

**PECO ENERGY COMPANY  
STATEMENT NO. 2R**

**BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

**MARIA POVACZ**

**v.**

**PECO ENERGY COMPANY**

**DOCKET NO. C-2015-2475023**

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**REBUTTAL TESTIMONY**

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**WITNESS: GLENN PRITCHARD**

**SUBJECTS: DESCRIPTION OF PECO'S AMR  
AND AMI METER SYSTEMS;  
RESPONSE TO MS. POVACZ'S  
CONCERNS REGARDING BOTH  
SYSTEMS; PECO'S TARIFF  
ACCOMMODATIONS**

**DATED: May 18, 2016**

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SECRETARY'S BUREAU

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1 **I. Introduction and Purpose of Testimony**

2 **Q1. Please state your name, professional position, and business address.**

3 A. My name is Glenn Pritchard. I am employed by PECO Energy Company (“PECO” or the  
4 “Company”) as Manager of Advanced Grid Operations & Technology Group. My business  
5 address is 2301 Market Street, Philadelphia, PA 19103.

6 **Q2. Please provide an overview of your qualifications.**

7 A. I have a degree in electrical engineering, and I maintain a license as a Professional  
8 Engineer. For the past eight years, my work has focused on Advanced Meter Installation  
9 (“AMI”) technology, and I was a principal in choosing the technology chosen by PECO. I have  
10 been invited to make presentations on AMI to the Institute of Electrical & Electronics Engineers,  
11 the Edison Electric Institute, and the Electric Power Research Institute. I have spoken about  
12 AMI meters on behalf of the United States Trade & Development Agency in South Africa,  
13 Vietnam, and Turkey.

14 **Q3. Based on the credentials described above, what are your fields of expertise that are  
15 relevant to this proceeding?**

16 A. I am an expert in the design, operation, and technology of advanced grid installations.

17 **Q4. What is the purpose of your rebuttal testimony?**

18 A. My testimony describes PECO’s existing Automatic Meter Reader (“AMR”) meter  
19 system, and then describes the new AMI meter system, demonstrating that it is not a “mesh”  
20 system and noting that it does not use “pulses.” I then address a series of concerns raised by Ms.  
21 Povacz in her testimony. I demonstrate that:

22 \* PECO has not made misleading statements in its comparison of radio frequency (“RF”)  
23 fields from the AMR and AMI systems;



1 A. The AMR system uses one-way RF transmissions from the meter assembly to the utility.  
2 The meters transmit once every five minutes for a 20 millisecond (ms) duration, at a maximum  
3 of one watt of power. I provided this and other relevant technical information to Dr. Christopher  
4 Davis, who used those data to calculate RF exposures associated with the legacy AMR system.

5 **Q7. Does the Complainant currently have an AMR meter installed at her residence?**

6 A. Yes. The AMR meters were universally deployed to PECO's approximately 1.7 million  
7 customers, including the Complainant. PECO's records indicate that an AMR meter assembly  
8 was installed at the Povacz residence in February 2002.

9 **III. PECO's New AMI Meter System**

10 **Q8. Please describe PECO's new AMI metering system.**

11 A. In 2011-12, PECO began to comprehensively install an AMI system in its service  
12 territory. The AMI system also uses RF communications to transmit meter information from  
13 each customer location to a PECO network, although in the case of the AMI system, the  
14 communications are received by technology known as Tower Gateway Basestations, or "TGBs."  
15 From the TGBs, meter data is then transmitted to PECO over a fiber optic system and phone  
16 lines. As with the AMR system, that data is utilized in various PECO systems, including its  
17 MDMS, CIMS, and OMS systems. The data is also used to issue bills to customers. Exhibit  
18 GP-2 (Sensus AMI System) which is attached to my testimony, is a graphic representation of the  
19 communications that occur in the AMI system.

20 The AMI meters also include a second radio, known as the ZigBee radio, that allows the  
21 meter to communicate with devices within the home. The ZigBee also uses RF transmissions to  
22 communicate.

23 **Q9. Please describe the RF transmissions from the AMI system.**

1 A. The AMI system allows two-way RF transmissions from the meter assembly to the  
2 utility, and from the utility to the meter assembly. The AMI meters are initially programmed to  
3 transmit once every ninety minutes for a 70 millisecond (ms) duration, at a maximum of two  
4 watts of power. However, once meters are installed, PECO adjusts the transmission periodicity  
5 to the lowest number of transmissions that will allow the AMI meter to effectively communicate  
6 with the PECO backbone system. In Ms. Povacz's neighborhood, the existing meters have been  
7 tuned to six or seven transmissions per day. I expect the Povacz meter to be tuned to that same  
8 periodicity. The ZigBee radio will transmit every five minutes until such time as it acquires  
9 communication with a device within the home, and then its transmission periodicity will be  
10 adjusted downward to the level needed for the meter to effectively communicate with the internal  
11 devices. The ZigBee radio transmits at approximately 1/10<sup>th</sup> of a watt, and the duration of each  
12 transmission is less than one microsecond. I provided this and other relevant technical  
13 information to Dr. Christopher Davis, who used those data to calculate RF exposures associated  
14 with the AMI system.

15 **Q10. Is the PECO system the same as other utility smart meter systems?**

16 A. There are many similarities, but there are also some important differences. First, most  
17 utility smart meter systems transmit in the frequency range of 902-927 MegaHertz ("MHz").  
18 This frequency band, known as the Industrial, Scientific, and Medical (or "ISM") band, is  
19 utilized by many different entities and, consequently, it can sometimes be difficult to obtain clear  
20 communications within that band. PECO choose a system that operates at a frequency just  
21 below the ISM band, at 901.1 to 901.2 MHz (meter to TGB) and a second band, just above the  
22 ISM band, at 940.0 to 940.1 (TGB to meter). These bands are reserved for PECO's use in its  
23 service territory. The primary virtue of operating within these narrow, reserved bands is that the

1 communications pathways are much easier to access and utilize. PECO can therefore  
2 accomplish the same operational outcomes using far less RF data transmissions than typical  
3 utility smart meter systems.

4 *Because of the crowded nature of the ISM band used by many utility smart meter*  
5 *systems, those systems are often built to facilitate regular redundant communication pathways.*  
6 *These redundant communications primarily occur meter-to-meter in an approach known as a*  
7 *“mesh,” in which the meters regularly communicate not only with the TGBs (or their*  
8 *equivalent), but also communicate regularly with each other. Mesh systems can have thousands*  
9 *of transmissions a day, largely to insure good communication in the crowded ISM band.*

10 *Because PECO’s AMI system operates within the narrow, reserved bands, it does not operate as*  
11 *a mesh system, and there are very few meter-to-meter communications.*

12 **Q11. Does the PECO system use “pulsed” RF transmissions?**

13 **A.** No. As described in more detail in the testimony of Dr. Davis, the PECO system, does  
14 not use pulsed RF transmissions to communicate.

15 **Q12. Why is PECO installing its AMI system?**

16 **A.** In 2008, the Pennsylvania General Assembly passed Act 129, which requires the  
17 *installation of “smart meters” with certain characteristics. Importantly, in order to meet the*  
18 *requirements of Act 129 a smart meter must have the ability to engage in two-way*  
19 *communications with the utility base system, and to communicate with devices in the home.*  
20 *PECO’s AMR system did not have either of those capabilities. Consequently, PECO must*  
21 *replace its existing AMR system with a new metering system that has those capabilities. After*  
22 *investigation, PECO chose its AMI system as its preferred technology. It proposed installation*

1 of that system is a subsequent filing to the Commission, which approved PECO to proceed with  
2 system-wide installation of its AMI system, including new AMI meters at all customer locations.

3 **IV. Comparison of RF Fields From the Legacy AMR System and the New AMI System**

4 **Q13. Ms. Povacz claims (Povacz Statement No. 3, pp. 6-7) that PECO has provided**  
5 **“conflicting information” comparing the level of RF fields from her AMR meter and AMI**  
6 **meter. Please comment.**

7 A. As demonstrated in the testimony of Christopher Davis, PECO Statement No. 3, the RF  
8 fields from both the AMR and the AMI meters are markedly below the Federal Communication  
9 Commission’s MPEs for RF exposure. I consider that to be a high level comparison of the RF  
10 fields, and viewed at that high level the fields levels for the AMR and the AMI are similar in that  
11 they are both well below the MPEs. However, for an individual location such as the Povacz  
12 residence, we are able to take the comparison to a more granular level and compare the expected  
13 fields at this location from the AMR and the AMI. As Dr. Davis’s testimony demonstrates, the  
14 MPE exposure from the AMI is substantially lower than from the AMR. It is as though someone  
15 has a budget of \$100.00 to buy a gift, and their two options respectively cost ten cents and one  
16 cent. In the context of a \$100 budget, I would characterize those costs as being quite similar to  
17 each other. But if someone asked me which is larger, I would conclude that ten cents is an order  
18 of magnitude larger than one cent. I see no conflict in presenting the data to highlight both of  
19 those points.

1 V. Use of Fiber Optics, Phone Lines, and Reading Meters Using Drive-By Vans

2 **Q13. In her direct testimony (Povacz Statement No. 3, p. 38), Ms. Povacz suggests that**  
3 **PECO should have its meters communicate using fiber optics rather than RF**  
4 **transmissions. Did PECO consider that approach?**

5 A. Yes, it did. We utilize fiber optics for the PECO backbone system, in which the TGBs  
6 communicate with the PECO system. However, we found that there is no generally available  
7 commercially feasible fiber optic alternative for having the meters communicate with the TGB  
8 element of the system. We also estimated that installation of a fiber optics system for the meters  
9 to communicate with the TGBs would have added billions of dollars of cost to the system.

10 **Q14. Ms. Povacz also notes (Povacz Statement No. 3, p. 38), that PECO's smart meter**  
11 **system for its natural gas meters uses fiber optics, and suggests that means that a similar**  
12 **technology could be used for electric meters. Please comment.**

13 A. PECO's gas and electric systems both use RF transmissions to communicate from the  
14 meter to the TGBs. PECO's gas and electric systems both use fiber optics for the backbone  
15 communication between the TGBs and the rest of the PECO system. There is nothing about  
16 PECO's gas metering system that suggests that it is feasible to use fiber optics for the meter to  
17 communicate with the PECO system.

18 **Q15. Ms. Povacz also notes (Povacz Statement No. 3, p. 38), the existence of a smart meter**  
19 **system in Chattanooga, Tennessee that utilizes fiber optics. Please comment.**

20 A. I am familiar with the Chattanooga system. The City has installed a citywide fiber optic  
21 system that will be used to provide internet, cable tv, and phone service to effectively the entire  
22 City. Smart meters will be integrated into that system using copper communication facilities.  
23 Approximately 60% of the smart meters will communicate using the copper communication

1 facilities. The remaining 40% of the installed smart meters will communicate using an RF  
2 wireless communication “mesh” technology in which the meters regularly communicate with  
3 each other using RF transmissions, which means that all Chattanooga residents have RF  
4 exposure from the mesh operations of the Chattanooga smart meter grid. In addition, the  
5 Chattanooga system was originally built for the purpose of providing cable tv and WiFi to every  
6 customer that subscribed; every Chattanooga subscriber therefore has RF exposure from WiFi as  
7 well. I also note that it is now estimated that the Chattanooga system will have a total  
8 installation cost of \$300 - \$500 million. The service territory of the Chattanooga Electric Power  
9 Board is approximately 600 square miles, and it serves approximately 170,000 meters. The  
10 PECO service territory is approximately 1713 square miles, and PECO serves approximately  
11 1,700,000 meters. The Chattanooga experience is thus one of the reasons that I conclude that  
12 installing a similar system in the PECO service territory would cost in the billions.

13 **Q16. Ms. Povacz also suggests (Povacz Statement No. 3, p. 38) that PECO could use**  
14 **phone lines to have its meters communicate with the PECO system. Please comment.**

15 A. Ms. Povacz’s testimony refers to PECO’s legacy practice of having the AMR meters of  
16 some of its largest industrial customers communicate using dedicated phone lines. That  
17 functionality is being eliminated as part of the system wide move to AMI meters; the large  
18 industrial customer meters will also communicate using RF.

19 **Q17. Ms. Povacz also notes (Povacz Statement No. 3, p. 4) that in PECO’s legacy AMR**  
20 **system, approximately 12,000 AMR meters were not able to communicate with the PECO**  
21 **backbone system, and suggests that PECO make “exceptions” in the AMI system to allow**  
22 **for meters that do not communicate with the PECO backbone. Please comment.**

1 A. The 12,000 AMR meters that Ms. Povacz mentions all communicated with the PECO  
2 system using RF transmissions; they simply had difficulty communicating well, typically due to  
3 physical or geographical configuration. Because these meters could not communicate well with  
4 the MicroCell Controllers, PECO would drive RF-enabled vans through certain neighborhoods to  
5 collect the data from those meters. One of the advantages of the AMI system is that, because of  
6 its use of the narrow, licensed 901.1-901.2 MHz communication band, PECO expects to  
7 eliminate use of drive-by vans.

8 **VI. AMI Meters – UL and FCC Compliance, Safe Installation, Fires, and “Dirty**  
9 **Electricity”**  
10

11 **Q18. Ms. Povacz claims (Statement No. 3, pp. 35, 43) that PECO has misled customers as**  
12 **to whether its AMI meters are registered with Underwriters Laboratories (“UL”). Please**  
13 **comment.**

14 A. The Landis + Gyr Focus AX-SDR meter, which will be installed at the Povacz residence,  
15 has been tested for compliance with UL standards. UL information for the meter is attached as  
16 Exhibit GP-3 (UL Information). Ms. Povacz raises two further points. She claims that the UL  
17 information applies only to the AX-SD meter, and not to the AX-SDR. That is incorrect. The  
18 AX-SDR is part of the SD series of meters, and is covered by Exhibit GP-3. Second, Ms. Povacz  
19 notes that the Landis + Gyr meter does not carry a UL sticker. That is correct. The Landis + Gyr  
20 meter has been tested for compliance with UL standards, but is not manufactured under the  
21 auspices of the UL “Follow Up Service.” It therefore does not carry a UL sticker on its face;  
22 nonetheless, it has been tested for compliance with UL standards.

23 **Q19. Ms. Povacz claims (Povacz Statement No. 3, p. 44) that PECO gives its customers a**  
24 **“false sense of security” with respect to the FCC compliance. Please comment.**

1 A. Ms. Povacz argues that the FCC's Maximum Permissible Exposures ("MPEs") do not  
2 apply to the ISM band (902-927 MHz), and that it is therefore misleading for PECO to state that  
3 it meets the FCC's MPEs. I disagree. First, while no license is necessary to operate in the ISM  
4 band, operations within that band are still subject to MPE limits. Second, PECO's AMI system  
5 is licensed to operate in a narrow reserved band just below the ISM band (901.1-901.2 MHz).  
6 Third, as Dr. Davis's testimony demonstrates, PECO's RF transmissions from PECO's AMI  
7 meters are well below the FCC's MPEs. There is nothing misleading about stating that this is the  
8 case.

9 **Q20. Ms. Povacz raises several questions (Povacz Statement No. 3, pp. 8-9) about**  
10 **whether a "hot" install of an AMI meter can be performed safely. Please comment.**

11 A. PECO requests, but does not require, a cold install of AMI meters – that is, it requests  
12 that the electricity in the house be turned off. Both hot and cold installations are safe to  
13 perform, but a hot installation carries a small risk of electrical "flash" that does not exist in a cold  
14 installation. PECO minimizes that risk by requesting the cold install, and by requiring its  
15 installers to wear personal protective equipment when replacing the meters to protect against the  
16 possibility of a flash. There are very few cases of flash during meter changeouts, but if a flash  
17 were to occur at a location, PECO would investigate whether damage to home wiring had  
18 occurred before completing its meter installation. But absent an actual flash occurring, cold and  
19 hot installations are both safe methods of changing out meters, as long as personal protective  
20 equipment is used by the installer.

21 Ms. Povacz notes (pp. 8-9) that, in 2012, she saw an installer work on her neighbor's meter  
22 without the use of personal protective gear. I don't know what work the installer was  
23 performing, or whether it was done "hot" or "cold," and I therefore can't comment on the

1 specific event. But there have been no reports of any damage or flashes for Ms. Povacz's  
2 neighbors, so I conclude that the installations in her neighborhood were safely completed.  
3 Finally, if Ms. Povacz is concerned that a "hot" install will damage the wires in her home, I note  
4 that PECO prefers to do the work at her home as a "cold" install and will arrange accordingly.

5 **Q21. Ms. Povacz also raises concerns (Statement No. 3, p. 9) that smart meters can cause**  
6 **fires. Please comment.**

7 A. When PECO began its AMI meter deployment, it was using meters from a different  
8 manufacturer. PECO received early reports that a small handful of the meters experienced over-  
9 heating. PECO halted installation; investigated; removed the meters from the first manufacturer;  
10 engaged a different manufacturer with different meters for its meter supply; and installed the new  
11 meters. With the new meters, PECO has not had any similar over-heating incidents.

12 **Q22. Ms. Povacz claims (Statement No. 3, p 42, 46) that PECO's smart meters will create**  
13 **"dirty electricity." Please comment.**

14 A. Ms. Povacz states that the "dirty electricity" claim is supported by PECO's Answer to  
15 Interrogatory Povacz I-20. She claims that this Interrogatory Answer demonstrates that: "The  
16 smart meters installed by PECO are conducting excessive RF interference onto the customer's  
17 electrical wiring." That is not what PECO's Interrogatory Answer says. Instead, it says that all  
18 sources of electricity create harmonics, that the harmonics will exist regardless of the form of  
19 meter and whether there is any meter at all, and that any fields created by the AMI meter will be  
20 "vanishingly small next to the fields and harmonics that are created by the electric service that is  
21 being measured by the AMI meter." I've attached the full answer as Exhibit GP-4 (PECO  
22 Answer to Interrogatory Povacz I-20), and I adopt it as my testimony on this issue. PECO's  
23 AMI meters do not create "dirty electricity."

1 **VII. Ms. Povacz's Issues With the Povacz AMR Meter**

2 **Q23. Ms. Povacz notes that her AMR meter is in "perfect working order," (Povacz**  
3 **Statement No. 3, p. 3) and inquires why it needs to be replaced. Please comment.**

4 A. I agree that Ms. Povacz's AMR meter is in perfect working order, but that is not the issue  
5 that is driving replacement of the meter. The AMR meter does not have the functionality  
6 necessary to meet the requirements of Act 129. (It cannot perform two-way communication, and  
7 it cannot communicate with devices within the home.) Even though the meter is still working, it  
8 therefore must be replaced in the move to Act 129 compliance.

9 **Q24. Ms. Povacz claims (Povacz Statement No. 3, p. 7) that "PECO admits that they do not**  
10 **service anything past installation," citing PECO's Answer to Povacz I-6. Please comment.**

11 A. The Commission's regulations generally require meters in place to be tested for accuracy  
12 on a cycle of 16-20 years, depending upon certain characteristics of the meter. PECO performs  
13 those tests. The Povacz meter was installed in 2002. Povacz I-6 asked whether PECO had  
14 inspected the meter in place since that time – that is, in the intervening 14 years. PECO has not  
15 tested the Povacz AMR meter in place – it is not scheduled for such testing for years, and in any  
16 event PECO will have the meter changed before the testing requirement applies – and PECO  
17 thus stated in its discovery response that it has not inspected the meter since installation. That is  
18 not the same as admitting "that they do not service anything past installation." However, if Ms.  
19 Povacz would like an accuracy test on her AMR meter, I will authorize such a test.

20 **Q25. Ms. Povacz claims (Povacz Statement No. 3, pp. 35-36, 42) that there are**  
21 **"inconsistencies" between PECO's records and her photographs of the AMR meter**  
22 **installed at her residence. Please comment.**

1 A. There are no inconsistencies. PECO's records state that the Povacz AMR meter is a  
2 Siemens/L +G/Duncan electro-mechanical meter with a a Landis + Gyr AMR Communications  
3 Transmit-Only Meter Module. Ms. Povacz's photographs indicate that her AMR meter is a  
4 Landis + Gyr meter. "Landis + Gyr" and "L+G" are two forms of the same company name –  
5 PECO's records are consistent with the photograph. As to the communication module, Ms.  
6 Povacz's photographs indicate the meter is "utilizing the Cell net Data Systems." There is no  
7 inconsistency here, either. When PECO first implemented its AMR system, the entire  
8 communications network was run by Cell Net, regardless of what communication module was  
9 installed on the meter assembly. PECO's records show that Ms. Povacz has a Landis+ Gyr  
10 TOMM, which at the time of installation was operated by Cell Net. Nothing in Ms. Povacz's  
11 photo is inconsistent with those records.

12 Ms. Povacz also claims (p. 42) that PECO's records are not accurate because, in its discovery  
13 responses, it stated that it tested her meter in prior to installation in 2001, then installed it in  
14 2002. There is nothing inconsistent or inaccurate about those answers. It is standard practice to  
15 test meters for accuracy at the shop before they are installed. PECO's records show that it  
16 followed that sequence in 2001 (testing) and 2002 (installation) for the Povacz meter. Finally,  
17 Ms. Povacz claims (pp. 42-43) that PECO's records are inaccurate because she moved into her  
18 home in 2001 and she does not recall her meter being changed in 2002, as per PECO's records.  
19 I've attached a copy of the meter installation record for the Povacz residence showing an  
20 installation date of February 23, 2002, as Exhibit GP-5 (Povacz Meter Installation Record). I  
21 note that the Povacz meter is an outdoor meter. The change to an AMR meter over 14 years ago  
22 therefore may not have been a noticeable event.

1 **VIII. Accommodations in PECO's Tariff**

2 **Q 26. Does PECO's Tariff allow any accommodation for customers with respect to**  
3 **installation of AMI meters?**

4 A. Yes. PECO's tariff makes two accommodations. The first has to do with location of the  
5 meter. Under Tariff Rules 3.2 and 3.4, the customer has the option to relocate their meter to a  
6 different location because the customer chooses the location of the meter board and socket. If  
7 *the customer would like a different location for the AMI meter, they can simply hire an*  
8 *electrician to move the meter board/socket to a new location on their property. This will, in*  
9 *some situations, require work on the PECO system to extend PECO's conductors to the new*  
10 *meter board location. PECO views such changes to its system to be "for the accommodation of*  
11 *the customer"* and thus, under PECO's Tariff Rule 6.2, the customer would be responsible for the  
12 cost of changes to the PECO system. Once those changes are made, PECO would simply install  
13 the AMI meter at the new, customer-chosen, location.

14 Second, PECO's Tariff Rule 14.1 allows third parties to come onto its system and provide  
15 *alternative advanced meter technology, on a competitive basis. Rule 14.1 allows for an*  
16 *Advanced Meter Services Provider ("AMSP") to provide Advanced Metering Services.*

17 *Currently, no AMSPs have come forward to provide alternative Advanced Metering Services.*

18 *However, if the market develops and makes such alternative meter services available, then*  
19 *PECO's Tariff already contains a provision that allows for such meters and meter technology to*  
20 *be deployed, subject to the third party being licensed by the Commission, the meters meeting the*  
21 *requirements of Act 129, and the AMSP's services being properly integrated into PECO's*  
22 *computer systems. I have attached copies of the Tariff rules discussed above as Exhibit GP-6*  
23 *(Select Tariff Rules).*

1 **Q27. Ms. Povacz has requested two accommodations regarding the AMI meter. Please**  
2 **comment.**

3 A. Ms. Povacz has requested that PECO abstain from installing an AMI meter at her  
4 residence, and that it remove the AMI meter from her neighbor's home. In both cases, it would  
5 violate Act 129 to grant her the requested accommodation, because that would leave those two  
6 locations with meters that are not compliant with the provisions of Act 129.  
7 Moreover, granting these accommodations would not materially change Ms. Povacz's RF  
8 exposure. Dr. Davis's testimony establishes that Ms. Povacz has many other sources of RF  
9 exposure, but even if we just focus on RF exposure from the PECO AMI system, I note that  
10 PECO has already installed nearly 1.7 AMI meters in its service territory, and Ms. Povacz is  
11 going to regularly encounter PECO AMIs anywhere that she travels in PECO's service territory.  
12 Indeed, as shown in Exhibit GP-7 (Map Showing AMI Meters Near Povacz Residence), AMI  
13 meters have been installed at all buildings in her neighborhood.

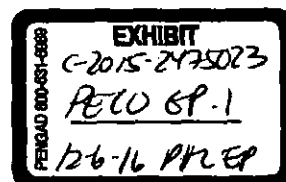
14 **IX. Conclusion**

15 **Q Does this conclude your rebuttal testimony?**

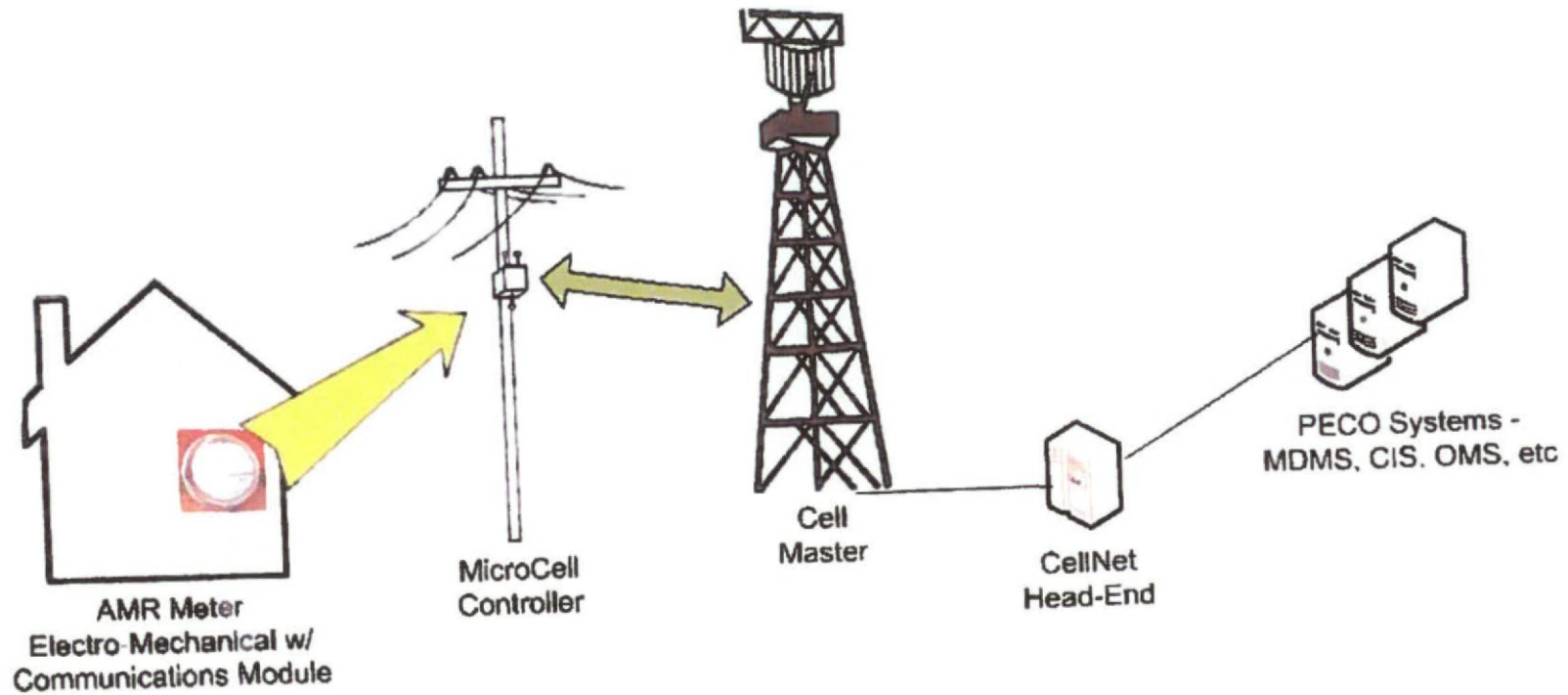
16 A. Yes.

17

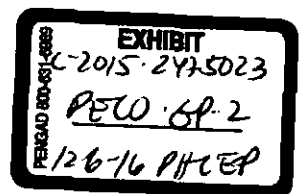
**PECO Exhibit GP-1**  
**Landis + Gyr AMR System**  
**(2000 – Present)**



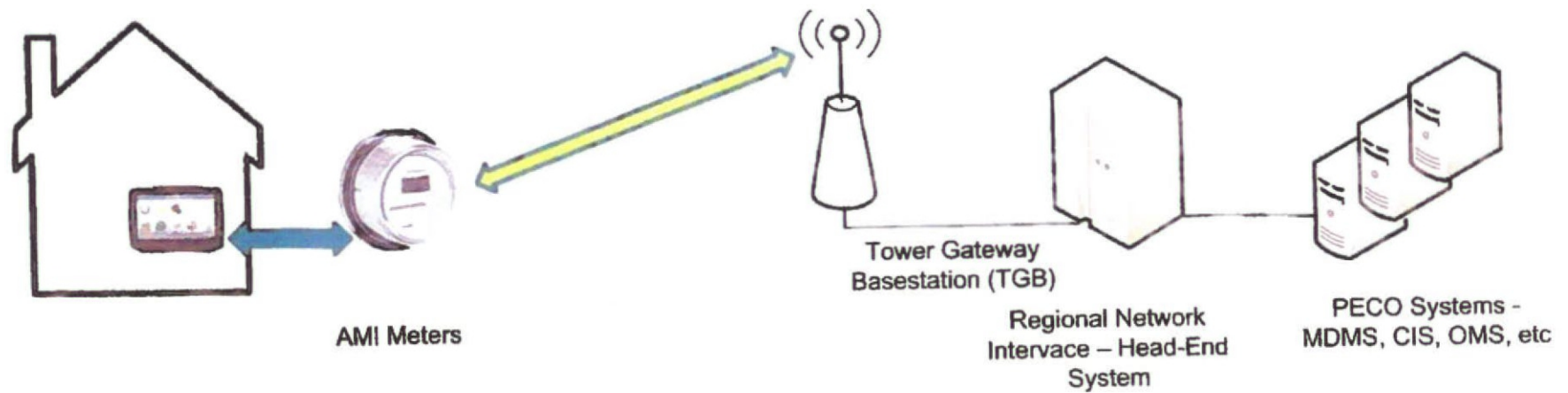
# Landis+Gyr AMR System



**PECO Exhibit GP-2**  
**Sensus AMI System**  
**(2011 – Present)**

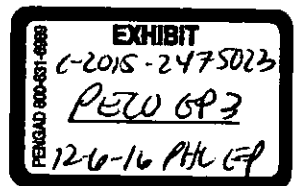


# Sensus AMI System



**PECO Exhibit GP-3**

**UL Information**





**POCZ.E364197  
Meters, Electric Utility**

[Page Bottom](#)

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**Meters, Electric Utility**

See General Information for Meters, Electric Utility

**LANDIS & GYR INC**  
2800 Duncan Rd  
Lafayette, IN 47904-5012 USA

E364197

**Detachable Electric Utility Meters, "FOCUS" Series, Models AX# or AL#.**

# - May be followed by "-SD"; may be followed by "Modular", "EPS", or "Integrated"; may be followed by "Polyphase" or "Polyphase Wide Range".

Last Updated on 2015-12-01

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[Questions?](#)

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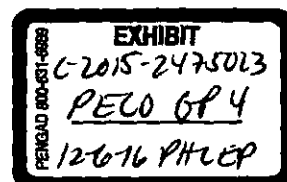
[Page Top](#)

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**PECO Exhibit GP-4**  
**PECO Answer to Interrogatory Povacz I-20**



**PECO Energy Company's Answers to  
Interrogatories and Requests for Documents  
of Complainant Maria Povacz, Set I**

**Povacz I-20:** Does the Povacz Intended Smart Meter have the capability of sending (a) EMF and harmonics over Romex cable commonly used in residences in Pennsylvania, and/or (b) through walls of residential homes?

**PECO Answer to Povacz I-20:**

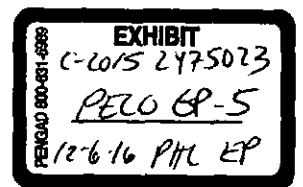
The question does not define "EMF." PECO understands the phrase to refer variously to electric and/or magnetic fields or to electromagnetic fields, depending upon the frequency under discussion, including power frequency fields and radio frequency fields.

Whenever there is a flow of electric current through wires, electric and/or magnetic fields are created, and harmonics can be induced on nearby cables and wires. Every house that receives electric service, which is provided at a frequency of 60 Hz, will experience this phenomenon, regardless of the form of meter or whether there is any meter at all. In addition, every appliance within the home will also induce fields and harmonics. The AMI meter is powered by a small amount of electricity at the frequency of 60 Hz, and it therefore also can induce fields and harmonics on nearby cable. Those fields and harmonics will be vanishingly small next to the fields and harmonics that are created by the electric service that is being measured by the AMI meter.

The purpose of the AMI communication module is to transmit over radio frequencies away from the house. Any transmission through walls would be very attenuated (much reduced). Any radiofrequency signal that was picked up by a Romex cable or similar cable would be severely attenuated over a short distance.

**Responsible Witness:** Glenn Pritchard and Dr. Christopher Davis

**PECO Exhibit GP-5**  
**Povacz Meter Installation Record**



View Meter Information for Meter Point Number 1

Meter Point Edit Help

Type:	<input type="text" value="KWH"/>	Meter Status:	<input type="text" value="On"/>
Load Type:	<input type="text" value="General Service"/>	Cut Location:	<input type="text"/>
Status:	<input type="text" value="Active"/>	Meter Exception:	<input type="text"/>
Date:	<input type="text" value="02/23/02"/>	Meter Point Location:	<input type="text" value="Outside"/>
Set:	<input type="text" value="02/23/02"/>	Reading Device:	<input type="text" value="Standard"/>
Removed:	<input type="text" value=""/>	Unbilled Reason:	<input type="text"/>
Meter Number:	<input type="text" value="032503176"/>	Meter Read Schedule:	<input type="text" value="Monthly - All months"/>

Number of Dials:   Fire at Premise

AMI Certification

Method:  Date:

Reading Constants:

Reading Type	Constant	Flat Ac
GS Tot Kwh	1	

Correction Factor:

Months Since Last Company Reading:

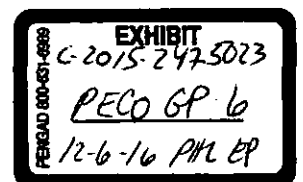
Consecutive Company Reads:

Estimated Usage:

View...

Meter Details...

**PECO Exhibit GP-6**  
**Select Tariff Rules**



**Exhibit GP-3 Selected Provisions of PECO's Electric Service Tariff**

**3.2 METER LOCATION.** There shall be provided, free of expenses to the Company, at a location outdoors, unless otherwise designated by the Company or another AMSP, which the Company or another AMSP will designate in writing upon request, a suitable place for the meter or meters and any other supply, protective or control equipment of the Company or another AMSP which may be required in the provision of service. The customer shall provide access and space, in an amount deemed necessary by the Company, to install and maintain its meter(s) and equipment. This location shall be convenient, unimpeded and easily accessible to the Company's employees, contactors and agents. The Customer shall also minimize any risk for damage and/or harm to the Company's employees, contractors, agents and equipment at the meter location. There also must not be any impediment or obstruction of the Company's ability to receive, an adequate communication signal from its meter(s) for remote reading purposes. The meter(s) location shall also be situated so that the meter(s) are not concealed, but shall be situated in a fashion acceptable to the Company.

---

**Exhibit GP-3 Selected Provisions of PECO's Electric Service Tariff**

**3.4 SERVICE ENTRANCE EQUIPMENT.** All equipment beyond the point of delivery, except the meter, shall be installed by the customer. Installation shall be in conformity with the National Electrical Code and the Company's published "Electric Service Requirements", and shall include, where necessary, an approved sealable device for mounting a meter. The meter will be supplied, owned and sealed by the Company or another AMSP.

**Exhibit GP-3 Selected Provisions of PECO's Electric Service Tariff**

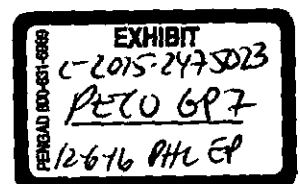
**6.2 SERVICE - SUPPLY ALTERATIONS.** Changes related to a service-supply line or a meter owned by the Company, including the installation of protective devices or visual markers to denote safe operating distance from the Company's facilities, for the accommodation of the customer, shall be at the expense of the customer. If the alteration to the Company's facilities is temporary in nature and the materials used in that alteration can later be re-used by the Company, as for example the installation of protective "hard cover" to allow a customer, developer, or contractor to work safely in close proximity to the Company's facilities, then at the Company's discretion it may charge a refundable deposit in lieu of charging the customer for the cost of the re-usable materials.

**Exhibit GP-3 Selected Provisions of PECO's Electric Service Tariff**

**14.1 SUPPLY OF METERS.** An EGS that is also an AMSP may provide Advanced Meter Services in accordance with the Electric Generation Supplier Coordination Tariff. Otherwise, subject to Rules 14.3 and 14.9, the measurement of service for billing purposes shall be by meters furnished and installed by the Company. The Company will select the type and make of metering equipment to be used for meters supplied by the Company, and may, from time to time, change or alter the equipment, its sole obligation being to supply meters that will accurately and adequately furnish records for billing purposes. In fulfilling its obligations with respect to metering and meter reading, and with respect to AMSPs that provide Advanced Meter Services, the Company will comply with Electric Generation Supplier Coordination Tariff.

**PECO Exhibit GP-7**

**MAP Showing AMI Meters Near Povacz Residence**



# of Meters

- Yellow = 1
- Blue = 2
- White = 3
- Green = 4
- Red = 5
- Orange = 6
- Pink = 7
- Purple = 8
- Brown = 9+
- Black = No



COMMONWEALTH OF PENNSYLVANIA  
PUBLIC UTILITY COMMISSION

-----X  
SUSAN KREIDER V. PECO POWER :  
COMPANY :  
 Initial Hearing. Various :Docket No. C-2015-2469655  
 Disputes :  
 -----X

Pages 1 through 217 Hearing Room 4125  
 4th Floor  
 801 Market Street  
 Philadelphia, Pennsylvania

Monday, March 7, 2016

Met, pursuant to notice, at 10:00 a.m.

BEFORE:  
 DARLENE D. HEEP, Administrative Law Judge  
 CHRISTOPHER PELL, Administrative Law Judge

APPEARANCES:  
 SUSAN KREIDER  
 169 West Queen Lane  
 Philadelphia, Pennsylvania 19144  
 (Pro se)  
 WARD SMITH, Esquire  
 SHAWANE LEE, Esquire  
 2301 Market Street  
 Philadelphia, Pennsylvania 19103  
 (For the Respondent/PECO)

EXHIBIT  
 C-2015-2469655  
 PECO GP8  
 1/27/16 PHLEP

Commonwealth Reporting Company, Inc.  
 700 Lisburn Road  
 Camp Hill, Pennsylvania 17011

(717) 761-7150

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 1-800-334-1063  
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Ex GP-8

96

1 GP-1 labeled: "Landis + Gyr, G-Y-R, AMR System.

2 Was this prepared by you or under your direction or  
3 supervision?

4 A. Yes, it was.

5 Q. Is this -- what does this represent?

6 A. This represents the system that is used to read AMR  
7 based meters at PECO.

8 Q. Is this the system -- what's called the legacy  
9 system at PECO?

10 A. Yes, that is correct.

11 Q. When was this installed?

12 A. This system was installed starting in 2000, the year  
13 2000. Installation completed in 2003.

14 Q. Okay. Is it still operating as an overlap to the  
15 AMI system as you --

16 A. Yes, it is.

17 Q. Tell us what is being represented in this graphic  
18 please?

19 A. Yes, starting from left to right we have an electric  
20 meter here. The electric meter transmits data to a device  
21 called a MicroCell Controller.

22 Q. And when you say transmitted, is that what's  
23 represented by the yellow arrow -- that yellow arrow that  
24 is one direction?

25 A. Yes. Yes. This meter transmits data once every

FORM 2

1 five minutes throughout the day.

2 Q. Okay. And since the arrow is in one direction, what  
3 are you trying to represent there?

4 A. That is a one-way transmission. There's no way to  
5 communicate to the meter.

6 Q. Okay. And you said it transmits how often?

7 A. Once every five minutes.

8 Q. Thank you. And the MicroCell Controller it receives  
9 the information and then what happens?

10 A. The MicroCell Controller collects the five-minute  
11 transmissions from the meter, then once a day relays that  
12 to a second device, a Cell Master through another wireless  
13 connection.

14 Q. Okay. Then what happens to the data?

15 A. Once at the Cell Master, it is then forwarded to  
16 the -- what I'll call the head-end controller. That is the  
17 server that operates the system and then ultimately to  
18 PECO's internal applications.

19 Q. Now, I note that you -- in the communications  
20 between the Cell Master to the Cell Net Head End and then  
21 onto to the PECO system, there's no arrows.

22 How does that communication occur?

23 A. This is occurring through the public telephone  
24 network or the internet.

25 Q. Okay. And the PECO systems that you have listed on

1 the right-hand side, you have abbreviations there of MDMS.

2 Let's start with that one.

3 What is MDMS?

4 A. The MDMS is the Meter Data Management System.

5 Q. And what does it mean to be integrated with the  
6 MDMS?

7 A. This means that data is sent from the Cell Net  
8 Head-End to the system and the data is populated in that  
9 database.

10 Q. And then what does PECO do with that saved data?

11 A. That data is ultimately used to produce bills. The  
12 CIS system as designated here would be the customer  
13 information system. That is responsible to create the bill  
14 itself and then I also reference the OMS System which is  
15 the outage management system. This is a system we use to  
16 process and track outages.

17 Q. Okay. Now when this system was fully deployed, how  
18 many of these meters existed on the PECO System?

19 A. In excess of 1.7 million electric meters.

20 Did everyone have them?

21 A. Yes.

22 Q. Did Ms. Kreider have one?

23 A. Yes.

24 Q. How many of the MicroCell Controllers existed at  
25 that point in time?

1 A. Approximately 8300.

2 Q. Okay. How many of the Cell Masters?

3 A. Ninety Cell Masters.

4 Q. We're going to hear later from Dr. Davis who is  
5 going to talk about radio frequency exposures from these  
6 systems.

7 Did you provide Dr. Davis with any information about  
8 the technical characterizes of this system so that he could  
9 do those calculations?

10 A. Yes, I did. I gave several different elements  
11 including what the frequency of the system operates.

12 Q. And that is?

13 A. The frequency is a band from 902 to 927 megahertz.

14 Q. Okay. Next?

15 A. I also discussed the power output while transmitting  
16 of the meters themselves which is one watt. I've also  
17 discussed as said before the periodicity of the transmit  
18 which is every five minutes.

19 Q. Okay. Is there any other information?

20 A. This information such as the gain and the  
21 directionality of the antennas and the maximum electric  
22 field of the meter itself.

23 Q. Okay. Thank you. Now I would like to direct your  
24 attention to what has been marked Exhibit GP-2 which was  
25 previously distributed in part to Ms. Kreider and I'll

1 place a copy of GP-2 up on the board here.

2 Now tell us what was -- was this prepared by you  
3 under your direction and supervision?

4 A. Yes, it is.

5 Q. Tell us what you're referencing in this graph?

6 A. This illustration represents the AMI Advanced Meter  
7 Platform that we are currently using to read meters.

8 Q. And let's start with the question that was asked of  
9 the last witness.

10 Why is PECO installing this system?

11 A. This system is being installed in direct response to  
12 Pennsylvania Act 129 of 2008.

13 Q. And let's ask the specific question that Ms. Kreider  
14 asked earlier.

15 Why are we installing -- why is PECO installing it  
16 now rather than waiting until 2023?

17 A. The directive was to install the meters -- install  
18 the entire system by 2023. That was given such a long  
19 duration to account for the time it takes to install such a  
20 system. Specifically, to visit over 1.7 million locations  
21 and also to install the communication network and -- of the  
22 back office IT systems.

23 Q. When did PECO begin the installation of the AMI  
24 System?

25 A. In 2010.

1 Q. When did it become energized?

2 A. The communication network became energized  
3 immediately.

4 Q. Okay. Now we heard Ms. Eison testify earlier that  
5 we're at over 1.7 million meters installed with a few  
6 thousand left.

7 When do you anticipate finishing installation of all  
8 the meters?

9 A. That will be this year in the next two months I  
10 believe.

11 Q. Thank you. Now take us through this system and  
12 compare it, if necessary, to the prior system.

13 A. Certainly. In this case, we can start with the AMI  
14 meter that's depicted in the left-hand side of the screen.  
15 That meter has two communication means. The primary means  
16 is to the Tower Gateway Base Station. This is a collector  
17 that we have located typically in substations. We have  
18 approximately 179 of these collectors. The AIM meters do  
19 transmit much less frequently than the AMI readers  
20 themselves.

21 Q. And how frequently do the -- you said the AMR  
22 meters, the current meters, transmits every five minutes.

23 How often do these transmit?

24 A. These typically transmit ten times a day on  
25 average.

1 Q. Okay. What's the maximum length of time that one of  
2 these can transmit in a day?

3 A. The maximum is 96 times per day.

4 Q. And that would be every 15 minutes?

5 A. Correct.

6 Q. Thank you. What was the approximate cost of this  
7 effort to install these meters and gateway stations and all  
8 related materials?

9 A. It was an approximately 750 million dollar  
10 project.

11 Q. Now, Ms. Kreider, has suggested the possibility of  
12 installing fiber optics for the communications that we are  
13 currently doing as radio frequency communications.

14 Did PECO evaluate the possibility of using fiber  
15 optics for those communications?

16 A. During our discovery phase, we looked at several  
17 different technologies. Fiber optics are not commonly  
18 available for this purpose. If it were to be available, it  
19 would be considerably more costly.

20 Q. What is considerably more costly mean?

21 A. Into the billions of dollars.

22 Q. Thank you. Did you provide any information to  
23 Dr. Davis to assist in his calculation of the radio  
24 frequency fields from this system?

25 A. Yes, similarly as the AMI system that provide the

1 frequencies that the meter transmits.

2 Q. Which are?

3 A. In this case, it's 901.1 to 901.2 megahertz.

4 Q. And that is for the -- now we're going to talk about  
5 this yellow leg first we're going to talk about?

6 A. Yes. I also provided information on the power  
7 outlet while transmitting which is two watts and then the  
8 transmit periodicity as I spoke of before.

9 Q. That was the ten times per day?

10 A. Yes.

11 Q. Now let's talk about the other transmitter over  
12 here. I've heard you refer to that not on this testimony  
13 yet, but previously the ZigBee transmitter?

14 A. Yes, that is a communication brand name for  
15 communications into the home for consumer devices.

16 Q. Can I ask you to talk about the characteristics of  
17 the radio transmissions of that device?

18 A. Yes, certainly. This information was provided as  
19 well, but typically at 2400 megahertz -- to be channeled  
20 that is and the power output would be approximately 130  
21 milliwatts.

22 Q. Okay. And that's less than one watt?

23 A. Yes, 1,000 times less.

24 Q. Did you provide that information to Dr. Davis as  
25 well?

1 A. Yes, I did.

2 Q. Thank you. Now, let's talk about the functionality  
3 of these AMI meters with their communications. You stated  
4 earlier that they were installed in response to Act 129.  
5 Does a meter have to have certain characteristics in order  
6 to be compliant to Act 129?

7 A. Yes, it does. Act 129 specifies 14 different  
8 functions including heavy bidirectional communications.  
9 Have the ability to report outages and having the ability  
10 to transmit energy consumption and the price of energy to  
11 the home.

12 Q. Now have you done an evaluation of whether the PECO  
13 AMI system meets all 14 characteristics?

14 A. Yes, it does.

15 Q. Now that we understand some of that function of the  
16 AMI system, could you please tell us what some of the  
17 operational advantages are of having the AMI system in  
18 place as compared to the AMR system?

19 A. Yes, the AMR system is designed to report monthly  
20 meter readings. The AMI system by Act 129 requirements  
21 provides hourly data to both PECO and the consumers.  
22 Furthermore, there are other advanced functions of the AMI  
23 platform such as outage management. Whereby if the meter  
24 will tell us when power is lost and when power is restored.  
25 This has helped us enable enhanced reliability and how the

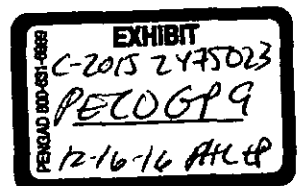
Exhibit GP-9

PECO FCC Licenses

Covering the Range 901.1 – 901.2 and 940.0 – 940.01

Frequency	License Number (Call Sign)	Comment
900.00 -- 900.05 940.00 – 940.05	WQUZ510	Attached
901.05 – 901.1 940.05 – 940.1	WQUZ511	Provided by Ms. Kreider in Appendix 51 (and also attached)

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ULS License

**PCS Narrowband License - WQUZ510 - PECO Energy Company**

Call Sign	WQUZ510	Radio Service	CN - PCS Narrowband
Status	Active	Auth Type	Regular

**Market**

Market	NWA255 - U.S. and Possessions	Channel Block	01
Submarket	10	Associated Frequencies (MHz)	000901.00000000- 000901.05000000 000940.00000000- 000940.05000000

**Dates**

Grant	02/25/2015	Expiration	01/09/2025
Effective	02/25/2015	Cancellation	

**Buildout Deadlines**

1st	2nd
-----	-----

**Notification Dates**

1st	2nd
-----	-----

**Licensee**

FRN	0003268000	Type	Corporation
-----	------------	------	-------------

**Licensee**

PECO Energy Company 2900 Lord Baltimore Dr. Baltimore, MD 21244 ATTN Maurice A. Noel	P:(410)470-8561 F:(410)470-8599 E:Maurice.Noel@constellation.com
---	--

**Contact**

Ballard Spahr LLP  201 S. Main Street, Suite 800 Salt Lake City, UT 84111 ATTN Sharon M. Bertelsen	P:(801)531-3000 F:(801)531-3001 E:bertelsens@ballardspahr.com
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**Ownership and Qualifications**

Radio Service Type	Mobile		
Regulatory Status	Non-Common Carrier	Interconnected	No

**Alien Ownership**

Is the applicant a foreign government or the representative of any foreign government? No

Is the applicant an alien or the representative of an alien?

Is the applicant a corporation organized under the laws of any foreign government?

Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative

thereof or by any corporation organized under the laws of a foreign country?

Is the applicant directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country?

The Alien Ruling question is not answered.

**Basic Qualifications**

The Applicant answered "No" to each of the Basic Qualification questions.

**Tribal Land Bidding Credits**

This license did not have tribal land bidding credits.

**Demographics**

Race

Ethnicity

Gender

ULS License

**PCS Narrowband License - WQUZ511 - PECO Energy Company**

Call Sign	WQUZ511	Radio Service	CN - PCS Narrowband
Status	Active	Auth Type	Regular

**Market**

Market	NWA255 - U.S. and Possessions	Channel Block	02
Submarket	10	Associated Frequencies (MHz)	000901.05000000- 000901.10000000 000940.05000000- 000940.10000000

**Dates**

Grant	02/25/2015	Expiration	01/25/2025
Effective	02/25/2015	Cancellation	

**Buildout Deadlines**

1st	2nd
-----	-----

**Notification Dates**

1st	2nd
-----	-----

**Licensee**

FRN	0003268000	Type	Corporation
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**Licensee**

PECO Energy Company 2900 Lord Baltimore Dr. Baltimore, MD 21244 ATTN Maurice A. Noel	P:(410)470-8561 F:(410)470-8599 E:Maurice.Noel@constellation.com
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**Contact**

Ballard Spahr LLP  201 S. Main Street, Suite 800 Salt Lake City, UT 84111 ATTN Sharon M. Bertelsen	P:(801)531-3000 F:(801)531-3001 E:bertelsens@ballardspahr.com
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**Ownership and Qualifications**

Radio Service Type	Mobile		
Regulatory Status	Non-Common Carrier	Interconnected	No

**Alien Ownership**

Is the applicant a foreign government or the representative of any foreign government? No

Is the applicant an alien or the representative of an alien?

Is the applicant a corporation organized under the laws of any foreign government?

Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative

thereof or by any corporation organized under the laws of a foreign country?

Is the applicant directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country?

The Alien Ruling question is not answered.

**Basic Qualifications**

The Applicant answered "No" to each of the Basic Qualification questions.

**Tribal Land Bidding Credits**

This license did not have tribal land bidding credits.

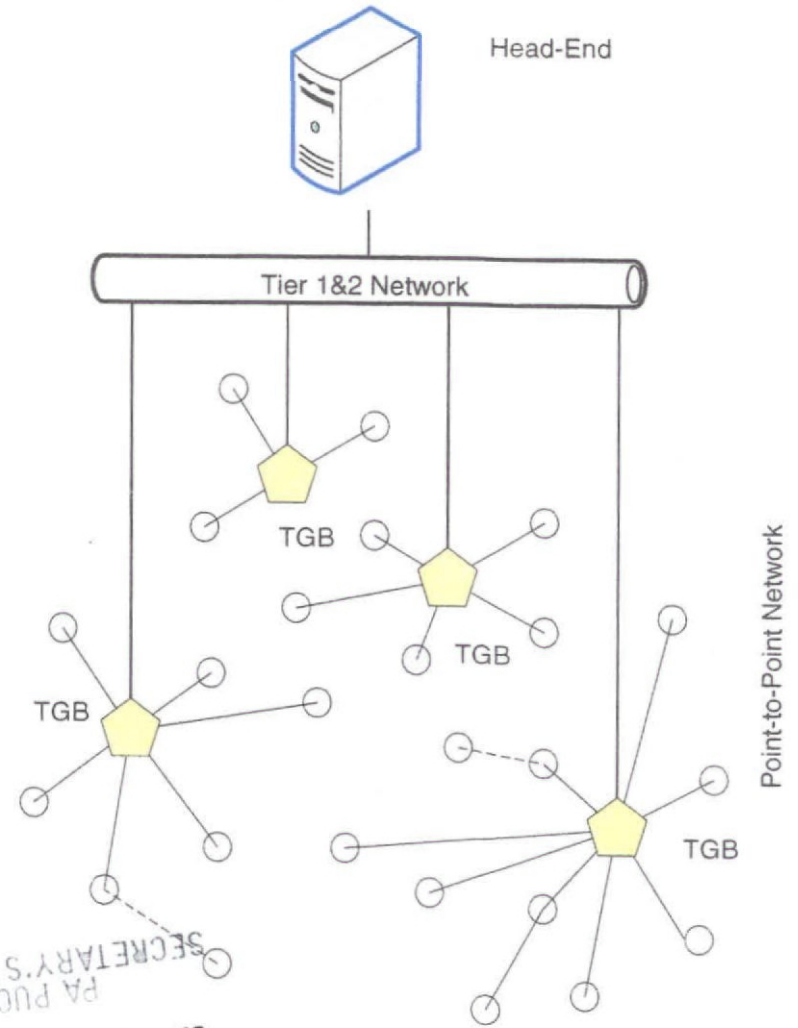
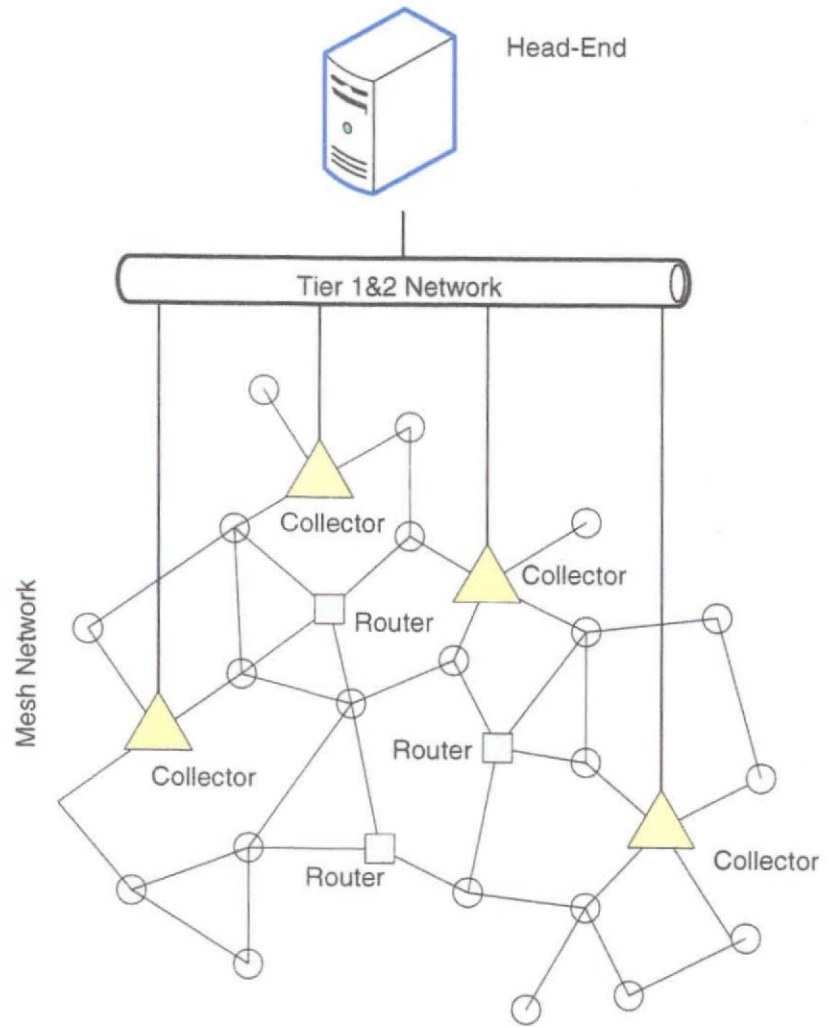
**Demographics**

Race

Ethnicity

Gender

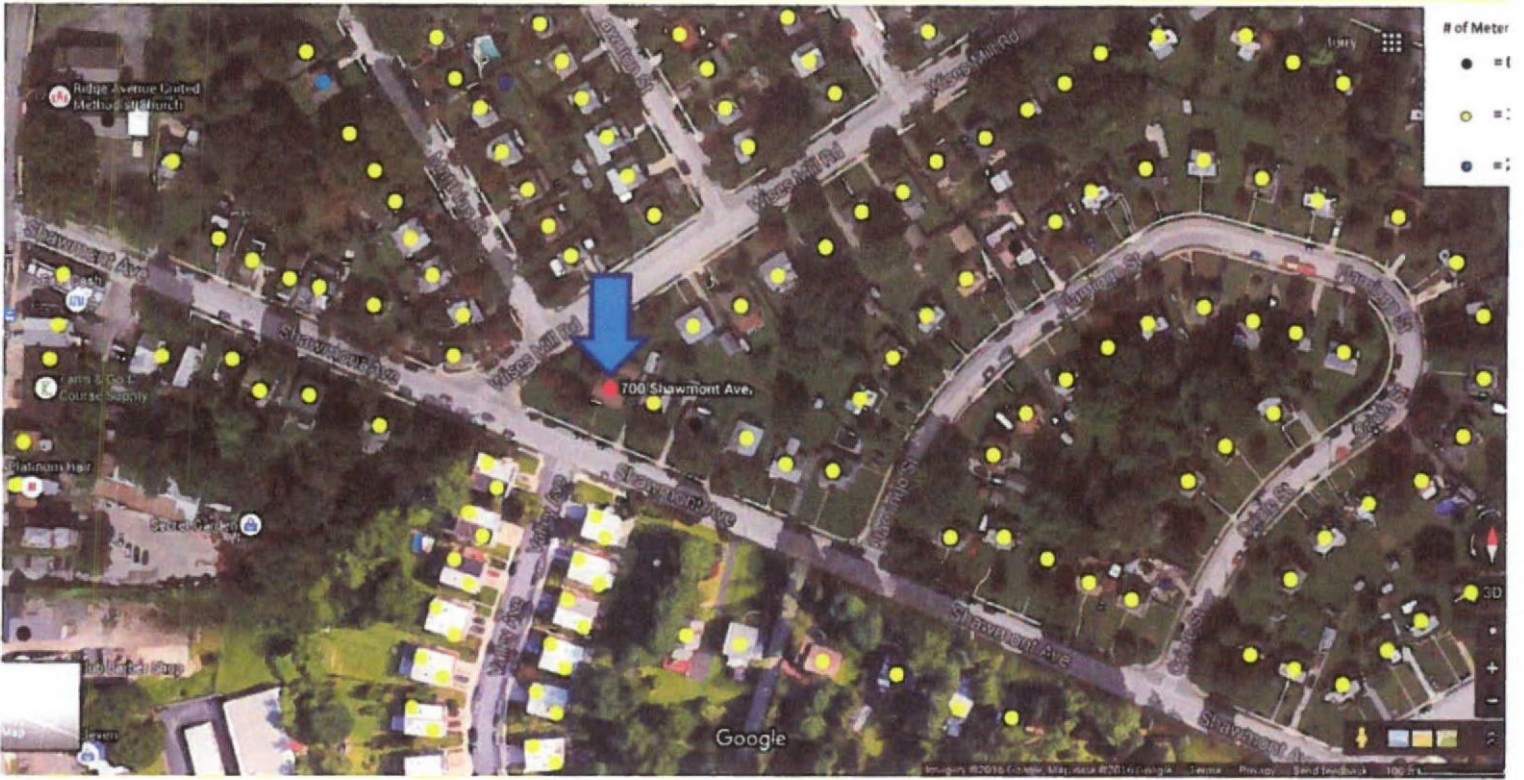
# Mesh vs. Point-to-Point



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 C-2015-295023  
 PECO G&P ID  
 12-16-16-PM-ef

PELO & P-11



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PA PUC  
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