from the top down do not look promising. Regulators primarily tend to serve the needs of those they regulate and have established comfortable, long-standing relationships with the industry, and they are not likely to initiate changes in their business model.¹⁹ Investor-owned utilities tend to be large state employers and elected officials have little incentive to challenge them. Utilities historically have enjoyed solid profits guaranteed by regulators. Federal energy policy has been gridlocked for years and does not provide much reason for optimism.²⁰ Fossil fuel industry interests are enormous and have enjoyed decades of success securing legislation and subsidies cemented with solid political support. Carbon tax and cap-and-trade legislation have been stymied.²¹ Meaningful policy leadership is unlikely to come from the top, unless caused by some clearly catastrophic event or consequence. Federal funding priorities need to be re-oriented. Specific recommendations are made in the “blueprint” provided below—but first, it is useful to critically examine the problem.

A bottom-up grass-roots rebellion?

In his most recent book, *Reinventing Fire*, longtime energy technology and policy expert Amory Lovins (2011) lays out a detailed plan for freeing society of its addiction to fossil fuels by saving energy through the implementation of efficient vehicles, buildings, and manufacturing plants, and by producing energy through renewable sources such as windmills and rooftop solar. Lovins anticipates that local economic forces and state and local initiatives generated from the bottom-up by people “fed up with gridlock” will make an “end-run around gridlock.” In a recent interview, Lovins commented,

...policies are needed to unlock or speed the transition, but they don't require an act of Congress. So we're end-running Washington gridlock, and we're doing that through a combination of market forces, entrepreneurship, and local economic forces, and a combination of military innovation, to end-run the ineffective institutions, notably Congress. (Flatow, 2011).

Of course it would be most desirable if the federal government would keep its eye on the ball and provide long-term policy and technology guidance and leadership to effect the transition that Lovins advocates. Unfortunately, this is unlikely. Short-term thinking, politics, and conflicts of interest prevail, making gridlock a well-institutionalized status quo. The nuclear power chimera has wasted enormous resources for decades. More recently, “tight oil” and natural gas “fracking” are in vogue and heavily subsidized, diverting financial and technical resources while risking vast unknown and unintended consequences. It will likely be left to the people to reinvent the electricity system largely from the bottom up community initiatives, motivated by desire for a clean energy future, control of energy costs, economic growth, and local control of environmental, health, and privacy factors.

A new utility business model?

A new utility business model will be needed soon. A sharp decline in energy demand has resulted in cancellation or delay of new power plants and transmission facilities. Industry

analysts and executives see a “...shift in the utility industry created by increased energy efficiency, small generation projects, such as rooftop solar, and changes in public policy...” and suggest that “We are entering a new era...Everyone is looking for power in their backyards.” (Jaffe, 2011).

In recent testimony before the Colorado Public Utilities Commission (PUC), Xcel Energy changed its seven-year resource plan (filed October 31, 2011), cutting its estimated need for additional generation to 292 megawatts—down from the nearly 1000 megawatts²² forecast just a year earlier (Haeger, 2011, p. 4). The Xcel testimony stated “A combination of a very weak economy and the success of our DSM [demand side management] and *Solar Rewards*^{TM 23} programs has resulted in a reduction of over 500 megawatts of generation capacity in just the past year” (p. 5). Xcel does not see a significant need to increase renewable energy until 2028 (p. 13)—its investment in coal generation being simply too great.

The United States’ utility system has grown fat and complacent, shielded by an indulgent regulatory system that has masked market realities, insulating utilities from the consumer. But when the situation finally reaches a tipping point, change may come with shocking rapidity. When investor-owned utilities can no longer conceal or veil increasing fuel costs, face declining revenues, and cannot provide a path toward a renewable and sustainable energy future, their customers may bypass them or bolt outright. When such a process begins, it can become self-reinforcing. On November 1, 2011, voters in the City of Boulder, Colorado, passed ballot measures to move toward municipalizing the city’s electricity grid. The measures passed in spite of nearly \$1 million in campaign funds spent by Xcel Energy to defeat them—a level of spending ten times that of citizen groups supporting the measures. It is not clear what will happen as utility investments in obsolete systems become stranded and can no longer be protected by regulators. What is clear however is that the will of people to secure their energy future may be stronger than powerful utilities ever imagined.

In his book *Smart Power*, utility industry economist Peter Fox-Penner (2010) provides an insightful and comprehensive analysis that predicts the collapse of the old utility business model based on the sale of commodity kWh and on ROR on assets, with utilities enjoy

for the utility industry. These models include 1) the “smart integrator” model, and 2) the “energy services utility” model. The smart integrator is a utility that retrenches into a distribution company that manages smart pipes and wires. The smart integrator is therefore a network operator and not a commodity seller. The energy services utility is a utility that becomes customer service centric and incentivized to energy efficiency, which generates or buys electricity for its customers. Fox-Penner notes that migration to these models will likely be crisis-driven, and that the industry is not yet in crisis. However, that situation may soon be changing.

Present smart meter approach is irresponsible

The smart grid may yet be an important key to a new energy economy, but the current smart meter approach is irresponsible—financially, politically, and technologically. This is because the smart meter emphasis does not contribute to the balancing of supply and demand or to the integration of renewable sources, while sapping the resources needed for true progress and squandering public support. Over the last year, utilities around the country have installed an

estimated two million smart meters. These were included as part of \$3.4 billion in federal stimulus funding to “modernize” the nation’s power grid. The Edison Institute (IEE) estimates that 65 million smart meters will be deployed by 2015, representing 54% of U.S. households, and that as of September 2011, 27 million smart meters had been installed (IEE, 2011). The presumed contribution of these meters to the goals of the smart grid deserves close examination.

In 2010, The *Smart Grid Investment Grant Program*, part of the *American Reinvestment and Recovery Act*, provided matching funds to utility projects. In rolling out the money, President Obama spoke about how the program would “...spur the nation’s transition to a smarter, stronger, more efficient and reliable electric system” that would “promote energy-saving choices for consumers, increase efficiency, and foster the growth of renewable energy sources like wind and solar” (Obama, 2009). The main elements of the program are identified in the quote below:

Empowering Consumers to Save Energy and Cut Utility Bills — \$1 billion. These investments will create the infrastructure and expand access to smart meters and customer systems so that consumers will be able to access dynamic pricing information and have the ability to save money by programming smart appliances and equipment to run when rates are lowest...

Integrating and Crosscutting Across Different “Smart” Components of a Smart Grid — \$2 billion...funding a range of projects...including smart meters, smart thermostats and appliances, synchrophasors, automated substations, plug in hybrid electric vehicles, renewable energy sources, etc. (Obama, 2009).

Thus was the intention. Over the ensuing two years, a number of valuable smart grid research and demonstration projects were initiated and useful transmission and distribution automation improvements were implemented with a portion of the federal money. These actions worked to the benefit of utilities and their customers—mainly by bringing about increased reliability and efficiency through improvements in distribution, transmission and generation (EnerNex, 2010).²⁴ However, the unfortunate reality is that very little progress has been made toward moving the grid toward distributed renewable energy or enabling the other goals proclaimed in the program goals cited above. Disproportionate benefit from the funding has accrued to utilities and meter and metering network manufacturers (e.g., Elster, GE, Itron, La

promise of smart thermostats, smart appliances, usage displays, and renewable energy source integration continues to languish.

The wrong technology

Following the initial hype about smart grid and all of the benefits it could bring, the smart meter rapidly became “low hanging fruit” that would provide “two-way communication” to the end user that could deliver all the wonderful benefits of the smart grid. So the narrative went. But this starry-eyed account turned out to be wrong. In reality, the smart meter delivered unemployed meter readers²⁵ and a deluge of meter data that utilities had no idea what to do with. It delivered little or nothing of value to the consumer. The smart meter also delivered a public increasingly soured on the smart *grid*, which came to be perceived as a “bait-and-switch” by industry and politicians.

The digital smart meter is a twenty-year old technology that was rapidly seized on because it was off-shelf and relatively quick and easy to install²⁶ and because it offered to cut labor costs. But the technologies and standards needed to implement a true smart grid were not available—and

are still not available. The requisite technologies and standards are difficult to develop and putting them in place will require much research, development, standardization, product engineering, and marketing, along with new business models.

One of the supposed benefits of smart meters is the enabling of time-based rates. In reality, smart meters and dedicated smart meter networks are not necessary for this purpose—there are better technical approaches.²⁷ Moreover, time based variable rates are not effective or equitable without automated customer in-home or on-premises equipment to respond to them and manage usage (and perhaps on-premises generation or storage) accordingly. Additionally, time-based rates must take into account the situation of lower-income users who may not be able to purchase expensive automated energy-management equipment. Without proper implementation, time-based rates risk being seen as nothing but subterfuge for rate increases, further souring the public on the smart grid.

In recent blog discussions, utility engineers commented that some elements of the smart grid—such as distribution automation and monitoring, outage isolation, voltage optimization, remote meter reading, billing, and back-office operations—have yielded operational efficiencies and benefits. But bloggers went on to comment that the “heavy lifting” requisite to realize the smart grid promise of load balancing, demand response, and renewable integration has yet to be seriously undertaken. One engineer wrote “...home area networks, customer load controls, real-time usage monitoring, load shifting are all very costly and time consuming to manage and implement. The [utility] business case just isn’t there” (Damiano, 2011). The message here is that the utility industry is not equipped or incentivised to develop and produce the range of products and services needed to realize the full promise and expectation of the smart grid.

Finally, serious questions have been raised concerning the proper role of utilities in dealing with users’ personal data—reaching into consumers’ homes to extract meter data and to exercise control over their appliances and their lives—a topic that will be considered in detail later in this paper, as will the limitations and misconceptions surrounding smart meters and the dere

Much federal smart grid spending is motivated by the need to stimulate the economy, but more care could be taken to make sure funding is directed in a manner that serves this outcome. Spending on infrastructure that will actually transform the energy economy will pay off in jobs and global competitiveness. This will require independent energy policy and strategic thinking and not continuation of the status quo service to established industry interests. In *Reinventing Fire*, Lovins (2011) makes the business case for a new approach to energy that would cost less and provide more—and that gets the nation off of coal, oil, and nuclear energy by 2050. In a recent interview, Lovins commented

...as we rebuild our dirty, insecure, obsolete-in-many-ways electricity system, which we have to do anyway over the next 40 years, it’s going to cost about \$6 trillion net present value, no matter what we build...

So we’re going to have to rebuild the electricity system, anyway, and we are rebuilding it day by day. But if we look at what we could rebuild, we could do business as usual. We could do a new nuclear and so-called clean coal scenario. We could do centralized renewables, distributed

renewables. And surprisingly, these four scenarios differ only immaterially in cost, but they differ profoundly in risk (Flatow, 2011).

Lovins' point is that if we choose investment in a modernized electricity grid that integrates distributed renewable energy technologies, the total investment will not be measurably different, but the benefits will be vastly greater and risks lower because we will have created a sustainable carbon-free energy economy that will, in turn, benefit the broader economy.

Creative destruction

Joseph Schumpeter, the early 20th century economist and a prophet of free-market capitalism, described economic progress in terms of “creative destruction”²⁸ wherein market forces eliminate obsolete and less productive legacy industries to make room for investment in more innovative, economic, and productive technologies and industries (Schumpeter, 1942). Accordingly, investments in obsolete or unproductive industries are (and should be) written off and discarded. But in the entrenched carbon energy economy, this is not likely to occur. Regulators have been propping up investor-owned utilities (IOUs) for a long time. But this may be drawing to an end and the result may be impending crisis. In the event of a collapsing energy industry, powerful energy and financial interests would likely demand their own Troubled Assets Relief Program (TARP) or E.U.-style taxpayer bailout to protect the interests of private stockholders and/or bondholders.

The following examples illustrate that ratepayers, consumers, and taxpayers, are currently being asked to prop up financially unsustainable utilities—a situation that may be approaching its limits.

The “financial brownout”

In November of 2011, Xcel Energy told the Colorado PUC that the company's projected 7-year demand had dramatically dropped by 994 megawatts (a drop equal to the total output of Xcel's new \$1 billion Comanche unit 3 coal plant in Pueblo just completed last year) and that Xcel does not anticipate the need for more renewables until 2028 (Jaffe, 2011). Then, with

electricity bill by \$4 (Jaffe, 2011a).

In a contemporaneous case, Duke Energy announced that the company would take a \$220 million charge against earnings²⁹ to cover some of the massive cost of building its new marquee “clean coal” plant at Edwardsport, Indiana. Duke now projects the plant's cost at \$3 billion—\$1 billion more than originally forecast (Smith, 2011). The Indiana Utility Regulatory Commission has allowed the utility to charge customers \$2.35 billion so far, and probably will allow more such charges before the plant is completed. The \$220 million charge (loss) follows a \$44 million third quarter charge taken by Duke (and its shareholders) on the plant the previous year. In essence, as costs escalate and benefits become more dubious, regulators who are subject to political forces may become less willing to continue to simply pass all costs through to ratepayers—thus stranding more utility investments over time.

These are but two examples illustrating that IOUs are on an unsustainable collision course with a financial iceberg—as projects become less and less economically viable, regulators may come under increasing pressure to disallow charges to ratepayers, thus raising financial risks to the

utilities and their shareholders and bondholders. The political economics of utility coal are crowding out renewable energy. Ratepayers, consumers, and taxpayers are being asked to prop up a business model that is financially unsustainable and already failing—the model is effectively “browning out.” Renewable energy is held hostage to coal and utility profits, and the ransom may ultimately require a public bailout—buying out the stranded IOU-owned coal plants and decommissioning them in order to shift the grid from baseload coal to renewables.

II. The smart meter canard: a misguided focus on the smart meter

The smart meter is a canard—a story or a hoax based on specious and grandiose claims about energy benefits ostensibly derived from the promise of “two-way” communication with the customer. Specifically, these supposed benefits are held to derive from display of energy use data, control of energy appliances, knowledge of grid load distribution, supply/demand balancing, renewable integration, lower bills, and other “hand-waving.” These energy benefits have not been delivered, or have been only minimally delivered by the meter networks. The present smart meter focus is wholly misguided for reasons that are technical, economic, privacy-related, public health-related, and structural (i.e., related to a dysfunctional industry/market structure).

Technical reasons – unneeded and inappropriate technology

First of all, smart meters have failed to deliver smart grid benefits for fundamentally technical reasons. Examples include that 1) the networks do not generally provide full two-way communication, 2) customer usage display was, in most cases, of stale data (24 hour delayed) on a third-party website—on-site real-time display is not feasible using most meter backhaul networks—and 3) smart meters and their networks cannot or are ill-equipped to implement demand response load control strategies.³⁰

Meter networks generally are not true two-way communication networks—they are intended for polling meters and not designed to handle in-bound signaling for demand response (DR) strategies or to communicate with home automation systems, in-home devices, or smart appliances.³¹ Even if meter networks were able to do so, the back-office software to support such applications is not available or is in a primitive state of development and not standardized. These networks do not provide a full-function open premises information “gateway” to the home. Even if the meters did provide a gateway function, they would likely be implementing a top-down centralized control strategy (ACORE, 2011).³² Such an approach is not well understood, would not operate practically on a large scale due to its complexity, and would not likely be acceptable to consumers due to its intrusiveness. The old centralized control paradigm is inconsistent with the concept of distributed energy resource and with state-of-the-art smart grid technology.³³

Who is the gatekeeper?

Another important limitation to the centralized utility approach is that it positions the utility as the “gatekeeper” and controller of the “gateway” to the consumer and his home. The demarcation between monopoly utility space and customer market space was clarified over two decades ago in the case of wire-line telephone monopolies with the decisions and policy changes culminating in the divestiture of AT&T. One result was enormous market growth in new markets for premises equipment and services. The electricity grid today is facing the same demarcation inflection point as the telephone network experienced. The gateway belongs to the consumer, not to the electric utility. A demarcation and opening of the consumer premises space to market competition could unleash the creative energy of the consumer electronics industry, the home appliance industry, and others. Full two-way smart grid communication among premises-based systems, products, and services—facilitated by a consumer-controlled gateway device and already available data services (i.e., Internet and Web access via DSL, cable, fiber, etc.)—would

free the smart grid from the stifling control of utilities and their proprietary meter-reading networks. The gateway alternative is further described below in relation to the topic of privacy.

Data for what?

Meter data is not necessary to the basic purpose of a smart grid (e.g., supply/demand balancing, DR, and renewable integration). The original motivation behind remote meter reading (including AMI) was the elimination of meter readers and automation of back-office billing systems.³⁴ Currently, however, data is collected primarily because it can be. Utilities do not know what to do with all the meter data and probably did not ask for it in the first place. The accumulation of data was simply a consequence of the process of automated remote meter reading. Recent discussions on the blog operated by the utility think-tank *UtiliPoint* reflect this quandary. “Utilities are becoming paralyzed with the storage and attempted manipulation of such large quantities of data...we must look past the initial pain to discover what we can do with the data” (Warsaw, 2011; 2011a). These data were initially an ancillary and largely unintended by-product of remote meter reading, but third-party jackals have begun craving the data for tangential marketing and promotion and other forms of commercialization, as has occurred with the Internet and Web (e.g., Facebook, Google, Amazon, etc.).

What is almost always assumed or alluded to by meter advocates, but never explained, is how reading meters, however frequently, can serve the goals of functions of the smart grid—i.e., balancing supply and demand. Never explained is how granular personal meter data helps manage the grid. It is believed by some that consumer electricity usage behavior data may be useful to utilities or to consumers. But it is not clear how such data would actually be applied, nor is it clear that there are not cheaper and more benign ways to acquire it. SCADA³⁵ networks already provide utilities with the aggregate transformer or substation load data needed to assess distribution loads and conditions. A premises meter is not needed, or would be impractically cumbersome to use, to aggregate data to derive distribution grid load information. The notion that a utility supercomputer could somehow centrally micromanage a vast network of individual household appliances is fantastical—the stuff of science fiction scenarios.

In contrast, management of premises demand response, supply/demand control/monitoring of solar systems, electric vehicles (EVs), or batteries would be better accomplished by distributed control through intelligent energy management devices and transactional control strategies. What is needed is not meter data flowing *out of the premises*, but rather grid load, time-of-use signals, or electricity transactional data flowing *into the premises* so that the premises can manage its own energy. This would require full two-way communication via a gateway with premises-based equipment such as home automation systems (HA), smart inverters, smart appliances, energy management systems, etc. that do the job of managing energy on-premises.

Present day meters do not provide such a gateway. The meters generally do not provide data directly to the customer, but rather upload it to the utility, which may or may not provide it later to customers via a third-party web portal (usually delayed by at least 24 hours). Customer usage displays would need to be real-time or near real-time to be useful to consumers³⁶ and even then the best displays are no substitute for premises-based automated energy management equipment that would act on behalf of consumer priorities and do so entirely within their own homes.

Muddying the waters

Smart metering systems are highly arcane and non-engineers tend to assume unquestioningly that the smart meter is a vital part of smart grid technology. Such an assumption is commonplace even among those vocal in raising challenges to the meters on privacy grounds and other bases. For example, in a key paper on the topic of smart grid data privacy by the Privacy Commissioner of Ontario, Canada, the necessity of collecting granular meter data (including details about personal electricity and appliance usage) was unquestioningly accepted, thus conflating the smart grid with smart meter.

The Smart Grid has the potential to deliver substantial value, but is a significant endeavour that will require privacy risk mitigation measures to be taken. The infrastructure that will support the Smart Grid will be capable of collecting detailed information on energy consumption use and patterns within the most private of places – our homes (Cavoukian, 2011).

Another example of this mistaken assumption is a widely cited landmark paper by Elias Quinn (2009) that initially and thoroughly revealed the privacy risks of highly granular meter data. Even Quinn erroneously views such data as essential to the smart grid:

Proper management of this new information pool could support energy efficiency efforts and demand-side management (DSM) initiatives... The more information gathered, the better supported DSM initiatives, efficiency investments, and conservation efforts (p. v).

Essentially, an electric utility could capitalize on the information to facilitate more efficient network management, peak load reduction, load shaping, and any number of other such uses. (p. 4).

[Meter data facilitates] provision of electricity usage information in real-time, allowing dynamic response to changing prices or environmental signals, and the ability to identify household activities (p. 7).

Left unexplained in most discussion of smart meter data is exactly how these data serve the proclaimed purpose. The confusion may be understandable, in part because both Cavoukian and Quinn have backgrounds in policy and law, not in engineering. Unfortunately, those sufficiently knowledgeable to understand the technical details of how the metering systems work and how they are applied by the utility industry are often reticent about raising questions regarding the actual role and value of the meters. Ironically, even those who should know better perpetuate this confusion: “The major benefit provided by the Smart Grid, i.e. the ability to get richer data to and from customer meters and to other electric devices, is also its Achilles’ heel from a privacy viewpoint” (NIST, 2009, p. 84). This quote not only misstates the benefit of the meter, but thoroughly conflates and confuses the smart meter with the smart grid.

Green Button magic

In an attempt to establish some perception of value in the growing river of metering data, the National Institute of Standards and Technology (NIST) and the U.S. Department of Energy (DOE) embarked on a major push in the Fall of 2011 known as the “Green Button”—an effort to solve the data display standardization problem. The Green Button was inspired by the successful “Blue Button”, which standardized the format for provision of health information for veterans through a simple one-click website button. The Green Button standardized the format of energy consumption data (including meter data) summaries, presumably for display on smart

thermostats and other in-home devices or websites, and for automated machine-to-machine exchanges. The Green Button standardization appears to have been broadly adopted, although unfortunately, it still did not address the meter data delay problem.

Based on this author's discussions with some of those individuals involved in the Green Button initiative, it was a promotion based on a theory that could be critically paraphrased as follows: "we don't really know what to do with all this data or how to use it, but if we put it in a standardized format and make it readily available, third party geeks and nerds (i.e., creative entrepreneurs) will figure out how to do something useful with it—and maybe save some energy somehow." By this magic, government officials and utilities may be perceived by the public as retrospectively accomplishing something of value with their meters. Unfortunately, the Green Button ultimately is likely to serve mainly as a temporary substitute for automated in-home energy management systems while feeding a superfluous market for data and potential invasions of consumer privacy.

Economic reasons – unbalanced costs and benefits

The smart meter push has begun to sour consumers on the potential of the smart grid and has led to cynicism concerning the ability of the government and utility industry to promote energy policy to serve the public interest. At the same time, observers are coming to realize that government and industry are wasting billions of taxpayer and ratepayer dollars that could be put to productive use creating a sustainable electricity grid.

Following are some of the economic arguments supporting the position that investment in smart meters is misguided. Smart meters:

- do not reduce electric bills but may actually increase them (due to introduction of dynamic pricing schemes, rate recovery of deployment costs, etc.),
- do burden consumers with costly meters and proprietary meter networks rather than utilize already existing communication networks, while costs are passed to ratepayers by regulators through rate increases and generous guaranteed ROR on assets, do not improve or manage consumer energy use or facilitate supply/demand balancing, consumer demand response, or integration of renewable energy,
- do destroy local jobs, and
- do divert or squander dollars that could have brought us closer to a renewable-based electricity infrastructure.

It is important to remember that the *Smart Grid Investment Grant Program* awarded matching funds that required equal matching by grantees—a cost generally passed on to ratepayers.

State officials push back

Illinois Governor Pat Quinn recently vetoed legislation that would have paid for the widespread installation of smart meters and other electricity grid "improvements." According to Quinn in a recent *Smart Grid News* article,

...utilities are trying to change the rules to guarantee themselves annual rate increases and eliminate accountability. I will not support a bill that contains sweetheart deals for big utilities, which could leave struggling consumers to pick up the tab for costs such as lobbying fees and executive bonuses (Berst, 2011).

Governor Quinn added that the state could ensure continued innovation and investment in the electricity grid and create new jobs "...without compromising core safeguards for Illinois consumers." Attorney General Lisa Madigan commented "This bill would have been devastating for consumers."

Another example of pushback by state authorities on economic grounds is the Brief of George Jepson, Attorney General of Connecticut before the state Department of Utility Control (CDUP) urging rejection of Connecticut Light & Power's (CL&P) plan to install 1.2 million new smart meters. CL&P had conducted a pilot study of 1,251 residential and 1,186 commercial meters in 2009. Jepson said,

CL&P's proposal would force the company's ratepayers to spend at least \$500 million on new meters that are likely to provide few benefits in return. ... The pilot results showed no beneficial impact on total energy usage and the savings that were seen in the pilot were limited to certain types of customers and would be far outweighed by the cost of installing the new meter systems. ... Also the existing meters, installed between 1994 and 2005 have a useful life of 20 years and replacing them early would incur additional costs for customers. (Jepson, 2011)

Jepson's brief went on to say that CL&P

...should install the technology at its own expense and then demonstrate during a full rate proceeding...the costs are known and measurable and the meters are used and useful, that its expenditure for this purpose was prudently incurred. Only then, should the DPUC consider whether, and to what extent, those costs should be included in rates.

Jepson also commented that dynamic (i.e., time-based) rates (a justification for smart meters) are punitive to certain types of customers, including many elderly, those with sick or young children at home, those who work second or third shifts, and many small businesses. The Governor added that while time-based rates can be useful and should remain an option for electric customers, these rates can be handled in better ways and customers should not be forced to their economic detriment.

Pushback due to costs and benefits has emerged in other states as well. In 2010, Maryland regulators blocked a utility's smart meter proposal, citing inadequate planning and potential cost to customers. In California, class-action litigation against PG&E asserted that due to a hasty rollout, old billing systems were merged with new smart meters, frequently resulting in erroneous overcharges (Zeller, 2010).

Rate burdens and overcharges

Claims of overcharging have emerged in Texas and other states. Some have questioned the accuracy of digital smart meters. And as illustrated above, additional problems come about when (as is more often than not the case) the switch to smart meters is accompanied by rate increases to pay for them or, more subtly, meters are bundled with dynamic pricing that results in higher rates. Ratepayers in Colorado experienced four electric rate increases in three years, including a rate hike to pay for Xcel's *SmartGridCity*TM project in Boulder—a smart meter network that replaced less than half the meters in town but still enjoyed a \$45 million retroactive rate recovery award from the Colorado PUC (Fehrenbacher, 2010). In addition, the system, installed in 2008, failed to deliver the promised in-home devices for demand response, home automation, displays, renewable integration, and other promised greenery.³⁷

Some regulators are beginning to wake up. The Hawaii Public Utilities Commission rejected a \$115 million smart grid project that relied on the installation of wireless smart meters. The state Division of Consumer Advocacy said, “Our office was concerned that the investment would be made but ratepayers wouldn’t see the benefits. ...The utility should create a comprehensive plan for upgrading the electricity grid before it makes another attempt to use ratepayer money to put advanced electric meters in homes and businesses” (Niese, 2010).

It is becoming increasingly recognized that the costs of smart meter networks exceed the benefits—over and above the lost opportunity cost (i.e., the lost opportunity to invest the same money more wisely). Such benefits as actually accrue are primarily to utility operations and result from the elimination of meter reader jobs, reduction of truck rolls, expediting of back-office billing systems, etc. Consumer benefits are obscure and very indirect. For example, an exhaustive DoE-funded report filed with the Illinois PUC found all “customer benefits [were] realized indirectly through utility [benefits]” (EnerNex, 2010, p. 59). With respect to a claimed “societal benefit,” the report found “...reduced CO² emissions...attributable directly to meter installation is likely to be minor and...is obtained by the reduction in the use of vehicles by the utility for its meter-reading workforce” (p. 61). This would seem to be a less than salutary benefit. Further, it does not consider the emissions and costs of producing, installing, and maintaining extraneous networks and meters. Additionally, much of the electronics is likely to be sourced abroad.

Privacy reasons – privacy and “progress” collide

Smart meters enable an unnecessary invasion of consumer privacy that offers no (or highly dubious) associated benefits. The issue of smart meter data privacy was brought to the fore by the circulation of a landmark paper by Elias Quinn (2009). Quinn’s report was addressed to the Colorado Public Utilities Commission and subsequently resulted in an ongoing inquiry. The paper also found its way around the world and was partially included (with its diagrams) in a nationa

Although various types of data may be involved, the term “smart grid data” fundamentally refers to detailed, highly granular meter data (e.g., 1, 5, or 15 minute interval recordings)³⁸ collected by meters and showing the aggregate electric usage from a customer premises. Subsequent data processing/disaggregation is capable of identifying individual appliances (load signatures) and discerning usage patterns (customer habits). In this sense, the data become personally identifiable information (PII) for each particular user/customer. The privacy and security implications of the Quinn paper were far-reaching and troubling. Figure 2 below shows a typical household electricity demand profile and has been reproduced in the CSWG report (NIST, 2010, p 13) and appears often in other reports.

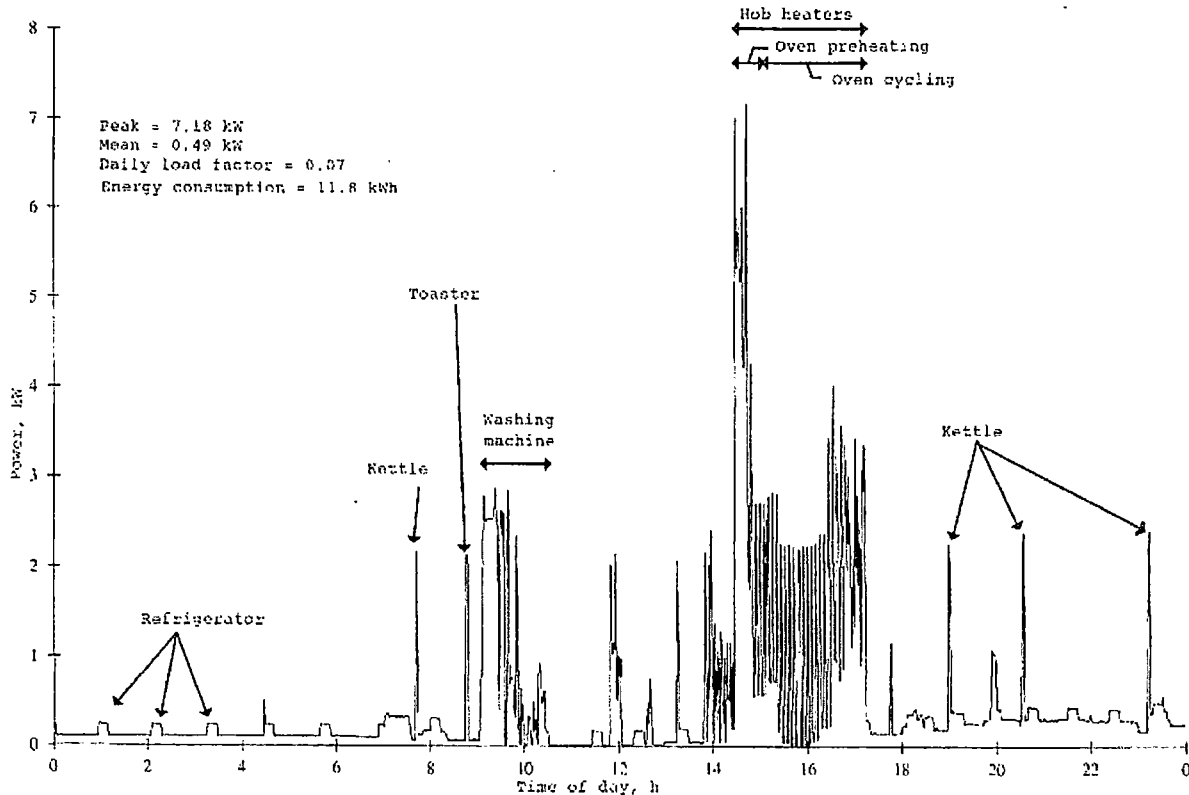


Figure 2 — Household electricity demand profile recorded on a 1-minute time base

Quinn comments on the implications of such data mapping capabilities

...the massive deployment of smart meters across the country and the trend toward finer and finer interval data means that more and more information will be discernable about more and more people. While the raw information about when an appliance event occurred in a given home may not seem to be sensitive information, it could be used to construct a detailed picture of residential life. Tracking appliance events means smart grid information could tell you the answer to questions like

- How often does a given customer eat microwave dinners as opposed to cooking three-pot meals?
- How many hours of TV does a resident watch? What kind of TV is it?
- When does a resident normally shower (and so cue an electricity draw from the water heater)? (Quinn, 2009, p 9)

The list of questions of interest to third-parties is potentially infinite: How many people live in the house? When do they go to bed? When do they get up? When do they have coffee? What brand of coffee pot do they have? What brand and model of refrigerator do they have? How old is it?

Quinn raised privacy as a regulatory issue but he also saw a trade-off between privacy and economic opportunity, viewing smart meter data, if properly managed, as a potentially transformational mechanism for utility business models, which could be decoupled from the sale

of commodity kWh, and on guaranteed ROR on assets, to electricity management (i.e., an alternative way to make money by exploiting or selling the meter data and/or creating new services). It could be argued that, although laudable in its motivation, this notion is naïve in view of the recent history of Internet data privacy abuse, but that is the subject for another paper.^{39 40}

In a more recent paper, Doran and Quinn (2010) continue to see "...societal benefits such as grid reliability and energy efficiency..." in granular meter data, demonstrating their continuing lack of understanding of the technical application of meter data in utility practice.

In summary, granular meter data reveal intimate details about consumers' personal lives while providing little or no value with respect to achievement of the potential benefits of a smart grid. The existence of such data constitutes a significant threat to personal privacy, perpetuates extraneous and tangential technical development, diverts resources, stimulates consumer pushback against the smart grid, and builds a constituency for unnecessary and potentially harmful and/or redundant metering networks and for the development of applications that may be detrimental to consumer and societal interests.

Why is this data being collected/transmitted?

The purpose of collecting meter data is usually stated, or assumed to be, electricity management (e.g., demand-side load management, efficiency consulting, energy savings, customer feedback/display, etc.). More likely, data collection occurs simply because it can be easily and cheaply done by remote metering technology (i.e., an adjunct artifact) originally deployed to reduce meter-reading costs. It is not clear exactly how such fine-grained data collected on such a large scale can be used effectively for electricity management or other stated purposes of the smart grid. Nonetheless, the idea that the data constitute an effective tool for electricity management is a virtually unchallenged seemingly "commonsense" notion that is pervasive throughout promotional, policy, and academic literature.

The gate

can serve as communication gateways for other premises energy management equipment and applications. But this is not a likely long-term outcome. European and international standards and regulators are moving away from the idea that consumer data should be under the control of utility companies due to privacy and economic concerns. Moreover, consumers are increasingly unlikely to favor such an idea.

Recent regulatory initiatives in Germany and The Netherlands mandate an *independent* standardized gateway that controls and manages all access to all metering devices to assure consumer data privacy and security (BSI, 2011; NN, 2011). Such a gateway is to be considered under the control of the customer and not the utility, and includes a special security/encryption module that controls data access and policy (e.g., restrict the frequency of meter reads, the amount and type of data read, data retention, data use, etc.). The standardized gateway also provides communication access between various external service providers and in-home devices (e.g. home automation systems, energy management systems, etc.) using home area networks (HANs)⁴¹ that communicate with various smart appliances. This same gateway concept was also

suggested by the Cyber Security Working Group report (NIST, 2010) as a method to mitigate security and privacy risks.

There are other methods that use demand response for distributed load control where the utility or third-party service provider delivers pricing and energy data to a consumer Energy Management System (EMS) through a gateway. Intelligent appliances and/or the consumer EMS use this pricing and energy information to optimize energy consumption according to consumer preferences. With the insertion of a gateway and local intelligence, any feedback to the utility could be load control results for the entire household, rather than by an appliance... Thus it is possible to protect consumer privacy at the macro level by choosing a system design that minimizes frequent access to granular data from outside the consumer site (p 37-38).

The use of a gateway as a “firewall” to structurally separate and protect networks is well known in the information technology industry. It is axiomatic in the data security industry that the best way to limit security risk is to simply not collect, transmit, or store information except where necessary. If information can be effectively processed and utilized within a local network, it need not be passed to another. A further reason to take the gateway/EMS approach to security and privacy is to make smart devices into consumer electronic products. With appropriate industry standards in place, home energy systems and appliances, un-tethered from utilities and grid operators, could spawn a mass market such as occurred for television, home entertainment, telephone, and computer products (Schurr, 2012). A consumer market for energy management devices and smart appliances, including energy-related applications and services, could dramatically advance the diffusion of distributed renewable energy (Wacks, 2011; 2012).⁴²

Public health and radiation reasons – “collateral damage”?

Thirdly, many smart meter networks installed today use wireless mesh technology, a constant source of electromagnetic radiation in the microwave frequency spectrum. This radiation has largely unpredictable propagation characteristics and unknown long-term health effects. The biological effects of electromagnetic fields (EMF) are not fully understood and have become an established matter of public concern and active scientific inquiry. Public concern over smart meter EMF radiation has become a primary factor fueling public resistance to smart meter installation. In California, more than 57 cities and counties have de..... smart meter installation and a dozen local governments have passed ordinances prohibiting them (Hart, 2011).^{43 44} In July, 2012, the Maine Supreme Court unanimously ruled against the PUC, ordering reconsideration of smart meter safety issues (Sharp, 2012). Potential health risks, radio noise pollution, and possible alternative technologies are considered below.

Health risk

It is obvious from decades of research on a wide range of frequencies within the radiofrequency (RF) spectrum that EMFs have biological effects, and associated health effects are likely. But the nature and extent of such effects (including cumulative effects) and any associated risk is not clear. Such effects have not been well researched for all frequencies and power densities, including those relevant to smart meters. For example, mobile phone radiation has long been a matter of concern and some scientific controversy. The World Health Organization (WHO) had conducted a study of cancer risk in cellphone users, known as the *Interphone Study*, begun in the late 1990s and sponsored by thirteen nations, various cellphone manufacturers, and other industry groups (Interphone, 2012).⁴⁵ WHO has reportedly been assuring consumers that no

adverse health effects had been established (Dellorto, 2011). However, in May of 2011, a review of the research by WHO's International Agency for Research on Cancer (IARC) found evidence that mobile phone users display significantly increased incidence of glioma and acoustic neuroma brain cancer (Dellorto, 2011). After reviewing the WHO *Interphone Study* and other evidence, IARC classified radiofrequency radiation as a Class 2B "possible carcinogen"—thus listing cell phone use, and other RF emitting devices and equipment, in the same "carcinogenic hazard" category as lead, engine exhaust, and chloroform.⁴⁶ In regard to the WHO review of the research, one cancer researcher referencing one form of risk—that from *thermal* effects (i.e., tissue heating)—noted the following.⁴⁷

What microwave radiation does in most simplistic terms is similar to what happens to food in microwaves, essentially cooking the brain... So in addition to leading to a development of cancer and tumors, there could be a whole host of other effects like cognitive memory function, since the memory temporal lobes are where we hold our cell phones (Dellorto, 2011).

Other criticisms of the Interphone Study have also emerged, including that the evidence for risk may have been understated due to design flaws by as much as 25% (Morgan, 2010).

Then in October, 2011, a large government-funded study by Danish researchers found no increased risk of brain cancer associated with mobile device use, although the study was criticized because "brain tumors can take a long time to develop" (Cheng, 2011), and because of serious design flaws in this ongoing study that would serve to underestimate risk⁴⁸ (BMJ, 2012; ElectromagneticHealth.org, 2011; 2011a).

Although both involve microwave frequency radiation, it is difficult to draw a comparison between cellular telephones and smart meters. Cellphones are used intermittently and held close to the head, while (mesh network) meters operate continuously, and the radiation generated may or may not be in close proximity to residents. Moreover, propagation characteristics vary widely. An added complication with cellphone measurements is that newer cellphones employ adaptive power control techniques. This means that actual transmitted maximum power levels can vary over orders of magnitude depending on conditions. Nevertheless, many utility customers in several states have reported a variety of harmful effects in nausea, neurological diseases, heart irregularities, cognitive impairment, fetal risks, etc.

In response to health concerns of the California legislature, the California Council on Science and Technology (CCST) produced a report that found, in part

1. Wireless smart meters, when installed and properly maintained, result in much smaller levels of radio frequency (RF) exposure than many existing common household electronic devices, particularly cell phones and microwave ovens.
2. The current FCC standard provides an adequate factor of safety against *known thermally* induced health impacts of existing common household electronic devices and smart meters.
3. To date, scientific studies have not identified or confirmed negative health effects from *potential non-thermal* impacts of RF emissions such as those produced by existing common household electronic devices and smart meters.
4. Not enough is currently known about *potential non-thermal* impacts of radio frequency emissions to identify or recommend additional standards for such impacts (CCST, 2011, p. 4).

Critics of this report responded that it “minimized” some risks and failed to provide modeling or actual measurements of smart meters (Maret, 2011, p. 1), and that “...rather than being an independent science-based study, the CSST [report] largely cuts and pastes estimates from a brochure by the Electric Power Research Institute (EPRI), an industry group, issued some weeks earlier” (Hirsch, 2011, p. 1). Hirsch, a nuclear policy analyst at the University of California, also challenged the report’s failure to consider the relative duty cycles of smart meters, cellphones, and microwave ovens, and he contended that the cumulative whole body exposure from meters could actually, under some circumstances, be 100 times higher when appropriate corrections are made.

Other critics of the CSST Report challenge the third and fourth findings (above), i.e., that there is a lack of evidence of non-thermal health effects from RF radiation. The presently accepted measure of EMF dose is the thermally-based specific absorption rate (SAR)—the rate at which electromagnetic energy is absorbed by tissue. Columbia University cellular biologists Blank and Goodman (2012) propose that the SAR value used to set the safety standard for EMF “...fails as a standard for predicting cancer risk...because cancers are believed to arise from mutations in DNA...” They argue that such DNA changes can be induced at electromagnetic radiation levels that are orders of magnitude lower than those observed SAR thermal effects. They propose that changes in DNA induced by interaction with EMF could be a better measure of the biologically effective dose...” They also propose a specific mechanism of non-thermal energy absorption based on the properties of DNA acting as a “fractal antenna” structure with an extremely wide frequency range (Blank and Goodman, 2011).⁴⁹

Another contrast between cellphones and meters is that cellphone use is optional and under control of those being exposed, whereas smart meters are not. In an interview related to the CCST report, Hirsch commented accordingly.

Interviewer: “What is the risk to the public?”

Hirsch: “We don’t know. At the moment it is uncertain what is the health effect of RF radiation. It could turn out to be significant. It could turn out to be insignificant. It is a large experiment on a very large population. I live in a house, I don’t choose to have a smart meter. Whole body cumulative exposure of a smart meter is one hundred times that of a cellphone. It may be another asbestos [situation]” (Hirsch, 2011).

In summary, the CCST Report offers a highly problematic basis for steering public policy for a number of reasons. In any case, it seems clear that more study is needed on the effects of wireless smart meters if they are to be installed in peoples’ homes on a large scale. An array of scientific opinions have been advanced and no general consensus has emerged on the question of whether significant EMF health risk exists from exposure to smart meters. Following are some examples of positions on both sides of the question, starting with some that accept EMF risks as being plausible or likely.

Olle Johansson, PhD, Associate Professor, Department of Neuroscience, Karolinska Institute in Sweden, and Professor, Royal Institute of Technology, argues that an array of health effects and disorders have been demonstrated to result from non-thermal levels of EMF and that utility meters and other emitting appliances should be hard-wired (Johansson, 2012).⁵⁰

Karl Maret, MD, a physician specializing in electrical and biomedical engineering, has similarly argued that EMF health effects are likely and should be mitigated by shifting to hard-wiring meters (Maret, 2012).⁵¹ In recent testimony to the Senate Finance Committee in the Vermont State Legislature, Dr. Maret emphasized the need to hard-wired meters, saying, “With the wired meters our health long-term would be more assured. There would be no radiation whatsoever, and I think that’s the core issue here.” (Caruso, 2012)

On the other side of the issue, some have argued that EMF health risks from smart meters are likely minimal or absent and should not be a matter of concern. Dr. Harry Chen, the Vermont state health commissioner and an emergency medicine physician, told Vermont lawmakers not to worry about the radiation emitted by wireless smart meters, suggesting that meters “emit less than 1 percent of the radiation emitted by cell phones” (VPR, 2012). Chen’s testimony contrasted with a recent report on smart meter risks commissioned by the Santa Cruz County Board of Supervisors in California, as well as with a recent report on smart meter risks by the American Academy of Environmental Medicine (AAEM, 2012).

Santa Cruz Health Officer Poki Stewart Namkung concluded that too few scientific studies have been conducted on smart meter and radiofrequencies’ long-term effects to assess the health risks. Namkung commented, “The public health issue of concern is the involuntary exposure of households to electromagnetic field (EMF) radiation” (KSBW.com, 2011). Her report resulted in the Board of Supervisors vote extending the county’s moratorium on PG&E’s wireless meters.

The American Academy of Environmental Medicine (AAEM) adopted a resolution in January 2012 calling for a halt to wireless smart meters based on a review of the scientific and medical literature. The resolution stated, “Chronic exposure to wireless radiofrequency radiation is a preventable environmental hazard that is sufficiently well documented to warrant immediate preventative public health action” (AAEM, 2012, p 1). The resolution affirmed that the FCC guidelines consider only thermal exposures and so are inadequate for application to public health standards. The AAEM resolution stated

The literature raises serious concern regarding the levels of radiofrequency (RF – 3KHz-300GHz) or extremely immediate and complete moratorium on their use and deployment until further study can be performed. ...The current medical literature raises credible questions about genetic and cellular effects, hormonal effects, male fertility, blood/brain barrier damage and increased risk from certain types of cancers from RF and ELF levels similar to those emitted by “smart meters.” Children are placed at particular risk for altered brain development, and impaired learning and behavior. ...Given the widespread, chronic and essentially inescapable ELF/RF exposure of everyone living near a “smart meter”, the Board of the American Academy of Environmental Medicine finds it unacceptable from a public health standpoint to implement this technology until these serious medical concerns are resolved (p 1).

Due to protests and dissent in the United Kingdom over smart meter health risks, including a recent 265-page report on the subject published by the charity Radiation Research Trust, a £12 billion government program to install smart meters underwent modification to allow people to “opt out” (Jamieson, 2012). “Opt-out” rights have also been approved by regulators at locations in numerous U.S. states, including California, Michigan, Illinois, Vermont, Maine, Oregon, and Nevada, and a federal lawsuit has been brought by the City of Naperville, IL over the utility-imposed installation of smart meters on homes. The Maine Supreme Court recently decided that

the PUC had not given adequate consideration to radiation risk and ordered reconsideration of the challenges to smart meter installations (Sharp, 2012).

In the face of widespread and growing health concerns, the unavoidable question arises: why invest in something with known potential for harm that would impact millions of people—especially when there are other viable and arguably superior alternatives?

Radio noise pollution and interference

Even utility grid operators recognize a certain level of risk associated with EMFs. With the growing use of devices such as cardiac pacemakers and defibrillators, power companies have become concerned about the potential for electromagnetic interference in the workplace. To address this concern, the Electric Power Research Institute (EPRI) has developed a personal electromagnetic field monitor for utility workers who wear implanted medical devices on the job (EPRI, 2011).

Homes are subject to increasing levels of radio noise introduced by products such as compact fluorescent lamps, switched-mode power supplies (e.g., for computers and electronic devices), Wi-Fi routers, remote control systems, cordless phones, baby monitors, and computers. Adding smart meters to the mix raises the level of electromagnetic cacophony and introduces new opportunities for interference and mis-operation. Pacific Gas and Electric has determined that certain models of Ground Fault Interrupter (GFI) circuit breakers, safety devices intended to protect from electrocution, may malfunction if they are installed in close proximity to smart meters and have asked smart meter manufacturers to develop transmitters with lower power output for such situations (Sage, 2011a).

There seems to be little justification for adding the constant chatter of mesh networks to ambient EMF pollution. This added pollution potentially interferes with sensors and other, possibly more important appliances as well as with critical communications (e.g., in particular, with a new genre of ultra-low power battery-less radio sensor devices known as “energy harvesti

Alternatives for metering, including other methods of communicating energy data to or from the home, that produce much less radiation, are effective, readily available, and often already in place. These include conventional cable, DSL, cellular radio (GPRS), optical fiber, and powerline carrier networks. The introduction of dedicated meter networks when less costly and risky alternatives already exist may have less to do with data communication than with profits and business strategies predicated on control of the market and the customer. Obviously, more research on the health and biological effects of EMFs is needed⁵², but meanwhile, it would seem that the default choice should be on the side of caution and safety—known as the *precautionary principle*. The risks associated with smart meter implementation, added to privacy risks and to the costs of new dedicated and proprietary communications networks, are not justified in the face of the dubious benefits to be had. The potential for significant collateral damage to public health, unnecessary interference, and the availability of adequate or superior alternatives for meter communication with utilities, argue strongly for consideration.

Structural reasons – diversion of resources

A fourth and final reason the smart meter approach is misguided is structural—i.e., related to the industry market structure and a mis-direction of resources and benefits. The smart meter has spawned a parasitic market pyramid structure that diverts financial resources, regulatory policy, and technical innovation onto ancillary and unproductive paths.

The smart meter network market pyramid

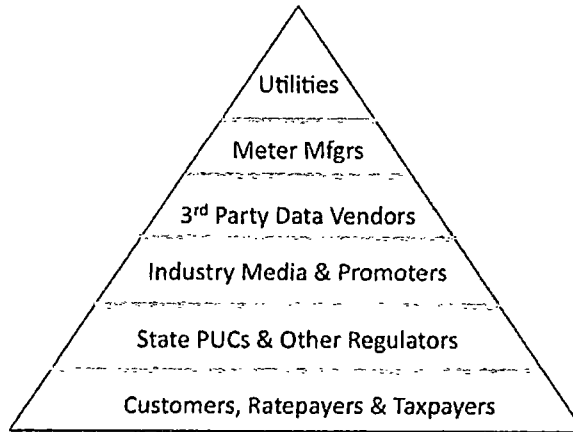


Figure 2 — Smart meter network market dependency pyramid

The “false promise” of the smart meter and its data has created a dependency pyramid or “food chain” tangential to smart grid and energy policy goals. This pyramid is shown in Figure 2. Actors at each level of the pyramid benefit from the activities of the levels above and below, as in a food chain. At the top of the pyramid are the utilities, satisfying their immediate goals of reducing labor and billing costs. Further down the pyramid we find the meter and network manufacturers, third-party data and MDMS vendors, media, and regulators, progressively feeding on the spin-off business. Finally, the consumer (and ratepayer or taxpayer) is at the base of the pyramid (and of the food chain), ultimately paying the costs. None of this activity significantly advances the declared goals of a smart grid, which is to balance supply and demand and to create a viable energy economy, but instead provides substantial benefits that flow to the actors at each level of the pyramid as shown in table 1.

Table 1 — Smart meter pyramid actors and benefits

Level	Institutional actor	Benefits enjoyed	Examples
1	Utilities	Reduce labor and billing costs, truck rolls; perpetuate the centralized control/generation/transmission grid architecture; federal subsidies and grants	PG&E, Duke Energy, Xcel Energy
2	Meter and metering network manufacturers	Immediate sales of equipment, software, and consulting to utilities	GE, Itron, Landis+Gyr, Oncor; Silver Spring Networks, Siemens

3	Third-party data aggregators, Meter Data Management System (MDMS) vendors	Create a new market: commodification of personal data; sell data aggregation and management software and services	OPower, Symbiotics, GridPoint, Current Group, Tendril, HP, Oracle, Cisco, Siemens
4	Industry media and promoters	Promotional opportunities, conferences, reports, advertising revenue	Smart Grid News, UtiliPoint, Forbes, Smart Grid Today, Pike Research
5	State PUCs and other regulators	Appearance of action, protecting utility clients	California PUC
6	Consumers, ratepayers, and taxpayers	Paying the tab (some may feel good—as if something worthwhile is being done)	All electricity users, customers, and ratepayers

“ Federal smart grid policy at the highest levels seems confused and suffering from a fundamental lack of understanding of the problems associated with the future of electricity and energy. Policy statements reflect the belief that the basic solutions involve fixing or modernizing the existing electricity grid rather than addressing the pressing need for complete structural transformation of electrical service that goes beyond particular “smart” technologies. ”

III. Federal smart grid policy: What's wrong with it?

Federal smart grid policy at the highest levels seems confused and suffering from a fundamental lack of understanding of the problems associated with the future of electricity and energy. Policy statements reflect the belief that the basic solutions involve fixing or modernizing the existing electricity grid rather than addressing the pressing need for complete structural transformation of electrical service that goes beyond particular “smart” technologies. The design of the smart grid could shape how the entire electricity grid is transformed.

Misguided and confused policy leadership at the top

This fundamental misunderstanding of the problem is illustrated in last sentence of the Obama press announcement quoted earlier (Obama, 2009).

Empowering Consumers to Save Energy and Cut Utility Bills — \$1 billion. These investments will create the infrastructure and expand access to smart meters and customer systems so that consumers will be able to access dynamic pricing information and have the ability to save money by programming smart appliances and equipment to run when rates are lowest. *This will help reduce energy bills for everyone by helping drive down “peak demand” and limiting the need for “stand-by” power plants – the most expensive power generation there is.* [emphasis added]

The statement above implies that the energy solution is based on use of the smart grid to shave peak electric energy usage by shifting loads thus increasing baseload dependency—exactly the wrong approach! Rather, the answer is precisely the opposite—that “stand-by” power plants need to be engaged, along with renewable energy sources and smart grid technology, to completely eliminate baseload generation. The administration policy approach would not “reduce energy bills,” but rather would *increase* them⁵³ as well as increase CO² emissions and other pollution. This is because it is precisely baseload generation that is “the most expensive power generation there is,” if one considers the con

In June, the National Science and Technology Council (NSTC) of the Executive office of the President issued a white paper entitled *Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future* (NSTC, 2011). This report represents the latest high-level policy statement on electricity from the Obama administration. It was developed by a committee of the NSTC based on input derived from ten executive agencies, six offices within the White House, and three independent agencies. The report drew as well from a range of corporations, the utility industry, a public blog, two DoE requests for information (RFIs), and responses from a selection of stakeholders to outreach efforts.

This NSTC Report provides an opportune framework for a critique of prevailing national policy thinking about the smart grid. It encapsulates and exemplifies what is wrong—and what could be made right—with U.S. energy and electricity policy.

The “four pillars”

The essential “four pillars” of the proposed policy put forward in the NSTC *Policy Framework* report are briefly summarized below.

Pillar 1 — “Enable cost-effective smart grid investment” (Chapter 3)

- State and federal regulatory policies to incentivize and influence utility business models.
- Federal investment in smart grid R&D and demonstration projects.
- Information sharing to encourage investment and avoid duplication.

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Pillar 2 — “Unlock innovation” (Chapter 4)

- Federal encouragement and support for development of open standards.
- Federal, state, and local action to reduce peak generation costs and expand demand management.
- Federal and state monitoring to protect consumers and prevent anticompetitive practices.

Public Service
Commission

Pillar 3 — “Empower consumers” (Chapter 5)

- Provide information and education to consumers about smart grid technologies and options.
- Standardized machine-readable consumer energy consumption data (i.e., meter data display).
- Regulatory initiatives encouraging user-friendly data usage tools and in-home devices.
- Regulatory encouragement of consumer meter data privacy protection.
- Regulatory/policies for consumer protection (billing, health/safety, disputes, disconnect, etc.).

Pillar 4 — “Secure the grid” (Chapter 6)

- Federal support for development of open standards for cybersecurity and risk assessment.
- Federal and stakeholder cybersecurity culture, simulation, vulnerability & risk management.

Key failings of the NSTC policy framework

The key failings of the proposed NSTC policy framework and of the entire report are identified and discussed below.

Confusing electricity policy with energy policy

The title of this report from the office of the federal chief executive, *Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future*, conflates and confuses two topics—*energy* and *electricity*. Electricity is a subset of energy. How does a better electricity grid “enable” a secure energy future? This is unexplained and the unfortunate conflation of terms represents a lost opportunity. The report does not tie electricity policy to energy policy and so fails to provide a “big picture” strategy. By conflating the relationship between the two topics, the report misses the key relationship between *energy* and *electricity* policy and becomes myopic, lacking a broader perspective from which the means to transform the energy economy could be examined.

Electricity supply issues not mentioned

Presumably, “smart grid” implies the use of information technology (IT) to improve our electricity supply, so it becomes incumbent to show the relationship between the grid and its supply. The report completely neglects to address supply issues, most of which are critical factors. Several of these supply-related issues are discussed briefly below.

1. Fossil fuel market dysfunctions not addressed

Electricity is a subset of “energy.” The report neglects to make this clear. For example, the report could have considered impacts on electricity market/system of coal subsidies, externalization of

environmental and social costs of fossil fuels, fossil fuel subsidization, interlocking relationships between coal suppliers and utilities, lack of any comprehensive congressional energy policy, etc.

2. Coal dependency and market issues not discussed

The NSTC Report lacks any mention of the inordinate dependency of electricity on coal. One would expect to see some mention of the vulnerability of the electrical power supply to limits on coal supplies and cost projections (see Glustrom, 2009). Also missing is mention of the increasing cost of coal due to mounting Asian demand for U.S. coal, environmental problems and pollutants (e.g., Sulfur, Mercury, CO², etc.), and competition for water resources.

3. Electric vehicle increases coal dependency

Moving the transportation system from petroleum fuels to electricity could create even more dependency on coal within the present structure. Therefore, getting electricity off of coal could have a critical impact on the broader energy picture. This topic deserved some discussion in the NSTC Report, especially because the electrification of vehicles will require a smart grid to coordinate the integration of such a massive additional demand for electricity.

4. Baseload dependency of today's grid

Moving toward renewables requires reduction of baseload dependency and possibly an increased use of natural gas (peaking generation)—at least as a transitional fuel (pending advances in energy storage technologies). Increased use of natural gas brings its own set of economic, environmental and social costs that should have been considered in the report. What are the implications of such a shift in terms of national energy policy? What about the costs of renewable “curtailment” by utilities to protect baseload investments? The topic of baseload dependency is completely missing from the NSTC Report.

5. Fuel cost projections and need for distributed generation

A convincing case has been made by various analysts that wind and solar generation are already at parity with natural gas—and even with coal generation—in terms of actual cost per unit generated (Farrell, 2011). The success of rooftop solar photovoltaic feed-in tariffs in Germany stands as an example, being in part responsible for bringing Germany to a total of approximately 18% renewable overall. The topics of “localization” of renewable generation and of fuel cost projections, and their critical implications, are not addressed in the NSTC Report. With reference to these critical topics, the NSTC Report provides only a brief paragraph concerning distributed energy resources (DER).

6. Nuclear power issues

Nuclear power is a form of baseload generation that provides approximately 20% of U.S. electricity generation. What are the limits of nuclear power in the overall future electricity picture? This topic should have been mentioned in the NSTC report under the pillar on grid security, along with associated risks (e.g., vulnerability to solar flare electromagnetic disturbances, hacker attacks, grid outages, severe weather phenomena, earthquakes, tsunamis, etc.).

Report relies on unclear grand transformative language

The NSTC Report uses grandiose visionary language to invoke the “promise a smarter grid” in terms that have become commonplace but remain ill-defined. See for example the celebratory promises in *Xcel Energy Smart Grid: A White Paper* (Xcel, 2008). This sort of visionary rhetoric has been in use long enough to evoke broad skepticism among informed readers and listeners and accordingly should be toned down or used with great caution in official policy statements.

1. Dubious reliance on smart meters

There seems to be an inordinate emphasis in the NSTC Report on “smart meters” and their assumed functions/benefits, implying that these devices are somehow essential to the smart grid. Questions addressed in this paper concerning what benefits these devices actually provide, and to whom, are left completely unexplained.

2. Mounting public pushback

The NSTC Report does not acknowledge that there is mounting pushback on the smart grid from the public, states, regulators, and public officials based on objections to smart meters. Ignoring dissident positions on smart meters could result in poorly-informed public policy and may further inspire a growing grassroots rebellion.

3. Perception of “bait & switch”

The NSTC Report fails to engage public skepticism about the supposed benefits of smart meters that unfortunately may spill over to skepticism about necessary development of a viable smart grid. The increasingly common notion that smart grid policy is fundamentally about benefits to the utility industry and its political supporters and raises costs to consumers—the notion of smart meter “bait and switch”—may be exacerbated rather than alleviated by the NSTC Report.

4. Wasted money and opportunity

Some aspects of federal policy reinforced by the report may impede—and may have already impeded—the development of a genuine smart grid that could serve national energy goals. Federal policy has created problems by introducing tangential factors such as too much stimulus money chasing too few actual installable smart grid products, causing an inordinate emphasis on smart meters and their dubious benefits, instead of doing the research needed for a real smart grid. This has resulted in public pushback to the detriment of DER and the true thrust of the smart grid vision. It would seem that any frank and honest federal policy assessment should face this issue and propose solutions.

Missing mention of imminent changes in utility business models and regulatory focus

The NSTC Report fails to engage the possibility of pending failure of the electrical system and industry or to propose any transformation of the conventional IOU business model (i.e., based on sale of commodity kilowatt hours and on return on assets). Moreover, the focus of the NSTC Report is mostly on conventional regulatory incentives that swim upstream against the basic utility business model. It would have been appropriate to address the basic problems associated with the current unsustainable utility business model and discuss alternative business models and associated legislation and/or regulatory policies that could be introduced to create a new

environment. This topic has gained some attention in recent years and is well documented (Fox-Penner, 2009), yet it is not mentioned in the NSTC Report.

Fuel price trends and business implications

NSTC Report fails to provide discussion of the effects of fuel price trend curves on business models and market choices (e.g., increasing costs of carbon & nuclear vs. declining costs of solar, wind, and other renewables) or of the effects of diseconomies of scale between technologies (e.g., solar & wind lack conventional economies of scale and thus are unappealing to capital-intensive utility rate recovery and to centralized management strategies).

Missing discussion of dependency on baseload generation

The NSTC Report completely misses what is perhaps the most important single policy issue of all in bringing renewable energy into the grid—baseload dependency.

1. Curtailing the wind and the sun

Absent from the NSTC Report is analysis of the fundamental conflict between renewables (variable) and baseload (constant) generation and of the increasing need by utilities for wind/solar “curtailment” to protect their baseload investments. What lies beyond baseload and how can this dependency be broken? The question is not addressed.

2. Distributed energy resources

There is very little discussion in the NSTC Report of renewable integration, especially DER. Only a single paragraph in the report is devoted to the topic of DER, providing only lip service and little serious consideration or analysis. No discussion is provided concerning how DER could defer or eliminate the need for expanded transmission line investments and thus address associated environmental, financial, and political problems and the problem of vulnerability to catastrophic system failure from numerous possible causes.

3. Pitfalls of demand response with baseload generatio

By shifting loads from peaks to valleys of the daily demand curve, demand response flattens the curve and can make the system more efficient by raising the total proportion of baseload generation. Although more efficient, this flattening of the curve has a downside in that it allows and encourages increased levels of baseload generation by dirty coal sources. This increased dependency on baseload generation makes renewable integration even more difficult. The NSTC Report misses any consideration of this fundamental problem.

4. Advances in demand response and transactive control strategies

The NSTC Report mentions only three methods of (demand response) load control: largely obsolete direct load control (DLC), time-of-use (ToU) techniques, and manual intervention by consumers. No mention is made of leading edge research in demand response strategies such as “transactive energy” research by DoE/Pacific Northwest National Laboratories (PNNL). These promising state-of-the-art methods for supply/demand balancing and renewable integration were pioneered in 2007 by the DoE (i.e., the PNNL Olympic Peninsula Trial) and are currently being further developed in DoE-sponsored large scale trials funded under the 2010 Smart Grid

Investment Grant Program (i.e., the Pacific Northwest Smart Grid Demonstration Project (Ambrosio, 2008)).

5. Distributed premises-based controls

The NSTC Report provides no discussion of premises-based energy controls, products and systems that can play major roles in DER and renewable integration. These include premises gateways, energy management systems (EMS), home automation (HA), premises power management, smart inverters, smart appliances, rooftop solar, storage, and advanced supply/demand response (transactive control strategies vs. simple demand response), or transactional energy.

6. Electric vehicles

There is very little discussion in the NSTC Report about the introduction of electric vehicles (EVs). Only a single paragraph in the report is devoted to the topic of EVs, providing only cursory mention of the topic. Several major car manufacturers are rolling out EVs of various types in the next two years and the implications—both negative and positive—for the electricity grid are enormous. EVs represent a major challenge and opportunity for the smart grid and should have been considered in the NSTC Report.

“Secure the Grid” chapter misses the target

The section of the NSTC Report devoted to the topic of electricity and grid security misses the most important aspect—decentralization of the electricity supply, including DER—while focusing almost entirely on a relatively minor aspect—information technology and encryption, known as “cybersecurity.” Following are some important aspects of electricity security that are missing from the report.

1. Security through decentralization

The NSTC Report provides no discussion of former CIA Director, James Woolsey’s well-known decentralization approach to grid security and to energy security (Woolsey, 2007). In a recent interview, Woolsey stated “There is no one in charge of security for the grid...A so-called ‘smart grid’ that is as vulnerable as what we’ve got is not smart at all. It’s a really, really stupid grid” (Woolsey, 2011).

2. Vulnerability of top-down policy perspective

The NSTC Report does not consider the vulnerabilities and shortcomings associated with reliance on centralized top-down information technology approaches to addressing generation/transmission and grid management/control security issues.

3. Security through gateways and firewalls

The NSTC Report is missing any discussion of structural approaches such as premises gateways and firewall architectures, which are mentioned as important approaches to security and privacy in the key NISTIR 7628 Report *Guidelines for Smart Grid Cyber Security from the Cyber Security working group*, vol. 2 (NIST, 2010, p. 37-8). This NISTIR 7628 report recognizes that an important approach to grid security is to not collect or transmit unnecessary information and

to insulate subsystems (e.g., homes and buildings) through gateways and firewalls. This approach is entirely missing from the NSTC Report.

4. Vulnerability of centralized generation and transmission to catastrophic events

The NSTC Report provides no discussion of “worst case” risks associated with the present grid architecture, such as from the projected increase in severe weather events, from solar flares and resulting electromagnetic disturbances (Kappenman, 2012), and from nuclear reactors stranded without power for backup cooling. Meter networks could be susceptible to hacking and virus attacks that could remotely turn off millions of customers. How can these risks and vulnerabilities be addressed by a smarter grid?

Inordinate dependency on regulatory policy approaches.

The NSTC Report depends inordinately on regulatory policy approaches. Regulatory strategies as substitutes for market activity may be appropriate where market failure has occurred, but they are not substitutes for viable business models. As mentioned previously, sometimes within a system of market capitalism the “creative destruction” of obsolete businesses and institutions is needed to transform failed business models and revitalize market competition (Schumpeter, 1942).

1. Limitations of regulatory approaches

It is well established that regulators are susceptible to chronic “regulatory capture” by those that they regulate (Peltzman, 1976), and that public officials have a tendency to serve their own interests rather than those of the public (known as “public choice” theory). Regulatory capture and public choice theory are well-developed topics in policy research.⁵⁴ The NSTC Report’s reliance on regulatory policy and regulatory initiatives fails to recognize the limits on what they can accomplish in transforming institutional models and the electricity system.

2. Non-regulatory approaches

The NSTC Report could have considered the possibility that the era of the regulated monopoly electric utility is coming to an end and examined questions concerning what alternative non-regulatory forces/approaches are (or could be) in play, what new models are under discussion (e.g., as suggested in *Smart Power*, Fox-Penner, 2009), and whether useful parallels can be drawn from the experience of telecommunications deregulation. The NSTC Report provides no such guidance or examination and makes no mention of such questions.

Conclusions about the NSTC Smart Grid Policy Framework

The Four pillars of the *NSTC policy framework* are wobbly. Overall, the report is disappointingly superficial, myopic, un-critical, and regulatory-centric. Although the report contains some valuable points and some useful topical place-keepers, they are generally not examined in depth or treated with appropriate seriousness.

The NSTC Report’s faults are surprising given the resources that such a high level council could have mustered. The listing of resources at the end of the report (and common knowledge about how energy policy is written in Washington) indicates that the report’s input is likely to have come largely from industry-related sources and insiders—not the most auspicious approach to

find innovative ideas and challenge an entrenched century-old industry paradigm. This top-level federal government report on electricity policy provides a valuable lesson in why effective policy leadership is not likely to come from the top—from individuals and institutions with commitments to or vested interests in the existing paradigm.

On the other hand, a critical examination of the NSTC Report and its shortcomings offers a plausible basis from which to develop a more thorough and rigorous policy framework with a proper vision of what the smart grid could become. Although inadequate to support a “temple” of energy policy for the future, the four “pillars” may be better seen as legs on a stool if provided with appropriate cross-bracing. These four legs can be strengthened by filling the gaps identified above to provide a more solid and complete policy framework.

The next section of this paper will explain the elements necessary for a new economy of electricity that will avoid the economic, privacy, security, reliability, and potential public health impacts of the present approach.

IV. Blueprint for a new energy economy: Roadmap for transformation

This Paper proposes a “blueprint” for a new economy of electricity. Its principal goal is the transformation of the economy of electricity from carbon to renewable and sustainable sources of energy. Such a transformation of electricity is prerequisite to transformation of the transportation network, as well as the rest of the energy economy. The blueprint includes technical and institutional elements to serve as foundational building blocks of policy. Many of the technical elements already exist and some are in use and undergoing commercialization. However some are not yet commercialized and some are not yet fully developed or standardized. For the blueprint to be put in place, substantial policy and institutional changes need to occur. These changes will occur, deliberately or forced by political economic circumstances. The present situation is simply not sustainable. It would be best for all concerned if these changes could be undertaken willingly and intelligently before they are forced by escalating crises.

In *Reinventing Fire*, Amory Lovins (2011) makes the case that businesses and ordinary people, not federal policy makers, will drive the transition to an intelligent energy future and that there is much that can be done on a local level. Lovins makes the case that this transition is possible—and can even be profitable—an idea that runs counter to commonplace media accounts of the burdensome cost penalty of moving to renewable and sustainable energy technologies. Tremendous opportunities lie ahead, if we can see past the archaic centralized electricity generation model, which can no longer sustain contemporary economies and societies, to a more economical and efficient scenario whereby free, renewable sources are prioritized and local opportunities for power generation are pursued.

If discussion surrounding energy strategies and policies can move beyond shallow thinking—such as the notion that a new utility meter represents a foundational element on the path to sustainability—and move toward comprehensive and clear thinking about the objectives and means available, transforming the electricity system can be only the first step in a greater transformation to a new energy future that is sustainable, secure, and a source of economic wealth. We are in a critical historical moment when the stakes are high and the opportunities are great—as are the hazards. The only option not realistically on the table is continuation of the status quo.

Technologies to create a true smart grid and decentralized power generation

The key technical changes needed to enable transformation to a new sustainable energy economy focus on 1) designing and implementing the means to replace baseload generation with renewable generation—preferably distributed and localized, and augmented by renewables with 2) flexible generation and storage, and 3) advanced supply/demand response smart grid technology, including end-user situated power and storage management technologies and transactional control strategies.

Key 1—Renewable generation

The renewable generation sources considered in this discussion are primarily wind and solar, although an array of other renewable and sustainable technologies may also be applied. Solar photovoltaic (PV) technology enjoys the same declining “silicon” cost curve as computers and

electronics. Electricity from PV is now at or near cost parity with coal, especially when externalized costs and subsidies are taken into account (Farrell, 2011; Lovins, 2011). Windmills (especially small scale) also enjoy substantial economies of mass production (like appliance manufacturing) and produce power at nearly the same efficiency, regardless of scale.⁵⁵ For wind and solar, the fuel is free and unlimited.

Studies conducted by DoE's Lawrence Berkeley National Laboratory (Mills and Wiser, 2010) show that problems of wind and solar variability can be mitigated by geographical distribution of smaller installations rather than by concentration in large solar farms.

Traditionally, the reliability of small PV systems' power output has been a concern for utilities, project developers and grid operators, since all it takes is a few clouds to disrupt the power flow of a small array. But the Berkeley Lab study suggests that when PV plant arrays are spread out over a geographic area, the variability in power output is largely eliminated. (Stroud, 2010).

Economies of scale tend to be flat for both wind and solar, so there is little economic advantage in building large farms. Additionally, distributed generation mitigates transmission line construction capital costs and transmission inefficiencies,⁵⁶ as well as environmental and political problems. Wind and solar are somewhat complementary in that they tend to have opposite daily cycles (i.e., the wind blows more at night in many regions and the sun shines during the day). Predictive weather modeling technologies can effectively inform load and wind/solar forecasting. For example, the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, developed a system of weather data sets and prediction models that resulted in a 35 percent improvement in localized wind forecasts, saving Xcel Energy an estimated \$6 million in 2010 (Snider, 2011).

Key 2—Flexible generation and storage

Flexible generation, sometimes called “peaking” generation, refers to quick response sources that fill in gaps and dips in the daily supply/demand curve that shifts when wind and solar (or other variable or unpredictable sources) are not producing power. Flexible generation is currently provided primarily by natural gas-fired turbines (large, small, and micro scale), but such generation may also be provided by hydro (large, small, and micro scale), reciprocating generators and other sources that can be turned on or off quickly. Storage technologies include pumped hydro, batteries (conventional and advanced), electric vehicles, flywheels, compressed air, thermal (including hot water), and an array of other technologies currently under development.⁵⁸

Key 3—Advanced supply/demand response/transactional energy

Advanced supply/demand response, or transactional energy, refers to smart grid technology that uses locally available communication media and protocols (e.g., Internet access via cable, DSL, fiber optic, wireless, etc.) to facilitate real-time coordination of supply and demand among grid users (including utilities, independent producers, electricity customers, electric vehicles, homes, and other buildings). Such protocols are in development (Cazalet, 2011) and can be applied to facilitate “transactive control strategies” (including variable pricing, time-based pricing, etc.).⁵⁹ This communication would employ household or building information gateway devices connected to premises-based energy management systems (EMS) and power conditioning

equipment (e.g., smart inverters, chargers, batteries, power factor compensation devices, home automation systems, smart appliances, electric vehicles, smart meters, feedback displays, etc.).⁶⁰

All of the above items could be economically produced according to appropriate industry standards and distributed by consumer electronics, home appliance, building and construction, solar installation, and related industries through existing retail channels. Similarly, commercial and industrial buildings and facilities could be served through established conventional distribution channels. Energy-related communication and management services could create massive opportunities for Web service providers and consumer electronics and appliance manufacturers and serve to accelerate the diffusion of advanced supply/demand response into the grid.

The overall benefit of advanced supply/demand response is the facilitation of renewable integration with the grid, filling gaps in variable and/or unpredictable wind and solar sources and also minimizing the need for flexible “peaking” generation sources.

Needed policy and institutional shifts

The most important policy and institutional change needed to bring about the transition to a new energy economy is the dismantling of the legacy “natural monopoly” electricity business model based on the “cost of service” regulatory paradigm (see Lovins, 2011). This transformation can be undertaken mostly at a state and local level and is accomplished by deregulating electricity generation—enabling every user to be a generator, and possibly seller of energy back into the grid.⁶¹ The local electricity grid (including the smart grid) is a public resource—as are public streets or the water and sewer infrastructures—and state and local legislators can act. Why should the grid be under the control of a monopoly utility? The traditional conception of “natural monopoly” was based on now-obsolete economies of scale in coal-based generation and transmission/distribution and large capital investment that characterized the early Edison companies. Distributed renewable and smart grid technologies have rendered the concept of natural monopoly policy no longer applicable, necessary, or beneficial for electrical generation and t

The new grid

A new conception of “the grid” is needed (Farrell, 2011). If state and local governments take action to deregulate generation, and “feed-in” is opened to all, market forces can act and the needed institutional shifts can occur. A new conception of “the utility” is also needed, and those utilities that adapt to it will survive (see Fox-Penner, 2009; Schurr, 2012). Required is a shift of the utility business model from a commodity model to a service model based on maintaining local distribution lines and transformers—not on building and operating generating plants, transmission lines and other capital projects.

Citizen action at the state and local level

What specifically needs to occur at the state and local level? The first step is for states and localities to open the market for generation. Every user should be a potential producer. This is the strategy that has been successfully implemented in Germany and other parts of Europe. Similar deregulation of generation and reregulation of distribution has begun in parts of the United States, partly in the form of state laws that allow “community choice aggregation”—

allowing localities to choose the source supplier of their local grid, even if the grid is operated by a local monopoly utility. Such laws and regulatory policies should make a clear “demarcation” that *the customer premises (including the meter) are also deregulated, are clearly the domain of the consumer, and are open to market competition.*

Another necessary step is the implementation of state laws and regulatory policies that facilitate the transition of utilities to grid service providers (i.e., maintaining the wires and poles) that no longer depend on the commodity sale of kWh and on ROR on assets. A further step is for localities to “municipalize” by condemning and taking over their local power grid, and forming their own municipal utilities that serve the needs of communities rather than the needs of utility investors and managers.

Getting beyond the gridlock

The future will be driven by economic forces and local markets—*all electrons are local*—aligning the grid with society’s needs rather than with the interests, investment choices, guaranteed profits, and guaranteed return on capital of private corporations. Regulatory bodies are inherently vulnerable to capture; therefore reliance on them must be minimized and confined only to true market failure situations.

Unlocking the grid can be accomplished by policy choices that can be made largely at the state and local level. If intelligent choices are not made, the present trajectory of coal and environmental economics will unavoidably cause the regulated utility monopolies to financially self-destruct, such that the public will be asked to pay ever higher costs and eventually finance industry bailouts.

Action plan — Refocusing investment on sustainability

An immediate restructuring of investment is needed for the transformation of electricity and of the grid, including a re-definition of the smart grid as more than, and other than, metering. Short-term and long-term actions must be taken. These actions require changes in both technology and policy. Some of the necessary technology is already available and other technology remains to be developed. The most basic change required is a re-orientation toward distributed energy resources and renewable energy integration—moving away from dependency on baseload generation, particularly coal, as quickly as possible.

The above program is essentially the vision articulated by Farrell (2011) and by Lovins (2011). Although neither Farrell nor Lovins deal specifically with smart grid technology, the design and implementation of a viable smart grid can and must be a key element in the transformation that they envision. The following recommended actions will eliminate or mitigate the problems relating to privacy, security, reliability, economic inefficiencies, and potential public health impacts that are associated with the current paradigm of electric provision and metering and will form a new focus for private and government investment.

Immediate action recommendations

- Stop deploying smart meters and dedicated smart meter networks. Conventional metering is adequate and existing Internet broadband networking (e.g., DSL, cable, fiber, etc.) will be satisfactory for future remote meter-reading and smart grid applications (cutting jobs should not be a priority).

- Shutdown or convert baseload coal plants to renewables or to non-baseload natural gas⁶² as rapidly as possible. This should include directing investment away from illusory “clean coal” or nuclear power baseload generation and toward renewable and distributed generation.
- Focus incentives on installation of rooftop solar PV and other distributed energy resources (including local windmills and small scale hydro) through financial incentives and policy incentives such as net metering and feed-in tariffs.
- Initiate action at the local and state levels through appropriate legislation and regulatory policies (e.g., deregulation of generation, local renewable subsidies, net-metering tariffs, feed-in tariffs, solar gardens, efficiency programs, unified and simplified building codes for solar installation, etc.).⁶³

Medium-term action recommendations

- Move forward with development of technology and standards to support commoditization of home and building communication gateways and energy management devices (e.g., household gateways, EMS devices, smart appliances, smart inverters, cheap batteries, EV chargers, supply/demand response protocols, transactive control protocols, etc.).
- Engage the consumer electronics and appliance industries in commoditization of the above elements.
- Implement policies, requirements, and procedures for assuring product safety, including limitation of unnecessary EMF emissions.
- Continue developing technology and standards to support SCADA (i.e., distribution grid) interoperability, including the enabling of distribution networks to function as microgrids and accept local generation.
- Support development of technology and standards to support the emerging EV industry and charging infrastructure.
- Develop new technology and standards for consumer and industrial smart grid apps, including trials and demonstration projects to test these.
- Reconsider and carefully reevaluate the economic viability and environmental costs of large wind farm or solar farm and transmission projects.

Longer-term action recommendations

- Fund electricity storage technology research and development and commercialization.
- Develop new technology and standards for consumer and industrial smart grid apps.
- Continue funding research and development for hydrogen fuel cell and related technology that could expand the range of clean energy generation and storage options.

“ The present situation is simply not sustainable.

It would be best for all concerned if these changes could be undertaken willingly and intelligently before they are forced by escalating crises.

Tremendous opportunities lie ahead, if we can see past the archaic centralized electricity generation model, which can no longer sustain contemporary economies and societies, to a more economical and efficient scenario whereby free, renewable sources are prioritized and local opportunities for power generation are pursued. ”

*You never change things by fighting existing reality.
To change something, build a new model that makes
the existing model obsolete.*

—Buckminster Fuller

V. Conclusion: pressing need for new energy strategy

America and the world are facing not only an industrial transformation, but a social transformation as well. Big corporations, governments, and large institutions have left the people behind in pursuit of wealth and power. But people are adapting and organizing around new media and institutions of lateral power.⁶⁴ The utility industry is facing (potentially) “creative destruction” as its traditional business model fails—the industry has become too big, too unwieldy, too unmanageable, and too ungovernable to function. It has become part of a massive “electricity-industrial complex”⁶⁵ analogous to the military-industrial complex famously noted by President Eisenhower in 1961. Its technology has now become too complicated and beset with too much socio-technical risk.⁶⁶

Utility meter networks intrude into homes and distract and divert attention and resources from the real task at hand while bringing unnecessary risks. Granular meter data expose intimate details of individual lives but do not facilitate the advantages claimed by meter proponents, such as demand response, dynamic pricing, or local generation and storage. Data should flow into the home—rather than out of the home—to distribute the generation and control of electricity. It is time for government, industry, and communities to move away from smart meters and baseload dependency to get on with the work of developing technology and standards for distributed renewable integration, in-home devices, smart appliances, and other innovative products and services that can unburden an electricity grid that has become overly complex, vulnerable, and uneconomical.

A new vision of a clean energy future

Although there are notable exceptions within some agencies, the federal government has generally failed to provide needed leadership and vision. Congress and high level policymakers seem to be committed more to protecting established industrial and financial interests than to plotting a viable course for the future. At the state level, PUCs and other public officials are tied to large corporate interests in carbon, to lobbyists, and to political careers. Too often, ratepayers, citizens, and communities are abandoned to their own resources. It is left to the people to “occupy” the grid and transform it to shape a sustainable clean energy future for the United States and for the world.

From smart grid to “Intergrid”

Due to emerging public skepticism and pushback, manufacturers, service providers, grid operators, and policymakers at all levels should begin by abandoning the term “smart grid” in favor of a more appropriate term. *Intergrid* was suggested by Jeremy Rifkin in his recent visionary work on energy, *The Third Industrial Revolution* (Rifkin, 2011). Rifkin compares the grid with the Internet, where intelligence is distributed to the periphery. He envisions that in the future, people will be “...generating their own green energy in their homes, offices, and factories and sharing it with one another across intelligent distributed electricity networks—an Intergrid—

just like people now create their own information and share it on the Internet” (p. 36). This transformation took place in telecommunications well over a decade ago, bringing competition and the creativity of the market to the telephone network and customer premises. Now it is the time for electricity to do the same. America was a leader in the genesis of telephony and electricity. America now has an opportunity to be a leader in taking electricity and society to a new, clean, economically viable, and sustainable energy future.

References

- AAEM (2012). Members of the Board, American Academy of Environmental Medicine. *Decision Proposed Decision of Commissioner Peevy (Mailed 11/22/2011) Before the Public Utilities Commission of the state of California On the proposed decision 11-03-014*. January 19. <<http://emfsafetynetwork.org/wp-content/uploads/2009/11/AAEM-Resolution.pdf>>
- ACORE (2011). "Integration of Renewables into the Smart Grid." *Renewable Energy Teleconference Series*, American Council on Renewable Energy (ACORE), October 19 <<http://renewableenergyinfo.org/index.php/archives/8-archives/55-wednesday-october-19-2011>>
- Ambrosio, Ronald, 2008. "The GridWise Olympic Peninsula Project: real-time price controls of distributed energy resources dramatically reduced stress on local distribution systems," Case Studies, Customers and Markets, IBM Research, 2008. <www.UtilitiesProject.com/documents.asp?d_4610#>
- Amin, S. Massoud (2011). "U.S. Electrical Grid Gets Less Reliable: Since 1995, outages have steadily increased as R&D steadily declined." *IEEE Spectrum*. January <<http://spectrum.ieee.org/energy/policy/us-electrical-grid-gets-less-reliable>>
- Baan, Robert (2012). Personal communication. February 2.
- Barringer, Felicity (2011). "New Electricity Meters Stir Fears," *New York Times*, January 30.
- Berst, Jesse (2011). "Ouch! Illinois governor dumps smart grid bill." *Smart Grid News*. September 13. <http://www.smartgridnews.com/artman/publish/Business_Policy_Regulation/Ouch-Illinois-governor-dumps-smart-grid-bill-3995.html>
- Blank, Martin, and Reba Goodman (2011). "DNA is a fractal antenna in electromagnetic fields." *International Journal of Radiation Biology*. Vol. 87, pp. 409-15
- Blank, Martin, and Reba Goodman (2012). "Electromagnetic fields and health: DNA-based dosimetry." *Electromagnetic Biology and Medicine*. Early Online: 1-7, 2011 Copyright Q Informa Healthcare USA, Inc. ISSN: 1536-8378 print / 1536-8386 online DOI: 10.3109/15368378.2011.624662
- BMJ (2012). "Use of mobile phones and risk of brain tumours: update of Danish cohort study." *Recent Rapid Responses: British Medical Journal*. 20 January. <<http://www.bmj.com/content/343/bmj.d6387?tab=responses>>
- Brookings (2011). "Sizing the Clean Economy: A National and Regional Green Jobs Assessment." *Metropolitan Policy Program at Brookings*. <http://www.brookings.edu/metro/clean_economy.aspx>
- Brooks, David (2011). "Where the jobs aren't." (*New York Times*) *Daily Camera*. September 8. P. 8A.
- BSI (2011). *Protection Profile for the Gateway of a Smart Metering System*. Bundesamt für Sicherheit in der Informationstechnik [Federal Office for Information Security]. Bonn, Germany, August 8. <<http://www.bsi.bund.de>>
- Caruso, Aimee (2012). "Introducing the Meter: Qualms Accompany New 'Smart' Devices." *Valley News*. February 3. <<http://www.vnews.com/02032012/8325038.htm>>
- Cavoukian, Ann (2011). "Privacy by Design: Best Practices for Privacy and the Smart Grid." in *ISSE 2010 Securing Electronic Business Processes: Highlights of the Information Security Solutions Europe 2010 Conference*. Norbert Pohlmann, Helmut Reimer and Wolfgang Schneider, Eds. pp 260-270.
- Cazalet, Edward (2011). "Automated Transactive Energy (TeMIX)". *Grid-Interop 2011*. Phoenix, December 5. <<http://www.pointview.com/data/files/2/1062/2143.pdf>>
- CCST (2011). *Health Impacts of Radio Frequency from Smart Meters*. California Council on Science and Technology. April, 52 pages. <<http://www.ccst.us/publications/2011/2011smart-final.pdf>>

- Cheng, Maria (2011). "Can you hear me now: Study finds no cellphone-cancer links." *Associated Press, Daily Camera* October 21, p. 16A.
- Damiano, Richard (2011). "Are utilities retreating from the smart grid front lines?", *Smart Grid News*, November 8. <<http://www.smartgridnewstalk.com/showthread.php/350-Are-utilities-retreating-from-the-smart-grid-front-lines>>
- Dal Bó, Ernesto (2006). "Regulatory Capture: A Review." *Oxford Review of Economic Policy*. Oxford: Oxford University Press, vol. 22, no. 2. pp 203-225.
- Dellorto, Danielle (2011). "WHO: Cell phone use can increase possible cancer risk." *CNN Health* <<http://www.cnn.com/2011/HEALTH/05/31/who.cell.phones/index.html>>
- Doran, Kevin and Elias Quinn (2010). "Consumer Privacy and the Smart Grid." in Kevin Doran, Frank Barnes, and Puneet Pasrich (Eds.), *Smart Grid Deployment in Colorado: Challenges and Opportunities*. Boulder: University of Colorado at Boulder, June 2010. p. 42. <<http://cees.colorado.edu/sgreport.pdf>>
- ElectromagneticHealth.org (2011). "British Medical Journal's Upcoming Cell Phone Study Deeply Flawed, Say Experts." <<http://electromagnetichealth.org/electromagnetic-health-blog/british-medical-journal-study-flawed/>>.
- ElectromagneticHealth.org (2011a). "Critical Comments by Leading Experts on Danish Study Claiming to Find No Link Between Cell Phone Use and Brain Tumors." <<http://electromagnetichealth.org/electromagnetic-health-blog/critical-comments-danish-study/>>.
- EnerNex (2010). "Collaborative Report." *Illinois Statewide Smart Grid Collaborative*. Compiled by EnerNex Corporation. September, 30 <<http://www.ilgridplan.org/Shared Documents/ISSGC Collaborative Report.pdf>>
- EPRI (2011). *State of the Technology 2011*. Report 1023459, Electric Power Research Institute. Palo Alto <www.epri.com>
- Farrell, John (2011). *Democratizing the Electricity System: A Vision for the 21st Century Grid*. Minneapolis: New Rules Project, June, <<http://www.newrules.org>>
- Fehrenbacher, Katie (2010). "SmartGridCity is a Smart Grid Flop", *Cleantech News and Analysis*, August 4, <<http://gigaom.com/cleantech/smargridcity-is-a-smart-grid-flop/>>
- Flatow, Ira (2011). "Reinventing Fire: Getting Beyond Fossil Fuels", *Science Friday*, National Public Radio, interview with Amory Lovins, broadcast October 21. <<http://www.sciencefriday.com/program/archives/201110215>>
- Fox-Penner, Peter (2010). *Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities*, Island Press.
- Fox-Penner, Peter (2011). *Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities*. Web Seminar. Fulbright & Jaworski LLP. July 13. <http://www.fulbright.com/index.cfm?fuseaction=seminars.detail&eventID=5833&site_id=492>
- GAO (2004). U.S. General Accounting Office. *Renewable Energy: Wind Power's Contribution to Electric Power Generation and Impact on Farms and Rural Communities*. September <<http://www.gao.gov/new.items/d04756.pdf>>
- Glustrom, Leslie (2009). *Coal—Cheap and Abundant—Or Is It? Why Americans Should Stop Assuming that the US Has a 200-Year Supply of Coal*. Version 1.1. Released February <http://cleanenergyaction.files.wordpress.com/2011/10/coal_supply_constraints_cea_0212091.pdf>
- Haeger, Kurtis J. (2011). "Direct Testimony and Exhibits of Kurtis J. Haeger on behalf of Public Service Company of Colorado," *Docket 11A-325E*, Public Utilities Commission of the State of Colorado. October 31.
- Hart, Joshua (2011). "Smart Meters threaten our health, civil liberties." *Santa Cruz Sentinel*. September 11. <http://www.santacruzsentinel.com/opinion/ci_18871318>

- Hirsch, Daniel (2011). *Comments on the Draft Report by the California Council on Science and Technology "Health Impacts of Radio Frequency Smart Meters."* January 31. <http://www.committeetobridgethegap.org/pdf/110212_RFrad_comments.pdf>
- Hirsch, Daniel (2011a). *Factsnow*. Interview by Devra Davis. April 23. <<http://www.youtube.com/watch?v=IsT-pN-5uWQ>>
- IEC (2011). "IEC supports renewable energies: wind, water and sun come into play." *e-tech: news & views from the IEC*. October. p. 41. <<http://www.iec.ch/etech>>
- IEE (2011). *Utility-Scale Smart Meter Deployments, Plans & Proposals*. Edison Institute for Electric Efficiency. September. <http://www.edisonfoundation.net/IEE/issueBriefs/Smart_Meter_Rollouts_0911.pdf>
- Interphone (2012). *The INTERPHONE Study*. World Health Organization, International Agency for Research on Cancer. <<http://interphone.iarc.fr/>>.
- Jaffe, Mark (2011). "Utilities power down on building plans" *Denver Post*, November 6, page 1-K. <http://www.denverpost.com/business/ci_19270103>
- Jaffe, Mark (2011a). "Xcel Energy files for \$142 million rate increase, would raise the average household electricity bill by \$4." *Denver Post*, November 22, <http://www.denverpost.com/business/ci_19393293>
- Jamieson, Isaac (2012). *Smart Meters—Smarter Practices: Solving emerging problems*. EM-Radiation Trust. January. <http://www.radiationresearch.org/images/Documents/001-006_SM_Cover_Contents_Intro_0120130.pdf>
- Jepsen, George (2011). "Brief of George Jepsen, Attorney General for the State of Connecticut," State of Connecticut Department of Utility Control. *Docket No. 05-10-03RE04*. February 8.
- Johansson, Olle (2012). Personal communication. February 3.
- Kahin, Debra (2011). "Calif. County Criminalizes Smart-Meter Installations," *New York Times*, 5 January. <<http://nytimes.com/gwire/2011/01/05/05greenwire-calif-c...>>
- Kappenman, John (2012). "A Perfect Storm of Planetary Proportions: The approach of the solar maximum is an urgent reminder that power grids everywhere are more vulnerable than ever to geomagnetic effects," *IEEE Spectrum*, February <<http://spectrum.ieee.org/energy/the-smarter-grid/a-perfect-storm-of-planetary-proportions>>
- KSBW.com (2012). "Santa Cruz Health Officer Discloses Findings on Smart Meters." January 30. <<http://www.ksbw.com/Santa-Cruz-Health-Officer-Discloses-Findings-On-Smart-Meter>>
- Lovins, Amory (2011). *Reinventing Fire: Bold Business Solutions for the New Energy Era*. Chelsea Green Publishing.
- Maret, Karl (2011). *Commentary on the California Council on Science and Technology Report. "Health Impacts of Radio Frequency from Smart Meters."* January 30. <<http://sagereports.com/smart-meter-rf/?p=368>>
- Maret, Karl (2012). Personal communication. March 1.
- Mills, Andrew and Ryan Wiser (2010). *Implications of Wide-Area Geographic Diversity for Short-Term Variability of Solar Power*. Lawrence Berkeley National Laboratory. September. 48 pages. <<http://eetd.lbl.gov/ea/reports/lblnl-3884e.pdf>>
- Morgan, Lloyd (2010). "Re-evaluation of the Interphone Study: Application of a Correction Factor." *32nd Annual Bioelectromagnetics Society conference*. Seoul, Korea, June. <<http://electromagnetichealth.org/electromagnetic-health-blog/risk-of-brain-cancer-from-cell-phone-use-underestimated>>
- Niese, Mark (2010). "Hawaii, Maryland opt out of smart meters." *Business Week*. July 28. <<http://www.businessweek.com/ap/financialnews/D9H84CT00.htm>>

- NN (2011). *Privacy and Security of the Advanced Metering Infrastructure*. Privacy and Security Working Group, Netbeheer Nederland. Anahem, The Netherlands. September
- NIST (2009). *NIST Framework and Roadmap for Smart Grid Interoperability Standards (Release 1.0)*. September 2009. Gaithersburg, MD: National Institute of Standards and Technology.
- NIST (2010). *NISTIR 7628 Report—Guidelines for Smart Grid Cyber Security: Vol. 2, Privacy and the Smart Grid*, The Smart Grid Interoperability Panel (SGIP)—Cyber Security Working Group, August 2010. Gaithersburg, MD: National Institute of Standards and Technology.
- NSTC (2011). *Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future*. National Science and Technology Council (NSTC) Executive office of the President. June. <<http://www.whitehouse.gov/sites/default/files/microsites/ostp/nstc-smart-grid-june2011.pdf>>
- Obama, Barack (2009). *President Obama Announces \$3.4 Billion Investment to Spur Transition to Smart Energy Grid*. The White House, Office of the Press Secretary, October 27. <<http://www.whitehouse.gov/the-press-office/president-obama-announces-34-billion-investment-spur-transition-smart-energy-grid>>
- Peltzman, S. (1976). "Toward a More General Theory of Regulation," *Journal of Law and Economics*. 19, pp. 2211-48.
- Quinn, Elias (2009). *Smart Metering & Privacy: Existing Law and Competing Policies*, Spring. available at <http://www.dora.state.co.us/puc/DocketsDecisions/DocketFilings/09I-593EG/09I-593EG_Spring2009Report-SmartGridPrivacy.pdf>.
- Regelson, Kenneth (2011). *Boulder Light and Power Utility: Colorado's 30th City Electric Utility*. Presentation of August 24.
- Regelson, Kenneth (2012). "Modeling Electricity and Renewables v1.1.xlsx." April. <[http://www.energyshouldbe.org/download_files/Modeling Electricity and Renewables v1.1.xlsx](http://www.energyshouldbe.org/download_files/Modeling%20Electricity%20and%20Renewables%20v1.1.xlsx)>
- Rifkin, Jeremy (2011). *The Third Industrial Revolution: How Lateral Power is Transforming Energy, the Economy, and the World*. New York: Macmillan.
- Sage (2011). *Assessment of Radiofrequency Microwave Radiation Emissions from Smart Meters*. Sage Associates Environmental Consultants. Santa Barbara, CA: Sage Associates, January 1. <<http://sagereports.com/smart-meter-rt/>>
- Sage (2011a). *Assessment of the EPRI Technical Report: An Investigation of Radiofrequency Fields Associated with the Itron Smart Meter*. Sage Associates Environmental Consultants. Santa Barbara, CA: Sage Associates, November 11.
- Schumpeter, Joseph (1942). *Capitalism, Socialism and Democracy*.
- Schurr, Alan (2012). "Why Smarter Energy is inevitable, but utilities' role is not." *Parks Energy Summit 2012*. Austin, Texas. February 28–March 1. <<http://www.parksassociates.com/ibm-webcast-2012-attendees>>.
- Sharan, Sunil (2011). "The lesson from Solyndra: It's time to deregulate the energy market." *Washington Post*. October 17 <http://www.washingtonpost.com/national/on-innovations/the-lesson-from-solyndra-its-time-to-deregulate-the-energy-market/2011/09/14/gIQANaBFrL_story.html>
- Sharp, David (2012). "Maine Public Utilities Commission didn't address smart meter safety, court says." *Bangor Daily News*, July 12. <<http://bangordailynews.com/2012/07/12/business/maine-public-utilities-commission-didnt-address-smart-meter-safety-court-says/>>
- Smith, Rebecca (2011). "Duke to Take \$220 Million Charge on 'Clean Coal' Plant." *Wall Street Journal*. October 21. <<http://online.wsj.com/article/SB10001424052970203752604576643483260915402.html>>
- Snider, Laura (2011). "NCAR helps forecast wind output," *Daily Camera*, Friday, November 11. p. 1B.

Stroud, Sara (2010). "DOE: Big Utilities Can Get Reliable Power from Small Solar PV Arrays." *Reuters*. <<http://www.reuters.com/article/2010/09/28/idUS373896815920100928>>.

VPR (2012). "Health Chief Says Smart Meters Are Safe." *VPR News*. Vermont Public Radio. January 27. <http://www.vpr.net/news_detail/93211/health-chief-says-smart-meters-are-safe/>

Wacks, Kenneth (2011). "Smart Grid Impact on Consumer Electronics." *CABA iHomes & Buildings*. Winter, volume 8, number 4. pp 12-15. <<http://www.caba.org/ihomesandbuildings>>

Wacks, Kenneth (2012). "Sync your home: Smart grid standards for residential customers." *ISO Focus*. June, pp 18-21. <http://www.iso.org/iso/home/news_index/iso-magazines/isofocusplus_index/isofocusplus_2012/isofocusplus_2012-06.htm>

Warsaw, Rand (2011). "'Sandy' Data from Smart and Automated Meters." *UtiliPoint Issue Alert*, July 29. <<http://www.utilipoint.com/IssueAlert/article.asp?id=3331&Print=true>>

Warsaw, Rand (2011a). "Finding Truth in the Smart Grid Data." *UtiliPoint Issue Alert*, August 24. <<http://www.utilipoint.com/IssueAlert/article.asp?id=3340&Print=true>>

Woolsey, R. James and Anne Korin (2007). "Turning Oil into Salt: We must become independent—not just of imported oil, but of oil itself." *National Review*, September 25. <<http://article.nationalreview.com/>>

Woolsey, James (2011). *EnergyNOWnews*. Interview with Thalia Assuras. August 11. <http://www.youtube.com/watch?v=aQImZpKW_lo>

Xcel (2008). *Xcel Energy Smart Grid: A White Paper*. Xcel Energy Inc. 1 February, p 2 <<http://cleanefficientenergy.org/resource/xcel-energy-smart-grid-white-paper>>

Zeller, Tom Jr. (2010). "'Smart' Meters Draw Complaints of Inaccuracy". *New York Times*. November 12. <<http://www.nytimes.com/2011/11/13/business/13meter.html>>

¹ specifically, concerns regarding health and biological effects of electromagnetic fields, for example (Sage, 2011).

² even some state regulators are blocking smart meter deployments pending better justification (Zeller, 2010).

³ Rifkin contrasts "lateral" political power with centralized hierarchical political power, attributed in part to transformations in media and communication technology (e.g., Internet, social media, etc.).

⁴ Although solar and wind are emphasized here because of their broad development, a range of other promising renewable/sustainable sources could also be included such as geothermal, ocean thermal, wave, small scale hydro, etc.

⁵ As explained later in this paper, conventional utility business models depend on the sale of electricity as a commodity, on return on assets, and on regulatory protection of strong economic interests. These dependencies push investment toward baseload generation (e.g., coal, nuclear, baseload natural gas) and away from distributed, and variable and less predictable sources (e.g., solar, wind, etc.). Some other countries have been successful in deploying renewable sources because these economic interests are less influential.

⁶ during a mid-2011 industry webinar, utility economist Peter Fox-Penner commented that the smart meter was not a good "poster child" for the smart grid: that the meters had been deployed too rapidly and too broadly, and that it was a "mistake" by industry (Fox-Penner, 2011).

-
- ⁷ This multi-billion dollar investment in present generation smart meters has likely been wasted on obsolete technology that is unable to facilitate integration of renewable energy. There is essentially no possibility that most smart meters or meter networks will lead to greater sustainability. They are not “smart” in any relevant sense, and the metering function they perform can be better accomplished by other means including use of existing networks, as will be explored later in this paper.
- ⁸ Coal is used to produce 45% of U.S. electricity and 41% of world electricity (Lovins, 2011, p. 6). According to Lovins, “More than 70% of U.S. coal plants—half of U.S. coal capacity—are more than 30 years old, and 33% are more than 40. If they can all be affordably maintained and run until age 60, twice their normal accounting life, 94% of today’s coal capacity will still have to be retired by 2050 through sheer old age” (p. 175).
- ⁹ Such concerns and anxieties have been reflected in various writings notably including economist E.F. Schumacher’s influential work on decentralized and “appropriate” technologies, including his 1973 collection of essays, *Small is Beautiful: a study of economics as if people mattered*.
- ¹⁰ In 2010, about 95% of the solar photovoltaic power in Germany (17 gigawatts or 6% of the total electricity supply) is installed on individual rooftops.
- ¹¹ A 2004 U.S. General Accounting Office study (GAO, 2004) showed that local ownership can generate significantly higher impacts for a county. For example, a single 40MW wind project built in Pipestone County, Minnesota, would generate about \$650,000 in new income for the county annually. In contrast, that same 40MWs locally owned, would generate about \$3.3 million annually in the same county. The GAO evaluation looked at three counties in Iowa and two in Minnesota. For these five counties, local ownership provided 2.5 times more jobs and 3.7 times more total local area dollar impact. There are additional environmental benefits and technology development economic benefits to the local area.
- ¹² Guaranteed profits and double-digit ROR on assets also made utilities a relatively safe and stable investment in public securities markets, suitable for a wide range of investors.
- ¹³ “Baseload generation” is electricity primarily produced by large, fixed-output generators (usually coal or nuclear plants) that can (and must) run at full capacity most of the time to be efficient. Baseload plants offer significant economies of scale and require large investments (and thus yield large returns on that investment through rate-of-return (ROR) regulation).
- ¹⁴ Examples of such products and services include smart appliances, home energy management systems, smart inverters, economical battery storage equipment, communication gateways, and standardized demand response protocols and service providers.
- ¹⁵ The true value of demand response is realized when employed in a (non-baseload) renewable (but variable, such as wind and solar) source system when it can be used to shift peaks and valleys to quickly balance supply and demand.
- ¹⁶ Farrell (2011, p. 26) notes that “...long term power supply contracts from centralized baseload resources (e.g., coal) can cause variable (solar and wind) resources to be curtailed if there is no local load and no excess capacity on the grid. Thus today and in the short run, new renewables displace intermediate and peaking plants such as hydro generators or natural gas plants.”
- ¹⁷ It is interesting to note that in Germany, “feed-in” tariffs mandated by law the opposite situation: renewables have priority and it is baseload generation that must be curtailed. Nevertheless, as renewable percentages rise in any grid, new technical approaches are needed to balance supply and demand.

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- ¹⁸ For a more thorough explanation of the relationship between renewables and baseload and an easy-to-use spreadsheet-based graphic model that shows the effect of adding renewable generation with or without baseload, using actual historical renewable data from Boulder, Colorado and other sites in Colorado, see Regelson (2012).
- ¹⁹ The academic policy studies literature is well known on the topic of “regulatory capture” and “public choice theory” (see Wikipedia).
- ²⁰ Some notable exceptions are DoE research programs that have produced valuable technology and analytics (e.g., Pacific Northwest National Laboratory (PNNL), National Renewable Energy Laboratory (NREL), Pacific Northwest Smart Grid Demonstration Project, National Institute of Standards and Technology (NIST) *Smart Grid Roadmap*, some regulatory changes by the Federal Energy Regulatory Commission (FERC), etc.).
- ²¹ Carbon trading schemes, including carbon offsets and renewable energy credits (RECs), are primarily “feel good” schemes for polluters that mainly benefit financial market traders. They function, as did medieval indulgences for polluters, as gratuities for influential players in developing countries, and as an income source for consultants and certifiers. Their influence on carbon emissions is impossible to track or quantify since they are aimed at the *carbon user* rather than at the carbon source. Only a direct carbon tax *at the carbon source* would be likely to have a meaningful effect on emissions.
- ²² Xcel estimates that energy savings in its seven year plan will equal as much as 994 megawatts—equal to the size of its new \$1 billion Comanche unit #3 coal plant just completed last year (Jaffee, 2011).
- ²³ *Solar Rewards*[™] is a rate-payer funded rebate incentive program largely for rooftop solar installations and net-metering. It has installed solar panels on approximately 10,000 homes creating 89 megawatts of generation (Jaffee, 2011).
- ²⁴ Some benefits that have been realized include 1) increased electricity grid reliability, efficiency, and safety through improved distribution management and automation; including the improving the interoperability of SCADA networks, 3) improved operational efficiency by reduction of utility labor and operating costs; and 3) improved outage detection, location and correction.
- ²⁵ Sunil Sharan, a former director of the Smart Grid initiative at General Electric wrote in the *Washington Post* that the Smart Grid, while efficient and environmentally beneficial, will be a net job destroyer. For example, 28,000 meter-reading jobs will be replaced by the Smart [Meter] (Brooks, 2011; Sharan, 2011).
- ²⁶ Advanced Metering Infrastructure (AMI) was initially a set of standards known as ANSI C12 originally developed during the early 1990s to define data formats (i.e., data tables) and protocols for automatic meter reading (AMR).
- ²⁷ A more effective and comprehensive approach to time-based rates include employing premises gateways, energy management systems (EMS), and transactive control strategies described later in this paper. Implementing time-based rates with simply a meter without automatic load control equipment is probably worse than nothing because it disadvantages some customers and may alienate many. If such equipment is in place, the meter is ancillary.
- ²⁸ Schumpeter borrowed the term “creative destruction” from Karl Marx, but popularized it and linked it to entrepreneurship and economic innovation in his most important work, *Capitalism, Socialism and Democracy* (1942).
- ²⁹ Normally regulated monopolies are allowed to charge capital costs of construction assets against ratepayers. In the highly unusual Edwardsport case cited, the \$220 millions ratepayer charge was

disallowed by the regulators and Duke had to make a charge against its earnings (i.e., profits), and thus against its shareholders.

³⁰ for example, after \$100 million spent, Xcel's *SmartGridCity*TM could not even do the most primitive form of demand response, so they are still employing their old cellular radio-based *Saver's Switch*TM technology to control air conditioners. Their long-promised small-scale in-home device trial finally being installed in 2012 consists of *EnergyHub*TM, a complete third-party product that uses Internet and has no connection to the celebrated and costly *SmartGridCity*TM hybrid fiber/BPL smart meter network.

³¹ In particular, the radio "mesh" networks being widely deployed for metering (e.g., Silver Spring Networks) are extremely slow and suffer from addressing and transmission latency limitations that make them technically impractical for general-purpose point-to-point data communications services that a true gateway would require.

³² The complexity and pitfalls of utility centralized renewable integration and demand response control strategies, including such concerns as grid stability, how to use the coming meter data "tsunami", and changing business models with control implications were discussed by Jeff Taft, and Charlie Mathys during a utility industry webinar on renewable integration (ACORE, 2011).

³³ State-of-the-art smart grid research and testing is being conducted by the DoE Pacific Northwest National Laboratory and other federal labs. This research has developed advanced supply/demand response methods including transactive control strategies, however these are not yet standardized or commercialized, and thus not yet supportable by off-the-shelf consumer products or appliances.

³⁴ This author participated in the development of AMI standards during the early 1990s.

³⁵ SCADA (System Control and Data Acquisition) is an array of communication protocols that have been employed by the utility industry for decades, primarily for substation monitoring and distribution automation purposes, and are now considered to be a central element of the smart grid.

³⁶ Display of usage data would presumably lead consumers to change their energy use behavior—a problematic assumption for a number of reasons.

As noted earlier, a belated and diminished trial of third party in-home devices began to be installed in early 2012 following continued ins "*SmartGridCity*TM In-Home Device Pilot," did not actually utilize the *SmartGridCity*TM metering network infrastructure for which the Colorado ratepayers had been asked to pay \$45 million.

³⁸ Here, "interval" refers to the time interval over which the data are collected, not the interval of their transmission to the utility.

³⁹ Quinn compares data mining applications to "attracting flies".

⁴⁰ For detailed accounts of many data mining and Internet privacy abuses see the series of articles "Who Knows" published by the *Wall Street Journal*.

⁴¹ Examples of HANs include Ethernet, WiFiTM, ZigbeeTM, HomePlugTM, LonTalkTM, Z-WaveTM, BACnetTM, BluetoothTM, EchonetTM, and many others.

⁴² A robust and diverse consumer market for premises energy devices and apps could open the way to utilize alternatives to conventional wireless networking (e.g., optical fiber, power-over-Ethernet, low-voltage lighting, DC appliances and lighting, energy harvesting sensor network devices and applications, etc.).

⁴³ A list of opposed local governments can be found at <<http://stopsmartmeters.org/how-you-can-stop-smart-meters/sample-letter-to-local-government/ca-local-governments-on-board>>.

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- ⁴⁴ In Vermont, a new Senate Bill S214 is calling for utilities to obtain written consent from residents to install a smart meter that emits radiofrequency radiation, and to swap out meters that have been installed with analog meters at no cost to ratepayers, if requested. Thus far, “opt-out” options have been adopted by public utility commissions in California, Maine and Vermont though at a monthly cost to ratepayers.
- ⁴⁵ *INTERPHONE* was initiated as an international set of case-control studies focusing on four types of tumours in tissues that most absorb radiofrequency energy emitted by mobile phones: tumours of the brain (glioma and meningioma), parotid gland and acoustic nerve (schwannoma). The objective was to determine whether mobile phone use increases the risk of these tumours and, specifically, whether radiofrequency energy (RF) emitted by mobile phones is tumourigenic (Interphone, 2012).
- ⁴⁶ In a personal letter clarifying the IARC decision to the Collaborative for Health and the Environment EMF Working Group, Dr. Robert Baan, principal author of the IARC statement on Radiofrequency Radiation, stated: “The classification 2B, possibly carcinogenic, holds for all types of radiation within the radiofrequency part of the electromagnetic spectrum, including the radiation emitted by base-station antennas, radio/TV towers, radar, Wi-Fi, smart meters, etc” (Baan, 2012).
- ⁴⁷ In addition to risks from *thermal* (heating) effects from microwave radiation, there are also documented biological effects at *non-thermal* levels of radiation exposure that some consider to be of equal or more importance than the heating effects, as well as possible effects from exposure to EMFs from the phone’s battery.
- ⁴⁸ For example, business subscribers were classified as “non-users” as was any person who started using a cellphone after 1995. The proportion of the Danish population who had a cellphone subscription rose from 10% in 1995 to 95% in 2004 – all these people were also incorrectly still classified as being “non-users” in the latest analysis.
- ⁴⁹ The implications of the DNA mutation mechanism and fractal antenna absorption mechanism proposed by Blank and Goodman are far-reaching—i.e., that there may be no “safe” EMF dose, and that the only practical safety standard methodology may involve moving from SAR-based limits to the “as low as reasonably achievable” (ALARA) levels presently applied with respect to nuclear radiation. These mechanisms could also offer a plausible explanation for the surprisingly wide range of both adult and childhood health disorders being attributed to EMF exposure.
- ⁵⁰ According to Johansson, “Wireless smart meters emit pulsed radiofrequency radiation (microwaves) continuously throughout the day, sometimes many times a minute. We know this radiation has biological effects and that it travels through building walls. Studies have linked the presence of radiofrequency radiation at non-thermal levels of exposure with impairment in the immune system, the neurological system, cognitive function, memory, as well as with heart irregularities, depression, fatigue, sleep disturbance, headache, skin disorders, visual and hearing disruptions, movement difficulties, difficulty concentrating, as well as with DNA damage and with cancers. Studies have sometimes shown a paradoxical effect, where the less the power the greater certain biological effects, such as neuron death and blood brain barrier permeability. In the interest of preserving health, as well as preventing a public health catastrophe from excessive acute and chronic wireless radiation exposures, residential and commercial utility meters, as well as other smart grid technologies and appliances, should always be hard-wired and properly shielded” (Johansson, 2012).
- ⁵¹ According to Maret, “Wireless smart meters utilize non-thermal, pulsed microwave radiation to transmit power usage information between houses in a mesh network which are then relayed to the utility. This adds to the ever-increasing level of background microwave radiation in the

environment. The current exposure guidelines enforced by the FCC are only concerned with thermal damage caused by microwave radiation and are inadequate to protect our long-term health based on non-thermal exposures, which these meters produce. Because human beings are vulnerable to pulsed microwave radiation at non-thermal exposures, especially when it is produced chronically throughout the day, and also in the night when we are to heal and regenerate our bodies, there may be significant adverse effects on our health from installing wireless meters in our communities. Currently we are seeing a number of symptoms in electrically hypersensitive individuals after wireless Smart Meters were installed. When banks of these meters are installed in apartment complexes adjacent to sleeping and working quarters, there may be greater risk to health and well being. Hard-wired analog meters worked perfectly well to collect electricity usage data previously and should have been left in place” (Maret, 2012).

- ⁵² Some of the latest research as of this writing was presented at the *2012 Workshop on EMF & Health Risk Research* held from October 21–25 at Monte Verità, Ascona, Switzerland, where more than 120 participants gathered for the second “EMF Health Risk Research: Lessons Learned and Recommendations for the Future” workshop. This year's focus was on reproducible effects of low-level electromagnetic fields (EMF) on organisms, and on mechanisms of interaction between weak EMFs and human tissues. <<http://www1.itis.ethz.ch/mv-2/>> and <<http://betweenrockandhardplace.wordpress.com/2012/10/31/impressions-from-monte-verita/>>
- ⁵³ Bills would increase because of the financial and economic trajectory of coal generation as discussed in an earlier section regarding new coal plants and rate increases by Xcel and Duke.
- ⁵⁴ A comprehensive review of the academic literature on regulatory capture has been prepared by Dal Bó (2006).
- ⁵⁵ In contrast to solar PV, windmills may benefit somewhat from improved efficiency in regard to maintenance cost when clustered together.
- ⁵⁶ Transmission power losses can amount to approximately 10%, depending on the situation.
- ⁵⁷ The international Electrotechnical Commission (IEC) defines “small hydro power” (SHP) systems including “micro” (5 to 100 kW), “mini” (100 kW to 1 MW) and “small” (1 to 50 MW) projects that can be run-of-river or reservoir-based. They are “reliable, have minimal operating costs, a small environmental impact and use scaled-down versions of existing large hydro turbines” (IEC, 2011). These hydro generators can be integrated with domestic water supply systems where appropriate.
- ⁵⁸ The storage does not necessarily need to be large to significantly help stabilize the grid. Much benefit can be gained from momentary surge assistance providing time for other sources to ramp up or down to match supply/demand.
- ⁵⁹ *Transactive* control is control based on an automated negotiation among users (in contrast to centralized command/control methods), often employing a “price” mechanism (Cazalet, 2011).
- ⁶⁰ Such communication could be accomplished without predominant reliance on wireless technologies.
- ⁶¹ Although solar panels and windmills already feed some power into the grid, their variability and unpredictability limit the percent of power that can be effectively integrated with baseload generation. Advanced supply/demand response enables higher percentages.
- ⁶² At the same time, it must be recognized that any reliance on natural gas is only as a temporary transition or “bridge” solution, and the full costs of natural gas must be taken into account—especially the environmental and social issues related to the practice of “fracking.”

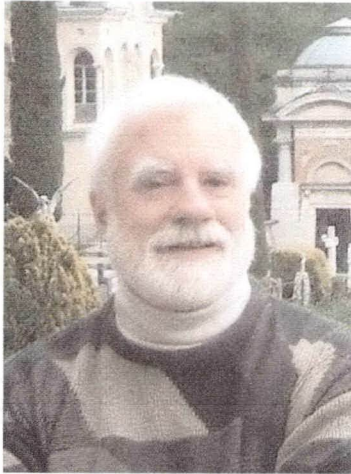
⁶³ Net metering is the ability of the customer to buy or sell electricity (depending on availability of locally generated power —usually solar) to the grid at some specified rate (i.e., to run the meter “backwards”). Feed-in tariffs provide for selling locally generated power (usually solar) directly to the grid at some specified ongoing rate (tariff).

⁶⁴ Lateral power is peer power or authority and stands in contrast with hierarchical (top down) power or authority.

⁶⁵ “Complex” means the network of contracts, procurement, and flows of money, resources, and obligations among individuals as well as politicians, regulators, corporations, and institutions.

⁶⁶ Such socio-technical risks include exposure to known and unknown health risks (e.g., environmental and EMF pollution), climate change risks, nuclear-related risks, personal privacy risks, security risks from accidental or deliberate grid vulnerability, financial risks, and risks from “normal” (inevitable) accidents that can occur in large complex technological systems (e.g., securities trading system failures, transmission grid blackouts, Three Mile Island, Fukushima, etc.).

“ It is not clear what will happen as utility investments in obsolete systems become stranded and can no longer be protected by regulators. What is clear however is that the will of people to secure their energy future may be stronger than powerful utilities ever imagined. ”



Author

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Dr. Schoechle is an international consultant in computer and communications engineering and in technical standards development. He presently serves as Secretary of ISO/IEC SC25 Working Group 1, the international standards committee for Home Electronic System and is a technical co-editor of several new international standards related to the smart grid. He also serves as Secretariat of ISO/IEC SC32 Data Management and Interchange, and he currently participates in a range of national and international standards bodies related to smart grid technology and policy issues.

As an entrepreneur, he has engineered the development of electric utility gateways and energy management systems for over 25 years and has played a role in the development of standards for home networks and for advanced metering infrastructure (AMI). He is a former faculty member of the University of Colorado College of Engineering and Applied Science. He is considered an expert on the international standards system, the topic of his 2009 book, *Standardization and Digital Enclosure*. Dr. Schoechle was a co-founder of BI Incorporated, a pioneer developer of RFID technology. He holds an M.S. in telecommunications engineering (1995) and a Ph.D. in communication policy (2004) from the University of Colorado, Boulder.

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Analysis: Smart Meter and Smart Grid Problems

**Legislative Proposal
December 2012**

Original edition sponsored by

Sonoma County Citizens

Against Smart Meters

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Introduction

This book was originally written to inform California legislators about Smart Meters. Though the proposals at the end have some California-specific language, and a number of California laws are cited, most of the information is general and is intended for any state or country.

This updated edition includes new information.

The situation with Smart Meters has not changed. As you will see, the problems created by these meters are far-ranging and extremely serious. To disregard them is lunacy.

Yet Smart Meters are still being “deployed” (the term used by the utility industry), and the problems are becoming more and more difficult to hide. Most political figures continue to discount or ignore the problems. Some officials have even adamantly refused to take any action. A review of campaign contributions can reveal why.

The news media in many areas of the country is not covering Smart Meters or is misinforming the public, and/or is maligning those who raise the various issues. This leaves the public in the dark about this program and its problems.

We need safe and reliable energy and water service. We also need a secure grid throughout the United States. I hope this information moves the public and policy makers to take action.

I have made every attempt to provide accurate information. I apologize for any errors, and I will correct them in subsequent editions.

Nina Beety
December 2012

What is a Smart Meter?

Smart Meters are new electric, gas, and water digital meters that send usage information via radiofrequency electromagnetic radiation (RF) to a utility company. They are primarily called AMI (advanced metering infrastructure) or AMR (automated meter reading) meters, and also have other trademarked names (for example, ERT, AWS).

In much of California, electric and gas Smart Meters are wireless. Smart Meters can also be wired. The meters collect our energy usage information in very detailed format and transmit that information directly to the utility company every day, throughout the day. Most electric meters use a mesh network system in which the meters relay the energy information from meter to meter until it arrives at a collector meter, which then sends the information on to an antenna, usually mounted on a utility pole. From there, it is transmitted to the utility company. Wired Smart Meters send the usage data via electrical lines or telephone lines.

Electric Smart Meters have a second antenna to “talk” to new Smart appliances and devices. This is called the Home Area Network (HAN). These appliances and devices, such as thermostats, air conditioning units, refrigerators, washing machines, dishwashers, and various sensing units are outfitted with 2-way transmitter/receivers which send to and receive information from the Smart Meter throughout the day.

The natural gas Smart Meters used by California investor-owned utilities are star system, which means these Smart Meters individually communicate directly with an antenna often mounted on a utility pole. Some electric Smart Meters also use a star system.

AMR meters usually refer to meters that use a drive-by reader to collect the data from the meter. Water meters are often AMR. Data collection is done at intervals, such as once a month. Some meters download information wirelessly on command by that reader; other AMR meters are constantly transmitting, and the reader “grabs” that transmission whenever they drive by. There is very little difference between AMI and AMR meters, and installing collector antennas in a neighborhood can enable some AMR meters to become full-fledged AMI meters with complete wireless connection to the utility company.

Non-Smart digital meters can have the capacity to be upgraded to Smart Meters merely by installation of a module which enables the wireless function. The switching mode power supply of digital meters is a major problem, as it is with AMI/AMR Smart Meters. This is one of the many issues covered in this report.

Smart Grid/Smart Meter problems and issues

Overview: The Smart Grid/Smart Meter program has created a growing array of serious problems needing immediate action. The mounting public health emergency and the potential for a national cyber-security and hacking crisis are just two issues that demonstrate the deeply flawed nature of the Smart Grid, Smart Meter, and Home Area Network programs. Doing nothing is not an option. The costly impacts to the public will continue to grow until this program is halted.

These problems include:

- Overcharging, accuracy, and the Structure Group report
- Reliability questions
- Privacy invasion
- Fires and electrical problems
- Health problems
- Switching mode power supply (SMPS)
- Interference with electronics
- Interference with medical devices
- Hacking/cyber-security
- Remote disconnection of power
- Vulnerability of nuclear facilities
- Vulnerability to electromagnetic pulses (EMPs)
- No utility liability for hacked data
- Increased burglary risk
- Increased metal and infrastructure corrosion
- impacts to building integrity
- Job loss
- Environmental costs
- Smart Grid/Smart Meters – energy intensive
- Weaponized RF
- Control of household electrical use
- FCC violations
- Burdensome and excessive costs
- Costs exceed benefits
- Fraudulent claims and unavailable information
- Strong-arm tactics by CPUC and utilities
- Violation of jurisdiction and mandate by CPUC
- CPUC procedural violations

- No CEQA EIR
- Violation of state and federal laws
- Overburdening utility easements
- Criminal negligence
- Strengthening utility monopolies
- Ignoring realities and open process

Smart Grid/Smart Meter problems and issues:

OVERCHARGING, ACCURACY, AND THE STRUCTURE GROUP REPORT

Customers have seen their bills go up for the same energy use, bills sometimes doubling, tripling and more – including for empty houses. This surfaced in Bakersfield and Fresno initially, and contrary to PG&E claims, the bill increases started in the winter time, not in the summer, according to Bakersfield Californian columnist Lois Henry.

The Structure Group was hired to evaluate these issues, but their hiring created some controversy. A cursory examination of Structure Group's own website reveals why -- this is not an independent auditing firm, though they, the utility industry, and the CPUC repeatedly state they are. This is a company which is thoroughly involved in Smart Grid deployment.

"Structure assists companies in implementing their Smart Grid initiatives"

www.thestructuregroup.com

Furthermore, Structure Group lists PG&E as a client. They also employ former PG&E personnel.

Smart Grid News lists Structure Group under "Key Players" as one of its 25 "industry's leading smart grid companies". http://www.smartgridnews.com/artman/publish/Key_Players/

...Structure's website indicates that it has worked with more than 120 utilities and energy companies in the United States and Europe. In one such arrangement discussed on the website, the firm was hired by an Oklahoma utility to help build support for its rollout of "smart grid" technology, which involves smart meters. The consulting firm hired to investigate Pacific Gas and Electric Co.'s SmartMeter system performed work for the utility as recently as last year, and at least two of the Houston-based firm's executives are former managers within PG&E's parent company.

Bakersfield.com: "Firm hired to study SmartMeters has had business ties to PG&E, March 31, 2010:

<http://www.bakersfield.com/news/local/x2143248587/Firm-hired-to-study-SmartMeters-has-had-business-ties-to-PG-E>

"TURN is very concerned about the Structure Group because of the fact that they have been a consultant to PG&E from 2002 to 2008," says TURN spokesman Mark Toney. "What that means, is they have a vested interest making sure that the SmartMeters are exonerated."

KGO-TV: "Texas utilities admit billing errors with SmartMeters," April 14, 2010:

http://abclocal.go.com/kgo/story?section=news/7_on_your_side&id=7386817

However, the CPUC continues to assert that this was an independent investigation.

When the report was released, the CPUC's Division of Ratepayer Advocates questioned the findings (October 29, 2010):

“The Commission should establish a process that allows interested parties to evaluate and comment on the Structure Group Report. The Commission should then make its own findings on the reasons for the problems consumers have experienced with PG&E’s SmartMeters, and decide whether they have been adequately addressed.”

As an example of a question about the analytic approach used, the Structure Group’s study sampled a number of meters in the laboratory and field, and relied on the results of this survey to conclude that the entire population of PG&E’s electric SmartMeters is accurate (8). However, for the critical field end-to-end test, only four (4) meters were tested and Structure Group concluded that they “did not identify issues during the testing of the meter billing system accuracy”. This statement is not the same as confirming that the complicated communication and data management systems and new interfaces with the existing billing system are not subject to errors. Similarly, Structure Group noted instances where PG&E swapped out high bill complaint meters in advance of previously scheduled field tests. The statement that “Structure did not identify malicious intent on the part of PG&E” does not address the more pertinent question of whether these instances of pre-testing meter replacement could have impacted the findings. As a final example, of the six (6) meters which were subjected to environmental testing, one meter did not meet the manufacturer’s or PG&E’s high temperature accuracy test. While the Report downplayed this failure by stating that this meter passed using averaged data, the implications of 16.6% of sampled meters failing a manufacturer’s specification at 122° Fahrenheit (F) needs to be addressed, particularly in light of the fact that meters in the Bakersfield area could be exposed to significantly higher temperatures.

(8) The Structure Group Report states at page 13 that:

“While Structure cannot ensure that all issues related to the SmartMeter™ program have been identified or that future issues may not develop at a later date due to process, controls, or technical modifications instituted after the completion of The Assessment, Structure’s evaluation provides the reasonable conclusion that PG&E’s SmartMeters™ are accurately recording electric usage within acceptable CPUC tolerances, and are being accurately utilized in Customer billing.”

Note that "CPUC tolerances" are 2%, whereas PG&E tolerances for digital meters are .5%, and the manufacturer's tolerances are .2%, per Figure 26, page 112 of the Report.

DRA Reply Comments on What the Commission Should Do in Light of the Structure Group Report, p. 3-5, 6, Application 07-12-009, October 29, 2010

DRA also stated in another proceeding that there is more work to be done to evaluate these meters to

“restore public confidence in SmartMeters (if such confidence is warranted)”

DRA Response to Application of Californians For Renewable Energy, Inc. (CARE) To Modify Decision 06-07-027, A.10-09-012, page 10, October 20, 2010

However, the CPUC did not agree.

In particular, we find that the argument of CCSF, DRA, and TURN that the Commission should use this proceeding to review the Structure Group Report is unconvincing. As noted previously, the facts alleged in the record of this proceeding, even if true, fail to warrant the suspension of the SmartMeter installation program. The PG&E reports cited by CCSF and the customer complaints reported in the media do not warrant the costly action of suspending the installation of a major infrastructure program that offers important conservation and demand response benefits. Thus, the Commission does not need the findings of the Structure Report to decide the matter before us.

As a general proposition, the Commission's requesting of a report does not trigger a proceeding. The Commission orders, sponsors, and receives many reports that do not become the subject of a Commission proceeding. An investigation of the Structure Report is not warranted in this proceeding nor necessary to its resolution.

Final Decision (10-12-031) Denying the City and County of San Francisco's Petition to Modify Decision 09-03-026, December 2010, p. 19, 20

When the CPUC did not follow its recommendations, the DRA began its own investigation of the Structure Group report. However, Structure Group refused to cooperate, and the CPUC did not compel them to do so.

Radiofrequency interference could be one explanation for these problems. There has been conjecture that wireless signals from other devices, such as cell towers, cell phones, even garage door openers, can interfere with the meters, much as the problem Toyota had with their cars.

The meters' numbers can also roll when there is no energy use. A farmer in California's Central Valley was charged almost \$12,000. from a Smart Meter connected to unused equipment. PG&E finally admitted it was a problem with the meters.

PG&E says the numbers on Brent Paul's SmartMeter actually rolled backward, charging him the high rate of \$11,857. That amount has been reversed to \$178, but Paul is one of hundreds of customers questioning the SmartMeter's accuracy that PG&E maintains is trustworthy.

"We did go out and put a SmartMeter in," Kern County PG&E spokesman Denny Boyles said referring to Brent Paul's SmartMeter mishap. "Something I have learned, when there's not draw in a meter, it has a tendency to roll slightly. It rolled slightly backwards. So in this case it rolled from all zeros to all nines so when we got a read, that's what showed."

Although his bill was adjusted, Paul, the co-owner of Paul Farms is convinced residential customers suffer with mistakes like this all the time.

<http://www.kget.com/news/local/story/Man-disputes-11-857-bill-from-PG-E/CWMFzCRF30-rmQ5ygd2moQ.csp>

<http://www.kget.com/news/local/story/PG-E-responds-to-11-857-utility-bill/QMXed7V4e0mtYffRjVJisg.csp>

Man disputes \$11,857 bill from PG&E and follow-up, October 8, 2009

This was in 2009, early in PG&E's Smart Meter program, yet they continued installing the meters.

There have also been questions about these wireless meters interfering with each other and the likelihood of bills being ascribed to the wrong customer. How frequently that happens, no one knows, because there has been no investigation.

In 2010, Stanford students had their billing information mixed up wirelessly with their neighbors, and they were billed for their neighbor's electrical use. They had the savvy to figure out why their bills had skyrocketed, but PG&E only took corrective action after Michael Finney and a Bay Area TV station got involved.

http://abclocal.go.com/kgo/story?section=news/7_on_your_side&id=7424533

Stanford students' bill mix-up raises questions about SmartMeters

In response to customers' high bills, utility companies have blamed the weather, new rates, water leaks, and the public, and have worked out payment plans. This is the reason why former State Senator Dean Florez got involved.

People are experiencing high bills in other parts of the country and the world as well. The website BurbankAction.com has several pages full of information and personal accounts on this, including overbilling in Australia.

<https://sites.google.com/site/nocelltowerinourneighborhood/home/wireless-smart-meter-concerns/smart-meter-consumers-anger-grows-over-higher-utility-bills>

<https://sites.google.com/site/nocelltowerinourneighborhood/home/wireless-smart-meter-concerns/lessons-learned-what-s-happened-in-australia>

Monterey Bay area TV news channel KION did a side-by-side comparison of an analog meter with a PG&E Smart Meter on a single family home for three months. The Smart Meter logged an extra 37 kilowatt hours over the three months, compared to the analog meter, costing an extra \$10.76. That would be a yearly increase of \$43.04 for 148 kilowatt hours. If all Smart Meters similarly measured energy, that would mean a substantial revenue increase for the utility companies, even at Feb. 2011 rates -- \$430 million for PG&E alone from its approximately 10 million customers. That is without time-of-use rates.

When presented with this information, utility companies claim that Smart Meters are more accurate and that consumers weren't paying enough with analog meters. However, ratepayers pay for most utility company costs, and these costs are factored into rates.

This issue also comes up with regard to who pays for the energy use of the mesh network and the transmissions to and from each meter and the collector antennas. PG&E claims that the company pays for everything on "their" side of the meter. Though this energy use may not show up in the kilowatt hours billed to a customer, it shows up in the rates the public has to pay for those kilowatt hours.

Smart Water Meters

Water bills have also skyrocketed with these new meters.

"I thought we were sinking in a hole of water," said Debbi Scarborough. "It scared me to death. I thought we had a major leak when I got the bill."

...Many of the problems arose after the installation of new, automated water meters, which began nearly five years ago, and involved contracts for meter installations, the electronic meters and software equipment.

The automated meter-reading technology eliminates the need for city workers to manually check every meter. Instead, they retrieve the data by driving by each property. The meter electronically transmits data showing the amount of water used.

From the beginning, there were problems.

In 2007, city auditors found they were "unable to verify electronic meter readings" because of "meter read errors, equipment failures or human errors."

Specifically, the audit said "about 9% of the meters could not be read due to broken or malfunctioning equipment."

Two years later, another audit concluded that a "high number of accounts" were not getting "actual meter readings" because of "meter read errors, equipment failures or human errors."

<http://www.cnn.com/2011/US/03/01/water.bills.war/index.html>

CNN: Skyrocketing water bills mystify, anger residents; bills rise to the thousands, March 2, 2011

Customers hire plumbers who in many cases find no leaks, not even leaky toilets.

Georgia, Massachusetts, Florida, North Carolina, Ohio, and now California have experienced overbilling problems with smart water meters. Neptune Technology Group is mentioned in the

CNN article. Neptune also makes the AMR water meters which California-American Water is installing in Monterey County, California -- the most recent example of bill spikes with a flurry of articles over the last few months.

"They offer a leak adjustment even when there is no leak," (Lindy) Levin said.

Jennifer Russo said she had two spiked bills a year apart.

"We have to have another solution," she said. "The leak adjustment isn't it."

http://www.montereyherald.com/local/ci_21781595/cal-am-water-customers-have-ally-complaints

Monterey Herald: Cal Am water customers have ally in complaints, Oct. 15, 2012

What further compounds the public mistrust is the lack of investigation by the water company and blaming the customer for the huge bills. In Monterey County, the water company has not even informed the public that these are Smart Meters (AMR). And despite these problems and the history of overbilling with Smart Meters, the local newspapers are not informing the public that these are Smart Meters. Monterey County newspapers are not alone; newspapers in other parts of California and the country are not reporting the problems and opposition to Smart Meters. One has to wonder why there is such a cover-up on this issue.

Incidentally, California-American Water is seeking reimbursement from ratepayers for water bill credits it has issued as "leak adjustments". The public is starting to ask whether these were leaks or misreads, and has protested any reimbursement for these "leaks" that may be only paper figures. With the widespread knowledge in the industry of Smart Meter overbilling problems, and without an investigation into the exact nature of these high bills, this looks like not only a cover-up, but attempted fraud.

RELIABILITY

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

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

"Among the problems that PG&E has admitted to are the following:

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

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

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

And then there’s this from PG&E’s March 2012 semi-annual report, with data as of December 31, 2011, which indicates something is wrong. The chart on the following page summarizes this data.

PG&E says:

As of the end of 2011, PG&E had installed nearly nine million second-generation gas and electric SmartMeters™ – far and away the largest AMI-deployment in North America – and the associated network equipment and information technology (IT) necessary to operate PG&E’s SmartMeter™ system. (p.3)

...The deployment of the RF Mesh network was planned to consist of an initial phase to deploy Access Points (APs) at defined locations throughout PG&E’s service territory, followed by subsequent phases to deploy additional APs to strengthen the network where required. As of December 31, 2011, PG&E had installed all of the 11,379 electric network devices (APs and Relays) and 4,817 gas network data collection units (DCUs) that it planned to install.

As of December 31, 2011, approximately **8,858,000** meters (approximately 4,711,000 electric and 4,147,000 gas) have been converted to, or replaced with, SmartMeter™ technology, representing approximately 91 percent of the total PG&E meter population. Of this number, PG&E has “activated” approximately **5,042,000** meters.... (p. 4)

In other words, even though the network devices are fully deployed and the complete IT “necessary to operate PG&E’s SmartMeter system” is in place, for some reason only 57% of the meters are activated.

The chart below in their semi-annual report breaks this down by gas and electric meters. It further shows that, though the electric and gas meter locations were 100% enabled, only 49% of the electric meters and 61% of the gas meters they installed were “activated.” Why?

**Pacific Gas and Electric Company
Advanced Metering Infrastructure Semi-Annual Assessment Report
SmartMeter™ Program Quarterly Report
March 2012
(CPUC Decisions 06-07-027 and 09-03-026)
Page 9**

Table II – 1: AMI Project Status as of December 31, 2011

Progress Toward Completion	Total Budgeted Plan	Actual	% of Total Project Plan Installed
Electric Network - RF Network	1,553	1,371	88%
Gas Network Collectors	5,000	4,815	96%
Electric Network Enabled Locations	5,260,391	5,260,391	100%
Electric Meter Installations*	5,630,886	5,074,494	90%
Electric Meters Activated	5,260,391	49% 2,503,631	48%
Gas Network Enabled Locations	4,449,040	4,449,040	100%
Gas Meter-Module Installations	4,449,040	4,147,136	93%
Gas Meter-Modules Activated	4,449,040	61% 2,538,535	57%

*Includes installation of retrofitted SmartMeters™.

Definition of “activated”:

“The Program realizes operational benefits when meters fitted with SmartMeter™ technology are installed, transitioned, and activated. Following installation, PG&E transitions gas and electric meters to wireless reads and billing when: (1) the meters are installed and capable of wireless reads and billing; (2) the communications network infrastructure is in place to remotely read the meters; and (3) the remote meter reads become stable and reliable for billing purposes. Once enough customers on a particular “route string” transition to SmartMeter™ billing, manual reading of the meters on that “route string” ceases, at which point those meters are considered “activated.”

Through 2011, approximately 8,638,000 meters have been transitioned, and approximately 5,042,000 meters have been activated...” (p. 23)

PG&E states that 91% of their meters have been changed to Smart Meters. Why are only 57% of those meters “activated”? Are the meters not “capable of wireless reads and billing” or are “the remote meter reads” not “stable and reliable for billing purposes”? Or is there some other problem?

Clearly, something is wrong.

Consumer profiling

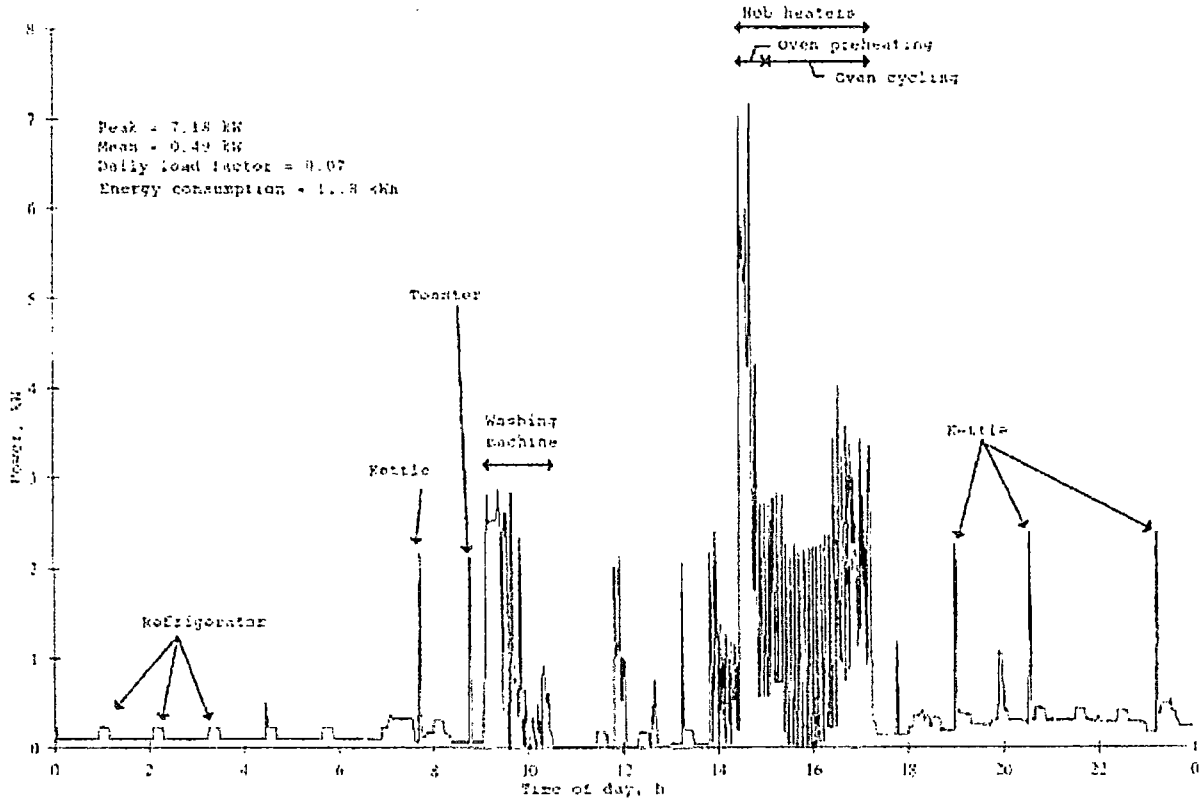


Image: National Institute of Standards and Technology

You Sure Drink a Lot of Tea: Smart meter data can show what's going on in a home, because tea kettles, toasters, and other appliances have identifiable load signatures.

Back in 2007, when the Dutch government announced that all 7 million homes in the Netherlands would be equipped with smart meters by 2013, it anticipated little resistance...But consumers worried that such intelligent monitoring devices, which transmit power-usage information to the utility as frequently as every 15 minutes, would make them vulnerable to thieves, annoying marketers, and police investigations. They spoke out so strongly against these “espionage meters” that the (Netherlands) government made them optional.

It all sounds less paranoid when you consider that each appliance -- the refrigerator, kettle, toaster, washing machine -- has its own energy fingerprint, or “appliance load signature,” that a smart meter can read. Anyone who gets hold of this data gets a glimpse of exactly what appliances you use and how often you use them.

Privacy on the Smart Grid, Ariel Bleicher, October 2010

<http://spectrum.ieee.org/energy/the-smarter-grid/privacy-on-the-smart-grid>

Note: the IEEE -- the Institute of Electrical and Electronics Engineers -- is a professional and industry organization.

The "smart" electric grid may be just a little too smart. Once a smart meter is attached to a home, it can gather a lot more data than just how much electricity a family uses. It can tell how many people live in the house, when they get up, when they go to sleep and when they aren't home.

It can tell how many showers they take and loads of laundry they do. How often they use the microwave. How much television they watch and what kind of TV they watch it on.

"This is technology that can pierce the blinds," said Elias Quinn, author of a smart grid privacy study for the Colorado Public Utilities Commission.

Source: Denver Post, "New electricity grids may be smart, but not so private," May 18, 2010: http://www.denverpost.com/frontpage/ci_15106430)

Smart Meters collect finely detailed personal energy usage data and wirelessly transmit that data to the utility company and to whoever has access to the feed. The level of detail collected by the meter can also be increased. Individual privacy was considered so important as to be enshrined in the California Constitution. This is an invasion of our privacy.

Spectrum IEEE:

Each appliance has its own energy fingerprint.

Smart Metering and Privacy: A Report for the Colorado PUC, Elias Leake Quinn, Spring 2009

"...the load signatures of various appliance categories are surprisingly unique, and an impressive amount of detail concerning customer usage habits could be discerned... smart meters allow for the collection and communication of highly detailed electricity usage information...all told, 52 million smart meters would be installed throughout the country over the next five to seven years. Smart-metered information, collected at levels as fine as one-minute intervals, can be disaggregated into its constituent appliance events, allowing both consumers and utilities (and anyone else with access to the information) to see exactly what makes up an individual household's electricity demands."

Elias L. Quinn: "Smart Metering & Privacy: Existing Law and Competing Policies," Spring 2009: http://www.dora.state.co.us/puc/DocketsDecisions/DocketFilings/09I-593EG/09I-593EG_Spring2009Report-SmartGridPrivacy.pdf

Chaos Communication Conference, Germany (January 2012) –

Hackers analyzed Smart Meter data and were able to identify “the number of PCs or LCD TVs in a home, what TV program was being watched, and if a DVD movie being played had copyright-protected material.”

<http://www.networkworld.com/community/node/79486>

Hacking For Privacy: 2 days for amateur hacker to hack smart meter, fake readings

At the Las Vegas Consumer Electronics Show, January 2012:

Tech companies are poised to gather unprecedented insights into consumers’ lives-- how much they eat, whether they exercise, when they are home and who they count as friends. Silicon Valley is in a gold rush for information, highlighted by Google’s announcement Tuesday that it would incorporate data posted by users on its social networking service into the results of its main search engine.

Microsoft’s Kinect game console collects some biometric information that Chief Executive Steve Ballmer said on Monday is a potential springboard for health-care and other industries.

“We are collecting data second by second,” said Tivo Senior Vice President Tara Maitra. LG was among several companies to showcase “connected homes,” where appliances are connected to one another as well as energy grids via the Web.

http://www.washingtonpost.com/business/economy/privacy-rights-activists-worry-about-potential-abuse-of-high-tech-devices-featured-at-ces-event/2012/01/10/gIQAX3kJpP_story.html

Aside from the home consumers, let's imagine a company's data center is making energy efficiency a top priority. The company management is keen on monitoring energy and reporting usage back to the grid. The data center facility controllers will communicate with smart meters and send data to the utilities to be analyzed. If in some way this data is leaked, it could pose serious issues to the overall security posture of the company and data center.

http://blogs.hbr.org/cs/2010/10/how_private_is_your_smart_grid.html

How Private Is Your Smart Grid Data? Usman Sindhu October 13, 2010

The profile at the beginning of this section is from the National Institute of Standards and Technology. Much finer data collection is planned through the Home Area Network (HAN), with transmitters in all appliances, and additional “Smart” devices.

The UCLA Smart Grid project has wireless sensors in rooms which can tell how many people are in the room. New cellular phone technologies (University of Texas, 2012), and conceivably Smart Meters as well, will be able to see through walls. This is the field of “remote sensing”. University of Illinois professor and Bioelectromagnetics Editor James Lin has demonstrated that

the Soviet microwaving of the Moscow Embassy between 1953 and 1976 could have been for testing just such remote sensing capability (Liakouris, 1998). Much research has been done since then on remote sensing applications, including for medical purposes, including

-- "Behind thick layers of nonconductive walls", "up to 30 meters"
 Microwave sensing of physiological movement and volume change: a review,
 James Lin, 1992

-- Under sponsorship of the U.S. Army, researchers used 850 MHz and 2.4 GHz microwave frequencies to monitor respiration and heart rate at a distance.

Note: electric Smart Meter frequencies are 900 MHz and 2.4 GHz.

A Digital Signal Processor For Doppler Radar Sensing Of Vital Signs, Lohman et al., 2001.

New devices, such as "baby radar" (University College Cork, Ireland, 2011), and other medical applications are being reported in the media frequently.

Who wants our information and why?

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

Source: "Potential Privacy Impacts that Arise from the Collection and Use of Smart Grid Data," National Institute of Standards and Technology, Volume 2, pp. 30–32, Table 5-3.

<http://spectrum.ieee.org/energy/the-smarter-grid/privacy-on-the-smart-grid>

Reprinted in www.burbankaction.com

California Public Utilities Commission:

Currently, there are about 200 firms or other providers of energy efficiency services who have Commission authorization to conduct energy efficiency programs or energy efficiency program evaluations and have access to information for this primary purpose under contract with the Commission. Beyond these firms, other government entities, such as local government and state agencies, implement energy efficiency programs and obtain access to consumption data under the Commission's supervision.

...Still other third parties may acquire consumption data: (including) from the utility via the "backhaul" with the consumer's authorization and pursuant to tariff conditions (currently Google obtains information in this matter from San Diego)...

CPUC Decision Adopting Rules to Protect the Privacy and Security of the Electricity Usage Data, Rulemaking 08-12-009, p. 34, 35, 7-29-2011

http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/140369.PDF

Data fusion

At a PUC workshop on Dec. 9, 2011, PG&E representatives said that customers would be able to compare their energy usage online to others with the same home square footage. Asked how they would know the square footage of our homes, a rep quickly responded, "That's public information."

Smart Grid TMC-Net.com:

"GridGlo is working with utilities to combine consumer household behavioral data with energy usage data—along with a dollop of data on weather, demographics, motor vehicle registrations, and even satellite imagery—and from all that, to draw strategic operational and marketing conclusions. **The process is called data fusion.**

Behave Yourself! The Utilities 'Have Got Your Numbers' and Next They'll Know Your Habits, Too

<http://smart-grid.tmcnet.com/topics/smart-grid/articles/176270-behave-yourself-utilities-have-got-numbers-next-theyll.htm>

The possibilities for data fusion are endless, particularly with the implementation of the Home Area Network. Medical and pharmaceutical records, and data collected from intelligent transportation systems are just a few examples of the data that can be "fused" together to create complete portraits of our daily lives.

New Samsung LED HDTVs "will now include built-in, internally wired HD cameras, face tracking and speech recognition capabilities, and twin microphones. In the 2012 8000-series plasmas, the cameras and microphones are built directly into the screen bezel. The 7500 – 8000ES-series TV's, however, will have the cameras permanently attached to the top of the set."

<http://info.themicroeffect.com/2012/04/06/cia-home-invasion-smart-tvs-and-the-internet-of-things/>

Former CIA Director David Petraeus on the “internet of things” at In-Q-Tel summit, April 2012:

“‘Transformational’ is an overused word, but I do believe it properly applies to these technologies,” Petraeus enthused, “particularly to their effect on clandestine tradecraft.”

“Items of interest will be located, identified, monitored, and remotely controlled through technologies such as radio-frequency identification, sensor networks, tiny embedded servers, and energy harvesters — all connected to the next-generation internet using abundant, low-cost, and high-power computing,” Petraeus said, “the latter now going to cloud computing, in many areas greater and greater supercomputing, and, ultimately, heading to quantum computing.”

Reported in <http://www.wired.com/dangerroom/2012/03/petraeus-tv-remote/>

In 1999:

"You have zero privacy anyway," Scott McNealy told a group of reporters and analysts Monday night at an event to launch his company's new Jini technology.
"Get over it."

McNealy's comments came only hours after competitor Intel (INTC) reversed course under pressure and disabled identification features in its forthcoming Pentium III chip.

... Sun Microsystems is a member of the Online Privacy Alliance, an industry coalition that seeks to head off government regulation of online consumer privacy in favor of an industry self-regulation approach.

... McNealy made the remarks in response to a question about what privacy safeguards Sun (SUNW) would be considering for Jini. The technology is designed to allow various consumer devices to communicate and share processing resources with one another.

"I think Scott's comments were completely irresponsible and that Sun and Intel and many of these leaders are creating public policy every time they make a product decision," said Lori Fena, chairman of the board of the Electronic Frontier Foundation.

Sun on Privacy: 'Get Over It', Polly Sprenger, Jan. 26, 1999

<http://www.wired.com/politics/law/news/1999/01/17538>

In 2009, McNealy's assessment was confirmed by Google's CEO, Eric Schmidt. In an interview with NBC's Mario Bartiromo, he proclaimed, "If you have something that you don't want anyone to know maybe you shouldn't be doing it in the first place." Schmidt's words have become Google's new mantra. Welcome to 21st-century corporate morality....

In 2010 it was revealed that Google partnered with the CIA in a venture called "Recorded Future." Google's vast data archive can be harnessed to meet "security" needs. This is especially troubling in light of a controversial bill being pushed through Congress, the Cyber Intelligence Sharing and Protection Act (CISPA). The act would allow sharing of data between companies like Google and the National Security Agency (NSA) to combat alleged cyber-security threats.

The Terrifying Ways Google Is Destroying Your Privacy

David Rosen, AlterNet May 20, 2012

www.alternet.org/story/155479/the_terrifying_ways_google_is_destroying_your_privacy

Journalist James Bamford spoke on March 21, 2012 on Democracy Now about the new facility in Bluffdale, Utah, being built by the U.S. National Security Agency to store collected data.

http://www.democracynow.org/2012/3/21/exposed_inside_the_nsas_largest_and#.T5F22Ve7pFU.mailto

There will certainly be a great deal of it.

In March, 2012, U.S. Attorney General Eric Holder signed new guidelines for the National Counterterrorism Center, lengthening to five years (previously 180 days) the amount of time the center can retain data on Americans when there is no suspicion that they are tied to terrorism.

The guidelines are also expected to result in the center making more copies of entire databases and "data mining them" using complex algorithms to search for patterns that could indicate a threat.

The center has developed a priority list of databases it wants to copy entirely, but he and other officials declined to say which ones they were.

"We're all in the dark, and for all we know it could be a rerun of Total Information Awareness, which would have allowed the government to make a computerized database of everything on everybody," said Kate Martin, the director of the Center for National Security Studies.

The guidelines were also signed by the director of national intelligence, James R. Clapper Jr., and the director of the center, Matthew G. Olsen.

U.S. Relaxes Limits on Use of Data in Terror Analysis

http://www.nytimes.com/2012/03/23/us/politics/us-moves-to-relax-some-restrictions-for-counterterrorism-analysis.html?_r=1&emc=na

There is a shift currently taking place in the security industry, replacing traditional analog systems with newer, IP (Internet Protocol) cameras and computer networking technologies... IP surveillance allows a virtually unlimited number of cameras and

computers to be interconnected to form a distributed surveillance network spanning vast distances (much like the internet in general).

You, yes you: welcome to the world of advanced surveillance Part 1 (5-part series written by Australian researchers and developers of this technology) <http://theconversation.edu.au/you-yes-you-welcome-to-the-world-of-advanced-surveillance-830>

Face recognition technology is being rolled out now, leaving no place unwatched.

Privacy, guaranteed under the Constitution, is quickly vanishing. We will soon live and move in the equivalent of glass-walled houses, every element of our lives watched, recorded, and archived. Smart Meters are part of this “convergence.”

Data marketing

Smart Grid TMC-Net.com:

‘We realized utilities were getting all this data from advanced metering infrastructure (AMI) deployments and there was no clear understanding [of] how to **monetize** the data or use the data,’ said Isaias Sudit, CEO of the origins of GridGlo.”

“Smart grid utilities are evolving into brokers of information,’ says industry analyst Marianne Hedin.”

Behave Yourself! The Utilities 'Have Got Your Numbers' and Next They'll Know Your Habits, Too

<http://smart-grid.tmcnet.com/topics/smart-grid/articles/176270-behave-yourself-utilities-have-got-numbers-next-theyll.htm>

From the CPUC proceeding on privacy and the Smart Grid, Docket #: R 08-12-009 (July 28, 2011)

- Commissioner Timothy Alan Simon, “I support today’s decision because it adopts reasonable privacy and security rules and expands consumer and third-party access to electricity usage and pricing information. I hope this decision stimulates market interest in the data.”
- “The privacy rules in today’s decision establish a solid framework for creating balance between protecting consumer privacy and fostering a new market for third-party participants,” said Commissioner Mark J. Ferron.

Press Release regarding Docket #: R 08-12-009, July 28, 2011

In May, AT&T and Verizon filed comments on the CPUC’s Smart Grid Workshop summary about market access to consumer data from Smart Meters:

A means to achieve a greater degree of certainty is to establish forward-looking, pro-competitive principles from the beginning that prohibit barriers to market entry. New

entrants need prompt, unfettered and reasonable access to the detailed customer usage data collected by a Smart Meter. And such access needs to reflect consistent, standardized methods across utilities. Principles such as these will spur investment and innovation in Smart Grid-enabled products and services and, in turn, will benefit customers, the environment and the economy. In short, the Commission should not delay the principles for access to detailed data at the customer side of the smart meter.

A. No barriers to entry

The IOUs should not impose onerous, expensive or cumbersome technical or administrative requirements on third parties that want to participate in the Smart Grid market. Any qualified third party should be able to participate without delay or unnecessary expense. That said, it is understandable that certain safeguards may be necessary to ensure the security and integrity of IOU systems and customer information. But any such network security safeguards should not become a means to impede or delay competitive entry or constrain innovation.

B. Prompt, Unfettered and Reasonable Access to Consumer Electricity Usage Data

...At a very minimum “unfettered and reasonable access” would mean that the IOU should not be able to dictate the level of granularity or the intervals of time during which smart meter data is extracted by third party equipment. Third parties should be able to extract detailed, granular, real-time information.... So long as the customer consents to give his or her information to a third party, that third party should be able to provide services that employs any or all of the information that the Smart Meter is equipped to collect. That is the most effective way to ensure that IOUs do not dictate the quality, quantity or speed at which the third parties extract information from the smart meter.

Joint Reply Comments of AT&T and Verizon to March 1, 2012 Smart Grid Workshop Summary, A. 11-06-006 et al., May 17, 2012

Privacy laws and rules change. What consumers have a choice about divulging one year, becomes “no choice” the next. If agencies such as the CPUC do not listen to the public, these issues must then be fought with attorneys in courts if members of the public have the money and can find the attorneys to do so. And the outcome has very little to do with what’s right or what’s constitutional.

FIRES AND ELECTRICAL PROBLEMS

There have been exploding meters, overheating meters, burning meters, house fires, “fried” appliances, burned outlets and electrical wiring, arcing, and interference with AFCIs and GFCIs. And there appears to be a vulnerability to surges with these digital meters.

Sage and Associates:

Typical gauge electrical wiring that provides electricity to buildings (60 Hz power) is not constructed or intended to carry high frequency harmonics that are increasingly present on normal electrical wiring...

The use of smart meters will place an entirely new and significantly increased burden on existing electrical wiring because of the very short, very high intensity wireless emissions (radio frequency bursts) that the meters produce to signal the utility about energy usage...

Reports detail that the meters themselves can smoke, smolder and catch fire, they can explode, or they can simply create overcurrent conditions on the electrical circuits...

Electrical wiring was never intended to carry this - what amounts to an RF pollutant - on the wiring. The higher the frequency, the greater the energy contained...

Faulty wiring, faulty grounding or over-burdened electrical wiring may be unable to take the additional energy load.

Wireless Smart Meters and Potential for Electrical Fires, January 2011

In August, 2011, 80 Smart Meters caught fire in East Palo Alto following a power outage and a surge when power was restored.

Some Palo Alto Utilities engineers said what happened in East Palo Alto illustrates why Palo Alto is moving cautiously before installing similar devices. Palo Alto utilities spokeswoman Debbie Katz said that surges have not burned out the city's analog meters....

Katz said the advantage of the analog meter is that it doesn't have internal electronics. When a power surge hits a digital meter, the extra jolt of electricity can disrupt the flow of data or even shut down the meter, she said.

But "the analog says, 'OK, whatever,' and keeps going. The SmartMeter says, 'Oh I've got a headache and I can't think,'" she said.

..."In the collective memory of TURN, we have not seen similar incidents with analog meters," (Mindy Spatt of TURN) said.

http://www.paloaltoonline.com/news/show_story.php?id=22378

Power surge raises questions about SmartMeters, Sue Dremann

3 Smart Meters exploded off the wall at Santa Rosa Mall (April 2011). Fires have been widely associated with Smart Meters, here and overseas. In Houston, TX, Leigh Law Firm specializes in Smart Meter-related fires.

The Australian Metropolitan Fire Brigade launched an official investigation into fires, linked to Smart Meters (November 2011). They ordered "all firefighters to report fires, where smart meters are present and has advised officers not to allow power companies to take the meters

from the scene." <http://www.3aw.com.au/blogs/breaking-news-blog/fires-linked-to-smart-meters/20111107-1n2jz.html>

Australia, February 2012:

"The state's electrical union fears someone will have to die before safety concerns about controversial smart meters are addressed. The Electrical Workers Union has repeated demands to suspend the rollout until power companies commit to mounting all meters on flame-resistant boards. But the Government and suppliers are adamant the units aren't a fire risk and are safer than those they replaced. Energy Safe Victoria is investigating claims power surges are causing smart meters to explode."

<http://www.heraldsun.com.au/news/more-news/smart-meter-death-fears/story-fn7x8me2-1226285463342>

From New Zealand:

Front line firefighters are concerned about the number of household power meter boxes that are bursting into flames.

There have been 67 callouts in Christchurch to electrical malfunctions so far this year, and new smart meters have been involved in three in the last five days.

Graham Hobbs considers himself lucky. He was woken at 4:30am to find his smart meter on fire.

"I lifted this up it was still glowing and smoking, and slammed it shut to try and seal it off."

The following night Kelvin Dixon, who lives nearby, suffered a similar fate.

"I pulled into my drive way and found my meter box on fire great amounts of smoke."

Mr Dixon is a registered electrician and says the contactor that sits beneath the smart meter caught fire and melted.

"I have suspicions that maybe the installation the terminals weren't tightened enough."

"It was very dangerous," says station officer Murray Jamieson. "The whole thing burnt out completely, last night's one was a melt down and it was significantly dangerous."

News 3 NZ: "Fire-prone meter boxes causing concern, June 3, 2010:

<http://www.3news.co.nz/Fire-prone-meter-boxes-causing-concern/tabid/423/articleID/159133/Default.aspx>

Quoted in BurbankAction.com

In Canada --

The smart meter on the side of my house caught fire and per the Fire Inspector it was the cause of the fire. Hydro came and took the meter saying it was there property. Who is at fault and if there property burnt my house why should I have to pay my deductible and risk my insurance to go up? Will my insurance go after the Hydro company? Should I get a good Lawyer?

Yahoo Answers: "Smart Meter caused a fire and hydro said meter was there property Who pays for the damages?"

<http://answers.yahoo.com/question/index?qid=20100724135841AAE29x3>

Because of overheating meters and Smart Meter fires, Pennsylvania's PECO Energy Co. suspended deployment of Smart Meters in August (2012). The Pennsylvania Public Utilities Commission and the neighboring Maryland Public Service Commission both opened investigations, as did the state of Illinois. In October, PECO changed from Sensus Smart Meters to Landys-Gyr Smart Meters. However, PG&E uses L&G meters and has had Smart Meter-related fires, exploding and overheating meters, and electrical problems as well.

In June (2012), the Ontario Office of Fire Marshall in Canada wrote a report on Smart Meter fires, and in September (2012), the Institute of Electrical and Electronic Engineers (IEEE) expressed its alarm over Smart Meter fires, including citing EMF Safety Network's archive of fire incidents.

This appears to be not just a matter of freak incidents that may or may not have taken place here or there.

...Obviously all companies with smart meter programs, and all their suppliers and sub-contractors, are going to have to take a close look at the issue of fire hazards. This is just the beginning of a difficult story...The last thing the smart grid needs is meters causing fires.

<http://spectrum.ieee.org/energywise/energy/the-smarter-grid/smart-meter-fire-reports>

Smart Meter Fires, Bill Sweet, IEEE Blog, September 5, 2012

In November (2012), a California Fire Captain came forward to detail how his household electronics malfunctioned repeatedly and two surge protectors melted down after two different Smart Meter installations.

<http://emfsafetynetwork.org/?p=9013>

Other accounts are here: http://emfsafetynetwork.org/?page_id=1280

These fire and electrical problems show no sign of going away, and with the possibility of microwave radiation rapidly increasing metal corrosion, including that of electrical wiring, this could quickly become disastrous for many homes and businesses.

One final note: Smart Meter manufacturer Sensus and Southern Power were sued in Alabama in 2009 by a former engineering employee for knowingly installing defective meters which could cause fires and using federal funds to do it. Ironically, the court declined to hear the case. <http://stopsmartmeters.org/2012/01/20/meters-that-endanger-shocking-details-from-a-whistleblower/>

Sensus Smart Meters are used by utilities including Nevada Energy (NVE), Portland General Electric (PGE), and formerly, PECO (Pennsylvania).

HEALTH PROBLEMS

Summary

People have reported serious health problems following Smart Meter installation. There is extensive scientific research showing health and environmental damage from radiofrequency (RF) and electromagnetic frequency (EMF) radiation, much of it decades old. In May, 2011, the World Health Organization's IARC declared radiofrequency electromagnetic radiation to be a possible carcinogen, and in January, 2012, the American Academy of Environmental Medicine called on the CPUC to immediately halt the program and investigate these issues. Yet, Smart Meter installation continues, and the problems are being ignored.

This is a public health emergency.

On May 31, 2011, the World Health Organization's International Agency for Research on Cancer (IARC) declared that the radiation that these meters emit is a Class 2B carcinogen – possible human carcinogen -- putting it in same category as lead and DDT.

Does this apply to Smart Meters? Yes.

From Dr. Robert Baan, member of the World Health Organization IARC:

“Although the key information came from mobile telephone use, the Working Group considered that the three types of exposure entail basically the same type of radiation, and decided to make an overall evaluation on RF-EMF, covering the whole radiofrequency region of the electromagnetic spectrum...So the classification 2B, possibly carcinogenic, holds for all types of radiation within the radiofrequency part of the electromagnetic spectrum, including the radiation emitted by base-station antennas, radio/TV towers, radar, Wi-Fi, smart meters, etc.”

Personal correspondence with Connie Hudson

IARC member Dr. Jonathan Samet, UCLA, confirmed this designation applies to all RF sources.

Authorizing

- wireless and RF-emitting Smart Meters on every building,
- an all-surrounding wireless mesh network and star system,
- transmitting collector antennas/access points and data collection units on utility poles,
- the wireless Home Area Network with transmitting Smart appliances and devices, and
- wireless components for the Smart Grid,

is authorizing a Class 2B carcinogen inside and outside of every building, everywhere.

There are no safe zones. There is no safe environment.

Smart Meters have a range of at least one mile and may go much farther. Silver Spring Networks has bragged their signal can penetrate mountains. These are tremendously powerful meters.

RF and microwave RF is generally measured in milliwatts or microwatts. One watt equals one million microwatts. RF radiation is very biologically potent. One ten-trillionth of one microwatt per cm² can alter genetic structure in e coli bacteria.

Three feet away from a Smart Meter is an estimated 53-160 times the whole body radiation exposure from a cell phone held to the head (Daniel Hirsch, CCST critique, 2011). These are very powerful meters.

Health complaints

I managed to have smart meter installation delayed at my house, but suddenly became sick overnight with palpitations, chest pain, insomnia, dizziness, inability to concentrate and memory loss and fainting spells. AFTER becoming sick I found out that the day I became suddenly sick was the day the smart meter roll-out was completed in my area and the smart meters were remotely turned on from base.

Dr. Federica Lamech, Australian physician

<http://stopsmartmeters.com.au/2012/03/26/sick-with-palpitations-chest-pain-insomnia-dizziness/>

People are getting sick following Smart Meter installation. Health problems include:

nausea and vomiting, agitation, migraines, dizziness and disorientation, tinnitus/hearing ringing or buzzing, auto-immune problems, insomnia/sleep problems, ear pain, seizures, heart rhythm disturbances, nosebleeds, pacemaker defibrillation, rashes, depression, suicidal thoughts, anxiety and other mood disorders, eye problems, increased blood pressure, physical weakness and/or pain, decline of health, pulsing or pressure sensations, cognitive problems including worsening memory and concentration and "brain fog", flu-like symptoms, urinary problems, hair loss, blackouts, developing hypersensitivity to other electronics and to wireless radiation.

These symptoms range from debilitating to life threatening. Symptoms tend to worsen and multiply over time. Some people have been forced to leave their homes due to the severity of these health problems

There have been reports of pets dying or becoming ill, bees disappearing, and nearby plants and trees dying.

Members of the public have submitted written complaints as well as testified during public comments at CPUC business meetings and met privately with commissioners. They have supplied the CPUC with voluminous material on the risks of this technology. In the fall of 2010, there was a private meeting at the CPUC with CPUC staff members where members of EMF Safety Network presented research on health impacts.

However, when PG&E Smart Meter program directors were asked at a CPUC workshop (December 9, 2011) if they were keeping track of health complaints, Jim Meadows, the head of the Smart Meter program, shrugged his shoulders, looking around at the other directors, and said, "I'm not aware of it."

Known serious cumulative and long-term effects

Research going back decades shows biological and health impacts from electromagnetic and radiofrequency radiation, including

DNA damage, causing single strand and double strand breaks; calcium ion efflux, where calcium ions leave cell membranes, causing those membranes to leak; sperm damage and dysfunction; cellular stress; increased risk for cancers and tumors; seizures; microwave hearing; brain damage, brainwave alteration, and changed brain function; decreased melatonin and other hormones; heart problems, including tachycardia; cataracts; thyroid changes, including thyroid cell death; damage to the blood-brain barrier which keeps toxins and other substances out of the brain, increasing the risk of stroke, auto-immune diseases, and dementia; suspected damage the blood-placental barrier, which protects babies; links to autism, ADHD, Alzheimer's, stroke; changes in the blood, including rouleau formation, where RBCs clump together, raising the risk of thrombosis;

and much, much more.

Stanford Research Institute (1974):

"the vast literature that exists on the biological effects of microwave radiation"

Polson, P, DCL Jones, A Karp, and JS Krebs. 1974. Mortality in rats exposed to CW microwave radiation at 0.95, 2.45, 4.54, and 7.44 GHz. Final Technical Report Prepared for U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Virginia, Contract DAAK02-73-C-0453. p. 1

<http://www.magdahavas.com/2010/09/06/pick-of-the-week-9-0-95-and-2-45-ghz-most-lethal-microwave-frequencies/>

The Swiss telecom company Swisscom (2004):

"The influence of electrosmog on the human body is a known problem."

Reduction of Electrosmog in Wireless Local Networks, Patent Application by Swisscom AG, Sept. 2, 2004, cited in The Swiss Experience, Magda Havas, p. 3
http://www.safeschool.ca/uploads/WiFi_Swisscom_Patent.pdf

Government of India, Ministry of Environment and Forests (2011):

The adverse effects of electromagnetic radiation from mobile phones and communication towers on health of human beings are well documented today."

Report on Possible Impacts of Communication Towers on Wildlife including Birds and Bees, October 2011

http://moef.nic.in/downloads/public-information/final_mobile_towers_report.pdf

Zorach Glaser compiled over 2300 references for the Naval Medical Research Institute in 1972. In 1997, Karl Hecht and Hans-Ullrich Balzer wrote a report for the German Federal Institute for Telecommunication based on 878 Russian studies from the years 1960-1996, In 2007, the international Bioinitiative Report was published which included over 1500 peer-reviewed studies on EMF and RF health effects; much of this information was subsequently published in the August 2009 issue of the journal Pathophysiology.

<http://www.ntia.doc.gov/broadbandgrants/comments/71B9.pdf>

The ECOLOG Institute was commissioned to do a report reviewing the scientific literature for T-Mobile which it presented in 2000. The long list of biological and health impacts it found from mobile telecommunications is all the more amazing because T-Mobile, the wireless industry, the utility industry, and the United States government have ignored the findings.

<http://www.hese-project.org/hese-uk/en/niemr/ecologsum.php> Summary

In the USA from 1955 until 1969, eleven large conferences took place under the title

"Microwaves – Their Biologic Effects and Damages to Health". The so-called Richmond Conference in 1969 presented such overwhelming facts that the ("Program for Control of Electromagnetic Pollution of the Environment", published December 1971) government report had to be compiled. Besides the microwave symptoms mentioned, gastric bleeding, leukemia, chromosome breakages, cancer, and clouding of the eye lenses were also observed by doctors in the USA.

Overloading of Towns and Cities with Radio Transmitters (Cellular Transmitter)
Karl Hecht, Elena N. Savoley, IRCHET International Research Centre of Healthy and Ecological Technology Berlin – Germany

www.hese-project.org/hese-uk/en/niemr/hechtvortrag070724englisch.pdf

Michael Bevington:

...a standard textbook on bioelectromagnetics (2007 edition) states that 'the biophysical lore prevailing until the late 1980s and lingering to this day' was that external EFs had no effect on human tissue unless they could trigger an excitable membrane, such as in the heart by a pacemaker, produce heating (thermal), or move an ion along a field gradient. 'However, the position had to be changed as the evidence for weak (nonthermal) EMF bioeffects became overwhelming'.(3)

(3) Barnes, Frank S., and Greenebaum, Ben (edd.), Handbook of Biological Effects of Electromagnetic Fields: Biological and Medical Aspects of Electrical Fields, CRC Press, 3rd ed. based on updated literature reviews to mid 2005, 2007), p.377.

Attitudes to the health dangers of non-thermal EMFs, 2008

http://www.powerwatch.org.uk/news/20080117_bevington_emfs.pdf

Robert C. Kane:

The bold step back ward is a historical accounting of the research that is available, has been available for forty years or more, and has been neglected or buried by an industry that will place its absolute need to sell products above the health and well-being of its own customers. The practice of producing such products can only be viewed as predatory.

(This book) is a commentary that presents a litany of past research studies, hundreds of research studies from the 1950s through the mid-1990s...These older studies are equally alarming (as current studies) in their findings of radiation exposure, DNA damage, chromosome damage, tissue damage, radiation absorption, cataract formation, tumor formation, memory loss, motor skills degradation, and more. There are many more studies, hundreds that might have been added, but the point is well made by those that are cited without the need to bludgeon the reader with more than what has been presented.

Cellular Telephone Russian Roulette, Robert C. Kane 2001

Kane was a senior research scientist and product design engineer for Motorola.

<http://microondes.wordpress.com/2010/04/17/robert-c-kane-cellular-telephone-russian-roulette/>

There are literally thousands of studies.

And the research continues, showing damage and biological impacts.

In 2007, the German research report Birds, Bees and Mankind: Destroying Nature by Electrosmog was translated into English. The following an excerpt:

4.2.2 Primary mechanism found: Enzymes transferring electrons are magneto-sensitive
Stimulation of free radicals – including NO (nitrogen monoxide) – through physical fields and radiated fields is therefore scientifically and reliably proven. But viewed critically, this is no proof of damage unless the underlying primary mechanism is identified.

For this reason, we searched for a long time for a link to explain the damaging effect. And we have found it in one of the latest studies: The NADH oxidase enzyme exhibits a high – and quite reproducible – sensitivity for magnetic and electromagnetic fields of mobile phones (FRIEDMAN et al. 2007).

... The NOX family is also responsible for a large range of pathological processes, especially neurodegeneration and heart diseases (BEDARD et al. 2007).

These oxidase enzymes are magnetically sensitive due to their capability of shepherding electrons through plasma membranes. When electrons move, an electrical current flows that in turn builds up its own magnetic field and also generates electromagnetic high frequency oscillations through acceleration and deceleration of electron movement. All these processes create sensitivity to external fields.

The electron transfer is finally responsible for the production of superoxide radicals and other reactive oxygen species (ROS). The consequences of this are far reaching in completely different areas, because radicals and ROS are very aggressive. In this way, the destruction of viruses and bacteria is promoted, the creation of proteins is forced through reinforced gene expression and finally cell proliferation is supported at the cost of cell differentiation.

Over-stimulation is a threat. It is analogous to a drug or medicine: Dosed correctly, the substance can be beneficial; but overdosing can be poisonous. This is exactly what happens with permanent exposure to magnetic and electromagnetic fields.

...Because this mechanism is so important, we shall summarise it in one sentence: The serious pathological disruption is caused by exposure to magnetic and radiated fields resulting in the creation of additional reactive oxygen species (ROS) such as superoxide radicals and hydrogen peroxide, that combine with the increasingly produced NO to form extremely toxic peroxinitrite, that in turn reacts with hydrogens to form more hydrogen peroxide. The consequences of the pathological process are listed further down.

Many vital substances, required for functioning of the body, are rendered useless.

If the cascade of effects is disrupted, the normal and healthy effects of NO are restored (HORNIG et al. 2001).

The NADH oxidase is important in another sense as well. It is also found in the cell nucleus where it can – depending on the redox system – control the gene expression, but can also damage genes (MASUKA, 2006).

Bees, Birds and Mankind: Destroying Nature by Electrosmog, Ulrich Warnke, 2007. p. 36.37

<http://broschuerenreihe.net/britannien-uk/brochure/bees-birds-and-mankind/index.html>

In his report, Dr. Warnke details the devastating results of this disruption.

And in January 2012, Electromagnetic Biology and Medicine published research showing 143 proteins in the mammalian brain dysregulated by this radiation, including in regions of the brain important for learning and memory.

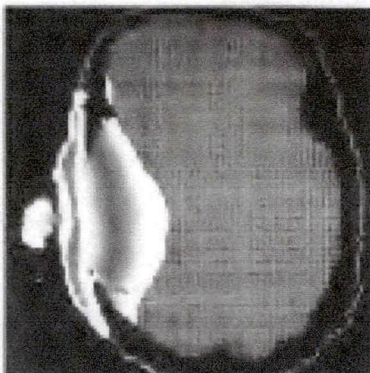
Brain proteome response following whole body exposure of mice to mobile phone or wireless DECT base radiation, Fragopoulou et al. Early Online: 1–25, 2012,

<http://www.emfacts.com/2012/01/new-paper-emf-effects-on-mouse-brain-proteome/>
Release

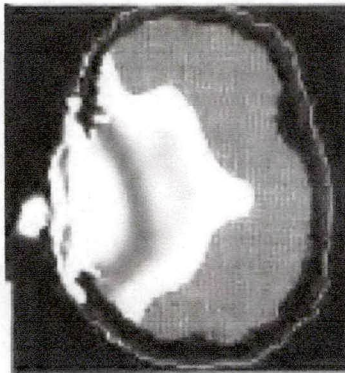
Children

In March 2012, research from Yale University showed in-utero exposure to 800-1900 MHz radiation from cell phones (electric Smart Meters are 900 MHz) caused hyperactivity and impaired memory.

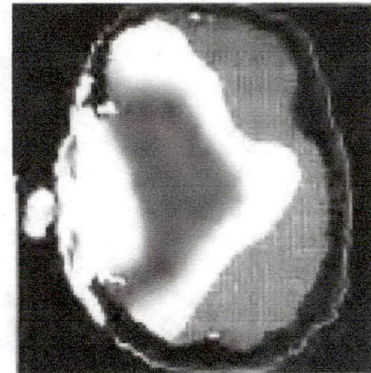
Children are much more vulnerable to electromagnetic and radiofrequency radiation, due to their developing nervous and immune systems, their thinner, softer craniums, and their much greater absorption into their brains and eyes. Om Gandhi, University of Utah, showed this in 1996 from cell phone exposure.



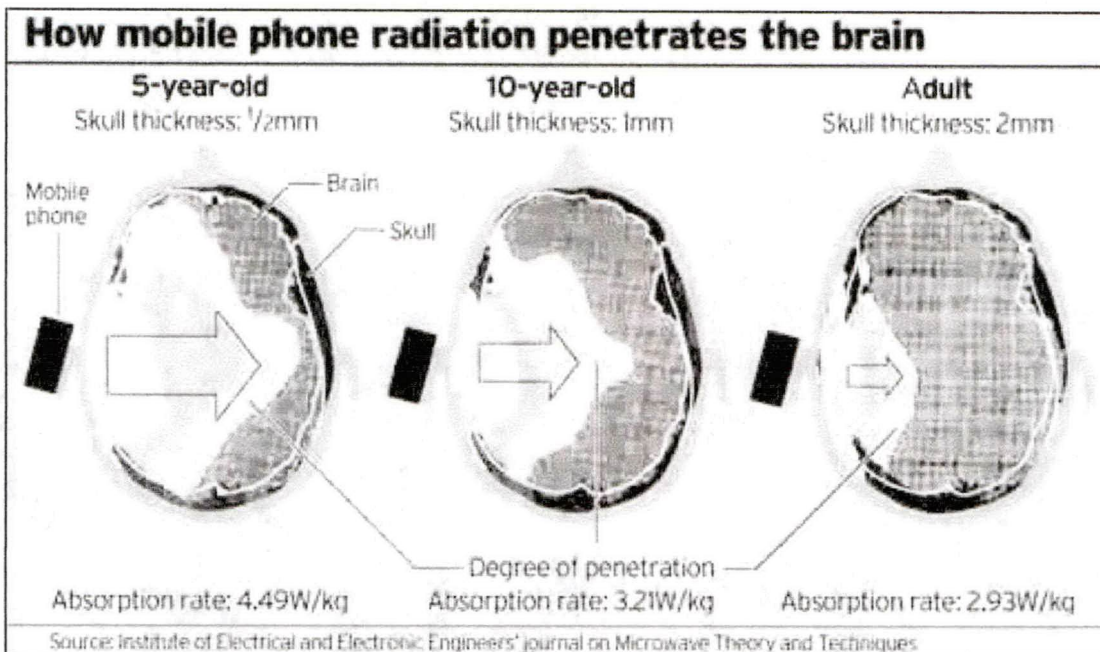
Adult



10 year old



5 year old



This is another representation of this information.

How many children sleep on the other side of the wall from Smart Meters?

Reflection and metal implants

Research from Japan showed that microwave RF can re-radiate in metal buildings increasing radiation intensity up to 2000 times (Hondou et al. 2006). Mobile homes are often made of metal. Reports by Sage and Associates, which found FCC violations by Smart Meters, included the discussion of reflection and re-radiation, as well as localized heating causing problems for those with metal implants (<http://sagereports.com/>).

Metal implants can magnify the intensity of the microwave exposure by forming standing waves and those with such implants may be vulnerable to tissue damage from microwave exposure. Swelling and pain associated with metal implants have been reported with the symptoms disappearing when exposure was stopped. Those with metal implants should be excluded from working with microwave emitting equipment.

Source: <http://www.magdahavas.com/2010/08/23/pick-of-the-week-7-hazards-of-microwave-radiations-review-from-1960/>

Kuo-Chiew Quan. 1960. Hazards of Microwave Radiations – A Review. *Industr. Med. Surg.* 29:315-318, July 1960 and reprinted in *Occupational Medicine, Medical News Letter*, Vol. 36, No. 10. November 18, 1960, pp 29-34.

http://www.magdahavas.com/wordpress/wp-content/uploads/2010/08/Quan_1960.pdf

Increased exposure in high density housing and with multiple meters

Personal account, Shane, California:

... I checked in with my neighbors in the small bungalow complex where I lived. EVERY person living there had begun to notice that they weren't feeling normal after the smart meters were installed. Examples: The hale-and hearty-fisherman who lived across the garden from me said he hadn't slept for more than an hour, the 20-somethings were having daily headaches and I couldn't help but notice that they were arguing all the time, the 40-something woman living in the building next door suspected she was starting menopause because of increased irritability and insomnia (8 smart meters had been installed directly below her bedroom) that drove her into her living room, the little kids next door began to scream and cry all the time, the 30-something woman upstairs was having daily headaches and exhaustion, the writer across the way developed blood pressure problems, and I was only able to tolerate my apartment for 4 hours at a time.

Apartment and condominium dwellers with multiple meters on one wall have increased exposure to this radiation.

Personal account, R.H. San Diego:

In July 2010, SDG&E installed Smart Meters in my condo complex. I own a townhouse that is situated in clusters: 8 units per cluster. Therefore 16 Smart Meters were installed in the utilities shed outside my kitchen/bedroom walls, ten feet away.

I began having symptoms of head burning and pressure on my chest within a few days. As time progressed the symptoms worsened. I had severe burning in my head and headaches of a new type. I started having palpitations, arrhythmias and flutter. I called SDG& E. Three people including an engineer and the director of the Smart Meter program came to my home, spent an hour talking and photographing the meters. They took no measurements of the radiation, though they said they would on the phone. The next day SDG&E informed me that they would not be replacing the meters with the analogue meters. They assured me that they are concerned about people's health.

By six weeks in, my cardiac symptoms were so severe and erratic that I had to move out. I rented an apartment, which turned out to be unsafe as well. The Smart Meters are everywhere. With the intensification of my symptoms, I have become EMF/RF sensitive and now have the above problems around cell towers, Wi-Fi and other sources, accompanied by skin rashes and burning.

I am being evaluated by a cardiologist. I have always had a strong, healthy heart, even told so by doctors. The cardiologist has sent me for an evaluation by a neurologist as well.

Five people have reported symptoms in my home: My father has experienced headaches and visual migraines. My mother reported having pressure on the upper part of her chest and palpitations. One neighbor exposed to these 16 cluster meters is experiencing headaches and chest tightness. Another neighbor has difficulty opening her eyes in the mornings after 8 hours by the meters. Her ophthalmologist could find no explanation. She said she uses her fingers to open her lids. All of the above symptoms have occurred since the smart meter installations. The symptoms are worsening for everyone.

I am running scared living this nightmare. I don't know where to live and fear for my well-being. I already have a prior immune disability and I thought I would be legally protected by the ADA. I don't know where it is safe for me to live. In addition, the financial impact of this disaster compounds. I pay my monthly mortgage and rented a place, which due to symptoms, I cannot stay in. I am not sure that I can rent or sell my condo in good conscience. I am seeking medical care including treatments not covered by any insurance. My out of pocket costs continue to grow.

These problems will only grow with time.

Swiss MP and physician Dr. Yolanda Gilli:

How high do you estimate the economic costs, for example as a result of the increase of multi-system diseases in area-wide introductions of smart grids, which operate with GSM, WLAN, or PLC?

Radiation risks and Smart Grid, Parliamentary filing (14 co-signers), 3-14-12

http://www.parlament.ch/d/suche/seiten/geschaefte.aspx?gesch_id=20123169

Electrohypersensitivity

Dr. Poki Stewart Namkung, Santa Cruz County Health Officer

In the 1950s, various centers in Eastern Europe began to describe and treat thousands of workers, generally employed in jobs involving microwave transmission. The afflicted individuals often presented with symptoms such headaches, weakness, sleep disturbance, emotional instability, dizziness, memory impairment, fatigue, and heart palpitations. Clinical research....found that the EMF involved was usually within the non-ionizing range of the electromagnetic spectrum. In the early 2000's, estimates of the occurrence of EHS began to swell with studies estimating the prevalence of this condition to be about 1.5% of the population of Sweden (Hilleert et al. 2002), 3.2% in California (Levalios et al., 2002), and 8% in Germany (infas Institut fur angewandte Sozialwissenschaft GmbH, 2003)....

Currently, research has demonstrated objective evidence to support the EHS diagnosis defining pathophysiological mechanisms including immune dysregulation in vitro, with

increased production of selected cytokines and disruption and dysregulation of catecholamine physiology (Genuis 2011).

Health Risks Association with SmartMeters, January 13, 2012

County of Santa Cruz, Health Services Agency

[http://sccounty01.co.santa-](http://sccounty01.co.santa-cruz.ca.us/bds/Govstream/BDSvData/non_legacy/agendas/2012/20120124/PDF/041.pdf)

[cruz.ca.us/bds/Govstream/BDSvData/non_legacy/agendas/2012/20120124/PDF/041.pdf](http://sccounty01.co.santa-cruz.ca.us/bds/Govstream/BDSvData/non_legacy/agendas/2012/20120124/PDF/041.pdf)

Arthur Firstenberg

The Soviets named it, appropriately, radio wave sickness and studied it extensively.

The Largest Biological Experiment Ever, 2006

<http://proliberty.com/observer/20070307.htm>

Catherine Kleiber

This impairment is known by many names: radiowave sickness, microwave sickness, EHS. Radiofrequency sickness results from overexposure to radiofrequency radiation. Radiofrequency sickness is not a disease. It is an environmentally induced functional impairment. Radiofrequency sickness has real and disabling consequences. People with radiofrequency sickness experience illness (or even death) upon exposure to radiofrequency radiation. The most common sources are electrical pollution – high frequencies that travel on building wiring – and transmitters – all wireless devices.

The iron-clad rule in environmental medicine is that where there are cases of toxic exposures the source of the exposures must be removed.

The only “cure” for radiofrequency sickness is not to be exposed to radiofrequency radiation. People with radiofrequency sickness often become ill almost immediately upon exposure, although the severity of the illness depends on how often the exposure occurs, the frequency and amplitude of the radiation signal and the duration of the exposure. Studies show pulsed microwaves, as utilized by modern communication devices - including transmitting meters - are very potent biologically.

A New Advocacy Crisis: Radiofrequency Sickness, for
National Council on Independent Living

<http://www.ncil.org/resources/radiofrequencyarticle.html>

In 1998, a survey conducted by the California Department of Health Services indicated that 120,000 Californians were unable to work due to electromagnetic pollution -- California EMF Program, The Risk Evaluation: An Evaluation of the Possible Risks From Electric and Magnetic Fields (EMFs) From Power Lines, Internal Wiring, Electrical Occupations and Appliances (2002).

EMF Safety Network:

EMF sensitivity is also known as electrohypersensitivity, electrosensitivity,

electrical sensitivity, and others. It is estimated that 3% of the population has EMF sensitivity and up to 35% have symptoms of EMF sensitivity. Opting out of the Smart Meter program, especially on living and working premises is absolutely essential because prudent avoidance is the only known relief for health symptoms from EMF sensitivity. Other vulnerable groups include children, pregnant women, seniors, people with medical implants and the immune compromised.

5.5.1 Electrohypersensitivity: State-of-the-Art of a Functional Impairment

"In summary it is evident from our preliminary data that various alterations are present in the electrohypersensitive persons' skin. In view of recent epidemiology studies, pointing to a correlation between long-term exposure from power-frequent magnetic fields or microwaves and cancer, our data ought to be taken seriously and analyzed".

Johansson, O. 2006. Electrohypersensitivity: State-of-the-Art of a Functional Impairment. *Electromagnetic Biology and Medicine*. December 2006; 25(4): 245-258.

5.5.2 European Parliament EMF Resolution

The European Parliament EMF Resolution of April 2009 "calls on member states to follow the example of Sweden to recognize persons that suffer from electrohypersensitivity as being disabled so as to grant them adequate protection as well as equal opportunities".

5.5.3 US Access Board Recognizes EMF Sensitivity (2002)

"The Board recognizes that multiple chemical sensitivities and electromagnetic sensitivities may be considered disabilities under the ADA if they so severely impair the neurological, respiratory or other functions of an individual that it substantially limits one or more of the individual's major life activities. The Board plans to closely examine the needs of this population, and undertake activities that address accessibility issues for these individuals.

"The Board plans to develop technical assistance materials on best practices for accommodating individuals with multiple chemical sensitivities and electromagnetic sensitivities. The Board also plans to sponsor a project on indoor environmental quality. In this project, the Board will bring together building owners, architects, building product manufacturers, model code and standard-setting organizations, individuals with multiple chemical sensitivities and electromagnetic sensitivities, and other individuals. This group will examine building design and construction issues that affect the indoor environment, and develop an action plan that can be used to reduce the level of chemicals and electromagnetic fields in the built environment."

in EMF Safety Network CPUC Application, A. 10-04-018, April 2010

Janet Newton, EMR Policy Institute.

FCC's RF limits ...do not protect individuals with EMR functional impairment. No federal agency keeps track of cumulative wireless radiation levels...Nor require signage to identify wireless environments so that individuals with EMR functional impairment can avoid these locations...

Testimony to Department of Justice December 2010 hearing on disabilities
Exhibit G, Southern Californians For Wired Solutions To Smart Meters (SCWSSM)
Protest Of SDG&E, SCE and PG&E applications for approval of Smart Grid
Deployment Plans, A.11-06-006 et al., August 4, 2011

Medical/Health organization response

On January 19, 2012, the American Academy of Environmental Medicine sent a letter to the CPUC calling for an immediate moratorium on Smart Meters.

“Chronic exposure to wireless radiofrequency radiation is a preventable environmental hazard that is sufficiently well-documented to warrant immediate preventative public health action...Given the widespread, chronic, and essentially inescapable ELF/RF exposure of everyone living near a ‘smart meter’, the Board of the American Academy of Environmental Medicine finds it unacceptable from a public health standpoint to implement this technology until these serious medical concerns are resolved. We consider a moratorium on installation of wireless “smart meters” to be an issue of the highest importance.”

<http://aaemonline.org/images/CaliforniaPublicUtilitiesCommission.pdf>

They also called for “immediate relief to those requesting it and restore the analog meters.” They have now released a position paper in April entitled “Electromagnetic and Radiofrequency Fields Effect on Human Health.” (http://aaemonline.org/emf_rf_position.html)

Santa Cruz County Health Department, January 13, 2012

“There are no current, relevant public safety standards for pulsed RF involving chronic exposure of the public, nor of sensitive populations, nor of people with metal and medical implants that can be affected by localized heating and by electromagnetic interference...”

“Evidence is accumulating on the results of exposure to RF at non-thermal levels, including increased permeability of the blood-brain barrier in the head, harmful effects on sperm, double strand breaks in DNA which could lead to cancer genesis, stress gene activation indicating an exposure to a toxin, and alterations in brain glucose metabolism.”

“...FCC guidelines are irrelevant and cannot be used for any claims of SmartMeter safety unless heat damage is involved.”

Health Risks Associated with Smart Meters, Health Officer Dr. Poki Stewart
Namkung MD, MPH; Attachment B, B1, B2

http://sccounty01.co.santa-cruz.ca.us/bds/Govstream/BDSvData/non_legacy/agendas/2012/20120124/PDF/041.pdf

In July 2012, Dr. David Carpenter, founder of the New York University of Albany’s School of Public Health and director of UoA’s Institute for Health and the Environment, together with several international experts, wrote the letter “Smart Meters: Correcting the Gross Misinformation”. That letter has now been signed by 54 international scientists and health professionals. <http://maisonsaine.ca/smart-meters-correcting-the-gross-misinformation/>

Austrian Medical Association:

The planned area-wide introduction of so-called ‘smart meters’, can lead to health consequences, in the opinion of the Department of Environmental Medicine of the Austrian Medical Association (ÖÄK)... The available transmission options such as radio or transmission over the power grid itself (Powerline Communication, short PLC) lead to electrosmog that is harmful to health. Additionally, with Power Line Communication the existing electrical lines and the connected devices now emit increasing electrosmog (electric fields in the Kilohertz range).

Press Release, February 4, 2012

The expected health consequences would be an increase in symptoms and diseases that fall into the category of so-called multi-system diseases. This illness is characterized by involving several organs or functional systems at the same time and in interaction... Who is liable in the event of health problems and diseases caused by the increased field exposure on the part of the Smart Meter?...

From the perspective of the Austrian Medical Association, the planned timetable of mandatory introduction of ‘smart meters’ should be reconsidered or suspended until pending clarification and solution of open questions.”

Letter to Austrian Federal Ministry for Economics, Family and Youth, 1-18-2012
Translated from German <http://www.aerztekammer.at>

The Austrian Medical Association also issued a report “Guideline of the Austrian Medical Association (ÖÄK) for the diagnosis and treatment of EMF-related health problems and illnesses (EMF syndrome)” on March 3, 2012.

<http://www.aerztekammer.at/documents/10618/976981/EMF-Guideline.pdf>

In that report, they set preliminary benchmarks for “normal” RF exposure at .0001 microW/cm² – ten million times lower than FCC guidelines.

Swiss MP and physician Dr. Yolanda Gilli to the Swiss Parliament (with 14 co-signers)—

With an area-wide introduction of "smart meters", and for example their connection via PLC, would massively increase the burden from these electric or magnetic fields on the Swiss population, Physicians for Environmental Protection (AefU) (1500 physicians) insist.

- How do you intend to preventatively protect the Swiss population against such radiation?
- How do you intend to enforce the precautionary principle? Are you prepared to tighten the limits?
- Do you share the opinion that through GSM, WLAN, or tethered Smart Grid PLC, the exposure of the population to fields in the intermediary frequency range is massively increased?
- What do you intend to do about it? Are you prepared to take accompanying measures?
- How high do you estimate the economic costs, for example as a result of the increase of multi-system diseases in area-wide introductions of smart grids, which operate with GSM, WLAN, or PLC?

Radiation risks and Smart Grid, Parliamentary filing, March 14, 2012

http://www.parlament.ch/d/suche/seiten/geschaeft.aspx?gesch_id=20123169

Division of Ratepayer Advocates

"There is clearly a high level of public concern over possible adverse safety and health impacts of the SmartMeter system. The Commission has an obligation to investigate whether these concerns are well founded, in a public proceeding...

To the extent that the Commission finds, based on information that is publicly and properly vetted, that the public's concerns are misplaced, the Commission's actions and explanations should reassure the public. If the Commission finds that there are health or safety problems that need to be addressed, it can (and must) proceed to finding solutions."

"DRA recommends immediate Commission action to address concerns about RF interference and possible adverse impacts on health and safety. . . The Commission has the primary authority and responsibility to protect the health and welfare of California residents by ensuring that public utility service is safe and reliable."

DRA Response, October 20, to A.05-06-028 Californians for Renewable Energy, Inc. (CARE), alleging Smart Meters ignited the San Bruno fire and calling for health and safety impacts to be evaluated, p. 4-5, 6

DRA further recommended that

- a) PG&E should be ordered to quantify SmartMeter RF emissions and customer exposure levels.

- b) The Commission should direct PG&E to explain what safety precautions it took in deploying SmartMeter equipment in close proximity to gas equipment.
- c) The Commission should review SmartMeter customer complaints to determine the prevalence and magnitude of interference from Smart Meter.

DRA Response to CARE, p. 6-9

Part of their conclusion states:

“To fully address the concerns that have been raised, the Commission should ensure that accurate, non-biased, comprehensive, evidence-based data is gathered and used to support its findings. It may want to consider public outreach efforts to ensure that the Commission’s findings and resolutions of RF issues restore public confidence in SmartMeters (if such confidence is warranted).”

DRA Response to CARE, p. 10

Administrative Law Judge Sullivan issued a proposed decision (PD) on October 26, in accordance with PG&E’s request, dismissing EMF Safety Network’s application raising health issues before the PUC. On November 15, 2010, the Division of Ratepayer Advocates once again weighed in with comments on PG&E’s request:

“Notwithstanding the FCC’s authority to set RF emissions standards, this Commission has ample authority (as well as a responsibility) under the Public Utilities Code to ensure that PG&E’s AMI system poses no threat to public health or safety. The PD errs in reaching conclusions based on limited and incomplete evidence about the RF emissions from PG&E’s AMI system. The record in this proceeding is not robust enough to support conclusions about the health impacts of Smart Meters. DRA recommends that the Commission delay consideration of this PD until additional evidence is compiled and reviewed in a public process. If the Commission decides to defer all questions concerning RF emissions of the AMI system to the FCC, it should refrain from making findings about Smart Meter RF exposure levels that are not supported by complete and adequate data, as this PD does. DRA strongly recommends the first approach as a means of building public confidence in the statewide advanced metering network, and restoring confidence in the Commission as a defender of the public interest.”

DRA Comments on Proposed Decision to Dismiss EMF Safety Network Application, A.10-04-018

And on Friday, November 19, 2010, DRA issued yet another document, commenting on the proposed decision.

PG&E’s opening comments state that “given the strength of the undisputed factual record in this proceeding, the PD’s dismissal of EMF Safety Network’s Petition is well-founded.” This statement is incorrect in two ways: the factual record in support of PG&E’s motion to dismiss the application is actually quite thin, and that evidence is clearly disputed by Network. In contrast, Network in its application and subsequent

filings provided references to many scientific studies indicating that there may be adverse health effects from RF emissions from wireless devices in common use (including a peer review of 1500 studies on the health impacts of known as the 2007 Bio-Initiative Report, which led the European Parliament to initiate an investigation on this subject). Accordingly, DRA agrees with Network that the PD grants PG&E's motion on the basis of weak and unreliable evidence, while ignoring more substantial evidence presented by Network.

The PD errs by: (1) relying on inadequate and disputed evidence about SmartMeter RF emissions submitted by PG&E; (2) ignoring evidence provided by Network, specifically, citations to scientific studies about health impacts of RF emissions from wireless devices; and (3) concluding that the SmartMeter RF emissions are within federal standards that do not in fact exist. The Commission should reject the PD and give serious consideration to investigating the health concerns raised by Network and other groups.

DRA Reply Comments on Proposed Decision, A,10-04-018
(Adopted decision was D.10-12-001)

CPUC response

Concerning CCSF's (City and County of San Francisco's) request that the Commission now use this proceeding to investigate EMF from SmartMeters, we decline to alter the scope of this proceeding. Moreover, the Commission, in D.10-12-001 (December 2, 2010), found that EMF produced by SmartMeters is "far below the levels of many commonly used devices," that the radio components of SmartMeters "are licensed or certified by the FCC" and that "it is not reasonable to re-open the Commission's review of Smart Meters for the purpose of considering the alleged health impacts of RF emission from Smart Meters."

Final Decision, 10-12-031, Decision Denying the City and County of San Francisco's Petition To Modify Decision 09-03-026, p. 21, December 2010

California Council on Science and Technology report on Smart Meters (2011)

The California Council on Science and Technology (CCST-- www.ccst.org) was asked by Assemblymembers Jared Huffman and Bill Monning to report on RF health risks from Smart Meters, whether FCC guidelines were sufficiently protective of public health, and whether additional standards were needed.

As background, the CCST is an appointed advisory panel for the state of California representing industry, university and government interests. It is not impartial or independent. It did not conduct any research.

Their findings: FCC guidelines are protective for thermal impacts from Smart Meters; non-thermal impacts are unknown. <http://www.ccst.us/publications/index.php>

The report did not say Smart Meters are safe.

This report was criticized by:

- California Department of Public Health, which actually did EMF research in the past,
 - Dr. Raymond Neutra (Director Emeritus of the CDPH unit that conducted EMF research),
 - Dr. De-Kun Li (Senior Research Scientist, Kaiser Permanente),
 - Dr. Karl Maret (electrical engineer and medical doctor) who reviewed the research in his critique,
 - Dr. David Carpenter (Director of the Institute for Health and the Environment, University of Albany, New York),
 - Daniel Hirsch (nuclear policy expert; UCSC lecturer; President, Committee to Bridge the Gap),
- and other scientists and health care professionals.

A prominent chart in the CCST report, which has been used repeatedly by utility companies in Smart Meter marketing materials, is in error. Daniel Hirsch exposed the errors in his critique of the CCST report. The CCST panel attempted to compare different units of measurement when comparing Smart Meter radiation exposure to that of cell phones and other microwave-emitting devices. This fundamental error reveals the lack of statistical background of the panel.

When Hirsch corrected these basic statistical errors (and Hirsch does not claim his answers are definitive but merely estimates), it revealed the following figures:

- at 10 feet from a Smart Meter, a person receives **5 – 16 times** the whole body radiation exposure from a cell phone held to the head
- at 3 feet from a Smart Meter, a person receives **53 – 160 times** the whole body radiation exposure from a cell phone held to the head
- using the inverse square calculation, at 1 foot, one Smart Meter exposes people to **450 - 1400 times** the whole body radiation exposure of a cell phone held to the head.

(Figure 3 and 4)

http://eon3emfblog.net/wp-content/uploads/2011/02/110212_GBG-on-Smart-Meters.pdf

How many children and adults sleep against walls where Smart Meters are mounted?

Much of the extensive research showing health damage from RF is at cell phone exposure levels. The implications of this much higher exposure are staggering.

Maine's Center for Disease Control hired experts from Exponent to assist its Smart Meter study and to report about the health effects from wireless smart meters. The Maine CDC report is often referenced by smart meter advocates. However, Exponent is a company that has defended the tobacco and asbestos industries in cancer cases. Exponent is featured in the

book, Doubt is Their Product: How Industry's Assault on Science Threatens Your Health, by David Michaels, Ph.D., M.P.H., Assistant Secretary of Labor for OSHA.

Industry response

Utility company response has been to repeat that Smart Meters are safe over and over again, on their websites, in media advertising, in public meetings, at the Public Utilities Commission.

Klaus Bender of the Utilities Telecom Council wrote a paper entitled: No Health Threat from Smart Meters.

The Utilities Telecom Council (UTC) is a global trade association dedicated to creating a favorable business, regulatory, and technological environment for companies that own, manage, or provide critical telecommunications systems in support of their core business. <http://www.utc.org/utc/about-utc>

He concluded his remarks by saying:

So when confronted with complaints that say smart meters cause a variety of health effects, ask the complainant to produce the science to support the claim. The conversation should end shortly thereafter.

His references were links to FCC web pages.

Cindy Sage of Sage and Associates wrote a rebuttal to his brief paper; she included 37 pages of research studies.

When asked if PG&E was keeping track of health complaints at a PG&E/Energy Commission workshop, Dec. 9, 2011, Jim Meadows, Director of Smart Meter program for PG&E, replied, "I'm not aware of it." This was after two years of customer complaints.

Richard Tell's reports for PG&E are frequently mentioned by the industry as studies PG&E had commissioned to assess safety. However, Richard Tell merely measured meter emissions against FCC exposure limits, nothing more. He did not assess safety. Health impacts were deferred to the FCC.

He also "time-averaged" the RF pulses emitted by Smart Meters, instead of providing the true maximum, or "peak" power, of those RF pulses. Time-averaging takes the time intervals of the pulses, and averages it with the intervals of time when the meter is not pulsing; an example would be to fire a gun twice in a minute, then average the intervals of actual firing with all the intervals where it was not fired. The resulting number for impact or pounds per square inch or velocity is meaningless, a junk number. The Tell reports are here:

<http://www.pge.com/mybusiness/edusafety/systemworks/rfsafety/index.shtml>

Dr. Leeka Kheifets is a utility industry researcher and consultant who testifies before city and county governments on behalf of the utilities – she has worked for the Electric Power Research Institute (EPRI) and PG&E. She also worked at the CPUC, and while there, had her financial records sealed. She has worked for EPRI while working for ICNIRP (International Committee for

Non-ionizing Radiation Protection) – a clear conflict of interest. But the worst and most flagrant conflict of interest and violation of the public trust was when she was hired to work for the World Health Organization as assistant to Michael Repacholi, head of WHO EMF Project while being paid by EPRI. She brought in other EPRI and industry personnel to assist with the work of writing EMF guidelines. There is extensive information on her and the WHO EMF project at www.microwavenews.com. The irony of this is that Kheifets' own research has shown impacts from this type of radiation.

The issue of conflict of interest comes up with other national and international agencies as well.

Industry response: EPRI – Electric Power Research Institute

The Electric Power Research Institute is the research arm of the electric power industry. As noted above, their personnel were involved in writing World Health Organization EMF guidelines. They have issued several reports about Smart Meters. Their work was cited in the CCST report and included in the chart in that report. They represent the industry.

Federal Communications Commission (FCC)

Norbert Hankin, U.S. EPA, 2002:

“The FCC’s current exposure guidelines, as well as those of the Institute of Electrical and Electronics Engineers (IEEE) and the International Commission on Non-ionizing Radiation Protection (ICNIRP), are thermally based, and do not apply to chronic, nonthermal exposure situations. They are believed to protect against injury that . . . result(s) in tissue heating or electric shock and burn. . . The FCC’s exposure guideline is considered protective of effects arising from a thermal mechanism. . . the generalization by many that the guidelines protect human beings from harm by any and all mechanisms is not justified.”

Letter to Janet Newton, EMR Policy Institute

http://www.emrpolicy.org/litigation/case_law/docs/noi_epa_response.pdf

FCC guidelines have been criticized for years by scientists and health professionals as inadequate for the reasons stated above. They are for short-term thermal exposure only, and they were modeled for a large man.

Robert Kane, Motorola engineer:

What we learn is that a repeated insult or irritation to a particular biological area, such as a small region of the brain, can lead to irreparable damage. That is, given the existence of energy absorption "hot spots," the existence of which have been verified by numerous researchers, then each damaging exposure to radiofrequency radiation provides a new opportunity that the damage will become permanent. Part of

the problem is that an exposed person would never know of the penetration and damage.

Perhaps even more troublesome is that tissue damage in the body is usually followed by a process of repair or restoration.

So, each damaging exposure is likely to activate the growth of new cells to replace damaged or destroyed tissue. Cells that participate in the repair process are also likely to be some of the cells that were earlier damaged.

S. M. Michaelson reported that the thermal sensation of pain is evoked when thermal sensors in the skin reach approximately 46°C. From data given in that same research report we learn that no sensation of warmth would be felt in the skin, or scalp, until a dose of radiofrequency radiation was so high that internal damage to deep tissue was certain to result.

Researchers have pointed out that electromagnetic energy in the 900MHz region may be more harmful because of its greater penetrating capability compared to 2450 Mhz. More of the energy in the 900 MHz frequency range is deposited deeply within biological tissue.

J. C. Lin concluded that 918 MHz energy constitutes a greater health hazard to the human brain than does 2450 MHz energy for a similar incident power density. (J. C. Lin, "Interaction of Two Cross-Polarized Electromagnetic Waves with Mammalian Cranial Structures," IEEE Transactions on Biomedical Engineering BME-23, no. 5 (September 1976): 371-75.)

Cellular Telephone Russian Roulette, p. 13, 14

The frequency of greater health hazard is the frequency for electric Smart Meters (902-928 MHz) and the mesh network.

PG&E representatives have said rather proudly that their meters emit 1/70 of 601 microwatts per cm², the FCC guidelines for 902-928 MHz frequency (the electric Smart Meter frequency band). They also have said they are not RF experts. That is very clear. Biological harm from microwave and radio frequency can occur at millions of times below FCC guidelines.

The proposed Austrian Medical Association "normal range" benchmark below takes that into account.

Austrian Medical Association recommendations for high frequency electromagnetic radiation (March 2012).

≥ .1 microW/cm²	very far above normal
.001 - .1 microW/cm²	far above normal
.0001 - .001 microW/cm²	slightly above normal
≤.0001 microW/cm²	within normal limits

FCC guidelines allow up to 1000 microW/cm².

FCC guidelines are 10,000 times higher than Austrian “very far above normal” recommendations, and 10,000,000 (ten million) times higher than Austrian “within normal limits” recommendations.

“The FCC MPEs for the general public are well recognized by most RF operators and these exposure limits are among the most stringent of those that exist. It is, therefore, relevant to use the FCC MPEs as bench marks for evaluating potential human exposure to the AMR system to be deployed by PG&E.”

Richard Tell, Supplemental Report on an Analysis of Radiofrequency Fields
Associated with Operation of the PG&E SmartMeter Program Upgrade System
October 27, 2008

This statement by Richard Tell is false.

FCC exposure limits are not among the most stringent of those that exist. Other countries have far more stringent limits than the U.S. Switzerland, Russia, Belgium, Italy, Bulgaria and Hungary allow 1/100 or less of the radiation which FCC guidelines allow. And the Swiss Physicians for the Environment in April, 2012, asked its government for a further downward revision by a factor of 10, based on the research.

The international Bioinitiative Report, released in 2007, reviewed more than 1500 peer-reviewed studies that demonstrate biological effects and negative health effects resulting from EMF and RF radiation exposure at non-thermal levels. That report has been taken very seriously overseas, together with its recommendation for a drastic lowering of permitted exposures.

European Parliament, September 2008:

(Members of the European Parliament) are greatly concerned at the Bio-Initiative international report on electromagnetic fields, which highlights the health risks posed by emissions from mobile-telephony devices such as mobile telephones, UMTS, Wifi, Wimax and Bluetooth, and also DECT landline telephones. It notes that the limits on exposure to electromagnetic fields which have been set for the general public are obsolete.

<http://www.europarl.europa.eu/sides/getDoc.do?language=en&type=IM-PRESS&reference=20080903IPR36136>

SWITCHING MODE POWER SUPPLY (SMPS)

One source of the emissions from Smart Meters deserves special focus. Daniel Hirsch’s charts correcting CCST exposure estimates were only for microwave RF exposure. That did not take

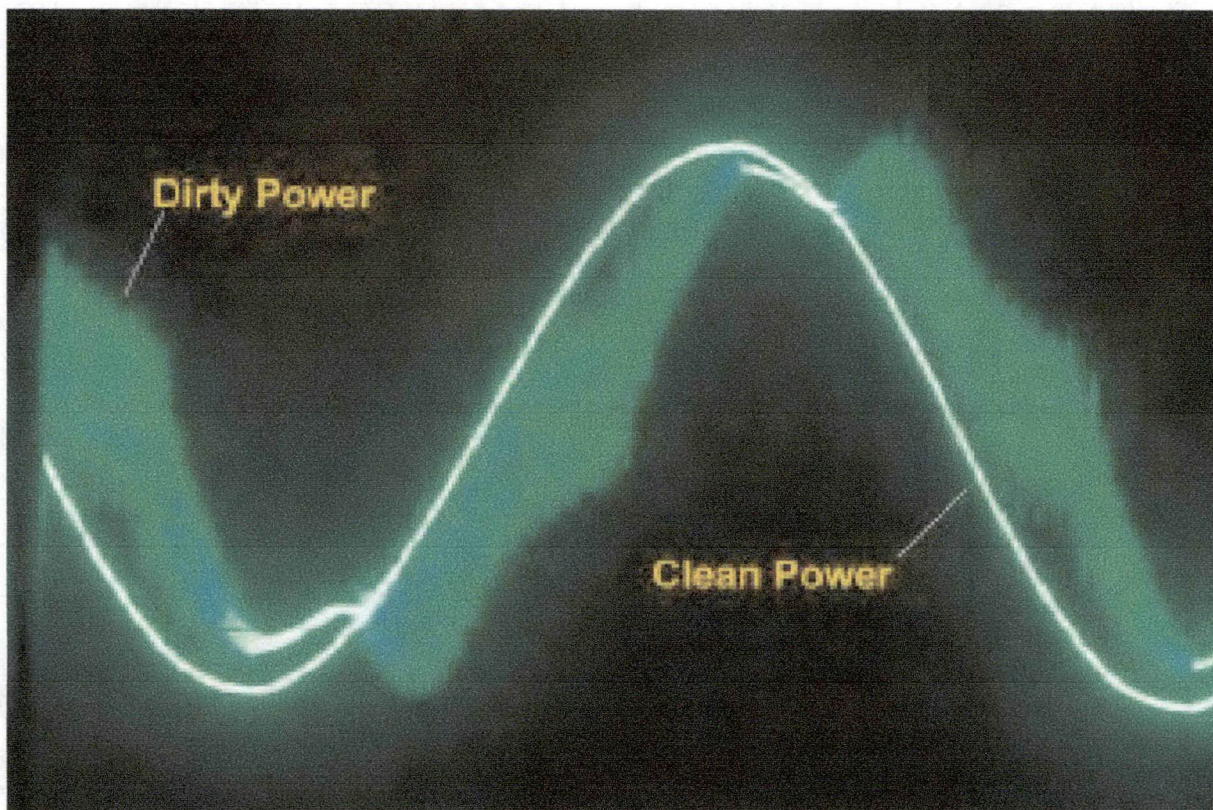
into account the EMF and RF from the switching mode power supply (SMPS) of digital, AMR, and AMI meters/Smart Meters.

The SMPS in these various digital meters creates powerful spikes of EMF and RF -- “dirty” electricity – and these occur constantly as the meter switches back and forth from alternating current (AC) to direct current (DC). <http://eon3emfblog.net/?p=2180>

This gets on house wiring, coupling to water and gas pipes, surrounding us in our homes, offices and other buildings, and traveling into other buildings. It also travels on and radiates from power lines.

This potent radiation problem and source, on its own, creates a serious health hazard which some scientists and engineers think is even more dangerous than the Smart Meter microwave emissions. And one could argue for an additive, even harmonic effect between the two sources of radiation which would only increase the level of harm.

“Dirty” electricity is a problem for digital meters, Smart Meters, and for wired Smart Meters using power-line carrier (PLC) systems. With PLC systems, utility companies are actually intentionally putting the RF signal on the lines.



from The Health Effects of Electrical Pollution, National Foundation for Alternative Medicine

Southern California Edison, Nevada Energy, and a number of municipal and investor owned utility companies, as well as PUCs, are insisting on digital or radio-off Smart Meters as an opt-out. This is not a solution.

Samuel Milham:

Since dirty electricity is a potent carcinogen, and causes numerous health problems, the only way to avoid a public health catastrophe is to send the smart meter information over existing telephone land lines or go back to the analog meters. I'm not making light of or ignoring the RF pollution caused by the smart meters, but think the dirty electricity may be a more serious and intractable problem.

Critique of CCST report, 2011

Retired epidemiologist (Washington State) Samuel Milham recently published a book "Dirty Electricity" which explains the phenomenon.

Austrian Medical Association:

The Austrian Medical Association emphatically calls to attention that with the area-wide introduction of 'smart meters' and their connection via power line communication (PLC), the Austrian population's exposure to electrical or magnetic fields in the intermediate frequency range (kilohertz range) would be massively raised. These fields are also emitted by cables in the building, including connecting cables to appliances and electrical appliances, far removed from the Smart Meter. The expected health consequences would be an increase in symptoms and diseases that fall into the category of so-called multi-system diseases. This illness is characterized by involving several organs or functional systems at the same time and in interaction. The consequences are, among others, an increased stress load on people. This can, depending on an individual starting position and exposure level, lead to an increased risk for exhaustion (keyword burn out), learning problems, depression, and cancer.

The Austrian Medical Association assumes that these health aspects and resulting significant socioeconomic consequences and costs were not considered up to then, because the technical and environmental medicine expertise in this regard were to given in the two reports (PWC, Kearney). These health and socioeconomic consequences that are to be expected are, from the perspective of the Austrian Medical Association, mandatory to be included in the consideration. The Austrian Medical Association strictly rejects another, in this case actually state-mandated, expansion of the Electrosmog exposure on the Austrian population.

January 18, 2012, Letter to Austrian Federal Ministry for Economics, Family and Youth

"Dirty" electricity is also created by electronics, appliances, and other household devices, some touted as "energy efficient." Light dimmer switches and compact fluorescent bulbs are often

cited as two of the worst sources. "Dirty" electricity is potent and damaging to biological systems, and is suspected as being a carcinogen.

Additional information on "dirty" electricity is available at www.electricalpollution.com.

INTERFERENCE WITH ELECTRONICS

People have reported problems with security systems, cordless phones, baby monitors, automated garage doors, and more.

"Right about the time that SmartMeters were installed, our phone went insane," wrote Jane Meckman of San Jose.

"Your article concerning the PG&E SmartMeter was exactly what I needed to see," wrote Mario after one of my earlier columns. "Ever since PG&E has installed that stupid device, our DirecTV has been having massive signal issues."

Violeta Perez of San Jose wrote that, "Ever since my SmartMeter was installed, my home alarm system has been going off randomly."

"A mystery has been solved for us," wrote Veronica Wong, complaining that her baby monitor has suddenly picked up static.

Cordless phones and crib monitors, patio speakers and wireless headsets are spitting out static and startling pops and crackles, they complained. Also affected, they said, are wireless microphones, security systems, motion detectors and remotely controlled garage doors. This equipment operates largely on the 900- to 928-megahertz radio spectrum.

http://www.mercurynews.com/top-stories/ci_16007725

SmartMeters interfere with baby monitors, other household gadgets, Sept. 2010

My home suffered numerous electrical problems after Smart Meters were installed. Ground Fault Interrupters (GFIs) tripped for no apparent reason, and a wide variety of appliances (old and new) stopped working. PG&E indicated the problem was with my old electrical meter. I was told that my old meter had been restricting electricity, so my house wiring and appliances were reacting to a new electrical flow, and the implication was that I was fortunate because these appliances would have burned-out long ago if this corrected flow had been there all along. At no time did PG&E disclose to me that Smart Meters operate in a fundamentally different manner from the analog/electromechanical meter, that the new meter was the source of the disruptions, or that Smart Meters were causing problems with GFIs and spiky conditions that damage appliances.

PG&E customer, personal correspondence

Smart Meter Interference: Assessment of Chatham-Kent Hydro Smart Meter Implementation:
The Smart Meters installed by Chatham-Kent Hydro utilize an unlicensed radio transmitter operating on the 902-928 MHz band to convey data back to the billing system...

This implementation is unwise for a number of reasons.

Much consumer equipment exists in this band. Early tests indicate that most of this equipment suffers from detrimental performance in areas where Smart Meters are installed. Most of these consumers are not aware that they are receiving interference from all the Smart Meters within range of their equipment. In many cases, the interference, which causes random loud pops or clicks, renders the devices completely useless to the consumer.

Chatham-Kent Hydro is aware that these devices will be negatively impacted, and states, "900 MHz telephones and baby monitors can be interfered with by the Smart Meter network. Our vendor has done testing in the area and they report that the devices ability to filter out the interference varies greatly from supplier to supplier. Some phones work perfectly fine while others report short "popping sounds" every minute or so. This interference is, although undesirable, within the realm of acceptable performance for devices operating in the 900-928 MHz band."

Technically, there is absolutely no way for any analog radio device to "filter out" this interference since it is co-channel interference and not a design deficiency. In other words, the undesired Smart Meter signal overpowers the desired signal on the same frequency, and there's no filter or other technology that could eliminate it. The occurrence of interference is much more frequent than once "every minute or so" as stated. In one recent sample, over one hundred "pops" were documented in a single minute, and this kind of intensity is observed throughout much of the day and night. There were very few times where the intensity dropped to the level claimed by Hydro. The problem with Chatham-Kent Hydro's assurance that this is "acceptable performance for devices operating in the 900-928 MHz band" is that it is ILLEGAL to cause this interference in the first place. Industry Canada requires all equipment operating under RSS-210 to cause no interference to other users, including licence-exempt users...

"Smart Meters operate in the 902-928 MHz frequency band, and the modules are fully certified for operation by Industry Canada and the Federal Communications Commission in the USA. i.e. the meters operate completely within regulations and are designed to coexist with any potential interferers. Because of the shareable nature of the band and the corresponding "rules" around its use, users cannot expect to have clear access, without interference from other devices."

Chatham-Kent Hydro

This interpretation is incorrect, according to Industry Canada, and could land Chatham-Kent Hydro in some expensive trouble. There is nothing about this system which is designed to “co-exist” with other users. Even though each TUNet module is Industry Canada certified, compliance with the regulations is not guaranteed. When these rules were implemented, Industry Canada and the various stakeholders which contributed input to the bandplan did not envision a mesh network of 32,000 such devices effectively monopolizing the entire band in a geographic area. The certification is for a single TUNet module, not an entire network.... The assertion that “users cannot expect to have clear access” is incorrect, as the regulations clearly state that licence-exempt users CANNOT cause interference to each other, therefore, users CAN expect to have clear access to individual frequencies in this band....

Chatham-Kent Hydro offered their solution to interference caused to consumer devices by Smart Meters:

“Thankfully, as time goes on, less and less devices will be operating in this band as most commercial products seem to be moving onto the 2.4GHZ and 5.8 GHZ bands.”

(Chatham-Kent Hydro also posted instructions on their website for customers to go out and purchase new equipment that used other bands.)

This is a presumptive statement, and what it really means is that they expect their system to chase consumers entirely off the band. It makes no accommodation for the thousands of 902-928 MHz devices already in use. Forcing a migration to other bands is a poor precedent, since there is nothing to stop some other user from deciding to use those bands and chasing consumer equipment to the next band, ad infinitum...

When contacted, Industry Canada was not even aware of the use of 902-928 MHz by Chatham-Kent Hydro for Smart Meters, but they are now. Under the rules, IC stated that the legality of this implementation is highly questionable, but it's worded in such a way that Industry Canada would only get involved if a licenced user is being interfered with.

However, the use of a network of 32,000 Smart Meters on this band effectively monopolizes it and prevents most other uses, which was never the intent of the bandplan, nor of RSS-210. It is highly likely that this kind of non-conforming use would be examined and banned in future bandplan updates, which could force the system to cease operation and move to a more appropriate system. Industry Canada and the Radio Advisory Board have already discussed the problem caused by Chatham-Kent Smart Meters.

Use of this band for meter telemetry required consultation with all stakeholders of the band. Nobody was consulted by Chatham-Kent Hydro, and most users are quite opposed to the ongoing implementation of these Smart Meters due to the clandestine use of 902-928 MHz without any public disclosure or consultation. Industry Canada

stated that the continued use of this band by Chatham-Kent Hydro is "highly risky", since they have no protection from interference whatsoever, and have no guarantee that long-term access to this band will continue to be allowed. They added that it doesn't matter "who's there first" or who spent the most money – Chatham-Kent Hydro has "no rights" when using this band; they can use it for now on a "cause no interference basis," and will receive "no protection from interference to their system."

VE3NCQ, Chatham-Kent Amateur Radio Club

http://www.ve3ncq.ca/wordpress/?page_id=10

CEPro: "Do Smart Meters Interfere with Alarms? --

"Alarm service providers should closely monitor the potential for interference to alarm systems, make appropriate filings with the FCC and others, and help employees understand the issue and how it may affect their installation and operational practices," the CSAA advises. "The difficulty of detecting sources of interference and accurately prevent it enhances the problems."

A report from consulting group Sage Associates says, "Devices in the home may experience RF bursts of high enough intensity to cause malfunction and/or damage. These events are reported where smart meters have been installed."

The report adds that alarms using unlicensed frequencies are "automatically" at higher risk, adding the interference creates "the possibility of [the alarm] going haywire, causing false alarms, costly city fines for responding to false alarms, and headaches for the homeowner."

"Association issues warning that electrical smart meters can cause wireless security systems go 'haywire.'" January 21, 2011

http://www.cepro.com/article/do_smart_meters_interfere_with_alarms/

Maine Public Advocate

To date, over 200 customers have contacted CMP (Central Maine Power) about problems with a variety of appliances and devices including phones (cell, cordless, and landline), answering machines, Internet routers and wifi, personal computers, TVs, garage doors, fire alarms, clocks and even electric pet fences....

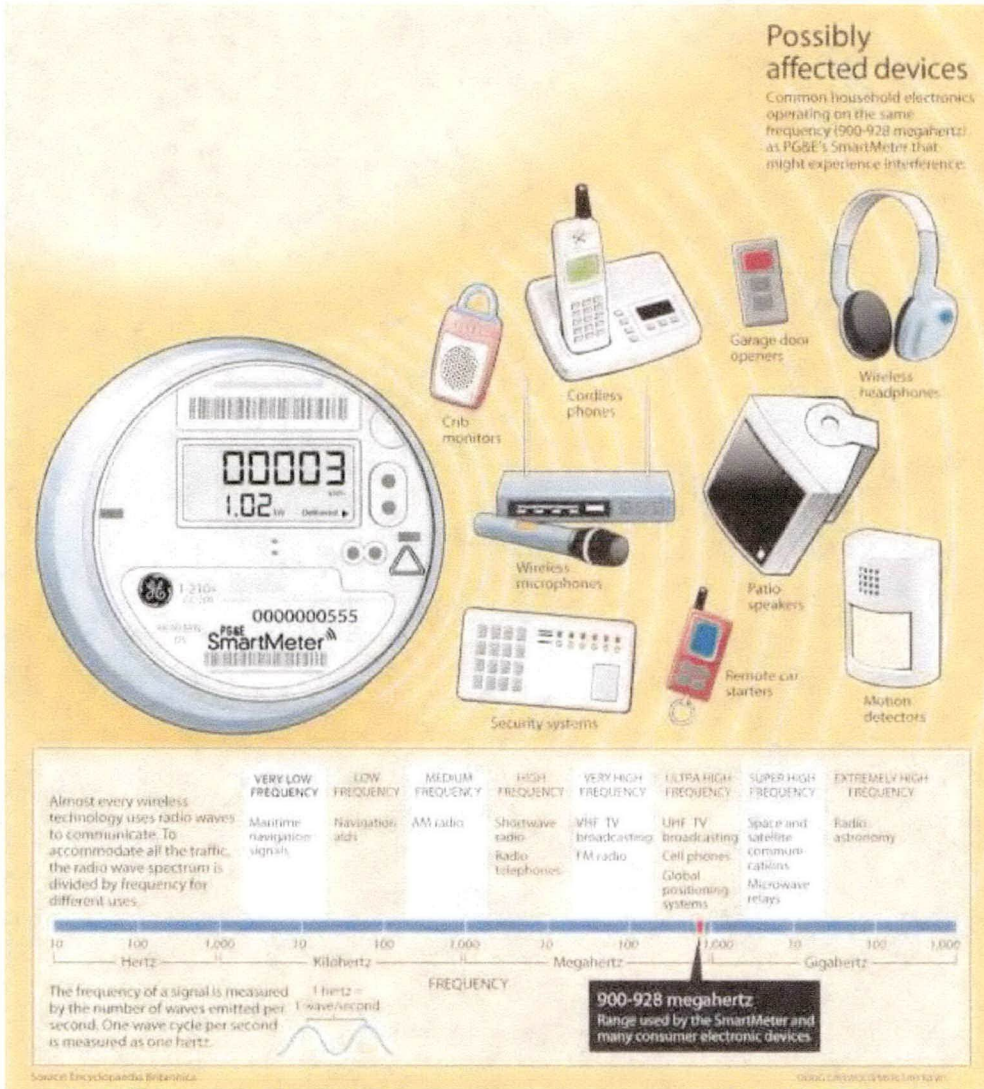
CMP received the first calls about interference problems shortly after they began installing the meters last fall, and they continue to receive calls as meters are installed in more communities.

Public Advocate Richard Davies said, "We believe that these 200 plus customers are only a subset of those affected. CMP has already installed nearly 425,000 meters, so there may be many more customers who are having problems with devices and appliances, but don't know that the problems may be caused by the smart meter.... My agency is

troubled by the possibility that people may be spending their time and money fixing a problem that may be caused by CMP's meters, and that can and should be fixed by CMP."

Press release, Maine Office of Public Advocate, November 17, 2011

http://www.maine.gov/tools/whatsnew/index.php?topic=meopa_news&id=318771&v=Default



http://www.mercurynews.com/top-stories/ci_16007725

INTERFERENCE WITH MEDICAL DEVICES

EMF Safety Network:

Widespread wireless installations including Smart Meters are creating safety risks for 20-25 million people, who have medical implants such as pacemakers, infusion pumps, metal rods and hearing aids. In some cases these interference risks are life threatening. Dr. Gary Olhoeft, professor of Geophysics in Colorado, has a medical implant, a deep brain stimulator for Parkinson's disease. Olhoeft shares his research and knowledge about wireless interference with implants. Video at <http://emfsafetynetwork.org/?p=4560>

In part two (of the video) Dr. Olhoeft describes a situation where as he passed through a retail store security system his stimulator was turned off. He shares, "I had to turn myself back on. I have about four seconds to do that before I start shaking so bad I can't do it."

Pacemakers and insulin pumps are just two common medical devices which have warnings about RF interference potential. One woman in Salinas had her pacemaker defibrillate 4-5 feet away from a Smart Meter at a PG&E demonstration.

Institute of Electrical and Electronics Engineers -- IEEE (1998)

The past few years have seen increased reports that medical devices, such as pacemakers, apnea monitors, electrically powered wheelchairs, etc., have failed to operate correctly because of interference from various emitters of radiofrequency energy. This condition is called radiofrequency interference (RFI)... If there exists the possibility of RFI problems to medical devices, steps should be taken to ensure that all sources of RF energy be kept at a sufficient distance.

Hundreds of incidents of RFI induced medical device failure have been reported, studied, and summarized. The most likely source of those failures has been RFI from mobile radio transmitters. The consequences have ranged from inconvenience to serious injuries and death. However, many more incidents may occur that are not reported because most users of medical devices are unaware that RF fields are present when problems are recognized and because of the intermittent nature of the failures that could cause them to be unobserved...

Portable wireless communications equipment, including cellular phones, handheld transceivers, and vehicle mounted transceivers, comprise one of the largest sources of RFI. Some medical devices are especially sensitive to the type of digital modulation that some of the wireless communications devices utilize...

In the mid-1980s, the US Food and Drug Administration (FDA) had become aware that approximately 60 infants died in the United States while being monitored for breathing cessation by one model of apnea monitor. Subsequent tests have shown that this particular monitor is extremely susceptible to low level RF fields, including those from mobile communication base stations several hundred meters away and FM radio broadcast stations more than one kilometer away. Other apnea monitors have been shown to be similarly susceptible to malfunction.

Radiofrequency Interference with Medical Devices, Technical Information Statement, IEEE Committee on Man and Radiation. IEEE Engineering in Medicine and Biology Magazine 17(3):111-114 (1998)

<http://ewh.ieee.org/soc/embs/comar/interfer.htm>

Janet Newton, EMR Policy Institute.

The most seriously threatened are the NIH-estimated 20 million Americans with IMDs. This is eight to 10 percent of Americans. Smart meters and wireless broadband present the most serious threat because of their ubiquitous deployment throughout the public's living and working environments... FCC's RF limits certainly do not protect those with IMDs or who require critical care equipment that can malfunction in the presence of wireless signals from outside sources. Such malfunctions can be fatal...No federal agency keeps track of cumulative wireless radiation levels, nor identifies critical levels in locations where individuals with IMDs may be at risk.

Testimony to Department of Justice, December 2010 hearing on disabilities Exhibit G, Southern Californians For Wired Solutions To Smart Meters (SCWSSM) Protest Of SDG&E, SCE and PG&E applications for approval of Smart Grid Deployment Plans, A.11-06-006 et al., August 4, 2011

In addition to the serious danger of interference, potential hacking of medical devices has already been demonstrated for insulin pumps, pacemakers and implantable cardiac defibrillators (ICDs). A team of researchers from the Universities of Washington and Maryland and Harvard Medical Center affirmed that pacemakers and ICDs could be attacked. They intercepted personal data and telemetry. They were able to change settings and therapies, and they successfully triggered command shocks to induce fibrillation.

Next-generation IMDs [implantable medical devices], which may incorporate greater communications capabilities and be more networked, should not rely solely upon external mechanisms like firewalls on external devices and controlled distribution of commercial programmers. Firewalls on wireless programmers or Internet-connected at-home monitors do not immediately protect the wireless links themselves and may not protect the integrity of communications.

According to security researcher Jay Radcliffe, a diabetic,

An attacker could intercept wireless signals and then broadcast a stronger signal to change the blood-sugar level readout on an insulin pump so that the person wearing the pump would adjust their insulin dosage. If done repeatedly, it could kill a person. Radcliffe suggested scenarios where an attacker could be within a couple hundred feet of a victim, like being on the same airplane or on the same hospital floor, and then launch a wireless attack against the medical device. He added that with a powerful enough antenna, the malicious party could launch an attack from up to a half mile away.

Black Hat hacker can remote attack insulin pumps and kill people, Chenda Ngak
http://www.cbsnews.com/8301-501465_162-20088598-501465.html

Why would someone do it? Dr. William Maisel, assistant professor at Harvard Medical School:

"Motivation for such actions might include the acquisition of private information for financial gain or competitive advantage; damage to a device manufacturer's reputation; sabotage by a disgruntled employee, dissatisfied customer or terrorist to inflict financial or personal injury; or simply the satisfaction of the attacker's ego."

...if a medical device embedded in the body were to glitch out, seemingly malfunction, and cause a target's death, who would think to look at it as a long-range wireless assassination which left no smoking gun?

Pacemakers and Implantable Cardiac Defibrillators: Software Radio Attacks and Zero-Power Defenses, presented at 2008 IEEE Symposium on Security and Privacy

Medical conditions have already been targeted. One known incident is when epileptics were targeted by computer in 2008 to induce seizures when an epilepsy website was attacked. Evidence links this incident to the group Anonymous.

The incident, possibly the first computer attack to inflict physical harm on the victims, began Saturday, March 22, when attackers used a script to post hundreds of messages embedded with flashing animated gifs.

The attackers turned to a more effective tactic on Sunday, injecting JavaScript into some posts that redirected users' browsers to a page with a more complex image designed to trigger seizures in both photosensitive and pattern-sensitive epileptics.

Hackers Assault Epilepsy Patients via Computer, Kevin Poulsen March 28, 2008
<http://www.wired.com/politics/security/news/2008/03/epilepsy>

Whether Intentional or as a result of rapid proliferation of wireless or RF-emitting devices, interference is a real problem. Jackie Christensen who has a deep brain implant (her "battery operated brain" or BOB for short) for control of Parkinson's disease, writes of some of the things she has to avoid:

large magnets, commonly found in refrigerator doors, grocery-store freezer doors and stereo speakers; metal detectors used in airport security; antitheft systems in stores; MRIs -- basically all large sources of electromagnetic interference (EMI). Each time I see (the medical device programmer), the list of potential problem products or situations grows: invisible dog fencing, home gaming systems with wireless controllers (Wii, Xbox 360, PS3), and cell phones in breast pockets.

It seems that every day, there is a new wireless product: light switches, pest-control systems -- you name it. And now the corollary products to *block* wireless signals are beginning to emerge, such as a Japanese device whose makers claim it can block cell-phone signals within 100 feet. If it can do that to a cell phone, what can it do to BOB and me?

I now find myself cringing whenever I hear of a new wireless widget, as I wonder what its implications will be for BOB and me, and for those with cardiac pacemakers or defibrillators, which could also be affected. Some of us seem to be more sensitive to sources of EMI than others. We are the proverbial canaries in the coal mine.

This canary is not going to go quietly, nor simply begin building a nest of tinfoil to block the electromagnetic interference.

http://www.emrpolicy.org/science/forum/29june08_christensen_op_ed.pdf
Wireless effects on Parkinson's brain implants: Watch where you're beaming that signal

This was written in 2008, before the deployment of Smart Meters.

The question has to be asked: how many people have died due to Smart Meters?

HACKING/CYBERSECURITY

Division of Ratepayer Advocates:

It should be obvious that the pre-AMI meters had no security problems other than a minor amount of energy theft. The meters were mechanical and did not include any components that could be reprogrammed. Hence, no truck rolls were required to change software for the entire stock of meters. The situation is similar with the DSCI system examined in A.05-06-028. Mr. Vahlstrom readily admitted under cross-examination that the DCSI system is relatively impermeable to security threats. As Mr. Vahlstrom stated, "there is not much you can do to hack a nonprogrammable device" (RT I, 130:13-15).

...Mr. Vahlstrom added that the disconnect switches that are part of the upgrade make a system "much more appealing for people who want to do something" (RT I, 129:18-19).

Thus Mr. Vahlstrom's argument collapses into nothing more than a solution to a problem created by the enhanced functionality added by the AMI upgrade. It was not a problem with the system examined in A.05-06-028, nor with the pre-AMI meter stock. ...the enhanced functionality brings about security concerns that didn't exist previously...

Opening Brief of DRA, August 29, 2008, in Application of PG&E for Authority to Increase Revenue Requirements to Recover the Costs to Upgrade its SmartMeter™ Program, A. 07-12-009. p. 46- 48

The grid, as it transitions to a Smart Grid, is becoming less secure.

"Every endpoint [meter] is a new potential threat vector," according to Doug Powell, manager, SMI Security, Privacy & Safety, for Canadian utility BC Hydro.

<http://www.marketwatch.com/story/hacking-expert-david-chalk-joins-urgent-call-to-halt-smart-grid-2012-04-12>

Scientific American (October 2010)

"Connecting what are now isolated systems to the Internet will make it possible to gain access to remote sites through the use of modems, wireless networks, and both private and public networks," says Melissa Hathaway. "Achieving greater efficiency and control requires hooking almost every aspect of the electricity grid up to the Internet, making it more vulnerable to cyber attacks."

Power Hackers: The U.S. Smart Grid Is Shaping Up to Be Dangerously Insecure, Melissa Hathaway,

<http://www.scientificamerican.com/sciammag/?contents=2010-10>

Computerworld (October 2011)–

The U.S. government is keeping a wary eye on what it says is hacking collective Anonymous' growing interest in attacking critical infrastructure targets.

A DHS bulletin posted this week assesses the ability of the collective to inflict damage on industrial control systems that manage equipment at power plants, water treatment facilities, chemical plants and other potential targets.

The report says that Anonymous recently called on members to target energy companies. DHS said the call is likely to attract both members of the collective and the broader activist hacking community.

DHS issues warning that Anonymous may attack infrastructure, Jaikumar Vijayan
http://www.computerworld.com/s/article/9220951/DHS_issues_warning_that_Anonymous_may_attack_infrastructure

Massachusetts Institute of Technology: "Future of the Electric Grid" (December 2011):

"Millions of new communicating electronic devices ... will introduce attack vectors -- paths that attackers can use to gain access to computer systems or other communicating equipment. That increase[s] the risk of intentional and accidental communications disruptions," including "loss of control over grid devices, loss of communications between grid entities or control centers, or blackouts."

Cyber security: Power grid grows more vulnerable to attack, report finds, Mark Clayton,

<http://www.csmonitor.com/USA/2011/1206/Cyber-security-Power-grid-grows-more-vulnerable-to-attack-report-finds>

Pike Research white paper (November 2011):

Utility cyber-security is in a state of near chaos. After years of vendors selling point solutions, utilities investing in compliance minimums rather than full security, and attackers having nearly free rein, the attackers clearly have the upper hand. Many attacks simply cannot be defended.

<http://www.pikeresearch.com/research/utility-cyber-security>

Homeland Security Newswire (December 2011):

SCADA systems' vulnerability (is) key weakness in Smart Grid deployments

<http://www.homelandsecuritynewswire.com/dr20111212-scada-systems-vulnerability-key-weakness-in-smart-grid-deployments>

New York Times (March 2012)

During the five-month period between October and February, there were 86 reported attacks on computer systems in the United States that control critical infrastructure, factories and databases, according to the Department of Homeland Security, compared with 11 over the same period a year ago.

None of the attacks caused significant damage, but they were part of a spike in hacking attacks on networks and computers of all kinds over the same period. The department recorded more than 50,000 incidents since October, about 10,000 more than in the same period a year earlier, with an incident defined as any intrusion or attempted intrusion on a computer network.

James A. Lewis, a senior fellow and a specialist in computer security issues at the Center for Strategic and International Studies, a policy group in Washington, said that as hacking awareness had increased, attacks had become more common. He said that the attacks on the nation's infrastructure were particularly jarring.

He added: "We hit rock bottom on this in 2010. Then we hit rock bottom in 2011. And we are still at rock bottom. We were vulnerable before and now we're just more vulnerable. You can destroy physical infrastructure with a cyberattack just like you could with a bomb."

New Interest in Hacking as Threat to Security, Michael S. Schmidt

<http://www.nytimes.com/2012/03/14/us/new-interest-in-hacking-as-threat-to-us-security.html? r=1>

Chaos Communication Conference, Germany (January 2012)

"It takes an amateur hacker only two days to hack a home smart meter and fake the readings -- which could result in a utility bill showing absolutely no power consumption at all." Hackers also analyzed Smart Meter data and were able to identify "the number of PCs or LCD TVs in a home, what TV program was being watched, and if a DVD movie being played had copyright-protected material."

Hacking For Privacy: 2 days for amateur hacker to hack smart meter, fake readings

<http://www.networkworld.com/community/node/79486>

Secretary of Defense Leon Panetta (June 2011)

I've often said that there's a strong likelihood that the next Pearl Harbor that we confront could very well be a cyber attack that cripples our power systems, our grid.

<http://www.energynow.com/video/2011/08/13/guarding-grid-08142011>

<http://abcnews.go.com/News/cia-director-leon-panetta-warns-cyber-pearl-harbor/story?id=12888905>

Now he has gone even further in a news report dated October 11, 2012:

In a speech before business executives in New York, Panetta revealed that cyber intruders have already gained access to some of America's critical control systems that run chemical, electric and water systems with the intent to "cause panic, destruction and loss of life."

<http://usnews.nbcnews.com/news/2012/10/11/14376572-panetta-cyber-intruders-have-already-infiltrated-us-systems?lite>

Panetta: Cyber intruders have already infiltrated US systems

Furthermore, it was reported in November (2012);

Last month an attack was carried out on the Telvent, the maker of software and services meant to be used with smart grid networks. The attack was announced as a breach of Telvent's internet firewall and security systems, and Telvent officials said the attack included the installation of malicious software and the theft of project files for OASyS SCADA...

In a time where these SCADA systems are used to regulate the electrical grid through the Internet or over phone lines, a serious attack can result in electricity being denied to hundreds of thousands of people.

<http://www.militaryaerospace.com/blogs/aerospace-defense-blog/2012/11/electrical-grid-attacked-cybersecurity-more-important-now-than-ever.html>

Electrical grid attacked, cybersecurity more important now than ever, Military & Aerospace, November 6, 2012

"100% certainty of catastrophic failure of energy grid within 3 years," says security expert David Chalk.

Chalk's strong words come amidst increasing reports of the smart grid's fatal insecurities, even from the governments and energy companies who are forcing their hand with the smart program. "Every endpoint [meter] is a new potential threat vector," according to Doug Powell, manager, SMI Security, Privacy & Safety, for Canadian utility BC Hydro.

"We're in a state of crisis," said Chalk. "The front door is open and there is no lock to be had. There is not a power meter or device on the grid that is protected from hacking - if not already infected - with some sort of trojan horse that can cause the grid to be shut down or completely annihilated."

"One of the most amazing things that has happened to mankind in the last 100 years is the Internet. It's given us possibility beyond our wildest imagination. But we also know the vulnerabilities that exist inside of it. And then we have the backbone, the power grid that powers our nations. Those two are coming together. And it's the smart meter on your home or business that's now allowing that connectivity.

"Unless we wake up and realize what we're doing, there is 100% certainty of total catastrophic failure of the entire power infrastructure within 3 years," said Chalk. "This could actually be worse than a nuclear war, because it would happen everywhere. How governments and utilities are blindly merging the power grid with the Internet, and effectively without any protection, is insanity at its finest."

Hacking Expert David Chalk Joins Urgent Call to Halt Smart Grid

<http://www.marketwatch.com/story/hacking-expert-david-chalk-joins-urgent-call-to-halt-smart-grid-2012-04-12>

Former CIA Director James Woolsey (August 2011):

"What they're doing now, they're constructing what they call a 'Smart Grid.' ... And a so-called 'Smart Grid' that is as vulnerable as what we've got is not smart at all, it's a really, really stupid grid."

<http://www.energynow.com/video/2011/08/13/guarding-grid-08142011>

Texas A&M (2010)

Attackers could manipulate power-grid data by breaking into substations and intercepting communications between substations, grid operators, and electricity suppliers. This data is used by grid operators to set prices for electricity and to balance supply and demand, the researchers say. Grid hackers could make millions of dollars at the expense of electricity consumers by influencing electricity markets. They could also make the grid unstable, causing blackouts.

The attacks would be difficult to trace, according to Le Xie, an assistant professor of electrical and computer engineering at Texas A&M University, speaking at the IEEE SmartGridComm2010 conference in Gaithersburg, Maryland, this week.

... Fixing the vulnerability will not be easy either.

...Deepa Kundur, a professor of electrical and computer engineering at Texas A&M, is developing simulations to help determine the risks involved. "It's not yet clear whether the smart grid will be worth the risks," she says.

How to Hack the Power Grid for Fun and Profit, Kevin Bullis
<http://mobile.technologyreview.com/energy/26472/>

Governmental Accounting Office (January 2011)

With respect to challenges to securing smart grid systems, GAO identified the following six key challenges:

- Aspects of the regulatory environment may make it difficult to ensure smart grid systems' cybersecurity.
- Consumers are not adequately informed about the benefits, costs, and risks associated with smart grid systems.
- Utilities are focusing on regulatory compliance instead of comprehensive security.
- There is a lack of security features being built into certain smart grid systems.
- The electric industry does not have an effective mechanism for sharing information on cybersecurity.
- The electricity industry does not have metrics for evaluating cybersecurity.

<http://www.gao.gov/new.items/d11117.pdf>

GAO: Electricity Grid Modernization

John McNabb, security expert (August 2011)

The smarter water meters become, the easier they're getting to hack. Like many things in electronics, water meters become easier for hackers to break into and misuse when they are upgraded to include wireless and computer technology.

The problem with the wireless water meters is that they are vulnerable because of the wireless medium they use. Communications are not encrypted (largely due to higher costs) and so they are easily intercepted, faked or even jammed. The sensors are unattended and hang on the meter, outside the house, and so they are easily tampered with. The cyber attacks against them can be active, where commands are issued to them, or passive, where the data is taken.

If people want to reduce their water bills, they could hack the sensors. They could also increase the bill paid by a neighbor they don't like, or evade restrictions on the amount of water used. And since the usage of water indicates the presence or absence of the homeowner, the hacked water meters can be used for surveillance purposes.

<http://venturebeat.com/2011/08/06/hacking-water-meters-is-easier-than-it-should-be/>

Hacking water meters is easier than it should be, August 6, 2011

University of South Carolina (November 2012)

Researchers at the University of South Carolina have discovered that some types of electricity meter are broadcasting unencrypted information that, with the right software, would enable eavesdroppers to determine whether you're at home.

The meters, called AMR (automatic meter reading) in the utility industry, are a first-generation smart meter technology and they are installed in one third of American homes and businesses. They are intended to make it easy for utilities to collect meter readings. Instead of requiring access to your home, workers need simply drive or walk by a house with a handheld terminal and the current meter reading can be received.

While many gas and water AMR meters continuously listen for a query signal from a meter reading terminal and only transmit a reading when requested, the researchers found at least one type of electricity meter works on the opposite principle. It continuously sends a meter reading every 30 seconds around the clock.

...said Wenyuan Xu, an assistant professor at the University of South Carolina, speaking to IDG News Service. "We thought about privacy and wondered how secure are the meters currently in use."

It turns out, not very.

...The good news is a new generation of meters based on a more advanced technology, called AMI (advanced metering infrastructure), are supposed to employ encryption. Guidelines from the National Institute of Standards and Technology's Smart Grid Interoperability Panel made such a recommendation in a 2010 report.

But that's too late for the AMR meters already installed across the U.S.

There are 46 million AMR meters in use in 2011, according to a U.S. Department of Energy report. That represents about one in three houses and businesses. While they are likely to be replaced with AMI meters, the slow upgrade cycle of utility companies could mean they remain in use for years to come.

http://www.computerworld.com/s/article/9233265/Smart_meters_not_so_clever_about_privacy_researchers_find

Smart meters not so clever about privacy, researchers find, November 5, 2012

David Dilworth, Director of Helping our Peninsula's Environment, found out not only that data is from PG&E is not encrypted until it reaches the collector antennas, but that it is relatively easy to get remote disconnect codes. He relates this incident:

A local scientist, Monterey Councilman Jeff Haferman, raised a concern at a Monterey Council meeting about Smartmeters. He asked "If PG&E (local electric power provider) can turn off your power remotely with a smartmeter, what keeps a hacker from doing that?" Or worse, he asked "what keeps a hacker from turning off whole neighborhoods – or an entire community?"

The PG&E representative was silent until prompted to respond. "I don't have any information on that. I'll get back to you." That was in February (2011), it's now October and PG&E has made no response or answer yet.

What we have learned since then is that your data going out and PG&E's "Power Shutoff" radio commands are not encrypted at the neighborhood level. This means "Smart"meter communication data is in "plain English" — it is readable by anyone with a laptop and WiFi. This means your so-called "Smart"meter is easily controlled by anyone with a laptop and a WiFi. Is this a wild speculative fantasy? No.

<http://daviddilworth.com/pol/smartmeters-facilitate-cyber-war-against-us/>

SmartMeters Facilitate Cyber War Against US, November 2011

He then relates a very simple procedure for discovering "shut-off" commands, which then can be used "to shut down your house electricity and millions of others – and probably all electricity and gas for your community's businesses and government as well."

Finally,

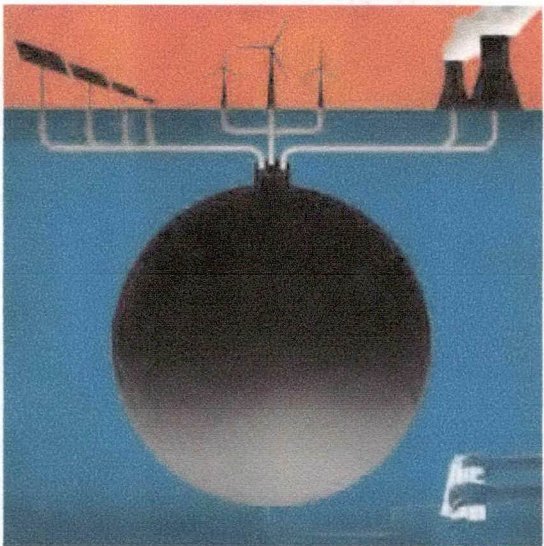
Defcon Hobbyist hackers have built a DIY flying spy drone that's capable of intercepting communications over remote Wi-Fi and cellular networks and beaming them to snoops located half a world away.

Short for wireless aerial surveillance platform, the WASP is equipped with a battery of off-the-shelf hacking tools that can secretly hover over unsuspecting targets and infiltrate their networks. A 4G cellular connection links it to a back-end server that allows operators to control its operations and monitor its sensors in realtime. All of the tools have been around for years, or even decades. What makes WASP novel is their all-in-one packaging in a 14-pound plane that can penetrate a target's geographical boundaries to tap a variety of electronic sources.

...At 27 inches high and 76 inches long, WASP can reach altitudes of 22,000 feet. It's equipped with a small computer running BackTrack 5, a penetration-testing tool that contains more than 500 separate components for hacking wireless networks, voice-over IP servers and other sensitive systems.

DIY aerial drone monitors Wi-Fi, GSM networks/Passwords cracked on the fly,
Dan Goodin, August 2011

http://www.theregister.co.uk/2011/08/05/flying_spy_drone/



REMOTE DISCONNECTION OF POWER

AARP, National Consumer Law Center, and Public Citizen:

¹ John Hersey, illustrator

<http://www.scientificamerican.com/sciammag/?contents=2010-10>

...Another major consumer concern that has yet to be addressed by smart metering proponents is the threat smart meters pose to consumer protections that have been developed over the last 30 years. Smart meters have been touted by industry proponents as offering the benefit of remote disconnection. From a consumer perspective, this is not a benefit but rather an erosion of fundamental consumer rights.

AARP, National Consumer Law Center, and Public Citizen Comments to: DEPARTMENT OF ENERGY Smart Grid RFI: Addressing Policy and Logistical Challenges, November 1, 2010," David Certner et al.

[http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/AARPNCLCPublic CitizenCommentsDOE1101.pdf](http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/AARPNCLCPublic%20CitizenCommentsDOE1101.pdf)

Quoted in

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

State of Maine, Office of Public Advocate:

While current PUC rules allow for this, we view this as very risky because of the possibility that the wrong house will be disconnected or that reconnection will malfunction. Also, when a CMP worker physically visits the premises to disconnect the power it not only reduces the chance of a wrongful disconnection, it also gives a non-paying customer one last chance to pay and avoid the dark. These benefits and protections vanish with AMI.

<http://www.maine.gov/meopa/smartgrid/index.shtml>

It's not just the dark. Particularly in hot summer or cold winter areas, or those who have medical devices or must keep the temperature at a certain level because of health problems, the risk to human life is substantial. In Wisconsin, the utilities cannot disconnect power from Nov. 1- April 15. In Maine, it is from Nov. 15 – April 15. However, does California have a similar law? What if people cannot pay their bill during hot or cold weather? What if elderly people who have become forgetful, forget to pay their bill? What if there is a mistake? There may be no second chance when the power is disconnected. A simple check by a human can remind someone to pay the bill, or give information on financial help to pay the bill, or verify that it is the right address.

Residential customers who are remotely disconnected without a last chance to make payment arrangements, or who shut themselves off with no utility contact (when their prepayment card runs out of funds) are at great risk in terms of health and safety.

A recent investigative news report from Texas (where deregulated electricity commodity vendors can offer service on a pre-paid only basis) tells of vulnerable pre-payment electricity customers being cut off without notice. Families with children have had to abandon their homes. A paraplegic who requires air conditioning to maintain a

safe body temperature lost his electricity on days when the temperature exceeded 100 degrees.

A heart failure patient who needed power for an oxygen machine was cut off twice by her pre-payment meter in one summer.

The risks of disconnection by remote control or by automatic action of a pre-payment meter or service limiter are also shown in the case of a 90-year old Michigan man who froze to death in his own kitchen last winter. When he was found, there were funds to pay for his bill on the table. But he had missed a payment and the utility had installed a service limiter. When the service limiter tripped, the gentleman could not or did not know how to reset the limiter.

Customers whose utilities are disconnected have died from hypothermia, from fires set by candles used for lighting in the absence of electricity, and from other consequences of loss of power. The concern of consumer advocates over the dangers of involuntary remote controls on household usage cannot be overstated.

AARP, National Consumer Law Center, and Public Citizen Comments to Department of Energy Smart Grid RFI: Addressing Policy and Logistical Challenges, November 1, 2010," David Certner et al.

http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/AARPNCLCPublic_CitizenCommentsDOE1101.pdf quoted in <https://sites.google.com/site/nocelltowerinourneighborhood/home/wireless-smart-meter-concerns/going-deep-understanding-the-big-picture-and-real-costs-and-concerns>

And with a remote shut-off, what are the possibilities of the signal going to the wrong house? With potential for mistakes, especially with this wirelessly involved system, the wrong household pays the consequences.

There are too many ways for this system to fall apart and harm people, especially with utility companies that already exhibit a disregard for the public's welfare or have difficulty with existing record-keeping.

It's just too easy to flip a switch back at the head office.

Los Angeles Times, February 5, 2010:

The Division of Ratepayer Advocates speculates that widespread installation of Smart Meters is part of the 75% increase in low-income shut-offs and 40% overall shut-offs by PG&E between Sept. 2008 and Sept. 2009, compared with the previous twelve months.

Jump in service disconnections sparks move by California, Marc Lifsher, 2/5/10
<http://articles.latimes.com/2010/feb/05/business/la-fi-puc-disconnect5-2010feb05>

Also: http://abclocal.go.com/kgo/story?section=news/7_on_your_side&id=7555472

However, of much greater impact is the threat of intentional disconnection by those with a little technical know-how (previously discussed under "Hacking/Cybersecurity"). They could disconnect an individual home, a neighborhood, a city, a region, or our nation. "They" could be a disgruntled ex-spouse or neighbor, a gang, a mischief-maker, or a terrorist. The cost of injury and death, and damage to our society is beyond calculating. We depend on electricity for even the most basic needs, such as power for pumping water. If these fail, most people have no back-up plan. And if it occurred in extreme weather areas, during the summer or the winter, with no way to cool or heat, the consequences would be horrifying.

And then, there is the threat to our nuclear reactors.

VULNERABILITY OF NUCLEAR FACILITIES

Nuclear reactors depend on external electrical power for their energy requirements.

Arne Gundersen:

...the most likely type of a nuclear accident is caused by a loss of offsite power. That is what happened at Fukushima: the power system AROUND the plant broke down. If that happens, not only will the plant not have power, but the street lights won't work. According to the NRC, the street lights DO work. Not only that, but your home lighting won't work and your radio and TV won't work. But according to the NRC, you will be able to contact the outside world by phones or by radio or by television.

But remember the most likely cause of a nuclear accident is loss of offsite power and that has NEVER been part of an emergency plan, assuming that all of that does not work.

<http://fairewinds.com/content/white-house-nrc-recommend-50-mile-fukushima-evacuation-yet-insist-us-safe-only-10>

If power is disconnected to these facilities, from whatever cause, generators must be relied on instantly to function. Energy must be available constantly to keep fuel rods and reactor cores cool.

A failure in this system, a failure in being able to shut down a reactor safely, could result in a nuclear disaster at each and every nuclear reactor, not just in California, but across the United States, affecting all of us.

That would create Fukushimas many times over.

Greg Palast:

A page from the notebook of an Emergency Diesel Generator expert, R.D. Jacobs, hired to monitor a test for a nuclear reactor's back-up cooling system.

This is to record that on my last visit,....I pressed [a company executive] saying that we just did not know what the axial vibration of the crankshaft was doing to the [diesel] units. I was unable to impress him sufficiently.

The diesels were "tested" by turning them on for a few minutes at low power. They worked fine. But R.D., a straight shooter, suspected problems. He wanted the motors opened and inspected. He was told by power company management to go to hell.

When we forced the plant builder [in Suffolk County, New York] to test the three Emergency Diesel Generators in emergency conditions, one failed almost immediately (the crankshaft snapped, as R.D.[Jacobs] predicted), then the second, then the third. We named the three diesels "Snap, Crackle, and Pop."

...I knew that all these diesels were basically designed, or even taken from, cruise ship engine rooms or old locomotives. . I'm not an engineer, but I suspect a motor designed for a leisurely float in Bermuda is not fit for a life-and-death scramble. So, I asked [an industry insider], "They really can't work at all, the diesels, can they?"

That's when he introduced me to the phrase "crash start."

On a ship, he explained, you would take half an hour to warm up the bearings, and then slowly build up to "critical" crankshaft speed, and only then add the "load." the propeller...

That's for sailing. But in a nuclear emergency, "the diesels have to go from stationary to taking a full load in less than ten seconds."

Worse, to avoid having to buy additional diesels, the nuclear operators turbo-charge them, revving them to 4,000 horsepower in ten seconds when they are designed for half that output.

The result: snap, crackle, pop.

I learned that, at Fukushima, at least two of the diesels failed before the tsunami hit. What destroyed those diesels was turning them on. In other words, the diesels are junk, are crap, are not capable of getting up to full power in seconds, then run continuously for days....

"So, you saying emergency diesels can't work in an emergency?"

"Actually, they're just not designed for it."
from Vulture's Picnic, p. 294-297

This is the present system in place to protect all of us in case of a power outage to nuclear reactors.

Former NRC Chairman Gregory Jaczko:

The events at Fukushima reinforce that any nuclear accident with public health and safety or environmental consequences of that magnitude, is inherently unacceptable. But we focused on the radiological consequences of this event. I believe we cannot ignore the large social and economic consequences such an event poses to any country with a nuclear facility that deals with such a crisis.

In Japan, more than 90,000 people remain displaced from their homes and land, with some having no prospect for a return to their previous lifestyle in the foreseeable future. While not easy to characterize, these are significant hardships on these people and they are inherently unacceptable. So as we look to the future and we look in a proactive way, we ultimately will have to address the issue of how do we deal with nuclear events that lead to significant land contamination. And displacement, perhaps permanently, of people from their homes and their livelihoods and their communities.

Arne Gundersen:

What you have just heard was the Nuclear Regulatory Commission's chairman, Gregory Jaczko, saying that the NRC does not take into account mass evacuations and people not getting back on their land for centuries when it does a cost benefit analysis as to whether or not a nuclear plant should be licensed.

<http://fairewinds.com/content/tokyo-soil-samples-would-be-considered-nuclear-waste-us>

Nor is it taken into account when considering the cost/benefit analysis of a Smart Grid, such as we have, or whether it should be built.

VULNERABILITY TO ELECTROMAGNETIC PULSES (EMPs)

Natural or Manmade

From Wikipedia, the free encyclopedia

An electromagnetic pulse (sometimes abbreviated EMP) is a burst of electromagnetic radiation. The abrupt pulse of electromagnetic radiation usually results from certain types of high energy explosions, especially a nuclear explosion, or from a suddenly fluctuating magnetic field. The resulting rapidly-changing electric fields and magnetic fields may couple with electrical/electronic systems to produce damaging current and voltage surges.

An EMP occurred in 1859 caused by the sun. It is known as a Carrington event, after solar astronomer Richard Carrington who observed it. It caused major problems for telegraph communications worldwide. We did not then have an electrical grid as we do now, with so much dependent on it. Much weaker solar storms since then have disrupted the electric grid and even melted transformers, and disrupted telephone communications, as well as ground-to-satellite communications and GPS navigation systems.

"More than 35 years ago, I began drawing the attention of the space physics community to the 1859 flare and its impact on telecommunications," says Louis J. Lanzerotti, retired Distinguished Member of Technical Staff at Bell Laboratories and current editor of the journal Space Weather... Lanzerotti points out that as electronic technologies have become more sophisticated and more embedded into everyday life, they have also become more vulnerable to solar activity.

A Super Solar Flare

http://science.nasa.gov/science-news/science-at-nasa/2008/06may_carringtonflare/

Washington State Department of Health

When "detonated," an EMP weapon produces a pulse of energy that creates a powerful electromagnetic field capable of short-circuiting a wide range of electronic equipment, particularly computers, satellites, radios, radar receivers and even civilian traffic lights. Since EMP is electromagnetic energy traveling at the speed of light, all of the vulnerable electronic equipment in the detonation zone could be affected simultaneously.

Society has entered the information age and is dependent on electronic systems that work with components that are very susceptible to excessive electric currents and voltages. Many of these electronic systems are controlled in some way by semiconductors. Semiconductor devices fail when they encounter an EMP because of the local heating that occurs. Failure of semi-conductive chips could destroy industrial processes, railway networks, power and phone systems, and access to water supplies.

Telecommunications equipment can be highly vulnerable and receivers of all varieties are particularly sensitive to EMP. Therefore radar and electronic warfare equipment, satellite, microwave, UHF, VHF, HF and low band communications equipment and television equipment are all potentially vulnerable to the EMP effect. Cars with electronic ignition systems/ and ignition chips are also vulnerable.

Some other notable collectors of EMP include railroad tracks, large antennas, pipes, cables, wires in buildings, and metal fencing. Although materials underground are partially shielded by the ground, they are still collectors, and these collectors deliver the EMP energy to some larger facility. This produces surges that can destroy the connected device, such as, power generators or long distance telephone systems.

Department of Health: Division of Environmental Health, Office of Radiation Protection
<http://www.doh.wa.gov/ehp/rp/factsheets/factsheets-htm/fs41elecpluls.htm>

This discussion is about a localized weapon, not about a general electrical storm over the earth.

Austrian Medical Association, February 2012 –

To date, the Interference resistance of smart meters is not clarified in the case of elevated solar activity. From NASA there are corresponding warnings for the years 2012 to 2014. This could lead to an increased risk to total failure of the power supply.

<http://www.aerztekammer.at>

Dr. Peter Vincent Pry, former Director of the US Nuclear Strategy Forum and President of EMPact America:

“... given our current state of unpreparedness, within 12 months of an EMP event, about two-thirds of the U.S. total population... would perish from starvation, disease and societal collapse.”

Cited in “Smart Meters – Smarter Practices,” Dr. Isaac Jamieson, for the Radiation Research Trust

http://www.radiationresearch.org/index.php?option=com_content&view=article&id=173

British House of Commons Defense Committee report on EMP as a developing threat:

Written evidence from the Government suggests that a severe space weather event, with resulting damage, may occur in the next few years...with the potential to cause damage to electrically conducting systems such as power grids, pipelines and signaling circuits....

The US National Research Council estimated the wider societal and economic costs of a severe geomagnetic storm occurring today to be around \$1-2 trillion...

It is essential that this hazard is sufficiently recognized and addressed by the Government and relevant civil bodies...

It is therefore vitally important that the work of hardening UK infrastructure is begun now and carried out as a matter of urgency.

Cited by Jamieson, 2/23/12

Isaac Jamieson, PhD, author of “Smart Meters - Smarter Practices”, commenting on the EMP risk at the Consumer Focus Meeting (UK), Feb. 23, 2012:

“A large scale EMP event would cause a devastating loss of life, with Smart Meters in their current configuration being far more vulnerable to damage than traditional analogue meters.”

Cited in Comments on CPUC staff report on Smart Grid deployment workshops, A.11-06-006, page 8-10. <http://docs.cpuc.ca.gov/efile/CM/162030.pdf>

Center for Electrosmog Prevention, March 2012:

Setting up our vital power grids to be more vulnerable to EMP events and tampering by relying on wireless infrastructure and in the control of multinational private corporations is irresponsible and may even be considered by some to be an act aiding and abetting our nation’s enemies.

Comments on CPUC staff report on Smart Grid deployment workshops, A.11-06-006, page 8-10. <http://docs.cpuc.ca.gov/efile/CM/162030.pdf>

NO UTILITY LIABILITY FOR HACKED DATA

CPUC, July 2011:

The utility is not liable for the third party’s use of the usage data since the usage data is not provided to the third party pursuant to a contractual arrangement with the utility... At this time in the evolution of the Smart Grid, the distinctions drawn here are reasonable for several reasons. First, the consumer has a right to the usage data. Second, under the rules adopted in this decision, the consumer can elect at any time to discontinue the provision of the data to the third party. Third, it is not reasonable to require utilities to police privacy policies of those entities who receive information pursuant to Commission requirement or customer wishes.

CPUC Decision Adopting Rules to Protect the Privacy and Security of the Electricity Usage Data, Rulemaking 08-12-009, p. 35, 7-29-2011
http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/140369.PDF

It does not appear that any provision was made for hacked data; hence, there is no liability to the utility, even though the utility created the situation from the beginning.

INCREASED BURGLARY RISK

Access to our energy usage data, which can be obtained wirelessly or from any one of the many companies with legal access to the data, will reveal when we are home and what room we are in, and when we are away.

Very alarming is the research by Dr. Andrew Michrowski that metal and metal infrastructure are suffering much more rapid corrosion due to radiofrequency and microwave radiation, "because cyclic pulsing at millions of times-per-second (or more) rapidly fatigues metal at the molecular level."

There has been a significant increase in corrosion problems in the last few decades, parallel to the spread and implementation of wireless technologies. Whereas in the 1970s, only a small number of engineers consulted on corrosion problems, now a full quarter of all engineers in North America are experts in corrosion trying to resolve problems associated with building structures, water and oil and gas pipelines, fluid containers. How radiofrequencies affect corrosion can be verified by anyone who replaces a fluorescent compact bulb [which typically emit RF] into a metallic fixture that once had an incandescent bulb. It takes only a few weeks to have the onset of paint coating corroding in lamp holders, followed by the steady eating away of metallic sheeting. Likewise, one can see which urban areas are exposed to elevated levels of microwave emissions: where sewer and telephone service covers rust – actually powder away rather than just coat themselves with oxidation, where fire hydrants crumble – even if installed within the previous 6 months - that is likely to be a zone subject to microwave emissions. Normally, such fittings last problem-free for decades. This is an effect of enormous burden to tax and rate-payers.

In 2008 the Federation of Canadian Municipalities has made an emergency plea to the federal government for \$123 Billion within 5 years to avoid building collapses in Canadian cities due to corrosion, which only emphasizes how outrageously expensive for our civilization is this problem of accelerated corrosion from radiofrequencies and microwaves is. What is little known is that most corrosion is induced by weak voltages and amperages from net currents in our electric power delivery systems, which are imbalanced. What is even less known that as the electric power system becomes more affected by the use of computers and wireless systems, radiofrequencies and microwaves penetrate the electric power system's ground via neutral wires. The ground in many populated areas now carries charges that are highly electronic with radiofrequency and microwave characteristics. This new phenomenon accelerates corrosion of materials – whether pipelines, rebars in buildings and transportation infrastructure or even nuclear power plant reactor rods - by quantum leaps. Galvanic coupling between alloys and hydrogen and e particles is accelerated, leading to hydrogen-induced cracking in steels. This conduction of charges has been observed with electrochemical impedance spectroscopy (EIS) and reported this year by scientists from Atomic Energy of Canada and the National Research Council of Canada. There is also greater spattering of deposits, crevice enhancements and oxidation reactions.

Electromagnetic fields: high-level microwave technology concerns. p. 9-10

Other effects, including corrosion (see the boxes as “non-wave-effects”: “electrochemical”, “chemical” → “rate of chemical reactions”; “chemical bonding”, “interaction with ferromagnetic materials”), are documented at intensities well below those that are able to heat body tissue, which were explained in the 1972 Canadian National Research Council flow charts... [see following page]

Wi-Fi, SMART meters, wireless gadgets – are they safe? p. 6
Whole Life Expo, Toronto, November 27, 2011

Dr. Michrowski and other experts are noticing that all electric power grids are being hit by the burgeoning use of wireless systems, radiofrequencies and microwaves that piggyback on the electrical distribution’s system’s “ground”.

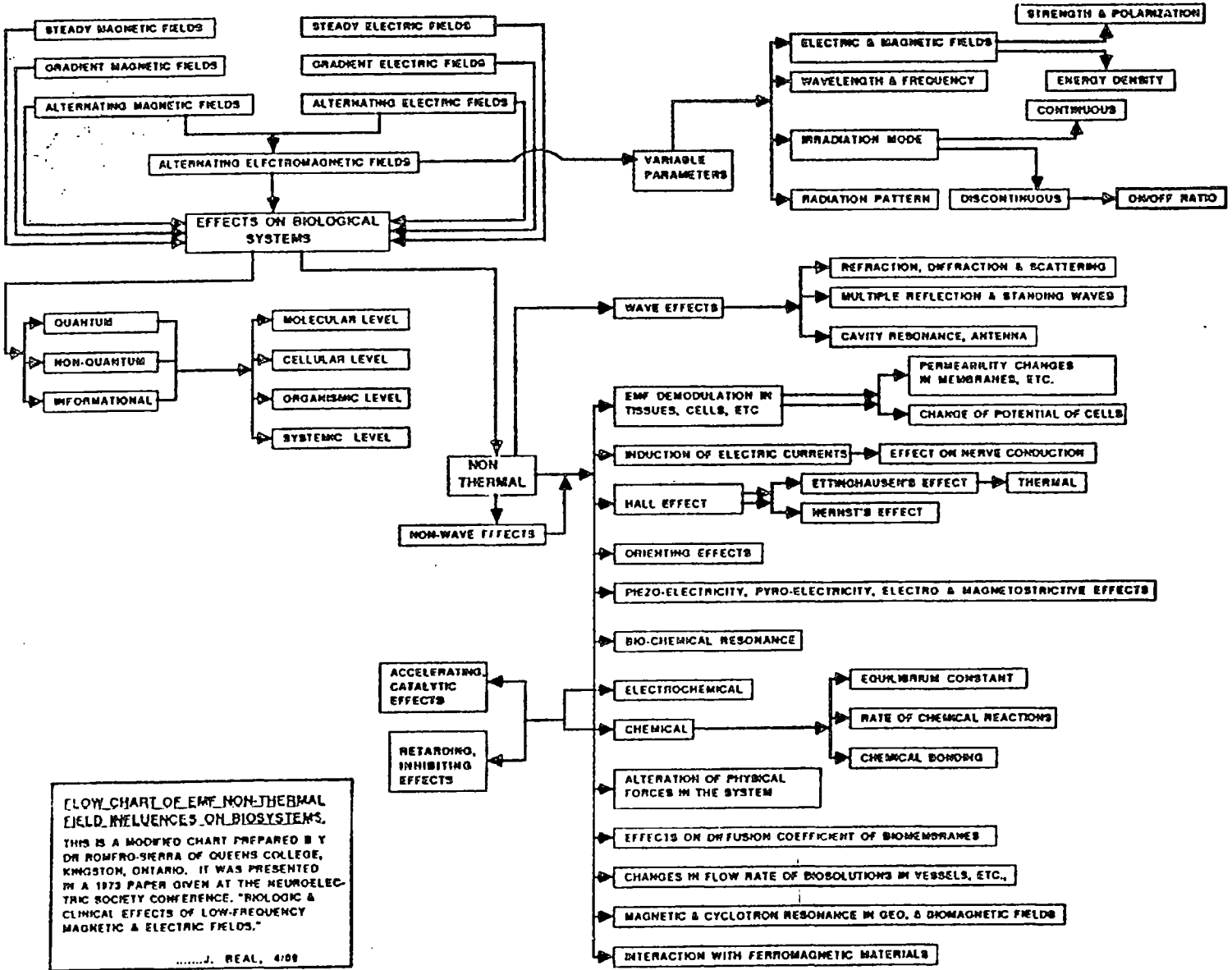
“The ground in many populated areas now carries charges that are highly electronic with radiofrequency and microwave characteristics. This new phenomenon accelerates corrosion of materials – whether pipelines, rebar in buildings and transportation infrastructure or even nuclear power plant reactor rods – by quantum leaps,” Dr. Michrowski explains. This deterioration is occurring because cyclic pulsing at millions of times-per-second (or more) rapidly fatigues metal at the molecular level.

Home wiring, nails and other metal fasteners, as well as electrical equipment, fuse boxes and metallic siding and framing are literally being rotted by invisible wireless harmonics that are now being found to violate building and electrical codes across North America. Instead of being addressed, wireless pitting of metal is about to be ramped up worldwide with the introduction of continuously pulsing smart meter and Radio Frequency ID (RFID) reporting grids operating at ever-rising frequencies. Buildings, bridges and pipelines are also facing early failure and collapse unanticipated by the engineers who designed them.

Nuclear power stations are especially vulnerable because nuclear radiation is already known to rot concrete, rebar, valves, pipes, tubing – even critical zirconium cladding around fuel rods. Acids, stress and water are other causes of nuke plant corrosion that may interact synergistically with nuclear and electromagnetic radiation to speed component failure. Experts like Dr. Michrowski fear that electromagnetic radiation is further shortening the already drastically reduced life-spans of nuclear power plants – many of which in the USA are currently being re-licensed for greatly increased power output beyond their designed life.

Bolstering their alarm are findings from a court hearing in Granby, PQ, took place September 19- 23, 2011.

As an expert witness, Dr. Andrew Michrowski of the Planetary Association for Clean Energy (PACE) was there from Monday to Thursday, and the final legal statements were made Friday.



FLOW CHART OF EMF NON-THERMAL FIELD INFLUENCES ON BIOSYSTEMS.
 THIS IS A MODIFIED CHART PREPARED BY DR ROMERO-SIERRA OF QUEENS COLLEGE, KINGSTON, ONTARIO. IT WAS PRESENTED IN A 1973 PAPER GIVEN AT THE NEUROELECTRIC SOCIETY CONFERENCE. "BIOLOGIC & CLINICAL EFFECTS OF LOW-FREQUENCY MAGNETIC & ELECTRIC FIELDS."
J. REAL, 4:08

Under cross-examination, Hydro Québec representatives admitted that they had measuring equipment of the highest sensitivity, they had never reported their findings. Hydro Quebec's measurements showed not only harmonics content, but also other emissions into the radio frequency range along the transmission line.

Dr. Michrowski writes: "In that urban-development district, some sewer tops (manhole covers) were rapidly rusting – or, more accurately, "shrinking" – in a strange non-rust-like colour. Instead of the familiar reddish-brown of oxidized iron, the surface was turning yellow (with spots) then orange. "I was able to obtain the power density data. At the wireless technology bandwidth the phenomenon became pronounced: in a few months the equivalent of 1 to 2 decades of traditional rust-corrosion was occurring.

"Then, as a presenter at the National Association of Corrosion Engineers (NACE) international meeting in Ottawa, I attended a series of thesis presentations by several teams of University of Waterloo students who were reporting a new type of corrosion. Their observations were taken at the Chalk River nuclear reactor (Atomic Energy of Canada Limited, the world's largest research reactor and one of the first to be built). It had been in good maintenance for decades – until recently.

"Their data revealed a linearly frequency-dependent, electron-stripping process that is so accelerated that there is no time available for oxidation (normal, red-brown rusting) to occur. This new corrosion phenomenon follows a fractal geometry pattern (branching out after each penetration-stripping), rather than progressing layer by layer. "This new branching degenerative phenomenon is designated 'Pit Corrosion'.

"Even without the use of sophisticated meters, you can now observe across the landscape –where there is significant presence of background microwave emissions – reinforced concrete sidewalks, bridges, and building foundations being 'eaten away'. Weakened window frames, popping panes and so on, are occurring. "Adding to the overload are more wireless gadgets: so-called SMART meters...

"Meanwhile Canadian municipalities express alarm, getting up-in-arms over the extraordinary new maintenance expenditures – many billions of dollars (trillions for their US colleagues) – which they face trying to maintain the provision of essential services. The infrastructure is corroding away thousands of times faster than planners expected their amortization plans to cover."

Oops! may be our epitaph.

<http://willthomasonline.net/smart%20meter%20insistence%20bowing%20to%20resistance.htm>

Smart Meter Insistence Bowing to Resistance, Will Thomas

Electromagnetically-induced Hydrogen diffusion has become so commonplace under such environmental conditions that a Russian scientist, P. S. Orlov proposed this year a

method of locating underground corroded (hydrogen saturated/embrittled) steel gas-supply pipes simply by measuring hydrogen leakages.

Electromagnetic fields: Questions and answers about wireless technologies,
2007 Whole Earth Expo

Who cares if the increase in wireless signals in environment corrodes bridges, basements of large buildings, bursts pipelines, water mains, gas mains, pops windows out of buildings, dissolves fire hydrants, sidewalks, sewer tops. Who cares...— as long as “boardrooms” are happy with the prospects of new, short term business - regardless of the trillions of dollars of losses to Canadian taxpayers due to emergent damages in the coming years.

Wi-Fi, SMART meters, wireless gadgets – are they safe? Whole Life Expo 2011
Toronto, November 27, 2011

Infrastructure impacts are critical and costly issues which must be examined.

NOTE: Dr. Andrew Michrowski can be contacted at:

The Planetary Association for Clean Energy, Inc.
Ontario, Canada
Email: paceincnet@gmail.com

IMPACTS TO BUILDING INTEGRITY

Curtis Bennett, Thermographix Consulting Corporation, in a letter to the British Columbia government, warns about the “molecular earthquakes” from Smart Meters and other wireless devices that threaten building integrity.

Building Code and Fire Separations

Blanketing areas with frequencies for ease of communication has serious ramifications on buildings and infrastructure that requires immediate attention. (British Columbia) Building Code and Part 4 don't want buildings subjected to molecular earthquakes. If you aggressively vibrate or electromagnetically induce everything, engineers, education, fire services and professionals at many levels have to be informed. You will have catastrophic failures with a domino effect at several levels....

Natural EMFs like solar radiation are so important, it is addressed in building codes.... We wire and construct building development as well as infrastructure to keep people safe from EMFs. We run cables instead of single conductors so the 60 Hz EMFs from each conductor cancel each other out. When we don't, the expanding and collapsing EMFs from singular wires would impact anything they interact with...

Frequencies blasting across the atmosphere to communicate with smart devices will interact with all infrastructure including industry. Electromagnetically induction and high

speed vibrations penetrating concrete isn't our objective. Whether smart meters on buildings or Wi-Fi in schools, frequencies are going through walls and structures. Towers, collectors or wireless infrastructure is communicating with meters and meter banks. The frequencies are blasting buildings, everything on the way there and going through structural components as well as fire separations. 900 MHz [electric Smart Meters] going through walls is going to cause molecules of construction material to change direction 1.8 billion times per second. 2.4 GHz [HAN frequencies] or 5 GHz in schools means 4.8 or 10 billion times per second...

Design Professionals including professional engineers, fire services have to be informed that when a structure will be vibrated billions of times per second. Buildings subjected to frequencies have to be designed for it I.e. RF Engineer from Norad reported their buildings had grounded copper mesh to address the potential charge from frequencies.

Engineers, municipalities, building inspection, etc. can't rule out the building's structure and fire separations compromised as a result of frequency interaction. Multiple smart devices under more load will increase the intensity of the molecular earthquakes caused to structures, fire separations, electrical systems, etc. Meter banks on highrises are in the basement or on the ground floor and vibrating the structure holding up the highrise.

Professionals signing off on buildings, municipalities, developers, fire services, insurers and banks haven't been informed the function of their building has changed as would liability. It brings complex liabilities forward which require clarification from the authorities having jurisdiction. If studies were completed on building and infrastructure safety, please advise ASAP. Every minute of this subtle radiation compounds problems.

We design fire separations to contain a fire(,) and fire rated drywall changing direction 1.8 to 10 billion times **per second** with frequency exposure is going to impact fire separation integrity and perceived safety of fire fighters.

...Please provide the appropriate response so we can address building inspections and building compliance for municipalities, professionals and insurers. Wi-Fi, smart meters and cellphones are determined to be low emissions devices that can be used 24/7. At billions of times per second, 24 hours per day and 7 days a week, how much can a structure or fire separation take before the building isn't safe?

Letter to Energy Minister, Government of British Columbia, March 7, 2012
Radio Frequencies Compromising Buildings, Fire Separations, Electrical Systems,
Fire Safety, Infrastructure, etc.

www.thermoguy.com/urbanheat.html

JOB LOSS

A PG&E rep admitted during a Marina City Council meeting in 2010 that when PG&E knew they were going to this program, they began shifting meter reading employees to temp positions,

and that when they said there was very little job loss, they were talking about very little “employee” job loss, not meter reader job loss.

How many meter readers have been employed by all the utility companies, including municipal utility districts? “Positions captured” is what the quarterly PG&E reports say. Literally, thousands of people statewide are losing their jobs due to this program. This program contributes to state unemployment.

For those utility companies using ARRA funds, this is in conflict with the stated intent of that program, which was to put people back to work, not take away their jobs.

Meter readers are often the ones who spot gas leaks. They have even responded to other emergency situations on their routes. That layer of oversight will be gone.

ENVIRONMENTAL COSTS

Humans aren’t the only ones who suffer.

After a week (after Smart Meters were installed), I noticed the millions of frogs that thrived here and all the crawfish in the creek completely disappeared, and the crickets’ chirps had all but left as well.

The trees started exhibiting grey/white patches on their bark, some patches as thick as paint. The bark was splitting on most trees, and appearing scabbed over and covered in fungi, lichen, and moss. Now these trees, from Portland, throughout Beaverton, Hillsboro, and Forest Grove are dying and falling to the ground at an alarming rate. ALL trees, that I have seen, are showing signs of disease or infestation, even the huge ancient ones (one of these fell in Forest Grove a week or so ago and blocked traffic).

My cats who slept with me since the day they were born spend most of their time outside now, not that the pulse can be escaped, and they, and some of the chipmunks outside, are becoming aggressive. My cats are nervous wrecks and my smallest spends days without coming in to eat.

Oregon

I have two dogs and it seems the smart meter bothers one of the dogs more than the other. I came home from work one afternoon and I saw the utility company truck pulling away. I had received a notice two weeks prior that they were going to install a smart meter, but I really did not think too much about it.

That very first night, my dog wandered the hallways whining and crying I have learned that the smart meter is more active at night. My dog’s face went completely white within a two week period. Usually this happens more gradually. He was also diagnosed with arthritis after two weeks of the smart meter forced radiation and he

refuses to sleep inside at night now. He just can't stand it. Which never, ever happened before. He always slept at the foot of my bed in the years prior.

My dog used to LOVE to go on long walks... Since the smart meter was installed (within a two-week period of time) he is only able to go on very short limited walks now due to swelling in his joints."

Canada

Susan Morin, Red Wolf Ranch, Grass Valley CA:

We had three bee hives that were healthy and had no other reason to leave—when bees are uncomfortable, threatened, or lack food sources, they leave. Now, a colony will leave individually, yet these hives, all on completely different areas of the property left within three days of the installation of a PG&E smart meter. We also called PG&E and asked them not to install, and they did when we were off the property.

I have read reports on the smart meters and was not enrolled that they were/are safe and now have evidence that they effected our personal livelihood and lost three hives which equates to \$250/hive loss, pollination loss to fruit tress (bees pollinate 80% of all fruits and vegetables) \$5k+/-, and honey as a source of medicine and food \$4k.

A man in Santa Cruz lives in a housing complex with flowering bushes that were popular with bees. After Smart Meters were installed in his housing complex, the bees were bumping into walls and acting disoriented. A reporter who came to interview him on the problems he was having with Smart Meters, asked, "What's wrong with the bees?" After a few days, the bees disappeared.

In a study done last year in France, when a cell phone was placed under a hive, the bees began piping, which they do when they swarm or are in distress (Favre, 2011).

The report Birds, Bees and Mankind: Destroying Nature by Electrosmog, translated from German in 2009, details the research showing extensive impacts from artificial EMF and RF on birds, bees, and humans.

"Today, unprecedented exposure levels and intensities of magnetic, electric, and electromagnetic fields from numerous wireless technologies interfere with the natural information system and functioning of humans, animals, and plants. The consequences of this development, which have already been predicted by critics for many decades, cannot be ignored anymore. Bees and other insects vanish; birds avoid certain places and become disorientated at others. Humans suffer from functional impairments and diseases. And insofar as the latter are hereditary, they will be passed on to next generations as pre-existing defects"

Bees, Birds and Mankind, Ulrich Warnke, p. 47. 2007

<http://broschuerenreihe.net/britannien-uk/brochure/bees-birds-and-mankind/index.html>

Magnetite, which navigational creatures, such as butterflies, bees, and birds have in their bodies (and humans have in their brains), is extremely sensitive to fluctuations in natural EMR. The only reason our communication devices work is because they are so much louder than that background EMR.

Biologist Andrew Goldsworthy:

Our present exposure to man-made microwaves is about a million billion billion (one followed by eighteen zeros) times greater than our natural exposure to these frequencies.

The Biological Effects of Weak Electromagnetic Fields, p. 4. March 2012

How will wild creatures navigate? And what other impacts are happening because of this exquisitely sensitive mineral in their bodies and in ours?

But that is just one impact. Warnke further details the impacts to bees including to their immune system, sense of smell, learning ability, and navigation:

3.10 Disrupted NO (nitric oxide) system damages learning ability, olfactory orientation and the immune system

...The salient fact is that the NO system is affected by magnetic and electromagnetic oscillations and may in the worst case become totally disrupted – finally destroying molecular functions.

As in mammals, nitric oxide (NO) normally acts as a carrier of information in insects as well. The synthesis and excretion of NO is particularly high in the insect brain. In bees, NO plays a role in the ability to smell and in learning processes (MÜLLER, 1997).

As proven in humans, if the NO system of bees is disrupted through the effect of technical magnetic fields, they lose the ability to orientate themselves by smell and the vital learning programme also becomes defunct. But since NO also materially controls the immune system, disruptions to the NO household always affect the immune defences of the organism as well.

p. 28. 29

And there are additional impacts as well.

His final section in the book, “Humans suffer functionality disorders,” is a devastating overview of the health impacts humans can expect as this exposure continues.

Dr. Warnke wrote this book before the much increased EMF and RF exposure from the worldwide roll-out of wireless and wired Smart Meters.

The government of India, Ministry of Environment and Forests released a report last year that looked at the impacts of the radiation from cell towers on wildlife, including bees.

The review of existing literature shows that the Electro Magnetic Radiations (EMRs) are interfering with the biological systems in more ways than one. There had already been some warning bells sounded in the case of bees and birds, which probably heralds the seriousness of this issue and indicates the vulnerability of other species as well. The electromagnetic radiations are being associated with the observed decline in the population of sparrow in London and several other European cities (Balmori, 2002, Balmori, 2009, Balmori & Hallberg, 2007). In case of bees, many recent studies have linked the electromagnetic radiations with an unusual phenomenon known as 'Colony Collapse Disorder'. A vast majority of scientific literature published across the world indicate deleterious effects of EMFs in various other species too.

Along with the growth of phone towers and subscribers, India is also witnessing a rapid population growth. To feed and support this rapidly growing population the agricultural security and the factors influencing them should be of concern. However, the population of many species such as honey bees, which is one of the most important pollinator and important factor for agricultural productivity, has seen a drastic population drop. Unfortunately we do not have much data about the effects of EMR available for most of our free-living floral and faunal species in India. Therefore, there is an urgent need to do further research in this area before it would be too late.

... Most of the short-term studies primarily looking into the thermal impacts of EMR exposure on biological systems have neither succeeded to detect any statistically significant changes in the biological processes nor could prove any acute change in health conditions at the present background levels of exposures (Brent 1999; Hanowski Niemi and Blake 1996; Hoskote, Kapdi and Joshi 2008; Lönn et al. 2005; Mixson et al. 2009; Zach and Mayoh 1984; Zach and Mayoh 1986). On the other hand, long-term studies have reported alarming observations, detecting negative consequences on immunity, health, reproductive success, behaviour, communication, co-ordination, and niche breadth of species and communities (Preece et al. 2007; Levitt and Lai 2010; Hardell et al. 2008; Hardell et al. 2007; Fernie and Bird 2001).

Report on Possible Impacts of Communication Towers on Wildlife including Birds and Bees, October 2011, p. 4, 6

http://moef.nic.in/downloads/public-information/final_mobile_towers_report.pdf

Their study reviewed 919 studies. "it should be noted that this is not a complete review of the impact of the electromagnetic radiation on all life forms as the mandate of the Committee was limited to birds and bees. However, for the context purpose the committee has referred to

many papers concerning other taxa.” (p. 5) Of the 919 studies, they found that 593 showed a negative impact of cell towers on birds, bees, human, wildlife and plants, 196 were neutral or inconclusive, and 130 showed no impact.

An experiment with frog tadpoles conducted in a normal city environment near cell towers found 90% mortality and abnormal behavior and reactions in an unshielded aquarium, compared to 4% mortality and normal behavior and reactions in a shielded aquarium. The study was for 2 months; the majority of the experimental group died within 6 weeks.

Balmori, A. 2010 Mobile Phone Mast Effects on Common Frog – The City Turned into a Laboratory, *Electromagnetic Biology and Medicine* 29: 31–35,2010

http://citizensforsafetechnology.org/uploads/balmori_city_as_lab1.pdf

A study of storks near cell towers found reproductive problems, aggression among nesting pairs, and infertility.

Balmori, A. 2005. Possible effects of electromagnetic fields from phone masts on a population of white stork. *Electromagnetic Biology and Medicine* 24:109-119

http://www.livingplanet.be/Balmori_EBM_2005.pdf

Government of India report:

House Sparrow (*Passer domesticus*) is associated with human habitation and it is one of the indicator species of urban ecosystems. A declining population of the bird provides a warning that the urban ecosystem is experiencing some environmental changes unsuitable for living in the immediate future (Kumar, 2010). London has witnessed a 75 per cent fall in House Sparrow population since 1994, which coincides with the emergence of the cell-phone (Balmori, 2002). Electromagnetic radiation may be responsible, either by itself or in combination with other factors, for the observed decline of the sparrows in European cities (Balmori, 2009, Balmori & Hallberg, 2007).

p. 14

A study with mice near a cellular antenna park found irreversible sterility after 5 generations. Exposure was between 1.05 to 0.17 microW/cm². Time -averaged (not actual or maximum) power density of the microwave radiation from Smart Meters is 8.8 microW/cm².

Magras 1997. Radio frequency radiation-induced changes in the prenatal development of mice. *Bioelectromagnetics* 18(6):455-461.

Analysis of Health and Environmental Effects of Proposed San Francisco Earthlink Wi-Fi Network:

A study funded by the Bavarian State Government in Germany followed reports of adverse health effects in dairy cattle after a Telecoms mast had been erected for TV and cell phone transmission. Scientists documented a significant drop in milk yield and behavioral disorders in some of the cows that related to the microwave transmissions

from the mast. When the cattle were moved to a farm 20 km away, their milk yield and behavior returned to normal within days.

When the cattle were returned to the mast environment their symptoms returned as well. Fodder analysis and the amount of feed could not account for the changes among the cattle. Analysis of aborted fetal material did not find any pathogens causing the abortion based on microscope and cultural examination and on serological tests. Autopsy of dead cows reported acute heart and circulatory collapse with internal bleeding from several organs. Exposure to RFR at the stable entrance was 80 microW/cm² and the highest reading reported on the farm near the stable was 350 microW/cm². These values are much lower than the FCC guideline of 1000 microW/cm².

Löscher and Käs. 1998. Conspicuous behavioural abnormalities in a dairy cow herd near a TV and Radio transmitting antenna. Practical Veterinary Surgeon 79: 5, 437-444. Cited in http://www.buergerwelle.de/pdf/snafu_havas_wifi.pdf

Microwave radiation alters e coli bacteria genetic structure at 1/ten-trillionth of 1 microW/cm² (Belyaev, 1996), far lower than the levels coming from a Smart Meter.

Biologist Andrew Goldsworthy:

Trees are now dying mysteriously from a variety of diseases in urban areas all over Europe and are also showing abnormal photoperiodic responses. In addition, many have cancer-like growths under the bark (phloem nodules) and the bark may also split so that the underlying tissues become infected. All of these can be explained as being a result of weak radio-frequency radiation from mobile phones, their base stations, WiFi and similar sources of weak non-ionising radiation. But first let us look at how living organisms use electric currents that they generate themselves and which perform vital functions in their normal day-to-day metabolism and growth. We will then go on to see how weak electromagnetic fields can disrupt these and bring about many unwanted biological effects.

Why Our Urban Trees are Dying, 2011. Dr. Goldsworthy is retired and was an Honorary Lecturer, Imperial College, London
<http://www.mastsanity.org/health/research/299-why-our-urban-trees-are-dying-by-andrew-goldsworthy-2011.html>

Wolfgang Volkrodt and Ulrich Hertel

“ . . . There is also this important fact: any tree may act as a receiving dielectric rod or monopole antenna with the ability to both absorb energy from the wave passing by and to scatter the wave in many directions. If the polarization of the transmitting tower antenna matches the particular tree or trees (i.e. vertical orientation of the antenna which is usually the case for collinear dipole arrays on towers), maximum coupling or

absorption of the wave energy by the tree will occur. Polarization and conduction currents will generally flow to the root system.

Chapter 11: "Brief Overview of the Effects of Electromagnetic Fields on the Environment" by Raymond S. Kasevich, BSEE, MSE, PE, Registered Professional Electrical ;Cell Towers: Wireless Convenience or Environmental Hazard? Proceedings of the 'Cell Towers Forum' State of the Science/State of the Law edited by B. Blake Levitt (2001)

Volkrodt provides evidence in his papers that the decimation of forests is not caused by acid rain but by the acidification of the soil due to "electrosmog."

"Microwaves are 'received' by our trees and finally converted into electrical currents which flow into the soil....A type of electric rectification takes place within the cell membranes. In turn, the direct current that spreads from the roots into the soil causes a type of electrolysis. And this, in turn – and not 'acid rain' – leads to the soil 'acidification' which is being repeatedly observed in the ground under trees exhibiting the new type of forest damage."

Are Microwaves faced with a fiasco similar to that experienced by nuclear energy? 1991

An additional environmental impact unrelated to radiation is the mining of rare earth minerals, which are needed for high tech and "clean" tech like cell phones and Smart Meters. The mining of these minerals, like tantalum, in the Congo is a major contributor to their civil war and the destruction of gorilla habitat, which may result in the extinction of gorillas. In addition, people there are enslaved to work the mines, and women are raped.

How is it that so many intelligent, inside-the-beltway environmentalists are buying into an eco-health-safety-finance debacle with the potential to increase energy consumption, endanger the environment, harm public health, diminish privacy, make the national utility grid more insecure, cause job losses, and make energy markets more speculative?

Answer: by not doing their homework.

[http://www.energybulletin.net/stories/2011-03-23/problems-smart-grids,](http://www.energybulletin.net/stories/2011-03-23/problems-smart-grids)

The problems with Smart Grids, B. Blake Levitt, Chellis Glendinning, Mar 18 2011

Environmental Defense Fund (EDF)

The Pecan Street Project, EDF's pilot project with government and industry partners in Austin, TX, is one of the nation's first comprehensive smart grid deployments. Launched in December 2008, the project recently completed its first phase, in which EDF played a leading role in development of recommendations forming the basis of the project... In December 2009 the Pecan Street Project received \$10.4 million in funding from the U.S.

Department of Energy... Pecan Street is the first of several partnerships EDF will launch to help design the future grid.

<http://www.edf.org/page.cfm?tagID=51221>

Despite being presented with evidence of harm, EDF remains a cheerleader for the Smart Grid. EDF's conflict of interest is substantial. EDF receives ratepayer funds from the CPUC for offering assistance. EDF board member Ann Doerr is the wife of John Doerr. He is one of the main venture capitalists backing Silver Spring Networks, of Smart Meter fame. And EDF is a partner in the Smart Meter/Smart Grid project in Austin, TX.

The Natural Defense Resource Council (NRDC) and the national Sierra Club are examples of two additional mainstream environmental groups that are corporate cheerleaders instead of environmental guardians.

<http://stopsmartmeters.org/2011/07/26/the-green-sheen-wearing-thin-how-corporate-environmental-organizations-are-providing-cover-for-the-mounting-ecological-catastrophe-of-the-%E2%80%9Csmart-grid%E2%80%9D/>

SMART GRID/SMART METERS -- ENERGY INTENSIVE

There is no proof of diminished greenhouse emissions. Quite the contrary.

The energy consumption of electronic devices is skyrocketing, as was recently reported by the International Energy Association ("Gadgets and gigawatts"). According to the research paper, the electricity consumption of computers, cell phones, flat screen TV's, iPods and other gadgets will double by 2022 and triple by 2030. This comes down to the need for an additional 280 gigawatts of power generation capacity... There are multiple reasons for the growing energy consumption of electronic equipment; more and more people can buy gadgets, more and more gadgets appear, and existing gadgets use more and more energy (in spite of more energy efficient technology

...While these reports are in themselves reason for concern, they hugely underestimate the energy use of electronic equipment. To start with, electricity consumption does not equal energy consumption. In the US, utility stations have an average efficiency of about 35 percent. If a laptop is said to consume 60 watt-hours of electricity, it consumes almost three times as much energy (around 180 watt-hour, or 648 kilojoules).

So, let's start by multiplying all figures by 3 and we get a more realistic image of the energy consumption of our electronic equipment. Another thing that is too easily forgotten, is the energy use of the infrastructure that supports many technologies; most notably the mobile phone network and the internet (which consists of server farms, routers, switches, optical equipment and the like),

...Most important, however, is the energy required to manufacture all this electronic equipment (both network and, especially, consumer appliances). The energy used to

produce electronic gadgets is considerably higher than the energy used during their operation.

An old-fashioned car uses many times more energy during its lifetime (burning gasoline) than during its manufacture. The same goes for a refrigerator or the typical incandescent light bulb: the energy required to manufacture the product pales into insignificance when compared to the energy used during its operation.

...Advanced digital technology has turned this relationship upside down. A handful of microchips can have as much embodied energy as a car. And since digital technology has brought about a plethora of new products, and has also infiltrated almost all existing products, this change has vast consequences... The most up-to-date life cycle analysis of a computer dates from 2004 and concerns a machine from 1990. It concluded that while the ratio of fossil fuel use to product weight is 2 to 1 for most manufactured products (you need 2 kilograms of fuel for 1 kilogram of product), the ratio is 12 to 1 for a computer (you need 12 kilograms of fuel for 1 kilogram of computer). Considering an average life expectancy of 3 years, this means that the total energy use of a computer is dominated by production (83% or 7,329 megajoule) as opposed to operation (17%). Similar figures were obtained for mobile phones.

While the 1990 computer was a desktop machine with a CRT-monitor, many of today's computers are laptops with an LCD-screen. At first sight, this seems to indicate that the embodied energy of today's machines is lower than that of the 1990 machine, because much less material (plastics, metals, glass) is needed. But it is not the plastic, the metal and the glass that makes computers so energy-intensive to produce. It's the tiny microchips, and present-day computers have more of them, not less.

While there are significant differences between configurations, all these manufacturing methods require between 1 and 10 megajoule of electricity per kilogram of material. This corresponds to 278 to 2,780 watt-hour of electricity per kilogram of material. Manufacturing a one kilogram plastic or metal part thus requires as much electricity as operating a flat screen television for 1 to 10 hours (if we assume that the part only undergoes one manufacturing operation).

The energy requirements of semiconductor and nanomaterial manufacturing techniques are much higher than that: up to 6 orders of magnitude (that's 10 raised to the 6th power) above those of conventional manufacturing processes. This comes down to between 1,000 and 100,000 megajoules per kilogram of material, compared to 1 to 10 megajoules for conventional manufacturing techniques.

Digital technology is a product of cheap energy

The research of Timothy Gutowski shows that the historical trend is toward more and more energy intensive processes. At the same time, energy resources are declining.

Gutowski writes: "This phenomenon has been enabled by stable and declining material and energy prices over this period. The seemingly extravagant use of materials and energy resources by many newer manufacturing processes is alarming and needs to be addressed alongside claims of improved sustainability from products manufactured by these means.

...The ecological footprint of digital technology described above is far from complete. This article focuses exclusively on energy use and does not take into account the toxicity of manufacturing processes and the use of water resources, both of which are also several orders of magnitude higher in the case of both semiconductors and nanomaterials. To give an idea: most water used in semiconductor manufacturing is ultrapure water (UPW), which requires large additional quantities of chemicals. For many of these issues, the industry recognizes that there are no solutions. There are also the problems of waste & war.

Last, but not least: the energy-intensive nature of digital technology is not due only to energy-intensive manufacturing processes. Equally as important is the extremely short lifecycle of most gadgets. If digital products would last a lifetime (or at least a decade), embodied energy would not be such an issue."

The monster footprint of digital technology, Kris De Decker, June 2009
<http://www.lowtechmagazine.com/2009/06/embodied-energy-of-digital-technology.html>

For Smart Meters, there is also the energy used for data transmission from the meters and the mesh network 24 hours a day, including the collector antennas. There is the energy required for data collection centers, to operate and for cooling.

That is for the technology itself.

As regards the public use of energy, the reduction of energy use by consumers is an assumption that has not been proven. In fact, there is evidence from the utility companies that it is not happening. Moving energy use to off-peak hours or reducing levels of heating or cooling is simply not practical for many, including those on fixed schedules and those who have health problems.

Rather than penalize the public for using more and more of the energy-intensive devices that are freely marketed and sold, it seems a good idea to rethink the nature and consequences of what our market economy creates. If our state is serious about energy conservation.

WEAPONIZED RF

Microwave signalling Smart Meters are a powerful technology with very suppressive properties "deployed" on every building throughout the United States.

Barrie Trower, retired British military intelligence expert in microwave weapons:

Debriefing spies during The Cold War extended my military education into the full diversity of stealth microwave warfare and communication systems. In so doing, I learned a list of approximately 30 pulse frequencies that could induce some 50 physical and mental ailments by entrainment.

Portland Public Schools are transmitting electromagnetic, specifically MW[microwave], frequencies at low exposure levels compared to thermal levels. However, these exposure levels are very high compared to natural background levels at the frequencies deployed: 2.45 GHz and 5 GHz frequency, which means between 2.45 and 5 billion cycles per second. When I realized that power densities and frequencies similar to those used as weapons during the Cold War were being used as WI-FI in schools, I decided to come out of retirement and travel around the world free of charge and explain exactly what the problem is going to be in the future."

Declaration, Civil Action No. Cv-739-MO, Alexandra Helene Morrison and David Mark Morrison v. Portland Public Schools

The Smart Meter Home Area Network antenna transmits at 2.4 GHz.

A single Smart Meter, at 3 feet, is already an estimated 53-160 times the whole body radiation exposure from a cell phone held to the head. It is emitting a Class 2B carcinogen according to the World Health Organization.

Microwave radiation kills quickly at high doses. This was demonstrated by the Stanford Research Institute study, testing 950 MHz and 2.45 GHz as low as 200,000 microW/cm² – almost identical to the frequencies used by electric Smart Meters. This study found that 950 MHz, the lowest frequency they tested, was the most lethal.

<http://www.magdahavas.com/2010/09/06/pick-of-the-week-9-0-95-and-2-45-ghz-most-lethal-microwave-frequencies/> overview
http://www.magdahavas.com/wordpress/wp-content/uploads/2010/09/Mortality_in_Rats_Exposed_to_CW_Microwave_Radiation.pdf

PG&E Smart Meters are capable of 2 ½ watts which equals 2 ½ million microwatts. Peaks have already been detected at over 20,000 microwatts per cm². That's 10% of a lethal dose at these frequencies.

Robert Becker:

Since 1986 the American Walter Reed Army Institute of Research has been working on the development of a new type of microwave weapons. In this research it was found that microwave energy within the range of 1 to 15 GHz enters all organ systems of the body, and that microwave pulses tend to couple with the central nervous system....

(This) constitutes a danger to all organ systems. The test program, which commenced in 1986, dealt with four areas:

1. Effect on immediate debilitation;
2. Immediate stimulation/irritation through acoustic effects;
3. Effects on influencing or prevention of work (activities), and
4. Effect on stimulus-controlled behavior.

In "The Spark of Life", 1991; cited by Wolfgang Volkrodt, "Are Microwaves faced with a fiasco similar to that experienced by nuclear energy?" p, 7, 9

In April 2012, the Russian government announced plans to introduce microwave weapons

Russian military have worked out non-lethal electromagnetic weapons that are presently undergoing tests... The USA is the leader in this field, and Russia has become the second state in the world that has started developing electromagnetic weapons.

Sources in Moscow say Mr Putin has described the guns, which use electromagnetic radiation like that found in microwave ovens, as 'entirely new instruments for achieving political and strategic goals'. Mr Putin added: 'Such high-tech weapons systems will be comparable in effect to nuclear weapons, but will be more acceptable in terms of political and military ideology.'

<http://www.dailymail.co.uk/news/article-2123415/Putin-targets-foes-zombie-gun-attack-victims-central-nervous-system.html#ixzz1rgW2NZUw>
http://english.ruvr.ru/2012_04_25/72924745/

The second article says that this research has been going on in the U.S. and Russia since the 1950s.

A very common complaint after Smart Meter installation is tinnitus or hearing ringing or buzzing. It was discovered in the 1950's that microwave radiation could be "heard," and researchers like Allen Frey worked to discover the mechanism and to see what uses it could be put to. A report for the U.S. Army elaborates some of the possibilities,

Incapacitating Effect: Microwave Hearing

Microwave hearing is a phenomenon, described by human observers, as, the sensations of buzzing, ticking, hissing, or knocking sounds that originate within or immediately behind the head. There is no sound propagating through the air like normal sound.

... This technology makes use of a phenomenon first described in the literature over 30 years ago. Different types of sounds were heard depending on the particular of the pulse characteristics.....One study (in 1975) using human volunteers, identified the threshold energy of microwave-auditory responses in humans as a function of pulse width for 2450 MHz radiofrequency energy. [Electric HAN network – 2450 MHz]

Tunability

The phenomenon is tunable in that the characteristic sounds and intensities of those sounds depend on the characteristics of the RF energy as delivered. ...it could only be heard within a person's head. In one experiment, communication of the words from one to ten using "speech modulated" microwave energy was successfully demonstrated. Microphones next to the person experiencing the voice could not pick up the sound. Additional development of this would open up a wide range of possibilities.

Recovery/Safety

Humans have been subjected to this phenomenon for many years. The energy deposition required to produce this effect is so small that it is not considered hazardous

Possible Influence on Subject(s)

Application of the microwave hearing technology could facilitate a private message transmission, It may be useful to provide a disruptive condition to a person not aware of the technology. Not only might it be disruptive to the sense of hearing, it could be psychologically devastating if one suddenly heard "voices within one's head."

Technological Status of Generator/Aiming Device

This technology requires no extrapolation to estimate its usefulness, Microwave energy can be applied at a distance, and the appropriate technology can be adapted from existing radar units... Signals can be transmitted long distances (hundreds of meters) using current technology.

Bioeffects of Selected Non-Lethal Weapons, 1998, released 12/06 by United States Army Intelligence and Security Command

http://www.wired.com/images_blogs/dangerroom/files/Bioeffects_of_Selected_Non-Lethal_Weapons.pdf p. 6-8

Nonlethal Weapons Could Target Brain, Mimic Schizophrenia; Sharon Weinberger, 2-08

<http://www.wired.com/dangerroom/2008/02/report-nonletha/>

Making people hear voices, making people believe they are schizophrenic, is a powerful capability. Representative Jim Guest of the Missouri Legislature has become an advocate for Americans who presently claim they are being electronically harassed.

In 2006, Project Censored, Sonoma State University, reported on capabilities already in use, including the LRAD – Long Range Acoustical Device – a “non-lethal” weapon, that has already been used against demonstrators and that can permanently injure and kill with internally experienced sound, as well as Voice to Skull weapons, “which uses microwave transmission of sound into the skull of persons or animals by way of pulse-modulated microwave radiation.”

US Electromagnetic Weapons and Human Rights, Peter Phillips, Lew Brown, Bridget Thornton, <http://www.projectcensored.org/wp-content/uploads/2010/05/ElectromagneticWeapons.pdf>

Investigative journalist and veteran William Thomas, in "Microwaving Iraq," describes the use of "poppers" or "domes" which use multiple frequencies to have specific disruptive physical and psychological effects, but also have unintended effects.

On the rooftop of a shrapnel-pocked building in the ruins of Fallujah, a team of GI's stealthily sets up a gray plastic dome about two-feet in diameter. Keeping well back from the sight lines of the street and nearby buildings, they plug the cable connectors on the side of the "popper" into a power unit. The grunts have no clue what the device does. They are just following orders.

"Most of the worker-bees that are placing these do not even know what is inside the "domes" just that they were told where to place them by Intel weenies with usually no nametag," reports my source, a very well informed combat veteran I will call "Hank".

The grunts call the plastic devices "poppers" or "domes". Once activated, each hidden transmitter emits a widening circle of invisible energy capable of passing through metal, concrete and human skulls up to half a mile away. "They are saturating the area with ULF, VLF and UHF freqs," Hanks says, with equipment derived from US Navy undersea sonar and communications...

"The "poppers, are capable of using a combo of ULF, VLF, UHF and EHF wavelengths in any combination at the same time, sometimes using one as a carrier wave for the others," Hank explains, in a process called superheterodyning. The silent frequencies daily sweeping Fallujah and other trouble spots are the same Navy "freqs that drove whales nuts and made them go astray onto beaches."

...He is concerned that innocent Iraqi families and unsuspecting GIs alike are being used as test subjects for a new generation of "psychotronic" weapons using invisible beams across the entire electromagnetic spectrum to selectively alter moods, behavior and bodily processes.

According to Hank's front-line buddies, Iraqis exposed to secret beam weapons "get laid back, confused and mellow, and then blast out in a rage, as opposed to our folks going on what could only be called a "bender" and turning into a mean drunk for a while."

Once they wander away from direct electromagnetic-fire, startled GIs come to their senses. They return to their units, Hank explains, saying, "What was I thinking?"

...The recovery rate among US troops "seems to be about a day or so, where the locals are not getting over it in less than a week or more on average," Hank has learned.

While the mobile microwave weapons currently deployed in Iraq may or may not lead to lasting harm, rooftop "poppers" and "domes" left to radiate for days at a time are

irradiating unsuspecting families already coping with illness, wounds, hunger and the stress of losing homes and loved ones...

...Very Low Frequency (VLF) weapons include the dozens of "poppers" currently deployed in Iraq, which can be dialed to or "long wave" frequencies capable of traveling great distances through the ground or intervening structures. As air force Lt Col. Peter L. Hays, Director of the Institute for National Security Studies reveals, "Transmission of long wavelength sound creates biophysical effects; nausea, loss of bowels, disorientation, vomiting, potential internal organ damage or death may occur."

Hays calls VLF weapons "superior" because their directed energy beams do not lose their hurtful properties when traveling through air to tissue. A French weapon radiating at 7 hertz "made the people in range sick for hours."

Microwaving Iraq: 'Pacifying' Rays Pose New Hazards In Iraq, 1-25-2005

Measurement by a member of the public has found the electric Smart Meter frequency of 900-928 MHz modulated by an ELF frequency of 11-15 Hz – brainwave range. Nausea, vomiting, dizziness and disorientation are symptoms people experience after Smart Meter installation, as well as sleep disturbance, inability to concentrate, memory problems and mood disorders.

Incapacitating Effect: Disruption of Neural Control

The nature of the incapacitation is a rhythmic-activity synchronization of brain neurons that disrupts normal cortical control of the corticospinal and corticobulbar pathways; this disrupts normal functioning of the spinal motor neurons which control muscle contraction and body movements. Persons suffering from this condition lose voluntary control of their body. This synchronization may be accompanied by a sudden loss of consciousness and intense muscle spasms

Mechanism to Reproduce the Desired Effects

Application of electromagnetic pulses is also a conceptual nonlethal technology that uses electromagnetic energy to induce neural synchrony and disruption of voluntary muscle control. The effectiveness of this concept has not been demonstrated. However, from past work in evaluating the potential for electromagnetic pulse generators to affect humans, it is estimated that sufficiently strong internal fields can be generated within the brain to trigger neurons.

..The ionic basis and biochemical substrate of this activation have been areas of considerable study but still leaves many questions unanswered. What are the basic cellular properties, present in normal cells and tissues, that could contribute to the generation of abnormal activity? What parts of the system are low threshold and function as trigger elements?

Different types of technologies could be employed to influence wide areas or single individuals. Because this technology is considered to be tunable, the influence on

subjects could vary from mild disruption of concentration to muscle spasms and loss of consciousness. The subject(s) would have varying degrees of voluntary control depending on the chosen degree of incapacitation.

Technological Status of Generator/Aiming Device

An electric field strength of roughly 100Kv/m over a time period of 1 nanosecond is approximately the condition thought to be necessary to produce the desired effect when provided to an overall repetition rate of 15 Hz. Such a field may be developed during a radar-like, high-peak-power, pulsed source or an electromagnetic pulse generator operating at 15 Hz. These technologies exist today sufficient to evaluate the disabling concept. Power requirements are not high because the duty factor is so low... Because there were no open literature reports from which to make inferences, there is some uncertainty about the power levels required.

Bioeffects of Selected Non-Lethal Weapons, 1998, released 12/06 by United States Army Intelligence and Security Command

http://www.wired.com/images_blogs/dangerroom/files/Bioeffects_of_Selected_Non-Lethal_Weapons.pdf p. 8-12

Researchers Gale Craviso and Indira Chatterjee, University of Nevada at Reno, have been working on various applications for the U.S. military.

This basic research initiative is geared ultimately toward developing effective and safe non-lethal technologies that alter skeletal muscle contraction and/or neural functioning via radiofrequency (RF)/microwave (MW) electromagnetic radiation. Major accomplishments included 1) near completion of studies examining the effect of 1 to 6 GHz MW fields on catecholamine release from chromaffin cells; 2) initiating studies using a novel exposure system for real-time imaging of intracellular effects in chromaffin cells in response to high electric field RF/MW pulse modulated radiation, broadband Gaussian pulses or RF/MW modulated Gaussian pulses with the frequency spectrum centered in the band 0.75-6 GHz; 3) completion of studies on the effect of 0.75 to 1 GHz RF fields on skeletal muscle contraction using fixed frequencies and just recently implementing frequency sweep paradigms; 4) initiation of studies to examine the effect of nanosecond electric pulses of high intensity on catecholamine release from chromaffin cells.

Sponsorship by U.S. Air Force

Naval Studies Board on Directed-Energy Non-Lethal Weapon

“The first radiofrequency non-lethal weapons, VMADS, is based on a biophysical susceptibility known empirically for decades. More in-depth health effects studies were launched only after the decision was made to develop that capability as a weapon. The heating action of RF signals is well understood and can be the basis for several additional directed-energy weapons. Leap-ahead non-lethal weapons technologies will

probably be based on more subtle human/RF interactions in which the signal information within the RF exposure causes an effect other than simply heating: for example, stun, seizure, startle and decreased spontaneous activity. Recent developments in the technology are leading to ultrawideband, very high peak power and ultrashort signal capabilities, suggesting the phase space to be explored for subtle, yet potentially effective non-thermal biophysical susceptibilities is vast. Advances will require a dedicated effort to identify useful susceptibilities."

National Academy of Sciences - National Research Council

An Assessment of Non-Lethal Weapons Science and Technology by the Naval Studies Board, Division of Engineering and Physical Sciences (National Academies Press (2002) (prepublication copy, page 2-13)

Cited in Bioinitiative Report, Section 4, p. 11, 12

At a foggy military base in Northern California years ago, an experiment was made with frequency to see if the fog could be eliminated. Someone stationed there agreed that frequency is powerful, recalling, "We didn't get rid of the fog, but we did kill all the wild turkeys."

This description of what women protesting at Greenham Common in England experienced:

A preview of what lies in store for long-suffering families in Iraq can be gleaned from Greenham Common, where the British Army reportedly used an electromagnetic weapon against 30,000 women who had camped for nearly two decades around that UK military base to protest the deployment of nuclear-tipped US cruise missiles.

One day in the summer of 1984, more than 2,000 British troops suddenly pulled back, leaving the fence unguarded. Peace mom Kim Besley recalls that as curious women approached the gate, they "started experiencing odd health effects: swollen tongues, changed heartbeats, immobility, feelings of terror, pains in the upper body."

Besley found her 30-year-old daughter too ill to stand. Other symptoms typical of electromagnetic exposure included skin burns, severe headaches, drowsiness, post-menopausal menstrual bleeding and menstruation at abnormal times. Besley's daughter's cycle changed to 14 days and took a year to return to normal.

Two late-term spontaneous miscarriages, impaired speech, and an apparent circulatory failure prompted the women to begin monitoring for a directed-energy beam. Using an EMR meter, they measured beams sweeping their camp at 100-times normal background levels.

Microwaving Iraq: 'Pacifying' Rays Pose New Hazards In Iraq, William Thomas, January 25, 2005

Reports periodically come out in the press about experiments conducted on the general public or on groups in our society by agencies within our own government or the military. Plutonium

injections, syphilis experiments, Agent Orange denied and soldiers still denied benefits, Gulf War illness denied and veterans denied benefits, patented genetically engineered “bugs” showing up in the general population, MKULTRA, atomic bomb experiments on soldiers, and on and on. The public usually learns about this decades after the incidents occur and after responsible parties are no longer alive. It is important to bear this in mind, as well as the danger from other nations and groups doing directed energy development.

The American government is now claiming responsibility with Israel for the Stuxnet virus.

Though utility companies claim aspects like duty cycles are fixed, it is important to note:

(Smart Meters have) the ability for remote installation of meter or communication board firmware which may be required for upgradability.

CPUc Opt-out decision, 2-9-12, p. 9, #7

If the meters can be hacked and “upgraded,” what is the possibility for harm, beyond the harm already being caused?

With the widespread use of microwave RF devices in our society, including cell towers everywhere, it is sobering to realize how these devices could additionally and intentionally harm our communities.

CONTROL OF HOUSEHOLD ELECTRICAL USE

Smart Meters can be remotely disconnected by utility companies.

In addition, “load control management” (Opt-out decision, 2-9-12), and “Smart” appliances with internal transmitters which communicate with the meter means external agencies can control the use of our appliances. Already reports are surfacing of people unable to use their appliances at certain times of the day.

A report for the Australian Ministerial Council on Energy Smart Meter Working Group states

Direct load control occurs when appliances within a customer’s premises are remotely controlled by a retailer, network operator or demand aggregator to lower electricity consumption without affecting the service provided by the appliance. Direct load control technology is being used to control appliances such as air conditioners, pool pumps and electric hot water systems. Importantly direct load control need not mean that an appliance is remotely turned off entirely. In the case of air conditioners, direct load control systems cycle the air conditioner compressor to lower electricity consumption whilst minimising the impact on the cooling capability of the air conditioner. This reduction in consumption translates into lower expenditure on electricity which implies a redistribution of retailer, generator and network operator surplus to consumers.

The initial effect of direct load control on customers is therefore likely to be relatively small. There is no change to the pattern of consumption as the result of DLC (ie, no substitution between peak and off-peak consumption), only a reduction in the level of peak consumption. It is likely that the function of the appliances will be maintained such that there will be no loss of value to the customer from using the appliance that is controlled...

There are a range of household and commercial appliances that could be the subject of remote automated load control. The most common appliances controlled through DLC programmes are air conditioners and swimming pool pumps.

This Phase 2 report also considers further the issue of the additional demand response that may be associated with incorporating either an interface for load control devices (functionality 15) or an interface to a Home Area Network (HAN) using an open standard (functionality 16) in a smart meter rollout.

Functionalities 15 and 16 both provide the capability for DLC as part of a smart metering rollout.

p, 17, 51, vii

<http://sedc-coalition.eu/wp-content/uploads/2011/05/NERA-08-02-29-Cost-Benefit-Analysis-Report-for-Australia.pdf>

Division of Ratepayer Advocates, CPUC

PG&E's AC Cycling program, recently renamed "SmartAC," is a dispatchable demand response program that delivers peak load reduction via direct load control of customers' AC units. During summer peak events, PG&E would remotely and intermittently turn off customers' AC units. In the AC Cycling Application (A.) 07-04-009, PG&E proposed two ways to do this: (1) directly by turning the AC unit on and off using a switch installed on the AC unit, and (2) indirectly by setting the thermostat back 4 degrees Fahrenheit

...As background, the California Energy Commission (CEC) sets energy efficient building standards, and considered the installation of remote-controllable Programmable Communicating Thermostats (PCTs) as a requirement for new home constructions and qualifying building retrofits. However, in January 2008, the CEC withdrew the proposed PCT requirement from its 2008 Building Standards. The PCT requirement had received negative mass media attention, and news articles on the public backlash appeared in major publications such as the New York Times and the San Francisco Chronicle. The consideration of the PCT requirement in CEC building standards, as a result, has been deferred.

...DRA questions whether PG&E can “seamlessly integrate” the HAN functionality with its SmartAC program operation as it claims. Operating the SmartAC program through the HAN interface does not mean that PG&E can replace the 900 MHz paging system approved for its SmartAC program. In fact, PG&E states in the Upgrade testimony that:

“Separate communications systems are likely to be necessary due to the possibility that customer-owned equipment installed under the current SmartAC program may not be able to communicate with the new HAN network.”

In other words, PG&E may not be able to operate all AC units participating in its SmartAC program through the HAN interface. PG&E has already successfully sought Commission approval of the SmartAC program, based on PG&E’s argument that it could ameliorate increasing AC load among new construction, and that:

“both PCTs and [AC] switches can be readily integrated with the so-called “smart meters” that it is rolling out in place of traditional meters as part of its advanced meter initiative (AMI) approved in D.06-07-027.”

As approved in D.08-02-009, PG&E has a communication system to remotely control PCTs. DRA points out that, during the period when the CEC was considering the Title 24 PCT requirement, it had proposed an AM/FM communication protocol. To promote interoperability, the CEC also considered requiring the PCTs to incorporate “communication expansion ports,” to allow for remote control of the PCTs via other communication systems, such as the 900 MHz paging system for which PG&E received ratepayer funding in D.08-02-009.

...Having yet another technology for PG&E to remotely control customers’ thermostats will not make customers more willing to surrender their thermostat control to PG&E.

Opening Brief of DRA, August 29, 2008, in Application of PG&E for Authority to Increase Revenue Requirements to Recover the Costs to Upgrade its SmartMeter™ Program, A. 07-12-009. p. 41- 44

In this document is mention that there are multiple ways to remotely communicate with thermostats and air conditioning units. Also stated is that PG&E didn’t think the then-current SmartACs would be able to communicate to the HAN, presumably because the HAN is 2.45 GHz, and the paging system PG&E received funding for is 900 MHz. A question not asked is will this paging system cause interference or receive interference from the 902-928 MHz Smart Meters?

To consider that PG&E and other utility companies plan to remotely turn on and off air conditioning units and thermostats in extreme weather is extremely alarming, especially given utility company competence, reliability, and concern about customer safety in other matters. What if the signal doesn’t make it back to the SmartAC to turn it back on, or does so only intermittently? Even if there is a manual override, what if the customer is not home and leaves children or animals in the house? What if the customer is not mobile? PG&E’s history alone on safety is chilling, and their competence as a company is regularly called into question. The above document is well worth reading on many counts.

The letter to the editor below was published in the Santa Rosa Press-Democrat:

PG&E technology

EDITOR:

For 17 years, PG&E has robo-dialed my house monthly to inform me, "Our records show that you are a dog owner . . ." For 16 of those years, the dog has been dead.

Correcting this should be easy. Per PG&E's instructions, all I have to do is press a number on the key pad to delete my number from the system. Up until now, it's only been mildly annoying when the very next month, I have received the same recorded message, "Our records show that you are a dog owner . . ."

Well, I just learned PG&E will soon install SmartMeters in my neighborhood. Am I worried? You bet I am. If PG&E's information technology department cannot effectively monitor and maintain the oldest and simplest phone technology (the removal of a phone number from its speed dial), how will it handle a highly sophisticated wireless network to accurately measure my gas and electric usage?

SmartMeters are only as smart as those who install, operate and maintain them. You'll have to forgive me if I question whether PG&E is up to the task.

JACQUELYN de l'EAU

Penngrove

June 20, 2010

<http://www.pressdemocrat.com/article/20100630/OPINION/100629506/1044/opinion02?Title=Wednesday-s-Letters-to-the-Editor>

FCC VIOLATIONS

There is strong evidence of violations of FCC standards and FCC regulations.

The EMF Safety Network alleges that PG&E Smart Meters violate one or more FCC conditions that determine RF exposure compliance. The FCC Grants of Equipment Authorization, which govern the rules upon which FCC compliance is based, warns that RF exposure compliance depends on specific conditions. The conditions include one or more of the following, depending on the specific make and model of Smart Meter.

- limited single module approval requires professional installation;
- antenna(s) must provide a separation distance of at least 20 cm from all persons;
- antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter;
- end-users and installers must be provided with antenna installation and

transmitter operating conditions for satisfying RF exposure compliance

Smart Meters are widely co-located in banks of multiple meters. Co-location also occurs within Smart Meters because electric Smart Meters include at least two internal RF antennas. One antenna is used for the mesh network system and the other is for the Home Area Network (HAN) systems. Antennas are designed to work in conjunction with the HAN and RF appliances and with other Smart Meters in a mesh network. Antennas have separate Grants of Equipment Authorization, which suggests that manufacturers have tested antennas in isolation and individually, and not in combination, which is how the Smart Meter and the Smart Grid system were designed to operate....

...Network alleges one or more FCC exposure compliance violations for the following meters PG&E is deploying: FCC ID numbers: OWS-NIC514, OWS-NIC507, and LLB6327PWM.

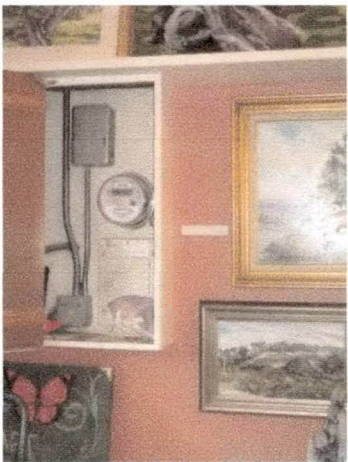
Furthermore, "antenna(s) must provide a separation distance of at least 20 cm (8 in.) from all persons," yet there are no warning labels on Smart Meters, and PG&E has actually encouraged people to get close to their meters to read them.

Many Smart Meters are installed within 20 cm of public access. In some cases the meters are installed inside homes and businesses. In many situations Smart Meters are easily accessible to the public. This rule is clearly violated.

EMF Safety Network, A. 10-04-018, Declaration p, 1. Jan. 5, 2011



Café in Berkeley



Businesses, Pacific Grove

Sage Associates, January 2011:

FCC compliance violations are likely to occur under normal conditions of installation and operation of smart meters and collector meters in California.

Sage Associates, Assessment of Radiofrequency Microwave Radiation Emissions from Smart Meters ITRON Smart Meter (SKAMI-4)

<http://sagereports.com/smart-meter-rf/>

Sage Associates, February 2011:

Violations of FCC safety limits for uncontrolled public access are identified at distances out to a distance of more than one foot for a single meter, and several feet for multiple meters, even under the most restrictive FCC formula using only a 60% reflection factor.

Sage Associates, Smart Meter Addendum Report,
PG&E Smart Meter (Silver Springs OWS-NIC514)

http://sagereports.com/smart-meter-rf/?page_id=429

“The emissions from one meter are strong enough that the public is put at risk from exposures outward from the meter from approximately one foot to over six feet, depending on the reflection factor,” says Cindy Sage, Sage Associates. “For multiple meters at the same location, the zone of impact where FCC limits may be violated is somewhere between three feet and 19 feet, depending on the reflection factor.”

Press release, Environmental Health Coalition of West Marin, February 18, 2011

BURDENSOME AND EXCESSIVE COSTS

- Costs borne by the public for the initial roll-out and subsequent program costs for a program which financially benefits the utilities and partners, whether by federal grants or rate hikes, instead of by shareholders.

DRA would like the Commission to apply some procedural restraint on what PG&E apparently perceives to be a runaway AMI gravy train. It is respectfully submitted that a Decision approving this cost-ineffective upgrade could lead to a staggering waste of ratepayer money. Very little, in terms of PG&E's AMI performance to date, causes DRA to have much confidence in PG&E. The jury is still out as to when, or if, its ratepayers will ever see the benefits identified in PG&E's original, or this upgrade proposal, that would justify its enormous cost. DRA does not find this Upgrade Application to be cost-effective, and therefore respectfully recommends that the Commission reject it.

Opening Brief of DRA, August 29, 2008, in Application of PG&E for Authority to Increase Revenue Requirements to Recover the Costs to Upgrade its SmartMeter™ Program, A. 07-12-009. p. 5

- For time-of-use pricing, increased energy costs
 - for those on fixed schedules
 - for businesses which use power during peak hours, such as restaurants
 - for individuals with medical conditions which
 - require certain temperatures
 - require 24-hour medical devices
 - for the housebound
 - for low income ratepayers

- Future costs of HAN-enabled devices, retrofits, and Smart appliances will be borne by consumers.

PG&E assumes residential customers will purchase in-home information feedback devices (IHD's) that will be able to communicate with the meters. Electric energy consumption information can then be transmitted directly from the meters to the in-home information displays.

Opening Brief of DRA, August 29, 2008, in Application of PG&E for Authority to Increase Revenue Requirements to Recover the Costs to Upgrade its SmartMeter™ Program, A. 07-12-009. p. 31

(Consumers can purchase those home energy monitors now, without a Smart Meter.)

- Current costs to the public:
 - Fire damage
 - Damaged electronics and wiring,
 - Medical costs including
 - medical visits for diagnosis and treatment
 - hospital trips
 - medications
 - therapies
 - Shielding materials
 - Loss of use of homes or portions of homes
 - Loss of value of homes or commercial property
 - Moving expenses and storage fees
 - Restriction of life with resultant economic costs to cities and counties
 - Inability to work and lost income
 - Costs of unemployment benefits

- Long-term chronic and/or degenerative medical conditions
 - Damage to children
 - DNA damage
 - Increased cancer and tumor risks
 - Increased Alzheimer's risk
 - Increased risks for stroke
 - Increased ADHD and autism
 - Increased heart problems and pacemaker malfunctions

- Accidents and deaths
- Costs of remote disconnection consequences to people, particularly in extreme weather areas.
- Costs of direct load control impacts to vulnerable populations, such as the elderly and the ill, in extreme weather areas.
- Costs of loss of bees and other pollinators, with resultant impacts to food availability and food system
- Costs of loss of birds and increased costs of insect control if bird loss isn't balanced by insect loss
- Costs of forest loss, especially urban forests, with increased and more rapid replacement costs for cities to replace tree cover and habitat, and hazardous conditions for the public with sick trees.
- Societal costs due to widespread, increasing corrosion of metal infrastructure, including water mains, and buildings' structural frames and bridges, creating hazardous conditions and replacement costs.
- Societal costs from damaged building material integrity from RF radiation.
- Societal costs from increased vulnerability and incidents of hacking, EMPs, and cyberattacks
- Societal costs of nuclear accidents, including evacuation and relocation, contaminated land, air, and water, soil contamination for centuries, increased disease and death rates, damaged genetic material for all species, etc.
- Costs in hours, money, time away from family, and life deferred for 2 + years by members of the public to educate Californians and public officials about this program.

COSTS EXCEED BENEFITS

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

Connecticut Attorney General George Jepson (February 2011):

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

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

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

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

Illinois Attorney General Lisa Madigan (June 2011):

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

The \$63 million smart grid pilot program consumers are currently paying for has turned in disappointing results that reinforce what Rowe already knows. On hot summer days, people continue to run their air conditioners no matter how much information they have from their smart meter.

Consumers don't need to be forced to pay billions for so-called smart technology to know how to reduce their utility bills. We know to turn down the heat or air conditioning and shut off the lights. The utilities have shown no evidence of billions of dollars in benefits to consumers from these new meters, but they have shown they know how to profit.

I think the only real question is: How dumb do they think we are?"

Michigan Attorney General Bill Schuette (April 2012)

...at least two very substantial issues remain that must be further addressed before the MPSC (Michigan Public Service Commission) authorizes or approves any further deployment of smart meters by Michigan electric utilities and the recovery from ratepayers of the costs of smart meter deployment. First, there must be a sufficient demonstration that implementation of the smart meter programs will actually produce a net economic benefit to customers. Second, customers must be afforded a meaningful and fair opportunity to opt out of smart meter installation without being penalized by unwarranted and excessive costs.

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

programs upon ratepayers. To a significant extent, the asserted potential benefits to utility customers depend upon assumptions that a customer will consider additional “real time” data on electricity usage provided by smart meters, and adjust their electrical consumption to achieve cost savings under variable pricing programs that do not yet exist. (See Edison, Document No. 0146, p 5; and Consumers, Document No. 0148, pp. 6-7). Any assumption that large numbers of residential customers will have the time, ability and motivation to attend to, and act upon daily or even hourly changes in their electrical is questionable.

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

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

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

Division of Ratepayer Advocates, March 2012:

Executive Summary:

Key Findings presented in Section V of this report include:

- According to SCE’s AMI business case, the total cost to customers will be greater than \$5 billion, rather than the \$1.6 billion cost explicitly approved by the CPUC, which only included nominal deployment costs;
- Many forecasted benefits have been delayed or reduced, which erases the projected margin of net benefits as calculated in SCE’s business case [see below];
- SmartConnect-related costs not anticipated in SCE’s original business case have already been approved by the CPUC in other proceedings, beyond the over \$5 billion cost referenced above. In many cases, these costs were approved without a showing of incremental benefits, and DRA anticipates that more will be requested;
- SmartConnect features such as remote disconnect and SmartConnect-enabled time-varying rates have a high potential for adverse impacts for low-income and other “at-risk” customers... (p. 2)

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

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

Conclusion:

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

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

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

AARP, National Consumer Law Center, and Public Citizen:

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

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

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

Conclusion

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

Comments to Department of Energy Smart Grid RFI: Addressing Policy and Logistical Challenges, November 1, 2010

http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/AARPNCLCPublic_CitizenCommentsDOE1101.pdf

Cited in

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

The “attached paper” mentioned above is the report:

The Need For Essential Consumer Protections: Smart Metering Proposals And The Move To Time-Based Pricing, August 2010

www.nclc.org/images/pdf/energy_utility_telecom/additional_resources/adv_meter_protection_report.pdf

Table II
PG&E SmartMeter™ Program Enabled Energy Conservation Programs
Subscription Statistics
December 31, 2010

Program	Service Accounts	Energy Savings (MWh)		Demand Reduction (MW)		Total Financial Benefits (thousands)
		Energy Savings	Financial Benefits (thousands)	Load Impacts (MWs)	Financial Benefits (thousands)	
Energy Conservation						
Customer Web Presentment	128,000	0	\$0	0	\$0	\$0
Home Area Network	0	0	\$0	0	\$0	\$0
Energy Alerts	30,155	0	\$0	0	\$0	\$0
Total		0	\$0	0	\$0	\$0

PG&E 2010 Program Year SmartMeter™ Program Enabled Demand Response and Energy Conservation Annual Report, 4-29-11, p.20

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		Energy Savings	Financial Benefits (thousands)	Load Impacts (MWs)	Financial Benefits (thousands)	
Energy Conservation						
Customer Web Presentment	199,833	1,917	\$94	0	\$0	\$0
Home Area Network	0	0	\$0	0	\$0	\$0
Energy Alerts	73,261	0	\$0	0	\$0	\$0
Total	243,432*	1,917	\$94	0	\$0	\$0

* 29,662 customers were dually enrolled in CWP and EA; there were 243,432 unique service accounts
PG&E 2011 Program Year SmartMeter™ Program Enabled Demand Response and Energy Conservation Annual Report, 4-30-12, p. 21

The financial benefits for 2011 were \$94,000 divided by 199,833 enrolled customers. Each customer saved 47 cents for the entire year. The energy savings per customer was .0096 MWh or 9.6 kWh for the entire year.

In contrast,

Utilizing power strips, unplugging electronics and small appliances not in use	Savings: 300 kWh/yr
Utilizing a variety of energy savings measures	Savings: 1,712 kWh/yr (average single family home)

Source: Pacific Gas & Electric, "Path to your Energy Savings", 11-04-09

9.6 kWh per year versus 300 kWh per year – that’s a big difference.

UK National Audit Office (June 2011)

The costs of the UK Government’s plans to rollout smart meters to the country’s homes and businesses could escalate while providing little saving, warns the National Audit Office (NAO).

The report warns that the benefits are far from certain and there is limited evidence that consumers’ behaviour would be permanently changed.

<http://www.energyefficiencynews.com/i/4225/>

Smart Grid News (September 2011)

“Illinois Gov. Pat Quinn, citing an excessive financial burden on consumers, "sweetheart deals" and no guarantees of improved service, knocked down legislation that would have paid for the widespread installation of smart meters and other electric grid improvements.” His veto was overridden by the legislature.

Palo Alto, a municipal utility district, has decided after three years of research that they will not be installing Smart Meters for the time being. They found that Smart Meter benefits were overstated, and that costs exceeded benefits. <http://palalto.patch.com/articles/no-smart-meters-for-palo-alto-before-2015> Palo Alto is considered the heart of the Silicon Valley and is the home of Stanford University and EPRI. It took courage to take this action.

A white paper: “Advanced Metering Infrastructure – Implications for Residential Customers in New Jersey” states:

Savings to ratepayers. The estimates of savings to residential customers from AMI-enabled dynamic pricing, a form of time-differentiated pricing, hinge upon three major assumptions:

- the reduction in peak use per participating customer,
- the percentage of customers who will voluntarily participate, and

- the long-term persistence of the reductions per participating customer.
- There is considerable uncertainty regarding each of these assumptions despite the results from pilot projects in other jurisdictions. First, most pilots entice customers to participate through some form of “appreciation” payment and therefore provide no guidance regarding the percentage of customers who will voluntarily participate in the absence of such an incentive. Second, most pilots have only operated a few years, thus they provide little guidance regarding the long-term persistence of participation and reductions per participant.

It also concludes:

...reductions from dynamic pricing will not lead to significant reductions in annual emissions of carbon dioxide and sulfur dioxide which are a function of annual electricity use.

Report prepared by Synapse Energy Economics, Inc. for New Jersey Department of Public Advocate, Division of Rate Counsel, July 8, 2008. p. 2

http://www.state.nj.us/publicadvocate/utility/docs/AMI_White_Paper-final.pdf

Barbara Alexander, “Smart Regulatory Approach For Smart Grid Investments”:

- Federal policies are not mandatory; states have discretion about adopting any PURPA policies, including Smart Grid policies in the Energy Policy Acts of 2005 and 2007
- Rate impacts (AMI costs alone in CA over \$3 B; \$200-400/meter is typical)
- Technology obsolescence
- Almost 50% of residential customers have very low price elasticities (less than -0.10); half will make very little usage changes
- YET all must pay for program; TURN found that 60% of customers who use less than 6,000 kWh annually would have to shift more than half their peak load to see bill savings when costs of AMI taken into account
- TURN concluded that only a relatively small group of high usage residential customers can realistically shift sufficient peak load to find bill savings.
- PUGET SOUND ENERGY: Mandatory TOU prices for all residential customers abandoned in 2002 when analysis showed negative cost benefit and higher, not lower, customer bills
- Customers with most adverse bill impacts: multi-family and mobile homes
- MAINE: Mandatory TOU prices for high use electricity customers made voluntary with onset of restructuring and widespread customer dissatisfaction in face of higher electricity prices
- Elderly customers in newly built multi-unit condos and senior and low income housing complexes most adversely affected and without alternative options
- NEW YORK: Previous efforts to push for Time of Use pricing resulted in state law that prohibits such time-based pricing except as voluntary options.

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

Presentation, July 15, 2010, 2010 National Energy and Utility Affordability Conference
http://www.energyandutilityconference.org/Assets/2010%20Conference/2010%20Presentations/Plenary%201_Alexander.pdf
 As summarized in
<https://sites.google.com/site/nocelltowerinourneighborhood/home/wireless-smart-meter-concerns/going-deep-understanding-the-big-picture-and-real-costs-and-concerns>

FRAUDULENT CLAIMS AND UNAVAILABLE INFORMATION

Smart Meters and the Smart Grid are being installed without full disclosure to the public. Utility companies have repeatedly lied and concealed information from the public or given out misleading information, including the following:

- a) “There is a federal mandate.”
- b) “There is a state mandate.”
- c) “Smart Meters are much less exposure than cell phones”
- d) “Smart Meters empower the consumer by giving them information”
- e) “Analog meters undercharged customers”

- f) "Smart Meters transmit only 6 times per day"
- g) "Smart Meters only transmit for 45 seconds (PG&E median average), or a few minutes (SCE) each hour."
- h) "Smart Meters are low power."
- i) "Smart Meter emissions are a fraction of FCC guidelines."
- j) "Who is going to get close to Smart Meters?"
- k) "I'm sorry I don't have the answer. I'll have to get back to you on that."

"There is a federal mandate."

There is no federal mandate for this program; the Energy Act of 2005 only says this must be "offered" to customers, and it is only "upon customer request" that they receive time-based rates and Smart Meters.

"There is a state mandate."

Time-variant (time-of-use) pricing is optional with no penalty -- P.U.C. Section 745

"Smart Meters are much less exposure than cell phones."

Smart Meters are much greater exposure than cell phones. The Hirsch correction to the CCST chart, earlier discussed, estimated that Smart Meters at three feet give 53-160 times the whole body radiation exposure from a cell phone held to the head, as well as even greater exposure compared to other wireless devices. Yet the CPUC and utilities continue to give out false information to the public.

"Smart Meters empower the consumer by giving them information."

18-24 hours later, consumers get batched information for the previous day, not for individual appliances. They would have to keep a log to know what they used during the previous day, but with no separation of the energy usage of appliances, this would be impossible to break down.

Energy monitors that consumers can purchase now, give real-time information about their energy usage. These monitors also give this information privately.

"Analog meters undercharged customers"

Customers pay most of the utilities' expenses in rates. Un-tabulated, un-expensed energy would be factored into utility rates.

"Smart Meters transmit only 6 times per day"

The public has repeatedly asked for technical information from the utility companies, only to be stonewalled or given contradictory answers. Members of the public have repeatedly brought the results of their own investigations to elected officials and to the PUC, results which the utility companies denied.

When individuals measured pulses from Smart Meters occurring every few seconds, the utility companies repeatedly denied this. Only when ordered by Administrative Law Judge Yip-Kikugawa during the opt-out proceeding, did the utilities disclose data on transmissions.

PG&E electric Smart Meters transmit over **14,000 (mean average) to 190,000 times each day**, including the “only 6 times” for data transmission. SCE and SDG&E electric meters transmit from **1250 to 26,000 times per day**. This is a completely different picture than the few seconds or few minutes each day stated by the utility companies.

Most of the transmissions at this time are for network maintenance, though duty cycles for data transmission can increase. Also, these transmission totals may not include the relay transmissions from neighboring meters in the mesh network.

“Smart Meters only transmit for 45 seconds (PG&E median average), or a few minutes (SCE) each hour.”

Smart Meters transmit constantly throughout the day, 24 hours per day, as often as every few seconds. The public has repeatedly documented and reported this information.

“Smart Meters are low power.”

Words such as “weak”, “low power”, “miniscule” are repeatedly used by utility companies in their RF Fact Sheets to imply safety.

For example:

PGE’s SmartMeter™ technology makes use of low-power radiofrequency (RF) transmitters... These low power transmitters are found inside each power meter, in repeater units, and in access points.

Richard Tell, 2008 Smart Meter report for PG&E

www.pge.com/mybusiness/edusafety/systemworks/rfsafety/index.shtml

GWP’s smart metering devices communicate using relatively low-power, weak radio wireless signals that are similar or weaker in strength than those created by common consumer devices.

Glendale Water and Power Frequently Asked Questions,

http://www.glendalewaterandpower.com/radio_frequency_faqs.aspx)

SCE’s smart metering devices communicate using low-power, wireless signals that are similar or weaker in strength than those created by common consumer devices...--- levels much too low to produce tissue heating or an increase in body temperature.

Frequently Asked Questions (FAQs) About SCE’s Edison SmartConnect Meters And Radio Frequency

<http://www.cityofcalabasas.com/pdf/agendas/ctc/07192011/item6-attachment-4.pdf>

Utility personnel are not healthcare professionals or biologists. They dismiss biological non-thermal effects and research. They ignore or dismiss phenomenon such as calcium efflux, which occurs with weak EMF fields, in which calcium ions leave cell membranes allowing them to leak. They dismiss research such as altered genetic structure of e coli bacteria at .0000000000001 (1/ten-trillionth) microwatts per cm² (Belyaev) and altered EEGs in humans at .000000001

(1/hundred millionth) microwatts per cm² (Bise). And they dismiss the truly low levels of EMF that our body uses for cellular communication.

Truly alarming and criminal is the work the utility industry does to hide EMF health impacts from the public. This was discussed in "Health" under "Industry response."

"Smart Meter emissions are a fraction of FCC guidelines."

Southern California Edison:

A feature of the FCC's safety guidelines is that there is a safety factor of fifty included in the general population limits.

Edison SmartConnect meters and cell relays emit only a fraction of the FCC's human exposure limits.

Frequently Asked Questions, July 2011

<http://www.sce.com//CustomerService/smartconnect/industry-resource-center/rf-faq.htm>

These statements rely on the public's ignorance of the science.

No safe level for radiofrequency electromagnetic radiation exposure has been established. None. FCC guidelines are for a one-time brief exposure that does not cause heating in a large man. It is not for long-term, cumulative, repetitious, or constant exposure.

The FCC refuses to take into consideration biological, non-thermal effects which have been known and studied for decades.

FCC guidelines are among the most lax in the world. Countries are increasingly tightening theirs, lowering the levels they allow the public to be exposed to, while the U.S. calls other countries to "harmonize" their limits to match ours.

This year, the FCC decided to open an inquiry into its exposure guidelines.

The U.S. Federal Communications Commission plans to ask whether its standards protect people from mobile-phone radiation, a question it hasn't posed in 15 years, as people use smartphones for longer, more frequent calls.

Julius Genachowski, the agency's chairman, is asking fellow commissioners to approve a notice commencing a formal inquiry, Tammy Sun, a spokeswoman for the agency, said in an e-mailed statement. The notice won't propose rules, Sun said.

"Our action today is a routine review of our standards," Sun said. "We are confident that, as set, the emissions guidelines for devices pose no risks to consumers."

The FCC last updated its guidelines setting maximum radiation-exposure levels, which are based on the amount of heat emitted by mobile phones, in 1996.

<http://www.bloomberg.com/news/2012-06-15/mobile-phone-radiation-safety-to-be-examined-by-u-s-regulator.html>

Frontal and temporal brain tumors have increased 50% in the UK between 1999 and 2009 according to figures published in April by the British Office of National Statistics, and there has been a 1-2% annual increase in brain cancers in children according to Bordeaux Segalen University. And in November 2012, the Danish Cancer Society reported a doubling in aggressive brain cancer in men over the last 10 years. That is in addition to an epidemic of autism, ADHD, and Alzheimer's.

The FCC is "confident that...the emissions guidelines for devices pose no risks for consumers."

"Who is going to get close to Smart Meters?"

The photographs in the section "FCC violations" are a few examples of unavoidably close exposure the public has to Smart Meters and their radiation.

Meters, including banks of meters, are on the other side of walls where people spend a great deal of time, such as bedrooms and living rooms. Adults and children have beds on the other side of the wall from Smart Meters, within inches. Many meters are next to narrow walkways by the side of a house, or ganged together in a bank by a common walkway in an apartment complex. They are near where people keep their garbage cans or beside a garage door. And many of these are in areas where children have access and can play on them. The range and the penetrating value of the meters' pulses are important to keep in mind.

Finally,

"I'm sorry I don't have the answer. I'll have to get back to you on that."

This is a frequent answer from PG&E representatives and perhaps other utility companies as well. Many members of the public and elected officials have publicly commented that the utility company representatives do not "get back to you." The motivation for this is uncertain. However, it becomes another way to avoid giving the public straight answers.

STRONG-ARM TACTICS BY CPUC AND UTILITIES

CPUC and utility company employees and contractors have bullied and lied to people. They have ignored signs, hopped fences, waited until no one was home to install, and tasered at least one dog to install Smart Meters. They have told people they had no choice, even after the delay and opt-out programs were in place. They have laughed at people's concerns over pacemaker interference, and have walked past people saying "no," installing Smart Meters over their objections. In three cities, they used law enforcement personnel to force installation of Smart Meters, in two instances destroying protective cages and taking analog meters owned by the customers.

They have spied on the public and called nonviolent Smart Meter protestors insurgents. They have mounted glossy and deceptive public relations campaigns with ratepayer money to “educate” and “engage” the public and sell the program.

Despite the PUC’s mandate to employ low-cost, no-cost EMF mitigation, the PUC has ignored EMF hazards. The Electric Power Research Institute and utility companies have engaged in subterfuge by installing their personnel at the WHO EMF Project to hide evidence of health risk from power lines, putting not only the public but their own employees at risk. They have run roughshod over communities, rather than working with communities – for instance, Chino Hills – in power line construction for the Smart Grid.

Chino Hills Mayor: Open Letter to Southern California Edison and the CPUC
[http://www.chinohills.com/news-articles-
details/An Open Letter to SCE and the CPUC-1925](http://www.chinohills.com/news-articles-details/An%20Open%20Letter%20to%20SCE%20and%20the%20CPUC-1925)

While Smart Meter health problems are ongoing and increasing, though numerous protests have been filed at the PUC, and though moratoriums have been adopted by cities and counties, the utility companies have ignored the problems and the protests, and proceeded with installing Smart Meters, often at an accelerated pace. There was even a report that SCE installed a Smart Meter in the middle of the night, a very dangerous maneuver, if true; many people rely on medical devices, such as CPAP machines for sleep apnea, to breathe at night while they are sleeping.

PG&E is also deriding those who attempt to bring these health issues to the fore in proceedings at the PUC. For instance:

“It behooves us to point out, unfortunately, that the last sentence in paragraph 2 of sec. III A is unintelligible, which is inexcusable for a corporation that can hire the best lawyers available. It refers to a “procedurally impermissible collateral attack”. What kind of Orwellian statement is this? We, who are defending the people against a serious and intentional incursion on their welfare are being accused of “attacking”? It is “impermissible” for citizens to hold their government and its assigned agents accountable to the law and the constitution? Since when? Only in a tyranny would such a thought be intelligible. It is a disgrace that PG&E would stoop to such derogation and calumny against the citizens of this state. There is nothing, and can be nothing, that procedurally prohibits investigation (or even relitigation) into harms that occur in the wake of a government sponsored program carried out by a private corporation such as PG&E.”

PUC Application 11-07-009, Reply of Alameda County Residents
Concerned about Smart Meters to PG&E’s protest, Section 3.1

VIOLATION OF JURISDICTION AND MANDATE BY CPUC

CPUC has shared jurisdiction over utilities

The California Public Utilities Commission does not have sole jurisdiction over utilities. This is spelled out in Public Utilities Code Sections 2901-2906 and in Section 761.3d, and in the California Constitution, Article 12, Section 8. Municipal corporations, and federal, state, and local agencies, share jurisdiction with the CPUC in aspects of utility regulation, particularly regarding public health and safety issues.

The CPUC is not just ignoring the law about this shared jurisdiction; it is actively misleading, even lying to elected officials and the public about its jurisdiction and authority.

We are writing to inform you of our view that the Town of Fairfax's proposed ordinance would interfere with the exclusive jurisdiction of the California Public Utilities Commission (CPUC or Commission) over the regulation of public utilities.

Section 8 of Article 12 of the California Constitution states that "[a] city, county, or other public body may not regulate matters over which the Legislature grants regulatory power to the Commission." The Legislature has granted the Commission authority over a public utility's infrastructure, including the installation of meters. (See Public Utilities Code section 761, granting the Commission authority (i) to regulate the practices, equipment, appliances, facilities, service and the methods of supply and distribution of public utilities and (ii) to determine whether any of those are unjust, unreasonable, unsafe, improper, inadequate, or insufficient; see also Public Utilities Code section 701, granting the Commission jurisdiction to regulate every public utility in the State and do all things, whether specifically designated in the Public Utilities Act or in addition thereto, which are necessary and convenient in the exercise of such power and jurisdiction.)...

As part of your due diligence, I would ask that your office and the Town's legal counsel carefully consider the legal issues associated with the proposed ordinance.

Letter of Frank Lindh, CPUC General Counsel, to the town of Fairfax, August 2, 2010

CPUC general counsel Frank Lindh, formerly an attorney for PG&E, misquotes the Public Utilities Code. Section 761 actually says:

Whenever the commission, after a hearing, finds that the rules, practices, equipment, appliances, facilities, or service of any public utility, or the methods of manufacture, distribution, transmission, storage, or supply employed by it, are unjust, unreasonable, unsafe, improper, inadequate, or insufficient, the commission shall determine and, by order or rule, fix the rules, practices, equipment, appliances, facilities, service, or methods to be observed, furnished, constructed, enforced, or employed. The

commission shall prescribe rules for the performance of any service or the furnishing of any commodity of the character furnished or supplied by any public utility, and, on proper demand and tender of rates, such public utility shall furnish such commodity or render such service within the time and upon the conditions provided in such rules.

These duties are within the context of a hearing. This section, however, does not require that the Commission hold hearings. It does not provide any threshold over which evidence must be investigated. The Commission is required to “fix” a situation, only whenever it holds a hearing and finds that problems exist.

Section 761.3d then goes on to say:

(d) Nothing in this section shall result in the modification, delay, or abrogation of any deadline, standard, rule, or regulation adopted by a federal, state, or local agency for the purposes of protecting public health or the environment, including, but not limited to, any requirements imposed by the State Air Resources Board or by an air pollution control district or an air quality management district pursuant to Division 26 (commencing with Section 39000) of the Health and Safety Code.

That’s extremely clear, and Mr. Lindh omitted that section in his letter to Fairfax. Federal, state and local agencies may adopt deadlines, standards, rules and regulations for protecting public health and the environment. And these may not be modified, delayed, or abrogated (voided), presumably by the Commission.

So, here in the Public Utilities Code is jurisdictional power by federal, state, and local agencies over public health and environmental issues related to the utilities.

Furthermore, Mr. Lindh neglected to mention Sections 2901-2906 of the Public Utilities Code.

2901. Any municipal corporation may retain or surrender to the commission the powers of control vested in it to supervise and regulate the relationship between any one or more classes of public utilities, and their present or prospective customers, consumers, or patrons, and, if it has retained such powers over any class of public utilities, may thereafter surrender such powers to the commission.

2902. This chapter shall not be construed to authorize any municipal corporation to surrender to the commission its powers of control to supervise and regulate the relationship between a public utility and the general public in matters affecting the health, convenience, and safety of the general public, including matters such as the use and repair of public streets by any public utility, the location of the poles, wires, mains, or conduits of any public utility, on, under, or above any public streets, and the speed of common carriers operating within the limits of the municipal corporation.

2904. "Municipal corporation" means a city and county or incorporated city.

2906. "Powers of control" means all powers of control vested in a municipal corporation to supervise and regulate (a) the relationship between public utilities and their present or prospective customers, consumers, or patrons. The term does not include the powers of control vested in any municipal corporation to supervise and regulate the relationship between such public utilities and the general public in matters affecting the health, convenience, and safety of the general public, including matters such as the use and repair of public streets by any public utility, the location of the poles, wires, mains, or conduits of any public utility, on, under, or above any public streets, and (b) the speed of common carriers operating within the limits of the municipal corporation.

This is very clear: municipal corporations have vested powers of control to regulate the relationship between public utilities and the general public in matters affecting the health, convenience, and safety of the general public. And apparently, they cannot relinquish them.

Public Utilities Code Section 701, which Mr. Lindh notes, lists responsibilities of the Commission. However, it uses the verb "may," It does not use "will", "shall" or "must".

The commission may supervise and regulate every public utility in the State and may do all things, whether specifically designated in this part or in addition thereto, which are necessary and convenient in the exercise of such power and jurisdiction.

Section 761, however, uses the verb "shall" as far as the Commission taking action based on what it finds in a hearing – there is no choice given the Commission in that section. Section 701 appears to lay out the actions the Commission may take if it so chooses. Nothing is stated here that gives sole authority to the Commission.

One final note on Section 701: the CPUC may supervise and regulate every public utility. Period. It is not given jurisdiction to supervise and regulate the public. The relationship is further developed in Section 702:

Every public utility shall obey and comply with every order, decision, direction, or rule made or prescribed by the commission in the matters specified in this part, or any other matter in any way relating to or affecting its business as a public utility, and shall do everything necessary or proper to secure compliance therewith by all of its officers, agents, and employees.

So, the public utility "shall" obey and comply with the Commission, while the Commission "may" supervise and regulate the utilities. But the relationship is between them. The jurisdiction of the CPUC is the utilities, not the public.

Article 12, Section 8 of the California Constitution further states that cities have the right “to grant franchises for public utilities or other businesses on terms, conditions, and in the manner prescribed by law.” It also states that cities in existence as Oct 10, 1911, have “power over public utilities relating to the making and enforcement of police, sanitary, and other regulations concerning municipal affairs,” unless that power has been revoked by the voters.

Finally, there is the sovereignty and jurisdiction of the people.

The Bagley-Keene Open Meeting Act, which governs state agencies, states in its Preamble (Section 11120):

The people of this state do not yield their sovereignty to the agencies which serve them. The people, in delegating authority, do not give their public servants the right to decide what is good for the people to know and what is not good for them to know. The people insist on remaining informed so that they may retain control over the instruments they have created. This article shall be known and may be cited as the Bagley-Keene Open Meeting Act.

So, the California Public Utilities Commission shares legal jurisdiction over the utilities, particularly in regards to public health and safety, with federal, state, and local agencies, and with municipal corporations – cities and counties. And the public is sovereign and retains jurisdiction. To claim otherwise is a blatant lie.

There has also been considerable discussion of the overburdening of utility easements. These easement limitations are spelled out in Tariff Rule 16. Nowhere in the rule is an allowance for installing radio transmitting equipment on every building for the purpose of relaying information about a customer from building to building. Yet again, the CPUC appears to be overreaching its jurisdiction.

CPUC mandate violations

The California Public Utilities Commission serves the public interest by protecting consumers and ensuring the provision of safe, reliable utility service and infrastructure at reasonable rates, with a commitment to environmental enhancement and a healthy California economy.

CPUC Mission, 5/22/12 <http://www.cpuc.ca.gov/PUC/aboutus/pucmission.htm>

Public Utilities Code Section 761, cited in the previous section, states the Commission shall fix utility-related issues that, after a hearing, they find “unsafe, improper, inadequate, or insufficient.”

Furthermore, when SB 17 was adopted, this language was added to the Public Utilities Code:

It is the policy of the state to modernize the state's electrical transmission and distribution system to maintain safe, reliable, efficient, and secure electrical service.
Section 8360-69

The CPUC must make sure that the public is provided with safe, reliable, and secure energy to the public. However, there is substantial and growing evidence that it is not fulfilling its mandate, because it is neglecting, ignoring and denying the existence of various substantial problems.

There has been no investigation of the many problems with Smart Meters, other than the Structure Group report (previously discussed), and there have been no public hearings.

So, on one side, the CPUC is being grossly negligent and is failing to fulfill its mandate.

On a different issue, it is over-reaching in its mandate and powers.

California Constitution, Article 12, Section 6:

The commission may fix rates, establish rules, examine records, issue subpoenas, administer oaths, take testimony, punish for contempt, and prescribe a uniform system of accounts for all public utilities subject to its jurisdiction.

Public Utilities Code Section 701 says "The commission may supervise and regulate every public utility..."

Public Utilities Code 762:

Whenever the commission, after a hearing, finds that additions, extensions, repairs, or improvements to, or changes in, the existing plant, equipment, apparatus, facilities, or other physical property of any public utility or of any two or more public utilities ought reasonably to be made, or that new structures should be erected, to promote the security or convenience of its employees or the public, or in any other way to secure adequate service or facilities, the commission shall make and serve an order directing that such additions, extensions, repairs, improvements, or changes be made or such structures be erected in the manner and within the time specified in the order.

Public Utilities Code 768:

The commission may, after a hearing, require every public utility to construct, maintain, and operate its line, plant, system, equipment, apparatus, tracks, and premises in a manner so as to promote and safeguard the health and safety of its employees, passengers, customers, and the public."

The CPUC's jurisdiction is over the public utilities. It does not have jurisdiction over the public, other than setting the rates which utility customers must pay to get service.

The CPUC can mandate that the utilities offer Smart Meters to the public; that is within their authority. However, they cannot require that utilities install Smart Meters on the property of those who don't want them. The CPUC regulates utilities, and aside from setting rates, it cannot regulate the public. Therefore, there is no mandate to install Smart Meters. Hence, an opt-out is an irrelevancy.

CPUC vs. FCC

The CPUC inappropriately defers to the FCC as having jurisdiction over RF emissions from Smart Meters.

(In dismissing EMF Safety Network's application regarding health impacts from Smart Meters in D.10-12-001) At the Commission's December 2 (2010) public meeting, (President) Peevey stated, "I believe that relying on the FCC in this case is reasonable, prudent and fully consistent with our responsibilities to provide safe and reliable electric service to ratepayers. We're relying on the federal agency in this regard." Commissioner Peevey concluded his statements by telling the audience at the hearing, "You should take these concerns to the FCC, it's the proper body."

...The Commission, not the FCC, mandated RF Smart Meters in California. It is the responsibility of the Commission to "serve the public interest by protecting consumers and ensuring the provision of safe, reliable utility service and infrastructure at reasonable rates, with a commitment to environmental enhancement and a healthy California economy." (quote from CPUC home page: <http://www.cpuc.ca.gov/puc/>)
EMF Safety Network Application for Rehearing of Decision 10-12-001,
January 2011

Furthermore, PG&E, in its arguments, implied that Smart Meters are personal wireless service facilities over which the FCC was granted legal jurisdiction by Congress by quoting Section 704 of the 1996 Telecommunications Act.

But Smart Meters are not "personal wireless service facilities," otherwise known as cellular antennas or cell towers, and therefore, the FCC does not have jurisdiction over Smart Meters.

However, the FCC itself has denied jurisdiction over Smart Meters.

On September 9, 2010, Michael Boyd of Californians for Renewable Energy filed a complaint with the FCC over the installation of Smart Meters by PG&E and regarding RF compliance with FCC regulations. The FCC responded October 20, 2010.

The matter you have outlined in your correspondence does not come under the jurisdiction of the FCC. Included below is contact information for an agency that may be of more assistance.

Letter from Sharon Bowers, Consumer & Governmental Affairs Bureau, FCC

The agency she referred him to was the CPUC.

CPUC PROCEDURAL VIOLATIONS

The Smart Meter opt-out proceeding Phase 1 scope was sharply limited, and no hearing was held. The only evidence allowed was from by utility companies and their vendors.

In Resolution ALJ 176-3272 dated April 4, 2011, the Commission characterized this proceeding as a ratesetting proceeding and determined a hearing would be necessary. In the Assigned Commissioner's Ruling and Scoping Memo dated May 25, 2011, the Commission identified the issues to be addressed in this proceeding, without setting a schedule. The Commission also determined that a second pre-hearing conference would be necessary to establish a schedule. The Commission subsequently held a second prehearing conference, during which time the parties discussed the schedule for further proceedings among other things.

Based on this record, the parties to this proceeding reasonably expected the Commission to issue an order establishing deadlines for filing their testimony and set dates for a hearing. Yet, no further scheduling order was issued. The parties were never given an opportunity to submit written testimony.

Despite this procedural posture, the PD (Proposed Decision) would dispose of this case without a hearing. The PD determines that a hearing is not necessary because "there were no disputed factual issues material to the resolution of this application." The PD, however, makes this determination based solely on the uncontested evidence submitted by PG&E in support of its application.... The Commission cannot make such a finding when it prevented the parties other than PG&E from making a record.

City and County of San Francisco Comments on Proposed Decision on A. 11-03-014, December 12, 2011

<http://docs.cpuc.ca.gov/efile/CM/155223.pdf>

The evidence submitted by the IOUs was not evaluated nor allowed to be countered. Within a few weeks of the release of the information by PG&E and the other IOUs, Chairman Peevey issued a proposed decision, closing off further investigation. The date he issued the PD was immediately prior to Thanksgiving.

Numerous other local government, industry and public interest groups, and concerned citizens groups have become parties to this proceeding and expressed support for the Protest filed by the Town of Fairfax et al. The inability of these parties to join in these

Comments does not reflect their endorsement of the Proposed Decision or any disagreement with these comments. Rather, it is due to the presumably purposeful release of the Proposed Decision (and commencement of the twenty day period available for comment) at approximately 2:25 PM on November 22, 2011, leaving only hours more than one full business day before the Thanksgiving holiday. The Commission is well aware of the formal procedures which must be followed by governmental bodies in California in order to properly review and authorize an official position in proceedings such as this. The Commission's timing of the release of the Proposed Decision, combined with the known legal requirements binding on participating parties and practical realities of the Thanksgiving holiday, is one more example of the failure of the Commission to provide a meaningful ability to be heard in this proceeding. It is cumulative to the other such failures which in total, if the Proposed Decision is adopted, will result in reversible legal error as summarized in these Comments and demonstrated by the Commission's official records of the proceeding even if not set forth in detail here.

Comments by the Town of Fairfax et al. to the proposed decision of
Commissioner Peevey, Dec. 12, 2011

<http://docs.cpuc.ca.gov/efile/CM/155827.pdf>

When EMF Safety Network's application 10-014-018 was dismissed, it was on the basis of PG&E evidence solely. That application was dismissed without hearings, without even a pre-hearing conference. And the application for rehearing, filed in January 2011, has yet to be granted a pre-hearing conference, now 1 ½ years later -- despite an increasing volume of complaints from the public about the effects of the Smart Meter program.

Alameda County Residents Concerned About Smart Meters (ACRCASM) filed an application in August 2011. That application questions the legitimacy of the original Smart Meter authorization based on current evidence. However, it has also not been given a pre-hearing conference to date.

NO CEQA EIR

No CEQA EIR was prepared for Smart Meters or wireless Smart Meters.

PG&E has said this is one of the largest technological roll-outs in California history. Yet no CEQA EIR was done for Smart Meters -- wired or wireless.

CEQA Guidelines at Section 15126.2 requires Consideration and Discussion of Significant Environmental Impacts:

The Significant Environmental Effects of the Proposed Project. An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as

they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services.

Was a CEQA EIR done for the Smart Grid itself?

VIOLATION OF STATE AND FEDERAL LAWS

All people are by nature free and independent and have inalienable rights. Among these are enjoying and defending life and liberty, acquiring, possessing, and protecting property, and pursuing and obtaining safety, happiness, and privacy.

Article 1, Section 1, California Constitution:

The Smart Meter and aspects of the Smart Grid program violate our rights to enjoy life and liberty, protect our property, and obtain safety, happiness and privacy for all the reasons mentioned previously.

Violations of U.S. Constitution:

The Preamble to the Constitution:

We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity,...

This program creates extensive current and potential harm and violates the general Welfare. Furthermore, there is no liberty in a country or state which oversees a forced illegal program that puts surveillance devices on every building.

4th Amendment:

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause...

Smart Meters are surveillance devices installed without permits or warrants. They record highly detailed personal energy usage data that chronicles everything we do in our homes and when we are gone. That data is then wirelessly transmitted elsewhere and stored. This is unconstitutional.

14th Amendment:

...No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the US; nor shall any State deprive any person of life, liberty, or property, without due process of law...

The State of California is actively abridging the privileges of U.S. citizens through the enforcement of this program, and depriving residents of life and property, as well as liberty.

Federal law violations:

The Energy Policy Act of 2005 (H.R. 6) states

Section 1252 Smart Metering

(a) (14) Time-Based Metering and Communications.—(A) Not later than 18 months after the date of enactment of this paragraph, each electric utility shall offer each of its customer classes, and provide individual customers upon customer request, a time-based rate schedule under which the rate charged by the electric utility varies during different time periods and reflects the variance, if any, in the utility's costs of generating and purchasing electricity at the wholesale level. The time-based rate schedule shall enable the electric consumer to manage energy use and cost through advanced metering and communications technology.

(B) The types of time-based rate schedules that may be offered under the schedule referred to in subparagraph (A) include, among others—

(i) time-of-use pricing..., (ii) critical peak pricing..., (iii) real-time pricing..., and (iv) credits...

(C) Each electric utility subject to subparagraph (A) shall provide each customer requesting a time-based rate with a time-based meter capable of enabling the utility and customer to offer and receive such rate, respectively.

(f) FEDERAL ENCOURAGEMENT OF DEMAND RESPONSE DEVICES.—It is the policy of the United States that time-based pricing and other forms of demand response, whereby electricity customers are provided with electricity price signals and the ability to benefit by responding to them, shall be encouraged...

“Offer,” “upon customer request,” “encouraged” – there is no federal mandate for the Smart Meter program as it is being conducted in California.

Americans with Disabilities Act violations

Americans with Disabilities Act of 1990, 42 USC 12101 (as amended by ADA Amendment Act of 2008) defines a disability as

- A) a physical or mental impairment that substantially limits one or more major life activities of such individual;
- B) a record of such an impairment; or
- C) being regarded as having such an impairment

Major life activities

- A) include, but are not limited to, caring for oneself, performing manual tasks, seeing, hearing, eating, sleeping, walking, standing, lifting, bending, speaking, breathing, learning, reading, concentrating, thinking, communicating, and working.
- B) include the operation of a major bodily function, including but not limited to, functions of the immune system, normal cell growth, digestive, bowel, bladder, neurological, brain, respiratory, circulatory, endocrine, and reproductive functions.

The ADA Amendment Act of 2008

states at section 2, that "physical or mental disabilities in no way diminish a person's right to fully participate in all aspects of society, yet many people with physical or mental disabilities have been precluded because of discrimination; others who have a record of a disability or are regarded as having a disability also have been subjected to discrimination; Also the definition of disability in this Act shall be construed in favor of broad coverage of individuals under this Act to the maximum extent permitted by the terms of this Act.

US Access Board Recognizes EMF Sensitivity

"The Board recognizes that multiple chemical sensitivities and electromagnetic sensitivities may be considered disabilities under the ADA if they so severely impair the neurological, respiratory or other functions of an individual that it substantially limits one or more of the individual's major life activities. The Board plans to closely examine the needs of this population, and undertake activities that address accessibility issues for these individuals.

"The Board plans to develop technical assistance materials on best practices for accommodating individuals with multiple chemical sensitivities and electromagnetic sensitivities. The Board also plans to sponsor a project on indoor environmental quality. In this project, the Board will bring together building owners, architects, building product manufacturers, model code and standard-setting organizations, individuals with multiple chemical sensitivities and electromagnetic sensitivities, and other individuals. This group will examine building design and construction issues that affect the indoor environment, and develop an action plan that can be used to reduce the level of chemicals and electromagnetic fields in the built environment."

EMF Safety Network CPUC Application, A. 10-04-018, April 2010

The CPUC and utility companies have failed to accommodate those who are disabled due to electromagnetic sensitivities, and therefore, they are in violation of ADA. This includes rendering homes inaccessible, or making the home the only marginally safe place a person can be, if there is no Smart Meter, while restricting access to one's community.

These customers continue to experience discrimination and are harmed personally by the forced exposure to the radiation/rf/emf emitted by smart meters surrounding their homes.

...Numerous physicians have written letters to SCE [Southern California Edison] and the PUC warning of life threatening dangers to their patients if the patient is exposed to the radiation and dirty electricity that is created by the wireless smart meter mesh network. Medical conditions such as environmental illness, neurological damage, immunological damage, elderly, and children, respiratory and cardiac medical conditions are a few of the conditions that are adversely affected by this mesh network of wireless smart meters. These disabilities are recognized and given protection under federal and state laws infra.

...The mesh network and wireless smart meters surrounding their home cause a barrier to accessing their home either fully or partially. This barrier also causes illness and deterioration of their disability or medical condition.

...The consequence of this "deployment", throughout the State, literally on every home and business, leaves this vulnerable population in the unfathomable situation where they (are) excluded from participation in society and precluded from access to homes, businesses and government buildings and services. They cannot find anywhere to seek refuge because the mesh network is virtually everywhere.

Southern Californians for Wired Solutions to Smart Meters (SCWSSM),
Comments on SCE Compliance Filing, 11-07-020, January 16, 2012, p. 4, 5

California Constitution, Article 1 -- multiple violations:

(Constitution text source: www.leginfo.ca.gov/.const/.article_1)

SECTION 1

All people are by nature free and independent and have inalienable rights. Among these are enjoying and defending life and liberty, acquiring, possessing, and protecting property, and pursuing and obtaining safety, happiness, and privacy.

People have been arrested for defending their life, for protecting their property, and for pursuing their safety and happiness by trying to stop Smart Meter installation in their communities.

In this illegally forced installation of Smart Meters, they are barred from pursuing their privacy, safety, and happiness, barred from protecting their property, and barred from enjoying and defending their liberty and their lives.

With the new imposition of the illegal opt-out, only those with the financial wherewithal can participate – in itself a discriminatory process – in obtaining some small modicum of their Section 1 rights.

SECTION 3 (A)

(4) Nothing in this subdivision supersedes or modifies any provision of this Constitution, including the guarantees that a person may not be deprived of life, liberty, or property without due process of law, or denied equal protection of the laws, as provided in Section 7.

SECTION 7

(a) A person may not be deprived of life, liberty, or property without due process of law or denied equal protection of the laws;

There has been no due process of law for the deprivation of life, liberty, and property which people have experienced as a result of this program. People have been rebuffed at the CPUC, by the Attorney General's office, and by local city and county governments when they have attempted to assert their rights.

People have been deprived of liberty, including the right to travel freely in their own communities and equal access, because of Smart Meters, the mesh network and/or star system, and the data collection antenna infrastructure.

People have been deprived of their own property either because Smart Meters were installed on their homes or infrastructure installed nearby, because Smart Meters were installed on other homes nearby, or because of high frequency voltage transients ("dirty" electricity) travelling on electrical lines in their neighborhood and/or into their homes and buildings via electrical wiring and water pipes, making their homes or buildings unlivable.

And it is clear from the severity of symptoms some are experiencing, that they are in danger of losing their lives, leaving us to wonder how many hundreds have already died.

This has all happened without due process, without warning, without full disclosure to the public.

SECTION 13

The right of the people to be secure in their persons, houses, papers, and effects against unreasonable seizures and

searches may not be violated; and a warrant may not issue except on probable cause, supported by oath or affirmation, particularly describing the place to be searched and the persons and things to be seized.

As stated under the 4th Amendment of the U.S. Constitution, Smart Meters are, by their very nature, surveillance devices which violate our rights to be secure and private. Under the "Privacy" section, there was extensive information on how this information can be used, and that the wireless nature of its transmission, particularly with the mesh network, makes its availability to others very easy.

SECTION 19

(a) Private property may be taken or damaged for a public use and only when just compensation, ascertained by a jury unless waived, has first been paid to, or into court for, the owner. The Legislature may provide for possession by the condemnor following commencement of eminent domain proceedings upon deposit in court and prompt release to the owner of money determined by the court to be the probable amount of just compensation.

(b) The State and local governments are prohibited from acquiring by eminent domain an owner-occupied residence for the purpose of conveying it to a private person.

(c) Subdivision (b) of this section does not apply when State or local government exercises the power of eminent domain for the purpose of protecting public health and safety; preventing serious, repeated criminal activity; responding to an emergency; or remedying environmental contamination that poses a threat to public health and safety.

(d) Subdivision (b) of this section does not apply when State or local government exercises the power of eminent domain for the purpose of acquiring private property for a public work or improvement.

5. "Public work or improvement" means facilities or infrastructure for the delivery of public services such as education, police, fire protection, parks, recreation, emergency medical, public health, libraries, flood protection, streets or highways, public transit, railroad, airports and seaports; utility, common carrier or other similar projects such as energy-related, communication-related, water-related and wastewater-related facilities or infrastructure; projects identified by a State or local government for recovery from natural disasters; and private uses incidental to, or necessary for, the public work or improvement.

6. "State" means the State of California and any of its agencies or departments.

Private property is being taken and damaged by the installation of Smart Meters on one's property or adjoining properties, and through the installation on Smart Meter infrastructure. This has been ostensibly to further state energy policy and plans.

3. The best opt-out option to be adopted must balance the concerns expressed by customers against California's overall energy policy.
4. Allowing residential customers an opportunity to opt out of receiving a wireless SmartMeter should not impede ongoing state energy objectives.
8. Further review of the feasibility of continuing to offer an analog meter optout option may be warranted in the future to ensure that this opt-out option does not impede the full implementation of net metering, demand response and smart grid.

President Michael Peevey, Final Decision Modifying PG&E's Smart Meter Program to Include Opt-out Option, D12-02-014, February 9, 2012

This taking and damaging will most likely continue into the future as a result of the Smart Meter program.

Private property has also been taken and damaged by the installation of Smart Grid components and the creation of transmission corridors, such as in the city of Chino Hills, again to further provisions in state law.

This private property has been considered expendable.

KABC Channel 7 reported, "The California Public Utilities Commission sided with SoCal Edison, saying in a statement that "there are overriding statewide values which outweigh the community values of Chino Hills."

[http://www.chinohills.com/news-articles-
details/An Open Letter to SCE and the CPUC-1925](http://www.chinohills.com/news-articles-details/An_Open_Letter_to_SCE_and_the_CPUC-1925)

This taking and damaging is legal under the California Constitution because it is related to a "public work or improvement" defined as "utility, common carrier or other similar projects such as energy-related," etc. if it is taken under eminent domain.

However, there have been no eminent domain proceedings.

Furthermore, there must be compensation to the property owner.

However, there have been no court proceedings to establish compensation to the owners of these taken or damaged properties as a result of the Smart Meter program, and I am unaware of any court proceedings to establish compensation in situations such as for the citizens of Chino Hills.

Finally, the use of privately-owned buildings to site radio antennas to both send and receive data as part of the mesh network, for the benefit of utility companies, has been done without permits, permission, or compensation to the owners of each of those buildings – whether residential, commercial, or public.

SECTION 20

Noncitizens have the same property rights as citizens.

Anyone who has property in California has the above cited rights, and this program equally violates their rights.

These are multiple, serious violations of the California Constitution, pointing to the conclusion that the Smart Meter program is inescapably unconstitutional.

California penal code violations

Penal Code Section 273

(a) Any person who, under circumstances or conditions likely to produce great bodily harm or death, willfully causes or permits any child to suffer, or inflicts thereon unjustifiable physical pain or mental suffering, or having the care or custody of any child, willfully causes or permits the person or health of that child to be injured, or willfully causes or permits that child to be placed in a situation where his or her person or health is endangered, shall be punished by imprisonment in a county jail not exceeding one year, or in the state prison for two, four, or six years.

(b) Any person who, under circumstances or conditions other than those likely to produce great bodily harm or death, willfully causes or permits any child to suffer, or inflicts thereon unjustifiable physical pain or mental suffering, or having the care or custody of any child, willfully causes or permits the person or health of that child to be injured, or willfully causes or permits that child to be placed in a situation where his or her person or health may be endangered, is guilty of a misdemeanor.

273d. (a) Any person who willfully inflicts upon a child any cruel or inhuman corporal punishment or an injury resulting in a traumatic condition is guilty of a felony and shall be punished by imprisonment pursuant to subdivision (h) of Section 1170 for two, four, or six years, or in a county jail for not more than one year, by a fine of up to six thousand dollars (\$6,000), or by both that imprisonment and fine.

The utility companies have denied and hidden research findings showing links from ELF EMF to childhood leukemia and other diseases. When faced with scientific evidence of harm to children, including through research by consultant Leeka Kheifets, they continued straight ahead in this program. They have denied repeatedly any health risks and negative effects from the RF emissions from Smart Meters. They have refused to remove meters when told of health problems. When people with various pre-existing health problem, even with doctor's letters, have asked to retain their analog meters, they have been told they had to have Smart Meters.

Utility companies have taken no precautions to warn parents about keeping children away from Smart Meters, and there are no warning labels on the meters. Utility companies have installed Smart Meters, even banks of Smart Meters, on the other side of walls where children sleep.

Even though PG&E was informed that children in a Santa Cruz home were having nosebleeds and other symptoms after Smart Meters were installed, PG&E refused to remove the Smart Meter. When Bianca, the mother of those children, faced with no other choice, hired a licensed technician to remove the Smart Meter and openly returned it to a PG&E service center, along with 9 other customers in the Santa Cruz area, PG&E disconnected the power to those homes. One of Bianca's children is autistic spectrum. This child also takes medication that requires refrigeration. This was just prior to Christmas, during the winter.

The power disconnection happened the day of the Santa Cruz Board of Supervisors weekly meeting. The supervisors grilled PG&E Government Relations Representative Wendy Sarsfield, following public testimony where they heard what had happened. The video of that grilling can be viewed here: http://www.youtube.com/watch?v=yIGqz_2uGTs&feature=youtu.be Sarsfield and PG&E refused to budge.

The electricity stayed disconnected to those homes, including to Bianca and her children, for 5 days, until the YouTube video, media coverage, and letters from their state assemblyman and senator created too much pressure. Bianca came back home to a refrigerator full of ruined food, as I'm sure the others did.

What I don't understand is that those sitting in the room who knew the law -- attorneys and law enforcement -- did not arrest Ms. Sarsfield for child endangerment. Have we grown so used to the utility companies and large corporations in general doing whatever they want? Have we become so timid, so afraid? Why have we forgotten the law?

The CPUC and the utility companies, as well as their contractors and their union, have been given information on the hazards and risks from Smart Meters. They have heard hours and hours of testimony, and received substantial documentation on the scientific evidence for health dangers. They have heard what is actually happening to people, including a private meeting requested by the CPUC with members of EMF Safety Network in 2010, two years ago.

Gross or criminal negligence

Criminal negligence (sometimes referred to as "gross" negligence) takes place when an individual behaves in a way that is an extreme departure from the way that a "reasonable" person would act. Criminal negligence is basically analogous to an "I don't care what happens" type of attitude.

...Criminal negligence requires more than merely a mistake in judgment, inattention, or simple carelessness. It only pertains to conduct that is so outrageous and reckless that it

marks a clear departure from the way an ordinary careful person would act under similar circumstances.

The defendant must have knowledge of the danger

Actual or constructive knowledge means that either

1. the defendant *actually* knew that he/she was involved in behavior that was likely to result in death or serious bodily injury to another person, or
2. a reasonable person in a similar situation would have appreciated the risk. When this is the case, that knowledge is imputed to the defendant and is called "constructive" knowledge.

California's Legal Definition of "Criminal Negligence"

<http://www.shouselaw.com/criminal-negligence.html>

Members of the public have begged the utility companies, the CPUC, and their local government officials for mercy for themselves and their loved ones to have Smart Meters removed. They have been threatened with arrest and with power disconnection if they remove the meters themselves.

After public comment period is finished at the CPUC business meetings I've attended, the commissioners go on with their business meeting as if we had not spoken. Merely playing the tapes of the PUC meetings would be enough evidence to convict all members of the Commission, Executive Director Paul Clanon, and executive staff, and all utility company representatives present on criminal negligence and child endangerment. That is how shameful and flagrant their actions are.

Tariff Rule 16 violations, overburdening utility easements

This rule lays out the rules which the utility company must follow and limits it must abide by. In this rule, are the parameters for the easement granted to utility companies to enter a person's property – what they may do.

A. GENERAL (Cont'd.)

11. ACCESS TO APPLICANT'S PREMISES. PG&E shall at all times have the right to enter and leave Applicant's Premises for any purpose connected with the furnishing of electric service (meter reading, inspection, testing, routine repairs, replacement, maintenance, emergency work, etc.) and the exercise of any and all rights secured to it by law, or under PG&E's tariff schedules. These rights include, but are not limited to,

- a. The use of a PG&E-approved locking device, if Applicant desires to prevent unauthorized access to PG&E's facilities;
- b. Safe and ready access for PG&E personnel free from unrestrained animals;
- c. Unobstructed ready access for PG&E's vehicles and equipment to install,

remove, repair, or maintain its facilities; and
d. Removal of any and all of its property installed on Applicant's Premises after the termination of service.

Nowhere in this rule is there an allowance for installing radio transmitters. Nowhere is there permitted a function such as the mesh network which permeates everywhere, not merely the access area to the meters granted by the easement. And there is no utility easement for blanketing entire neighborhoods and cities with radiofrequency electromagnetic radiation from this system. It simply doesn't exist.

California Environmental Quality Act violation

CEQA Guidelines require consideration and discussion of significant environmental impacts:

Section 15126.2:

The Significant Environmental Effects of the Proposed Project. An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services.

<http://ceres.ca.gov/ceqa/guidelines/art9.html>

No CEQA EIR was done on the Smart Meter program. I have seen no evidence that a CEQA EIR was done on the Smart Grid, for SB 17, or as a part of any of the Smart Grid proceedings.

California Civil Code violations

California Civil Code Section 43

“ Besides the personal rights mentioned or recognized in the Government Code, every person has, subject to the qualifications and restrictions provided by law, the right of protection from bodily restraint or harm, from personal insult, from defamation, and from injury to his personal relations.”

The ongoing significant harm resulting from this program has repeatedly been brought to the attention of elected officials at the federal, state and local levels, CPUC commissioners and staff, medical personnel, even law enforcement. There is, in addition, the bodily restraint taking place when people cannot freely travel in their communities, where individuals are even trapped in their homes, or in portions of their homes, due to the radiation emitted by these meters and their infrastructure.

There is also the defamation and personal insult by utility company personnel, particularly visible in the PG&E/William Devereaux investigation at the PUC. PG&E personnel called rate payers “insurgents” who opposed to Smart Meters and nonviolently protested the program.

California Civil Code Section 50

Any necessary force may be used to protect from wrongful injury the person or property of oneself, or of a wife, husband, child, parent, or other relative, or member of one's family, or of a ward, servant, master, or guest.

<http://law.onecle.com/california/civil/50.html>

People who nonviolently stopped Smart Meter installation, because of the injury that would result to themselves, their families, and their homes from Smart Meters, were arrested. What would have happened if they had attempted to use force to stop installation?

In at least one case in the city of Salinas, law enforcement officers were used to enforce installation of Smart Meters. What would have happened if that individual had acted within his rights in Section 50? Or in the cities of Covina and San Gabriel, where officers assisted SCE personnel to vandalize private property to replace analog meters with Smart Meters – what would have happened if tenants of those apartment buildings had protected themselves by using force to stop the forced installation of Smart Meters, with armed law enforcement assisting the utility company?

California Civil Code Section 51

(b) All persons within the jurisdiction of this state are free and equal, and no matter what their sex, race, color, religion, ancestry, national origin, disability, medical condition, genetic information, marital status, or sexual orientation are entitled to the full and equal accommodations, advantages, facilities, privileges, or services in all business establishments of every kind whatsoever.

California Civil Code Section 51.7

(a) “All persons within the jurisdiction of this state have the right to be free from any violence, or intimidation by threat of violence, committed against their persons or property because of political affiliation, or on account of any characteristic listed or defined in subdivision (b) or (e) of Section 51, or position in a labor dispute, or because

another person perceives them to have one or more of those characteristics. The identification in this subdivision of particular bases of discrimination is illustrative rather than restrictive.”

California Civil Code Section 52

(a) Whoever denies, aids or incites a denial, or makes any discrimination or distinction contrary to Section 51, 51.5, or 51.6, is liable for each and every offense for the actual damages, and any amount that may be determined by a jury, or a court sitting without a jury, up to a maximum of three times the amount of actual damage but in no case less than four thousand dollars (\$4,000), and any attorney's fees that may be determined by the court in addition thereto, suffered by any person denied the rights provided in Section 51, 51.5, or 51.6.

(b) Whoever denies the right provided by Section 51.7 or 51.9, or aids, incites, or conspires in that denial, is liable for each and every offense for the actual damages suffered by any person denied that right and, in addition, the following:

(1) An amount to be determined by a jury, or a court sitting without a jury, for exemplary damages.

(2) A civil penalty of twenty-five thousand dollars (\$25,000) to be awarded to the person denied the right provided by Section 51.7 in any action brought by the person denied the right, or by the Attorney General, a district attorney, or a city attorney. An action for that penalty brought pursuant to Section 51.7 shall be commenced within three years of the alleged practice.

(3) Attorney's fees as may be determined by the court.

(c) Whenever there is reasonable cause to believe that any person or group of persons is engaged in conduct of resistance to the full enjoyment of any of the rights described in this section, and that conduct is of that nature and is intended to deny the full exercise of those rights, the Attorney General, any district attorney or city attorney, or any person aggrieved by the conduct may bring a civil action in the appropriate court...

By creating a fee-based opt-out, the state has discriminated against utility customers including those who are ill, low income, live in clustered housing and/or have multiple meters on one wall. By employing a forced installation and not recognizing illness or disability, much less personal rights to safety, the CPUC and the utility companies are in violation of the law.

This action of “conduct of resistance to the full enjoyment of ... rights” has been taken by the CPUC, by the utility companies, and by those employees and elected officials which have barred the public from their legal rights.

California Civil Code Sections 52.1 (a), (b), (d) (Interference with Exercise of Civil Rights)

(a) If a person or persons, whether or not acting under color of law, interferes by threats, intimidation, or coercion, or attempts to interfere by threats, intimidation, or coercion, with the exercise or enjoyment by any individual or individuals of rights secured by the

Constitution or laws of the United States, or of the rights secured by the Constitution or laws of this state, the Attorney General, or any district attorney or city attorney may bring a civil action for injunctive and other appropriate equitable relief in the name of the people of the State of California, in order to protect the peaceable exercise or enjoyment of the right or rights secured...

(b) Any individual whose exercise or enjoyment of rights secured by the Constitution or laws of the United States, or of rights secured by the Constitution or laws of this state, has been interfered with, or attempted to be interfered with, as described in subdivision (a), may institute and prosecute in his or her own name and on his or her own behalf a civil action for damages, including, but not limited to, damages under Section 52, injunctive relief, and other appropriate equitable relief to protect the peaceable exercise or enjoyment of the right or rights secured.....

(d) If a court issues a temporary restraining order or a preliminary or permanent injunction in an action brought pursuant to subdivision (a) or (b), ordering a defendant to refrain from conduct or activities, the order issued shall include the following statement: VIOLATION OF THIS ORDER IS A CRIME PUNISHABLE UNDER SECTION 422.77 OF THE PENAL CODE.

This has already been violated repeatedly by the CPUC, the utility companies and their contractors, and law enforcement personnel. This occurred on the phone with utility and CPUC representatives, as well as in person.

Those intimidated, coerced, and interfered with include not only individuals, but also counties, cities, and tribal governments. The CPUC and the utility companies and their contractors have lied and used veiled threats with regard to jurisdiction and power to coerce local governments. However, this does not seem to trouble the Attorney General, county district attorneys, or local law enforcement.

PG&E refused to pay the fine levied by the city of Watsonville when they illegally installed Smart Meters on a building after Watsonville had adopted their Smart Meter moratorium. Watsonville was within its legal right per Section 2902-2906 of the Public Utilities Code to adopt the ordinance, and PG&E violated the law.

But PG&E said no it didn't. "Smartmeter is a state mandated program, the CPUC has exclusive jurisdiction over it and they have said, it alone has jurisdiction over the Smartmeter program," said (PG&E) spokesperson Jeff Smith... PG&E said it...didn't do anything wrong, and it won't be paying any fine."The CPUC preempts any type of local ordinance," said Smith.

<http://www.kionrightnow.com/Global/story.asp?S=13334089>

Watsonville did not have the financial resources to pursue legal remedies, and so PG&E was able to threaten, coerce, and intimidate the city into not enforcing its ordinance.

California Civil Code Section 1708 (Duty to Avoid injuring persons or property)

Every person is bound, without contract, to abstain from injuring the person or property of another, or infringing upon any of his or her rights.

<http://codes.lp.findlaw.com/cacode/CIV/5/d3/3/s1708>

California Civil Code section 1709, 1710, 1711 Deceit-Damages and Fraud

1709. One who willfully deceives another with intent to induce him to alter his position to his injury or risk, is liable for any damage which he thereby suffers.

1710. A deceit, within the meaning of the last section, is either:

- The suggestion, as a fact, of that which is not true, by one who does not believe it to be true;
- The assertion, as a fact, of that which is not true, by one who has no reasonable ground for believing it to be true;
- The suppression of a fact, by one who is bound to disclose it, or who gives information of other facts which are likely to mislead for want of communication of that fact; or,
- A promise, made without any intention of performing it.

1711. One who practices a deceit with intent to defraud the public, or a particular class of persons, is deemed to have intended to defraud every individual in that class, who is actually misled by the deceit.

Members of the public have repeatedly been told falsehoods by utility personnel, including the quantity, frequency, and power of emissions from Smart Meters, that Smart Meters are safe, as well as attempting to induce them to “change their mind,” whether it was about getting on the delay list, or “opting out.” They have lied to them about the type of meter they were getting. They have lied to them about their ability to say “no.”

California Civil Code Section 1714

(a) Everyone is responsible, not only for the result of his or her willful acts, but also for an injury occasioned to another by his or her want of ordinary care or skill in the management of his or her property or person,...

One example of this is when PG&E Smart Meter program directors were asked at the PUC, after two years of complaints, if they were keeping track of health complaints, and Jim Meadows, head of the Smart Meter program replied, “I’m not aware of it.”

That is not only “want of ordinary care.” That is a willful act.

California Civil Code Section 1714.45 Product liability

(a) In a product liability action, a manufacturer or seller shall not be liable if both of the following apply:

(1) The product is inherently unsafe and the product is known to be unsafe by the ordinary consumer who consumes the product with the ordinary knowledge common to the community.

(2) The product is a common consumer product intended for personal consumption, such as sugar, castor oil, alcohol, and butter, as identified in comment i to Section 402A of the Restatement (Second) of Torts.

(b) This section does not exempt the manufacture or sale of tobacco products by tobacco manufacturers and their successors in interest from product liability actions, but does exempt the sale or distribution of tobacco products by any other person, including, but not limited to, retailers or distributors.

(c) For purposes of this section, the term "product liability action" means any action for injury or death caused by a product, except that the term does not include an action based on a manufacturing defect or breach of an express warranty.

(d) This section is intended to be declarative of and does not alter or amend existing California law, including *Cronin v. J.B.E. Olson Corp.* (1972), 8 Cal. 3d 121, and shall apply to all product liability actions pending on, or commenced after, January 1, 1988.

Though Smart Meters are in many ways inherently unsafe, this is not known to the "ordinary consumer." Therefore, it would appear that utility companies are liable for the damages Smart Meters cause.

California Civil Code Section 1770 (excerpts):

(a) The following unfair methods of competition and unfair or deceptive acts or practices undertaken by any person in a transaction intended to result or which results in the sale or lease of goods or services to any consumer are unlawful:

(5) Representing that goods or services have sponsorship, approval, characteristics, ingredients, uses, benefits, or quantities which they do not have or that a person has a sponsorship, approval, status, affiliation, or connection which he or she does not have.

(7) Representing that goods or services are of a particular standard, quality, or grade, or that goods are of a particular style or model, if they are of another.

(15) Representing that a part, replacement, or repair service is needed when it is not.

<http://codes.lp.findlaw.com/cacode/CIV/5/d3/4/1.5/3/s1770>

Smart Meters have been represented as conferring benefits which are uncertain and highly debateable at best. Representatives have misrepresented the functionality of Smart Meters, and lied about their emissions. Digital meters have been misrepresented to customers as

analog meters. Smart Meters were marketed to people as a required replacement, when they were merely an option.

California Government Code Section 11135

(a) No person in the State of California shall, on the basis of race, national origin, ethnic group identification, religion, age, sex, sexual orientation, color, or disability, be unlawfully denied full and equal access to the benefits of, or be unlawfully subjected to discrimination under, any program or activity that is conducted, operated, or administered by the state or by any state agency, is funded directly by the state, or receives any financial assistance from the state. Notwithstanding Section 11000, this section applies to the California State University.

(b) With respect to discrimination on the basis of disability, programs and activities subject to subdivision (a) shall meet the protections and prohibitions contained in Section 202 of the Americans with Disabilities Act of 1990 (42 U.S.C. Sec. 12132), and the federal rules and regulations adopted in implementation thereof, except that if the laws of this state prescribe stronger protections and prohibitions, the programs and activities subject to subdivision (a) shall be subject to the stronger protections and prohibitions.

(c)(1) As used in this section, "disability" means any mental or physical disability, as defined in Section 12926.

California Government Code Section 12926

(l) "Physical disability" includes, but is not limited to, all of the following:

(1) Having any physiological disease, disorder, condition, cosmetic disfigurement, or anatomical loss that does both of the following:

(A) Affects one or more of the following body systems: neurological, immunological, musculoskeletal, special sense organs, respiratory, including speech organs, cardiovascular, reproductive, digestive, genitourinary, hemic and lymphatic, skin, and endocrine.

(B) Limits a major life activity.

(iii) "Major life activities" shall be broadly construed and includes physical, mental, and social activities and working.

The Smart Meter program is administered through the CPUC. After months and months of public testimony of injury, primarily from women, a Mr. Vyas spoke at a hearing about the ill effects he was experiencing since Smart Meter installation. President Peevey told him to talk to PG&E and that he could have an analog meter. It appeared that it was Mr. Vyas' sex that got the response from President Peevey. He had not responded to the women who had asked for assistance.

The opt-out proposal discriminates against those who are electrically sensitive by making them pay for a modicum of safety.

Smart Grid authorization violations

Senate Bill 17, adding “Chapter 4: Smart Grid Systems” to the Public Utilities Code

8360. It is the policy of the state to modernize the state's electrical transmission and distribution system to maintain safe, reliable, efficient, and secure electrical service, with infrastructure that can meet future growth in demand and achieve all of the following, which together characterize a smart grid:

(a) Increased use of cost-effective digital information and control technology to improve reliability, security, and efficiency of the electric grid.

8363. This chapter shall be implemented in a manner that does not compromise customer or worker safety or the integrity or reliability of the electrical transmission and distribution system in this state.

“Safe, reliable, efficient, and secure,” “improve reliability, security and efficiency,” “does not compromise customer or worker safety or the integrity or reliability” – this program is having the exact opposite effect of what was envisioned.

Public Utilities Code violations

California Public Utilities Code Section 451 spells out the responsibilities of utility companies:

Every public utility shall furnish and maintain such adequate, efficient, just, and reasonable service, instrumentalities, equipment, and facilities, including telephone facilities, as defined in Section 54.1 of the Civil Code, as are necessary to promote the safety, health, comfort, and convenience of its patrons, employees, and the public

All rules made by a public utility affecting or pertaining to its charges or service to the public shall be just and reasonable.

California Public Utility Code Section 453 (b)

No public utility shall prejudice, disadvantage, or require different rates or deposit amounts from a person because of ancestry, medical condition, marital status or change in marital status, occupation, or any characteristic listed or defined in Section 11135 of the Government Code. A person who has exhausted all administrative remedies with the commission may institute a suit for injunctive relief and reasonable attorney's fees in cases of an alleged violation of this subdivision. If successful in litigation, the prevailing party shall be awarded attorney's fees.

The disabled and those with medical conditions cannot be charged for accommodating their disability/medical condition. Presumably those who do not wish to have a medical condition also cannot be discriminated against by charging different rates.

Very cleverly, CPUC President Peevey has said the current opt-out is for anyone who doesn't want a Smart Meter, whether they have a reason or no reason. In that way, he hopes to avoid violating this section. However, the effect is the same – if a person is electrosensitive, they will have to pay a fee to avoid even just the Smart Meters on their own dwelling. That discriminates and therefore, violates California law.

This law puts the very high hurdle of “exhaust(ing) all legal remedies with the commission,” and financial resources for an individual to initiate a court proceeding. As with many laws, rights do not come automatically. Though written into state and federal legal codes, relief can often only be obtained if one a) is well enough or even lives long enough to outlast the delays of the CPUC, and b) has the financial resources to initiate court action.

That is shameful, inherently unjust. and lacking in all common sense. Why is there a Constitution and codes of law if they aren't automatically enforced? People need relief now, in this and other situations. The public is not protected by the law as it is currently practiced. Instead, it protects those who perpetrate crimes.

Public Utilities Code Section 745

(d) On and after January 1, 2014, the commission shall only approve an electrical corporation's use of default time-variant pricing in a manner consistent with the other provisions of this part, if all of the following conditions have been met:

(1) Residential customers have the option to not receive service pursuant to time-variant pricing and incur no additional charges as a result of the exercise of that option. Prohibited charges include, but are not limited to, administrative fees for switching away from time-variant pricing,...

Utility companies may not mandate nor charge for those customers who do not opt-in to time-variant pricing, and Smart Meters are the vehicle by which time-variant/time-of-use pricing occurs.

California Public Utilities Code Section 761.3d

Legal jurisdiction of agencies over utilities

California Public Utilities Code Section 2901-2907

Vested powers of control of municipal corporations over utilities

The violation and misrepresentation of CPUC jurisdiction by the Commission and the utility companies was previously discussed in the section “Violation of jurisdiction and mandate by CPUC.”

Public Utilities Code 762:

Whenever the commission, after a hearing, finds that additions, extensions, repairs, or improvements to, or changes in, the existing plant, equipment, apparatus, facilities, or other physical property of any public utility or of any two or more public utilities ought reasonably to be made, or that new structures should be erected, to promote the security or convenience of its employees or the public, or in any other way to secure adequate service or facilities, the commission shall make and serve an order directing that such additions, extensions, repairs, improvements, or changes be made or such structures be erected in the manner and within the time specified in the order.

One way of avoiding the fact-finding described in section of the Public Utilities Code and Section 701 is simply not to hold a hearing. And this is what has been done with Smart Meters.

Local law and ordinance violations

All ordinances were ignored by PG&E. PG&E also refused to pay the fine levied by the city of Watsonville.

Permits have not been obtained for this program at the local level.

Radiofrequency transmitting and receiving equipment have been deployed without informed consent and without permits on all buildings and on utility poles.

The utility companies are using private property to site radio transmitters, which are used to relay signals for the companies. Yet, there has been no compensation or financial benefit to building owners for this use. This is a “taking” of private property.

This roll-out gives others the right to harm or threaten to harm – such as neighbors who won’t opt-out because they “don’t like you” – already reported by a number of people. This is a form of bullying.

The Smart Meter program violates at least one local wireless ordinance.

For example, a City of Sebastopol wireless facility ordinance requires that minor antennas cannot be installed within 10 feet of power lines, cannot be installed on wood structures, and are limited to six antennas in a single location. Smart Meters clearly contain minor antennas. Chapter 17, General Provisions Relating to Telecommunications Facility and Minor Antenna, Sections 17.100.010 (A) through (C)

“Reply Comments of EMF Safety Network on Proposed Decision of ALJ Sullivan,” November 22, 2010, pp. 1-3.

To repeat, there has been no Informed consent, and the precautionary principle is being ignored.

Law enforcement violations

California Civil Code section 52.3 (Law enforcement officer shall not deprive individual of constitutionally protected rights, privileges or immunity.) and section 52.3 (b) Attorney General may bring a civil action in the name of the people to obtain appropriate equitable and declaratory relief to eliminate the pattern or practice of conduct..."

Many law enforcement personnel are refusing to enforce city and county ordinances as well as the Constitution. They have escorted Smart Meter installers past peaceful demonstrators, and evicted PG&E customers attempting to openly and peacefully return de-installed Smart Meters to PG&E. Law enforcement officials have arrested people for enforcing a local ordinance. They have also arrested demonstrators who have attempted to stop installations. They have assisted SCE installers in vandalizing and stealing private property and forcibly installing Smart Meters in Covina and San Gabriel. They have assisted PG&E installers in installing Smart Meters against the wishes of residents. But they have not arrested PG&E, SCE, or SDGE employees or contractors, nor have they held them accountable.

In addition, the District Attorney offices in at least two counties (Monterey and Santa Cruz) have refused to take action to protect the public. The California Attorney General's office, both under former Attorney General Jerry Brown, and under current Attorney General Kamala Harris, has also refused to act. In the case of Kamala Harris, her response to letters signed by a variety of public advocacy organizations and members of the public has been silence.

CRIMINAL NEGLIGENCE

For five years, the California Public Utilities Commission and the utility companies have heard hours and hours of public testimony at PUC public meetings and received written complaints about the various problems with Smart Meters. Members of the public have met individually with commissioners and staff.

In spite of that, they have ignored or denied evidence of harm, not opening hearings, not undertaking investigations, not stopping the program.

Hundreds of people in Bakersfield and around the state reported major problems since Pacific Gas & Electric started installing so-called smart meters two years ago (in 2007). Complaints have spiked as the utility began upgrading local meters with even "smarter" versions...

Even worse, though, has been PG&E's response -- accuse, deny, obfuscate and shuffle. (That's somewhat better than the Public Utilities Commission, I suppose, which never got back to me at all!)

No matter. I've found that with PG&E, answers tend to vary anyway.

As we reported in May, customers checking their usage online saw that the SmartMeters were reporting usage even during power outages.

PG&E admitted there was a glitch in the system, it wouldn't affect anyone's bills and the upgraded meters wouldn't have that problem.

Nope.

On September 3, one of The Californian's bloggers (check it out here: <http://people.bakersfield.com/home/Blog/rwestfall/49095/>) was monitoring his usage while on vacation and saw it was at five kilowatts per day until -- blip -- for no reason at all it jumped to 57 kilowatts per day.

First he was told it was a bad read and would correct itself (which it didn't). Then he was told the information customers get isn't accurate anyway.

But again, don't worry, it won't affect your bill. HUH?

Complaints to the PUC have gone essentially nowhere. One woman I spoke with was told by a PUC rep she should move out of Bakersfield.

Lois Henry, 'SmartMeters' leave us all smarting, Bakersfield Californian,
September 12, 2009

<http://www.bakersfield.com/news/columnist/henry/x746309880/Lois-Henry-Smart-meters-leave-us-all-smarting>

PG&E started hearing about "blown out" appliances in 2008 – four years ago. Did they take action then? No. And appliances and electronics are still malfunctioning. And the public is not being told that this can be a Smart Meter problem.

When asked if PG&E was keeping track of health complaints at a workshop at the CPUC on December 9, 2011, Jim Meadows, the head of PG&E's Smart Meter program, after shrugging his shoulders and looking around the room at other Smart Meter program directors, including the former head of the Smart Meter program, said, "I'm not aware of it."

<http://www.youtube.com/watch?v=drgLF8TNA0c&feature=youtu.be>

Though personnel, like PG&E's Michael Herz (and reportedly, consultants including Dr. Leeka Kheifets), have actually visited homes of people who have complained of Smart Meter-related health problems, PG&E is not keeping a database of Smart Meter health complaints. Instead, PG&E is focusing its efforts and ratepayer money on public relations -- "reaching out to consumers", "customer engagement" and "education centers".

The day the PUC voted on the opt-out decision, February 1, 2011, the Commission heard an hour and a half of public testimony beforehand, much of it concerning the health problems people were experiencing. When public testimony concluded, at least one commissioner read from a pre-prepared statement supporting the proposed opt-out decision. The decision was then approved, and public testimony was ignored as it had been at many other PUC meetings.

One participant told the commission, after they approved the decision, that these are crimes against humanity.

STRENGTHENING UTILITY MONOPOLIES

Instead of developing localized, independent energy systems, the state and the CPUC have encouraged for-profit existing monopolies to become more powerful, centralized, and exclusive, at the expense of consumer choice and freedom.

This was underlined when Gov. Jerry Brown appointed PG&E Vice President Nancy McFadden to his office. Ms. McFadden was in charge of the Proposition 16 campaign to restrict the ability of cities and counties to create municipal utility districts. That proposition was defeated by the voters. Yet the governor appointed her to be an advisor in his office.

IGNORING REALITIES AND OPEN PROCESS

Not to have extensive, well-publicized public hearings and fact findings when the Smart Grid and Smart Meters were being considered, including from independent experts, is a violation of the public trust. This, according to PG&E spokespersons, is one of the largest technological roll-out in California history. In addition, perhaps the more common-sense input from the public would have revealed many of these problems before they arose and halted this program before it was approved.

If conserving energy and lowering our carbon footprint is the goal, the state has ignored basic educational and conservation approaches. There was no discussion with the public, or looking at alternative methods to solve our energy situation.

Some experts believe we have plenty of energy. CPUC Commissioner Florio has said there is a 50% energy glut, and PG&E reps stated to the Monterey City Council in 2011 that California has "plenty of energy".

How much of the push for the Smart Grid is due to the artificial energy shortage and brown-outs created during the Enron fraud of which PG&E was a part? Former PG&E Vice President Nancy McFadden was in Gov. Gray Davis' office during that time, and is now back working with Governor Jerry Brown. Why?

However, if there is a coming energy shortage, all parties are refusing to engage in open, honest dialogue with the public.

What is our true energy situation? What are our true state energy needs?

How did this happen?

Origins

The federal government ignored the known risks with this technology, including the risks to national security, and encouraged with legislation (Energy Act of 2005) and grants (ARRA) the deployment of this system.

Public agencies, such as the EPA and the FCC, did not step in. A report prepared by EPA scientists on the carcinogenicity of EMF in the 1980s, initially classifying EMF as a probable carcinogen, has still not been released to the public by EPA officials. Members of the federal RF Interagency Working Group raised substantial questions on standards in 1999. The FCC has refused repeated calls to revise national standards to include non-thermal impacts, in marked contrast to the European Parliament and many member nations which have been revising or considering revising limits downward. The Austrian Medical Association has proposed “preliminary benchmarks” that are 10 million times lower than ours – FCC 1000 microW/cm² (maximum) vs. .0001 microW/cm² Austrian recommendation. The Swiss organization Physicians for the Environment proposes lowering Swiss limits by a factor of 10; for instance, cell tower antennas are subject to a limit of 5 microW/cm². This would further lower that to .5 microW/cm² – 2000 times lower than FCC guidelines.

Overseas medical doctors and governments are taking the extensive research and documents, such as the Bioinitiative Report, seriously. As a result, they are taking measures to protect the public.

Industry has proceeded in an approach more akin to the Gold Rush and piracy than to any responsible business practices. Known and potential problems were ignored by utility companies and municipal utility districts, especially in the rush to obtain federal grants and meet deadlines under ARRA.

Report after report has shown security problems because of “compliance minimums”.

With regard to public health risks, telecommunications companies, utility companies, and those with knowledge of RF/EMF health impacts continued to ignore, bury, or even pervert the extensive research on risks to the public and proceed as if all was well. They have used industry insiders like Leeka Kheifets to provide scientific cover. Dr. Kheifets is rather legendary in this regard, working for the WHO, Electric Power Research Institute, PG&E, even the CPUC. These companies have lied to the public repeatedly, and at least in the case of PG&E, spied on and engaged in espionage-like activities, calling those opposing Smart Meters “insurgents”. Some of those opposing Smart Meters have experienced tampering with their computers and suspected phone tapping.

The CPUC has failed to comply with its own mandate to insure “safe, reliable, efficient, and secure electrical service” P.U.C. 8360-69. They have ignored laws. CPUC personnel have bullied communities and the public, loudly asserting sole jurisdiction in contradiction to the Public Utilities Code and the California Constitution. The CPUC has ignored the public and the harm being reported, and they have treated the public as invisible. They have been grossly negligent, endangering the public health, the environment and the grid, ignoring international public health warnings. They have ignored prior CPUC decisions to employ low-cost EMF mitigation measures and to continue to study this issue. They have put inaccurate, out-dated, and PUC decision-friendly information on their website. They have lied to the public, and misled the legislature. Latest reports to the legislature avoid all mention of the extensive problems and the opposition by the public.

Chris Ackerman, CPUC spokeswoman --

“The primary function of the CPUC is to insure that the utilities we regulate are in compliance with the tariffs (rules) we use to regulate them. We are not a consumer advocacy group.”

Phone conversation with Marilyn Garrett, February 16, 2010

That is abundantly clear.

There has been utility company dominance in state agency and state governance. Examples are CPUC chairman Michael Peevey (SCE), CPUC General Counsel Frank Lindh (PG&E), Marzia Zafar, Energy Division and CPUC spokesperson (Sempra, SoCal Gas). PG&E execs Nancy McFadden and Dana Williamson are top aides in Governor Jerry Brown’s office, and Williamson directs the governor’s Washington D.C. office;

IOU companies and many municipal utility districts, and the CPUC have not only been unresponsive to the public, even ridiculing and dismissive. In the face of suffering and illness, high bills, appliance problems and interference, etc., they have poured ratepayer dollars into increased public relations “outreach”, aggressively pushing this program on the public instead of facing and fixing the problems.

Overall, the four-day workshop identified that the utilities believe that for the most part their Plans are complete and any weaknesses arise from misunderstandings. Moreover, the utilities believe these misunderstandings can be dispelled if stakeholders initiate constructive dialogue with the respective utility.

CPUC Smart Grid 4-day workshops, excerpt from 3-1-12 report, p. 10

The CPUC has dismissed formal filings on these issues without holding hearings, and rubber stamped utility company claims of safety, accuracy, etc. The CPUC commissioned the Structure Group to prepare a report on accuracy despite protests of bias and conflict of interest, and accepted their findings without demur. They did not undertake the further investigation advocated by the Division of Ratepayer Advocates in 2010, as previously mentioned.

Opt-Out Limitations:

An opt-out is fundamentally flawed, because it ignores the many, very serious problems with Smart Meters and the Smart Grid.

Opt-outs ignore those with implanted medical devices (IMDs) or “who require critical care equipment that can malfunction in the presence of wireless signals from outside sources. Such malfunctions can be fatal... No federal agency keeps track of cumulative wireless radiation levels, nor identifies critical levels in locations where individuals with IMDs may be at risk...The most seriously threatened are the NIH estimated 20 million Americans with IMDs. This is eight to 10 percent of Americans. Smart meters and wireless broadband present the most serious threat because of their ubiquitous deployment throughout the public's living and working environments...”

Janet Newton, EMR Policy Institute. Testimony to Department of Justice December 2010 hearing on disabilities

Opt-outs ignore the health risks to the general public from RF – it is a possible carcinogen -- and require no warning signage or alerts to the public.

Opt-outs ignore the fact that Smart Meters are deployed everywhere -- businesses, homes, public buildings, schools, etc. – on every building that has a meter and has not “opted out.” The RF radiation from these and the mesh network and access points and antennas is everywhere, and cannot be avoided.

Opt-outs do not address the growing overall amount of wireless radiation everywhere from all wireless devices which is not being monitored by state or federal agencies. Cumulative levels are not being tracked.

The current opt-out only applies to residential customers. The current opt-out doesn't include businesses, schools, or public buildings.

The current opt-out doesn't address densely situated buildings, clustered housing, or multiple meters on a wall, including many bedroom walls.

Time-variant pricing (time-of-use pricing) is opt-in – P.U.C. Section 745. Not “opting in” is at no charge. Costs of opt-out should have been included in original program.

Opt-out fees

Opt-out fees for time-variant pricing (which is what Smart Meters are used for) are illegal under Public Utilities Code Section 745 on or after 2014.

An opt-out fee discriminates against those with medical conditions and violates the Americans with Disabilities Act.

An opt-out fee discriminates against low-income customers.

In September 2010, at a PG&E and industry Smart Meter information forum in the Santa Clara Valley, representatives said that 60% of PG&E customers and 25% of those in Southern California had requested to opt-out from Smart Meters. These are industry figures, so the actual numbers, especially now, may be much higher.

“The fees imposed on customers are arbitrary and appear to be intended to dissuade customers from opting-out” – City and County of San Francisco, December 2011

In December, 2012, at a PG&E/Energy Commission joint workshop, PG&E representatives described a survey done by Southern California Edison to gauge ratepayer opt-out. They found that fees and increased levels of fees caused a significant decrease in those interested in opting-out.

The Sacramento Municipal Utility District meeting on February 29, 2012 was very frank about the reason for opt-out fees:

One Director: “I think the 166 dollars up front will convince them they can really afford a lot of tin foil hats.”

Another Director: “But they’re already wearing them.”

Director Sherman: “Can we narrow our rate action strictly to 2500 [customers] and there is no opt out for the folks who already have them [Smart Meters]. Just narrow it just to those folks and also I’m wondering . . .given Nancy’s calculation shall we reconfigure it with a shorter payback [laughter]. There ought to be -- These are actual costs and we’re giving you a break because we’re doing it over these many years versus...what we ought to do is tell you to pay it right up front--all of it.”

“Making sure we’re not making it too easy for customers to not go along with the program--but not be responsive to customers. . . think this is a right balance. \$124.00 and \$54.00 a month is going to be very expensive for the vast majority of our customers. . .We’re willing to work with you. More than that money would look so cost prohibitive, would look like we’re not going to give them an option.”

Director: “This is going to be subsidized, but it’s a very small amount of money because the number’s going to drop off precipitously. And you’ve priced it and I understand the logic of how you priced it so it’s not totally out of the ballpark for someone to be able to pay. So what’s going to happen is people will say—that’s fine. I’ll take the (Smart) meter. So my guess is you are going to be down under 500 when they see these numbers--that

middle number that you put up so SMUD is going to bear the costs, but it's a cost to get past this problem. That's really what it is. With the constraints that you've put on it--If you put the constraints of nobody else except this group and if you move, the meter goes in, the calendar will take care of the problem."

One of the persons says if it gets to a low enough number such as 90 people,
"...the remaining 90 customers must move to a smart meter or tell them they will increase it by quite a bit."

Director: "A bridging effort toward getting everyone on the smart meter grid. . .If someone feels trapped in their home, they may feel trapped in their home for a whole host of reasons."

[The trapped discussion has to do with they are making this such a narrow opt out that someone will not be able to move to a different home and have the opt out]

"Sunset clause--opt in prior to end of year--Closed after that." "After 9 months, no new enrollments."

[This is also so the social media doesn't get onto it and people learn they can do this. So they are making it available in a very small window period]

Customers' health concerns about effects of radiation are called an "extreme" viewpoint.

One Director: I have no sympathy. Clearly their concerns are unfounded in my mind. If you think it will give you a stomach ache, it will.

Director Posner: Cut them off if they don't want the (Smart) meter and keep them in the dark.

In dealing with the press:

One Director: SMUD adopts out-out—working to have a neutral story—giving the messaging point we would discuss today. We would not communicate or discuss with the press the nuances of different rate options. We would simply be very direct and focused. This is our opt out policy. Story would pretty much be a non story very quickly."

"The less that's said about this [opt out option] the better."

"under the radar" "We want very limited communication and nothing on our website."

Quotes and comments from

<http://stopsmartmetersirvine.com/2012/03/20/smud-audio-tape-the-makings-of-a-sham-smart-meter-opt-out-ditto-burbank-glendale/>

<http://stopsmartmeters.org/2012/05/23/sacramento-municipal-utility-district-they-can-really-afford-a-lot-of-tin-foil-hats/>

<http://smartmetersmurder.com/0065.html>

The whole tape is here:

http://smud.granicus.com/MediaPlayer.php?view_id=16&clip_id=811

Center for Electrosmog Prevention --

All Extra Fees And Costs Are Illegal, Prejudicial, Preferential, Disadvantage, Discriminate And Block Access

All costs proposed by Judge Yip-Kikugawa are illegal under California Public Utilities Code Section 453, which subjects all customers and those with medical conditions to prejudice and disadvantage, requiring different rates and charges, giving preferential treatment to those with higher incomes.

(a) No public utility shall, as to rates, charges, service, facilities, or in any other respect, make or grant any preference or advantage to any corporation or person or subject any corporation or person to any prejudice or disadvantage.

(b) No public utility shall prejudice, disadvantage, or require different rates or deposit amounts from a person because of ancestry, medical condition, marital status or change in marital status, occupation, or any characteristic listed or defined in Section 11135 of the Government Code...

(c) No public utility shall establish or maintain any unreasonable difference as to rates, charges, service, facilities, or in any other respect, either as between localities or as between classes of service. (California Public Utilities Code Section 453)

These costs and fees discriminate against utility customers as these costs are a disincentive to obtain an analog meter, which may be necessary for safety and security, guaranteed by the California Public Utilities Code, the CA and US Constitutions, and may be considered international human rights violations as indicated above, especially as analogs are intended to (be the standard), per federal energy guidelines.

By allowing or charging fees of any kind, the CPUC and utilities will be infringing upon the rights of all customers and citizens, noted in California Public Utilities Code Section 453. In particular, this will create a situation whereby those middle income or lower middle income families struggling to pay costs in a depressed and uncertain economy, or those with financial concerns of any kind,...will not be able to pay the extra fees and will constitute a impediment or disincentive, to accessing the analog meters.

Customers with physicians who have determined smart meters may be unhealthful or a risk to health should not be charged for an opt-out as California Law does not allow utilities to charge additional fees for medical reasons. In addition, they must be able to insure that their property is not irradiated by their neighbors' smart meter(s) and public

access facilities are RF radiation free from metering sources so that they can avoid increased RF radiation and maintain their health and safety.

Conclusion: People should not have to pay extra to access energy and be safe and secure, nor should smart meters be forced upon customers per state and federal laws. The disabled, those with medical conditions, or the poor or financially struggling should not have access blocked to analog metering. Fees of any kind must be stricken from the opt-out plan for utility customers, as these are illegal. Provide a no-cost analog option to all customers.

The only conclusion one can logically come to is that the fees for opt-outs are punitive and intended to dissuade customers from choosing an analog option.

Center for Electrosmog Prevention, Comments on Proposed Decision on UCAN,
11-03-015, March 15, 2012

As members of the public have repeatedly stated, an opt-out fee is extortion, allowing utility companies the right to extort.

Publicly owned utilities

Kiku Lani Iwata, Burbank Action

Publicly owned utilities (including municipal utilities) are not included in the smart meter opt out programs approved by the CPUC. A list of these utilities is found in this promotional brochure by the Calif. Municipal Utility Association for reference:
http://www.anaheim.net/utilities/anaheim_cmua.pdf.

Publicly owned utilities service million of California residents who do not reside in the vast territory serviced by PG&E, SCE and SDG&E. Customers of these publicly owned utilities also want the right to opt out, but some of their utilities, for instance BWP, GWP and SMUD in Burbank, Glendale and Sacramento, have adopted smart meter "opt-out" programs that fail to offer the analog option (the option these utilities have adopted are a different form of smart meters, thus, failing to address the privacy and health concerns) and are thus providing to their residents an unfair, inequitable, discriminatory and prohibitory opt-out program compared to millions of Californians serviced by the investor-owned utilities that must offer the analog option per CPUC's decision on smart meter options. BWP and SMUD have also imposed one-time-only opt-out deadlines, violating the civil liberties of residents that they service, either confining them to their homes or forcing them to evacuate or flee from their homes.

The CPUC does not regulate these publicly owned utilities except when it concerns matters of public safety; however, the CPUC has so far failed to acknowledge there is a public safety problem with smart meters. These publicly owned utilities, for the most part and unlike the CPUC, also fail to have an independent ombudsman or consumer

advocate department or representative to represent consumers who oppose and do not want smart meters on their homes or businesses.

Smart Meter Opposition:

As of 7/22/12, 56 cities and counties, and 1 tribal government have taken formal actions opposing Smart Meters. 14 of those communities adopted ordinances prohibiting Smart Meter and infrastructure installation in their communities in **bold**).

Humboldt County

Lake County

Marin County

Mendocino County

City and County of San Francisco

San Luis Obispo County

Santa Barbara County

Santa Cruz County

Sonoma County

Tehama County

Ventura County

Arcata

Belvedere

Berkeley

Blue Lake

Bolinas

Buellton

Calabasas

Camp Meeker

Capitola

Carpinteria

Clearlake

Cotati

Fairfax

Fillmore

Fort Bragg

Goleta

Grover Beach

Lakeport

Marina

Mill Valley

Monterey

Monte Sereno

Morro Bay

Mount Shasta

Novato

Ojai

Pacific Grove

Palo Alto

Piedmont

Richmond

Rio Dell

Ross

San Anselmo

San Rafael

San Luis Obispo

Santa Cruz

Sausalito

Scotts Valley

Seaside

Sebastopol

Solvang

Simi Valley

Thousand Oaks

Watsonville

Willits

Big Valley Band of the Pomo Indian Tribe

Cities and counties have also joined formal filings at the PUC against Smart Meters.

Political and community organizations including the Marin Association of Realtors, the California Peace and Freedom Party, the San Francisco Sierra Club, the Sonoma County

Republican Central Committee, and the Alameda County and Monterey County Green Parties have called for a moratorium or a complete halt to this program.

In March, Palo Alto (a municipal utility district) decided after three years of research not to install Smart Meters because the costs would exceed benefits, and the benefits are minimal. They had also been monitoring the problems and complaints with Smart Meters.

Nationwide, opposition to Smart Meters includes bills in the Michigan, Maryland, and Georgia legislatures; Smart Meter and Smart Grid lawsuits, including in Texas, Alabama, Maine, Illinois and Hawaii; a petition for a referendum to halt Smart Meter installations in Naperville, Illinois, which collected over 4200 signatures; the Connecticut and Illinois Attorney Generals and Illinois governor opposed plans for Smart Meters; the Maine Public Advocate raised objections to Smart Meters, including over electronic interference problems; and the Vermont Legislature has now mandated a free opt-out for consumers.

Internationally, 90,000 Australians in the state of Victoria refused Smart Meters as of December, 2011, and the Australia Electrical Works Union is calling for a halt to the program until fire safety issues are addressed; in the United Kingdom, the National Audit Office warned about costs and uncertain benefits from the roll-out, and the British and Dutch government have now made Smart Meters voluntary due to public opposition; in British Columbia, 13,000 residents signed a petition to halt the program and demanding a full review, and the Union of British Columbia Municipalities adopted a resolution calling for a moratorium, investigation into the problems, and no-cost alternatives to consumers.

And the opposition grows.

Legislative Solutions:

Overview and objectives:

- Halt Smart Meter deployment on all buildings throughout the state
- Re-deploy analog meters on all buildings throughout the state
- Immediately protect those who request relief, including creating zones of safety
- Hold RF health impact hearings
- Costs should be borne by shareholders
- Require rapid CPUC action on current and future matters affecting public health and safety and consumer fraud, and prohibit inaction

To address the problems with this program, we are asking for action in phases, beginning immediately, for all electric, gas and water meters, the Smart Meter program as a whole, and the Smart Grid.

Phase One

An immediate halt to any and all further deployment or activation of the AMI/AMR/Smart Meter/Smart Grid Programs or digital meters, and AMR/AMI water meters statewide for all investor owned utility companies (IOUs), municipal utility districts (MUDs) and private utilities.

Immediate de-activation of infrastructure, collectors, WiFi, servers, etc.

Immediate reinstallation with analogs at no charge for all ratepayers who request them. This will include a no-cost analog perimeter/zone of safety without Smart Meters or digital meters. of no less than 1000 feet radius. This includes residences, businesses, schools, and public buildings. Alert the public to this program via TV, radio, newspaper, and bill inserts.

Communities which have adopted ordinances by their local government will immediately be made Smart Meter-free, and access points, data collection infrastructure, and all other infrastructure removed as well.

Begin overall redeployment of analog meters, beginning with removal of all banks of Smart Meters/digital meters; progressing to removal of all wireless and digital meters and infrastructure from the smart grid, with full public disclosure.

Disclose all collector meter and repeater locations

Place radio frequency radiation (RFR) warning signs at all Smart Meter locations, and on all infrastructure.

Prohibit the disposal of analog meters, and require that they be securely stored and accounted for.

Commence immediate state public hearings and investigation into Smart Meter problems, including radiofrequency radiation (RFR) health and safety issues. Alert the public to this investigation through TV, radio, and newspaper advertising.

Where Smart Meters are still in place, require a premise visit before disconnection of service.

A utility's premise visit to the customer's dwelling at the time of disconnection which is required in some states is for the purpose of allowing the utility to respond to customer statements at the time of disconnection, detect a medical emergency, or other conditions that may result in forbearance by the utility from effectuating the disconnection of service, and consider the customer's dispute allegations if made orally at that time. Where an attempt at personal contact is required, some utilities accept customer payment by means of a credit or debit card.

www.nclc.org/images/pdf/energy_utility_telecom/additional_resources/adv_meter_protection_report.pdf

Prohibit power disconnection throughout the state in severe weather areas during critical times of the year.

Require zero emissions/no increase in RF/EMF emissions from additions or changes to the grid

Require the CPUC to open evidentiary hearings on RF health impacts from utility company Smart Grid/Smart Meter program immediately, in compliance with the CPUC's mandate.

Launch investigation into personnel and commissioners in the CPUC and CEC for conflicts of interest with the utilities and telecommunications industry. Include those who have received complaints from the public and have not taken action during this time. Terminate all personnel including commissioners who have failed to take action to protect the public.

Phase Two – within 30 days

Within 30 days of Phase One beginning, the public shall be notified via ads in local newspapers, on radio and in billing statements/a letter to all utility customers

- a) that the program is being halted and Smart/digital meters are being de-installed.
- b) of health effects which members of the public are experiencing
- c) of the full range of complaints about wireless smart meters and digital meters, with content of notification to be approved by EMF Safety Network and associates.
- d) of the possibility of fire and explosions from Smart Meters and afforded the opportunity for immediate no-cost change out and use of a traditional analog meter if they encounter appliance losses, humming, or intermittent power outages.

Establish public information and awareness-raising campaigns within 30 days and continue on an on-going basis on the risks of all possible harmful long-term health or biological effects from electromagnetic fields on the environment and on human health, pets, animals, insect

populations wildlife, or the environment as determined by independent researchers, scientists, and experts in the field of electromagnetic radiation and in particular RF radiation. These campaigns should especially include information on possible health impacts on children, teenagers, and young people of reproductive age. Content of notification to be approved by public advocacy groups including EMF Safety Network, Ecological Options Network, Stop Smart Meters, Center for Electrosmog Prevention, Cellular Phone Task Force, EMR Policy Institute.

Continue replacing all AMI/AMR/Smart Meters and digital meters with analog meters.

Begin removing access points/collector antennas, and wireless infrastructure.

Commence an investigation into the CPUC and its ties to industry. Recommendations for reform include replacement of staff and commissioners, including those with conflicts of interest.

Subpoena records related to consumer complaints and health problems related to Smart Meters, including phone conversations, correspondence, and contacts with customers, including site visits, from all utility companies.

Recognize electrohypersensitivity as a disability and a functional impairment, requiring accommodation.

Phase Three

Commence state investigation on how to “harden” the grid, and replace all wireless components with wired devices. Require that there be no additional EMF emissions from any grid components, and include adding shielding. Also require no RF or microwave emissions.

Require the CPUC, within 30-45 days of receiving formal filings regarding health, safety, or consumer fraud issues affecting Californians statewide or entire communities, specific areas or a significant number of Californians, to open proceedings with a pre-hearing conference and set a calendar of hearings. Replace language in CPUC duties from “may” to “shall”.

Further require that evidentiary hearings on consumer fraud or health or safety issues commence at the CPUC within 30 days of that prehearing conference.

Require the CPUC to open evidentiary hearings within 30 days of receiving information on consumer fraud or health or safety issues affecting Californians statewide or communities or specific areas.

Require concurrent oversight by Assembly Utilities and Commerce Committee and if deemed necessary by a simple majority of the Committee, separate evidentiary hearings by the Committee.

Change California Constitution so that CPUC commissioners are elected, rather than current system of appointments

Fiscal impacts (see also Costs under “Problems”):

- Costs to California residents forced out of homes
- Property loss -- takings – loss of use of home
- Costs to California residents who become ill – medical expenses, shielding costs, damage to health, long-term costs
- Death
- Emotional harm
- Fires, electrical wiring, appliance and electronic damage
- Loss of wages – 120,000 Californians unable to work according to 1998 CDPH EHIB study
- Unemployment costs
- Cost of Smart appliances and devices
- Environmental damage
- Loss of bees
- Increasing state/taxpayer liability for impacts from program not halted
- Future costs of downed grid, locally, regionally, throughout the state, or the entire country
- Grid blackout across Southern California to Arizona
- Costs of Smart Meter/Smart Grid program thus far through rates, ARRA funds, and other taxpayer-funded mechanisms

Other States:

		<u>Status</u>
Vermont	Senate Bill 0214 no fee opt-out	May 2012 -- Passed
Georgia	Senate Bill 459 opt-out	Feb. 2012 -- Passed Senate Mar. 13, 2 nd reading in House
Michigan	House Bill 5411 opt-out, rules for data use	No hearing yet in House Energy and Tech. Committee

	House Bill 5439 no fee for opt-out, rules for power disconnection, data use, AMI installation procedures	No hearing yet in House Energy and Tech. Committee
Maryland	House Bill 878 opt-out provisions	Unfavorable report by House Economic Matter Committee Killed in committee
Texas	Rep. Dennis Bonnen, who authored Texas' original Smart Meter authorization legislation, and Sen. John Carona have announced that if the Texas Public Utilities Commission does not take action to allow Smart Meter opt-outs, they plan to introduce opt-out bills. Rep. Bonnen: "Never was it presented as something that would be forcibly deployed," http://www.texaswatchdog.org/2012/12/texas-lawmakers-push-for-customer-optout-from-smart-meters/1354820718.column	

Prior or similar legislation:

AB 37 opt-out legislation –
Introduced by Asm. Jared Huffman, December 2010.
Died in committee.

Websites for additional information:

EMF Safety Network	www.emfsafetynetwork.org
Burbank Action (Smart Meter pages)	www.burbankaction.com
Maryland Residents Against Smart Meters	www.marylandsmartmeterawareness.org
Stop Smart Meters	www.stopsmartmeters.org
Stop Orange County Smart Meters	www.stopocsmartmeters.com
Stop Smart Meters Irvine	www.stopsmartmetersirvine.com
Center for Electrosmog Prevention	www.smartmeterdangers.org
Stop Smart Meters Australia	www.stopsmartmetersau.com
Stop Smart Meters Georgia	www.stopsmartmetersgeorgia.org
Naperville Smart Meter Awareness	www.napervillesmartmeterawareness.org
W4AR	www.w4ar.com
Citizens for Safe Technology	www.citizensforsafetechnology.org
American Academy of Environmental Medicine	www.aaemonline.org
Electrical Pollution	www.electricalpollution.com

There are many more websites with information.

For a list of additional websites: www.stopsmartmeters.org

Exhibit 14

Videos to watch: Very important

Nerve Disrupting Frequencies from the Smart Meter demonstration

<https://www.youtube.com/watch?v=4NTSejgsjTc>

Video recording of the Electro Smog meter on my Smart Meter output:

<https://www.youtube.com/watch?v=rPg84LXENKc>

Recording of the Noise Pollution I hear (please listen with headsets):

<https://www.youtube.com/watch?v=JFOyYnsfK0k>