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January 14, 2016

Washington Utilities and Transportation Commission
1300 S. Evergreen Park Drive S. W.
P.O. Box 47250
Olympia, Washington 98504-7250

Attention: Mr. Steven King, Executive Director & Secretary

RE: Tariff WN U-28 (New Tariff Schedule 77)

Dear Mr. King,

Attached for electronic filing with the Commission is the Company's proposed tariff WN-U28, Schedule 77, Electric Vehicle Supply Equipment (EVSE) Pilot Program. The purpose of this tariff filing is to establish a new tariff for the Company's proposed EVSE Pilot Program.

I. SUMMARY OF EVSE PILOT PROGRAM

An Avista EVSE program is key to enabling greater Electric Vehicle (EV) adoption that results in benefits to all customers. A comprehensive EVSE program aligns with State policy goals to achieve societal benefits, is responsive to customers, and addresses critical adoption barriers. It also provides important channels for learning and paves the way for cost-effective off-peak charging, improved system planning, and ultimately lower total life-cycle costs of grid infrastructure. Additionally, as noted in the recently adopted resolution of the NW Energy Coalition, which reflects the broad consensus in support of utility involvement in accelerating the EV market, "the electrification of the transportation sector provides an opportunity to use the electric grid more efficiently and cost-effectively, to the benefit of all utility customers."¹

Avista proposes a two-year pilot program to install up to the following number of AC Level 2 EVSE² at the following locations: 120 residential single-family homes (SFH), 100 at workplaces, fleet and multi-unit dwelling (MUD) locations, and at 45 public locations. In addition to the

¹ NW Energy Coalition Resolution on the Electrification of Transportation, adopted December 4, 2016: http://www.nwenergy.org/data/EV-Resolution-Adopted-12_4_15.pdf

² AC Level 2 EVSE charges at 208/240 volts AC and typically recharges a vehicle at 3.3 kW to 6.6 kW.

Level 2 EVSE installations, Avista is proposing to install DC Fast Charging EVSE³ at seven locations as part of the pilot program. The following table provides a summary of the targeted EVSE installations over the two year pilot program.

Charging Type	Year 1	Year 2	Total
Residential SFH Level 2	40	80	120
Workplace/Fleet/MUD Level 2	30	70	100
Public Level 2	20	25	45
Public DC Fast Charging	2	5	7

All Level 2 installations will be completed at sites that are customers of Avista. Of the Level 2 EVSE installations, “smartchargers” will be planned for installation in 100 residential and 90 other locations. Smartchargers provide enhanced capabilities that allow for data acquisition, network communication, and demand response, which is essential to determine baseline charging profiles, enable demand response experiments, and ultimately help shape the long term impact of EV charging for the greatest benefit of all customers.

Cost estimates for the various types of Level 2 and DC Fast Charging EVSE installations in the Company’s service territory are as follows:

Charging Type	EVSE equipment	EVSE installation	Site property & Premises wiring	Utility distribution	Total cost per EVSE port connection
Residential SFH L2	\$500	\$150	\$675	\$50	\$1,375
Workplace/Fleet/MUD L2	\$700	\$350	\$1,700	\$750	\$3,500
Public L2	\$2,500	\$500	\$3,000	\$2,000	\$8,000
Public DC Fast Charging	\$35,000	\$55,000	\$10,000	\$25,000	\$125,000

The Company will pay for the upfront cost of the EVSE equipment, installation, and any required utility distribution upgrade. These costs are the basis for the estimated Capital and costs further described below. In addition, the Company will provide a reimbursement for the site property premises wiring for Level 2 EVSE up to \$1,000 for residential installations and \$2,000 per port connection for all other installations as proposed in the pilot program. The premises wiring reimbursement costs are included in the Operation and Maintenance costs described below.

If the Company reaches its targeted installation rates during the two-year pilot program, the estimated Capital and Operation and Maintenance costs are as follows:

³ DC Fast Charging EVSE provides DC Electricity at high voltage, usually delivering power at 50 kW or more.

	Year 1	Year 2	Year 3	Totals
Capital	\$704,500	\$1,610,750	\$0	\$2,315,250
O&M	\$271,135	\$329,833	\$179,458	\$780,425
Totals	\$975,635	\$1,940,583	\$179,458	\$3,095,675

The Company proposes to fund the pilot-program through its normal capital funding program, with no request for an accounting deferral or tariff rider to collect funds for the program. Instead, the Company will seek recovery of Capital and Operations and Maintenance (O&M) costs through the normal General Rate Case process. O&M costs include credits paid to automobile dealers for data acquisition, administrative expenses, premises wiring reimbursement, data analytics, and reporting. The majority of the O&M costs during the course of the pilot program represent one-time expenses. The expected annual O&M cost beginning at the conclusion of the two-year pilot program is approximately \$179,458 per year. The estimated annual revenue requirement after the equipment is installed (Year 3 and beyond) is \$686,194 (see workpapers for calculation), which equates to an approximate 0.14% bill impact to customers (prior to any offset from the increased sales of electricity from additional EVs).

II. BACKGROUND

A. Factors Driving Adoption of Electric Vehicles

A number of factors are driving increased adoption of electric passenger vehicles both regionally and globally. These factors include:

1. Environmental Benefits

Customers using a conventional vehicle powered by an internal combustion engine (ICE) emit over 5 tons of CO² per year, per vehicle, and the transportation sector represents close to 50% of all CO² emissions in Washington State.⁴ Avista customers who drive a plug-in electric vehicle (EV) use electricity that is generated by a variety of sources, emitting 1.06 tons of CO² per EV each year, a reduction of 79%.⁵ Surveys show that environmental benefits are one of the top three reasons why customers purchase an EV.⁶ Increasingly, State and Federal governments recognize the opportunity to realize environmental benefits through electrified transportation. As stated in House Bill 1853, passed in the 2015 WA legislative session, “The legislature finds that state policy can achieve the greatest return on investment in reducing greenhouse gas emissions and improving air quality by expediting the transition to alternative fuel vehicles, including electric vehicles.” In addition to the near-term benefits of improved air quality, over the long-

⁴ Washington State Department of Transportation. *Washington State Electric Vehicle Action Plan*. December, 2014.

⁵ Avista Corp (2015). *Electric Integrated Resource Plan*. August 31, 2015. 0.27 metric tons of CO² per MWh * 3,555 annual kWh/EV * 1.1 tons/metric ton = 1.06 tons of CO² per EV each year

⁶ California Center for Sustainable Energy (2013). *California Plug-in Electric Vehicle Driver Survey Results*. May, 2013.

term the electrification of the transportation sector will likely play a key role in the larger effort to reduce climate change risk.⁷

2. Improving Battery Technology and Manufacturing Costs

Over the last few years, the manufacturing cost of a lithium-ion battery pack for an EV has been reduced from over \$600 per kWh installed capacity to under \$400 per kWh.⁸ By 2020 if not earlier, researchers predict costs will lower to about \$200 per kWh, which would then make the total ownership costs of battery electric vehicles competitive with internal combustion engine (ICE) vehicles without federal tax incentives, when gasoline prices are at or above \$2.60 per gallon. By 2025, battery costs are projected to decrease to about \$160 per kWh.⁹

3. Significant Fuel and Maintenance Cost Savings

At \$3.00 per gallon of gasoline, the average household spends over \$2,800 in gasoline costs each year to drive its ICE vehicles. Driving EVs the same number of miles at current electricity prices would cost under \$500 per year – a savings of over \$2,300 per year, per household. This translates to a fuel cost of \$0.53 per gasoline gallon equivalent for electric vehicles, compared to the average ICE vehicle on the road. In addition, maintenance costs are reduced by \$3,100 over the life of a battery electric vehicle, compared to a generic conventional ICE vehicle.¹⁰ This keeps more discretionary dollars in the hands of customers which benefits the EV owner, as well as the local economy.^{11,12} Electricity prices are also much more stable than gasoline, which has shown volatile price swings between \$1.73 and \$4.33 per gallon over the last 10 years.¹³

4. Vehicle Performance and Owner Satisfaction

EV drivers consistently report very high satisfaction with their EVs.¹⁴ A superior driving experience is afforded by the electric motor that provides a quiet ride and instant torque, with no tailpipe emissions. In addition, the electric driving range of most EVs is adequate to meet the needs of the majority of drivers for their daily driving needs, as the average person drives 29

⁷ Ryan, Nancy. (2015). *Engaging Utilities and Regulators on Transportation Electrification*. Energy and Environmental Economics. March 1, 2015.

⁸ Kamath, H. (2014). *Batteries and Electrification*. Presentation to the Edison Electric Institute. Electric Power Research Institute. August 19, 2014.

⁹ Hensley, R., Newman, J., and Rogers, M. (2012). *Battery Technology Charges Ahead*. McKinsey Quarterly. July 2012.

¹⁰ Electric Power Research Institute (2014). *Total Cost of Ownership for Current Plug-in Electric Vehicles*. Publication No. 3002004054.

¹¹ Energy and Environmental Economics, Inc. (2014). *California Transportation Electrification Assessment, Phase 2: Grid Impacts*. October 23, 2014.

¹² Drive Oregon (2015). *The Returns to Vehicle Electrification*. This study estimates that 4,500 current EVs in Oregon contribute between \$1.8 million and \$10.2 million additionally each year to the economy, as well as \$191,600 to \$676,700 in local and state tax revenues.

¹³ Gas Buddy (2015). *120 Month Average Retail Price chart (Washington)*.

http://www.washingtongasprices.com/Retail_Price_Chart.aspx, accessed September 17, 2015.

¹⁴ California Center for Sustainable Energy (2013). *California Plug-in Electric Vehicle Driver Survey Results*. May, 2013.

miles per day.¹⁵ Many customers purchase or lease an EV to do something good for the environment, but then are pleasantly surprised by the convenience, enjoyable driving experience, and operating cost savings of their EV.¹⁶

5. Policy Support

Mounting support from Washington State's government is apparent from the recent publication of the Washington State Electric Vehicle Action Plan¹⁷, and several bills introduced in the recent Washington legislative session. This includes House Bill 1853 which provides "a clear policy directive and financial incentive to utilities for electric vehicle infrastructure build-out."¹⁸ Ongoing federal tax credits of up to \$7,500 per EV purchase are expected to remain available until phase-outs beginning in 2020, and the U.S. Department of Energy continues to fund large programs supporting the adoption of electric vehicles. In addition to short- and long-term economic and environmental benefits, energy independence is a strategic motivation for supporting transportation electrification, in order to reduce reliance on foreign oil sources and thereby strengthen national security.¹⁹

B. Barriers to EV Adoption

Although many factors are driving the adoption of EVs, a number of significant barriers also exist which must be overcome to enable entry in the mass market and full-scale EV adoption. These barriers include:

1. Upfront Purchase Cost

Due to the cost of the battery, electric motor and related control systems, and low economies of scale, EVs currently have a higher upfront purchase cost than a similarly sized and equipped ICE vehicle. For example, the purchase of a new 2015 Nissan LEAF (an EV) is approximately \$30,000, while the 2015 Nissan Versa (an ICE vehicle) is \$18,000. After the federal tax credit of \$7,500, the Nissan LEAF net purchase price is \$22,500. This represents an effective purchase premium of 25% for a Nissan LEAF compared to the Nissan Versa. Although the Nissan LEAF provides a better driving experience and lower total lifecycle costs²⁰, this higher upfront cost takes precedence for many individuals who forego an EV purchase as a result. Lower purchase costs will occur with improved battery technology, reduced production costs, and the

¹⁵ U.S. Department of Transportation (2009). *2009 National Household Travel Survey*.

¹⁶ The Register-Guard (2015). "EV drivers love their cars and wouldn't go back". Guest Viewpoint by Rep. Phil Barnhart (D-OR). September 9, 2015.

¹⁷ Washington State Department of Transportation (2015). *Washington State Electric Vehicle Action Plan, 2015-2020*. February, 2015.

¹⁸ House Bill 1853, Section 1, Paragraph (3).

¹⁹ U.S. Department of Energy (2014). *EV Everywhere Grand Challenge: Road to Success*. January, 2014.

²⁰ Electric Power Research Institute (2014). *Total Cost of Ownership for Current Plug-in Electric Vehicles*. Publication No. 3002004054.

development of the EV used car market. For example, a 2013 Nissan LEAF lease return in new condition with less than 9,000 odometer miles, may be purchased today for under \$15,000.²¹

2. Battery Degradation Concerns

Many potential consumers worry about the possibility of battery degradation, large battery replacement expenses, and rapid market value depreciation of an EV. The strong fear of battery degradation and replacement costs persists despite lab testing data that show batteries may perform satisfactorily for the life of the vehicle, and substantial Original Equipment Manufacturers' (OEM) guarantees such as Chevy's battery warranty for 100,000 miles. This barrier will be lessened over time as EVs with high mileage capabilities demonstrate satisfactory performance. Alternatively, creative business models that lease the batteries to the EV owner may help overcome this barrier.²²

3. Low Customer Awareness and EV Promotion

Most consumers are not aware of the current opportunities and benefits afforded by EVs. Much of this may be attributable to OEMs such as Ford, GM, and Nissan which have limited marketing and promotion.²³ Furthermore, most dealerships have demonstrated a lack of knowledge and interest in selling EVs, do not adequately inform customers, and in some cases steer them away from an EV purchase.^{24,25} This barrier may be overcome with more active promotion and marketing by the OEMs, incentives to dealers, and other public education and outreach programs that help raise consumer awareness and interest.

4. Low Electric Driving Range and Limited Charging Availability

There are two main types of EVs: battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).²⁶ BEVs rely exclusively on an external source of electricity to power the vehicle, as they do not have a secondary propulsion system powered by an ICE. Other than Tesla models, the typical BEV has a driving range of under 100 miles between battery charges. This is sufficient to handle customer driving needs on most days, but is not practical for the

²¹ This example came from the experience of an Avista employee who recently purchased a used Nissan LEAF in the Seattle marketplace from Paramount Motors.

<http://www.paramountmotorsnw.com/inventory.asp?showOnly=Nissan>

²² Lim, Michael K., Mak, Ho-Yin and Rong, Ying (2014). *Toward Mass Adoption of Electric Vehicles: Impacts of the Range and Resale Anxieties*. August 29, 2014.

²³ Morris, Charles (2015). "New Study: Lack of coherent sales concepts is responsible for weak EV sales." *Charged Electric Vehicles Magazine*. September 18, 2015.

²⁴ Morris, Charles (2014). "Are auto dealers the EV's worst enemy?" *Charged Electric Vehicles Magazine*. September 9, 2015.

²⁵ Consumer Reports (2014) "Dealers not always plugged in about electric cars, Consumer Reports' study reveals." *ConsumerReports.org*. April 22, 2014.

²⁶ Vehicles commonly known as "hybrids" or "Hybrid Electric Vehicles" (HEVs) rely entirely on gasoline as an energy source, as the onboard ICE is used to turn a generator which supplies electric energy to the battery. HEVs cannot receive electricity from an external source, and therefore are not relevant to filing.

occasional longer trip, or for those who regularly commute longer distances. PHEVs use both gasoline and electricity supplied by an external source. PHEVs are not limited by driving range between battery charges as they have a secondary propulsion system powered by gasoline, which takes over once the battery is depleted. However, PHEVs have smaller battery packs with lower electric driving ranges, usually between 11 and 40 miles depending on the model. If the driver of a PHEV wishes to drive on electric power and avoid gas-driven miles, they must recharge more frequently than BEV drivers. The barrier of limited electric range for both BEVs and PHEVs will be mitigated by improvement in battery technology that enables larger battery packs with longer electric range at lower cost, and the availability of charging equipment, as detailed in subsequent sections.

C. Types of Charging Equipment and Costs

Charging equipment, also known as Electric Vehicle Supply Equipment (EVSE) is available in three different categories.

1. AC Level 1 EVSE

Level 1 EVSE connects the vehicle to AC electricity at 110 volts, usually providing power to the vehicle at 1.4 kW. This results in 3 to 5 miles of driving range gained per hour of charging, taking between two to ninety hours²⁷ to charge an empty battery depending on battery size.²⁸ This is sufficient to recharge the battery overnight for the average daily driving distance of 29 miles, in about 6.4 hours of continuous charging. However, for many vehicles with larger battery packs, Level 1 may not be sufficient to recharge the battery in a reasonable amount of time, e.g. after longer trips or on those days when several smaller trips may be needed. Level 1 EVSE is provided as standard equipment with the purchase of an EV, such that this level of charging is available to households with a standard 110 volt receptacle near the EV's parked location. For those households residing in multiple unit dwellings (MUDs), off-street parking with 110 volt receptacles are often not available, which makes charging overnight impractical.

2. AC Level 2 EVSE

At 220 volts AC, Level 2 EVSE typically recharges the vehicle at 3.3 kW to 6.6 kW, corresponding to a 20 amp or 40 amp protected circuit, taking between 1.3 to 2.7 hours to recharge the average driving distance of 29 miles.²⁹ Some vehicles like the Tesla Model S are equipped to charge at 10 kW to 20 kW, requiring a 50 amp to 100 amp protected AC circuit. Other than residential installations in single family homes (SFH), Level 2 EVSE is also

²⁷ For example, a Nissan LEAF has a range of 84 miles, requiring 17 to 28 hours to recharge at Level 1. A Tesla vehicle at 230 or more miles electric range, would require 90 hours of continuous charging at Level 1 to fully recharge from a near empty battery state.

²⁸ A Chevy Volt PHEV with 38 miles electric range could take between 8 to 13 hours to recharge from empty to full at Level 1. A Toyota Prius PHEV has an electric range of only 11 miles and even if the battery is fully depleted, would recharge within 2 to 4 hours at Level 1.

²⁹ Assuming an average energy consumption of 3.3kWh per mile, 29 miles requires 8.8 kWh of energy; this corresponds to 1.3 and 2.7 hours charging time, for 3.3 kW and 6.6 kW charging, respectively.

commonly found in MUDs, workplace, fleet and public locations. However, in these applications the Level 2 EVSE usually includes more robust housings and mounting hardware, and in some cases added software functionality. Also, the installation usually involves more extensive trenching, conduit lengths, supply panel and utility distribution upgrades, which adds considerable cost compared to residential EVSE installs in single family homes. Both Level 1 and Level 2 EVSE use a standard conductive coupler known as a J1772 connector to attach to the vehicle and supply electricity to the vehicle's rectifiers.³⁰

3. DC Fast Charging EVSE

DC Fast Charging EVSE provides DC electricity at high voltage, usually delivering power at 50 kW or more. For vehicles equipped to connect with DC Fast Charging EVSE, the onboard rectifiers are bypassed and DC electricity is provided directly to the battery, gaining 165 miles driving range per charging hour or more. DC Fast Charging EVSE is relatively expensive and usually found only in commercial fleet or public locations. However, as opposed to public Level 2 EVSE, the charging time of the vehicle is greatly reduced to as low as 15 minutes to significantly recharge the battery. For this reason, DC Fast Charging EVSE is a critical enabler of practical, longer distance EV driving. As battery technology advances and manufacturing costs are reduced, more vehicles are expected to have larger battery packs similar to today's Tesla vehicles. Therefore, it is reasonable to expect that the need for residential and dedicated workplace Level 2, as well as public DC Fast Charging EVSE will increase over time.³¹ Unfortunately, DC Fast Charging EVSE has not been standardized under one type of connector that works for all vehicles. Three different types of DC Fast Charging connectors are utilized: Tesla, CHAdeMO, and SAE Combo. Generally, Tesla connectors only work for Tesla models, CHAdeMO for Nissan, Kia and Mitsubishi, and SAE Combo for the remainder of EVs equipped with a DC fast charging connection. For this reason, new DC Fast Charging EVSE installations (non-Tesla) should incorporate a dual-connector with both CHAdeMO and SAE Combo connections.

D. EVSE Installation Costs

Avista's experience with EVSE installations is limited. Based on review of various literature and discussion with subject matter experts,^{32,33,34} cost estimates for the various types of Level 2 and DC Fast Charging EVSE installations in our service territory are as follows:

³⁰ A rectifier is an electrical device that converts an alternating current into direct current by allowing a current to flow through it in one direction only.

³¹ Comments by Dan Bowermaster, Electric Transportation Program Manager, Electric Power Research Institute

³² Electric Power Research Institute (2014). *Assessment of Compressed Natural Gas and Electricity as Transportation Fuels for Utility Fleets and Utility Customers*. Report No. 3002000295.

³³ Comments by Dan Bowermaster, Electric Transportation Program Manager, Electric Power Research Institute

³⁴ Electric Power Research Institute (2013). *Electric Vehicle Supply Equipment Installed Cost Analysis*. Report No. 3002000577.

Charging Type	EVSE equipment	EVSE installation	Site property & Premises wiring	Utility distribution	Total cost per EVSE port connection
Residential SFH L2	\$500	\$150	\$675	\$50	\$1,375
Workplace/Fleet/MUD L2	\$700	\$350	\$1,700	\$750	\$3,500
Public L2	\$2,500	\$500	\$3,000	\$2,000	\$8,000
Public DC Fast Charging	\$35,000	\$55,000	\$10,000	\$25,000	\$125,000

Installation of Level 2 EVSE in a single-family residential garage usually involves installing premises wiring for a dedicated 220 volt circuit from the electric supply panel to the charging equipment. In our service territory, this cost is estimated at \$675 including permit and inspection. The cost of the Level 2 EVSE equipment is approximately \$500, plus approximately \$150 for EVSE installation and testing. In some cases, utility distribution upgrades such as higher capacity transformers may be needed. This results in a total cost estimate of \$1,375 for a typical residential installation.

Level 2 EVSE installations for MUDs, workplaces and commercial fleets are more expensive than most residential applications, with greater cost variability due to a number of variables, such as the location of where the EVSE must be located in relation to the power source, additional trenching, protection or barriers to protect the EVSE from damage. These types of EVSE installations are estimated at \$3,500 per port connection. Public Level 2 EVSE are usually more expensive still, for a total cost of about \$8,000 per port connection. These costs reflect the common need for significant ground trenching work with extended conduit lengths, repaving, panel upgrades, and occasionally utility distribution equipment upgrades. DC Fast Charging installations are the most expensive, estimated at a total cost of \$125,000 each. Very careful selection of DC Fast Charging EVSE site locations is necessary to maximize utilization and limit costs by avoiding areas requiring extensive utility distribution feeder supply and trenching work.

In addition to these costs, the use of EVSE “smartchargers” which have communications, data collection, and in some cases meter-grade sensing and demand response capabilities, add approximately \$2,000 per port connection. Lastly, there are recurring operations costs involving network communications, data management and analysis.

E. Charging Infrastructure Assessment

About 80% of charging is expected to occur at home, 10% to 15% at the workplace, and 5% to 10% percent at public charging locations.³⁵ As mentioned earlier, residential charging at Level 1 and Level 2 is adequate to meet the daily driving needs of many EV drivers. However, the availability of workplace charging is of major importance as a catalyst for adoption, as it allows

³⁵ Halliwell, John (2013). *Plug-in 2013 Infrastructure 101 Presentation*. Electric Power Research Institute. September 30, 2013.

many PHEV owners to drive to and from work using electricity in both directions, and to extend the commuting range of BEV owners. In fact, the availability of workplace charging can “make or break” the decision to drive an EV. For example, the U.S. DOE showed that twenty times as many employees drove EVs when charging was made available at the workplace, compared to the average worker.³⁶ Public Level 2 EVSE is needed to enable local driving needs beyond the normal daily commute, and public DC Fast Charging EVSE is necessary to enable longer distance EV travel. Although public Level 2 and DC Fast Charging EVSE in many cases are not highly utilized, their visibility and availability help build awareness and confidence in the ability to find a charging station if the battery gets low, or as a convenient way to take the occasional longer trip. This greatly helps overcome consumer “range anxiety” and enable EV purchase decisions.³⁷ It’s also essential to recognize the importance of site location. For example, public Level 2 EVSE located at a car dealership may be useful in rare emergencies, but most likely would lack public visibility or convenience as a place to park the vehicle for an extended period of time in normal circumstances.

The following number of EVSE port connections for each type are deemed adequate to serve 1,000 EV drivers, compared to the number available in our service territory today.^{38,39}

Charging Type	Number of EVSE port connections needed per 1,000 EVs	Current Number of EVSE port connections in Avista WA service territory
Residential Level 2	500	unknown
Workplace Level 2	270	unknown
Public Level 2	67	17
Public DC Fast Charging	5	1

Note that due to location, of the seventeen public Level 2 EVSE currently available, most are unsuitable for convenient or routine use by EV drivers as only four are available to the general public located near shopping or other attractions where a driver might realistically want to spend two hours or more time.

Based on vehicle registrations and RL Polk research data, as of June 30, 2015 an estimated 250 to 300 Avista customers drive EVs in Washington.⁴⁰ This is segmented by approximately 45%

³⁶ U.S. Department of Energy (2014). *Workplace Charging Challenge Progress Update 2014: Employees Take Charge*. November, 2014.

³⁷ Nick Nigro, Jason Ye, and Matt Frades (2014). *Assessing the Electric Vehicle Charging Network in Washington State*. September, 2014.

³⁸ Electric Power Research Institute (2014). *Guidelines for Infrastructure Planning: An Explanation of the EPRI Red Line/Blue Line Model*. Publication No. 3002004096.

³⁹ www.plugshare.com. Accessed September 18, 2014.

⁴⁰ Washington State Department of Transportation (2015). *Plug in Electric Vehicles Registered in Washington as of June 30, 2015*.

PHEVs and 55% BEVs, the great majority of which are registered in Spokane County. The relatively low adoption rate per capita in our service territory compared to the Puget Sound region is due at least in part to the low level of accessible charging infrastructure.⁴¹ For example, the absence of DC Fast Charging EVSE in nearby towns and cities around Spokane and along I-90 means EV drivers cannot practically use their vehicles to take longer trips between neighboring cities and towns, such as Spokane, Pullman, Chewelah, and Clarkston, let alone between Spokane and Seattle or Portland, Oregon. This situation undoubtedly dampens EV adoption in our service territory.⁴²

The chart below illustrates the projected growth of EV's on Avista's system, given reasonable low, medium and high adoption scenarios over the next 25 years.^{43,44,45} This represents EV penetration of 3%, 12%, and 20% of all vehicles on the road by 2040 for the low, medium and high scenarios, respectively. The low scenario is simply a regression of the low adoption rate seen thus far, projected forward with an assumption of small population growth. Avista believes the low scenario is very conservative as EV adoption has been hampered in its service territory due to the lack of EVSE. As a benchmark comparison, in the 10 years since the introduction of HEV's, the penetration is already greater than 3%. Even greater EV adoption than the high scenario shown below may be needed to achieve emerging policy goals to mitigate climate change risks.⁴⁶ However, this would most likely require significant political and cultural influence beyond that considered here.

⁴¹ Of the approximately 300,000 EVs registered in the United States, about 46% are located on the west coast, with 120,000 in California, 5,600 in Oregon, and 12,000 in Washington.

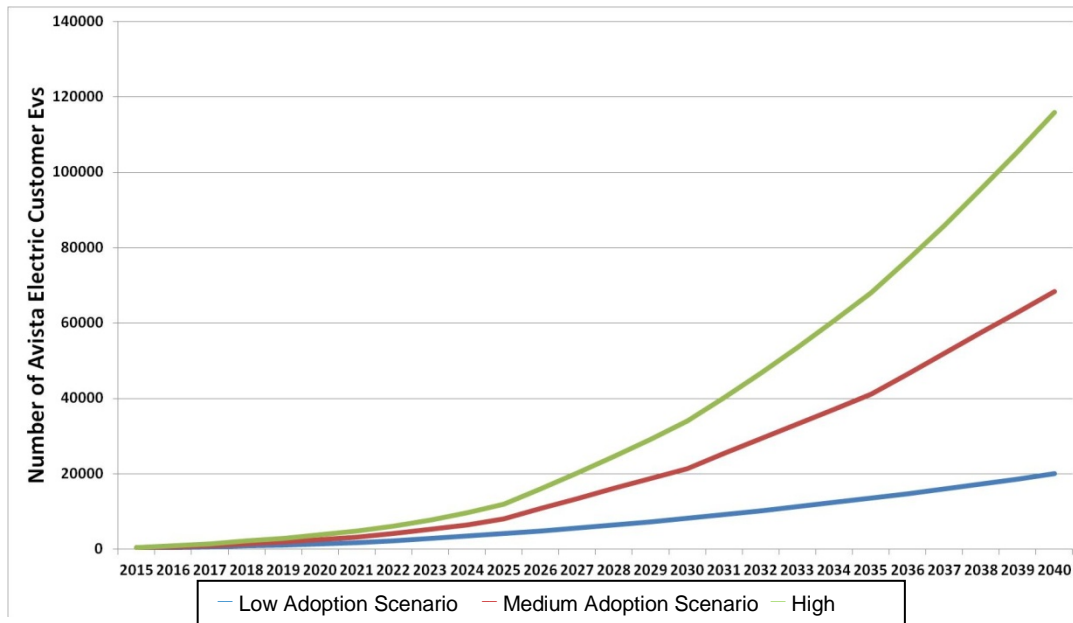
⁴² Nick Nigro, Jason Ye, and Matt Frades (2014). *Assessing the Electric Vehicle Charging Network in Washington State*. September, 2014.

⁴³ Electric Power Research Institute (2012). *The Plug-In Electric Vehicle Market: Current Status and Long-Term Outlook*. Publication No. 1024103.

⁴⁴ Shields, Craig (2011). *Predicting the Electric Vehicle Adoption Curve*. Presented at the 2011 Electric Vehicle Summit.

⁴⁵ Santa-Eulalia, Luis Antonio de; Neumann, Donald; Klasen, Jorg (2011). *A Simulation-Based Innovation Forecasting Approach Combining the Bass Diffusion Model, the Discrete Choice Model and System Dynamics*. Presented at SIMUL 2011: The Third International Conference on Advances in System Simulation.

⁴⁶ Ryan, Nancy. (2015). *Engaging Utilities and Regulators on Transportation Electrification*. Energy and Environmental Economics. March 1, 2015.



In the near term, through 2020 the medium and high adoption scenarios translate to between 2,500 and 3,800 Avista customers with EVs, respectively. Adequate charging infrastructure is a key enabler to accelerate and achieve these higher rates of EV adoption in the near term, which in turn has a major effect on the trajectory of longer-term adoption. As it stands, currently available charging infrastructure is inadequate to support the number of EV drivers in our service territory today, and grossly inadequate to encourage higher EV adoption rates in the future.

F. Benefits of EV Adoption and the Need for an Avista EVSE Program

Greater numbers of EVs benefit all utility customers when the billed revenue from EV customers exceeds the costs of serving them.⁴⁷ For example, the California Transportation Electrification Assessment showed that each EV provides billed revenue of over \$2,500 net present value above utility costs over its lifetime.⁴⁸ In the long term, much of this may depend on the flexibility of EV charging to occur during system off-peak times, such that the utilization of grid infrastructure is maximized. For example, “smartcharging” techniques to encourage off-peak charging could result in the avoidance of grid upgrades for up to 50% of residential households with an EV,⁴⁹ as well as substantial reductions in major capacity investments.

A preliminary Avista study indicates that net present value contributions of \$500 to \$2,000 per PEV may be possible in a medium adoption scenario, resulting in negative rate pressure. However, sensitivity analysis shows that depending on different assumptions for EV adoption scenarios, base charging profiles, shifting of on- to off-peak charging times, and the level of

⁴⁷ Ryan, Nancy. (2015). *Engaging Utilities and Regulators on Transportation Electrification*. Energy and Environmental Economics. March 1, 2015.

⁴⁸ Energy and Environment Economics (2014). *California Transportation Electrification Assessment – Phase 2: Grid Impacts*. October 23, 2014.

⁴⁹ Vermont Energy Investment Corporation (2015). *In the Driver’s Seat: How Utilities and Consumers Can Benefit from the Shift to Electric Vehicles*. April 30, 2015.

EVSE investment by the utility, a range from slightly negative to slightly positive rate pressure could occur.⁵⁰ Empirical data acquired from a statistically significant number of customers is necessary to establish base charging profiles and model system impacts with greater certainty.

In addition to all customers benefiting from EV billed revenue exceeding costs, EVs result in other benefits including improved air quality and lower greenhouse gas emissions, energy security, macro-economic benefits resulting from reduced transportation fuel costs, and overall energy conservation. As an example, using a total resource cost test (TRC), the California Transportation Electrification Assessment showed a net benefit of \$5,000 per EV, and using a societal cost test (SCT) showed a net benefit of over \$6,100 per EV.⁵¹ In light of the many benefits of EVs and in order to achieve greenhouse gas emission reductions, the Washington Governor's office has set a Results Washington Clean Transportation Goal of 50,000 EVs registered in the state by 2020.⁵²

In the near term, the number of EVs in Avista's service territory will have a negligible effect on revenues and rates, in terms of added electric load and costs to serve that load. Continued energy efficiency improvements such as reduced lighting energy usage with the switch to LEDs, is expected to result in negative to flat electrical use per customer through 2035.⁵³ Over time, greater adoption of EVs may act to offset these reductions, possibly resulting in slightly positive overall usage per customer. Regardless of average loads, however, it is possible that on-peak EV charging could result in the need for increased peak capacity. Utility assets can be better utilized if electricity for EVs is consumed during off-peak periods, thereby delaying investments in generation and distribution infrastructure.⁵⁴ As part of an EVSE program, deliberate demand response experiments may enable an assessment of the feasibility, costs and benefits associated with getting customers to charge their EVs off-peak, and help inform improved long-term infrastructure planning that ultimately optimizes system lifecycle costs.

An Avista EVSE program can also serve participating customers by alleviating informational and first-cost barriers. EV owners and organizations desiring Level 2 EVSE at home, at work or at public locations are faced with significant effort to gain reliable information, evaluate charging needs, product vendors, installation contractors, and municipal code requirements. Many opt to forego purchase and installation of a Level 2 EVSE, due to information uncertainty, inconvenience, and up-front purchase and installation costs. A program sponsored by Avista would provide assistance to these customers and value in the form of reliable information and effective EVSE products and services.

⁵⁰ Avista Corporation (2015). *Electric Vehicle Impact Study*. July 22, 2015.

⁵¹ Energy and Environment Economics (2014). *California Transportation Electrification Assessment – Phase 2: Grid Impacts*. October 23, 2014.

⁵² Results Washington, <http://www.results.wa.gov/what-we-do/measure-results/sustainable-energy-clean-environment/goal-map>

⁵³ Avista 2015 Electric Integrated Resource Plan, Figure 3.15

⁵⁴ Driving an average of 11,400 miles per year in an EV at 3.3 miles per kWh, results in 3455 kWh electric consumption per year. This represents a 29% increase over the current 11,664 kWh average used by Avista's retail customers.

In addition, the use of Level 2 EVSE at home and at work results in lower electrical resistance losses than Level 1 EVSE, for an equivalent amount of energy delivered. This can provide efficiency gains of 2.3% to 12.8%, depending on a variety of factors.⁵⁵ Over the course of time and with growing numbers of EVs on the system, the efficiency gains from charging at higher voltage levels effectively reduces the total lifecycle cost of charging at Level 2.

Finally, an effective EVSE program can address the lack of EVSE in our service territory and greatly increase the availability of workplace charging. This is necessary to facilitate regional EV travel, build range confidence, and achieve higher EV adoption rates. As public EVSE are expensive, a more limited quantity and careful selection of site locations is imperative to minimize costs and maximize benefits.

In summary, an Avista EVSE program is key to enabling greater EV adoption that benefits all customers. A comprehensive EVSE program aligns with State policy goals to achieve societal benefits, is responsive to customers, and addresses critical adoption barriers. It also provides important channels for learning and paves the way for cost effective off-peak charging, improved system planning, and ultimately lower total lifecycle costs.

III. EVSE PILOT PROGRAM DETAILS

The factors driving EV adoption, the need to overcome barriers, and the potential for short-term benefits as well as substantial long-term utility customer and societal benefits, have led Avista to propose a two-year EVSE pilot program that accomplishes two primary objectives:

1. install a moderate number of different EVSE types in beneficial locations, in order to immediately support EV adoption and develop the capability to deploy an effective EVSE program on a larger scale.
2. Determine EV residence locations and base charging profiles for residential, workplace and public charging locations, in order to better estimate system impacts, facilitate long-range planning, and design useful demand response experiments.

Specifically, the pilot’s targeted number of EVSE port installations are listed below:

Charging Type	Year 1	Year 2	Total
Residential SFH Level 2	40	80	120
Workplace/Fleet/MUD Level 2	30	70	100
Public Level 2	20	25	45
Public DC Fast Charging	2	5	7

Included in the installation figures above are proposed “smartcharger” installations for 100 residential (out of the total 120) and 90 combined workplace and public Level 2 EVSE port

⁵⁵ Vermont Energy Investment Corporation, Transportation Efficiency Group (2013). *An Assessment of Level 1 and Level 2 Electric Vehicle Charging Efficiency*. March 20, 2013.

connections (out of the total 145). Statistically significant sample sizes of BEV, PHEV, commuting and non-commuting subsets are targeted in these “smartcharger” installations, with data acquisition, network communications, and demand response capabilities. Cost estimates for the pilot program are as follows:

	Year 1	Year 2	Year 3	Totals
Capital	\$704,500	\$1,610,750	\$0	\$2,315,250
O&M	\$271,135	\$329,833	\$179,458	\$780,425
Totals	\$975,635	\$1,940,583	\$179,458	\$3,095,675

The Company proposes to fund the pilot-program through its normal capital funding program, with no request for an accounting deferral or tariff rider to collect funds for the program. Instead, the Company will seek recovery of Capital and O&M costs through the normal General Rate Case process. O&M costs include credits paid to automobile dealers for data acquisition, administrative expenses, premises wiring reimbursement, data analytics, and reporting. The majority of the O&M costs during the course of the pilot program represent one-time expenses. The expected annual O&M cost beginning at the conclusion of the pilot program is approximately \$179,458 per year. The estimated annual revenue requirement after the equipment is installed (2018 and beyond) is \$686,194 (see workpapers for calculation), which equates to an approximate 0.14% bill impact to customers.

Attached tariff Schedule 77 explains the following elements of the program:

- i. Availability – the pilot program will be available to electric customers in the Company’s Washington service territory.
- ii. Eligibility requirements – participants of the program must be a customer of Avista, and for residential customers must own or lease an EV.
- iii. Site selection – all residential, workplace, and MUD site locations shall qualify if the customer meets all eligibility criteria of the program. Level 2 public installations shall qualify if the EVSE is at a site location where users are likely to reside for more than two hours. DC Fast Charging EVSE site locations will be determined by the Company, based on locations that minimize costs and will be utilized by the greatest number of EV drivers.
- iv. Ownership of EVSE – all equipment installed will be owned and maintained by the Company.
 - v. Premises wiring reimbursement – described below.
 - vi. Customer obligations – described below.
 - vii. EVSE Site Agreement – described below.

Participants of the pilot program will include existing EV drivers, new EV drivers during the course of the pilot, and public and private organizations, all of which are Avista customers. Regular reviews and reporting of results, adaptive management, and adjustments during the two-year period are expected. Further details are provided below.

A. EVSE

EVSE will be purchased and owned by Avista, with an expected depreciable life of ten years. One or more vendors will be selected for the pilot following requests for proposals. Standard Level 2 EVSE will be capable of charging at a minimum of 3kW output power. In addition, “smartcharger” Level 2 EVSE will be capable of data collection, network communications, and demand response. Data collection will include amperage, voltage, date, time, and battery state. A limited number of public Level 2 EVSE may be capable of user payment. DC Fast Charging EVSE will generally be capable of 50kW output power and user payment.

Installation of some standard (non-networked) EVSE allows Avista to understand costs and operational implications for this category of EVSE, and forms a stronger relationship with the customer whereby a smartcharging EVSE could be more readily installed in the future. We anticipate that following the 2-year pilot program installation period, if a longer term installation program is proposed and launched, it will involve a much higher proportion of standard chargers until such time as the market makes available smartchargers at reduced costs, such that overall benefits outweigh costs in a shorter time horizon. As stated in the petition, a transition from petroleum to electric vehicle transportation results in net benefits to all customers and society in general. For these reasons it is important for Avista to utilize and become familiar with some standard EVSE as part of the pilot program.

B. Installation

Coordination, installation and inspection of EVSE will be designed to streamline the process and provide a satisfying Customer experience, while ensuring required safety and permitting is performed. Installations will be performed by Avista contractors selected through a request for qualifications process.⁵⁶ Contractors will deliver, install and test EVSE, following verification that electrical supply service meets all code and legal requirements.

C. EVSE Site Agreement

For purposes of the pilot program, the EVSE Site Agreement will include the obligation of the Customer to participate in regular feedback surveys and future demand response experiments until such time as the EVSE is removed or the agreement is terminated.

The Customer must also agree to be responsible for routine inspection, maintenance and troubleshooting not requiring technicians (e.g., resetting the circuit breaker). Operation and maintenance (O&M) activities requiring field technicians will be accomplished by qualified contractors, selected through a request for qualifications process. Customers will be responsible to pay Avista for electricity delivered to EVSE, and by law may not resell this electricity to EV drivers using EVSE. In many workplace and public locations the cost of electricity is relatively small, such that the total cost to enable and transact payments may be more than simply

⁵⁶ Contractor selection is critical to the success of this pilot so as to install EVSE in accordance with all code requirements, provide prompt follow-up services where needed, and ensure high customer satisfaction.

providing charging services free of payments.⁵⁷ However, in some public Level 2 EVSE locations, the EVSE may need to be managed for optimal use, possibly including port availability control and a reasonable payment by the EV driver.⁵⁸ In limited cases such as these, the terms of payments by EV drivers will be determined by the Customer who is hosting the EVSE and paying for the electricity.

In contrast, DC Fast Charging EVSE will require payment by the EV driver. This helps ensure availability for drivers that depend on it to make a longer trip, rather than others using it for “free” local driving needs that can be met by charging at home or at work. In the case of DC Fast Charging EVSE, Avista will own and maintain all equipment from the transformer to the EVSE, and transact EV driver payment for electricity use at the EVSE. In these cases, Avista will seek a property easement from a site host if it does not own the property, and request that the site host notify Avista’s maintenance contractors in the event of any problems with the DC Fast Charging EVSE.

For all AC Level 2 EVSE the term of the Site Agreement will be ten years or until such time that either the Customer or the Company terminates the agreement and removes the EVSE from the Customer’s location. At the end of the term of the EVSE Site Agreement the Company will work with the Customer on potentially replacing or upgrading the EVSE and signing a new EVSE Site Agreement, removing the EVSE, or provide the Customer the option to purchase the EVSE from the Company.

D. Premises Construction and Wiring

A strong incentive is needed to gain adequate participation levels and ensure a successful pilot program. This is accomplished in part through reimbursement of installation costs, up to a reasonable limit. Under the pilot program, Level 2 EVSE installations will be contracted between the Customer and the assigned installation Contractor. Upon receipt of documentation that demonstrates satisfactory operation and the completion of legal inspection(s), costs will be reimbursed to the Customer up to a maximum of \$1,000 per port connection for single-family residential installations, and \$2,000 per port connection for workplace and public installations. The Customer retains full responsibility and ownership of all premises wiring downstream from the utility meter, and any premises construction work performed in the course of the installation. In the event that a participating customer terminates his or her agreement prior to the end of the term, the charging units from early terminations will be reclaimed, with no compensation requirements, and redeployed at other customer sites.

In the case of DC Fast Charging EVSE installations, the Company will pay for all installation costs, retain ownership and maintain equipment from the transformer to the EVSE.

⁵⁷ At a commercial rate of \$0.11 per kWh and a charging rate of 3.3 kW delivered to the vehicle, the Customer would be responsible for \$0.36 per hour of actual charging, and \$2.90 for 8 hours of continuous charging. In a workplace setting dedicated to employee use, the average commuting distance of 29 miles range per day would require 8.8 kWh, or 2.7 hours of charging for a cost of \$0.96.

⁵⁸ For example, at a pay-for-use parking lot near a downtown core or shopping mall, or in a hotel owner’s parking lot where the EVSE is available for non-guests at certain times.

E. Data Acquisition through Signed Customer Releases

EV sales volume, residence location, and contact information are critical to effective system planning and successful pilot participation. Avista is proposing that automobile dealers who sell EVs be paid \$100 per Avista customer that purchases an EV, up to the first 250 customers, if they collect this data and submit it to the Company. This credit will act as an incentive for dealers to obtain information from the customer, at the customer's written consent of information disclosure, and then provide it back to the Company. The incentive will be paid regardless of whether the customer elects to install a Level 2 EVSE.

F. Evaluation and Adjustment

The pilot program will be continuously evaluated for improvement and adaptive management adjustments, including two annual reports. Customer feedback and performance metrics will be reviewed on a quarterly basis, including:

- Number, type and location of PEV purchases and charger locations
- Charging data quantity and quality
- Customer satisfaction
- Installation costs
- Dealer response rate
- Installation and service lead time
- Budget spending and cash flows

All aspects of the pilot project and improvement adjustments will be evaluated including:

- Metering integration
- Customer outreach and education
- EVSE performance
- Contractor installation and service performance
- Residential apartment and commercial/public installations
- Consideration of future program revisions

G. Demand Response and Controlled Charging

As described in the customer Site Agreements, customers will allow the Company to control charging in instances where the installed EVSE has smartcharging capabilities. Avista plans to collect data uninfluenced by demand response for a minimum of one year after the installation of the EVSE, and possibly longer depending on participation levels, until such time that the Company is able to establish baseline charging profiles. Analysis of this data will help determine customer behaviors and system impacts, as well as the specifics of potential demand response experiments, i.e., exactly when and for how long the Company should attempt to

modify the charge time from one day to the next, given the charging behavior that is demonstrated.

Demand response experiments will continue well beyond the initial 2-year period of the pilot program installations, for those customers electing to continue participating in the program. Four basic categories of EV drivers are of interest for establishing baseline charging profiles as well as participation in controlled charging: BEVs, PHEVs, commuters, and non-commuters. The Company would like to install smartchargers for 20+ Customers in each group for the residential installations in order to form a reasonable statistical sample. Demand response will generally be done for residential and workplace Level 2 installations where the vehicles are parked for many hours, but not for public installations where the EVs are parked for just a few hours. Each day, charging is curtailed when demand is at its peak, but with the goal of fully charging the EV by the time the customer needs to use the vehicle. Customer notifications and right to opt-out will be available, via email and/or smartphone communication. This is all designed with the primary goal to convincingly demonstrate how much on-peak load can be shifted to off-peak, and with important details such as what percentage of demand response events are opted-out of, and if customer satisfaction can remain high compared to uninfluenced charging. Future demand response experiments with other parameters may be devised, in which case the Company will submit a proposal to the Commission for approval.

H. Post-Pilot

Ongoing data acquisition and demand response experiments will continue for several years following EVSE installations. This will entail O&M expenses including project management, data management fees, return service visits, and miscellaneous administrative costs at an estimated \$179,458 per year.

Following the conclusion of the pilot program the Company will re-evaluate the costs, benefits, and need for continued investment in EVSE. The Company will use this evaluation to inform the framework of a future long-term program.

Avista requests the tariff revisions become effective March 14, 2016. If you have any questions regarding this filing please contact Shawn Bonfield at 509-495-2782 or myself at 509-495-8620.

Sincerely,

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Enclosures