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AGRICULTURAL AND ENVIRONMENTAL CONSULTANTS

Offices in
Santa Barbara
Mammoth Lakes

September 22, 2010

Office of Engineering & Technology
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Attention: Julius Knapp, Chief, OET, FCC
Subject: Smart Meter RF Emissions - Compliance Questions

Dear Mr. Knapp,

Thank you for your response to my letter dated March 15, 2010 in which I raised questions about the validity of compliance testing for smart meters. Your letter raises more questions than it answers.

FCC compliance with existing regulations for uncontrolled public access is not reliably demonstrated. The FCC must take further steps to evaluate whether existing compliance testing and certification of smart meters "in the manner and locations installed" relied on faulty assumptions and information, and are thus unreliable. Timely reassessment is critical to avoid further deployment, which will waste resources and place people and property at risk. Violations of existing FCC safety limits can be expected to occur "in the manner deployed and operated."

Factors that Affect Reliability of FCC Compliance Test Results to Date

- 1) The FCC Equipment Authorization (EA) program in the Office of Engineering and Technology has erred in assuming "*that smart meters are similar to low-power devices like WI-FI base stations*" and "*are not expected to be used close to the body*". Your letter indicates "*(D)etailed evaluation of the SAR is not required if the 20 cm separation distance can be maintained.*" Clearly you are unaware of the hundreds, perhaps thousands of cases where people do not maintain at least 20 cm distance because the meters are located within occupied space on their property or within their home. These people "*do not use smart meters voluntarily this close to their body*" but are placed into potentially dangerous situations involuntarily by their local utility. Violations of FCC safety limits are predicted.
- 2) The FCC Equipment Authorization (EA) program does not consider peak power on the Grants of Equipment Operation. This is the appropriate measure of power relevant to interference concerns. Peak power from smart meters must be assessed in light of scores of complaints from consumers who have found that smart meters interfere with other electronics including security systems, lighting controls, ham radio operations, baby surveillance monitors, office equipment, sensitive scientific measurement instruments, arc fault circuit interrupters, ground fault interrupters, and medical implant devices.¹ There is no valid reason for ignoring localized effects from high peak power pulses from smart meters. Complaints about electromagnetic interference can be requested from the California Public Utilities Commission (ssc@cpuc.ca.gov)



- 3) Reflections in typical home environments necessitate the use of Equation 6 (100% reflection) and even additional factors for reflection where reflective surfaces (tile, concrete, stainless steel, and other typical interiors and appliances) will invalidate test results using Equation 10 (with only 60% reflection). Published studies underscore how use of even the highest reflection coefficient in Equation 6 likely underestimates the potential for reflection and hotspots.^{2,3,4}
- 4) The duty cycle or 'traffic' on smart meters has been substantially underestimated in FCC compliance assessments. Utilities in California are representing the wireless transmissions to occur anywhere from a few times per hour to once per four hours. Yet, measurements in the San Francisco Bay Area of California vary widely from location to location.

Some show 8-15 wireless transmissions per minute or more. These systems may have duty cycles (RF bursts every few seconds) that greatly increase public exposure, and change the compliance picture in very significant ways. The FCC must evaluate real-life use 'in the manner operated' with far higher duty cycles. Since every meter can be a 'repeater' for other nearby meters, on what basis has the FCC determined the frequency of wireless transmissions that do not originate within one property?

Further, wireless companies are already promoting the resale and use of smart meter wireless capacity to augment existing cell tower capacity (for wireless communication and data transmission).⁵ Nothing prevents the other 5%% or 50% or 90% of wireless capacity from being sold to and used by second-party commercial interests. These plans are already being promoted in the telecom industry literature.

- 5) Compliance in situations with multiple meters on one wall of a living unit has not been properly assessed. For example, multi-family residential units may have 8 to 16 wireless meters on one wall, where a child may have a bed on the other side of the wall; or a playroom for children, or a work space for home office use, or a bedroom for a convalescing family member, a person with medical implant devices or an aged parent with special medical needs. If the duty cycle is far higher than the FCC has considered, or the reflections are significantly greater, then compliance reports done to date are inadequate.
- 6) Electronic interference with arc fault circuit interrupters (AFCIs) has been documented with the introduction of wireless smart meters.¹ Pacific Gas & Electric (PG&E) has been required by the CPUC to report on consumer complaints, including those complaints about interference with AFCIs after smart meters have been installed. AFCIs are now mandated for bedrooms, including for lighting controls in the National Electric Code. Such conflicts between the federally-mandated electrical safety code and the smart meter rollout underscores the complete inadequacy of studies prior to their mass deployment in the United States. AFCIs are specialized safety controls on electrical wiring that are installed to prevent electrical wiring fires.



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The assertion you make that *"the meters' contributions to the total potential exposure at any location are small, as only the nearest few transmitters can add meaningfully to the total"* is an unsupportable conclusion, as you have been misled on basic operational modes for a meter, and multiple meters in one location. With far higher levels of reflection and 'traffic' taken into account, the combined power density and SARs may be substantial, and will likely violate existing limits for uncontrolled public access, and for localized exposures. Each meter has multiple antennas within it, and they operate in virtually all directions (are omnidirectional). Thus residents may likely find areas on their property and within their homes that are exceptionally high wireless exposure zones, and therefore unusable. Further complicating the assessment is the use of personal wireless devices and home systems (security systems, etc.) that already use up some of the allotted exposure background. None of these factors is adequately assessed in existing compliance testing.

7) The assertion that *"the general issue of cumulative exposure from an arbitrary group of transmitter installations or from all transmitters distributed in the environment can appear complex:..."* *"signal losses ensures that only the contributions of nearby transmitters are significant"* does not take into account the existing background radiofrequency and microwave radiation burden from other sources, including proximity to AM, FM, TV and other wireless facilities. The combined RF/MW exposures may well place people and their property *"over the top and in violation"* with the addition of smart meters and the relay function for other homes in the area.

8) Your response on interference with medical devices is not reassuring. Part 15 of the FCC Rules that are meant to avoid interference with *"WI-FI devices, cell phones and other typical consumer products"* are not preventing such interference today, as the FCC and FDA heard in the recent proceeding on medical implants and RF interference."⁷ It is one thing to say that people with sensitive medical implants subject to electronic interference should avoid using cell phones or flying on airplanes; it is another thing entirely to put a device on one's home that can cause the same level of health threat, and is quite unavoidable by the occupant. To say that *"certain medical devices may need specific precautions in many other environments; these are generally considered during FDA approval of the individual medical devices"* is to ignore the reality of people who already are implanted with deep brain stimulators, who will be unable to live in the homes they inhabit now, or work in their offices because of the additional threat of disconnecting or disabling of their life-saving devices.

The Department of Justice administers rules and regulations for Americans with Disabilities, and should be brought into this discussion while the FCC further investigates smart meter compliance issues. The rights of ADA patients with sensitive medical devices that are subject to electronic interference who may be disabled or face lethal consequences from such interference are not sufficiently considered in FCC assessments to date. As the CPUC and perhaps other state utility regulatory agencies are relying on the FCC's assertion of compliance, the issues raised in this letter have great consequence to millions of ratepayers if it is a false assurance of safety.



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Julius Knapp, Chief, OET

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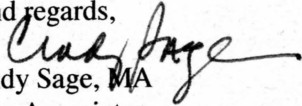
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The issue of smart meter rollout nationwide is likely to have significant impacts on health, security, electromagnetic interference, privacy, on people with medical implant devices, on potential fires and on the value and utility of private properties as a result of these combined effects.

By August 15, 2010, the California Public Utilities Commission received over 5000 complaints from PG&E consumers alone about smart meter performance problems.⁷ Widespread public concern is evidenced in news media, much of it indicating the difficulty consumers have in filing such complaints. As a result, the consumer complaint totals are probably much higher for PG&E customers, and there is no CPUC process yet to collect complaints from SCE or SDG&E customers. It is unrealistic to expect individual consumers to make time-consuming complaints also to the FCC, and seek individual investigations and redress from the FCC as you conclude in your August 6th response.

Thank you for your timely attention to this matter. I will be forwarding copies to relevant California and federal legislators and committee members.

Kind regards,


Cindy Sage, WA
Sage Associates

References

¹ Pacific Gas and Electric Company. Advanced Metering Infrastructure January 2010 Semi-Annual Assessment Report and SmartMeter™ Program Quarterly Report (Updated) (CPUC Decisions 06-07-027 and 09-03-026).

² Vermeeren G Gosselin MC Gosselin Kuhn S kellerman V Hadmen A Gati A Joseph W Wiart J Meyer F Kuster N Martens L. The influence of the reflective environment on the absorption of a human male exposed to representative base station antennas from 300 MHz to 5 GHz, Phys. Med. Biol. 55 (2010) 5541-5555 doi:10.1088/0031-9155/55/18/018

³ Hondou T Ueda T Sakat Y Tanigwa N Suzuki T Kobayashi T Ikeda K. Passive Exposure to Mobile Phones: Enhancement of Intensity by Reflection, Journal of the Physical Society of Japan Vol. 75, No. 8, August, 2006, 084801 (2006) The Physical Society of Japan

⁴ Hondou T, Rising Level of Public Exposure to Mobile Phones: Accumulation through Additivity and Reflectivity. Journal of the Physical Society of Japan, Vol. 71, No. 2, February, 2002, pp. 432-435 (2002) The Physical Society of Japan,

⁵ http://www.research.att.com/articles/featured_stories/2010_01/201002_techview_smartgrid.html
<http://gigaom.com/cleantech/att-taps-into-smart-grid-with-smartsynch/>
<http://arstechnica.com/telecom/news/2009/03/-att-plugs-into-grid-powers-smart-meters-conversations.ars>
<http://seekingalpha.com/article/131405-at-t-smartsynch-cellular-smart-meter-partnership-signs-up-first-utility>

⁶ Joint FCC/FDA hearings, July 2010. FCC Docket No. ET 10-120; FDA Docket No. FDA-2010-N-0291 Federal Communications Commission (FCC) and Food and Drug Administration (FDA) to Hold Public Meeting on Regulatory Issues Arising from Health Care Devices that Incorporate Radio Technology Wireless Communications Networks to address the joint FDA/FCC hearing on "challenges and risks posed by the proliferation of new sophisticated medical implants and other devices that utilize radio communications to effectuate their function, as well as challenges and risks posed by the development and integration of broadband communications technology with health care devices and applications."

⁷ California Public Utilities Commission, Public Advisor's Office, Data on Smart Meter Contacts through August 15, 2010



Federal Communications Commission
Washington, D.C. 20554

August 6, 2010

Ms. Cindy Sage
Sage Associates Environmental Consultants
1396 Danielson Road
Montecito, CA 93108-2857

Dear Ms. Sage:

Thank you for your letter of March 15, 2010, in which you request that we review compliance with FCC radiofrequency (RF) exposure limits for the "Smart Meter" technology being implemented by utilities across the country. In particular, you expressed concern about multiple adjacent Smart Meter installations used to service multiple dwellings such as condominiums, and the effect of increased data traffic on exposure from collector or controller units.

The FCC Equipment Authorization (EA) program in the Office of Engineering and Technology has taken a very conservative approach to RF exposure compliance for low-power network devices such as Wi-Fi base stations and Smart Meter transceivers. For such devices that are not expected to be used close to the body, it is generally unnecessary to perform routine specific absorption rate (SAR) evaluations as field strength or power density is a sufficient and appropriate measure of exposure. The maximum field strength at a distance can be derived from the effective radiated power (ERP). Also, FCC field strength limits, like the SAR limits, are time-averaged. Accordingly, for devices that will not be used within 20 centimeters of the body, we rely on the "source-based" time-averaged ERP and require that it be less than our specified values of 1.5 or 3 watts, depending on frequency,¹ in order to ensure compliance with our exposure limits. This does not imply that FCC exposure limits will be exceeded at distances less than 20 cm, but only that detailed evaluation of the SAR is not required if the 20 cm separation distance can be maintained.

It is useful in considering this issue to recognize that the power level specified on the Grants of Equipment Authorization issued by the EA program is the peak power as this is the power relevant to interference concerns. For exposure evaluations, however, the average power is relevant, which is determined by taking into account how often these devices will transmit. Since the purpose of these devices is to provide very infrequent information they transmit in occasional bursts. Thus, for exposure purposes the relevant power is maximum time-averaged power that takes into account the burst nature of transmission, and based on the typical maximum time-averaged transmitter power for many of these devices, they would generally be compliant with the local SAR limit even if held directly against the body.

With respect to multiple adjacent Smart Meter installations, since the antennas for each device are mounted individually on each utility meter, the separation distance from people for most of the transmitting antennas is relatively large compared to 20 cm and the

¹ See Section 2.1091(c) of the FCC rules.

meters' contributions to the total potential exposure at any location are small, as only the nearest few transmitters can add meaningfully to the total. Further, as a practical design matter, when several of these meters are placed in a cluster, they have to communicate with a single controller. In order to ensure that the controller receives the information properly, only one transmitter can communicate with the controller at a time, eliminating the potential for exposure to multiple signals at the same time.

The general issue of cumulative exposure from an arbitrary group of transmitter installations or from all transmitters distributed in the environment can appear to be complex, but as discussed, the need for orderly communications requires that a few sources normally dominate. In addition, the exponential decrease in signal strength over distance and additional signal losses due to non line-of-sight conditions for distant sources ensures that only the contributions of nearby transmitters are significant.

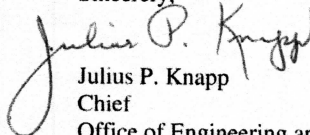
In summary, compliance for Smart Meters is determined according to the operating and installation requirements of each type of meter during equipment certification, and is based on the maximum transmission duty cycle for the device, including relay functions. Necessary installation requirements to maintain compliance for each meter are specified in the Grant. Irrespective of duty cycle, based on the practical separation distance and the need for orderly communications among several devices, even multiple units or "banks" of meters in the same location will be compliant with the public exposure limits. These conditions for compliance are required to be met before a Grant can be issued from the EA program and auditing and review of Grants is a routine function of the FCC laboratory.

With respect to interference to medical devices, which you also raise in your letter, Smart Meters typically operate under Part 15 of the FCC Rules. Those rules specify power limitations to avoid interference. The Smart Meter wireless technologies used today are not significantly different from Wi-Fi devices, cell phones and other typical consumer products. Certain medical devices may need specific precautions in many other environments; these are generally considered during FDA approval of the individual medical device.

I hope that this information will be helpful. In addition, some technical information on the subject has been developed by the Electric Power Research Institute (EPRI) and we have enclosed that information for reference.

Please know that the FCC is continually monitoring the issue of RF exposure and related health and safety concerns, both in the general terms of the continuing propriety of its regulations, and in individual cases where substantive concerns are raised.

Sincerely,

A handwritten signature in dark ink, appearing to read "Julius P. Knapp". The signature is fluid and cursive, with the first name "Julius" being the most prominent part.

Julius P. Knapp
Chief
Office of Engineering and Technology