Jefferson County Public Utility Dist. No. 1, WA

FOLLOW-UP QUESTIONS

1. **The meters need to be accurate. We should also have verification that they have been tested in conditions similar to what they will face in our marine environment.**

Response: Itron has rigorous quality assurance processes to ensure the safety, accuracy and reliability of our meters. We comply with safety and performance standards established by a number of industry standards bodies including the American National Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE) and Underwriter's Laboratory (UL).

ANSI is the official representative of the International Organization for Standardization (ISO) and sets electrical safety and operating standards for the United States. These standards have also been adopted by many utilities in the U.S. and Canada. These safety and operating standards address topics such as humidity, rain, voltage surge and other areas to ensure meters operate properly when functioning within certified operational parameters.

Itron meters meet all applicable standards for accuracy. Our meters are rigorously tested for accuracy before they leave the manufacturing plant, and are regularly tested by our utility customers and third parties to ensure continuing accuracy. In fact, studies done by independent third parties have consistently showed that digital meters are more accurate than their mechanical predecessors. A comprehensive study on smart meter accuracy ordered by the Texas Public Utility Commission conducted by Navigant Research showed that 5,622 of 5,627 (or 99.91 percent) of smart meters from Itron and another manufacturer randomly pulled from the field and tested were accurate to within the +/- 0.5 percent accuracy standard required by the utilities there.

With regard to Jefferson County's marine environment, OpenWay Riva CENTRON meters are ANSI C12.1 compliant devices. The meters pass all requirements specified in ANSI C12.1 Section 4.7.3.22 Weather Simulation Test, ANSI C12.1 4.7.3.23 Salt-Spray Test, and ANSI 4.7.3.24 Rain Tightness.

For more compliance information about our meters, please refer the Accelerated Life Test Reports that accompanies our response.

2. **The meters need to be safe. Having documentation of where the meters are in use and asking if they have had any safety issues. Having documentation on what organizations have certified the meters and what standards and codes they meet (UL, International Electrical Code, etc.).**

Response: Since the product's introduction in 1998, Itron' has manufactured and shipped some 60 million CENTRON® solid-state electricity meters to utilities throughout North America. This is the underlying solid-state metering technology platform Jefferson County PUD is planning to install. In addition, Itron has installed more than 20 million OpenWay CENTRON meters at leading utilities throughout the U.S. and Canada in support of their advanced metering and smart grid initiatives. These products have operated safely and reliably in the field for many years and they continue to set the standard for safety in the metering industry.

In addition, OpenWay Riva CENTRON single-phase meters are UL 2735 approved. The OpenWay Riva CENTRON polyphase meter is pending UL 2735 approval. The anticipated approval date is 4/28/18. The meters have also been approved by Measurement Canada and Met Labs.

Below is a list of some of our current customers that have OpenWay CENTRON electric meters deployed.

Utility	Project Summary	Deployment Period	Location
AVANGRID	12K electric meters	2017	Ithaca, New York, USA
Avista Utilities	253K electric meters	2017	Spokane, Washington, USA
BC Hydro and Power Authority	1.95M electric meters	2011	British Columbia, Canada
Burlington Electric Department	20.5K electric meters	2012	Burlington, Vermont, USA
CenterPoint Energy	2.3M electric meters	2009	Houston, Texas, USA
Consumers Energy	1.8M electric meters	2012	Michigan, USA
DTE Energy	2.6M electric meters	2009	Detroit, Michigan, USA
Duke Energy	2.0M electric meters	2014	Multiple states, USA
Duquesne Light Company	625K electric meters	2013	Ohio, USA
FirstEnergy	2.1M electric meters	2011	Multiple states, USA
FortisBC	130K electric meters	2014	British Columbia, Canada
Glendale, City of	86K electric meters	2009	Glendale, CA, USA
Los Angeles Department of Water and Power	50K electric meters	2012	Los Angeles, CA, USA
Madison Gas & Electric	7.5K electric meters	2016	Madison, Wisconsin, USA
National Grid USA	15K electric meters	2012	Massachusetts, USA
San Diego Gas & Electric	1.4M electric meters	2009	San Diego, California, USA
Southern California Edison	5M electric meters	2009	Los Angeles California, USA
Wadsworth, City of	12,000 electric meters	2010	Wadsworth, Ohio, USA

3. How will the customers' information and data will be kept confidential and not provided to 3rd parties?

Response: In providing operation of the smart metering system and delivery of data (i.e., Managed Services) to Jefferson County PUD, Itron is contractually obligated to abide by all applicable data privacy policies in place at Jefferson County PUD, as they pertain to customer information and/or data collected by the smart metering system. Itron will honor and enforce – without exception -- all applicable data privacy policies of the utility, as well as any additional data privacy provisions stipulated in the contract. We will never provide or sell any Jefferson County PUD customer data to third parties.

A possible exception to this would be if a data sharing request is made by the Jefferson County PUD - with proper authorization from participating customers. For example, if Jefferson County PUD provided

optional energy efficiency consulting services to its customers from a third-party provider that required metering-based data to do the analysis. This would require both utility and customer authorization for Itron to provide data to a third party to support a program or service such as this.

4. **Cybersecurity – how do we ensure the system cannot be hacked? Information from other utilities on their experience would also be helpful.**

Response: It is important to note that no personal identifiable information (PII) ever transits the network – only meter number, consumption information, and alerts, such as outage notifications. All messages between the endpoints and the OpenWay headend (OpenWay Operations Center) are encrypted to protect data integrity. In addition, command and control messages are encrypted and digitally signed with an asymmetric ECC key to protect integrity of control, preventing the meter from being spoofed by a system posing as OWOC. The local Wi-Fi interface is protected with a WPA2-AES-128 key. The WPA2-AES-128 key is different for each meter. A hacker attempting to access the system through a meter using the Wi-Fi local radio would not be able to affect the network beyond that meter. Systems upstream of the meter utilize strong encryption and individual account credentials to prevent the transmission of unauthorized data or commands. Web services are only exposed internally and thus are in an environment in which denial of service attacks will not occur. The security framework authenticates an access request from a web services call through the use of tokens. If the system hosting the web services can send an authentication token compatible with Microsoft's WCF Web Services framework (i.e., WS-Security Policy, WS=Trust WS-Federation and token profiles (Kerberos, SAML)), the headend can authenticate that user.

At the network level, every smart meter or grid device joining the mesh network must be authenticated to the network before being allowed access to the head end infrastructure. The mesh network is encrypted using the Federal Information Processing Standard (FIPS) Advanced Encryption Standard (AES). This encryption is independent of and additional to the data encryption described earlier. Hence there are two levels of encryption operating on the smart meter mesh network, one at the smart meter application level and one at the network level.

Itron has also partnered with a range of cyber security experts including IOactive, RSA Security, Thales and others, to design, develop, and rigorously test our systems. Itron also leverages the security investments of key technology partners such as Cisco and Microsoft, who spend billions of dollars each year on security.

Additionally, Itron Managed Services operations are certified under ISO 9001 and ISO 27001 Information Security Management System. All of our customers to date have accepted the Itron ISO certifications to fulfill their governance, risk management, and compliance requirements. These customers include large IOUs. Itron engages an independent audit company to provide annual recertification. We would be glad to provide our certification upon request.

5. **We need to have an opt-out policy in place.**

Response: We believe this is for Jefferson County PUD to respond to – as it appears you want to provide your customers an “opt out” mechanism for having an AMI meter installed.

6. **We need to address the issue of home privacy. We need to show how the meters cannot “spy” on the customer or operate in tandem with any appliances in the customers’ home or business. Explain what would be necessary for this to occur and how this can’t occur as they would be deployed.**

Response: In addition to their RF wireless and Powerline Carrier communications (PLC), Itron’s OpenWay Riva meters are also equipped with Wi-Fi radios to provide remote access to the meter for

utility workers during installation and if the meter ever needs reprogramming or maintenance in the field. This Wi-Fi radio uses robust security features that prevent potential hacking. Unlike a smart phone or laptop computer, the meters do not broadcast an SSID message required to identify and join Wi-Fi networks. In other words, no one can "see" it. Nor does the meter provide a Wi-Fi access point to the internet; that access point is the utility technician's laptop computer. Lastly, the Wi-Fi radio uses robust encryption and authentication measures to ensure security of data traffic when the Wi-Fi radio is utilized for field maintenance purposes.

Like other smart meters on the market, OpenWay Riva meters do provide the capability, with the customers permission, to support utility services and programs that enable the meter to communicate with in-home devices such as smart thermostats, displays, load control devices, EV chargers, or a smart inverter on a solar panel, and ultimately, smart appliances. This can be done through a gateway device in the home, using either wired or wireless communications, which then can connect to these devices for smart energy management purposes, provided they have the proper communications interface.

The ability for the smart meter to communicate and interact with other devices and assets in the customer home is only done with the customer's explicit permission or choice to enroll in a service or program that utilizes this connectivity. These communications capabilities support a broader portfolio of services and programs for consumers, including home energy management; time-varying rates; load control and demand response programs to manage peak demand; integration of customer-owned solar and other forms of distributed energy resources into the grid; etc. But these are always voluntary/opt-in services or programs that require the customer's express permission and consent.

This new generation of OpenWay Riva meters also has the ability to analyze high-resolution (1-second) data in the meter. These high-resolution data include watts, voltage, VARs, power factor, frequency and the utility utilizes the meter as a grid sensor to help ensure grid safety, efficiency and reliability. For instance, this data can be used to detect high-impedance connections or "hot spots" on distribution system wiring or a downed power line, enabling the utility to detect and repair safety problems quickly or alert the customer to a wiring problem that could be a fire hazard.

The ability to analyze this detailed data in the meter also opens up the possibility, with the proper software installed on the meter, for disaggregation of loads by appliance etc. in the customer premise. Load disaggregation opens many doors to improved energy efficiency for customers. Other companies provide load disaggregation services by installing specialized equipment (such as CT clamps) in the home. Itron is currently developing a load disaggregation application to run on its OpenWay Riva meters. When commercially available, this application would only be installed on meters where customers have specifically chosen load disaggregation services and authorized installation of the necessary software on their meter.

7. **State how often the meters would be sending out RF signals. During the testing phase, we would need to verify this with field measurements. At my own home when we took readings on the two Itron AMR meters at my house they were sending out signals every 30 seconds to 1 minute. This despite the statement by our staff that these meters should be communicating only once every 5 minutes. If we say the meters will communicate only once every 4 hours or some other timeframe, we need to be able to field verify.**

Response: OpenWay Riva meters communicate regularly throughout the day to send consumption data back to the utility; process and send alarm events, such as a power outage or restoration notification messages; or regular network management beaconing and coordination traffic to ensure the continuous connectivity and reliability of the mesh network. The utility may collect data two or three times per day, but

these regular transmissions for network connectivity may take place as often as every 30 seconds to a few minutes. These connectivity transmissions typically last a few milliseconds.

However, and this is a very important point, the frequency of the transmissions is irrelevant to the amount of RF emissions the devices produce or people are subjected to. That may sound counter-intuitive but RF exposure is determined by three variables: the duty cycle or the total amount of time spent transmitting during a 24-hour period; the signal strength of the communicating device; and the distance the device operates from people. Because of the way they operate and where they are located, smart meters result in much less exposure to RF emissions than other common devices such as cell phones.

- **Limited time on the air:** Itron meters transmit for very short intervals - spread throughout the day - and thus have a very small duty cycle. This results in RF exposure levels that are a fraction of the limits specified by regulatory agencies, including the FCC and Industry Canada.
- **Low power**: Our devices are low power (one watt or less). These low levels of RF exposure are well below the regulatory limits.
- **Limited proximity to humans:** Our devices are typically installed outside the home. Since RF energy falls off very quickly with distance, this typically represents much lower exposure than other emitting devices located within the home.

The average duty cycle for Itron's OpenWay meters is 0.21 percent or less than three minutes per day. This is based on an extensive 2015 field study at BC Hydro in Vancouver, BC, which has installed 2.9 million Itron OpenWay meters. This duty cycle figure includes communications to collect consumption data from the meter, meter alarm events such as outage notifications, periodic software and network upgrades, and network coordination to maintain connectivity in the mesh.

8. We need to verify whether the meters are doing any power switching or to what extent they are doing any power conversion to operate their own electronics.

Response: The OpenWay Riva CENTRON meters use a switch-mode power supply design that converts the AC voltage directly to the usable DC voltage. The meter is powered from the line side terminals and the energy used to run the meter is not billed to the end customer.

9. Do the meters have a battery or other energy storage device? What is the purpose of such battery or energy storage device?

Response: OpenWay meters include a lithium battery, soldered onto the board and designed to last the life of the meter. The battery is only used to maintain the meter's internal clock when the meter is without power.

10. What other technologies are available for getting the data from our meters? What would a business plan look like for each type of technology?

Response: There are several types of technologies that have been used over the years to improve the efficiency of traditional manual metering operations where a meter reader would go from house to house, visually read the meter, write down the info, then return to the utility office to re-enter the information in a billing system.

Itron, as a global industry leader, has developed and commercialized several of these technologies, some of which may still be in use at Jefferson County PUD or other nearby utilities, including:

- **Electronic Meter Reading**: Developed in the late 1970s and early 1980s: EMR took the paperwork out of meter reading by introducing portable handheld computers and application software so that meter readings could be entered electronically, improving the efficiency of the process.
- **Automatic Meter Reading**: This development in the 1980s introduced radio communication technology into handheld computers, vehicle-based computers and meters to automatically gather basic consumption data via wireless communications as a meter reader walked or drove down the street. This also alleviated customer privacy concerns for their property, and safety concerns for the meter reader, such as dangerous dogs.
- **Fixed Network Meter Reading**: Starting in the late 1990s, utilities began to install fixed network communications in their service territories to gather data from the meters. Jefferson County uses one of these early generation networks that was originally installed by Puget Sound Energy. So in some respects, Jefferson County already utilizes an early generation of smart meter technology, though that system is rapidly approaching the end of its useful life. These early networks, with collectors mounted on power poles, provided only one-way communications, and were the predecessors of today's more advanced two-way networks, such as what Jefferson County PUD is planning to implement, that provide significantly expanded capabilities and benefits compared to earlier systems.
- **Powerline Carrier Communications (PLC**): For decades utilities – especially rural cooperatives with lower density service territories -- have used their own power lines to transmit and collect data from customers' meters. However, PLC communications, by itself, presents several challenges in terms of speed, performance and infrastructure costs in the U.S. market that have made it a niche solution.
- **Cellular Communications**: Some utilities have chosen to implement smart metering systems that rely on cellular communications. Itron, which does provide cellular meters, has found cellular meters to be an effective "drop-in" solution to support strategic deployments in certain areas or customer segments. But the cost of the modems, recurring carrier charges, and potential lack of reliable cellular coverage in some locations have made for a challenging business case for all-cellular deployments.

For these reasons – primarily cost effectiveness, reliability and control that comes with owning the network -- utilities in the U.S. and Canada have overwhelmingly selected RF wireless communications technology for their smart metering projects over the years. According to the 2016 Scott Report, which tracks annual shipments of smart meters dating back to the 1990s, wireless RF communications account for about 90 percent of all smart meter shipments in the U.S. and Canada.

11. Verify how the meters measure electricity usage. Do they average the usage? Are there different kinds of technology used for measuring electricity usage? What do we know about the accuracy of each type of technology?

Response: OpenWay Riva CENTRON meters are ANSI C12.20 (American National Standard for Electricity Meters – 0.2 and 0.5 Accuracy Classes) compliant devices. The single-phase meter is a 0.5% compliant device while the polyphase meter is a 0.2% compliant device.

The OpenWay Riva CENTRON single phase meter uses the Hall Effect to measure metered current and voltage dividers.

The metrology performs the direct sampling of the voltage and current waveforms and the raw processing of these samples to compute all the energy quantities. Low level signals proportional to the service voltages and currents are connected to the analog inputs of the Application Specific Integrated Circuit

(ASIC). The ASIC individually samples the signals and sends the digital results to the compute engine in the ASIC 4,096 times per second. The compute engine takes these samples, applies precision calibration corrections and computes all the quantities required for the specific meter configuration.

All energy values are stored in the metrology and passed to the register via the Board-to-Board (B2B) connector using Itron protocol BLURT messages. The BLURT message contains: Wh d, Wh r, VAh d, VAh r, instantaneous voltage, instantaneous demand, and status information.

The OpenWay Riva CENTRON polyphase meter uses voltage dividers to extract a measurable voltage level and current transformers to extract a measurable current level from the service voltage and current. These circuits produce low-level signals that are exactly proportional to the service voltage and current. These low-level signals are sampled simultaneously by six analog-to-digital converters packaged in a single device. The voltage and current waveforms from each meter phase are sampled 4096 times per second. Using this type of circuit requires that the ground for the electronics be connected to line neutral.

Special techniques employed in the digital sampling process ensure that the sample measurements track the waveform shape exactly, even when the normal 50/60 Hz sine wave becomes distorted. These techniques make the meter much more accurate than standard induction/mechanical meters under high harmonic conditions because high-frequency waveform components do not go undetected.

A dedicated microprocessor analyzes the rapid succession of voltage and current samples and computes instantaneous values and energy quantities. Because processing is done at the sample rate, the meter can determine both active and reactive power.

The register processor accumulates the desired active energy, reactive energy, demand, Time-of-Use (TOU), and load profile quantities. In addition, this processor maintains the LCD and real-time clock.

12. We need to verify and document that energy used by the meter is not billed to the customer.

Response: The OpenWay Riva CENTRON meters are powered from the line side terminals and the energy used to run the meter is not billed to the end customer.

13. We need to show a full business plan for all the costs associated with the meter replacement, including costs over time and any agreements we must have with the manufacturer. We should compare these costs to our current meter system costs.

Response: Per the contract, Jefferson County PUD will conduct the meter change outs.

14. What types of metering systems are other public utilities using in WA State? What are their costs and experiences? Are they happy with their system?

Response: Utilities in Washington State, whether investor-owned or municipal, have selected and installed a variety of systems from the leading smart meter providers, including Itron.

- Avista in Spokane has selected OpenWay Riva from Itron (the same as Jefferson County PUD) and will begin territory-wide installation of 253K electric and 156K gas meters in mid-2018.
- Seattle City Light has selected an RF wireless smart metering system from Landis & Gyr with the entire system expected to be installed by 2019.
- Some Municipal and Public Utility Districts have moved ahead with installing smart meters, while other are still in the planning stages. Virtually all the public/municipal utilities in Washington state have announced their plans or intention to install smart meters in the coming years.

15. **Which utilities have purchased the Itron AMI meter? What has been the experience of these utilities? How many years have they been in service? What have their costs been? How has reliability been? Have they lived up to the sales pitch? Did they see metered electricity sales go up after replacement?**

Response: See response to question 2, which provides a partial list of utilities in the U.S. and Canada that have successfully implemented Itron's OpenWay smart metering technology. Together they represent more than 20 million smart meters and grid devices deployed and have been operating safely and reliably in the field for 10 years in some cases, with planned lifecycles of 20 years. Virtually all of these customers have found or created greater value from the system and data for their operations and customers than their original business cases contemplated. For instance, BC Hydro, just to the north of Jefferson County PUD, has stated that business case projected BC Hydro would achieve $70 million in benefits in the first three years. BC Hydro has realized $100 million in benefits during that time, primarily from operational savings. Because digital smart meters are very accurate, and because older mechanical meters tend to "slow down" over time and under-record actual usage, utilities tend to see a small increase in sales and customers a small increase in their bills once new smart meters are installed. This dynamic can and must be managed proactively through the customer communication and outreach process to avoid unnecessary customer concern and backlash.