BEFORE THE PUBLIC UTILITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF PACIFICORP,	**)**	
dba PACIFIC POWER,	**)**	
APPLICATION FOR	**)**	**DOCKET NO. UM 1810**
TRANSPORTATION	**)**	
ELECTRIFICATION PROGRAMS	**)**	

SIEMENS EXHIBIT 100

REPLY TESTIMONY OF CHRIS KING

October 25, 2017

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I. Introduction

In accordance with ALJ Ruth Harper's ruling of September 13, 2017, Siemens offers testimony in this proceeding in reply to ChargePoint's Response Testimony In Opposition to Stipulation of David Packard, filed October 4, 2017 ("Testimony"). Our testimony responds to the following points raised in the Testimony:

- We believe the Stipulation would *accelerate* rather than "hamper"[1] transportation electrification in Pacific Power's service territory.

- We believe the Stipulation would actually "stimulate innovation, competition and customer choice in electric vehicle charging and related infrastructure and services"[2] by stimulating the overall growth of the electric vehicle (EV) market by reducing the barriers to ownership and operation for EV owners.

- Contrary to the Testimony's claim, the Stipulation does not prevent customer choice,[3] nor does it result in a "lack of options" that would cause would-be EV drivers to "forego electric transportation options altogether."[4]

- Without disputing the importance of customer choice, Siemens's global experience is that the "linchpin"[5] that determines whether transportation electrification is successful (or not), is not customer choice BUT the overall cost of EV ownership and operation for the customer.

- Adding Pacific Power to the market will do more to *stimulate* rather than "dampen" competition.[6]

- RFPs and the Stipulation are important steps toward "widespread electrification" and, in contrast to the Testimony's claims, will "stimulate innovation" and "provide consumers with increased options in the use of charging equipment."[7]

[1] Testimony at line 2-3, page Packard/4.
[2] Ibid at line 16-17, page Packard/5.
[3] Ibid at line 8, page Packard/10.
[4] Ibid at line 13-14, page Packard/26.
[5] Ibid at line 6, page Packard/9.
[6] Ibid at line 9, page Packard/11.
[7] Ibid at line 18-20, page Packard/12.

- Siemens, a market participant, expects to "benefit from these learnings" of Pacific Power's Public Charging program.[8]

- We agree with the Testimony that this is a nascent market[9] and that "the most prudent use of ratepayer funds for transportation electrification would be to use those funds to stimulate a self-sustaining market for publicly available charging stations"[10] – and hold the opinion that the Stipulation is an important step in stimulating a self-sustaining market in the long run.

- We agree with the Testimony that the Commission "provide direction to Pacific Power on the appropriate role of the utility in transportation electrification efforts", and we provide some examples of the benefits of utility participation to animate the EV market.[11]

- We agree with the Testimony that "Pacific Power should look to national examples of the appropriate role for utility involvement in TE", and we provide examples of successful utility programs with key elements of the same approach as the Public Charging program as proposed in the Stipulation. In these examples, the vendors providing technology to utilities include ABB, ChargePoint, EVgo, Fuji, Nissan, and Signet – demonstrating the robust competitive market for providing EVSE in such programs.

II. Siemens is a market participant offering a wide range of TE products and services.

Siemens was the world's first large industrial corporation to commit to zero net carbon emissions by 2030. The company is a global powerhouse in technology, infrastructure, and services, offering a wide variety of technology solutions to a broad spectrum of customers. Relevant to TE, our technologies include:

- hardware and software for charging light, medium, and heavy duty vehicles;

- software and services, including smart phone apps, for managing charging and engaging electric vehicle and electricity customers;

- make-ready equipment ranging from transformers to service drops;

[8] Ibid at line 11-12, page Packard/22.
[9] Ibid at line 6, page Packard/25.
[10] Ibid at line 22-23, page Packard/23 through line 1, page Packard/24.
[11] Ibid at line 3-5, page Packard/29.

- utility software to plan, operate, and manage the grid, including integrating EV charging into system operations;

- software to run transmission grids and wholesale electricity markets;

- battery storage and microgrid systems for DC fast charging installations; and

- building management and operations software that can integrate EV charging operations.

We operate in over 180 countries and spend over $5 billion annually on research and development, including substantial amounts on TE-specific technologies.

Our customers span a wide range of participants in the TE ecosystem. We sell to utilities, federal and state governments, cities, site owners (both residential and commercial, including for workplace charging), transit authorities, non-utility charging network providers, and others.

III. The Stipulation would accelerate rather than "hamper" transportation electrification in Pacific Power's service territory

There are several barriers to EV adoption. Barriers relevant to this proceeding have been identified as fuel prices, availability of charging stations, public visibility, and awareness.[12] The Stipulation is a modest program that addresses these four barriers by providing charging at reduced cost, by providing additional charging stations, by having public outreach to increase visibility, and by implementing an education program to increase awareness. By definition, lowering barriers to adoption will serve to accelerate EV adoption in Pacific Power's service territory, provided that Pacific Power's programs do not discourage other market participants

[12] - Makena Coffman et al., "Factors Affecting EV Adoption: A Literature Review and EV Forecast for Hawaii," Report No. HNEI-04-15, April 2015.

from participating in the market. In California, the Public Utilities Commission investigated the issue of utility ownership of charging stations and approved some utility programs that include such ownership, finding that the programs were not anti-competitive.[13]

IV. The Stipulation would actually "stimulate innovation, competition and customer choice in electric vehicle charging and related infrastructure and services" by promoting the overall growth of the electric vehicle (EV) market through reduction of the barriers to ownership and operation for EV owners.

As noted in Section III, above, the Stipulation would reduce market barriers and have a beneficial effect on growing the transportation electrification market. This, in turn, would stimulate innovation, competition, and customer choice, because a growing market attracts more participants. Competition in growing markets leads to innovation and customer choice. The alternative, i.e. not implementing the programs proposed in the Stipulation, would have the opposite effect. There would be no catalysts to animate the market in Pacific Power's service territory, leading to slow growth and stagnation. These conditions discourage market participants from entering, thus stifling innovation and customer choice.

V. Contrary to the Testimony's claim, the Stipulation does not prevent customers from choosing charging equipment and services, nor does it result in a "lack of options" that would cause would-be EV drivers to "forego electric transportation options altogether."

[13] - CPUC Decision 16-01-045, January 28, 2016.

The Stipulation would result in the installation of a small number of additional charging stations. By definition, this would increase customer choice, because these stations do not currently exist. The program would neither prevent nor inhibit other market participants from installing additional chargers at any location of their choosing. Moreover, as noted in Sections III and IV above, the Stipulation's programs will grow the market and encourage new entry and innovation. All of these factors create additional options, not "a lack of options."

VI. Without disputing the importance of customer choice, Siemens's global experience is that the "linchpin" that determines whether transportation electrification is successful (or not), is not customer choice BUT the overall cost of EV ownership and operation for the customer.

The Testimony states: "In ChargePoint's extensive experience with publicly available charging station programs around the country and in Europe, customer choice is the linchpin that determines whether a program will be successful or not." The Testimony includes no citation to evidence. A review of the literature leads to a differing conclusion that the most important factor affecting the success of EV programs is the cost to the consumer.[14] Accordingly, any programs that reduce the cost of EV ownership, such as the proposed Public Charging program, will increase the likelihood of program success.

[14] See, for example, Makenna Coffman, *op. cit.*, at 6, and Petra Levay *et al.,* "The effect of fiscal incentives on market penetration of electric vehicles: A pairwise comparison of total cost of ownership," Energy Journal, June 2017.

VII. Adding Pacific Power to the market will do more to stimulate rather than "dampen" competition.

As noted in Section III, the Stipulation programs will stimulate the market. This will lead to greater interest by market participants in Pacific Power's service territory and, thus, greater competition. An analogous market is that for energy efficiency products and services. This is a vibrant, highly competitive market across the U.S., one in which Siemens participates. In many, if not most, states, utilities have a major role in the energy efficiency market, a role that has not inhibited and, on the contrary, has greatly promoted competition in that market. In the transportation electrification market, Siemens believes that both utilities and non-utilities should be able to participate in the market, provided the utility participation is not anti-competitive. We do not see the Stipulation programs to be anti-competitive.

VIII. RFPs and the Stipulation are important steps toward "widespread electrification" and, in contrast to the Testimony's claims, will "provide consumers with increased options in the use of charging equipment."

As noted in Section III, the Stipulation programs will stimulate the market and accelerate EV adoption. This will lead to greater interest by market participants in Pacific Power's service territory. Market participants will invest to create more innovate products and services, as well as provide consumers with increased options in the use of charging equipment. In the RFP process, vendors compete both on price and features, with utilities typically selecting winners based on a combination that keeps prices low and factors in the higher value of enhanced features when

appropriate. Siemens's experience with utility RFPs is that when they are properly executed, they stimulate innovation by vendors more often than not.

IX. Siemens, a market participant, expects to "benefit from the learnings" of the proposed Pacific Power programs.

As noted in Section II, Siemens is an active participant in the transportation electrification market. Based on the goals of the pilot as defined in the Stipulation, we expect to learn more about the effect of such charging stations on EV adoption, consumer response to such infrastructure, the integration of chargers into the grid, and other important topics.

X. We agree with the Testimony that this is a nascent market and that "the most prudent use of ratepayer funds for transportation electrification would be to use those funds to stimulate a self-sustaining market for publicly available charging stations" – and believe that the Stipulation is an important step in stimulating a self-sustaining market in the long run.

As noted in the discussions above, we believe the Stipulation programs will reduce barriers to EV adoption and stimulate the market. This will promote the all important goal of timely market growth and expansion, which are the most import elements of achieving a self-sustaining market.

XI. We agree with the Testimony that the Commission provide direction on the appropriate role of the utility in the transportation electrification effort, and we provide some examples of the benefits of utility participation.

We agree that the Commission should provide direction on the appropriate role of the utility in electrifying the transportation sector in Oregon. One of the Commission's goals should be to determine how best to leverage utility assets and capabilities to maximize benefits and minimize costs of TE (thus reducing the cost of EV ownership) as well as drive grid benefits. Siemens's position is that the market should be open to all participants.

a. Oregon needs to fully leverage utility assets and capabilities to maximize the benefits associated with EV ownership and operation to animate the market.

EVs offer the obvious benefit to their owners (or operators) of providing transportation and to society of reducing GHG and other air pollution. However, EVs also offer important benefits (or can impose additional costs) to the electricity grid, wholesale electricity markets, and integration of both centralized and distributed renewable generation. For the grid, EVs can provide peaking capacity and, thus, act as a non-wires alternative to traditional grid reinforcement when there is a need for additional capacity. For wholesale markets, EVs can provide peaking capacity and ancillary services such as imbalance energy. For renewable generation, EVs can reduce curtailments by using wind and solar energy at times of abundance (overgeneration). We refer to these as the full value stack of EV benefits.

These benefits are widely recognized, but there is less discussion of how to capture the benefits. Capturing the full value stack requires:

- an end-to-end integrated system approach that is only possible via the active involvement and participation by the utility;

- seamless, low-cost, reliable, and efficient integration of EV charging data and operations with utility planning, operational, business, and customer systems; and

- a robust connection with transmission operational and wholesale market systems.

Utility planners can minimize their grid investment requirements if they know where and when EV charging loads are occurring and how those loads will grow over time. Utility operators can maintain reliability by having the same information in near real time, as well as the ability to either control such charging or accurately predict how EV owners (or their third party service providers) will control such charging in response to price signals. Utility customer engagement and charging management software can send price or control signals to smart phones and directly to electric vehicle supply equipment (EVSEs) or third party service providers, as well as allow consumers to program their charging preferences. Utility meter data management systems can use the data from chargers to disaggregate consumption – at the interval level – of EVSEs from the premise to enable application of separate tariffs to the premise owner and the EV. Utility billing systems can use this disaggregated data to calculate bills for EV-only tariffs, incentive payments for demand reductions during peak times, and other financial incentives adopted by the Commission. Utility rate designers can use the data to develop rates that enable EV owners to minimize the cost of charging by taking advantage of low-cost wholesale rates, especially during times of abundant wind and solar power. And because these rates can be EV-only by disaggregating the whole house data, customers can keep their preferred rate for their other-than-EV consumption. Utility demand response program operators can use the EV data to bid peak demand reductions and ancillary services into the wholesale market. The examples cited above are not exhaustive.

b. Oregon needs to fully leverage utility assets and capabilities to minimize the costs associated with EV ownership and operation to animate the market.

Utilities also have important assets and capabilities to reduce the total cost of ownership (TCO) – buying, owning and operating EVs. Of course, capturing the full benefits as described above directly reduces operating costs by minimizing electricity costs, including costs that might otherwise be required to reinforce the grid. Utilities can greatly reduce costs in three key areas: asset ownership and maintenance, EVSEs, and the consumer experience. They can have the greatest ability to reduce these costs when they own EVSEs.

A core competency and central business model element for utilities has always been asset ownership and maintenance. They specialize, in part, in the distribution grid, which consists of very large numbers (millions) of widely dispersed devices that must operate safely and reliably with low maintenance costs for periods of decades. EVSEs are exactly this type of asset and, in fact, have many features in common with smart meters (data recording, communications, electronics in harsh environments, etc.). Utilities have the necessary expertise, business processes, and software for deploying, managing, and maintaining these assets. Utilities can achieve scale economies in borrowing, maintenance personnel and systems, customer base, and other areas to that minimize EVSE deployment, ownership, and maintenance costs. Utilities have access to low cost capital. They have the ability to depreciate the assets over long periods of time, because they have long-standing franchises and investors whose expectations are consistent with lengthy depreciation periods. Utilities have the ability to redeploy assets such as EVSEs, if needed, to other customers, because they have very large, diverse, and lasting customer bases. On the maintenance side, utilities have existing field personnel and mobile workforce

management systems to provide reliable and efficient services across a widely dispersed service territory. These maintenance capabilities not only reduce costs but also ensure that consumers relying on their EVSE for charging will have rapid and high quality response to a service need – an essential element of Oregon policymakers providing consumers with the comfort they need to fully rely on an EV as their sole transportation source.

Utilities can play a major role in reducing EVSE costs as well. One way is by procuring larger quantities of EVSEs. Quantity discounts enabled by large scale utility purchases reduced smart meter costs by two thirds virtually immediately.[15] Today's EVSE purchases are in the quantities of up to hundreds; utility procurements could increase that level to potentially thousands. Another way is through standardizing functionality. These standard features allow for interoperability – a key requirement for cost reduction – and reduced risk of obsolescence.

Utilities can also play a major role in minimizing consumer experience costs, a major barrier to EV adoption.[16] For example, utilities can play a key role in substantially reducing concerns and uncertainties for consumers when buying an EV. There are many questions in which the utility is not involved that relate to a specific vehicle's features and performance, but the utility can assist by being the trusted energy adviser regarding EV fueling costs, EVSEs and access to charging infrastructure.

[15] - Personal experience in three decades of experience with advanced and smart meters.
[16] - "Finding: Most potential PEV customers have little knowledge of PEVs and almost no experience with them. Lack of familiarity with the vehicles and their operation and maintenance creates a substantial barrier to widespread PEV deployment." in "Overcoming Barriers to Electric-Vehicle Deployment," National Research Council, 2013.

XII. Pacific Power should look to national examples of the appropriate role for utility involvement in TE, and we provide examples of successful utility programs with key elements of the same approach as the Public Charging program as proposed in the Stipulation.

Drive Electric Vermont has been documented by the Department of Energy as a major success case study in promoting the TE market.[17] As a result of the program, Vermont saw "more than a six-fold increase in charging stations over the last three years", and the state of Vermont tied Detroit, Michigan in having the highest percentage of plug-in EV registration for cold-weather U.S. cities.

Drive Electric Vermont was a broad effort involving multiple government agencies and parties, but the utilities played a central role in buying, installing, and coordinating the siting of charging stations.[18] Green Mountain Power built the largest utility-owned network, 38 Level 2 EVSE locations, with most being dual port that are capable of charging two PEVs at once. Green Mountain Power also maintains a network of 13 DC Fast Chargers. Burlington Electric Department implemented and maintains four Level 2 EVSE sites (principally dual port); one site also includes two DC Fast Chargers. Stowe Electric funded and placed three dual-port Level 2 EVSE in 2015 and planned to installed eight more in 2016.

All three utilities purchased equipment from a variety of vendors, including ABB, ChargePoint, EVgo, Fuji, Nissan, and Signet – demonstrating the robust competitive market for providing EVSE.

[17] - U.S. Department of Energy, "Drive Electric Vermont Case Study," March 2016.
[18] - Ibid at page v.

XIII. Qualifications

My name is Chris King. I am employed by Siemens as the Chief Policy Officer of the Digital Grid business unit. My business address is 4000 E. Third Ave., Foster City, CA 94404. My current responsibilities include leading global policy and strategy initiatives on behalf of Siemens for electric utility digitalization and automation, especially related to distributed energy resources, and including transportation electrification. I have been employed in the electricity industry for over three decades – which includes Pacific Gas & Electric Company, three Silicon Valley start-up companies in the advanced metering and software sector, and, for the past five years, at Siemens. I have extensive experience in rate design, energy efficiency, demand response, advanced metering, grid modernization, consumer engagement, and retail competition. I have testified on these matters before the California Public Utilities Commission, the California Legislature, the Energy and Commerce Committee of the U.S. House of Representatives, and other state regulatory commissions and legislatures. I hold Bachelor and Master of Science degrees in Biological Sciences from Stanford University, a Master of Science, Management from the Stanford Graduate School of Business, and a J.D. from Concord Law School. I have been awarded three smart meter and smart grid patents.