BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

Docket # UE-160082, Avista EVSE Pilot Program

COMMENTS OF THE NATURAL RESOURCES DEFENSE COUNCIL

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I. INTRODUCTION

The Natural Resources Defense Council (NRDC) submits these comments to the Washington Utilities and Transportation Commission (Commission) in general support of Avista's proposed Electric Vehicle Supply Equipment (EVSE) Pilot Program. NRDC is a non-profit membership organization with around 85,000 members and activists in Washington and a long-standing interest in minimizing the societal costs of the reliable energy services that a healthy Washington economy requires. We have participated in numerous Commission proceedings over the last 30 years with a particular focus on representing our Washington members' interest in the utility industry's delivery of cost effective energy efficiency programs, renewable energy resources, and other sustainable energy alternatives.

NRDC and Climate Solutions co-sponsored the NW Energy Coalition's resolution on transportation electrification, which voices the widespread support for utility efforts to accelerate the electrification of the transportation sector. Below is the full text of that short resolution, adopted by unanimous vote of the coalition's membership in December, 2015:

> *WHEREAS greenhouse gas emissions from the burning of petroleum fuels for transportation make up a large share of Northwest states' climate pollution; and*
>
> *WHEREAS electric vehicles are more efficient at converting stored energy into drive power than vehicles powered by internal combustion engines; and*
>
> *WHEREAS particularly on the Northwest's electric grid, the well-to-wheels emissions of carbon dioxide and other pollutants from electrified transportation are lower than those from diesel- or gasoline-powered equivalents; and*
>
> *WHEREAS the emissions advantage and public health benefits of electrified transportation will increase as fossil plants are retired and as the Northwest's electric grid continues to integrate increasing amounts of renewable energy; and*
>
> *WHEREAS electrification can apply to many transportation end-uses, including battery-powered light-duty (passenger) vehicles, industrial vehicles such as forklifts, shore power and propulsion systems for marine vessels, passenger buses, delivery vans, heavy rail, truck-stops, and cargo handling equipment, among others; and*
>
> *WHEREAS reducing the number of vehicle-miles traveled and reducing the pollution attributable to each vehicle-mile traveled are complementary measures necessary to meet societal goals; and*
>
> *WHEREAS especially in the Northwest, the price of electricity as a transportation fuel is significantly lower and more stable than gasoline or diesel, and therefore transportation electrification can reduce fuel costs and keep energy dollars in our local economies instead of sending them far away to pay for oil; and*
>
> *WHEREAS widespread transportation electrification, by reducing air pollution in*

populated areas, offers a way to improve human health, particularly in low-income and disadvantaged communities that are disproportionately exposed to unhealthy air; and

WHEREAS low-income households most exposed to unhealthy air and most in need of fuel cost savings have not yet shared equally in the benefits associated with the use of electricity as a transportation fuel; and

WHEREAS 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; and

WHEREAS over time, the inherent flexibility of electric transportation loads can facilitate the integration of increasing amounts of variable renewable energy sources onto the electric grid; and

WHEREAS since the days of the New Deal, the natural endowments of the Northwest have brought the benefits of electrification to its inhabitants, and now the customers of privately and publicly owned utilities likewise stand to benefit from the efficient electrification of the transportation sector;

NOW THEREFORE BE IT RESOLVED that the NW Energy Coalition:

Supports local, state and federal programs and policies that make electrified transportation a more attractive option for drivers of all income levels and that increase access to electricity as a transportation fuel across a diversity of neighborhood and workplace settings, including multi-family housing and areas where homes lack private off-street parking;

Encourages local governments to streamline permitting procedures for the installation of electric transportation infrastructure, both publicly accessible and private;

Encourages state and local governments to promote electric vehicle readiness in new and existing buildings, as practicable, through building codes and retrofits;

Supports providing clear legal authority for utilities and governments to participate in the electrification of transportation and its infrastructure in ways consistent with other provisions of this resolution;

Endorses investment by utilities and governments in programs and services that promote the electrification of the transportation sector and increase access to the use of electricity as a transportation fuel in ways that facilitate a healthy market for charging services and infrastructure, particularly in low-income and disadvantaged communities;

Believes that utility investments and programs related to electrified transportation should be structured to spread the benefits of electrification to all utility customers regardless of whether they are electric-vehicle drivers;

Supports utility policies and programs that help minimize environmental impacts and generation, transmission, and distribution costs, while providing customers with the opportunity to maximize savings relative to gasoline and diesel;

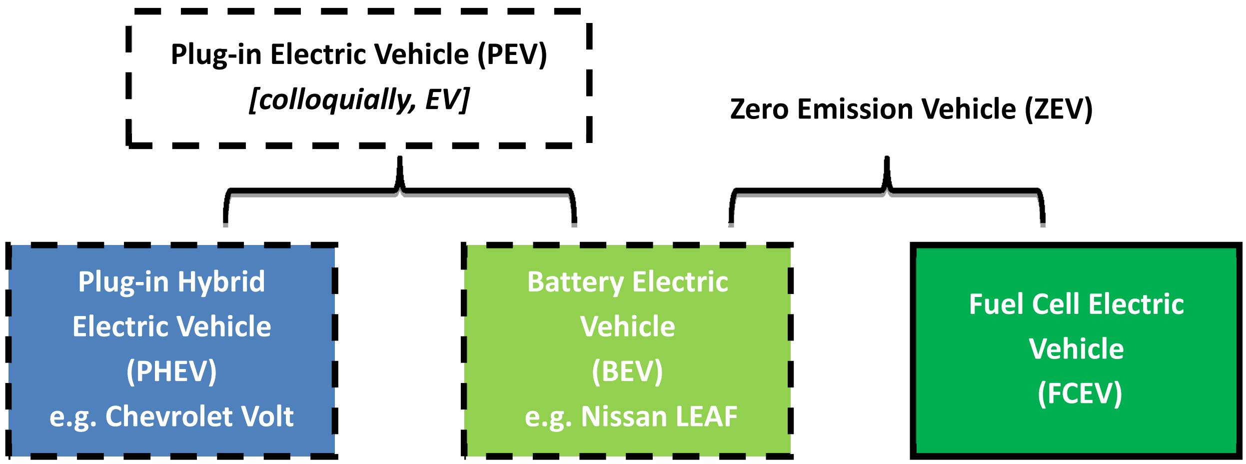
Believes customers who charge electric vehicles in a manner that is consistent with the optimization of grid efficiency should realize fuel cost savings relative to gasoline or diesel and opposes the imposition of unfair rates, fees, or customer charges that could undermine those savings; and

Believes programs and investments in transportation electrification should be *complementary and additional to programs and investments in energy efficiency, conservation, and renewable energy.*

II. Vehicle Technology and Terminology

Regrettably, the transportation policy space rivals the traditional utility policy world in its use of acronyms. Figure 1harmonizes the categories of vehicle technology described in sources used in these comments.

Figure 1: Vehicle Types



The EVSE Pilot Program proposed by Avista appropriately focuses on plug-in electric vehicles (PEVs), commonly referred to as "electric vehicles" or "EVs," which can be charged with electricity from the electric grid. This includes both Battery Electric Vehicles (BEVs) that rely entirely upon electricity and Plug-in Hybrid Electric Vehicles (PHEVs) that rely upon electricity for daily driving needs, but use gasoline for longer trips. While PHEVs can be driven primarily on electricity, because they have tailpipe emissions when operating on gasoline, they are not referred to as Zero Emission Vehicles (ZEVs).

III. The Need For Widespread Transportation Electrification

A. Meeting Federally Required Air Quality Standards and State Greenhouse Gas Reduction Targets Requires Comprehensive Transportation Electrification

PEVs are increasingly needed to meet clean air standards in the most polluted areas of the country. It is estimated over 50,000 Americans in the lower 48 states die prematurely from traffic pollution every year, which is over one-and-a-half times as many as die in traffic accidents.[1] In California, regulators have concluded that broad deployment of zero- and near-zero emission

[1] *See* Fabio Caiazzo et al., *Air pollution and early deaths in the United States*, Atmospheric Environment, 2013; National Highway Traffic Safety Administration, Fatality Analysis Reporting System (FARS) Encyclopedia.

technologies in the South Coast and San Joaquin Valley air basins will be needed in the 2023 to 2032 timeframe to attain current national health-based air quality standards as required by federal law, and that, by 2040, all passenger vehicles sold in California will need to be zero-emissions vehicles.[2] Major metro areas outside of California with a history of poor air quality, such as Houston and Dallas, are increasingly looking to PEVs to comply with federal ozone standards.[3]

Numerous independent studies have come to the same conclusion: reducing global warming pollution to 80 percent below 1990 levels by 2050 will require a dramatic shift to electric-drive vehicles powered by zero-emitting energy sources.[4] Because just 15 to 17 million passenger vehicles are sold each year in the U.S., it will take decades to transform the existing the U.S. stock of 250 million vehicles. Meeting long-term global warming pollution reduction targets, studies have estimated PEVs will need to account for 40 percent or more of new vehicle sales by 2030.[5] In the long-term, Fuel Cell Electric Vehicles (FCEVs) could gain significant market share and play an important role in meeting 2050 climate goals, but PEVs will remain the dominant advanced vehicle technology for the foreseeable future. Hydrogen fuel cell technology faces significant obstacles in terms of technology costs and a near-complete lack of re-fueling infrastructure. At this point, only two fuel cell models are available and only in very limited numbers. U.S. sales of fuel cell vehicles are forecast to total less than 8,000 through the end of this decade.[6] In sum, fuel cell electric vehicle technology lags significantly behind PEV technology, which will remain the dominant advanced vehicle technology beyond the useful life of the investments proposed by Avista.

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[2] Vision for Clean Air: A Framework for Air Quality and Climate Planning, June 27, 2012.

[3] Brice Nichols, Kara Kockelman, & Matthew Reiter, "Air Quality Impacts of Electric Vehicle Adoption in Texas",Transportation Research Part D (May 2014)

[4] *See* California Council on Science and Technology, *California's Energy Future*, May 2011; Williams et al., *The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: The Pivotal Role of Electricity, Science*, January, 2012; Joshua Cunningham (Air Resources Board), *Achieving an 80% GHG Reduction by 2050 in California's Passenger Vehicle Fleet*, SAE International Journal of Passenger Cars, December, 2010; Max Wei et al., *Deep carbon reduction in California require electrification and integration across economic sectors*,. Environ. Res. Lett. 8, 2013; Melaina and Webster, *Role of fuel carbon intensity in achieving 2050 greenhouse gas reductions within the light-duty vehicle sector*, Environ. Sci. Technol. 45, 3865–3871, 2011; International Energy Agency, *Transport, Energy, and CO2: Moving Towards Sustainability*, OECD/IEA, 2009; National Research Council, *Transitions to Alternative Vehicles and Fuels*, The National Academies Press, 2013.

[5] See California Air Resources Board, *Vision for Clean Air: A Framework for Air Quality and Climate Planning*, Public Review Draft, June 27, 2012; and National Research Council, *Transitions to Alternative Vehicles and Fuels*, National Academies of Science, 2013.

[6] Baum and Associates, *U.S. Electric Vehicle Sales Forecast; Detail by Type by Company by Segment by Calendar Year*, Monday, March 09, 2015.

B. Reliable Access to Electricity as Transportation Fuel at Both Multi-Unit Dwellings and Workplaces is Necessary to Accelerate the Plug-in Electric Vehicle Market

Avista's decision to target workplace and multi-unit dwellings reflects the consensus of experts reflected in a recent report of the National Research Council of the National Academies of Sciences (commissioned by the Department of Energy at the direction of the U.S. Congress) entitled, "Overcoming Barriers to the Deployment of Plug-in Electric Vehicles," which characterizes home and workplace charging as follows:

> *First, home charging is a virtual necessity for all PEV classes given that the vehicle is typically parked at a residence for the longest portion of the day. Accordingly, the home is (and will likely remain) the most important location for charging infrastructure, and homeowners who own PEVs have a clear incentive to install home charging. Residences that do not have access to a dedicated parking spot or one with access to electricity clearly have challenges to overcome to make PEV ownership practical for them.*
>
> *Second, charging at workplaces offers an important opportunity to encourage PEV adoption and increase (electric vehicle miles travelled). Specifically, it could double the daily travel distance that is fueled by electricity if combined with home charging and could in principle make possible the use of limited-range (battery electric vehicles) when no home charging is available.* [7]

The National Research Council report also documents the utility of these two charging infrastructure segments for specific classes of PEVs:

- Limited-range plug-in hybrid electric vehicles ("minimal PHEVs"), such as the Toyota Plug-in Prius, which has an all-electric range of six miles
- Extended-range plug-in hybrid electric vehicles ("extended-range PHEVs"), such as the Chevrolet Volt, which has an all-electric range of 53 miles
- Typical battery electric vehicles ("limited-range BEVs"), such as the Nissan LEAF, which has a range of 84 miles or 107 miles (depending on the model)
- Long-range battery electric vehicles ("Long-range BEVs"), such the Tesla Model S, which has an all-electric range of up to 270 miles, and the forthcoming Tesla Model 3 and Chevrolet Bolt, which will both have ranges in excess of 200 miles.

The report concludes home charging is a "virtual necessity" for all classes of PEVs, and that workplace charging can expand the market for all types of PEVs, extend the range of pure battery electric vehicles, and increase the "eVMT" (electric vehicle miles traveled) and the value proposition of plug-in hybrid electric vehicles. Table 1, which illustrates these conclusions, is

[7] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press, 2015, p. 6.

reproduced below from the relevant table in the National Research Council Report:

Table 1: "Effect of Charging-Infrastructure Categories on Mainstream PEV Owners by PEV Class"[8]

Infrastructure Category	PEV Class	Effect of Infrastructure on Mainstream PEV Owners
Home (Level 1 or Level 2 AC)	Long-range BEV	Virtual Necessity
	Limited-range BEV	Virtual Necessity
	Range-extended PHEV	Virtual Necessity
	Minimal PHEV	Virtual Necessity
Workplace (Level 1 or Level 2 AC)	Long-range BEV	Range extension, expands market
	Limited-range BEV	Range extension, expands market
	Range-extended PHEV	Increases eVMT and value proposition; expands market
	Minimal PHEV	Increases eVMT and value proposition; expands market

In sum, Avista's decision to target multi-unit dwellings and workplaces reflects the broad consensus of experts at both the state and national level that doing so is critical to accelerate the PEV market. Considerations specific to these two priority segments are discussed below.

1. *Increasing Access to Electricity at Multi-Unit Dwellings is Necessary to Achieve a Mass Market for Plug-in Electric Vehicles*

Drivers are very unlikely to purchase plug-in vehicles if they cannot plug-in at home, where cars are typically parked for 12 hours out the day.[9] Unfortunately, less than half of U.S. vehicles have reliable access to a dedicated off-street parking space at an owned residence where charging infrastructure could be installed.[10] To-date, almost 90 percent of PEV drivers live in single-family detached homes.[11] As the National Research Council notes: "Lack of access to charging infrastructure at home will constitute a significant barrier to PEV deployment for households without a dedicated parking spot or for whom the parking location is far from access to electricity."[12] It is essential for the PEV market to move beyond single family detached homes to scale up to meet long-term climate and air quality goals. Installing charging stations at apartment buildings and other multi-unit dwellings could unlock the potential for a broader, younger, and more diverse market for PEVs.

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[8] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press, 2015, p. 85.

[9] *See* Adam Langton and Noel Crisotomo, *Vehicle-Grid Integration*, California Public Utilities Commission, October, 2013, p. 5; *see also* Marcus Alexander, *Transportation Statistics Analysis for Electric Transportation*, Electric Power Research Institute, December, 2011.

[10] Traut et al., US Residential Charging Potential for Electric Vehicles, (Transportation Research Part D), November, 2013.

[11] Center for Sustainable Energy, *California Plug-in Electric Vehicle Owner Survey Dashboard*.

[12] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press, 2015, p. 116.

2. *Deploying Charging Stations at Workplaces Can Drive Sales, Increase Electric Miles Driven, and Ensure PEVs are Available to Absorb Excess Solar Generation*

The range-extending function and visibility of charging stations in the social context of a workplace can spur additional vehicle sales. Nissan credits a workplace charging initiative with a five-fold increase in monthly PEV purchases by employees at Cisco Systems, Coca Cola, Google, Microsoft, and Oracle.[13] Likewise, the Department of Energy recently concluded employees of companies that participated in its "Workplace Charging Challenge" were 20 times more likely to drive a PEV than the average worker.[14]

Workplace charging can effectively double the electric miles driven on a daily basis by PEVs. This is especially important for PHEVs that can operate on both electricity derived from the grid or gasoline, such as those listed in Table 2, which have shorter all-electric ranges than BEVs.[15]

Table 2: Electric Ranges of New and Upcoming Plug-in Hybrid Electric Vehicles[16]

Year	Make and Model	All Electric Range (Miles)
2015	Toyota Prius Plug-in	6
2015	Porsche 918 Spyder	12
2015	BMW i8	14
2015	Porsche Cayenne S E-Hybrid	14
2015	Porsche Panamera S E-Hybrid	15
2016	Ford C-MAX Energi	19
2016	BMW X5 xDrive40e	14
2016	Ford Fusion Energi	19
2016	Cadillac ELR	40
2016	Chevrolet Volt	53
2016	*Audi A3 E-tron*	*25*
2016	*Mercedes-Benz C-Class Plug-in*	*25*
2016	*Mercedes-Benz S500 Plug-in*	*20*
2016	*Mitsubishi Outlander Plug-in*	*30*

As shown in Table 2, there are only two PHEVs with all electric ranges that exceed the U.S.

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[13] Brandon White, Senior Manager of EV Sales Operations, Nissan North America, at EPRI Plug-in 2014, "Taking the 'Work' Out of Workplace Charging."

[14] U.S. Department of Energy, *Workplace Charging Challenge – Progress Update 2014: Employers Take Charge*.

[15] California New Car Dealers Association, *California Auto Outlook*, February, 2015.

[16] Source: fueleconomy.gov [Note: ranges shown in italics have not yet been tested by EPA, but reflect estimates available in the press]

daily average driving distance of 35 miles.[17] It should also be noted that annual averages that include many days when cars are not driven mask the fact cars are often driven well in excess of the average and that weekday and weekend driving patterns differ significantly.[18] A more sophisticated analysis of household driving patterns conducted by the Electric Power Research Institute (EPRI) reveals that one-in-four weekdays cars are driven, they are driven more than 40 miles, which exceeds the electric range of all but two PHEVs on the market.[19] Workplace charging can ensure many of those longer trips can still be achieved without the use of gasoline.

Workplace charging can also improve the utility of BEVs and help alleviate "range anxiety" (the fear of being stranded with an empty battery) for drivers who want to make the occasional longer trip after work. EPRI's analysis reveals that one-in-ten weekdays a vehicle is driven, it is driven in excess of 70 miles, which approaches the point at which many drivers of the pure-battery electric vehicles would begin to suffer from range anxiety, with about ten miles of fuel left to reach a destination with a charging station. The fear of being stranded is not just a source of anxiety for those who have already purchased BEVs, but a significant barrier to a mass market for BEVs.

In sum, workplace charging can drive the adoption of both BEVs and PHEVs, as summarized by the National Research Council:

> *Charging at workplaces provides an important opportunity to encourage the adoption of PEVs and increase eVMT. BEV drivers could potentially double their daily range as long as their vehicles could be fully charged both at work and at home, and PHEV drivers could potentially double their all-electric miles. Extending the electric range of PHEVs with workplace charging improves the value proposition for PHEV drivers because electric fueling is less expensive than gasoline. For BEVs and PHEVs, workplace charging could expand the number of people whose needs could be served by a PEV, thereby expanding the market for PEVs. Workplace charging might also allow households that lack access to residential charging the opportunity to commute with a PEV.* [20]

Workplace charging is also essential to allow the Commission to leverage the growing customer investment in PEVs to support the integration of variable renewable generation. Washington

[17] Note: General Motors classifies the Cadillac ELR and Chevrolet Volt as "Extended Range Electric Vehicles."

[18] 1970-2008: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2009, Washington, DC, 2011, Table VM-1 and annual. 2009-on: See Appendix A for Car/Light Truck Shares. (Additional resources: www.fhwa.dot.gov).

[19] Marcus Alexander, *Transportation Statistics Analysis for Electric Transportation*, Electric Power Research Institute, December, 2011.

[20] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press, 2015, p. 117.

PEV drivers have already purchased batteries that collectively represent about 400 megawatt-hours of advanced chemical energy storage that could be used to address this new load shape by absorbing afternoon solar generation and overnight wind generation.[21] The Commission should take advantage of that sunk-investment to benefit all utility customers. Avista's proposed deployment of charging infrastructure at workplaces will ensure PEVs are available to serve this purpose. Combining both workplace and residential charging will provide maximum availability to help cost-effectively integrate renewables. Workplace and home charging are needed to make this possible; PEVs that are not connected to the grid cannot support the grid.

C. A Robust Direct Current Fast Charging Network is Needed to Expand the Market for Battery Electric Vehicles

While Level 1 and Level 2 charging is well suited for long dwell time locations, faster charging is needed for locations where vehicles will not be parked for hours. Researchers from Cornell University who analyzed network effects associated with quarterly PEV sales in 353 metro areas found, "the increased availability of public charging stations has a statistically and economically significant impact on EV adoption decisions."[22] According to surveys conducted at such locations in the San Francisco Bay Area by NRG's EVgo, when given the choice, drivers prefer Direct Current (DC) fast charging 12-to-1 over Level 2 charging.[23] Washington's network of DC fast charging stations must be significantly expanded in order to accelerate the market for BEVs that cannot rely upon gasoline to make the occasional longer trip.

Consumer research shows the lack of "robust DC fast charging infrastructure is seriously inhibiting the value, utility and sales potential" of BEVs.[24] In sum, without access to a reliable network of DC fast charging stations to give consumers the confidence they need, many will not purchase pure BEVs. According to market research done by Nissan, having sufficient fast charging infrastructure in place would double the number of LEAF owners who would re-

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[21] Assuming sales-weighted average battery size of 24.6 kWh, based on sales data from the Department of Energy's Alternative Fuels Data Center and the Washington State Department of Transportation's estimate of 16,000 PEVs in the state.

[22] Li et al., *The Market for Electric Vehicles: Indirect Network Effects and Policy Impacts*, Cornell University, February, 2015.

[23] Charles Morris, *Given the choice, EV drivers prefer DC fast charging 12-to-1 over Level 2*, Charged EVs Magazine, November 12, 2015.

[24] Norman Hajjar, *New Survey Data: BEV Drivers and the Desire for DC Fast Charging*, California Plug-in Electric Vehicle Collaborative, March 11, 2014.

purchase a BEV.[25] Nissan also saw a marked increase in LEAF sales in 2013 when they deployed a large number of DC fast charging stations across North America and Europe.[26] Similarly, Tesla officials report their DC fast charging network has been critical to growing sales of the Model S sedan.[27] However, deploying fueling infrastructure is not the core business of automakers, who did not enter the gas station business to sell gasoline powered vehicles. Likewise, while state and federal programs have supported much of the existing charging network, public funding alone will likely not be sufficient to meet the scale of the challenge. Unfortunately, without extremely high-utilization rates, it is difficult for independent firms to realize a profit in the time frame required for most private enterprises.[28]

Advances in battery technology that enable affordable longer range BEVs, such as the forthcoming Chevrolet Bolt, will not reduce, but increase the need for DC fast charging stations. Most consumers will not attempt to make the occasional intercity trip using limited-range BEVs, because recharging multiple times, even with DC fast charging stations, would significantly extend the time required to reach a destination. However, the Tesla DC fast charging network is evidence the combination of longer-range vehicles and the availability of DC fast charging can both enable vehicle sales and intercity travel. Tesla reports that usage rates of its DC fast charger network for road trips increased five times this summer relative to the previous summer.[29] As more automakers introduce vehicles that can complete the occasional longer trip while re-fueling during stops that would likely be made regardless to eat meals, use restrooms, or buy coffee, demand for DC fast charging stations will increase significantly.

D. Widespread and Intelligently Integrated Vehicle Charging Could Lower Electric Rates for All Utility Customers

In an era of modest or declining load growth due to energy efficiency gains, growing customer investment in distributed generation, and increasing costs to maintain and modernize the grid, there is a growing concern about a dramatically-termed "death spiral," whereby increasing costs borne by a decreasing pool of customers causes rate increases that drive away

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[25] Peterson, David, "1700 Fast Chargers by 2016", presentation to the California PEV Collaborative, Nissan North America, March 10, 2015. Slide 5 citing Nissan's Market Intelligence Report

[26] Rovito, M., Charged Electric Vehicles Magazine, "Will Nissan's No Charge to Charge program drive LEAF sales?" July 3, 2014.

[27] Cal Lankton, Director of EV Infrastructure, Tesla Motor Company, at EPRI Plug-in 2014, "Plenary Panel: Technology Marches On - The Impact of New Vehicle and Infrastructure Technologies."

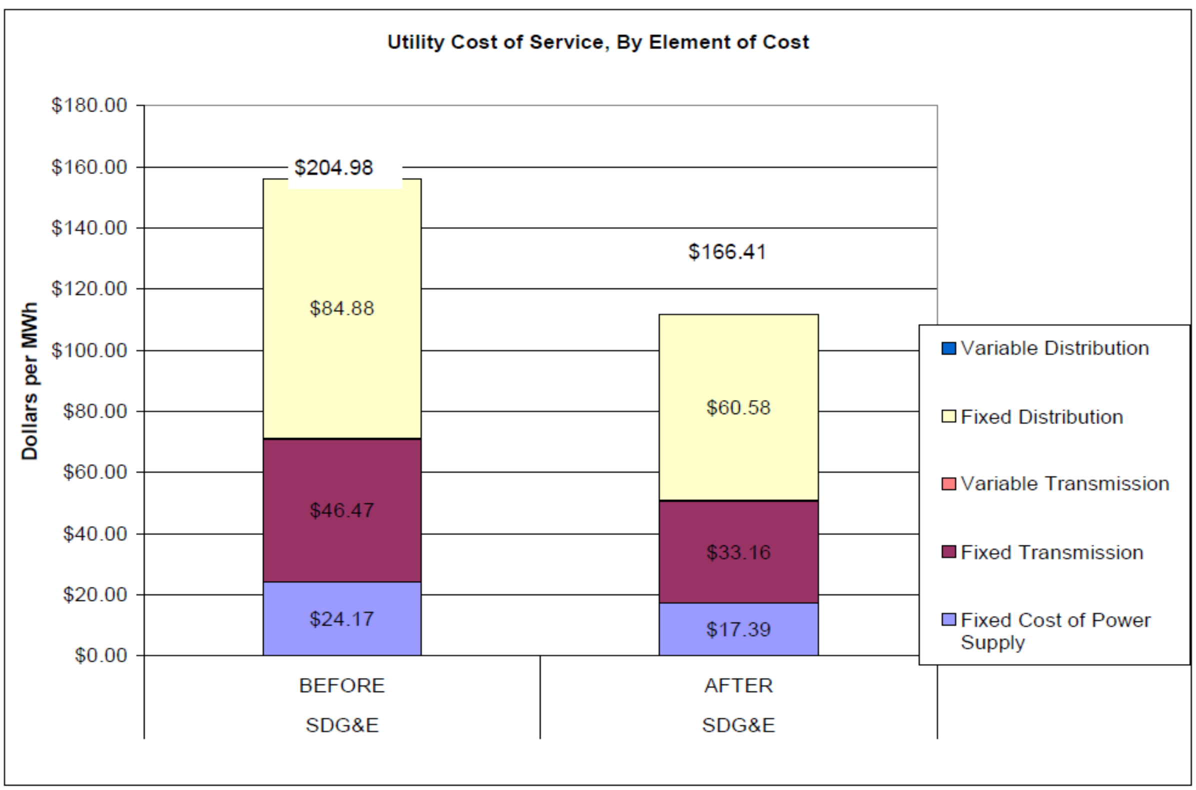
[28] The EV Project, *Lessons Learned on the EV Project and DC Fast Charging,* April, 2013.

[29] Nicholas Brown, *Tesla Supercharge Use Increased 5x Over In 1 Year*, CleanTechnica, September, 2015.

more customers. This phenomenon will likely not result in the death of the electric industry or render the grid irrelevant, but it could result in increasing bills for those who can least afford to invest in distributed generation and home energy storage. Efficient transportation electrification could mitigate this adverse outcome.

Analysis conducted by researchers at the Pacific Northwest National Laboratory concludes there is sufficient spare generation capacity in the nation's electric grid to power virtually the entire light-duty passenger vehicle fleet without necessitating the construction of any new power plants, if vehicle charging load is integrated during off-peak hours and at lower power levels.[30] The same researchers also modelled impacts on the marginal price of electricity associated with transformative transportation electrification on two utilities, Cincinnati Gas & Electric and SDG&E. The results of a 60 percent PEV penetration scenario in SDG&E territory are illustrated in Figure 2.

Figure 2: Theoretical San Diego Gas & Electric Cost of Service Before and After the Integration of Plug-in Vehicle Load (60 Percent Penetration Scenario)



[30] Michael Kintner-Meyer Kevin Schneider Robert Pratt, *Impacts Assessment of Plug-in Hybrid Vehicles on Electric Utilities and Regional U.S. Power Grids*, November, 2007.

These results should not be construed as a forecast, but the directional shift (~20 percent reduction in the cost of electricity) is significant. Non-PEV customers would benefit from such efficient transportation electrification in the form of lower electricity bills. Avista's pilot alone will not be sufficient to facilitate this level of transportation electrification, but it could play a critical role in accelerating adoption early in the market, placing Washington a path to achieve significant net-benefits for the body of utility customers.

Plug-in vehicle load is unique in its potential to facilitate such a reduction in the cost of energy. There is no other load of comparable power and magnitude that is flexible enough to be pushed to hours of the day when the system is underutilized or when there is over-generation of renewable resources. In many ways, efficient transportation electrification is the most visible and scalable application to demonstrate the productive role utilities could play in managing a "smart grid" to provide reliable, environmentally responsible, and cost-effective energy services in a manner that does not leave the responsibility of paying for the electrical grid with those who are least able to do so.

E. Managed Charging is Needed to Realize the Long-term Vision of Efficient Transportation Electrification

Transportation electrification done at a scale necessary to meet air quality and climate goals will have significant implications for the electrical grid. If it is done poorly, the costs will be substantial and could undermine the viability of a strategy that is critical to meet mid- and long-term goals. However, with the right policies and programs in place, the electrification of the transportation sector could be cost-effective, facilitate progress towards the Washington's renewable energy and energy efficiency goals, and maximize benefits for all utility customers.

In California, one of the world's largest PEV markets with about 200,000 vehicles, costs associated with integrated PEV load to-date have been *de minimis*—less than 0.1% of PEVs have required a service line and/or distribution system upgrade.[31] An analysis of California's distribution systems also reveals that a mass market for PEVs could be achieved without significant new investments if the right policies are put in place.[32] However, modelling conducted by the Sacramento Municipal Utility District shows that managed charging will likely

[31] *See* California Auto Outlook, February, 2016; Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison, *Joint IOU Electric Vehicle Load Research Report 4th Report*, Filed on December 24, 2015.

[32] Energy and Environmental Economics (E3), *California Transportation Electrification Assessment Phase 2:Grid Impacts*, October 23, 2014.

be needed at higher levels of vehicle penetration to minimize distribution system investments.[33] Likewise, the analysis done by the Pacific Northwest National Laboratory that demonstrates the potential for transportation electrification to reduce the marginal cost of electricity assumes charging is accomplished in a manner that takes advantage of existing spare capacity and does not require extensive grid hardening. Real world data from the Department of Energy's "EV Project" demonstrates that, in jurisdictions without active utility PEV programs where time-of-use tariffs are either not available or not widely adopted, PEV customers will plug-in and charge immediately upon returning home from work, exacerbating evening system-wide peak demand, but that in jurisdictions with effective utility education and outreach and time-variant price signals, the vast majority of PEV charging occurs during off-peak hours.[34] In other words, active utility programs, time-variant rates, and effective customer education and outreach will be needed to ensure efficient transportation electrification benefits all utility customers in the long-term.

IV. CONCLUSION

In light of the pressing need to accelerate the PEV market in the manner that supports the electric grid, NRDC urges the Commission to act expeditiously on Avista's EVSE Pilot Program.

Dated: March 9, 2016 Respectfully submitted,

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[33] Berkheimer, J., Tang, J., Boyce, B., and Aswani, D., *Electric Grid Integration Costs for Plug-In Electric Vehicles*, SAE Int. J. Alt. Power. 3(1):2014, doi:10.4271/2014-01-0344.
[34] *See* http://www.theevproject.com/documents.php