

March 25, 2014

ED FRIEDMAN, ET AL,
Request for Commission Investigation into
Smart Meters and Smart Meter Opt-Out

EXAMINERS' REPORT

NOTE: **This Examiners' Report contains the recommendation of the Commission Staff. Although it is in the form of a draft Commission Order, it does not constitute Commission action. Parties may file comments or exceptions to the Examiners' Report on or before 4:00 P.M., Friday, April 11, 2014.**

I. SUMMARY

For the reasons discussed in this Order, we conclude that Advanced Metering Infrastructure (AMI), including the use of "smart meters," as implemented and operated by Central Maine Power Company (CMP or the Company), is a safe, reasonable, and adequate utility service as required by statute. We base our conclusion on the following findings:

- The radio frequency (RF) emissions from CMP's smart meters and other AMI components comply with duly promulgated federal safety regulations and other RF emission standards;
- No state, federal, or Canadian regulatory body or health agency that has considered the health impacts of smart meters (including Maine's Center for Disease Control and Prevention (Maine CDC)) has found smart meters to be unsafe;

- The scientific evidence presented in this proceeding is inconclusive with respect to the human health impacts from low-level RF emissions generally;
- There are no credible, peer-reviewed scientific studies in the record that demonstrate, or even purport to demonstrate, a direct human health risk specifically from smart meter RF emissions;
- The studies that have been presented in the record to demonstrate the risk to human health from exposure to RF-emitting devices are based on exposure to substantially higher levels of RF emissions than smart meters;
- The relative RF emission exposure from smart meters is significantly less than other commonly used RF-emitting electronic devices; and
- CMP's installation and operation of its smart meter system is consistent with federal and state energy policy and is a generally accepted utility practice throughout the country.

II. BACKGROUND

A. Smart Meter Proceedings

1. Authorization of AMI Investment

CMP initially proposed to implement Advanced Metering Infrastructure (AMI) in 2007. The proposal included providing solid-state meters or meter modules to all of its

customers that supported a two-way communications network and a meter data management system ("smart meters"). AMI includes the smart meters, network devices, and related systems that allow for automated and remote meter reading, detailed customer usage measurement and data storage, and communications to and from customer meters. AMI systems provide potential operational savings (e.g., lower storm restoration costs) and a platform for programs that allow customers to lower their energy costs through more accurate and timely information and pricing programs that better reflect the hourly and seasonal differences in electricity costs (e.g., time-of-use rates).

Concurrent with the Commission's consideration of CMP's AMI proposal, Congress enacted the American Recovery and Reinvestment Act of 2009 (ARRA). Pub. L. No. 111-5, 123 Stat. 115 (2009). The ARRA included a provision whereby electric utilities could become eligible for grants of matching funds from the U.S. Department of Energy (DOE) for up to 50% of the cost of a qualifying Smart Grid program. *Id.* § 405; 123 Stat. 115, 143. CMP applied for a grant and, in October of 2009, received notice of a grant award of \$95.9 million.

On July 28, 2009, the Commission gave initial approval to CMP's AMI project. *Central Maine Power Company, Request for Alternative Rate Plan*, Docket No. 2007-00215(II), Order Approving Installation of AMI Technology (July 28, 2009). In that Order, the Commission stated that AMI:

[is] an important technology that will ultimately reduce utility operational costs, improve customer service and provide customers with necessary tools to use electricity more efficiently and lower their electricity bills, for example, by reducing or shifting usage during high cost periods in response to market price signals. In particular, AMI and associated systems are necessary to provide customers with the option of obtaining rates that are time-differentiated to more closely reflect the actual power costs through the day.

Id. at 2.

The Commission subsequently granted final approval for the installation of CMP's AMI project on February 25, 2010. *Central Maine Power Company, Request for Alternative Rate Plan*, Docket No. 2007-00215(II), Order Approving Installation of AMI Technology (Feb. 25, 2010).

2. Opt-Out Investigation

On January 7, 2011, the Commission initiated a proceeding to consider whether CMP should provide customers with the option to opt-out of the installation of a smart meter on their premises. *Elisa Boxer-Cook, et al., Request for Commission Investigation in Pursuing the Smart Meter Initiative*, Docket No. 2010-00345, *Teresa Swinbourne, et al., Request for Commission Investigation into Unreasonable, Insufficient and Discriminatory Decisions to Implement the use of Smart Meters to CMP Customers Disregarding Choice in Regards to Wireless Activity and Consumer's Right to Privacy Within Their Homes*, Docket No. 2010-00389, Notice of Investigation (Jan. 7, 2010). The Investigation was initiated pursuant to 35-A M.R.S. § 1302 in response to two ten-person complaints regarding the safety of CMP's smart meters, particularly with regard to the RF emissions associated with the smart meters' communication system. The Commission limited the scope of the proceeding to the issue of whether CMP's

position of not providing alternatives to the installation of a smart meter was an unreasonable, insufficient, or unjustly discriminatory utility practice.

The Commission subsequently received three other ten-person complaints regarding CMP's smart meters, and these complaints were consolidated into the investigation commenced as a result of the Boxer-Cook and Swinbourne complaints. *Suzanne A Foley-Ferguson, et al., Request for Commission Investigation Into Advanced Metering Infrastructure In Accordance with the Legislature*, Docket No. 2010-00398, *Stephen & Diane Wilkins, et al., Request for Commission Investigation Into CMP's Violation of Homeowner Rights and the Exposure of the Public Health Risk of Smart Meters*, Docket No. 2010-00400, Notice of Investigation (Feb. 18, 2011); *Julie Tupper, et al., Request for Commission Investigation to Allow CMP Customers to Retain Existing Analog Meters*; Docket No. 2011-00085, Notice of Investigation (Apr. 22, 2011) (collectively with the Boxer-Cook and Swinbourne complaints, the Opt-Out Investigation).

On May 19, 2011, the Commission issued a Part I Order and on June 22, 2011 issued a Part II Order jointly in all five Dockets cited above (collectively, the "Opt-Out Orders").¹ The Commission made no specific findings regarding the safety of CMP's smart meters but, based largely on a recognition of the desire of many customers to have a choice regarding the installation of a smart meter, ordered that CMP's provide its

¹ Pursuant to Chapter 110, § 11(C)(2), the Part I Order described the Commission's decision in the proceeding and the Part II Order provided the background, analyses, and reasoning underlying the Commission's decision.

residential or small commercial customers with two alternatives to the installation of a smart meter: (1) an electro-mechanical meter ("existing meter option"); or (2) a standard smart meter with the internal network interface card (NIC) operating in a receive-only mode ("transmitter-off option"). The Commission ordered that customers electing either "opt-out" option be assessed both an initial one-time charge and a monthly charge to cover the incremental system costs CMP would incur to provide and maintain the opt-out options.²

On July 12, 2011, Suzanne Foley-Ferguson filed a motion to requesting that the Commission reconsider the Opt-Out Orders. *Suzanne A Foley-Ferguson, et al., Request for Commission Investigation Into Advanced Metering Infrastructure In Accordance with the Legislature*, Docket No. 2010-00398, Motion to Reconsider Order (July 12, 2011). Among Ms. Foley-Ferguson's grounds for reconsideration was information reflected in a May 2011 World Health Organization (WHO)/International Agency for Research on Cancer (IARC) report that classified RF emissions generally as a possible carcinogen (WHO Report). Ms. Foley-Ferguson also cited as grounds for reconsideration the proposition that asking people to pay to protect their health from what the WHO determined to be a possible carcinogen amounted to extorting money for

² For customers that choose the existing meter option, there is a one-time charge of \$40 and a recurring monthly charge of \$12.00. For customers that choose the transmitter-off option, there is a one-time charge of \$20 and a recurring monthly charge of \$10.50. *Part I Order* at 3. Customers who are eligible for the Low Income Home Energy Assistance Program qualify for low-income assistance as follows: a customer whose income is equal to or less than 100% of the Federal Poverty Guidelines receives a 50% reduction in the initial and ongoing opt-out fees; a customer whose income is greater than 100% of the Federal Poverty Guidelines receives a 25% reduction in the initial and ongoing opt-out fees. *Part II Order* at 14.

a perceived public benefit in violation of the Hobbs Act (18 U.S.C. § 1951). Ms. Foley-Ferguson argued that the above information and the other grounds put forth in her motion should compel the Commission to reconsider its decision to authorize opt-out fees and instead "socialize" the costs among all ratepayers. On August 24, 2011, the Commission issued an order addressing each of Ms. Foley-Ferguson's concerns and denying her Motion. *Suzanne A Foley-Ferguson, et al., Request for Commission Investigation Into Advanced Metering Infrastructure In Accordance with the Legislature*, Docket No. 2010-00398, Order Denying Motion for Reconsideration (Aug. 24, 2011). Neither Ms. Foley-Ferguson nor any other party in the Opt-Out Proceeding filed an appeal of the Opt-Out Orders.

3. Friedman Complaint

On July 29, 2011, Ed Friedman and eighteen other persons filed a complaint pursuant to 35-A M.R.S. § 1302. *Ed Friedman, et al., Request for Commission Investigation into Smart Meter Opt-Out*, Docket No. 2011-00262, Ten-Person Complaint Pursuant to 35-A M.R.S.A. Section 1302 Regarding "Smart Meters" & "Smart Meter" Opt-Out as Promulgated by the Maine Public Utilities Commission (MPUC) (Jul. 29, 2011). Mr. Friedman's complaint was against CMP for charging its customers a fee to opt-out of CMP's smart meter program, and against the Commission for its Opt-Out Orders which required CMP to charge an opt-out fee. *Id.* at 1. Mr. Friedman requested that the Commission open an investigation to examine CMP's opt-out program based on new information released subsequent to the Opt-Out Orders and examine privacy and electronic trespass issues that the Mr. Friedman felt had not been satisfactorily addressed in the Opt-Out Investigation. *Id.* As relief, Mr. Friedman requested that the

Commission stay the installation of smart meters or, in the alternative, that future installations be on an "opt-in" basis, that CMP provide opt-outs at no charge to customers, that the Commission require CMP to present information regarding health, interference, and privacy concerns associated with smart meters, and that the Commission establish a toll-free hotline within the Office of the Public Advocate where consumers could place smart meter-related complaints. *Id.* Mr. Friedman also accused CMP and the Commission of extortion in violation of the Hobbs Act and raised issues regarding the health effects of smart meters, along with privacy and trespass concerns. *Id.* at 4-5.

On August 31, 2011, the Commission dismissed Mr. Friedman's complaint. *Friedman, et al.*, Docket No. 2011-00262, Order Dismissing Complaint (Aug. 31, 2011). The Commission stated that the opt-out options in the Opt-Out Orders addressed in a comprehensive way the issues raised in Mr. Friedman's complaint. *Id.* at 5. The Commission found that all of the issues raised by Mr. Friedman were raised by one or more of the parties in the Opt-Out Investigation and were considered by the Commission and resolved during that investigation or in subsequent orders on motions for reconsideration. *Id.* The Commission stated that CMP was implementing the directives contained in the Opt-Out Orders and the related orders on reconsideration; thus, CMP had taken and was in the process of taking adequate steps to remove the cause of Mr. Friedman's complaint. *Id.* Accordingly, the Commission dismissed Mr. Friedman's complaint as to CMP. *Id.* As to the portions of Mr. Friedman's complaint directed at the Commission, the Commission found that there was no statutory basis for

a complaint of this type. *Id.* Accordingly, the Commission dismissed the portions of the complaint directed at the Commission as without merit. *Id.*

Mr. Friedman subsequently filed, on September 20, 2011, a motion asking that the Commission reconsider its dismissal of his complaint. *Friedman, et al.*, Docket No. 2011-00262, Motion for Reconsideration (Sep. 20, 2011). The Commission took no action on Mr. Friedman's motion; pursuant to Commission Rules, the motion was denied by operation of law on October 11, 2011.

On October 31, 2011, Mr. Friedman filed notice of his intention to appeal the Commission's dismissal of his complaint. *Friedman, et al.*, Docket No. 2011-00262, Notice of Appeal (Oct. 31, 2011). Mr. Friedman appealed the Commission's dismissal of the portions of his complaint directed at CMP and raising health, safety, privacy, trespass, and Fourth Amendment concerns. *Id.* at 2. Mr. Friedman also appealed the Commission's dismissal of the portions of his complaint directed at the Commission itself. *Id.*

B. Law Court Decision

On July 12, 2012, after briefing and argument, the Maine Supreme Judicial Court sitting as the Law Court issued a decision on Mr. Friedman's appeal. *Friedman v. Pub. Util's Comm'n*, 2012 ME 90. The Law Court affirmed the Commission's dismissal of the portions of Mr. Friedman's complaint directed at CMP which raised privacy, trespass, and Fourth Amendment concerns. *Friedman*, ¶¶ 12. The Law Court also affirmed the Commission's dismissal of all of the portions of Mr. Friedman's complaint directed at the

Commission itself. *Id.* ¶ 13. However, the Law Court reversed the Commission's dismissal of the portions of Mr. Friedman's complaint directed at CMP that raised issues regarding the health and safety implications of smart meters and remanded those issues back to the Commission for further proceedings. *Id.* ¶ 11.

The Law Court found that, while the Commission, in the Opt-Out Investigation, considered the health and safety issues raised by Mr. Friedman in his complaint, the Commission did not "resolve" those issues. *Id.* The Law Court then found that because the Commission explicitly declined to make a determination regarding the health concerns raised in the Opt-Out Proceeding, the Commission could not then rely on the Opt-Out Proceeding as a basis for treating the concerns in Mr. Friedman's complaint as resolved.³ *Id.*

III. INVESTIGATION ON REMAND

Pursuant to the Law Court remand, on July 24, 2012, the Commission opened an investigation into "the health and safety issue related to CMP's installation of smart

³ The Law Court also found that because the Commission had not made a finding on the safety of smart meters, the Commission was not in a position to conclude that the opt-out fee was "not unreasonable or unjustly discriminatory." Because we make the finding today that smart meters are a safe, reasonable, and adequate utility service pursuant to 35-A M.R.S. § 101, our conclusion in the June 22, 2011 Part II Order in the Opt-Out Proceeding that the fees associated with opting-out are reasonable and not unjustly discriminatory is supported by the necessary finding regarding safety as specified by the Law Court.

meter technology."⁴ *Friedman, et al.*, Docket No. 2011-00262, Notice of Investigation (July 24, 2012) (Notice). In the Notice, the Commission stated that it would conduct the investigation in accordance with "the general purpose of Maine's utility regulatory system," as described in 35-A M.R.S. § 101, which states: "[t]he basic purpose of this regulatory system is to ensure safe, reasonable and adequate service...." *Notice* at 1.

The Commission further clarified the scope of this proceeding after being presented with a motion by CMP to limit the investigation to a determination of whether CMP's smart meters complied with current Federal Communication Commission (FCC) RF emission standards. The Commission declined to find, as was suggested by CMP, that it was preempted from making independent findings regarding RF emissions, and stated that the applicability of the FCC standards to this investigation "is a matter that should be further explored through evidence and argument during the proceeding." *Friedman, et al.*, Docket No. 2011-00262, Order Denying Motion for Order on Scope of Proceeding at 2 (Oct. 10, 2012).

⁴ On August 7, 2012, the Commission received a complaint signed by Deborah Oliver and twenty-three other persons against CMP. *Deborah Oliver, et al., Request for Commission Investigation into Central Maine Power Company and Smart Meters*, Docket No. 2012-00412, "Ten-Person" Complaint Pursuant to 35-A M.R.S.A. Section 1302 (Aug 7, 2012) (Ms. Oliver's complaint is dated August 6, 2012, but was filed at the Commission on August 7, 2012). Ms. Oliver requested that, in response to the July 12, 2012 Law Court decision, the Commission initiate an investigation, pursuant to 35-A M.R.S. § 1302, into health and safety concerns associated with CMP's smart meters. *Id.* at 2. Because the issues raised in Ms. Oliver's complaint are identical to issues raised in Mr. Friedman's complaint, the Commission consolidated Ms. Oliver's complaint into this proceeding. *Deborah Oliver, et al.*, Docket No. 2012-00412, Notice of Investigation and Consolidation (Sep. 26, 2012).

A. Parties

The Commission's July 24, 2012 Notice of Investigation designated CMP as a party in this proceeding and provided interested persons with an opportunity to intervene and become full parties. *Notice* at 1-2. On August 10, 2012, the Hearing Examiners issued a procedural order stating that Mr. Friedman, as the lead complainant, is a party to the proceeding pursuant to Chapter 110, § 105(m).⁵ *Friedman, et al.*, Docket No. 2011-00262, Procedural Order at 1 (Aug. 10, 2012). Further, the Hearing Examiners granted the following petitions to intervene:⁶

- Office of the Public Advocate (OPA)
- Deborah Oliver
- Diane Wilkins
- Rep. Andrea Boland
- Alan Stone
- Paulette Beaudoin
- Suzanne Foley-Ferguson
- International Brotherhood of Electrical Workers Local 1873
- Autumn Brook
- Jane Edwards
- Elery Keene
- Averyl Hill
- David Fournier
- Mary Fournier⁷
- Theodore and Cornelia Tibbals
- Mary Hankins
- Elisa Boxer

⁵ Chapter 110 of the Commission's Rules was recently revised and updated. Chapter 110, § 105(m) is now Chapter 110, § 2(K). Further, pursuant to Chapter 110, § 2(L), the lead complainant is designated as the agent for all other signatories to a complaint filed under 35-A M.R.S. § 1302.

⁶ None of the signatories to Mr. Friedman's complaint filed petitions to intervene in this proceeding.

⁷ Mary Fournier's petition to intervene was granted over CMP's objection.

- Jack and Deborah Heffernan
- Jennifer Lunden
- Citizens for Health
- John Evrard
- Laurie Wolfrum
- Julie Tupper

Id.

B. Public Comments

Throughout the course of this proceeding, the Commission has received in excess of forty comments from members of the public. All public comments are available in the Commission's Case Management System (CMS) which may be accessed via the Commission's website at www.maine.gov/mpuc. The Commission also received extensive public comments in the Opt-Out Proceeding (Docket No. 2010-00345).

C. Evidence and Discovery

On September 19, 2012, in support of CMP's assertion that its smart meters are safe, the Company submitted the pre-filed direct joint testimony of Dr. Yakov Shkolnikov, Ph.D. and Dr. William H. Bailey, Ph.D. (Exponent Testimony). CMP also submitted, as Exhibit B to the Exponent Testimony, an RF monitoring field study, "Measurement Validation of Exposure Predications from Central Maine Power Smart Meter Network" conducted by Dr. Shkolnikov. (Exponent Study). As another exhibit to the Exponent Testimony, CMP included the joint testimony of Dr. Linda S. Erreich, Ph.D., Dr. Shkolnikov, and Dr. Bailey that was submitted on November 16, 2010 in the Opt-Out Investigation.

On February 1, 2013, Mr. Friedman submitted pre-filed testimony from Girish Kumar, Ph.D.; David O. Carpenter, M.D.; Richard Conrad, Ph.D.; Dariusz Leszczynski, Ph.D.; De-Kun Li, M.D., Ph.D., MPH; Lennart Hardell, M.D., Ph.D.; Jerry L. Phillips, Ph.D.; Lloyd Morgan, B.S. Electrical Engineering; William J Rea, M.D.; and Richard Conrad, Ph.D. Mr. Friedman also submitted lay testimony from multiple witnesses. The lay witnesses testified primarily on their perceived sensitivity to RF emissions and the associated health impacts the witnesses believe to be caused by smart meters.

Also on February 1, 2013, the OPA filed a Smart Meter RF Testing Report conducted by True North Associates and C2 Systems, and Citizens for Health submitted the pre-filed testimony of Timothy Schoechle, Ph.D.

On April 17, 2014, CMP filed the rebuttal testimony Drs. Shkolnikov and Bailey, generally refuting the testimony of Mr. Friedman's witnesses.

The parties and Staff conducted extensive discovery throughout the proceeding, including multiple rounds of data requests and several technical conferences. Moreover, during the proceeding, the Hearing Examiners admitted over one hundred peer-reviewed scientific studies into the evidentiary record. The Commission also admitted into the evidentiary record, or took administrative notice of, several other documents related to smart meters prepared by and for other jurisdictions both in the United States and abroad, including reports from the Health Council of the Netherlands, the Vermont Department of Health, the Public Utilities Commission of Texas, the

California Council on Science and Technology, the Electric Power Research Institute, the FCC, the Lawrence Berkeley National Laboratory, the Michigan Public Service Commission, the Federal Energy Regulatory Commission, and the Institute of Electrical and Electronics Engineers.⁸

D. Hearings and Post-Hearing Process

On August 7, 2013, the Commission held a public witness hearing at the University of Maine at Augusta. Additionally, public witnesses who were unable to attend the public witness hearing were allowed to submit written testimony provided that the testimony was submitted in affidavit form under oath. Multiple witnesses who testified at the public witness hearing submitted sworn testimony and several public witnesses put forward scientific studies for admission into the record of this proceeding as addenda to their sworn oral testimony.

The Commission held a hearing in this matter on October 30, 2013. Mr. Friedman's witness Dr. Lennart Hardell and CMP's witness Laney Brown were available for examination at the hearing.

On December 13, 2013, CMP, Mr. Friedman, Ms. Wilkins, Ms. Foley-Ferguson, and the OPA filed post hearing briefs. These parties, with the exception of Ms. Foley-Ferguson, also filed reply briefs on January 24, 2014.

⁸ A list of the studies and reports admitted into the evidentiary record of this proceeding is attached to this Order as Appendix A.

IV. CMP SMART METER SYSTEM

CMP's AMI system communicates and transmits metering data using a "mesh" network made up of individual customer smart meters and other devices installed throughout CMP's service territory. *Boxer Cook, et al.*, Docket No. 2010-00345, Part II Order at 2. A radio device in the smart meters communicates with other smart meters and network devices ("repeaters") within a Neighborhood Area Network (NAN). *Id.* The NANs link to the Wide Area Network (WAN) through network devices referred to as "Extender Bridges" or "Collectors." *Id.* The WAN is a high-capacity wireless communications network covering CMP's entire service area that moves information to and from CMP's Head End System (HES) using "extenders" and "gateway devices." *Id.* The HES is the "controller" for the AMI system, and coordinates information flows between CMP customers and CMP's Meter Data Management System. *Id.* at 2-3. The smart meters and other devices transmit customer usage and other data via RF signals between and among various points in the network. *Id.* at 3.

CMP's smart meters and other NAN devices communicate via an internal radio that transmits and receives radio signals at a frequency of approximately 2.4 GHz (2.4 billion cycles per second). *Boxer-Cook, et al.*, Docket No. 2010-00345, Data Request ODR-01-21. The smart meters and other NAN devices each have a single antenna and operate at an equivalent isotropically radiated power (EIRP) of between 1.6 - 2.5 watts.⁹

⁹ The EIRP of a device is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna. *FCC, Office of Engineering and Technology*, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" OET Bulletin 65, Edition 97-01 at 2 (Aug. 1997) (OET Bulletin 65)

Friedman, et al., Docket No. 2011-00262, Data Request DW-01-10 Attch. 1. WAN devices each have multiple antennas and communicate at a frequency of approximately 5.8GHz and an EIRP of between 4 watts and 63 watts.¹⁰ *Id.* WAN devices are typically mounted on pole-tops, towers, lighting structures, and occasionally on other structures such as windmills. *Friedman, et al.*, Docket 2011-00262, Data Requests DW-01-32, DW-01-30, DW-01-70. Gateway devices transmit data approximately eight times per day and poll the extender bridges for data, on average, eight times per day. *Friedman, et al.*, Docket 2011-00262, Data Request DW-01-33.

Other than for software updates and other occasional system communications, CMP's smart meters are expected to each generate one, 4.26 millisecond "stay alive" beat signal per hour to let the network know the smart meter is still functioning, and then generate a ten beat signal of approximately 42.6 milliseconds once per day containing energy usage information. *Exponent Study* at 5-6. However, because CMP's system is configured as a "mesh network," in addition to its own information, a smart meter may also be transmitting information from other smart meters. *Exponent Study* at 4. The number of "descendant" smart meters that a given smart meter has determines the total duration of time that the smart meter will be transmitting each day. Ninety-nine percent of CMP's smart meters have sixty or fewer descendants.¹¹ *Exponent Study* at 9-11.

¹⁰ 5.8 GHz is a frequency also used by many Wi-Fi routers.

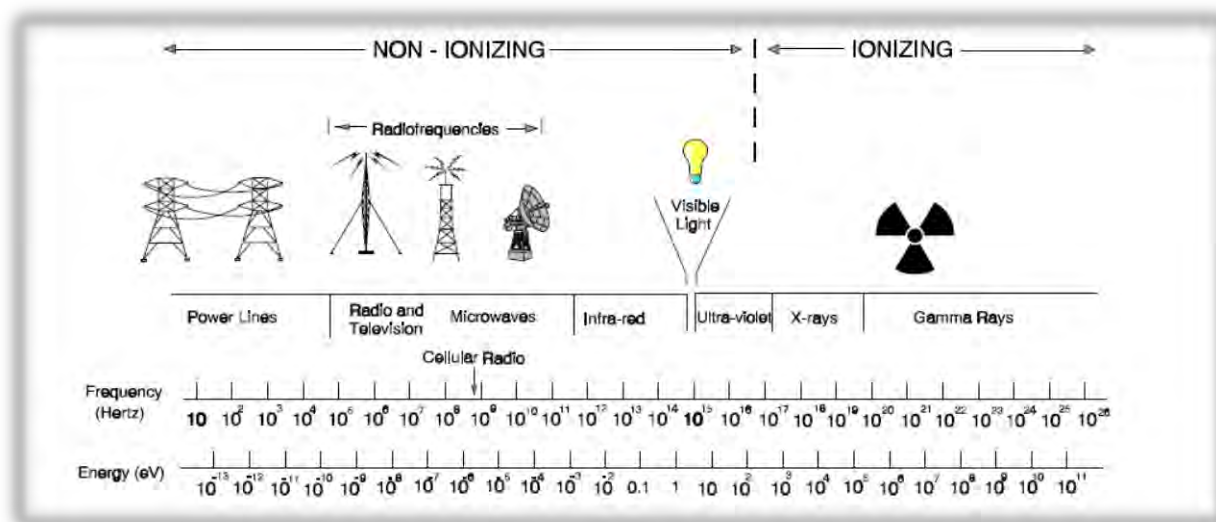
¹¹ This is based on data collected by Trilliant, Inc., the provider of CMP's smart meters. Trilliant collected actual signal data from 1,100 randomly selected smart meters over a 13-day period and stratified the meters based on the number of beat signals transmitted.

With sixty descendants, a smart meter would transmit "stay alive" signals each day for approximately 6.24 seconds (61 x 4.26 milliseconds x 24 hours), and energy usage signals each day for approximately 2.6 seconds (61 x 42.6 milliseconds) for a total signal duration of approximately 8.8 seconds per day. The vast majority of CMP's smart meters transmit for much shorter periods each day, and the average smart meter on CMP's system transmits for a total of approximately 4.4 seconds per day. *Boxer-Cook et al.*, Docket No. 2010-00345, Data Request ODR-01-29. For those meters that are in the highest one-percentile in terms of number of daily signals transmitted, *i.e.*, meters that have *more* than sixty descendants, testing demonstrated that the meters transmitted an average of approximately 35,000 signals per day. *Friedman, et al.*, Docket No. 2011-00262, Data Request DW 01-97. At 4.26 milliseconds per signal, this is approximately 149 seconds, or 2.5 minutes per day. According to CMP, longer transmissions for software and firmware updates are expected to occur twice each year. *Exponent Testimony* at 4. However, due to programming and other constraints, in no event can a smart meter have more than 4,998 descendants or have a "duty cycle" (the percentage of time the smart meter can transmit) of more than 10%. *Exponent Study* at 11; *Exponent Testimony* at 4. Therefore, a smart meter cannot be sending an RF signal for more than 3 minutes out of any thirty minute period.

V. NATURE AND EFFECTS OF RF EMISSIONS; EXPOSURE LEVELS

According to the FCC, electromagnetic radiation "consists of waves of electric and magnetic energy moving together (*i.e.*, radiating) through space at the speed of light." *FCC, Office of Engineering and Technology*, "Frequently asked questions about the safety of radiofrequency (RF) and microwave emissions from transmitters and

facilities regulated by the FCC," available at <http://transition.fcc.gov/oet/rfsafety/rf-faqs.html#Q1>. Signals within the electromagnetic spectrum are often referred to as electromagnetic frequencies or "EMF."¹² The higher the frequency of an electromagnetic wave, the greater the energy associated with each photon of that wave. Rays with enough energy to strip electrons from atoms and molecules are referred to as "ionizing" radiation. X-rays and gamma-rays are examples of ionizing radiation and are known to cause biologic damage. Rays that do not contain sufficient energy to cause ionizing effects are referred to as "non-ionizing" radiation. RF signals fall within the non-ionizing portion of the electromagnetic spectrum. Many other common electronic devices, including cell phones, computers, cordless phones, and Wi-Fi routers, also operate at frequencies and power levels similar to those used by CMP's smart meters.



¹² A concern sometimes raised in the context of electric transmission and distribution is the EMF associated with power lines. However, unlike the EMF from smart meters which occur in what is generally considered the RF portion of the electromagnetic spectrum, the EMF associated with electricity on power lines occurs at a very low frequency (60 Hz, or 60 cycles per second, in the United States) and has substantially different characteristics as a result. Such low frequency EMF is often referred to as "extra-low frequency" (ELF) EMF.

FCC, Office of Engineering and Technology, OET Bulletin 56, "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields" at 3 (Aug. 1999) (OET Bulletin 56).

Although RF signals are non-ionizing, at sufficient strength they can cause tissue heating.¹³ The biological effects resulting from tissue heating are often referred to as "thermal" effects. Thermal effects are a known mechanism for biological damage. Many of the standards and guidelines developed by various organizations and countries are based on an assumption that potentially harmful biological effects occur at a measure of the rate at which the body absorbs RF energy (known as the "specific absorption rate" or "SAR") of 4 W/kg, as averaged over the whole-body. *FCC, OET Bulletin 56 at 11.* Different safety factors are applied to this value to obtain each agency's limits depending upon the frequency used by the device (the most restrictive limits occur in the frequency range of 30-300 MHz where whole-body absorption of RF energy by human beings is most efficient); whether the exposure is related to the general public ("uncontrolled") exposure or for occupational ("controlled") exposure; and the expected proximity to the human body of the device when in use.¹⁴

¹³ At frequencies below 3 kHz, RF signals can also cause induced voltage gradients and/or electric currents in the body. However, CMP's meters operate at frequencies of approximately 2.5 GHz.

¹⁴ Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment, have been made fully aware of the potential for exposure, and can exercise control over their exposure. General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure.

Other, *i.e.*, non-thermal, biological effects from RF emissions have also been described, although a causal relationship to RF exposure has not been established. See Section IX(E), below.

VI. RF EMISSION STANDARDS

The following table is a summary of some of the standards in place or proposed by governmental agencies and groups that are relevant to the frequencies used by CMP's smart meters:¹⁵

Exposure Limits for the General Public (as of April 2011)	
MPE (mW/cm²)	SAR (W/kg)
<p style="text-align: center;"><u>1 mW/cm²</u></p> <ul style="list-style-type: none"> • United States (FCC) (30 minute avg) • Canada (6 minute average) • Cyprus • Czech Republic • Estonia • Finland • France • Germany • Hungary • Ireland • Luxembourg • Malta • Portugal • Romania • Slovakia • Spain • Australia • Austria • Sweden • United Kingdom • Recommendation Council of the European Union • International Commission on Non-Ionizing Radiation (ICNIRC) (6 minute average) 	<ul style="list-style-type: none"> • United States (FCC): 0.08 W/kg (whole body); 1.6 W/kg (partial body) • Health Canada: 0.4 W/kg (whole body) 8 W/kg (over 1g of body part) 20 W/kg (over any 10g of body part) • International Commission on Non-Ionizing Radiation (ICNIRC) (6 minute average) .08 W/kg (whole body) 2 W/kg (head and trunk) 4 W/kg (limbs)
<p style="text-align: center;"><u>0.1 mW/cm²</u></p> <ul style="list-style-type: none"> • Slovenia (certain instances) 	
<p style="text-align: center;"><u>0.06 – 0.07 mW/cm²</u></p> <ul style="list-style-type: none"> • Greece 	
<p style="text-align: center;"><u>0.01 mW/cm²</u></p> <ul style="list-style-type: none"> • Bulgaria • Italy (certain instances) • Lithuania • Poland • Russia 	

¹⁵ All limits have been converted to mW/cm² and W/kg for comparison purposes.

<p style="text-align: center;"><u>0.001 mW/cm²</u></p> <ul style="list-style-type: none"> • ECOLOG-Institut¹⁶ 	
<p style="text-align: center;"><u>Other Standards</u></p> <ul style="list-style-type: none"> • Seletun Statement: 0.00017 mW/cm² • BioInitiative (2012)¹⁶: 0.0000003 mW/cm² – 0.0000006 mW/cm² 	

Friedman, et al., Docket No. 2011-00262, Data Request DW-01-065; *Health Canada*, Safety Code 6.

A. Federal Communications Commission

The FCC is charged with regulating communications by radio, television, wire, satellite and cable within the United States and its territories. The development and enforcement of the federally-mandated RF exposure standard is part of the FCC's responsibilities under the National Environmental Policy Act of 1969 (42 U.S.C. § 4321 *et seq.*) (NEPA). NEPA establishes the basis for evaluating the effect of emissions from FCC-regulated transmitters on the quality of the human environment and identifying situations where adverse health impacts may occur. The FCC is responsible for providing licenses for RF emissions and its regulations cover matters relating to public health and safety and have been designed to ensure that the levels of RF emissions that consumers are exposed to are not harmful.

¹⁶ In his reply brief, Mr. Friedman reports that the ECOLOG Institut recommended standard is 0.1 W/m², or 0.01 mW/cm². *Friedman Reply Brief* at 12, 16. Mr. Friedman further states that the BioInitiative Report recommended 0.01 mW/cm². *Friedman Reply Brief* at 16. These values appear to be in error. The ECOLOG Institut report recommends a limit of 0.01 W/m² or 0.001 mW/cm². *ECOLOG-Institut*, "Mobile Telecommunications and Health, Review of the current scientific research in view of precautionary health protection" at 37 (Apr. 2000). The 2007 BioInitiative report recommended a limit of 0.1 µW/cm² (or 0.0001 mW/cm²). However, in 2012, the BioInitiative group issued a revised recommendation of 0.3 nW/cm² - 0.6 nW/cm² (or 0.0000003 mW/cm² - 0.0000006 mW/cm²). *BioInitiative 2012*, "Conclusions," available at <http://www.bioinitiative.org/conclusions/>.

On August 1, 1996, after reviewing several recommendations, the FCC adopted the National Council on Radiation Protection and Measurements (NCRP's) recommended Maximum Permissible Exposure (MPE) limits for field strength and power density (power in watts per unit area). FCC, OET Bulletin 65. Before the FCC published its rule, it received endorsements from the U.S. Environmental Protection Agency (EPA), from the FDA, and from the U.S. Occupational Safety and Health Administration. FCC, OET Bulletin 56. The EPA reaffirmed its opinion in 1999 and 2002. *Public Utility Commission of Texas, Infrastructure and reliability Division, Staff Report, "Health and RF EMF from Advanced Meters: An Overview of recent Investigations and Analyses,"* Project No. 40190 at 33 (Dec. 2012) (PUC TX Report).

The FCC's MPE limits apply to FCC licensees and also to the use of RF emitting equipment used in license free bands. Devices such as smart meters operate in the unlicensed spectrum for which the FCC has pre-defined rules for both the hardware and the deployment methods of the transmitting radio to ensure compliance with MPE limits. Because of this, smart meters must be tested and evaluated in certified laboratories prior to sale to utility companies to ensure their compliance with the FCC's requirements, including RF exposure limits. Such evaluations are documented in equipment certification reports provided by the manufacturer to the FCC. The applicable MPE for CMP's 2.4 GHz smart meters for members of the public is 10 watts per square meter (or its equivalent 1 milliwatt per square centimeter (mW/cm²)) averaged over 30 minutes. 47 CFR § 1.1310.

For devices, such as smart meters, which are normally used at a distance of at least 20 cm from the body, the FCC allows devices to be evaluated based on either the "specific absorption rate" (SAR) or the "maximum permissible exposure" (MPE) power density, but notes that the MPE is the normal measure of exposure.¹⁷ FCC, OET Bulletin 65 at 15. The amount of RF exposure that a person is subjected to during the signal transmission is evaluated based on the following formula:¹⁸

$$S = PG/(4\pi R^2)$$

where:

S = power density (in appropriate units, e.g., mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna

R = distance to the antenna (in appropriate units, e.g., cm)

This formula demonstrates that the strength of the smart meter's RF signal drops off exponentially with increases in the distance from the transmitter. By way of example, if the power density (S) = 0.2 mW/cm² when the distance (R) = 10 cm, multiples of the distance would change the exposure as follows:

R (cm)	S (mW/cm ²)
10	0.2
10*2 = 20	0.2/(2 ²) = 0.05
10*3 = 30	0.2/(3 ²) = 0.022
10*4 = 40	0.2/(4 ²) = 0.0125

¹⁷ For devices normally used within 20 cm of the body, the FCC requires that the exposure be evaluated with respect to the "specific absorption rate" (SAR) limit which is a measure of the rate at which the body absorbs RF energy and is usually expressed in units of watts per kilogram (W/kg). FCC, OET Bulletin 56 at 13. Devices normally used at 20 cm or more away are far enough away from the RF emitter to be located in what is commonly referred to as the "far-field" zone of the radiation source, e.g., more than several wavelengths distance from a typical RF source, and therefore can be evaluated based on their MPE power density limit measured in mW/cm².

¹⁸ FCC, OET Bulletin 65 at 19. As noted in OET Bulletin 65, this equation is generally accurate in the "far-field" of an antenna but will over-predict power density in the near field, where it could be "considered a 'worst case' or conservative prediction."

In addition, the duration of the signal is relevant to whether a device meets the FCC standard for exposure. While the FCC requires that devices like smart meters be tested for their peak, or maximum RF emission for compliance purposes, the exposure limits for the general population exposure are based on the exposure over a thirty minute average.¹⁹

Finally, we note that on March 27, 2013, the FCC released an Order on radio frequency exposure limits and policies requesting comments to determine whether its RF exposure limits and policies need to be reassessed. *FCC, ET Docket No. 13-84, FCC 13-89, Further Notice of Rulemaking and Notice of Inquiry* (Mar. 29, 2013) (Notice of Inquiry) . The Notice of Inquiry is intended to open discussion on both the continued appropriateness of the current RF exposure limits and possible policy approaches regarding RF exposure. In the notice the FCC stated:

We continue to have confidence in the current exposure limits, and note that more recent international standards have a similar basis. At the same time, given the fact that much time has passed since the Commission last sought

¹⁹ In an August 6, 2010 letter from Julius Knapp, the Chief of the FCC's Office of Engineering and Technology, to Cindy Sage, the FCC advised that it is the average power, not the peak power, of a device that is relevant for exposure evaluation:

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 time-averaged transmitter power for many of these devices, they would generally be compliant with the local [specific absorption rate] limit even if held directly against the body.

Letter from Julius Knapp to Cindy Sage (Aug. 6, 2010) (Knapp Letter).

comment on exposure limits, as a matter of good government, we wish to develop a current record by opening a new docket with this Notice of Inquiry.

Notice of Inquiry, ¶ 205.

As of March 2014, Comments and Reply Comments have been submitted by interested citizens and industry groups in the *Inquiry* docket, but no further action or schedule has been set by the FCC.

VII. RELATIVE RF EXPOSURE LEVELS FROM COMMON DEVICES

The record in this proceeding clearly demonstrates that CMP's smart meters result in RF exposure levels that are orders of magnitude below the FCC limit and other RF standards, as well as other devices in prevalent use in today's society, such as cell phones.

The Figures below summarize RF exposure levels from CMP's smart meters, other AMI network devices, and other common RF-emitting devices. The data derives from Dr. Shkolnikov's testimony and a study conducted by the Texas PUC. *PUC TX Report*. Similar exposure levels are also reported by the California Council on Science and Technology (CCST). *CCST, Final Report, "Health Impacts of Radiofrequency Exposure from Smart Meters"* (Apr. 2011) (CCST Report). (The PUC TX and the CCST Reports are discussed in Section IX(F), below).

Figure 1 below presents the information in tabular form, and Figure 2 in graphical form. Because the exposure levels vary by orders of magnitude, graphs in Figure 2 are presented using both a linear scale and logarithmic scale. In Figure 2 below, which

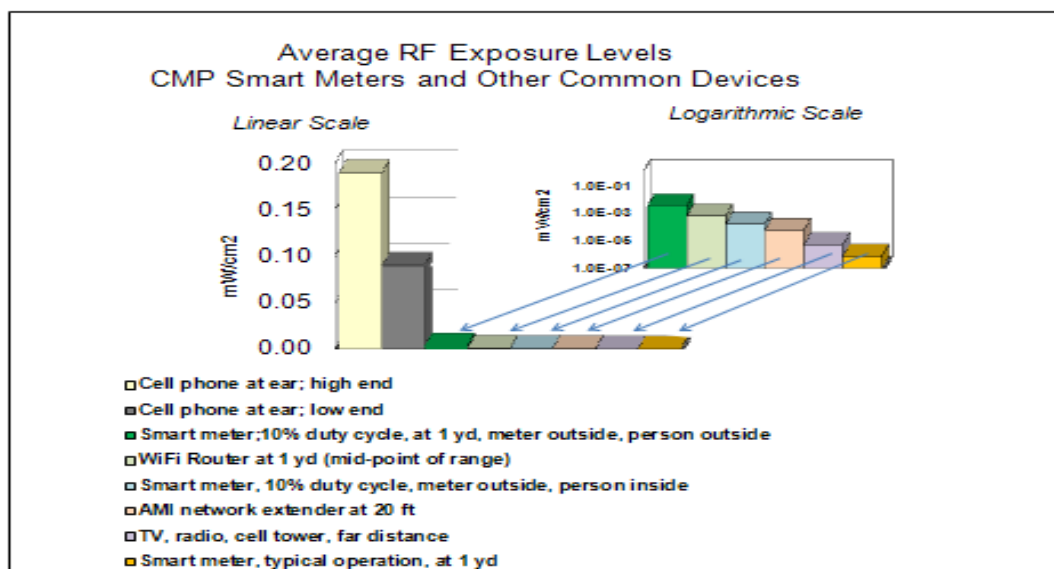
uses a linear scale from 0.0 to 0.2 mW/cm², most of the devices shown have exposure levels that are relatively so small that they appear to be zero. In the expanded portion of Figure 2, each interval on the Y-axis represents a factor of 10, and the scale is from 10⁻⁷ (one ten-millionth) to 0.1mW/cm², which allows the exposure level information to be visible on the same graph, even given the differences in orders of magnitude.

FIGURE 1²⁰

RF Exposure Levels from CMP AMI and Other Common Devices
 Source: ODR-01-29 and TX Study

Device	Location	Average Exposure (mW/cm ²)	Notes
FCC limit		1.000000	
Cell phone	At ear	0.190000	High end of range
Cell phone	At ear	0.090000	Low end of range
Smart meter @ 10% duty cycle	1 yard away, meter and person outside	0.003100	Max. operating time
WiFi router	1 yard away	0.0002 - 0.001	Constant operation
Smart meter @ 10% duty cycle	1 yard away, meter outside, person inside	0.000150	Max. operating time
AMI network device	20 feet away	0.000054	
AMI network device	60 feet away	0.000006	
TV, radio, cell towers	Typical distances away	0.000005	
Smart meter @ typical operation	1 yard away, meter outside, person inside	0.000008	

FIGURE 2



²⁰ Unless specifically noted, all of the exposure levels in Figures 2 assume that there is no absorptive or reflective material between the device and the subject of the exposure. Any such material (e.g., the meter enclosure, exterior siding, insulation, drywall, etc.) would necessarily decrease the level of exposure for a given distance from the device.

VIII. POSITIONS OF THE PARTIES

A. Central Maine Power Company

CMP's position is that it has met its burden to demonstrate that its installation of smart meters and associated infrastructure constitutes a safe, reasonable, and adequate utility service. CMP states that this proceeding has generated substantial scientific data that goes well beyond what is needed for the Commission to fulfill its statutory obligation to determine whether or not CMP's smart meter deployment is an unreasonable utility practice. CMP argues that the overwhelming consensus within the scientific community and among public health policy-makers, regulatory agencies, and judicial bodies throughout the world, is that wireless smart meter technology does not pose a threat to public health.

Moreover, CMP states that the record evidence in this proceeding demonstrates that (1) the Maine CDC does not have health concerns associated with smart meters; (2) CMP's AMI system complies with the FCC RF safety standards, and the current FCC RF emission standards for smart meters are adequate; (3) CMP's smart meters comply with international RF emissions safety standards; (4) as confirmed by actual field measurements, the level of RF emissions from smart meters is orders of magnitude below other natural and manmade sources of RF; (5) public health policy-makers, who have looked specifically at smart meters have concluded that meters do not pose a public health risk; (6) the health data on other wireless technologies, primarily cell phone data, do not suggest health risks at the level of RF emissions from smart meters; and (7) CMP's smart meters emit RF that are below the levels

recommended by Mr. Friedman's witnesses and more stringent standards for smart meters would not meaningfully reduce an individual's overall RF exposure.

B. Mr. Friedman

Mr. Friedman's position is that, during this investigation, CMP has provided no affirmative proof that its AMI system does not cause adverse health effects. Mr. Friedman emphasizes that it is CMP that has the burden to resolve doubts and uncertainties about the state of the science, the level of RF radiation emitted, or ultimately the extent of the safety risk. The burden of resolving uncertainties must fall on the party with the affirmative obligation to ensure safety, not on the individuals who are exposed to the risk. Moreover, Mr. Friedman argues that CMP has a heightened burden of proof because a person's right to "obtain safety" is paramount in that place where the person can and should best exercise the right - the privacy of their home. Mr. Friedman concludes that CMP's failure to resolve or explain the uncertainties in the science and to provide affirmative proof of safety compels a finding against CMP.

Mr. Friedman points to the testimony from nine expert witnesses he presented, some of whom have conducted extensive original research and who are purportedly among the most qualified experts in the world on the health effects of low-level RF radiation. Mr. Friedman states that the testimony confirms that low-level RF radiation creates health and safety risks to humans and that this conclusion is further supported by hundreds of scientific studies and by the sworn lay witness testimony of dozens of people who have suffered adverse health effects from exposure to RF radiation,

including smart meter radiation. According to Mr. Friedman, the risk is clear and safety is not ensured.

Mr. Friedman also argues that CMP's witness testimony, that based on field tests, CMP's smart meters are in compliance with FCC standards is unreliable. Mr. Friedman similarly argues that the field tests of the OPA witnesses are also unreliable.

C. Ms. Wilkins

Ms. Wilkins's position is that CMP's evidence fails to satisfy its burden of proof. Ms. Wilkins states that the consultants of both CMP and the OPA that measured the RF emissions are inexperienced and not qualified to test emissions from smart meters to determine FCC compliance. Moreover, Ms. Wilkins argues that compliance with the FCC's exposure guidelines will not protect from the long term, non-thermal adverse biological effects because the FCC guidelines were only designed to protect from thermal heating effects from RF exposures and do not protect people from long-term, chronic, non-thermal exposures to RF. Specifically, Ms. Wilkins states that it is peak power RF exposure levels from the smart meters and not the thirty minute, time averaged, power densities used by CMP's consultants, that measure the true impact to human tissue and, therefore, CMP's exposure testing report is not relevant to determining if the AMI system is safe.

Ms. Wilkins argues that the evidence and testimony provided in this case by Mr. Friedman's witnesses and relevant additional support from the record shows there are many undeniable cumulative, adverse biological effects which subject the persons

exposed, especially children, to an unnecessary and indefensible increased risk of serious adverse health effects. These include: cancer; DNA damage; damage to human sperm, reproduction and pregnancy; and damage to the Brain Blood Barrier.

D. Ms. Foley-Ferguson

Ms. Foley-Ferguson states that the wireless smart meter rollouts in the United States represent the largest proliferation of constant EMF ever initiated and the cumulative effects of EMF have never been determined to be "safe." Ms. Foley-Ferguson further states that, until recently, exposure to EMF emitting devices has been by "choice" not by force, and that people remain exposed even if they do not have a smart meter. Accordingly, Ms. Foley-Ferguson argues that CMP's AMI system is a forced and coerced exposure to a known environmental stressor and carcinogen by the utility.

Based on scientific studies, Ms. Foley-Ferguson argues that the Commission cannot determine that the health and safety of Maine residents are not jeopardized by the adoption of CMP's AMI system. Accordingly, Ms. Foley-Ferguson states that the Commission should recognize that there are adverse health effects from smart meter RF emissions.

E. OPA

The OPA's position is that the Commission may base a determination that the CMP smart meter network constitutes safe, reasonable, and adequate facilities and service upon a finding that the smart meter network is compliant with FCC regulations.

In addition, the OPA argues that a finding based upon a national standard would be consistent with the Legislature's requirement that smart grid deployment be consistent with applicable standards for reliability, safety, security and privacy and that takes into account the implementation of smart grid functions in other jurisdictions." 35-A M.R.S. §. 3143(3).

The OPA notes that, pursuant to FCC's rules, smart meters are tested and evaluated in certified laboratories prior to sale to utility companies to ensure their compliance with the FCC's RF exposure limits. Such evaluations are documented in equipment certification reports provided by the manufacturer to the FCC. Moreover, the OPA states that the FCC standard or similar standards for safety have been used in other jurisdictions as a basis to determine that smart meters do not pose a health risk. Finally, the OPA states that his office commissioned a study (a) to measure the maximum and average power output of a sample of smart meters and other system components of CMP's AMI system and (b) to assess whether the signal intensities from the components of the system were in compliance with the FCC regulations that prescribe limits for safe exposure of humans. The measurements taken for the OPA Study showed that even when combined with other RF signals occurring in an urban setting, the aggregate level of RF emissions was, on average, roughly 20 times lower than the FCC standards.

IX. DISCUSSION AND DECISION**A. Overview**

At the outset, we discuss the Commission's role and responsibilities in resolving the health and safety issues presented in this proceeding. The Legislature has charged the Commission with the responsibility of regulating the rates and operations of public utilities in Maine. As stated in 35-A M.R.S. § 101, the purpose of Commission regulation is as follows:

The purpose of this Title is to ensure that there is a regulatory system for public utilities in the State and for other entities subject to this Title that is consistent with the public interest and with other requirements of law.... The basic purpose of this regulatory system as it applies to public utilities subject to service regulation under this Title is to ensure safe, reasonable and adequate service, to assist in minimizing the cost of energy available to the State's consumers and to ensure that the rates of public utilities subject to rate regulation are just and reasonable to customers and public utilities.

Maine law further requires that "every public utility shall furnish safe, reasonable and adequate facilities and service." 35-A M.R.S. § 301. In addition, with respect to smart grid technology implementation, the Commission has the specific statutory obligation to ensure that utilities meet applicable standards for reliability, safety and security. 35-A M.R.S. § 3143.

It is important to emphasize, however, that the Commission is neither a health nor a scientific agency, and it is clearly not the role of the Commission to resolve the scientific debate regarding potential health impacts of RF emissions. The Law Court

specifically recognized the Commission's lack of technical expertise to conduct an independent investigation of these issues:

Although the Commission may not have the technical expertise necessary to conduct an independent investigation on this issue, the Commission's orders appear to recognize that other state and federal agencies do. As an administrative body authorized to conduct hearings and engage in fact-finding, the Commission is not precluded from considering the findings and conclusions of other state and federal agencies.

Friedman et al., 2012 ME 90, ¶ 11 n. 7.

Therefore, our role is to resolve the question as to whether CMP's installation and operation of wireless smart meters and the associated mesh network constitutes a safe, reasonable and adequate utility service. In making this determination, we must review and give weight to all of the scientific and health information contained in the record before us. However, we must also review the matter in a broader context that includes an examination of the compliance of CMP's smart meters with all applicable federal or state regulations; determinations and conclusions by other state, federal, and international agencies on RF emissions generally and smart meters specifically; promotion of State and federal energy policies; the pervasiveness of RF emitting devices in the environment; and consistency with generally accepted utility practice.

Finally, we emphasize that the question of safety in this context is a public policy determination and not a scientific conclusion. The responsibility for determining "safety"

lies with government agencies, not individual scientists.²¹ The Legislature in its charge to the Commission to ensure "safe, reasonable and adequate" service could not have intended that the Commission ensure absolute safety with zero risk of harm; this is particularly true with regard to electricity which, by its very nature, has inherent safety risks. Safety is a relative and contextual term, determined not only by an understanding of the scientific evidence and potential risks, but also by a policy judgment as to the acceptability of those risks given the benefits of the technology.

B. Legal Standards and Burden of Proof

As stated above, the question before the Commission in this proceeding is whether the installation and operation of CMP's smart meters constitutes safe, reasonable, and adequate utility facilities and service. It is CMP that has the burden to demonstrate compliance with this statutory directive. 35-A M.R.S. § 301. CMP must make this showing by a preponderance of the evidence. *Re: Request for Commission Investigation Into the Reduction of Services to the Residents of Jackman and Surrounding Communities*, Docket No. 1994-00462 (Sep. 1, 1995) (utility, in ten-person complaints, has the burden to prove by preponderance of evidence that its service is safe, reasonable and adequate).

Mr. Friedman argues that that the Commission should employ a heightened level of scrutiny in this proceeding because the issue involves the safety of Maine residents and, therefore, CMP must provide enough reliable scientific evidence to conclude with a

²¹ In this respect, we agree with the position of CMP's witnesses as expressed in their Rebuttal Testimony at 152.

high degree of certainty that there is no risk of harm and that safety is ensured.

Friedman Brief at 7-8, 72. We agree that the issues before the Commission in this proceeding are of substantial importance. However, there is no basis in law for a heightened standard of proof and the utility's burden in this proceeding, as stated above, is to demonstrate by the preponderance of the evidence that the installation and operations of its smart meters constitute a safe, reasonable, and adequate utility practice. It is simply impossible for CMP or anyone else to "prove" with the degree of certainty apparently advocated by Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson that low-level RF emissions have no potential to cause harm under all circumstances. Science simply cannot prove a negative. Such a requirement or standard of proof logically would lead directly to prohibition of smart meter deployment with the implication that all RF emitting devices should be banned and could raise difficult questions with regard to other utility facilities and practices, for example, the operation of power lines and natural gas pipelines cannot be said have zero risk of harm to the public.²²

C. Compliance with RF Emission Standards

The evidence in this proceeding demonstrates that CMP's AMI network is in compliance with the FCC, Canadian, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) as well as other governmental standards. As discussed in Section VI above, the FCC has the direct federal authority to promulgate rules regarding emissions and safety associated with RF devices and therefore compliance

²² Several of Mr. Friedman's witness would not support an outright ban of RF emitting devices. See Section IX(J), below.

with FCC standards is of utmost importance in our review of the safety of CMP's smart meters.

1. FCC Smart Meter Certification

As discussed above, smart meters are required to be tested and evaluated in certified laboratories prior to sale to utility companies to ensure their compliance with the FCC's RF exposure limits. No party has contested the fact that, prior to CMP acquiring the Trilliant's Smart Meter and Mesh system, the safety of that equipment was established through the FCC application process by Trilliant for the FCC Grant of Equipment Authorization. CMP has deployed only equipment that has been certified by the FCC for compliance with the appropriate safety levels.

For CMP's smart meters, the FCC compliance testing showed peak signal strength of between 0.41 mW/cm^2 and 0.45 mW/cm^2 at a distance of 20 cm,²³ well below the FCC limit of 1.0 mW/cm^2 even without taking the duty cycle of the meters into account. At a distance of 3 feet, the peak signal would be expected to have degraded to approximately 0.02 mW/cm^2 and at the average smart meter duty cycle, even if it all occurred in the same thirty minute period, the thirty-minute average exposure at three feet from the smart meter would be reduced to approximately 0.00005 mW/cm^2 ,

²³ Landis+Gyr FOCUS AX = 0.411842 mW/cm^2 ; GE I-210 = 0.445379 mW/cm^2 (ODR-03-05, pages 8 and 49, respectively).

approximately 20,000 times below the FCC standard. Even at the maximum duty cycle of 10%, the exposure would be approximately 500 times below the FCC standard.²⁴

2. Field Tests of CMP Smart Meters

For purposes of this proceeding, both CMP and the OPA undertook and submitted the results of field measurement studies of the RF emissions of CMP's smart meter system as a means to confirm compliance with FCC standards. The results of both studies support the conclusion that the exposure levels from CMP's smart meters and related equipment are well below the FCC MPE limit.

CMP's study was undertaken by Exponent to validate its previously calculated RF exposure levels. The Exponent study involved measurements at three smart meter sites selected from a sample of 1,100 meters from which signaling frequency (*i.e.*, number of signals) data had been collected. Based on the signaling frequency data, Exponent selected three sites with smart meters considered to communicate at the low, typical and high points of the signaling frequency range. Exponent's measurements were all performed outside the residences at a distance of 3 feet from the smart meter. None of Exponent's measurements (recorded on a running, 30-minute average) exceeded the lower detection limit of its equipment of 0.00017 mW/cm². It should also

²⁴ $S_{\text{at } 20\text{cm}} = 0.411842$, $S_{\text{at } 36\text{in}} = 0.411842 / (36\text{in} * 2.54\text{cm/in} / 20\text{cm})^2 = 0.0197 \text{ mW/cm}^2$;
 $S_{\text{at } 20\text{cm}} = 0.445379$, $S_{\text{at } 36\text{in}} = 0.445379 / (36\text{in} * 2.54\text{cm/in} / 20\text{cm})^2 = 0.0213 \text{ mW/cm}^2$;
Average duty cycle at 4.4 seconds over 30 minutes = $4 / (30\text{min} * 60\text{sec}) = 0.24\%$. Thirty minute Avg S (at 0.24% duty cycle) = between $0.0197 * 0.0024 = 0.000048$ and $0.0213 * 0.0024 = 0.000051$; Thirty minute Avg S (at 10% duty cycle) = between $0.0197 * 0.1 = 0.00197 \text{ mW/cm}^2$ and $0.0213 * 0.1 = 0.00213$.

be noted, that these measurements would have included all RF sources (not just the subject meter) within the detection band of the equipment.

The OPA's study (conducted by True North Associates and C2 Systems) involved three smart meter sites, plus two repeater sites and one extender bridge site. Two of the three smart meter sites it chose were in densely populated parts of Portland, and the third was at a single-family home in a more rural area. Sites 1 and 2 were at three and nine smart meter banks, respectively. The two repeater sites were in densely populated parts of Portland and each had over 5,000 smart meters within a half mile distance. The extender bridge was in a commercial/residential part of Westbrook and listed as supporting over 2,000 smart meters. Unlike Exponent's configuration, the equipment measured both the maximum as well as the average exposures, based on the 6 minute average for occupational exposure. For the meter survey, the OPA's study measured two readings below the limit of reliability identified for the equipment it was using (at Sites 2 and 3) and one reading above that value (Site 1). The Site 1 reading was reported as 13.4% of the MPE for the general population. The OPA's study of the extender bridge and repeaters were reported to be less than 1% of the FCC general public MPE.

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson argue that these studies do not provide any validation of FCC compliance, stating that the studies were fatally flawed for several reasons including: (1) the smart meters tested were not chosen from a statistically valid sample; (2) there is no proof that the smart meters were actually

transmitting during the measurement periods; (3) the OPA study truncated measurement during the active period and may not actually have captured the most active part of that period; (3) the "worst case" smart meter configuration was not measured; (4) the measurement equipment was not sensitive enough to detect the smart meter RF; (5) peak exposure was not measured; and (6) the tests do not address non-thermal exposures.

We acknowledge that the Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson raise issues with respect to the degree of certainty provided by the studies. However, because the smart meters and related equipment were tested and determined to be compliant with FCC limits prior to being acquired and installed by CMP, the field studies, by themselves, are not determinative of FCC compliance. Notwithstanding their alleged flaws, we conclude that these field studies are informative in that they provide support for the conclusion that the RF emissions from CMP's smart meters are far below the FCC limits as the measurements indicate.

3. Other Field Studies

In addition to the CMP and OPA field studies, the record also includes a field study of smart meter RF emissions performed by the Electric Power Research Institute (EPRI) in 2010 and by the Vermont Department of Health in 2012. Both studies concluded that RF emissions from smart meters are well below regulatory limits set by the FCC.

The EPRI study was conducted on a cluster of 10 smart meters located within a "meter farm" containing approximately 7,000 smart meters over 20 acres. The smart meters were operated continuously (100% duty cycle) for purposes of the study and measurements were taken both in front and behind the rack over a 4 day period. The EPRI study reported that even under continuous operation, at 1 foot in front of the smart meter bank, the maximum exposure was only 10% of the FCC limit and behind the smart meter bank, even at 8 inches, exposure was less than 1% of the FCC limit. *Electric Power Research Institute, "Radio-Frequency Exposure Levels from Smart Meters," November 2010.*

Although there are a number of differences between the meters used in the EPRI study and those used by CMP, the results are still useful to consider. The EPRI study meters operate at a different frequency than CMP's meters (the EPRI study used meters that operate from 902 to 928 MHz -- CMP's meters operate at 2.45 GHz) and a different power level than CMP's meters (the EPRI study meters operate at 0.25 W – CMP's operate at approximately 1W). However, while the power of the EPRI study meters was roughly 25% of the power of CMP's meters, in the study, the EPRI meters were operated continuously. CMP's meters are limited to operating no more than 10% of the time. In addition, because the EPRI study meters operate at a different frequency, there is a different FCC limit that applies. The FCC limit for the EPRI study meters is the meter frequency divided by 1,500 or 0.60 – 0.62 mW/cm² (approximately 40% below the limit applicable to CMP's meters).

The Vermont Department of Health conducted a study of smart meters installed by Green Mountain Power. *Vermont Department of Health, "Radio Frequency Radiation and Health: Smart Meters"* (Feb. 10, 2012) (VDH Report). The meters examined were similar in power and frequency to the meters in the EPRI study. The VDH Report also found the exposure from the smart meters was well below the FCC limits (0.05 mW/cm^2 – 0.14 mW/cm^2 at 12 inches from the meters) and that RF levels dropped to near background levels at a testing distance of three feet or more from the meter. The VDH Report also examined RF exposure inside the residence and found that no level above the background level was detected during meter operation. Finally, the VDH Report examined the levels of RF during a remote connection and remote disconnection of the smart meter and found that the RF levels detected during this communication was similar to the levels detected during other normal operation.

4. Meter Banks

In response to particular concerns regarding banks of several smart meters, given the relative short duration of smart meter transmissions and necessary physical separation of meters, the FCC has indicated that even banks of units will be compliant with the FCC public exposure limits. As noted by the FCC:

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.

Knapp Letter.

D. Adequacy of FCC Standards

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson argue that the FCC's standards are not adequate on two basic grounds: 1) the FCC standards are based on average not peak exposures; and 2) the FCC standards are not designed to protect against non-thermal effects of RF emissions.

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson are correct that the FCC does not set a peak limit for exposure. The exposure limits are set based on the average exposure over a certain time (6 minutes for occupational exposure and 30 minutes for the general population). However, to obtain an FCC ID, FCC compliance testing requires that the peak emissions be tested and reported. In general, the FCC assumes that in most instances, it is not possible to have sufficient information or control regarding how long people are exposed in an "uncontrolled" environment so that averaging of exposure over the designated time period (30 minutes) is normally not appropriate. However, given the known duty cycles of smart meters, as noted in the earlier-referenced letter from Julius Knapp, for smart meters, the FCC views the relevant power as the "maximum time-averaged power that takes into account the burst nature of transmission." Because CMP's smart meters are limited to a maximum operation of 10% of the time, the 30 minute average exposure would be at most 10% of the peak exposure. Nonetheless, as described in Sections IX(C) above, CMP's smart meters have peak exposures between 0.41 mW/cm^2 and 0.44 mW/cm^2 , well below the FCC limit of 1.0 mW/cm even without taking the duty cycle into account.

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson are also correct that the FCC standards were specifically designed to prevent harm associated with thermal effects of RF, and do not explicitly address other, *i.e.*, non-thermal, potentially harmful effects. However, on this point, we generally agree with the proposition that, with respect to non-thermal effects, there is currently insufficient conclusive scientific evidence to would support a causal relationship between RF emissions and negative health effects. For example, according to the PUC TX Study "Governmental health agencies from around the world, including but not limited to the U.S, Canada, the UK, and Australia, as well as academic institutions and other researchers, have stated that there are no known *non-thermal* effects from exposure to RF EMF." *TX PUC Study at 62*. Given this lack of scientific evidence on causal relationship, there is no basis to determine that additional standards should be applied, nor that the absence of standards related to non-thermal effects renders the FCC standards inadequate. We emphasize that, even at the maximum 10% duty cycle, CMP's smart meters meet the most restrictive governmental standards identified in Section VI of 0.01 mW/cm² provided a person was at least 17 inches from the meter during operation. At the average duty cycle, CMP's meters would meet all of the referenced governmental standards even if a person stood only six inches from the meter for the full time that it operated.²⁵ From inside a building, these exposures would be substantially less (see Section VII and the EPRI and the VDH Report discussed in Section IX(C)(3) below).

²⁵ Some governmental standards use a 6 minute average rather than the FCC's 30 minute average. At 4.4 seconds per 6 minutes (or 1.22% duty cycle) and CMP's $S_{at\ 20cm} = 0.445379$, $S_{at\ 6in} = 0.445379 / (6in * 2.54cm/in / 20cm)^2 * 0.012 = 0.0093\ mW/cm^2$. At 10% duty cycle, CMP $S_{at\ 20cm} = 0.445379$, $S_{at\ 18in} = 0.445379 / (17in * 2.54cm/in / 20cm)^2 * 0.1 = 0.0096\ mW/cm^2$.

Finally, we note that we are not aware that any state has acted to adopt state-specific RF emission standards for any RF emitting device, and it is unclear whether a state could take such action; arguably, states could be prevented from enacting any such standards by principles of federal preemption.

E. Scientific Studies and Health Impacts

During the course of this proceeding, the parties and public witnesses put forward numerous scientific studies for admission into the evidentiary record. The Examiners admitted over one-hundred scientific studies into the record of this proceeding. The scientific studies submitted by the parties in this matter fall into several broad categories. Studies and articles were submitted regarding the "precautionary principle," industry bias in the examination of issues regarding EMF and RF, the effects of EMF and RF on animal health, and the effects of EMF and RF on human health. Most of the health related studies centered on the emissions from cellular telephones, and the vast majority of studies focused on the effects of RF emissions on animals, primarily rats and mice. Certain of these studies indicate potentially adverse biological effects from the RF exposure levels studied. However, as noted above, there have been no studies provided or cited that even purport to indicate negative health effects from the much lower RF exposure levels from smart meters.

In addition, some scientific studies indicate the possibility of non-thermal biological impacts on animals from RF emissions and, possibly non-thermal biological impacts on human health from cell phone use. The Commission also recognizes that many individuals report a heightened sensitivity to RF emissions and attribute illness or

other physical symptoms to RF exposure. Nevertheless, to date scientific studies have not identified or confirmed negative non-thermal biological impacts on human health from the RF emissions of smart meters.²⁶

1. The Precautionary Principle

Generally speaking, the "precautionary principle" is an approach to scientific evidence and policy making that prescribes taking measures to forestall negative outcomes before they occur. *European Environment Agency, "Late Lessons from Early Warnings: The Precautionary Principle 1986-2000," Env. Issue Report No. 22 (2001).* Under the precautionary principle, actions to prevent such harms are usually taken "before there is strong proof of harm." *Id.* at 13.

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson, while not addressing the "precautionary principle" directly in their briefs, submitted several treatises on the subject and urged the Commission to use a precautionary approach to determining permissible levels of RF emissions from smart meters. *See, e.g., Friedman Brief* at 54, 72; *Wilkins Brief* at 28, 61, 66. Based on this precautionary approach, the Mr. Friedman and Ms. Wilkins state that the only appropriate remedy is the complete removal of all smart meters and related components. *Friedman Brief* at 72; *Wilkins Brief* at 73.

²⁶ This conclusion is consistent with that of the Maine CDC and all other state agency reviews of health impacts from smart meters. See Section IX, below.

The OPA acknowledges that precautionary RF emission standards are an option, but states there is no conclusive scientific evidence suggesting that current FCC standards are inadequate. *OPA Brief* at 11.

CMP cites to several sources, including the Maine CDC, that suggest the precautionary approach to RF emissions from smart meters suggested by Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson in this matter are unnecessary and unreasonably low. *CMP Brief* at 37-38. However, CMP also states that if background levels of RF were eliminated, CMP's smart meters emissions would be twenty to forty times below the lowest suggested limit, the 2012 BioInitiative Report limit. *Id.*

We recognize the existence of the "precautionary principle" and do not, in the abstract, disagree with the general conceptual framework that there may be instances where the risk of harm is so apparent that preventative measures are necessary even in the absence of conclusive evidence of actual harm. Based on the record in this case, however, we do not find that RF emissions from CMP's smart meters, at the specific frequency and power levels of those emissions, justify the application of such preventive measures. Accordingly, we do not agree that application of the "precautionary principle," in the form and with the remedies suggested by Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson, is appropriate in this case.

2. Industry Bias

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson put forward several articles discussing potential biases toward industry on the part of the scientists conducting

research into RF emissions. The general conclusion of these articles is that because some science is funded by industry, or conducted by scientists who receive compensation from industry in one form or another, such science cannot be trusted as being an impartial look at the potential hazards of RF (or whatever the specific potential hazard may be). See, e.g., *Hardell, et al.*, Secret Ties to Industry and Conflicting Interests in Cancer Research, 50(3) Am. J. Indust. Med (Mar. 2006); and *Hardell, et al.*, Letter to the Editor, 1-3 Int'l J. Epidemiology (2010).

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson frequently argue that this bias is present in the testimony provided by CMP's expert witnesses in this proceeding, and that, accordingly, the Commission should question the reliability of those experts. *Wilkins Brief* at 5, 8, 36, 45, 63; *Friedman Brief* at 30-32. Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson also argue that the scientific studies that are unfavorable to their view of the case are similarly affected by bias and the conclusions of those studies should be questioned by the Commission. *Wilkins Brief* at 34-39, 45 ("the CCST, LBNL, AGNIR, INCIRP, SCENIHR, Danish Cohort, Maine CDC, and Swedish Working Life reports should be disregarding [sic] by the PUC"); *Friedman Brief* at 17 ("the AGNIR review is neither comprehensive nor unbiased").

We do not deny that it is possible for scientific studies and the scientists who conduct them to be influenced by industry to such an extent that the conclusions reached by such studies and scientists should be either disregarded or regarded dubiously by policy makers. In this case, while Mr. Friedman, Ms. Wilkins, and Ms.

Foley-Ferguson strongly suggest that such bias is present with CMP's expert witnesses and the studies that undermine Mr. Friedman's, Ms. Wilkins's, and Ms. Foley-Ferguson's positions, there is no evidence in this case that there is any actual bias at play. The mere association of an expert witness with a utility, or the fact that that a witness is compensated by a utility, does not render null and void that expert's opinion. Likewise, the fact a particular study was underwritten by industry or that a particular scientist has received compensation in one form or another from industry does not render the study or scientist unreliable. Much more is needed than innuendo and assumption to prove bias. Accordingly, we decline to use bias as a reason to diminish the weight given to CMP's experts or the studies on which they rely in this matter.

3. Animal Studies

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson have submitted many studies that address the impact of RF emissions, EMF, and microwaves on the specific organs, body parts, and biological systems (*e.g.*, eye lenses and cornea, reproductive organs, brain, liver, kidney, blood, fertility, protein response, cellular stress) of several different animals (*e.g.*, rats, mice, rabbits, insects).

While many of these studies suggest potential adverse impacts of RF emissions, EMF, or microwaves on animals at certain frequencies and power levels, none of these studies address the potential impact of RF of the frequency and power levels emitted by CMP's smart meters. Indeed, the exposure levels in the animal studies submitted by Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson are much greater, in many cases

several orders of magnitude greater, than the RF exposure levels associated with CMP's smart meters, even emissions measured in extremely close proximity to the smart meter. At the typical proximity to smart meters for people or animals, the exposure levels are so attenuated it is impossible for us to conclude, based on the animal study evidence presented here, that there is a credible risk of human harm from the RF emissions of CMP's smart meters.

4. Human Studies

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson have also put forward many studies that address the impact of RF emissions, EMF, and microwaves on the specific organs, body parts, and biological systems of humans. Most of the human studies involved the effects of RF emissions from cellular telephones.

Some of the studies indicate that there is reason to believe that long-term, very close proximity exposure to the RF emissions from cellular telephones could potentially result in increased risks of certain tumors and cancers. As with the animal studies, however, the RF exposure levels in the human studies are much greater—and particularly the studies involving very close proximity exposure to cellular telephones, many orders of magnitude greater—than the RF exposure levels associated with CMP's smart meters, even emissions measured in extremely close proximity to the smart meter. Moreover, even at the much higher exposures related to cellular phone use, there is no scientific consensus that this exposure is causal to harmful effects.

At the typical proximity to smart meters for people or animals, the exposure levels are so attenuated it is impossible for us to conclude, based on the human study evidence presented here, that there is a credible risk of harm from the RF emissions of CMP's smart meters.

5. World Health Association Classification of RF Emissions as Potentially Carcinogenic

The International Agency for Research on Cancer (IARC), an agency of the United Nations' World Health Organization (WHO), has classified radiofrequency electromagnetic fields as possibly carcinogenic to humans. IARC released its findings in 2013 in IARC Monograph Volume 102, "Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields." The IARC concluded that there is limited evidence in both humans and animals for the carcinogenicity of radiofrequency radiation, and classified radiofrequency electromagnetic fields as "possibly carcinogenic to humans (Group 2B)."

A Class 2B classification means that RF EMF has been deemed as possibly carcinogenic to humans. RF EMF was designated as a class 2B carcinogen due to evidence associating glioma and acoustic neuroma, two types of brain cancer, with wireless telephone users. *Michigan Public Service Commission*, Case No. U-17000, Report to the Commission at 10 (Jun. 29, 2012) (MPSC Report). The WHO provided more detail as to why RF EMF was classified as a Group 2B carcinogen:

The international pooled analysis of data gathered from 13 participating countries found no increased risk of glioma or meningioma with mobile phone use of more than 10 years. There are some indications of an

increased risk of glioma for those who reported the highest 10% of cumulative hours of cell phone use, although there was no consistent trend of increasing risk with greater duration of use. The researchers concluded that biases and errors limit the strength of these conclusions and prevent a causal interpretation. Based largely on these data, IARC has classified radiofrequency electromagnetic fields as possibly carcinogenic to humans (Group 2B), a category used when a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence.

VDH Report at 14 (quoting WHO Report).

Although the WHO's classification of RF emissions is an important consideration, its 2B classification was based on studies involving wireless phones, not smart meters. In addition, the IARC Group 2B classification is only a suggestion of a possible causal relationship with carcinogenic effects. As shown in Section VII, above, while both wireless phones and smart meters emit RF, smart meters result in a substantially lower level of exposure to such emissions. Thus, the WHO classification does not change our conclusion that the existing science has not identified or confirmed negative health effects from RF emissions from smart meters

6. Maine CDC

The Maine Center for Disease Control & Prevention (Maine CDC) is the agency in Maine charged with the responsibility to provide the leadership, expertise, information and tools to assure healthy conditions for all Maine people.²⁷ On November 8, 2010, the Maine CDC issued a report regarding health issues related to smart meters. *Maine CDC*, "Maine CDC Executive Summary of Review of Health Issues Related to Smart

²⁷ The Maine CDC website contains information regarding its role in ensuring and evaluating health issues impacting Maine citizens.
<http://www.maine.gov/dhhs/mecdc/about-us.shtml>

Meters" (Nov. 8, 2010) (Maine CDC Report). The Maine CDC reviewed materials submitted to the agency regarding smart meters, as well as health studies and assessments from government agencies and affiliated private and academic organizations including the World Health Organization, the FCC, the National Cancer Institute, the National Institutes of Health, and several Canadian and European agencies.

The Maine CDC Report concluded:

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

Maine CDC Report at 4.

7. Electromagnetic Hypersensitivity

Many individuals have reported a heightened sensitivity to RF and EMF and have reported numerous health impacts associated with the RF emissions from smart meters, including physical and cognitive difficulties. However, to date, there are no dependable scientific studies that confirm the existence of such hypersensitivity.

The WHO has issued documents on the topic of possible existence of individual electromagnetic hypersensitivity (EHS), a condition in which certain people seem to be especially susceptible to EMF, exhibiting a wide range of physical afflictions. The studies typically attempted to elicit symptoms under controlled laboratory conditions.

The WHO concluded that the symptoms experienced by those who have been described as EHS were not correlated with EMF exposure, and therefore there was no scientific basis to link EHS symptoms to EMF exposure. *WHO, "Electromagnetic Fields (EMF): Fact Sheets and Backgrounders," available at <http://www.who.int/mediacentre/factsheets/fs296/en/index.html>*. Accordingly, while we do not dispute that the individuals who report EHS may experience real symptoms, there is no evidence upon which to conclude that RF, and specifically RF from CMP's smart meters, is a cause of their symptoms. Moreover, as stated in Section IX(E)(6) above, the Maine CDC has concluded that studies have not indicated an association of EMF exposure and symptoms that have been described as electromagnetic sensitivity

F. Decisions of Health and Regulatory Agencies

As stated in Section IX(E)(6), the Maine CDC has concluded that there is no consistent or convincing evidence to support a concern for health effects related to the use of radiofrequency in the range of frequencies and power used by CMP's smart meters.²⁸ As the state agency in Maine with the responsibility and expertise to assess public health concerns and risks, we place great weight on the Maine's CDC's assessment of the health and safety issues posed by CMP's smart meter program.²⁹

²⁸ On November 5, 2012, the Commission informed the Maine CDC of this proceeding, and invited the Maine CDC to update or supplement its November 2010 report. The Maine CDC did not provide any further information in response to the Commission's November 5, 2012 letter.

²⁹ Ms. Wilkins, in her reply brief at 3, responds to CMP's reliance on the Maine CDC report by emphasizing e-mails in the record in which Dr. Dora Mills, the then Director of the Maine CDC, stated that she never said that "smart meters are safe." Such a statement is not surprising nor of any particular significance in that it is universally recognized that it is impossible to scientifically prove absolute safety. For example, the

Moreover, we also place significant weight on the work and conclusions of other state health and regulatory agencies that have specifically considered the health impacts of utility smart meters.³⁰ Those assessments are discussed below.

1. California Council on Science and Technology

In April 2011, the California Council on Science and Technology (CCST) completed the CCST Report. The CCST is an independent, not-for-profit entity established by the California Legislature and is responsible for offering unbiased expert scientific advice to the state government on technology-related policy issues. The CCST compiled and assessed evidence to determine whether FCC standards for smart meters are sufficiently protective of public health and whether additional technology-specific standards are needed for smart meters to ensure adequate protection from adverse health effects. After evaluating the body of scientific literature and consultation with experts in radio and electromagnetic emissions regarding smart meters, CCST found that the FCC standards provide an adequate factor of safety against known RF health impacts of smart meters and other electronic devices in the same range of RF emissions. *CCST Report* at 7. Additionally, CCST found that there was no clear evidence that additional standards are needed because neither the scientific literature

Lawrence Berkeley National Laboratory's Smart Grid Technical Advisory Project *Review of the January 13, 2012 County of Santa Cruz Health Services Agency memorandum: Health Risks Associated with Smart Meters* (April 12, 2012) states that while science can work to understand the cause of effects that are observed, it has never been able to declare anything completely safe.

³⁰ Ms. Wilkins, in her post-hearing brief at 33, argues that the Commission should not rely on various government reports because they are not peer-reviewed. The issue of whether a document is peer-reviewed is taken into consideration when examining studies by scientists in academic journals, not when a governmental organization issues a report or a decision.

nor CCST's expert consultations support that there is a causal link between RF emissions and non-thermal health impacts. *Id.* at 8. Following the release of the CCST report, the Health Officer of the County of Santa Cruz Health Services Agency (Santa Cruz) issued a memorandum that was critical of the CCST report and concluded that there is no scientific data to determine if there is a safe RF exposure level regarding non-thermal effects. *Poki Stewart Namkung, M.D., M.P.H, Health Officer, County of Santa Cruz Health Services Agency, "Health Risks Associated with Smart Meters"* (Jan. 13, 2012). The Lawrence Berkeley National Laboratory's (LBNL) Smart Grid Technical Advisory Project examined Santa Cruz's memorandum and found its conclusion problematic. *Roger Levy and Janie Page, Smart Grid Technical Advisory Project, Lawrence Berkeley National Laboratory, "Review of the January 13, 2012 County of Santa Cruz Health Services Agency memorandum: Health Risks Associated with Smart Meters"* (April 12, 2012). LBNL questioned the Santa Cruz memo's accuracy, noting that the memo made statements that were technically and scientifically incorrect, that it did not provide a balanced review of the research, that many of the scientific sources used were not peer reviewed and that the memo relied extensively on one journal, denying itself exposure to a variety of sources. *Id.*

2. Michigan Public Service Commission

In June 2012, the Michigan Public Service Commission (MPSC) Staff issued MPSC Report after reviewing submitted comments, peer-reviewed scientific studies and resources from other agencies. The MPSC Staff concluded that after reviewing the available literature and studies, the health risk from smart meters is insignificant. *MPSC*

Report at 28. Additionally, the MPSC Staff concluded that federal health and safety regulations provide assurance that smart meters are a safe technology. *Id.*

3. Texas Public Utility Commission

In December 2012, the Staff of the Public Utility Commission of Texas reviewed the scientific research on the potential health effects of RF emitted by wireless devices including smart meters and released the PUC TX Report. The Texas Commission Staff concluded that decades of scientific research have not provided proof of biological effects from exposure to low-level RF signals from smart meters and that there was no credible evidence to suggest that smart meters emit harmful levels of RF.³¹ *PUC TX Report* at 62.

4. Vermont Department of Health

In February 2012, the Vermont Department of Health, in the VDH Report, concluded that the current regulatory standards for RF from smart meters are sufficient to protect public health. *VDH Report* at 1. The Department of Public Health made this conclusion after an extensive review of the available scientific literature and current FCC regulatory health protection standards. Additionally, the Department of Public Health made actual measurements of emissions from smart meters installed by Green Mountain Power. *Vermont Department of Public Health, "An Evaluation of Radio Frequency Fields Produced by Smart Meters Deployed in Vermont,"* prepared by

³¹ In addition to assessing the RF associated with smart meters, the Texas study also reviewed literature related to the ELF associated with smart meters. It referenced an Australian study that found that smart meters have lower ELF emissions than traditional analog electromechanical meters, as well as other common household appliances such as vacuum cleaners, hairdryers, power tools and fans. *Id.* at 46.

Richard Tell Associates, Inc. (Jan. 14, 2013). The readings verified that even at close proximity to the smart meter, the emissions were well below the limits set by the FCC.

Id. at 93.

5. British Columbia Utilities Commission

In July 2013, the British Columbia Utilities Commission (BCUC) issued a decision in the Matter of FortisBC Inc., approving a Certificate of Public Convenience and Necessity (CPCN) for the AMI project of FortisBC. *In the Matter of FortisBC, Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project, Decision* (Jul. 23, 2013) (FortisBC Decision). In approving the CPCN for the AMI project, the BCUC conducted an extensive public hearing process that included testimony from the public and scientific experts on smart meters.

The BCUC found that Safety Code 6, the code adopted by Health Canada that specifies Canada's radiofrequency exposure guidelines, provides an appropriate degree of precaution in setting limits on RF emissions and that the RF emissions from the smart meters are significantly below the levels set out in Safety Code 6.³² Safety Code 6 is similar to the FCC standards. The BCUC also stated that while some individuals may feel strongly that smart meters will have a negative impact on their health, the scientific evidence did not persuade the BCUC that there is a causal connection between RF emissions and the symptoms of electromagnetic hypersensitivity. *Id.* at 137.

³² Health Canada is the department of the Canadian government responsible for public health. Health Canada's "Safety Code 6 (2009)" is a code that specifies Canada's radiofrequency exposure guidelines.

6. Health Canada

In December 2011, Health Canada, the Canadian governmental department concerned with public health, concluded that exposure to RF energy from smart meters does not pose a public health risk. *Health Canada. "It's Your Health- Smart Meters"* (Dec. 2011).³³ Health Canada noted that unlike cellular phones, where the transmitter is close to the head and the RF energy that is absorbed is localized to one specific part of the body, the RF from smart meters is generally transmitted at a much greater distance from the body. Health Canada noted that this leads to very low RF exposure levels across the entire body, similar to exposure to AM or FM radio broadcast signals. Health Canada also found that because exposure levels were below both Safety Code 6 and international safety limits, it did not consider any precautionary measures necessary. Additionally, Health Canada found that even where multiple smart meters are together, the exposure level will still be well below Safety Code 6 due to the infrequent nature of transmission.

G. Consistency with Federal and State Policy

The degree to which CMP's AMI is consistent with both State and federal energy policies is an important factor in our consideration of the reasonableness of CMP's utility service. As discussed below, it is clear that CMP's AMI deployment is consistent with these policies.

During its 2010 session, Maine's Legislature enacted An Act to Create a Smart Grid Policy in the State (Smart Grid Policy Act) (P.L. 2010, Ch. 539, codified at 35-A

³³ <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/meters-compteurs-eng.php>

M.R.S. § 3143). The Smart Grid Policy Act states that it is the policy of the State of Maine to promote in a timely and responsible manner the development, implementation, availability and use of smart grid functions.³⁴ These smart grid applications include increased use of digital information and control technology to improve the reliability, security and efficiency of the electric system, deployment of smart grid technologies, including real-time, automated, interactive technologies that optimize the physical operation of energy consuming appliances and devices, for purposes of metering, communications concerning grid operation and status and distribution system operations, and provision to consumers of timely energy consumption information and control options. 35-A M.R.S. § 3143(3).

On the federal level, the Energy Policy Act of 2005 (Pub. L 109-58) (EPAct 2005), encouraged utilities to offer time-based rates with a time-of-use meter to all customer classes and requested that state public utility commissions investigate the installation of time-of-use meters and communication devices to enable time-based pricing rate schedules and other demand response programs.

The Energy Independence and Security Act of 2007 (Pub. L. 110-140) (EISA) supported modernizing the nation's electric grid and contains provisions directing the DOE promote smart grid advancement. The American Recovery and Reinvestment Act

³⁴ "Smart grid functions" are defined in the Smart Grid Policy Act as "those functions that advance the policy of the United States as specified in the federal Energy Independence and Security Act of 2007, Public Law 110-140, Section 1301, including functions that enable consumers to access information about and to manage and adjust their electricity consumption or to generate and store electricity and functions specified in Section 1306(d) of that Act." 35-A M.R.S. § 3143(1)(C).

of 2009 (ARRA) amended EISA authorizing DOE to provide financial support for smart grid demonstration projects and advanced grid technology investments, such as AMI. It is under this authority that the DOE provided a \$95.9 million grant to CMP with respect to its AMI project.

H. Benefits of AMI

As discussed above, we have previously found that AMI will enable CMP to provide improved and enhanced service to customers, including by supporting more timely restoration of service after an outage, allowing for remote service connections, and providing detailed and near-real-time usage information and related systems that will allow customers to benefit from using electricity more efficiently. AMI is a key component of a "smart grid" that is expected to support the provision of electricity that is increasingly clean, efficient, reliable and safe at a potential lower cost to consumers. Smart meters allow direct two-way communication between utilities and customers, which enables end users to adjust their demand in response to price changes that reflect the condition of the electricity grid. These end user adjustments can help to protect the overall reliability of the electricity grid, cut costs for utility customers, and improve the operation and efficiency of the electricity grid. The smart grid will also enable grid operators to better balance electricity supply and demand in real-time, which becomes increasingly important as more intermittent wind and solar generation resources are added to the grid.

I. Utility Practice

CMP's installation and operation of AMI, including the installation and operation of smart meters, is clearly consistent with generally accepted utility practice. Utility installation of smart meters and associated systems has been steadily growing over the last several years. A FERC survey indicated that between 2007 and 2011, the number of installed smart meters grew from approximately 7 million to approximately 38 million. See Federal Energy Regulatory Commission, *Assessment of Demand Response and Advanced Metering: Staff Report*, Oct. 2013 at 3). According to FERC, smart meters are seen as an essential part of grid modernization. *Id.*

It is clear that that smart meters and associated systems are quickly becoming the primary replacement meter to the existing electromechanical meters.³⁵ See *TX PUC Report* at 12. Consequently, traditional electromechanical meters are rapidly becoming obsolete and are generally not in production. See *MPSC Report* at 2.

J. Voluntary Use of Technology

Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson argue that, because CMP has not met its burden to prove that smart meters are safe, they should be removed and

³⁵ According to an IEE (an institute of the Edison Foundation) August 2013 Report, the following utilities have installed smart meter systems Alabama Power (AL); Oklahoma Gas & Electric (AR); Pacific Gas & Electric (CA); Sacramento Municipal District (CA); San Diego Gas & Electric (CA); Southern California Edison (CA); Black Hills Energy Corp (CO); Pepco (DC); Delmarva Power (DE); Gulf Power (FL); Georgia Power (GA); Idaho Power (ID); Bangor Hydro Electric Company (ME); Central Maine Power Company (ME); NV Energy (NV); Oklahoma Gas & Electric (OK); Idaho Power (OR); Portland General Electric (OR); PPL (PA); Black Hills Power (SD); Austin Energy (TX); CenterPoint Energy (TX); Oncor (TX); Wisconsin Power and Light (WI); Cheyenne Light, Fuel, and Power (WY); Black Hills Power (WY).

replaced with analog or wired meters. However, the Mr. Friedman's witnesses generally do not advocate a ban on the use RF emitting technologies. Rather, the emphasis of the Mr. Friedman's witnesses is the need for further scientific study, the need for customer information on potential safety risks, the mandatory nature of smart meters and the availability of alternatives to smart meters.

For example, Dr. Leszczynski stated:

I do not oppose the use of cell phones. Also, for any such action it is too late because this technology is omnipresent. However, the users should not be misled by statements that the current safety standards protect them from the effects of cell phone radiation. . . . Phones should have warning labels and ways of safe using cell phones, at the same time limiting exposures to radiation, should be actively promoted in the society. Smart meters is a new technology that is still not omnipresent and it would be prudent to stop implementing it at this stage. There are other methods to transfer information about the electricity usage. Smart meter radiation should be studied more before smart meters become omnipresent.

Friedman, et al., Docket No. 2011-00262, Data Request EXM 012-003.

Similarly, Mr. Morgan stated that that CMP should be required to post warning signs on smart meters and notes that such warnings are required for other RF EMF emitters. *Morgan Test.* at 26; *Friedman, et al.*, Docket No. 2011-00262, Data Request EXM 004-009.

Other of Mr. Friedman's witnesses draw a distinction between cell phones (and other RF emitting devices) and smart meters on the basis that the use of cell phones is "voluntary," while smart meter installations and exposure are "mandatory." For example, Dr. Hardell stated that "[e]xposure to RF-EMF from

smart meters is without consent in contrast to the use of wireless phones that are used by the individual's own choice." *Hardell Test.* at 29. Dr. Carpenter stated that:

In the case of smart meters there is a clear and obvious alternative, which is to leave the analogue meters in place....I am not opposed to all wireless employment, but urge that steps be taken whenever possible to reduce human exposure.... In the case of wireless smart meters, there is no benefit to the home owner, only to the utility, and they should not be installed anywhere. At the very least individuals must be able to opt-out of wireless smart meters without having to pay a fee to avoid possible harm or having any fiscal liability, which many cannot afford. Individuals must be allowed to control their own environment.

Friedman, et al., Docket No. 2011-00262, Data Request EXM 017-004.³⁶

Dr. De-Kun Li stated that the "use of cell phones is a voluntary exposure . . . [g]iven that installation of smart meters is mandatory in most places, RF EMF exposure from smart meters is an 'involuntary' exposure.'" *De-Kun Li Test.* at 6.

Finally, Mr. Friedman, Ms. Wilkins, and Ms. Foley-Ferguson express a concern that, even if individual customers can choice not to have a smart meter, they are still exposed to smart meter emissions from their neighbors and the mesh system.

³⁶ Dr. Hardell and Mr. Hart agree: Dr. Hardell stated that "The customer must have a choice not to have a smart meter installed with no cost..." *Friedman, et al.*, Docket No. 2011-00262, Data Request EXM 014-002, and Mr. Hart stated: "An "opt out" with associated fees has coercive or extortive effects on sensitive and non-sensitive populations alike and thus certainly has the effect of being a forced deployment.

In response, the Commission interprets the views of Mr. Friedman's witnesses, as summarized above, as expressions of opinions about public policy based on individual assessments of the value and nature of particular technologies. Most would agree that cell phones, Wi-Fi and other commonly used RF emitting devices should not be banned, even given possible health effects, because of the usefulness and popularity of such devices. Although not highly valued by some, as described in Section I (H) above, wireless smart meters also provide public benefits that are relevant to the policy question. The consequence of prohibiting smart meters would be the loss of significant public benefits.

Moreover, the Commission disagrees with Mr. Friedman's witnesses with respect to their point that smart meters are fundamentally different than other devices, *e.g.*, cell phones, in terms of the voluntary nature and the availability of alternatives. Again, this assessment is a matter of public policy judgment. It is true that customers choose to use cell phones. It is also true that there is an alternative to cell phones, *i.e.* wired phone service. In fact, there are currently non-RF alternatives to most, if not all, commonly used consumer RF emitting devices, including smart meters. CMP's customers have a choice not to have a smart meter on their premises through the opt-out program.³⁷ Moreover, as is true for smart meters, individuals are exposed to the RF emissions of other devices in their neighborhoods and communities, such as in most offices, libraries, retail stores, and restaurants. Finally, it is clear from the record that smart meters contribute a small fraction of the total RF to which the public is exposed in

³⁷The issue of whether customers should have to pay to opt-out is not before us in this proceeding.

a typical environment, thus, eliminating smart meters would have a negligible effect on RF exposure levels.

X. CONCLUSION

For all the reasons discussed above, we conclude that CMP's installation and operation of its smart meter system is consistent with its statutory obligation to furnish safe, reasonable and adequate facilities and service. CMP's smart system complies with applicable FCC standards, and would also meet other RF emission standards and guidelines. In addition, the scientific evidence presented in this proceeding is inconclusive with respect to the human health impacts from RF emissions generally, and do not even purport to demonstrate a direct human health risk specifically associated with RF emissions from smart meters. Thus, we find that the existing science on the health impacts of smart meters does not support a finding that their use by CMP is an unsafe utility practice. Moreover, CMP's installation and operation of its smart meter system is consistent with federal and State energy policy and generally accepted utility practice throughout the country, which provides additional support for the conclusion that CMP's actions in this regard constitute a safe and reasonable utility service as required by statute.

By this finding, we do not intend to diminish the concerns of Mr. Friedman and the intervenors regarding the possible health impacts from RF emissions. We concur with the recommendations of the WHO, CCST and others that continued research should be done on both the thermal and non-thermal impacts on human health from RF emissions. This is especially the case given the pervasiveness of RF emitting devices

in our society. However, for the reasons discussed above, the record in this proceeding clearly compels a finding that CMP's installation and operation of its smart meters and related devices and systems are consistent with its statutory obligation to furnish safe, reasonable, and adequate facilities and utility practice.

Dated at Hallowell, Maine this 25th Day of March, 2014

Respectfully Submitted,

/s/ Mitchell Tannenbaum

/s/ Jordan McColman

/s/ Leslie Raber

Hearing Examiners

On Behalf of the Advisory Staff

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