

Questions You May Want to Ask Your Electric Power Company about Wireless Smart Meters

Italicized comments express our current understanding of possible answers to some questions.

Health Effects

- (1) Before deciding to install Wireless Smart Meters on, or inside, the homes, buildings, and businesses throughout your service area, did you produce an analysis to assure that the radiofrequency/microwave radiation from the Wireless Smart Meter System would be safe for your customers?
 - If yes, how can we obtain a copy of that analysis?
 - If no, how did you establish that the Wireless Smart Meter System was safe for your customers?

Radiation Sources

- (2) Did your analysis consider the radiofrequency/microwave radiation from a single Wireless Smart Meter or the radiation from all components of the Wireless Smart Meter System, including
 - all Wireless Smart Meters in a community
 - all intermediate wireless relay devices in a community, such as
 - all Wireless Collector Smart Meters
 - all Wireless Repeaters
 - all wireless transmitters/receivers required to communicate between the intermediate wireless relay devices and your electric power company or its agents?
- (3) Did your analysis consider the radiation from both the 900 MHz transmitters and the 2.4 GHz (2400 MHz) transmitters in your Wireless Smart Meters?
 - If no, did your analysis address just one of the transmitters?
 - If yes, which one?
 - If yes, why did you not address the other transmitter?

We understand that the 900 MHz transmitters operate in the frequency band 902-928 MHz. They are used for two-way wireless communication among Wireless

Smart Meters and intermediate relay devices such as Collector Smart Meters and Wireless Repeaters in a community. (MHz stands for megahertz, or 1 million hertz.)

We understand that the 2.4 GHz transmitters operate in the frequency band 2400-2483.5 MHz. They are used for two-way wireless communication with Wireless Smart Appliances and electrical equipment inside homes, buildings, and businesses. (GHz stands for gigahertz, or 1 billion hertz.)

- (4) How did your analysis address the radiofrequency/microwave radiation already present from other sources in each community in which you planned to install your Wireless Smart Meter System?
- Did your analysis consider all such radiation, to which the radiation from your Wireless Smart Meter System would be added?
 - Or did your analysis assume that your Wireless Smart Meter System was the only source of radiation in each community?

Radiation Exposure Standards

- (5) What is the primary basis for your claim that the radiation from your Wireless Smart Meter System is safe for human beings?
- Is the primary basis the Federal Communications Commission Maximum Permissible Exposure (MPE) limits for the "General Population/Uncontrolled Exposure"?¹

We understand that those levels are the following, at the frequencies at which Wireless Smart Meters operate:

- *The MPE at 900 MHz: The radiofrequency/microwave power density, averaged over a period of 30 minutes, must not exceed 0.6 milliwatts per square centimeter (which is equivalent to 6 watts per square meter).*
- *The MPE at 2.4 GHz: The radiofrequency/microwave power density, averaged over a period of 30 minutes, must not exceed 1 milliwatt per square centimeter (which is equivalent to 10 watts per square meter).*
- Or is the primary basis something else?
 - If yes, what is the primary basis?

¹ Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65, Edition 97-01, August 1997.

(http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf)

Biomedical Research Literature and Biomedical Organizations

- (6) In your analysis, how many published archival biomedical research papers were considered and referenced?

We understand that at least 1800 archival biomedical research papers, published in recent years, address biological effects from exposure to electromagnetic radiation at various levels and frequencies.

- (7) What credence did your analysis give to the national and international health organizations and working groups that have objected, on health grounds, to further increases in the exposure of humans, and especially children, to radiofrequency/microwave radiation from multiple wireless devices, including Wireless Smart Meters?

- Did your analysis address the findings and recommendations coming from the following organizations?
 - World Health Organization/International Agency for Research on Cancer²
 - American Academy of Environmental Medicine³
 - American Academy of Pediatrics⁴

- Did your analysis address the findings and recommendations coming from working groups of scientists and medical doctors?
 - The Seletun Scientific Statement (2010)⁵
 - BioInitiative 2012 Report⁶
 - Biological and Health Effects of Microwave Radio Frequency Transmissions, A Review of the Research Literature (2013)⁷

² IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic to Humans , May 31, 2011. (http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf)

³ AAEM, "Smart Meter Case Series", October 23, 2013.

(<http://marylandsmartmeterawareness.org/wp-content/uploads/2014/02/AAEM-Smart-Meters.pdf>)

⁴ Letter from the American Academy of Pediatrics to the Honorable Dennis Kucinich, U.S. House of Representatives, December 12, 2012. (<http://www.scribd.com/doc/118348085/AAP-Supports-Child-Cell-Phone-Protection>)

⁵ Adamantia Fragopoulou and others, Scientific Panel on Electromagnetic Field Health Risks: Consensus Points, Recommendations, and Rationales, Reviews on Environmental Health, Volume 25, No. 4, 2010.

(http://www.sagereports.com/smart-meter-rf/docs/Fragopoulou_et_al_2010b.pdf)

⁶ BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors, BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation, December 31, 2012.

(<http://www.bioinitiative.org>)

⁷ Paul Dart, MD, and others, Biological and Health Effects of Microwave Radio Frequency Transmissions, A Review of the Research Literature, A Report to the Staff and Directors of the Eugene Water and Electric Board, June 4, 2013. (<http://apps.fcc.gov/ecfs/comment/view?id=6017465430>)

Interference with Medical Devices

- (8) Did your analysis address the possibility of electromagnetic interference from the Wireless Smart Meter System with medical devices?
- (9) Did your analysis consider both medical devices that employ wireless technology and medical devices that do not employ wireless technology?

Examples of medical devices include, but are not limited to,

- hearing aids
- infusion pumps (insulin pumps, pain medication pumps)
- implantable cardioverter defibrillators
- cardiac pacemakers
- oxygen concentrators
- sleep apnea devices
- wireless medical telemetry devices.

- (10) Have you received any complaints from customers who suspect interference with their medical devices from your Wireless Smart Meter System?
 - How many complaints have you received?
 - How many of the complaints did you find justified?
 - Did you address those complaints through compensation or other steps?

Warranty Against Health Effects

- (11) Are you confident enough in your analysis -- that the Wireless Smart Meter System is safe -- that you are willing to give your customers a written warranty indicating that you will accept liability for health consequences that can be properly attributed to your Wireless Smart Meter System?

Privacy, Personal Security, and Control

- (12) In your analysis, for what purposes did you need highly time-resolved (“granular”) data on all electrical activities taking place inside every home, building, and business in your service area, 24 hours per day throughout the year?
- (13) In your analysis, what was the granularity of the data collected by each Wireless Smart Meter?
 - every second

- every minute
- every hour
- some other time interval and, if so, what interval

(14) Did your analysis account for the possibility that your customers might feel that their electric power company does not have a right to collect, to store, to broadcast over the air (even if “encrypted”), and to post on a personal portal on the Internet (even if “secure”), data so detailed and so personal that it is sufficient to determine

- when they get up in the morning
- when they go to bed at night
- when they are at work
- when they are on vacation
- when they run each appliance or other piece of equipment in their homes, buildings, or businesses?

(15) What has been the disposition of the granular data that you have collected on your customers through their Wireless Smart Meters?

- Have you received any requests from data-mining companies or other companies, from law enforcement, or from local, state, or U.S. Government agencies for that data?
 - If yes, have you honored any of those requests?
- Have you offered such data to any individual or any organization?
- Have you sold such data to any individual or organization?

(16) Have you already used, or do you plan to use, the remotely controlled shutdown switch, built into each of the Wireless Smart Meters, to turn off the electric power to customers

- who have billing disputes with your power company
- who are late paying a bill?

Reliability

(17) When a power failure occurs in your electric power system, does that power failure more often affect

- a single house, building, or business
- or an entire community or region?

(18) In your analysis, why was installing a Wireless Smart Meter on every home, building, and business judged more important to reliability than improvements, to which the same dollars could have been applied, that affect entire communities or regions, such as

- burying power lines that are vulnerable to storm damage
- upgrading major equipment that delivers electrical power
- improving the monitoring of the health of the electrical power system at major junctions in the power grid?

Cyber Vulnerability

(19) In your analysis, what justification did you find for concluding that the Wireless Smart Meter System would not increase the cyber vulnerability of the electrical power system?

- In particular, does the presence, in each Wireless Smart Meter, of a shutdown switch, controlled by wireless signals, increase the cyber vulnerability of the delivery of electrical power to the home, the building, or the business with such a meter?
- Should the possibility of a shutdown caused by a wireless signal be of concern to customers who depend on the continuous operation of critical devices such as medical support equipment, security systems, and refrigerators?

(20) Has the delivery of electricity to any of your customers been unintentionally interrupted by a shutdown switch

- that you did not trigger with a wireless signal
- that you triggered accidentally with a wireless signal?

(21) Have you detected any instances of cyber hacking in your Wireless Smart Meter System?

- If yes, have you incurred any costs, as a result of such hacking,
 - from lost revenue
 - for identifying the specific cyber vulnerability that enabled the hacking
 - for software or hardware revisions to counter the cyber vulnerability
 - for replacing or modifying Wireless Smart Meters found too vulnerable to hacking?
- If you have incurred costs, as a result of hacking, will you pass those costs on
 - to your customers with Wireless Smart Meters
 - or to all of your customers, including those without Wireless Smart Meters even if their electricity meters are not vulnerable to hacking?

Fires

(22) Have any fires been reported in your service area for which your customers have suspected Wireless Smart Meters as the cause?

- If yes, how many fires?
- For how many of those fires did you hold the customers responsible?
- For how many of those fires did you accept responsibility and compensate your customers?
- For how many of those fires was the fire marshal given sufficient time to determine the cause of the fire before the damaged Smart Meter was removed by your company?
 - What did the fire marshal conclude was the cause of those fires?

(23) Have your installers been turning off the circuit breakers inside each customer's home, building, or business before installing Wireless Smart Meters, to assure that no current is flowing when the original meter is removed and the new meter is installed?

We understand that the purpose of this step is to prevent damage to the electrical contacts on the meters, and to the electrical contacts inside the box in which the meters are mounted, which can lead to high resistance, heating, and electrical fires.

Equipment Damage

(24) Have you received any complaints from your customers about damage to their electrical or electronic equipment that your customers associated with their Wireless Smart Meters?

- If yes, how many complaints?
- What did you determine were the causes of that damage?
 - Was the installation process for the Wireless Smart Meters at fault?
 - Was an operational issue with the Wireless Smart Meter System a factor, such as the unintentional triggering of the shutdown switches in the Smart Meters?
- For how many of the complaints did you hold your customers responsible for the damage?
- For how many of the complaints did you accept responsibility for the damage and compensate your customers?

Property Values and Property Taxes

(25) In your analysis, did you consider the negative impact of the installation of a Wireless Smart Meter on the value of the customer's property, given

- the increasing number of customers who do not want to live in a home, a building, or a community that has Wireless Smart Meters
- the number of jurisdictions that have required that the installation of Wireless Smart Meters not be mandatory
- the number of jurisdictions that have banned Wireless Smart Meters altogether?

(26) In your analysis, did you consider the impact of lowered property values on the property taxes that support the jurisdictions in which you are installing Wireless Smart Meters?

Costs

(27) In your analysis, by what percentage, on average, did you find that your customers would reduce their monthly electric bills once they had Wireless Smart Meters?

Our understanding is that the major argument made to customers for accepting Wireless Smart Meters is that the customers will be able to decrease their monthly bills for electricity, using detailed data about their energy consumption generated by the Wireless Smart Meters and accessed through a personal portal on the power company's web site.

(28) Has time-of-use metering been implemented for any, or all, of your customers who already have Wireless Smart Meters?

- If yes, when was it implemented?
- If no, when will it be implemented?

We understand that time-of-use metering is one of the many capabilities of Wireless Smart Meters. Such metering enables charging

- *a higher price per kilowatt-hour of electricity consumed during high-demand parts of the day, such as during summer days when air-conditioners are in use*
- *a lower price per kilowatt-hour of electricity consumed during low-demand parts of the day, such as during the night when most people sleep.*

(29) In your analysis, which of the following factors was judged most important to your claim that your customers' monthly bills would decrease once they had Wireless Smart Meters?

- Your company would reduce the price per kilowatt-hour of electricity (total monthly bill in dollars, divided by total kilowatt-hours consumed that month).
- The customers would reduce their consumption of electricity.
- The customers would move enough of their electricity consumption from high-demand hours of the day (like the daytime in the summer) to low-demand hours (like the nighttime) to realize a net saving through time-of-use metering.
- Some other factor, and if so, what other factor?

- (30) In your analysis, what was the rationale for believing that detailed data in kilowatt-hours from Wireless Smart Meters would motivate your customers more than their monthly bills in dollars to reduce electricity consumption?
- (31) In your analysis, how did you justify
- the cost of creating a new wireless communications system for Wireless Smart Meters
 - instead of using existing wired communications systems, like telephone lines, and cable and fiber-optic internet connections, for which Wired Smart Meters are already available?
- (32) Did your analysis account for the increased costs that time-of-use metering would impose on customers with family members at home during the daytime, such as
- families with children
 - the retired
 - the elderly
 - the unemployed
 - those with chronic illnesses or disabilities?
- (33) Have the objections of three State Attorneys General to Wireless Smart Meter Systems, based on their findings that the costs of those systems exceed any financial benefit to the customers, affected your assessment of the justification for those systems?
- Attorney General Lisa Madigan of Illinois⁸
 - Attorney General George Jepsen of Connecticut⁹
 - Attorney General Bill Schuette of Michigan¹⁰
- (34) Are you planning to seek, or have you already sought, a rate increase to recover the costs of the new Wireless Smart Meter System? If yes -
- Does that rate increase apply to customers who do not have Wireless Smart Meters as well as to customers who do have Wireless Smart Meters?
 - What is the effective date of that rate increase?
 - What is the size of that rate increase?

⁸ Lisa Madigan Opinion Editorial: ComEd Experiment Too Expensive for Consumers, Chicago Tribune, June 21, 2011. (<http://www.lisamadigan.org/Newsroom/lisainthenews/item/2011-06-lisa-madigan-opinion-editorial-comed-experiment-too>)

⁹ Jepsen Urges State Regulators to Reject CL&P's Plan to Replace Electric Meters, February 8, 2011. (http://www.ct.gov/ag/lib/ag/press_releases/2011/020811clpmeters.pdf)

¹⁰ Attorney General's Comments Pursuant to the MPSC Order Dated January 12, 2012. <http://efile.mpsc.state.mi.us/efile/docs/17000/0408.pdf>

Opt Out Availability and Status

(35) How many customers (ratepayers) do you have in your service area?

(36) Do you offer your customers the opportunity to opt out of the installation of a Wireless Smart Meter? If yes –

- How many of your customers have opted out to date?
- Are there fees for opting out?
 - If yes, what are those fees?

(37) Do some of your customers have electricity meters located inside, rather than outside, their homes, buildings, or businesses? If yes --

- How many such customers?
- How many of those customers have not responded to your requests for entry for the installation of Wireless Smart Meters?

(38) Will customers who have opted out, and who currently have a traditional analog mechanical meter with no wireless communications capability, be able to retain that meter? If no –

- What type of replacement electricity meter will they receive?
- Does the replacement electricity meter have a wireless communications capability, whether one-way or two-way?
 - If yes, are you notifying those customers in advance that you are replacing their analog meter with a wireless meter?

(39) Will customers who opt out, and who currently have a Wireless Smart Meter, receive a traditional analog mechanical meter with no wireless communications capability as a replacement? If not –

- What type of replacement electricity meter will they receive?
- Does that replacement electricity meter have a wireless communications capability, whether one-way or two-way?
 - If yes, are you notifying those customers in advance that you are replacing their Wireless Smart Meter with another wireless meter?

Meter Options

The questions in this section seek to identify the wireless meters offered and to obtain the minimum amount of information needed to determine the radiofrequency/microwave radiation exposure that these meters produce.

Wireless Smart Meters

(40) What makes and models of Wireless Smart Meters are you installing for your customers?

We are aware of two of the possibilities so far:

- *Landis+Gyr Focus AXR-SD*
- *General Electric I-210+c*

(41) What makes and models of the wireless communications modules are in the Wireless Smart Meters that you are installing for your customers?

We are aware of one of the possibilities so far:

- *Silver Spring Networks*

(42) In your analysis, what was the peak radiofrequency/microwave power output of the wireless transmitter in the Wireless Smart Meters?

According to a California court-ordered document¹¹ that provides data from Silver Spring Networks, which is the company that makes the transmitters/receivers in many Wireless Smart Meters,

- *the 900 MHz transmitter has a peak power output of 1 watt*
- *the 2.4 GHz transmitter has a peak power output of 125 milliwatts.*

(43) In your analysis, what was the gain of the antenna(s) of the Wireless Smart Meters, in the direction of maximum gain, at each of the two frequencies of operation, 900 MHz and 2.4 GHz?

According to the California court-ordered document described above, the gain of the antenna(s) is the following:

- *4.0 dBi (or a factor of 2.5) at 900 MHz*
- *none, which is 0 dBi (or a factor of 1) at 2.4 GHz.*

¹¹ Pacific Gas and Electric Company's Response to Administrative Law Judge's October 18, 2011 Ruling Directing it to File Clarifying Radio Frequency Information, pages 5 and 10. (http://emfsafetynetwork.org/wp-content/uploads/2011/11/PGERFDataOpt-outalternatives_11-1-11-3pm.pdf)

We understand that the antenna gain increases the radiofrequency/microwave power density produced by the antenna by the “factor” shown above, in the direction in which the gain has been measured.

- (44) In your analysis, how many transmissions of radiofrequency/microwave radiation per day does each Wireless Smart Meter make for any purpose, both on average and at a maximum, at 900 MHz and separately at 2.4 GHz?

According to a California court-ordered document referenced above, the number of transmissions of radiofrequency/microwave radiation per day for any purpose from the 900 MHz transmitter of each Wireless Smart Meter is

- *on average, 9981 transmissions of radiofrequency/microwave radiation per day, or one transmission every 9 seconds*
- *a maximum (99th percentile) of 190,396 transmissions of radiofrequency/microwave radiation per day, or two transmissions every second.*

Data were not provided in the California court-ordered document for the number of transmissions of radiofrequency/microwave radiation per day for any purpose from the 2.4 GHz transmitter of each Wireless Smart Meter.

- (45) In your analysis, what was the average and maximum total transmission time per day for any purpose from the 900 MHz transmitter, and separately from the 2.4 GHz transmitter, for each Wireless Smart Meter that you are installing?

Based on the California court-ordered document described above, the total transmission time per day for any purpose from the 900 MHz transmitter is

- *on average, 62 seconds per day, or about 1 minute per day¹² (issued as 9981 transmissions of radiation spread throughout the day, as noted above)*
- *a maximum of 875 seconds per day, or about 15 minutes per day¹³ (issued as 190,396 transmissions of radiation spread throughout the day, as noted above).*

¹² Pacific Gas and Electric Company’s Response to Administrative Law Judge’s October 18, 2011 Ruling Directing it to File Clarifying Radio Frequency Information. The value of 45.3 seconds for the “weighted average duty cycle” in Table 2-1 on page 5 is the median not the mean (average). The value of 62 seconds in footnote 4 on page 5 is the mean. (http://emfsafetynetwork.org/wp-content/uploads/2011/11/PGERFDataOpt-outalternatives_11-1-11-3pm.pdf)

¹³ Pacific Gas and Electric Company’s Response to Administrative Law Judge’s October 18, 2011 Ruling Directing it to File Clarifying Radio Frequency Information. The value of 875.0 seconds for the “weighted average duty cycle” in Table 2-1 on page 5 for the 190,396 transmissions tracks approximately with the median of 45.3 seconds per 9981 transmissions, suggesting that the value of 875.0 seconds is also a median, not a mean, even though not so annotated with a footnote. If so, when corrected to be based on the stated mean of 62 seconds per 9981 transmissions, the mean transmission time for the 190,396 transmissions would be 1180 seconds or 19.7 minutes, not 15 minutes. (http://emfsafetynetwork.org/wp-content/uploads/2011/11/PGERFDataOpt-outalternatives_11-1-11-3pm.pdf)

Data were not provided in the California court-ordered document for the total transmission time per day for any purpose from the 2.4 GHz transmitter of each Wireless Smart Meter.

Wireless Replacement Meters

The following questions are applicable if the replacement meters have any form of wireless communications capability, whether one-way or two-way.

- (46) What makes and models of wireless replacement meters are you installing for your customers?
- (47) What makes and models of wireless communications modules are in the wireless replacement meters that you are installing for your customers?
- (48) Are any of the wireless replacement meters ERT models?
- If yes, are they ERT “bubble-up” meters?
 - Or are they ERT “wake-up” meters?
 - If no, what type of wireless replacement meters are they?

We understand from a description of ERT meters made by Itron¹⁴ that ERT stands for “encoder receiver transmitter”. The Itron ERT electricity meters operate in the same frequency region as Wireless Smart Meters (900 MHz). There are two versions:

- *The “bubble up” version transmits data “every few seconds”, 24 hours per day throughout the year, so that the data can be picked up whenever a utility vehicle passes by.*
- *The “wake-up” version of this meter transmits data several times when polled by a wireless transmitter/receiver in a passing utility vehicle, typically once a month.*

The reference cited does not provide information about other important radiofrequency/microwave characteristics of the ERT meters.

- (49) What is the peak radiofrequency/microwave power output of the transmitter in the wireless replacement meter?
- (50) What is the gain of the antenna in the wireless replacement meter in the direction of maximum gain?

¹⁴ Itron ERT technology, Grid Insight. (<http://www.gridinsight.com/community/documentation/itron-ert-technology>)

We understand that the gain increases the radiofrequency/microwave power density produced by the antenna in the direction in which the gain has been measured.

- (51) If the answer to either question (49) or question (50) is unknown, what is the peak radiofrequency/microwave power density produced by the wireless replacement meter in the direction of maximum gain, and at what distance from the meter?
- (52) If the answer to either question (49) or question (50) is unknown, and if the answer to question (51) is also unknown, what is the peak electric field produced by the wireless replacement meter in the direction of maximum gain, and at what distance from the meter?
- (53) What is the average and maximum number of transmissions of radiofrequency/microwave radiation made per day for any purpose by the wireless replacement meter?
- (54) What is the average and maximum total transmission time per day for any purpose for the wireless replacement meter?