EXH. CAK-4r
DOCKETS UE-190529/UG-190530
UE-190274/UG-190275
2019 PSE GENERAL RATE CASE
WITNESS: CATHERINE A. KOCH

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-190529** **Docket UG-190530 (*Consolidated*)**
In the Matter of the Petition of **PUGET SOUND ENERGY** **For an Order Authorizing Deferral Accounting and Ratemaking Treatment for Short-life IT/Technology Investment**	**Docket UE-190274** **Docket UG-190275 (*Consolidated*)**

THIRD EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF

CATHERINE A. KOCH

ON BEHALF OF PUGET SOUND ENERGY

REVISED
AUGUST 22, 2019

REVISED
JANUARY 29, 2020

JUNE 20, 2019

PUGET SOUND ENERGY

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I. ADVANCED METERING INFRASTRUCTURE OVERVIEW

Q. Please describe the Advanced Metering Infrastructure project.

A. This project involves the installation of an Advanced Metering Infrastructure ("AMI") system, including a communication network and metering equipment, across PSE's electric and gas service territory for PSE's 1.2 million electric and 800,000 gas customers. Installation of the AMI network began in 2016 and installation of new AMI electric meters and gas modules began in 2018. Full deployment of the AMI network and electric meters and gas modules[1] will be completed in 2022-2023. Currently, the projected cost of the total project is $473 million, $456 million of which will be capital and $17 million of which will be charged to operations and maintenance ("O&M").[2] The total benefits associated with avoided AMR investment, Conservation Voltage Reduction ("CVR") to provide customer's energy savings, and implementing distribution automation using the AMI communication network, are estimated to be $668 million over the

[1] Electric meters have the AMI module integrated under the meter housing so when deploying the entire electric meter is replaced, whereas gas meters are upgraded by replacing the AMR module with an AMI module on the face of an existing meter.

[2] Appendix A, PSE 2016 AMI Business Case, at 5-6.

20-year life of the AMI assets.[3] As a result, the total present value revenue requirement is estimated at $258 million for the AMI project.[4]

The Appendix to Exh. CAK-4 contains the primary supporting documents of the AMI business case which are referenced in this testimony.

Q. Please describe PSE's investment in AMI.

A. The AMI assets that have been placed in service between October 1, 2016 and December 31, 2018, total approximately $~~89.8~~91.9 million and include (i) the communication network hardware, (ii) Command Center head-end software that includes the information technology ("IT") systems integration, and (iii) meter/module assets for gas and electric meters. A breakdown of the costs for each component is shown below:

AMI Components	Cost
Communication Network	~~$16,679,780~~$21,983,492
Command Center	~~$31,902,111~~$28,348,237
Electric Meters	~~$33,822,097~~$32,558,297
Gas Modules	~~$7,395,859~~$8,971,795
Total	~~$89,799,848~~$91,861,821

Approximately $48.5 million of the expenditure was associated with technology assets, specifically the communication core network and required software and hardware systems. This technology platform allows for secure transfer of meter

[3] *Id.* at 7.

[4] *Id.*

data between customers and PSE and allows for integration of this data into PSE's meter data management, customer information, and billing systems.

II. PROJECT STATUS

Q. Please describe the current status of the AMI project.

A. The AMI project requires deployment of: (i) network devices; (ii) command center and IT systems integration; (iii) electric meters; and (iv) gas meter modules. As of December 31, 2018, PSE has deployed 2,740 of the total 8,260 network devices across its service territories. The network devices deployed to date are primarily in PSE's combined gas and electric service territory. The AMI network will be fully deployed by 2020 with an additional 5,520 network devices installed.

The Command Center software and IT systems integration was completed in June 2018.

Electric meter and gas module deployment is rolling out by zip code. Electric meter deployment began in March 2018 and will average approximately 195,000 electric meters deployed annually. Gas module deployment began in June 2018 and will average approximately 175,000 gas modules deployed annually. As of December 2018, 172,418 electric meters and 44,928 gas modules have been deployed.

III. DECISION TO TRANSITION TO AMI

Q. Why did PSE decide to transition from AMR to AMI?

A. PSE's primary drivers for transitioning to AMI are (i) the failing and growing obsolescence of the existing AMR system; (ii) AMI's ability to expand voltage reductions for energy savings for customers; and (iii) AMI's ability to serve as a foundational technology providing a communications platform to advance distribution automation to improve reliability for customers. Additionally, AMI capabilities will enable customer choices such as access to more granular energy use information.

Q. When was the AMR system installed?

A. PSE's AMR system was installed between 1998 and 2001. The design life for AMR systems is 15 years and is now obsolete.

Q. What aspects of PSE's AMR system are failing?

A. In 2013, PSE assessed the performance of the various components of its AMR system concluding:[5] (i) the network equipment was failing at a rate of four percent annually; (ii) electric meters were failing at a rate of 1.6 percent annually; (iii) 36 percent of the gas AMR batteries were estimated to reach end-of-life between 2016 and 2020/2021 and would need replacement; (iv) commercial AMR

[5] Appendix A, PSE 2016 AMI Business Case, at 18.

gas modules were failing at a rate of above 11 percent annually; and (v) annual failure rates of all gas modules[6] were nearly four times higher than the 0.5 percent expected by many utilities. For commercial AMR electric meters, the performance for load profile reads was as low as 20 percent effective.

Q. What aspects of PSE's AMR system are becoming obsolete?

A. As I noted above, PSE's AMR system has exceeded its useful life. Moreover, the market is no longer enhancing or supporting AMR equipment and therefore there are significant supply chain risks as it has become increasingly difficult for PSE to find replacement equipment. For example, in 2016, a manufacturer, Elster, discontinued its A2 meter line, and in December 2018, PSE received notice of end of life of the AMR Focus AL 1-way product, which makes up about 23 percent of PSE's current AMR meter population. As AMR equipment failed, PSE needed to either refurbish the failed equipment or buy refurbished equipment. This approach, however, has become unsustainable in keeping pace with failure rates, placing PSE's entire system at risk.

Q. Were there other problems with the AMR system?

A. Yes. The AMR system was no longer functioning properly. The AMR system captures error codes that provides information when meter reads are not received from particular meters, so the issue can be addressed. However, on average,

[6] Appendix B, PSE Gas AMR Gas Module Weibull Analysis Results-Final, at 3.

50,000-60,000 meters are still manually read each month because an automated read cannot be obtained from the AMR system for some reason.[7] About 40,000 of these meters show up as "installed but not discoverable," meaning the meters are not being heard by the network. This is usually due to interference such as foliage on trees during summer months or placement in remote areas. About 15,000 meters are installed and discoverable but are not able to be read because of radio frequency noise, non-functioning AMR network equipment, or delays due to the time required to process a meter/module exchange in the back-end systems.

These performance and dependability concerns, combined with a growing shortage of replacement materials, led PSE to consider replacing the limited one-way technology of the AMR system with a more up-to-date, two-way AMI technology.

Q. Are there other reasons why PSE decided to transition from AMR to AMI?

A. Yes. Another factor in PSE's decision to transition from AMR to AMI was the service agreement with AMR service provider Landis+Gyr ("L+G"), who owned, operated, and maintained most of the AMR communication and meter modules.[8] PSE's service agreement with L+G provided PSE with an option to purchase all of the AMR assets previously owned by L+G for $1.00 in 2016, where PSE would also be responsible for the operation of the AMR system. This ownership

[7] Appendix A, PSE 2016 AMI Business Case, at 19.

[8] PSE has always owned the electric meters.

transfer meant that PSE would need to develop additional new operational and financial processes around its AMR system, or would need to enter into new contract negotiations with L+G or another vendor for a continuation of its managed service. As PSE pursued these scenarios, PSE reviewed the performance of the AMR system knowing its design life of 15 years was nearing an end. This provided the opportunity to consider transition scenarios for managing and/or replacing AMR, including consideration of moving to the next generation of metering in AMI.

Q. What options did PSE consider for managing the AMR system?

A. In 2013, PSE initiated a feasibility assessment[9] [10] to explore options for AMR management including: (1) "Status Quo," meaning PSE would purchase all of the AMR assets previously owned by L+G for $1.00 and take on performance of related operation services, with L+G continuing to perform some basic read services; (2) revert to fully managed service with L+G, meaning PSE would re-negotiate the L+G service agreement as it was being operated at the time (no transfer of assets, L+G manages all operations); (3) PSE owns and operates the system, executing on the L+G service agreement as written, but then PSE performs all operating services, including meter reads; and (4) similar to (3), but PSE outsources all operating services to vendors (potentially other than L+G).

9 Appendix A, PSE 2016 AMI Business Case, at 23.

10 Appendix C, PSE Future of Metering Infrastructure CSA (C).

PSE's review determined that proceeding towards the 'Status Quo' (option #1 above) would potentially save PSE between three and ten million dollars annually compared to continuing with the fully managed service (option #2 above).[11] However, more research was deemed necessary to assess all options, which led to further evaluation of the performance of PSE's AMR system as described above.[12]

Q. As a result of the AMR management review and AMR system performance concerns, what options did PSE consider in moving to an AMI system?

A. With AMR obsolescence and performance concerns identified, PSE proceeded with the feasibility analysis to consider four options for AMI,[13] against the Status Quo (option #1 above) including: (i) a hybrid AMI option in which PSE would assume ownership, operation, and maintenance of all AMR equipment, then utilize the L+G two-way AMI technology to build out a PSE-owned AMI network and deploy AMI based on business needs, followed by AMI replacement for attrition and growth going forward; (ii) a two-network and two-vendor option in which PSE would deploy the L+G Gridstream AMI network throughout the electric service territory and a second vendor's technology over the gas-only service territory; (iii) a full redeployment, installing a new two-way AMI network with a new vendor and converting all meters to AMI over three years; and (iv)

11 Appendix A, PSE 2016 AMI Business Case, at 23.
12 Appendix C, PSE Future of Metering Infrastructure CSA (C).
13 Appendix A, PSE 2016 AMI Business Case, at 23.

continue to utilize L+G (L+G Proposal) as its meter reading service provider for AMR and have L+G build out an AMI network and replace gas AMR meters, with PSE deploying electric AMI based on business needs, and then continuing to replace for attrition and growth going forward.

Q. What were the factors PSE considered in its analysis of a transition to AMI versus continuing with the AMR system, including the cost of each option?

A. As described above, in 2013, PSE began evaluating the costs and benefits of an AMI transition. AMR obsolescence, performance and availability concerns underpinned this analysis. PSE also examined the potential for benefits from AMI including remote disconnect and prepay enablement, CVR benefits to provide customer energy savings, and automated analysis of system status including outage device prediction that could not be achieved by continuing with the AMR system.[14] PSE evaluated the difference of each AMI option against the AMR Status Quo and determined that the hybrid (option i) had the greatest total estimated net present value ("NPV") net benefit difference over 25 years.[15] The two-network two-vendor (option ii) resulted in a positive NPV net benefit but was less than the hybrid option, and the other options resulted in negative NPV net benefits. These findings led to the decision to evaluate the hybrid AMI option

[14] Not all of these particular benefits were leveraged in the final business case.

[15] Appendix C, PSE Future of Metering Infrastructure CSA (C), at 10, Table 4.

with the likelihood that the AMI costs could be even further offset by the benefits to customers that AMI would bring.

Q. What deployment scenarios did PSE consider for AMI?

A. In 2014, PSE evaluated several deployment scenarios for AMI.[16] These scenarios included (i) a six-year roll out starting in 2018,[17] (ii) a ten-year roll out starting in 2018,[18] and (iii) timing the roll out to start when the AMR managed service contract was set to expire in 2023.[19] This evaluation demonstrated that the longer the roll out, the greater the cost, for two reasons: A delay in starting to move to AMI would result in missing potential AMI benefits, and the AMR system would continue to incur increasingly higher maintenance costs over a longer period of time. An AMI implementation over six years was lower present value revenue requirement than a ten year or delayed roll out until 2023.[20] PSE elected the six-year roll out.

16 Appendix A, PSE 2016 AMI Business Case, at 24-25.

17 Appendix D, PSE AMI Model 6yr.xlsx, Final Result worksheet.

18 Appendix E, PSE AMI Model 10yr.xlsx, Final Result worksheet.

19 Appendix F, PSE AMI Model 2023.xlsx, Final Result worksheet.

20 Analysis was calculated differently than final business case as it considered benefits differently, but purpose of analysis was to compare options not determine value.

Q. Did PSE consider implementing a non-communicating meter system to replace AMR?

A. Manual meter reading was considered briefly in 2014,[21] but was not worth pursuing due to the loss in operational excellence and customer satisfaction services that rely on AMR data including load research, energy efficiency programming, 120-hour guarantee, no cost off-cycle meter reading, outage notification and restoration verification, and troubleshooting for billing and operations.

Q. Were there additional considerations bearing on PSE's decision to move forward with a six-year implementation of the L+G AMI system?

A. Yes. The L+G product functionalities and service offerings compared favorably to those of its competitors and per the recent 2018 Frost & Sullivan Electricity Metering Final Report, L+G led the market at 40 percent for AMI electric meters and was second in the market at 28 percent (one percent lower than leader) for communications systems in 2017.[22] PSE also recognized the continued need to operate the AMR system with L+G while installing a new AMI system, which added complexity to considering multiple vendors or products. Additionally, the L+G service agreement provided that PSE would be obligated to pay a

[21] Appendix A, PSE 2016 AMI Business Case, at 24.

[22] Radio Frequency mesh continues to dominate the market as a proven communication technology that has wide acceptance with cellular based communication accounting for only four percent of market share in 2017.

termination fee ranging between $7.6 million and $37 million depending on the point at which it terminated the L+G service agreement prior to 2023.

Q. What did PSE decide to do?

A. Based on the various analyses conducted which concluded: 1) the AMR system was failing, performance was degrading, and product enhancements were unlikely; 2) proceeding with the current contract framework that PSE owns and operates the system model was most cost effective; and 3) future benefits that AMI provided were beneficial to PSE and its customers in terms of avoided investment, energy savings, and opportunity to advance reliability improvements effectively, PSE determined that it was beneficial to move to an AMI system as expeditiously as possible.

Rather than terminate the L+G agreement early (prior to 2023) and incur the termination penalty or continue to spend money on a system that PSE has deemed defunct, PSE negotiated and amended the L+G service agreement to include AMI technology and services commemorating across the board meter read fee reductions.

PSE incorporated the terms agreed upon in Amendment 4 which was signed June 30, 2015, into a contractual restatement with L+G which also resulted in enhanced contractual benefits effective January 23, 2017.

Q. Is PSE rolling out AMI faster than the rest of the industry?

A. No. By the end of 2017, 52 percent of the United States had deployed AMI with Washington, D.C. at 100 percent and several other states with greater than 90 percent. Far below most of the country, at the end of 2017, Washington State was at eight percent. Globally, AMI installations hit over 100 million a year in 2017.[23]

Q. How were management and the Board involved in the decision to implement AMI?

A. The Board and PSE Officers have been closely involved in the decision to implement AMI. On May 29, 2014, the first discussion regarding the AMR system was presented to the Board and Officers. On April 2~~8~~9, 2015, the AMR transition options, timeline, and approach towards a 2016 transition target was reviewed with the Board and Officers as Amendment 4 was being prepared for signature on June 30, 2015, with an Officer briefing on June 25, 2015. Officers and the Board reviewed information on August 2, 2016, regarding configuration options and deployment scenarios. The Officers reviewed the final sourcing strategy and business case on October 26, 2016. The Board reviewed information again on November 3, 2016, regarding the 2017 plan and budget and oversight, and on January 18, 2017, the Board confirmed the strategy to replace PSE's AMR technology with AMI, including confirmation of L+G as the AMI vendor.

[23] 2018 Frost & Sullivan Electricity Metering Final Report.

Additional project status updates to the Board were conducted on September 21, 2017 and on June 21, 2018.

IV. AMI CAPABILITIES AND BENEFITS

A. AMI Benefit Overview

Q. Please elaborate on what capabilities and benefits AMI two-way communication provides.

A. The AMI technology provides PSE with the ability to send and receive energy consumption data at a higher rate of security, fidelity and granularity than AMR. Additionally, the advanced analytics enabled by AMI's two-way communications help PSE (i) operate the grid more efficiently and reliably; (ii) analyze usage data in order to combat energy diversion; and (iii) forecast customer usage patterns to optimize energy supply and delivery. AMI's two-way communication will benefit customers now and in the future with features such as advanced outage prediction and communication without customer calls, availability of load profile and demand information, prepay metering services, and the ability to remotely disconnect and reconnect service for move-in/move-out. The AMI network will also allow for expansion and adaptability to evolving customer and business needs, such as trends towards distribution automation and decreased energy usage through expansion of PSE's existing CVR program and emerging technologies over the next 15-20 years.

Q. What are the features of the AMI system that provide future benefits to PSE's metering infrastructure?

A. The L+G products and system architecture that PSE is installing was chosen with the intent to anticipate future needs, capability and adaptability of metering infrastructure and customers' use of metering infrastructure. The AMI network, for example, can be adapted to an open standards-based network protocol which will allow approved and compatible products from other vendors to communicate securely and operate effectively on the network, thereby minimizing a risk of being restricted to a specific vendor's suite of proprietary capabilities. Additionally, the AMI meters that PSE is purchasing are certified to the Smart Energy Profile 1.x standard which means that any consumer device that meets this standard is interoperable. PSE will review consumer products for use with PSE AMI meters as new functionality is needed (i.e., energy efficiency programs, demand response programs, new products, etc.) and provide guidance to enable customer options.

Finally, in terms of hardware longevity, the L+G products have an extended life with the meters, modules, and batteries designed for 20-year[24] life, and the network is designed for 15-year life.[25]

[24] L+G product specifications.

[25] The network router batteries are only five-to-seven-year life. There are less than 9,000 routers in the fully designed AMI system.

Q. What are the principal benefits of the AMI project?

A. The principal benefits of the AMI project are: (i) avoided costs associated with the obsolescence of the AMR system; (ii) lower customer energy usage through implementation of CVR; and (iii) increased reliability at lower cost through implementation of distribution automation using the AMI communication network. I discuss each of these in greater detail below.

Q. What is the total benefit of the AMI project?

A. The total nominal benefit value of the AMI project is expected to be $668 million through 2037.[26] The benefits are described in more detail below.

B. AMR Obsolescence Avoided with AMI

Q. How will AMI avoid the obsolescense risk associated with AMR?

A. AMR obsolescence is a result of an unacceptable failure rate of meters and modules, an unacceptable failure rate of the communication network, decreasing manufacturer product supply, and lack of market focus on enhancing the AMR technology to meet the future needs. AMI will avoid the maintenance obligations that would otherwise increase if the existing AMR system were not replaced which includes increasing dependence on refurbishing existing equipment to meet replacement need.

[26] Appendix A, PSE 2016 AMI Business Case, at 7; Appendix G, PSE AMI Project Cost.xlsx (C), Scope Summary worksheet.

Q. How did PSE calculate the benefits of avoiding obsolescense risks?

A. PSE compared the difference in overall operating cost between (i) the AMR status quo, including the operating and maintenance cost and capital cost of refurbishing meters and acquiring scarce supplies from others and (ii) the similar investment for AMI.[27] The AMR status quo accounts for the increasing failure of gas module batteries and AMR network nodes while at the same time accounting for needing to serve new customers due to growth with refurbished equipment.[28]

The length of deployment was important as PSE recognizes that it will need to continue to supply AMR network equipment until the full implementation of AMI is completed and all AMR meters have been converted. In these assumptions, PSE assumed that in 2017 and 2018, new AMR equipment would continue to be purchased and installed as existing metering infrastructure needed replacement and then beginning in 2019, PSE would be refurbishing AMR equipment for needed installations prior to AMI implementation.

[27] Appendix G, PSE AMI Project Cost.xlsx (C), MM Repl Benefit worksheet.

[28] The MM Repl Benefit worksheet references AMX Global Tab worksheet with assumptions regarding attrition rates and customer forecasts.

Q. What are the calculated benefits of replacing the AMR system with AMI to avoid the re-investment in a failing system?

A. PSE calculated a nominal total savings of $230 million including capital and O&M investment avoided through 2037[29] [30] by implementing AMI over a six-year period.[31]

C. CVR Benefits Resulting From AMI

Q. How will AMI provide CVR benefits?

A. The AMI project will allow PSE to more broadly implement the CVR program, which lowers customers' energy usage through a reduction in supply voltage. Traditionally, substation voltages have been set such that the required minimum voltage at the end of the line is at a level that meets changing demands and conditions of customers served by that substation. This is set at the substation, as the utility has little to no consistent information of the voltage profile of individual customers. To maintain minimum voltage and prevent flicker or power quality issues for customers, the voltage set point is typically in the higher half of standard American National Standards Institute ranges. This approach can result in customers using more energy than necessary on some circuits or for many

[29] Appendix A, PSE 2016 AMI Business Case, at 8.

[30] Appendix G, PSE AMI Project Cost.xlsx (C), Scope Summary worksheet.

[31] For purposes of determining the present value revenue requirement of this project ($258 million referenced on page 2 above) only the O&M savings portion of this benefit was included ($1.7 million).

times of the day and year, as home equipment uses more energy when the voltage is higher. Unlike AMR, AMI meters provide detailed voltage and load data and this information allows PSE to not only ensure voltage set points remain within required standards but, in many cases, identify opportunities for PSE to fine-tune its electricity delivery to provide conservation benefit with no adverse impact to the customer.

Q. How is the CVR benefit implemented?

A. The CVR benefit is implemented by modelling circuits to determine and correct phase balancing, loading and voltage characteristics of the circuit. Voltage monitoring is conducted at selected points at the end of the circuit using voltage information from AMI meters. Using the modelling study and voltage monitoring data, static substation settings are implemented to serve customers within the lower half of the standard voltage range. AMI meters are needed to monitor the end of the circuit voltage before and after implementation of the CVR settings to check and verify the circuit modelling. PSE piloted this in 2013 and procured, installed, and maintained small quantities of AMI meters to specifically support this program.[32]

[32] PSE 2013-2014 PSE Conservation Voltage Reduction on Mercer Island Report.

Q. What are the calculated CVR benefits associated with installing AMI?

A. PSE estimated that CVR can be implemented on circuits associated with approximately 164 substations[33] and as a result, customers will benefit from energy usage savings. PSE assumed an implementation pace for this program to start with three substations and then ramp up to 12 substations annually by 2020. The benefit of energy savings was based on PSE's 2013-2014 CVR pilot, which found a 1.5 percent energy savings. Additionally, PSE estimated an avoided fixed capacity cost in alignment with the IRP due to CVR. PSE calculated a total nominal benefit of $436 million through 2037[34] as a result of implementing the CVR program using the AMI system.

D. Distribution Automation Benefits Resulting from AMI

Q. How will AMI bring distribution automation benefits?

A. The AMI project will result in avoided investment and maintenance needs for separate distribution automation ("DA")[35] communication network by leveraging the AMI network as opposed to utilizing a commercial cellular network—an option used for the transport of command and control messages to distribution grid assets at PSE.

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33 Appendix G, PSE AMI Project Cost.xlsx (C), AMX Global Tab worksheet.

34 Appendix A, PSE 2016 AMI Business Case, at 8; Appendix G, PSE AMI Project Cost.xlsx (C), Scope Summary worksheet.

35 Distribution automation extends intelligent control over electrical power grid functions in the electric distribution network to minimize outage time to customer

Q. How is the DA over AMI network benefit implemented?

A. The AMI mesh radio network can be utilized for this transport in lieu of cellular radios to provide secure communications between reclosers, switches and the control center. To use commercially available cellular networks for these communications requires a fixed investment in the radio and a reoccurring services cost per device, while the use of the AMI network would avoid these reoccurring service costs.

Q. What are the calculated DA benefits associated with installing AMI?

A. PSE estimated that it would need to install 40 DA devices annually[36] beginning in 2017 that would need to communicate to central control. With the AMI network in place, PSE estimated avoiding a cost of $120 inflated annually per device, with a calculated total nominal communication savings of $1.5 million through 2037[37] as a result of implementing DA over the AMI network.

E. Other Benefits

Q. Are there other benefits from AMI implementation?

A. Yes. There are additional benefits that can be realized from other initiatives such as PSE's Get to Zero initiative, which is focused on improving customer service

[36] Appendix G, PSE AMI Project Cost.xlsx (C), DA Benefit worksheet.

[37] Appendix A, PSE 2016 AMI Business Case, at 8; Appendix G, PSE AMI Project Cost.xlsx (C), Scope Summary worksheet.

by leveraging technology and improved processes for certain services. These benefits include remote disconnects and reconnects associated with customers' move-ins and move-outs, demonstrating the broad potential this technology will enable. PSE calculated these additional total nominal benefits to be $428 million through 2037,[38] largely associated with reduced truck rolls. These additional benefits were not factored into the final AMI financial analysis[39] but are discussed in the Prefiled Direct Testimony of Joshua J. Jacobs, Exh. JJJ-1T.

F. AMI Opt Out Procedures

Q. Does PSE have a mechanism for customers to opt out of AMI?

A. Yes. PSE has an approved optional Non-Communicating Meter ("NCM") service under Tariff Schedule 171, which will be effective July 1, 2019.

Q. What is NCM service?

A. Customers who opt out of the AMI service will receive an NCM and will pay a bi-monthly charge for manual meter reading. If they elect to change to an NCM after an AMI meter has been installed, they will incur a one-time charge per meter and then pay the bi-monthly charge for manual meter reading.

[38] Appendix A, PSE 2016 AMI Business Case, at 30.

[39] Associated with $258 million PV Revenue Requirement.

Q. What is the process for a customer to opt out?

A. When the NCM service becomes available in an area, PSE will contact customers to begin the process for eligible customers to receive an NCM. They will discuss the terms, conditions and eligibility requirements[40] of the NCM service with the customer. If the customer meets the eligibility requirements per Schedule 171, then they will be sent the tariff schedules for them to fill out and return within 60 calendar days. If they do not complete the submittals within 60 calendar days, the temporary hold on the AMI installation will expire and PSE will install an AMI meter at its own convenience.

Q. Can customers refuse an AMI meter before the NCM service is effective or available in their area?

A. Yes. Customers can communicate this to the deployment technician, deployment notification center, or our specialized back office team and retain their current meter. As of today, PSE has approximately 1,861 customers that have requested to opt out.

Q. If a customer chooses to opt out, will they lose any benefits?

A. Yes. The customer will be limited in technology driven capabilities and will not benefit from certain automated processes. For example, with respect to PSE's 24-

[40] PSE Electric and Gas Schedule 171 Optional Non-Communicating Meter Service, Section 1 Availability, 1.

hour and 120-hour service guarantee, customers who opt out of the AMI equipment will need to call PSE to trigger the starting point for the outage and service guarantee.

Q. Is there an impact to the cost or benefits associated with the AMI business case as a result of customers choosing to opt out?

A. The development of the optional NCM service under Schedule 171 is an incremental cost not considered by the initial AMI business case. Although PSE will experience costs associated with manual meter reads for the customers who opt out of the AMI service, these meter reading costs will be covered by those customers who opt out. Additionally, should a large number of electric customers in one area opt out, AMI reads would not be able to communicate via the mesh network, and PSE may need to install additional network equipment to collect reads from AMI meters in the area.

Relative to benefits, there could be an impact if a large number of customers on a particular circuit decide to opt out, preventing the ability to monitor voltage effectively. As a result, a circuit would not receive end of line CVR and those customers would not receive the benefit of this energy savings. The avoided AMR investment benefit will not be impacted as the AMR equipment will be replaced by a new meter. The DA over AMI network benefit will not be impacted either as long as an adequate network exists.

G. PSE Has Addressed the Security of the AMI System

Q. How is PSE securing the AMI system and customer information?

A. PSE has implemented advanced security capabilities within the AMI network. All AMI customer data is encrypted from the customer's meter to PSE's data center and personal information, such as name and address, is not stored on the meters nor transmitted through the meter network. AMI meters just provide energy usage data in more frequent intervals and only aggregated data is to be used without customer consent. In addition, PSE employs some of the most comprehensive security tools available to keep customer data safe and its cyber-security program is based on the same national standards followed by leading companies in the energy and defense industries.

Q. Are there concerns about the AMI network being hacked?

A. Safety and security are always at the forefront of PSE's work. PSE's AMI solution is not connected to the Internet, unlike the computer and mobile devices that are commonplace in everyday life. Not only is the system shielded from the Internet, but specialized hardware is utilized to track and secure all communications. Only devices that have been provisioned by PSE can communicate with the PSE AMI network.