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REPRESENTING AVISTA CORPORATION

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Washington Advanced Metering Project – Business Case



Avista
Corporation

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Washington Advanced Metering Project Business Case

Table of Contents

I. Executive Summary.	3
II. Introduction.	4
A. Advanced Metering Infrastructure	5
B. Industry Trends in Advanced Metering.	6
C. Avista’s Experience with Automated and Advanced Metering	7
D. Advanced Metering Security	7
E. Customer Meter Options	8
III. Customer Benefits from Advanced Metering.	9
A. Access to Interval Energy Usage Data	9
B. Customer Home Area Network Interface	9
C. Energy Alerts	9
D. Customer Privacy	9
E. Utility Employee Safety	10
F. Future Opportunities for Benefits	10
G. Elimination of Manual Meter Reading	11
H. Remote Rapid Reconnection	11
I. Outage Management	12
J. Energy Efficiency	13
K. Energy Theft and Unbilled Energy Usage	14
L. Billing Accuracy	16
M. Utility System Studies	17
N. Washington Advanced Metering - Project Benefit Summary	18
IV. Preliminary Estimate of the Project Cost	19
A. Electric Meters	19
B. Electric Meter Labor – Internal Cost	19
C. Electric Meter Labor – Contract Cost	19
D. Natural Gas Modules	20
E. Gas Module Labor – Contract Cost	20
F. Head End Hardware	20
G. Head End Software	20
H. Head End Labor – Contract and Internal Cost	20
I. Network Communications – Hardware	20
J. Network Communications – Software	20
K. Network Communications – Labor	20
L. Corporate Communications	20

M. Washington Advanced Metering - Project Cost Summary21

V. Preliminary Deployment Schedule 22

I. Executive Summary

Avista Corporation (“Avista” or the “Company”) is committed to a path of high customer satisfaction, which includes, among other things, offering its customers information and choices that help them manage their energy costs. The Company views advanced metering infrastructure (“advanced metering” or “AMI”) as an enabling technology key to this mission. Advanced metering has emerged as a powerful solution among a range of smart grid technologies that enables utilities to improve responsiveness to customer needs, improve information sharing with customers, and ultimately improve overall customer service. Advanced meters are capable of two-way communication and are equipped with the ability to measure the incoming and outgoing flow of electricity from a customer’s premises in configurable intervals that range from 5 minutes to an hour. This communication capability means the meter can remotely transmit energy-use information to the utility and the customer, and can also receive and respond to signals sent from the utility to the meter.

Avista is certainly not alone in the deployment of advanced metering. The drive of utilities to improve customer service levels, coupled with supportive regulatory policies, advances in metering technology, and reductions in the price of meters, have helped propel a trend toward digital metering across the industrialized world. Penetration of advanced meters in the U.S. has increased from just under 5% in 2008 to over 30% by 2013¹, and is expected to reach 50%² to 70%³ by the year 2020.

The range of customer benefits associated with advanced metering includes near real-time energy use information, energy alerts, more accurate billing, greater privacy, improved energy efficiency, and remote rapid reconnect of service. Advanced metering also provides the opportunity for pre-pay options, time-of-use pricing, improvements in the integration of customer-owned distributed generation, and demand-based pricing mechanisms. These systems also enable improved theft-loss prevention, outage management, utility infrastructure planning, employee safety, and reduced fuel and carbon emissions with fewer meter reader and service vehicles on the road. In addition to these benefits, advanced metering provides additional tools that allow the utility to communicate and transact with customers in ways the customer prefers.

The Company has entered the initial planning phase of a program to deploy advanced metering for its electric and natural gas customers in its Washington service area. The Washington advanced metering project will build on the Company’s experience with automated meter reading in Idaho and Oregon, and advanced metering in Pullman, Washington, to provide direct customer benefits and improved operations for Avista’s

¹ Assessment of Demand Response and Advanced Metering. Federal Energy Regulatory Commission Staff Report, October 2013.

² Leveraging Business Intelligence and Analytics to Improve Performance. Presentation by Gartner Research made to Avista, September 2014.

³ From Pike Research in 2012, as cited from Elster presentation made to Avista, 2015.

Washington customers. The project, which will encompass approximately six years, will deploy advanced meters to approximately 253,000 electric customers, and 155,000 natural gas customers⁴. The preliminary estimate of the capital cost for this program is approximately \$142.1 million. The Company has also estimated the quantifiable benefits associated with advanced metering. In the near term, the overall direct cost to customers associated with converting to advanced metering is expected to exceed the quantifiable benefits, but in the long term the overall benefit to customers is expected to exceed the costs. And, as highlighted above, advanced metering will provide immediate opportunities for improvements in customer communications, education, energy efficiency, carbon reduction, and a host of other benefits to both the customer and the Company.

II. Introduction

Utilities today are engaged in a major reinvestment effort in the nation's electric grid, with much of that focused on infrastructure designed to transform the system into the intelligent grid of the 21st century. Deployment of these modernization technologies is designed to improve the power grid's reliability and performance by optimizing electricity supply and demand through better visibility of the system and response capabilities. Known also as the "smart grid,"⁵ these technologies are designed to enhance power delivery by promoting intelligent two-way communication between suppliers and consumers. Ultimately, these types of investments will move the nation closer to establishing a more efficient and effective electricity infrastructure that is expected to help contain costs, reduce emissions, incorporate more sources of variable renewable energy, increase power grid reliability, and provide greater choice and flexibility for utility customers. Improving the efficiency of the nation's grid infrastructure is not the only driver of these investments. Utilities are also under increasing pressure to deliver customers an improved and more-tailored service experience and greater service value, on par with what they are experiencing in their interaction with other service providers.

Though utilities are viewed as lagging behind their retail counterparts when it comes to providing personalized customer experience, the industry is moving forward. Better understanding customer preferences allows the utility to differentiate its service offerings, which results in more informed and satisfied customers. More informed customers are more likely to participate in utility-sponsored initiatives and innovations, and they also perceive higher value from their personalized service. Developing this capability requires investment in a range of supporting technologies, one of which has been the deployment of meters equipped with two-way communication capability, referred to in the industry as "advanced" or "smart" meters. Utilities installing these metering systems are aiming to

⁴ Number of customers expected to receive meters over the six-year course of project implementation.

⁵ Smart grid technology includes everything from interactive appliances in homes to substation automation and sensors on transmission lines. It is a system that uses various technologies to enhance power delivery and use through intelligent two-way communication. Generators of electricity, suppliers and end-users are all part of the equation. With increased communication and information, smart grid implementation can monitor activities in real time, exchange data about supply and demand, and adjust power use to changing load requirements.

provide customers with tools to better understand and manage their energy use, deliver improved service quality and operational benefits, and achieve a greater degree of customer satisfaction.

A. Advanced Metering Infrastructure

Advanced meters themselves are only part of an integrated metering system. That is, they must be connected with specialized communication networks and information management systems in order to deliver value to the consumer and the utility provider. This entire system of meters, communications, and digital hardware and software systems is referred to as advanced metering infrastructure. A brief description of the major components of these systems is provided below.

1. Meters

Traditionally, utility customers have had few tools to effectively understand and manage their energy use, because conventional meters, including automatic meter reading (AMR) systems⁶, are not equipped to provide specific and timely information on consumption. Advanced meters⁷ can measure the incoming and outgoing flow of energy from a customer's premises in configurable intervals that range from 5 minutes to an hour. This communication capability means the meter can remotely transmit energy use information to the utility and the customer, and can also receive and respond to signals sent from the utility to the meter. When the advanced meter is paired with a customer-focused website or an in-home energy display, the information it provides enables the customer to make informed and timely decisions in relation to their energy consumption, helping the customer turn information into actions that benefit them.

2. Metering Communications Network

A specialized and secure communication system is required to transmit information between the advanced meter and the utility. And while there are various options available for providing this communication link, it is commonly accomplished by the implementation of three integrated systems, the Neighborhood Area Network, the Field Area Network and the Wide Area Network. The Neighborhood Area Network, also known as a "mesh network," is composed of the wireless communication that takes place between the individual advanced meters. Through this network of communication, information is transmitted from meter to meter and in the process is aggregated and transmitted to the Field Area Network. The latter is a broadband wireless system that may support only one function, such as advanced metering, but which can also be designed to support a full range of advanced grid-device communications. The Wide Area Network is a separate computer-based communication network that connects seamlessly with the Field Area Network. The Wide Area Network is responsible for transmitting metering data collected by the Field Area Network to the utility operations center. The design of

⁶ Automatic meter reading meters (or AMR) provide only one-way communication from the meter to the utility, and typically provide only one monthly reading of the customer's energy use.

⁷ The advanced electric meter project will involve a complete replacement of the conventional electro-mechanical meter. Advanced metering for natural gas is accomplished by replacing the mechanical register on the existing natural gas meter with a new digital, communicating module. The gas meter itself is not replaced.

these three network systems is dependent on the characteristics of each utility's system and the advanced metering solutions ultimately selected.

3. Meter Data Collection System

This system is composed of computer hardware and software applications that control and coordinate the communications networks as well as collecting the usage data from the advanced meters in the field. The software is designed and provided by the manufacturer of the advanced meters being installed. Metering data is then transmitted from the collection system to the utility's Meter Data Management System.

4. Meter Data Management System

This system includes computer hardware and software applications that are responsible for storing, validating, editing, and analyzing the advanced meter usage data. Metering information from this system is then imported to other specialized software applications to perform a range of business functions such as customer billing, outage management, conservation voltage monitoring, and theft detection.

B. Industry Trends in Advanced Metering

The drive of utilities to improve customer satisfaction and deliver operational benefits, coupled with advances in metering technology, has helped propel a trend toward digital metering across the industrialized world. Advanced metering systems today are more robust and reliable than previous iterations, and technologies are coalescing around proven approaches and standards. And as the technology continues to mature, the cost of the meters continues to decline. State and federal regulatory policies, as well as those of regulatory associations, such as NARUC, have also played a role in accelerating the deployment of advanced metering systems. The Energy Information Administration⁸ reported that in 2012, 533 U.S. utilities had installed 43,165,183 advanced meters. Data collected from various sources by the Federal Energy Regulatory Commission⁹, reported the penetration of advanced meters as climbing from just under 5% in 2008 to over 30% by 2013. In addition to rates of penetration, the report documents federal and state regulatory efforts promoting advanced metering, customer benefits resulting from deployment, and efforts around the nation to promote demand response initiatives. According to the Edison Foundation Institute for Electric Innovation, the number of advanced meters deployed in the U.S. had reached 50 million by July 2014, with a residential penetration rate exceeding 43%¹⁰. According to Gartner¹¹ research, the installation of advanced meters is expected to top 130 million in Europe by 2016. In the United States, the number of deployment projects for advanced meters is expected to reach 260 in 2016, double the number of deployment projects in 2009. Longer term, the

⁸ Energy Information Administration. Frequently Asked Questions: How many smart meters are installed in the U.S. and who has them?

⁹ Assessment of Demand Response and Advanced Metering. Federal Energy Regulatory Commission Staff Report, October 2013.

¹⁰ Utility-Scale Smart Meter Deployments: Building Block of the Evolving Power Grid. The Edison Foundation, Institute for Electric Innovation. September 2014.

¹¹ Leveraging Business Intelligence and Analytics to Improve Performance. Presentation by Gartner Research made to Avista, September 2014.

penetration of advanced meters in the U.S. is expected to reach 50% to 70%¹² by the year 2020.

Here in the Pacific Northwest, several investor-owned utilities have already implemented automated meter reading or advanced metering systems, including Avista, Idaho Power Company, Pacific Power, Portland General Electric, and Puget Sound Energy. In addition to these, many public utilities in the region, including Avista's neighbors Inland Power and Light and Kootenai Electric Cooperative, have installed advanced metering, or are in the planning or acquisition phase of doing so.

C. Avista's Experience with Automated and Advanced Metering

Avista's Washington advanced metering project will build on the Company's experience with automated meter reading and advanced metering to provide customer and operational benefits to Avista's Washington operations. In its Oregon service area, Avista has for many years operated a mobile meter data collection system that encompasses 104,000 meters. In 2004 - 2008, Avista installed approximately 220,000 automated meter reading meters in its Idaho service territory. This system employed multiple telecommunication technologies, including wireless networks, powerline carrier, and mobile field collectors.

In Pullman, Washington, the Company led a smart grid demonstration project that created the first "smart community" in the Pacific Northwest. The demonstration project was part of a larger federal initiative that was launched in 2009. The project involved the automation of many parts of the electric distribution system in Pullman, and included the deployment of advanced metering infrastructure. In addition to deploying advanced meters, Avista installed a wireless telecommunication network to provide connectivity with the meters, and a meter data management system to aggregate, store and display customer meter data.

D. Advanced Metering Security

In keeping with its Customer Privacy Policy, Avista is committed to ensuring that private customer information is safe and secure at all times. Providing robust security measures to help accomplish this is integral to the success of the Washington advanced metering project. Advanced metering systems today incorporate modern cyber security methods to ensure data is protected from the meters to the secure data center. Metering data is encrypted at the meter, and any access to the metering systems must be authorized and authenticated. Although security is embedded in the meter and system components, it is up to Avista to understand each component and to ensure that the equipment design and implementation meets the security requirements for this application. Items such as data integrity, availability, and confidentiality of customer information are considered each time a particular technology is assessed and implemented. To that end, Avista will leverage an existing "security working group" that applies risk assessments, oversees implementation of controls, and evaluates each technology device. The security working group is composed of a representative cross section of employees from the functional

¹² From Pike Research in 2012, as cited from Elster presentation made to Avista, 2015.

areas in the Company, and will include members associated with the advanced metering project, including the meter shop, distribution operations, information technology, security, application development, and others as necessary. The Company will use industry best practices based on a variety of guidelines and standards, including NISTIR 7628, since it deals directly with guidelines for smart grid cyber security.

The security working group will also develop a Washington advanced metering system security plan to document the Company's strategy for the secure implementation and operation of the system. The structure of the plan will focus on the assessment of security risks and control measures, and the implementation and monitoring of security controls. The plan will adopt what is known as a "cyclical" strategy because the review and assessment steps are repeated over time as the technologies and their respective risk profiles change and evolve. This group will carry out the implementation of the security plan, will address new and upcoming issues, perform evaluations of the effectiveness of controls, and make recommendations to the "oversight committee" when appropriate. The oversight committee is composed of directors and managers who are responsible for managing security risks at the enterprise level.

E. Customer Meter Options

Avista is aware of the range of customer issues and concerns that have been raised in connection with the deployment of advanced metering across the country. While the vast majority of consumers is willing to accept a new digital/communicating meter, there is a small percentage that can be strongly opposed to the installation of such equipment at their premises. Those consumers who refuse to receive a new meter are referred to as choosing to "opt out" of the program. The choice a customer makes to oppose advanced metering is typically motivated by three main drivers. The first is health concerns related to perceptions about radio frequency emissions. The second driver is a privacy concern over the kind of customer information being communicated by the meter and collected by the utility. The third has to do with perceptions about the accuracy of digital meters compared with conventional metering.

The Company believes that proactive customer communication is key to minimizing the number of customers who ultimately choose to opt out. In addition to early and active communication on the part of the Company, Avista will focus on providing ways for our customers to raise questions, issues and concerns they have about advanced metering. We believe responsive communication with the individual customer is the best way to address their issues and concerns. Additionally, by listening to customers, Avista can adjust its communications to ensure we are addressing the full range of issues that are important to our customers.

From its research and its own experience, Avista expects the number of customers who ultimately choose to opt out to be very small. For example, of the approximately 13,000 customers who received advanced meters in the Pullman project, none ultimately opted out of the program. Prior to deploying meters under the Washington advanced metering project, Avista will file a separate tariff with the Washington Utilities and Transportation Commission that will contain the proposed conditions under which any customer can opt

out of the advanced metering program. That, of course, comes at a cost to the utility and its other customers, as we separately dispatch trucks and service personnel to widely dispersed parts of our service area to read meters and perform other tasks as needed. Details of the proposed tariff will be discussed with Staff and other interested parties before it is filed.

III. Customer Benefits from Advanced Metering

Customers experience benefits from the deployment of advanced metering in a variety of ways. These include improvements in service quality and customer experience that are generally more visible to the customer, as well as those, which may not be visible to the customer, that serve to reduce operating costs associated with providing service. These benefits are also often categorized by whether or not their financial value can be readily quantified. A brief description of these customer benefits is provided below, including the Company's estimate of the annual financial value for those that are readily quantifiable. A summary table of these customer benefits and their estimated value is provided at the end of this section of the report.

A. Access to Interval Energy Usage Data

Conventional meters, including automated meter reading, provide the utility and its customers with only very basic, historical, monthly energy-use data. Advanced meters continuously measure customer energy use, which is recorded and stored at set intervals (typically every 5 to 15 minutes). This interval data is then periodically transmitted to the utility where it supports business processes and is made available to the consumer. Customers can use the utility web portal to view and analyze their recent interval-energy use to learn more about how they use energy, and as a tool to save energy and money.

B. Customer Home Area Network Interface

The home area network is a specialized wireless network for energy data; advanced meters have the capability to interface with this network. This interface allows the advanced meter to provide the customer actual real-time energy-use data via an in-home display or for use by a "smart" thermostat. As consumer technologies continue to evolve, the home area network interface to real-time energy data will play an increasingly important role in the development of "smart" homes and businesses.

C. Energy Alerts

The detailed information on energy usage provided by advanced metering gives the utility the ability to send outbound messages to customers about the status of their energy use at any given point in time. An example of an energy alert would be the customer's request to be notified by the utility when the customer's monthly usage reached a certain level, or instantaneous demand surpassed a customer-set number.

D. Customer Privacy

Because the advanced meter is transmitting energy-use information to the utility, there is no longer the need to have meter reading employees on the customer's property each month. While there will still be instances where utility employees must visit the

customer's premises, advanced meters significantly reduce the overall frequency of such occurrences.

E. Utility Employee Safety

The deployment of advanced metering reduces the number of instances where a utility employee is dispatched for a field service call. Fewer field service calls, in addition to eliminating manual meter reading, reduces the risk of injury to employees engaged in field activities.

F. Future Opportunities for Benefits

Advanced metering is an enabling technology that provides the platform to achieve additional customer value and satisfaction. Though some of these consumer benefits may not yet be practical in the Pacific Northwest, due to relatively low retail electricity prices, they have been implemented by utilities in other parts of the country. Having advanced metering capability allows the utility to have the technology available to integrate additional customer benefits as the timing becomes appropriate. Some of these future benefits are described below.

1. Rate Options

Advanced metering is a foundational technology for enabling the utility to implement rate structures that require interval metering capabilities. Some of these rate options include time-of-use pricing, critical peak pricing, and demand pricing. Of these options, demand pricing is emerging as a likely means to ensure customers' rates more accurately reflect the value of the system they use. This is particularly the case for customers owning distributed generation. Advanced meters with remote connectivity can also be used to support demand-response initiatives and rate offerings such as 'pre-pay' options.

2. Micro Grids and Smart Cities

The field area network installed as part of the advanced metering deployment can be designed as a 'multi-application' network. As such, the network can support the communication needs of a range of other grid modernization and automation efforts, including micro grids and smart cities initiatives.

3. Data Analytics

While there are many documented uses of the information provided by advanced metering that provide customers value, the industry expects it will provide the utility a platform for creative and innovative uses of interval energy and other data that will emerge over time.

4. Distributed Generation

Advanced metering provides the utility with improved capability to accommodate the increasing prevalence of customer-owned generation on its system. Advanced metering will provide a better understanding of the operation and effects of distributed generation on the system, as well as support a range of utility programs to appropriately compensate customers for the contribution of their generation.

G. Elimination of Manual Meter Reading

Deployment of advanced meters virtually eliminates manual meter reading, creating the opportunity for substantial operational benefits. These come from reduced labor costs, vehicle miles driven, diminished safety concerns, and reduced back office activities.

1. Regular Meter Reading Routes

In Avista's Washington service territory, there were approximately 40 meter readers that completed 4.66 million manual reads in 2013. Costs for manual meter reading include labor, meter reading hardware and transportation, along with apportioned costs for administration. Operational benefits resulting from advanced metering are estimated at \$4,842,671, which represents a reduction in only the direct costs associated with reading the meter.

2. Special Meter Reads

Meter readers perform an average of 7,750 special meter reads each year. While special reads are a small fraction of the overall reads gathered, they represent a significant cost since they are often not part of the meter readers' regular route. In addition to the time spent gathering the read, there are added costs for driving to and from the individual premises and for the customer service representatives' time spent setting up the read, and then updating the customer information after the read is complete. Operational benefits for special reads enabled by the implementation of advanced metering are estimated at \$204,017.

H. Remote Rapid Reconnection

The remote service switch is a feature of the advanced meter that allows it to be remotely disconnected and reconnected. In circumstances where a customer's service has been disconnected, those customers will experience a more rapid restoration of service through advanced metering. This is because the utility will no longer have to send a service person to the premises to physically restore energy service.

In 2013, Avista experienced over 150,000 instances of accounts being opened, closed or transferred in its Washington service area. Over 29,000 of these cases involved greater than one day between the close of one service and the opening of the next service, and 14,702 of these cases required the dispatch of field service personnel to physically disconnect or reconnect the service. The benefit of having remote service connectivity for all account opens and closes was estimated at \$1,728,042.

In the same year, Avista recorded over 39,000 contacts related to credit or collection issues, and over 30,000 instances where field service personnel were dispatched and physically suspended or restored service. With the deployment of advanced metering, the majority of these field dispatches would be avoided. The annual benefit associated with this change was estimated to be \$1,193,060. In addition to these costs, there are cases when a Company service employee who is dispatched to suspend service ends up making a collection on an account instead. This type of service call, as well as those related to leaving written notices, could be avoided with advanced metering, and the associated benefit was estimated to be \$453,454.

In addition, when a connection request falls outside normal business hours, there is a tariff-related charge to the customer for service after hours. With the capability for remote service connectivity, customers requesting reconnection after hours would have their service restored almost immediately, and could avoid paying an after-hours service fee. The Company estimated that in 2013 this would have saved customers \$104,040.

There are occasionally times when a service disconnect or reconnect becomes complicated and requires the presence of law enforcement personnel or other measures to ensure the safety of the Avista employee. With deployment of advanced metering, and the elimination of the need to dispatch field employees to perform this function, the Company estimates it would save \$25,896 each year.

Finally, Avista has estimated that the rapid reconnect feature will reduce customer call-time costs by \$107,242, and will reduce lost revenues by \$36,931.

I. Outage Management

Advanced meters are constantly sensing meter function and communicating with the utility's data systems to alert the utility of status changes. This allows the provider to know in near real-time whether there is power to the individual meter, or if it has been interrupted for some reason. When power is disrupted, the advanced meter is equipped to send a signal indicating a potential power outage at the particular customer premise. This outage information can be integrated with the utility's outage management system to provide a more complete picture of overall system outages. With better visibility of the many isolated outages during a large outage event, the investigation and restoration processes will be more efficient and shorter in duration, resulting in both operational and customer benefits.

Customers impacted by an electric outage, depending on the duration, can experience financial losses due to manufacturing disruptions, food spoilage and myriad other issues. This is particularly the case for commercial and industrial customers, who very often cannot conduct their business without the use of electricity¹³. The U.S. Department of Energy has developed a tool, known as the Interruption Cost Estimate Calculator (ICE)¹⁴ that can be used to estimate the ultimate cost to customers of an electric outage. To estimate the value of improvement in outage restoration times, the Company used the ICE calculator to place a value on its total outage time for 2013, and then assumed that on average, outage restoration times would be improved by five percent with the deployment of advanced metering. Similar figures have been reported in the industry to be as high as 10 percent¹⁵. For Avista, a 5 percent reduction in outage time produced a calculated savings for customers of \$2,218,195.

¹³ <http://www.onpower.com/pdf/EPRICostOfPowerProblems.pdf>

¹⁴ <http://www.icecalculator.com/ice/>

¹⁵ <http://www.onpower.com/pdf/EPRICostOfPowerProblems.pdf>

<http://tdworld.com/distribution-management-systems/amr-improves-outage-management>

<http://www.sdge.com/newsroom/press-releases/2012-11-14/sdge-launches-advanced-outage-management-system-benefit-region>

<http://www.silverspringnet.com/outage/pdfs/SilverSpring-Whitepaper-Outage.pdf>

<http://www.seattle.gov/light/ami/benefits.asp>

Each year, Avista dispatches field personnel to respond to electric outages that are ultimately determined to be on the customer's side of the meter. In these instances, the Company's facilities are working properly (there is power to the meter) and it is up to the customer to contact a commercial electrician to investigate and repair their problem. This circumstance is referred to a "false positive." With advanced metering, the customer service person taking the outage call will be able to query the meter in question to determine whether or not there is actually power to the meter, reducing the likelihood of a false positive. The Company has estimated that having this capability will reduce the incidence of false positives by 80%, resulting in an annual benefit of \$396,967.

The Company also expects that the number of customer calls to report outages will be reduced with advanced metering. This will result from more accurate automated outage notification to customers. The annual benefit associated with the reduced number of calls was estimated at \$69,498.

J. Energy Efficiency

There are two principal areas of energy efficiency savings enabled by the deployment of advanced meters, efficiency measures undertaken by the customer, and energy savings associated with the utility's management of the electric distribution system.

1. Customer Energy Efficiency

When customers have access to detailed and timely energy-use data they will be able to better understand their energy use. And when coupled with utility-provided information and education on energy consumption, customers will have new, advanced tools to undertake the structural and behavioral changes necessary to achieve their own personal energy conservation objectives.

Avista has estimated from its Pullman smart grid demonstration project, that approximately 5 percent of its eligible customers took advantage of the opportunity to use an in-home device that provided them real-time information on their energy use. This rate of participation is similar to results reported elsewhere in the country¹⁶. In addition to the rate of participation, customers who engaged with the real-time energy tools reduced their use of electricity by 3 percent on average. These findings are reasonably consistent with industry reports where the average electricity saved by each customer has ranged between 1 and 6 percent¹⁷. The Company used this information to estimate that its

<http://www.fpl.com/energysmart/pdf/esf3.pdf>

<http://www.greentechmedia.com/articles/read/pges-smart-grid-plans-for-shorter-power-outages>

<http://www.silverspringnet.com/article/accelerating-outage-restoration-with-smart-grid-technology/>

<http://energy.gov/articles/modernizing-grid-getting-more-out-america-s-energy-0>

¹⁶ <http://www.slideshare.net/breakingnews/unlocking-energy-efficiency-in-the-us-economy-1789726>

<http://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/projects/smart-metering/smi-program-business-case.pdf>

<http://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/projects/smart-metering/smi-program-business-case.pdf>

¹⁷ <http://www.slideshare.net/breakingnews/unlocking-energy-efficiency-in-the-us-economy-1789726>

<http://finance-commerce.com/2014/09/sustainable-reducing-energy-use-through-behavioral-science/>

<http://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/projects/smart-metering/smi-program-business-case.pdf>

Washington electric customers would save \$491,882 in annual energy costs through the deployment of advanced meters.

2. Distribution System Energy Efficiency

The electric distribution system is designed to operate within a voltage range, which is manually set for each neighborhood “feeder” line at a voltage regulator in the substation. The types and the magnitude of electrical loads on a feeder (e.g. motors vs. lighting) are constantly in flux, causing variation in the actual voltage level on that feeder over time. Since it’s important that a minimum line voltage always be maintained, the set-point voltage will be conservatively set at a higher voltage level than is required much of the time to provide an adequate buffer for the variation in loads. Since more electrical energy is required to support higher line voltages, this results in some inefficiency in the use of electricity at times when the line voltage is greater than the minimum required.

Recently, utilities have been able to deploy smart grid technology that allows them to adjust the voltage on a feeder based on voltage readings taken from the distribution line transformers along the feeder. This capability allows them to effectively reduce the energy required to maintain the minimum line voltage. This strategy is known as “conservation voltage reduction.” The approach uses a Distribution Management System application that receives voltage readings from the transformers, and sends voltage control signals to the regulator in the substation in near real time.

The energy savings from conservation voltage reduction can be further optimized by adding advanced meters that are equipped with voltage alarm capability. Now, instead of relying on voltage readings from the transformer, the actual voltage at the customer’s premises can be monitored and those readings can be used to further reduce the feeder voltage to meet the minimum level required.

Avista has experience with conservation voltage reduction through the implementation of two smart grid programs in Spokane and Pullman, Washington. By deploying advanced metering with voltage alarming capability, the Company estimates it will be able to further-lower the voltage on the distribution feeders (those equipped with conservation voltage reduction), resulting in an annual energy savings estimated at 0.5% or 13,798,937 kWh. The estimated value of the annual energy savings to customers is \$1,186,709.

K. Energy Theft and Unbilled Energy Usage

Tampering or theft diversion occurs when a customer has purposefully altered the meter so that power is consumed at the premises without being registered on the meter. Advanced meters are equipped with tamper alarms that will automatically communicate with the utility in the event a person should attempt to circumvent the metering of energy. In addition to the alarm capability, the utility can employ analytics to evaluate the interval metering data to help identify potential theft of service far more accurately. Using this theft-detection software helps the utility deploy field inspection personnel

http://www.intelligentutility.com/article/12/02/behavioral-approaches-energy-conservation-pay&utm_medium=eNL&utm_campaign=IU_DAILY2&utm_term=Original-Member

<http://www.utilitydive.com/news/could-reducing-peak-demand-5-be-as-simple-as-asking/329102/>

more efficiently, further reducing the frequency of field service calls and customer disruptions. In addition to helping curb theft of electricity, advanced metering also aids the utility in isolating potential unbilled usage at a premise, as well as identifying slow, failing and stopped meters.

The development of estimates for the value associated with energy theft is based on Avista's own experience, as well as a range of estimates from the utility industry. In most literature, the range of opportunity is between 1 and 3 percent of total utility revenue. In some business cases for advanced metering projects, the opportunity to address theft represents the single largest benefit among all those evaluated¹⁸. Avista believes the savings opportunity is greater than what we experience today with our conventional metering, but less than the industry averages. Accordingly, we have estimated the opportunity at 0.4% of total revenue. Several research studies, business cases, and anecdotal conversations with other utilities have supported this as a reasonable assumption¹⁹.

1. Theft Diversion

Currently, 80% of Avista's theft cases are represented by instances where the customer has turned on an inactive meter or has damaged the meter to the point where it stops reading. These circumstances can represent cases of complete diversion, where no usage at all is registered on the meter, partial diversion, and intermittent diversion. By taking advantage of meter alarming capability, coupled with powerful diagnostic analytics to identify meter locations where diversion is likely to be occurring, the Company estimates the potential benefit associated with identifying more of these diversion cases at \$1,053,322.

2. Unbilled Usage

Unbilled usage occurs when an account has been inactivated, and there is no customer associated with the account, but where energy usage is still occurring at the premise. This unbilled usage is difficult to initially identify with conventional metering, and consequently, it can take several weeks to several months before each issue is resolved. Advanced meters can either be disabled when an account is closed to prevent unbilled usage, or the meter can trigger an alarm when usage is occurring during a period when there is no active customer account. In either event, the amount of unbilled usage can either be eliminated or substantially reduced. Avista has estimated the annual net benefit opportunity to be \$235,081.

3. Slow or Failing Meters

These meters, as the name implies, simply under-represent the actual energy that is used at a premises. Depending on the degree of error, slow and failing meters can be very

¹⁸ Smart Metering & Infrastructure Program Business Case. BC Hydro, 2010.

¹⁹ <http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Achieving-High-Performance-with-Theft-Analytics.pdf>
http://www.electricenergyonline.com/show_article.php?mag=&article=456
http://sites.energetics.com/madri/toolbox/pdfs/business_cases/sdge_supplemental.pdf
[http://nuwnotes1.nu.com/apps/clp/clpwebcontent.nsf/AR/appendices/\\$File/appendices.pdf](http://nuwnotes1.nu.com/apps/clp/clpwebcontent.nsf/AR/appendices/$File/appendices.pdf)

difficult to isolate with conventional metering. The longer the time the meter is not functioning properly the more complex the issue becomes to resolve. This can create a significant under billing issue for customers, and it also places the under-billed revenue at risk for recovery. For this analysis, Avista assumed it would identify one third more slow or failing meters through the deployment of advanced metering. The annual benefit is estimated at \$169,817.

4. Stopped Meters

When a meter appears to have stopped recording energy use, it is flagged for investigation by the Company's meter shop personnel. Unfortunately, the great majority of the time meters are reported as potentially stopped, there has simply been no use at the premises and the meter is working properly. This is what's known as a "false positive." Currently, Avista experiences these false positives in 85% of the cases investigated for electric meters and 95% for natural gas meters. Reducing the number of field visits to investigate these false positives represents the core savings opportunity associated with stopped meters. Avista predicts that better analytics enabled by advanced metering will result in the reduction of false positives to a rate of 40% for both gas and electric meters. The net annual benefit associated with the reduction in dispatched field personnel is estimated at \$205,924.

L. Billing Accuracy

Because energy-use information is available from the advanced meter to the utility on a 5 – 15 minute interval, there is no longer a need to estimate bills related to manual meter reading, or for the processes of opening, closing, or transferring utility service. The customer service representative can simply query the meter and receive an actual reading of the metered usage. In addition to doing away with the need to estimate usage, the energy-use information also equips the utility customer service representative with timely and meaningful usage data to assist customers during billing inquiries. This increase in accuracy and convenience is valued by customers.

Each year, Avista's customer service representatives perform opens, closes and transfers of service that total over 150,000 transactions in its Washington service area. Avista expects its customer service representatives will save one minute on average for each of these calls if they do not have to estimate the closing and/or opening read. The benefit from this reduction in call time is estimated at \$266,658. The Company also estimates that the time reduction in calls associated with customer billing inquiries will result in an annual benefit of \$99,756.

Avista employs billing analysts who review customer billing data each month to look for anomalies that might suggest a problem with an electric or natural gas meter. Typical billing situations flagged by the analysts include abnormally high or low monthly bills. Each unusual billing situation is evaluated by analysts who have to make a determination whether to send a meter technician into the field to test the subject meter. Deployment of advanced metering will eliminate much of the review process for these types of bills because diagnostic algorithms in the metering system, along with communications to the meter, will be able to better determine whether or not there is an actual problem with the

meter. The benefit associated with a reduction in billing analysts' time has been estimated at \$71,338.

Another area of benefit resulting from advanced metering is in the work process known as "rebilling." There are a variety of instances that can lead to errors in the initial bill that is sent to a customer, particularly arising from the need to estimate a monthly bill. Since the customer service person will be able to acquire an actual reading from the meter in near real time for an account in question, there will no longer be a need to estimate bills. Avista estimates that 90% of the need for rebilling will be displaced, for an estimated annual benefit of \$43,692.

M. Utility System Studies

Utility departments such as rates and engineering use electricity load information in studies related to system planning, customer rates, reliability, and efficiency. Having information on the use patterns of the individual customer will allow Avista to better understand how and when each customer interacts with its system. This more-detailed information makes these particular studies easier and less expensive to perform and the results more accurate. In addition to these benefits, the deployment of advanced metering will reduce the cost of the annual meter testing program.

1. Retail Load Study

Every five years, the Company conducts a study of the electrical "demand" placed on the system by each of its groups or classes of customers. This information is used as part of the Company's cost of service analysis developed for each of these customer classes. Currently, this demand data is collected at hourly intervals from a sample of customers by using approximately 700 specialized meters that have been placed in the field for this purpose. Installing these meters, and moving them periodically, as well as providing them with communication capability, is a substantial portion of the cost of these studies. With the deployment of advanced metering, each customer meter will have the capability to record and communicate demand information, so there will no longer be a need to deploy specialized meters or pay their communication costs. The annualized benefit expected from this change is estimated at \$145,167.

2. Meter Shop

Each year, Avista meter technicians field test a sample of meters to determine whether the overall 'population' of meters in service is performing reasonably. The number of meters in the sample tested each year is approximately 1,900. The sample size is relatively large, in part, because over the years there have been several classes or 'families' of meters placed into service, and the sample must contain an adequate number from each of these meter families. With the deployment of advanced meters, there will be a much-more uniform population of meters, meaning the sample size of meters to be tested each year will be considerably smaller. The annual benefit estimated from the reduced testing effort is \$54,150.

3. Engineering Studies

Utilities are experiencing new influences, such as the increasing penetration of electric vehicles and customer-owned distributed generation, that are affecting the performance and predictability of their electric distribution systems. These new dynamics can impact the reliability of conventional engineering models that have been used to evaluate system performance and plan for future infrastructure investment. The data provided by advanced metering will help engineers better understand the new ways customers are interacting with the system, and to more accurately model current and future system performance.

N. Washington Advanced Metering - Project Benefit Summary

Area of Improvement	Quantified Annual Customer Benefit
Customer Experience	
Access Interval Usage Data	
Customer Home Network Interface	
Energy Alerts	
Customer Privacy	
Future Opportunity for Benefits	
Rate Options	
Microgrids and Smart Cities	
Data Analytics	
Distributed Generation	
Meter Reading	
Regular Reads	\$4,842,671
Special Reads	\$204,017
Remote Rapid Reconnect	
Account Open, Close, Transfer	\$1,728,042
Credit Connections	\$1,193,060
Credit Collections	\$453,454
After Hours Fees	\$104,040
Special Cases	\$25,896
Reduced Customer Call Time	\$107,242
Reduced Lost Revenue	\$36,931
Outage Management	
Customer Savings	\$2,218,195
Customer Side of Meter	\$396,967
Reduced Customer Calls	\$69,498
Energy Efficiency	
Conservation Voltage Reduction	\$1,186,709

Customer Installed Measures	\$491,882
Energy Theft and Unbilled Usage	
Theft Diversion	\$1,053,322
Unbilled Usage	\$235,081
Slow/Failing Meters	\$169,817
Stopped Meters	\$205,924
Billing Accuracy	
Estimated Bills	\$266,658
Bill Inquiries	\$99,756
Billing Analysis	\$71,338
Rebilling	\$43,692
Utility Studies	
Retail Load Studies	\$145,167
Meter Sampling	\$54,150
Engineering Studies	
Total	\$15,403,509

IV. Preliminary Estimate of the Project Cost

Avista has developed an initial estimate of the cost of implementing the Washington advanced metering project. The nature of this estimate should be considered preliminary since the technical requirements for the various systems have not been completed, and since none of the vendors' proposed configurations and final pricing for these systems is presently known. The preliminary estimate of the capital cost totals \$142.1 million, and the annual operating costs are estimated at \$5.2 million. Avista will continue to refine its estimate of the program cost through the course of the project as more-specific information is developed and available. The major component costs are described below followed by a summary table of the estimated costs associated with each component. Additional details related to the estimated costs are available in supporting work papers.

A. Electric Meters

Includes all types of electric meters, based on the quantity and unit cost of each type of meter.

B. Electric Meter Labor – Internal Cost

The expected Avista employee labor associated with the installation of commercial meters, providing advanced metering systems support, and performing meter re-installs.

C. Electric Meter Labor – Contract Cost

Estimated contract labor cost for installing residential electric meters.

D. Natural Gas Modules

Expected cost of the register modules for installation on existing natural gas meters, based on the quantity and cost of each module type.

E. Gas Module Labor – Contract Cost

Estimated cost for the contract labor required to install the natural gas meter modules.

F. Head End Hardware

Includes the meter data collection computer hardware, meter security computer hardware, the meter data management system hardware, and information technology back office equipment, data storage and central systems design.

G. Head End Software

Estimated cost of the software licenses for the meter data collection software, the data mapping tool, and the meter data management application.

H. Head End Labor – Contract and Internal Cost

Internal labor and vendor services for the installation of metering software, information technology systems design, customer web integration, security systems design, integration of enterprise business applications, database development, project management, and software packaging/testing.

I. Network Communications – Hardware

Includes meter data collectors for the field area network, network range extenders, communications repeaters, direct-connect cellular modules, and wireless mitigation. The wireless mitigation work includes structure placement to support the network repeaters, power line carrier substation equipment, the mobile collector system, satellite system, and the network management system hardware. The actual cost of these systems can vary substantially based on the ultimate technology selected.

J. Network Communications – Software

Estimate of the software license cost for the network management system for the field area network.

K. Network Communications – Labor

Includes the cost of installation of the meter data collector for the field area network and the labor portion of the wireless mitigation work.

L. Corporate Communications

Estimate of the cost to develop and distribute a range of communication materials for at least three educational packages that will be provided to customers during the course of the project.

M. Washington Advanced Metering - Project Cost Summary

Project Components	Investment	Annual Maintenance
Electric Meters	\$33,830,016	
Electric Meter Labor - Internal	\$3,389,939	
Electric Meter Labor - Contract	\$6,815,950	
Natural Gas Modules	\$8,443,323	
Gas Module Labor - Contract	\$4,261,978	
Head End Hardware	\$4,922,650	
Head End Software	\$859,650	
Head End Labor - Contract & Internal	\$9,075,926	
Head End Maintenance Service		\$2,096,258
Network Communications - Hardware	\$26,152,770	
Network Communications - Software	\$3,015,100	
Software Maintenance Support		\$484,990
Network Communications - Labor	\$29,268,732	
Avista Operating Costs		\$2,609,815
Corporate Communications	\$5,500,000	
AFUDC	\$6,591,695	
Total	\$142,127,727	\$5,191,063

V. Preliminary Deployment Schedule

Avista will continue having discussions with meter and other product vendors and will complete the development of technical requirements for the advanced metering system. The Company will develop requests for proposals for metering system vendors and move forward with the evaluations and selection of a system to be implemented. In addition to making the meter system selection, Avista will begin the acquisition of needed computer servers, software applications and security systems in 2015. The installation of new digital meters is slated to begin in 2016. At the same time, Avista will be installing the needed communications infrastructure and performing the work of systems integration. Meter installs will continue in 2017 with plans to complete residential meters in 2018. Final installations of communications infrastructure will also be completed in 2018. The installation of commercial meters will continue into 2019, with plans to complete the advanced metering project in 2020.