EXH. IH-1T
DOCKET UE-220701
WITNESS: IAN HAGAN

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

ALEXANDER AND ELENA ARGUNOV, THOMAS AND HEIDI JOHNSON, CHAD AND VICTORIA GROESBECK **Complainants,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-220701**

PREFILED RESPONSE TESTIMONY (NONCONFIDENTIAL) OF

IAN HAGAN

ON BEHALF OF PUGET SOUND ENERGY

FEBRUARY 9, 2023

PUGET SOUND ENERGY

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I. INTRODUCTION

Q. Please state your name, business address, and position with Puget Sound Energy.

A. My name is Ian Hagan, and my business address is Puget Sound Energy, P.O. Box 97034, Bellevue, Washington 98009-9734. I am employed by Puget Sound Energy ("PSE") as an Engineer III.

Q. Have you prepared an exhibit describing your education, relevant employment experience, and other professional qualifications?

A. Yes, I have. It is Exhibit IH-2.

Q. What are your duties as an Engineer III for PSE?

A. As an Engineer III at PSE I support Meter Operations, Data Integrity, and Billing to ensure the meter reads are accurate. These responsibilities include, but are not limited to, lab testing of equipment and troubleshooting in the field or in an office environment.

Q. What topics are you covering in your testimony?

A. My testimony addresses how PSE's meters accurately measure and record energy usage in kWh and how those measurements are reliable for purposes of eventually billing a customer.

II. RESPONSE TESTIMONY

A. How PSE Measures Energy Usage

Q. Have you reviewed the Complaint and the Prefiled Direct Testimony of Elena Argunov, in Docket UE-220701?

A. Yes, I have.

Q. Please explain your understanding of why Ms. Argunov claims PSE is "billing for consumption to be 4 times greater than it should be" and whether you agree with her claim.

A. My understanding is Ms. Argunov claims PSE is measuring kilo-watt ("kW") power demand with its Advanced Metering Infrastructure ("AMI") meters in fifteen-minute increments and then converts kW demand to kilo-watt hours energy ("kWh") by multiplying the kW demand read by a factor of four. As discussed in more detail below, this is not correct. PSE does not measure energy usage in this way. PSE's AMI meters measure kWh energy and record kWh reads in the Load Profile every fifteen minutes. No conversion from kW demand is taking place.

Q. Please explain the Load Profile.

A. A load profile records information about energy kWh usage through time. A load profile can contain up to eight metrics, or channels, in 5 to 60 minute intervals. PSE utilizes three metrics, or channels, in AMI meters: +kWh (delivered to customer), -kWh (received from customer), Vh PhA (service voltage). This record is sent to PSE in data packets for billing.

Q. How do PSE meters measure energy usage?

A. PSE meters measure and record energy usage in kWh for residential customers and small commercial customers.

A kWh is a standard unit of electrical energy regularly used by power utilities to bill customers for electrical consumption.

Q. Please explain how PSE's residential meters measure energy usage in kWhs.

A. AMI meters have voltage and current sensors that send voltage and current signals into the measurement processor. The measurement processor then digitizes the energy consumption data using a circuit that toggles a switch between two contacts, creating an impulse each time. Each throw of the switch corresponds to a constant, known quantity of energy, watt hour ("Wh"). The meter tracks both the count of these pulses for the kWh energy calculation and how fast the pulses occur for demand.

Q. Are PSE meters calibrated to measure both kW and kWh?

A. Yes, kW demand and kWh energy are measured simultaneously and recorded in different registers within the meter

Q. Why do PSE's "meter configuration" documents (Exhs. EACCH-13C, 14C, 15-C, 16C and 17C) show kW as the measurement units for Demand Metric.

A. This simply shows the meter is capable of measuring kW for demand billing, which is used for commercial and industrial customers with large electrical loads. Even though AMI residential meters have the capability to measure kW demand, this value is not used as a billing parameter for the typical residential and small commercial customers since they do not typically have a load large enough for demand billing. In contrast to the typical residential customer, these large load customers are not only billed for the amount of energy (kWh) they consume, but they are also billed for the highest demand per month. The standard metric for power usage in the event that parameter is needed for demand billing is kW. This is a separate measurement from kWh energy data used for all customers. kW demand is a billing parameter for customers with large electrical loads, not residential customers such as the Complainants.

Q. Do PSE's residential meter reads need to be converted into kWhs? Please explain.

A. No. The measurement processor within PSE's residential AMI meter is configured to store kWh energy data in the load profile. Every fifteen minutes it

will record the kWh energy usage, and there is no need to convert because the usage is already measured in kWh. Every four hours the meter will transmit the reads out in a data packet over the AMI network to the billing system, meaning the energy used for a particular fifteen-minute increment does not need to be divided nor is a multiplier used because the energy used is already recorded in kWhs by the meter. The kWh count for usage, or kWh energy register, is consistently running and does not reset every fifteen minutes or every hour as Ms. Argunov implies. For additional information regarding PSE's load profile as shown in the meter configuration documents, please see the Ms. Argunov's Exh. EACCH-13 and Exh. EACCH-14C. The Load Profile Configuration found on page three, shows the measurements from the meter are in kWh.

Q. Are PSE meters ever used to record interval demand or time of use billing? Please explain.

A. Some PSE meters record kWh interval energy as well as kW power demand, as these are needed for billing for certain commercial and industrial tariffs. For PSE AMI residential metering, the capability to register kW demand or time of use kWh energy consumption is possible, but it is not typically used since it is not needed for a typical residential billing.

Q. Ms. Argunov claims Exhs. EACCH-3.1, EACCH-3.2, EACCH-3.3C demonstrate PSE meters are not registering kWh and instead are reading in KW intervals. Do you agree? Please explain.

A. No. As I mentioned above, PSE meters have the capability to measure kW for demand billing, but the meters measurement for energy usage that is recorded and transmitted for residential customers is kWh. I will address each of these three exhibits that Ms. Argunov relies on and explain each one.

Exhibit EACCH-3.1 shows the display panel of two PSE meters, one which appears to display kW and another where the display shows kWh. However, a still photo of the display is not representative of all that is happening on the display. For that, we would need a video to show the changing display screen. For a typical class 200 AMI meter, which is the photo on the right, the display is constantly scrolling through several items: 888 Segment check, DIS Service Disconnect Switch status, 001 Delivered kWh, 002 Received kWh. The photo on the left shows a class 320 opt-out meter, which is a non-communicating meter. This meter is also scrolling through several items: 888 Segment check, 001 Delivered kWh, 002 Received kWh, 003 Max Demand (kW). The reason the class 320 opt-out meter shows kW demand on screen 003 is because this meter is capable of handling loads large enough for demand (kW) billing. Whether or not a customer is actually billed for kW demand is determined by their rate schedule.

Additionally, the pie shaped symbol in the left corner of the display is not showing that usage data is set for 15-minute intervals, as Ms. Argunov claims.

Exhibit EACCH-3.2 shows Ms. Argunov taking the average of fifteen-minute interval reads, and inferring these reads are in kW rather than kWh. This does not correspond with the actual usage of a customer because the fifteen-minute interval reads are in kWhs rather than kW. It also appears Ms. Argunov, in column L of the "Sample" tab, is taking kWh consumption data in column G and dividing that value by 4. This is incorrect. The consumption is already in kWh, therefore no division or conversion is necessary. Additionally, Ms. Argunov incorrectly equates kWh with speed in the "Similar Example" tab, whereas when the meter measures energy usage in kWh, as PSE's meters do, it is measuring the amount of energy used rather than the flow of energy. In Ms. Argunov's example, kWh is more equivalent to distance traveled, recorded every 15 minutes, while kW demand is more equivalent to average speed over a 15-minute interval.

Finally, Exhibit EACCH-3.3 appears to be a data request response which confirms the enabled setting in the meter is kWh energy delivered even though there are other functionalities. It is my understanding on page 5 of her Prefiled Direct Testimony, Exh. EACCH-1, Ms. Argunov is relying on the fact that the "Demand Metric" is set to kW on the meter configuration documents (Exhs. EACCH-13C, 14C, 15C, 16C, and 17C) to make these claims. kW demand and kWh energy are two different metrics. kW demand and kWh energy are measured simultaneously and recorded within separate registers of the meter. The Load Profile section of the configuration file (page 3 of Exh. EACCH-13C, 14C, 15C, 16C and 17C) is used for recording usage and indicates the meter is recording energy values +kWh (delivered to customer), -kWh (received from customer), and

voltage in 15-minute intervals. kW demand data is not recorded or communicated in the Load Profile. None of the exhibits mentioned here confirm Ms. Argunov's claims.

Q. How are AMI residential meters different than a typical non-communicating opt-out meter?

A. The metrology hardware is the same between an AMI meter and common non-communicating meters on PSE's electric system. The primary difference is that the non-communicating meter does not have the Gridstream communication module, or radio, to send the kWh data back to PSE's billing data collection system so the non-communicating meters are manually read. To facilitate manual meter reading the opt-out meter will have a magnetic optical port on the cover so meter readers can download the load profile data. Also, the non-communicating meter is not equipped with a remote disconnect switch and must be disconnected manually.

B. PSE's Meters Are Industry Standard and Reliable

Q. How do PSE's meters record actual electricity usage?

A. PSE's meters are pulse counting meters developed by Landis and Gyr ("L+G"). L+G meters digitize each energy pulse, which in turn registers the energy usage in kWh.

Q. Do AMI meters record actual energy usage in a unique way that is different from previous meters used by PSE?

A. No, the AMI meters do not record actual energy usage in a unique way compared to previous solid-state meters used by PSE.

Q. Why might an AMI meter not communicate usage?

A. An AMI meter may not communicate usage if there is a failed communication module on a meter, or a failed meter. A meter failure is an unlikely cause because the customers meters were accuracy tested, and the meters with radios are transmitting data today. Alternatively, it could be that the AMI meter communication network is experiencing problems in that area.

Q. If a meter read does not communicate usage to the billing platform, is the meter still recording energy usage? Please explain.

A. Yes, even if a meter is unable to transmit energy usage data, the meter is still recording and storing energy usage data in the load profile and on the energy register. Keep in mind the +kWh energy register is a running total of the energy that has gone through the meter, and the load profile is where the fifteen minute kWh interval data is stored. The onboard memory of the meter can store up to 102 days of load profile data before the old load profile data is overwritten. The +kWh energy register will continue to run and display the running total even if old load profile date is being overwritten. The meter will continue to attempt to transmit the energy usage information.

Q. How does PSE test a meter for accuracy?

A. PSE Meter Testers and Journeymen carry with them a measuring device called a Watthour Standard. This Watthour Standard is a watthour meter that is routinely calibrated biennially per the requirements of the NIST (National Institute of Standards and Technology). A known electrical load is sent through both the meter and the Watthour Standard. The Wh energy accumulation is compared between the meter and Watthour Standard for accuracy. This practice is not unique to PSE, and it is used industry wide.

Q. Does PSE use a multiplier when it measures usage and transmits it for residential billing?

A. No, all kWh reads in the 15-minute Load Profile data have no multiplier. As described above, this is because the meter already records energy usage in kWh.

Q. Please explain whether PSE's meters are industry standard.

A. Yes, the AMI meters follow American National Standards Institute (ANSI) industry standards. Specifically, they adhere to ANSI C12.1 for electric meters, ANSI C12.10 for physical aspects of watt hour meters, ANSI C12.18 Protocol specifications for ANSI Type 2 Optical Port, ANSI C12.19 Utility Industry end device data tables, ANSI 12.20 for electricity meters 0.2 and 0.5 accuracy classes.

Q. Please explain whether interval data is in kWh or needs to be converted to kWh.

A. The 15-minute Load Profile data is measured and recorded in kWh. No conversions are necessary.

III. CONCLUSION

Q. Does that conclude your prefiled response testimony?

A. Yes, it does.