Application No: 17-01-020, et al.

Exhibit No.: ________________

Witnesses: M. Whited________

M. Baumhefner____

K. Stainken_______

OPENING TESTIMONY OF MELISSA WHITED, MAX BAUMHEFNER, AND KATHERINE STAINKEN, SPONSORED BY THE NATURAL RESOURCES DEFENSE COUNCIL, PLUG IN AMERICA, THE COALITION OF CALIFORNIA UTILITY EMPLOYEES, SIERRA CLUB, THE GREENLINING INSTITUTE, THE UNION OF CONCERNED SCIENTISTS, AND THE ALLIANCE OF AUTOMOBILE MANUFACTURERS ON FAST CHARGING INFRASTRUCTURE AND RATES

July 25, 2017

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I. INTRODUCTION AND SUMMARY OF RECOMMENDED MODIFICATIONS

In accordance with the April 13, 2017 "Scoping Memo and Ruling of Assigned Commissioner and Administrative Law Judges," (Scoping Memo) the Natural Resources Defense Council (NRDC), the Coalition of California Utility Employees, Plug In America, The Greenlining Institute, Sierra Club, the Union of Concerned Scientists, and the Alliance of Automobile Manufacturers submit the testimony of Melissa Whited (Synapse Energy Economics, on behalf of NRDC), Max Baumhefner (NRDC), and Katherine Stainken (Plug In America) on Pacific Gas & Electric's (PG&E) Direct Current (DC) Fast Charging standard review proposal and San Diego Gas & Electric's (SDG&E) "Public Grid Integrated Rate (GIR)," filed in A.17-01-020 et al.

We recognize that SDG&E's "Public" rate was proposed in the context of priority review projects, but SDG&E has indicated the rate would be made generally available.[1] Likewise, the Scoping Memo requested testimony to be filed today on "fast charging infrastructure and rates," which we interpret to focus on SDG&E's Public rate, which was expressly designed for public DC Fast Charging applications. While Southern California Edison (SCE) also proposes "commercial" rates that were partially designed to accommodate DC Fast Charging, we reserve testimony on those rates for the August 1, 2017 filing, given the Scoping Memo calls for testimony on "commercial" rates on that date.

A. With the Following Modifications, PG&E's DC Fast Charging Project and SDG&E's Public Rate Should be Approved

1. PG&E Should Prioritize DC Fast Charging Sites that Include Complementary Technologies to Support the Grid and Renewable Energy Integration

PG&E should ask potential site hosts if they are contemplating installing on-site solar, energy storage, and/or vehicle-to-grid (V2G) capabilities and take the responses into account when scoring potential sites. This would better align with the directive included in Public Utilities Code §740.12(a)(1)(G) (emphasis added):

[1] *Reply of San Diego Gas & Electric Company (U 902 E) to Protests and Responses Regarding Application for Approval of Sb 350 Transportation Electrification Proposals*, A.17-01-020, March 13, 2017, p. 17: "Regarding EVgo's assertion that rates should be open to competitive market providers, SDG&E has in fact proposed such availability to all customers. (Direct Testimony of C. Fang (Chapter 5) at CF-4.)"

> *Deploying electric vehicles should assist in grid management, integrating generation from eligible renewable energy resources, and reducing fuel costs for vehicle drivers who charge in a manner consistent with electrical grid conditions.*

Likewise, preferential selection of sites that incorporate on-site solar, energy storage, and/or V2G is consistent with the relevant statutory standard of review, specified in Public Utilities Code §740.8, which defines "electrical service that is safer, more reliable, or less costly due to either improved use of the electric system or improved integration of renewable energy generation" as being in the interest of ratepayers.

2. SDG&E's Public Rate Should be Modified to be Better Account for the Intended Use Case

As detailed in section II, for public charging applications with itinerant users, SDG&E should replace its proposed dynamic hourly rate with a simple time-of-use (TOU) rate that would allow Electric Vehicle (EV) drivers to know what prices they will pay in advance and plan accordingly, where the peak period is defined as summer afternoon/evening hours (including weekends and holidays). SDG&E should also clarify that the Public rate will be made available to any customer who is offering charging to the public for a fee. These modifications would better align with the directives included in Public Utilities Code §740.12(a)(1) (emphasis added):

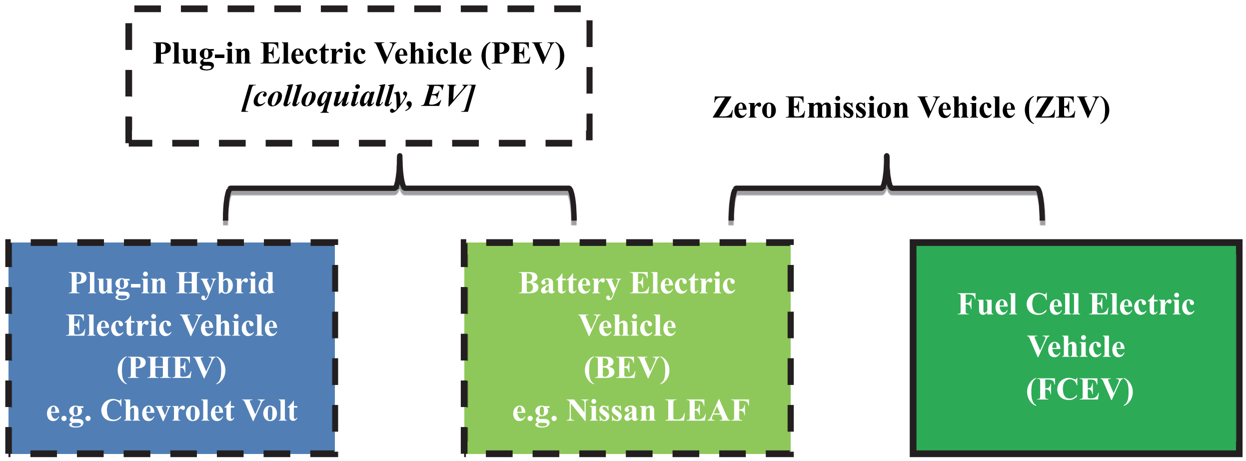
> *(G) Deploying electric vehicles should assist in grid management, integrating generation from eligible renewable energy resources, and reducing fuel costs for vehicle drivers who charge in a manner consistent with electrical grid conditions.*

> *(H) Deploying electric vehicle charging infrastructure should facilitate increased sales of electric vehicles by making charging easily accessible and should provide the opportunity to access electricity as a fuel that is cleaner and less costly than gasoline or other fossil fuels in public and private locations.*

II. VEHICLE TECHNOLOGY AND TERMINOLOGY

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

Figure 1: Vehicle Types



The utility proposals made pursuant to Public Utilities Code §740.12 appropriately focus 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, they are not referred to as Zero Emission Vehicles (ZEVs) because they have tailpipe emissions when operating on gasoline.

II. RATE DESIGN - WITNESS MELISSA WHITED, SYNAPSE ENERGY ECONOMICS, ON BEHALF OF THE NATURAL RESOURCES DEFENSE COUNCIL

A. SDG&E Should Modify its Public Charging Rate to Ensure EV Drivers Who Charge in a Manner Consistent with Grid Conditions Have the Opportunity to Realize Fuel Cost Savings

1. Statutory Directives Relevant to Rate Design for Transportation Electrification

Public Utilities Code §740.12(a)(1) specifies (emphasis added):

(G) Deploying electric vehicles should assist in grid management, integrating generation from eligible renewable energy resources, and reducing fuel costs for vehicle drivers who charge in a manner consistent with electrical grid conditions

(H) Deploying electric vehicle charging infrastructure should facilitate increased sales of electric vehicles by making charging easily accessible and should provide the opportunity to access electricity as a fuel that is cleaner and less costly than gasoline or other fossil fuels in public and private locations.

Public Utilities Code §740.12(a)(2) further specifies that implementing agencies shall take the findings reproduced above into account. Public Utilities Codes §740.12(b) also specifies that utility programs proposed pursuant to that section must be designed to "accelerate widespread transportation electrification." Numerous surveys reveal fuel cost savings are the most important motivator of EV purchase decisions.[2] Accordingly, to comply with the relevant statutory provisions and to ensure utility programs accelerate the EV market, those programs must deliver fuel cost savings for customers who charge in a manner consistent with grid conditions. Below we recommend modifications to the Public rate proposed by SDG&E to conform with the statutory requirements of Public Utilities Code §740.12.

2. <u>SDG&E's Public Rate Should be Modified to be Consistent with the Relevant Statutory Directives</u>

SDG&E's proposed Public rate is a dynamic hourly rate that is designed to recover all costs through the energy charge (i.e. $/kWh). The Public rate would not include a demand charge or fixed charges because it is designed to allow site-hosts to recover costs volumetrically from itinerant EV drivers. The Public rate would reflect the sum of several components:

- Hourly Base Rate = $0.13871 + CAISO Day-Ahead Hourly Price
- Dynamic Adders
    - System Top 150 Hours = $0.50535
    - Circuit Top 200 Hours = $0.18656

Based on 2016 data, the rate could theoretically range from approximately $0.13/kWh to $0.94/kWh on an hourly basis, a level of price volatility to which drivers, already fed up with the relatively modest fluctuations of gasoline prices, are not accustomed.

[2] Center for Sustainable Energy, *California Plug-in Electric Vehicle Owner Survey Dashboard*; Steele, David E., J.D. Power and Associates, "Predicting Progress: What We Are Learning About Why People Buy and Do Not Buy EVs," Electric Drive Transportation Association 2013 Annual Meeting, Washington, D.C., June 11, 2013; Maritz Research, "Consumers' Thoughts, Attitudes, and Potential Acceptance of Electric Vehicles," National Research Council meeting, Washington, D.C., August 13, 2013.

1. The Unpredictability of the Public Charging GIR is Not Well Suited for Public Charging

SDG&E proposes to apply the Public rate to applications where "there is no single dedicated customer associated with [the] sites" (e.g., sites with itinerant EV drivers as the ultimate end-users of charging stations).[3] However, the rate design is unnecessarily complex and creates uncertainty for itinerant EV drivers, which could serve as a disincentive to wider EV adoption. For example, many drivers would be surprised and not happy to arrive at a charging station needed to complete a trip and be forced to pay a $0.51/kWh adder for the top 150 system hours. That type of extreme variability might work for regular users in programs such as SDG&E's "Power Your Drive" workplace and multi-unit dwelling pilot, with employees or tenants who are provided the tools necessary to "set-and-forget," allowing algorithms to optimize charging within user-generated parameters, and who have the flexibility associated with long dwell-times to avoid charging during peak events. However, an hourly rate with such price volatility is not well suited to public applications where occasional users should be able to easily know what it would cost to charge at a public station upon which they may need to rely to complete their trip.

Public fast charging stations are used in a manner that is very different than home or workplace chargers. Under SDG&E's proposal, rates at public charging stations would vary hourly according to CAISO day-ahead prices, but also be subject to circuit and system adders. SDG&E asserts that, "when grid integrated hourly pricing in the public domain is easily communicated, charging station utilization will increase."[4] However, to respond to such price signals, EV drivers would presumably need to find and consult an SDG&E website in advance to find the hourly rates for multiple charging station locations they might need to complete a trip, an inconvenience that driving on gasoline does not present. Customers that fail to do so may arrive at a fast charging station they need to use to reach their destination, only to find prices above $1.00/kWh, which is the cost equivalent of driving a Toyota Prius on $15.60/gallon gasoline.[5] Even if EV drivers had the foresight to consult Plugshare, before getting in the car to plan their trip, it would not help them because Plugshare is not capable of relaying dynamic

[3] SDG&E, A.17-01-020, p. CF-27.
[4] *Opening Brief of SDG&E*, June 16, 2017, p. 36.
[5] Using the Department of Energy's "eGallon" methodology, adjusted to the efficiencies of a 52mi/gal 2017 Toyota Prius and a 0.30kWh/mi 2017 Nissan LEAF.

prices.[6] A dynamic rate is not well suited to public applications where rates should be easily known in advance, by itinerant, captive users, using readily-available resources.

Where price signals are too complex, uncertain, or un-knowable, customers are unlikely to respond to them. As the Utility Reform Network (TURN) notes, "these are complex rates that have not been tested for customer understanding or response to propose[d] price signals." [7] Likewise, the Office of Ratepayer Advocates (ORA) states the dynamic nature of the proposed rate "is highly experimental with uncertain outcomes in terms of customer reception and responsiveness."[8] ORA recommends SDG&E's hourly, dynamic rates be replaced with TOU rates, which "send a more consistent, pre-defined price signal and thus encourage regular and prolonged behavior modification for the times of consistently higher or lower prices."[9]

A simple TOU rate could still send a price signal that discourages charging during the vast majority of peak hours, without the complexity associated with the dynamic rate that makes it inappropriate for public charging applications. Ninety-two percent of the top 150 system peak hours in 2014-2016 fell during summer months between hour ending 14 and hour ending 21. The heat map in Figure 2 illustrates the tight clustering of system peak hours. The vast majority of circuit peaks (81 percent) occurred during these hours as well.[10] A simple TOU rate could send a strong, and knowable price signal that would encourage EV drivers to charge in a manner that does not strain the grid. TOU rates are also easier to learn and remember, allowing repeat customers to plan their trips without having to consult a website or app for each charging session.

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[6] PlugShare is the most commonly used web and app-based tool that helps drivers locate charging stations and aggregates details about specific stations, including applicable fees.
[7] *Opening Brief of TURN*, June 16, 2017, p. 33.
[8] *Opening Brief of ORA*, June 16, 2017, p. 51.
[9] *Id.*
[10] Note that although 81 percent of the single peak hours occurred in this range, 57 percent of the top 200 circuit peak hours fell within this window.

Figure 2: Heat Map of Frequency of 150 Top System Coincident Peaks (2014-2016)

	Month											
Hour	1	2	3	4	5	6	7	8	9	10	11	12
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	1	0	0	0
11	0	0	0	0	0	0	0	0	5	0	0	0
12	0	0	0	0	0	1	0	0	7	0	0	0
13	0	0	0	0	0	1	1	2	11	0	0	0
14	0	0	0	0	1	1	6	8	15	2	0	0
15	0	0	0	0	1	1	11	15	23	4	0	0
16	0	0	0	0	3	1	12	19	25	5	0	0
17	0	0	0	0	3	1	12	23	26	7	0	0
18	0	0	0	0	3	2	13	21	24	5	0	0
19	0	0	0	0	1	2	11	16	19	5	0	0
20	0	0	0	0	1	1	6	8	17	4	0	0
21	0	0	0	0	0	1	6	7	12	2	0	0
22	0	0	0	0	0	0	2	1	6	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0

It should also be noted that ensuring EV drivers charge on a TOU rate at public locations would by itself represent a significant advance relative to the status quo. As ChargePoint acknowledged in hearings in A.14-04-014, the vast majority of public charging locations that levy fees do not even charge for energy-delivered, but for time-parked (meaning that drivers of vehicles that can only charge at 3.3kW pay twice as much for the same amount of electricity as drivers of vehicles that can charge at 6.6kW), and that a "small percentage" of stations charge for actual electricity delivered, and of those that do, "an even smaller percentage" ("a few cases") use TOU pricing.[11] Accordingly, the Commission can adopt the recommendation that SDG&E's dynamic Public GIR be replaced with a simpler TOU rate, while still advancing the state of market by ensuring more EV drivers at public charging stations face reasonable and knowable price signals that encourage charging that supports the grid.

<u>Recommended Modification</u>

For public charging applications with itinerant users, SDG&E should offer a TOU rate. Because a TOU rate has pre-set peak and off-peak periods, EV drivers would be able to know

[11] A.14-04-014, Tr. Vol. 4, April 30, 2015, 800:28 to 801:16 (ChargePoint/Jones).

and learn when higher prices would be in effect by consulting widely-available tools such as "Plugshare," or simply through learning the peak period hours. This would better enable customers to plan their charging using public chargers well in advance and across multiple circuits, rather than only the day before by individual circuit. In addition, a standard TOU rate would not excessively burden customers who are unable to modify their travel plans and must charge during peak periods.

The TOU rate could be designed to include either two or three periods. Based on an analysis of the 2014-2016 data, a peak period defined as summer afternoon/evening hours (including weekends and holidays) appears reasonable. Such a rate would capture the vast majority of both system coincident peak hours and circuit peak hours in 2014-2016. However, the choice of the peak period should also consider how the peak period might shift over the next few years, and how to ensure that the TOU periods mitigate, rather than exacerbate, afternoon ramping conditions.

The Commission should also note this recommendation was also supported in briefs on the "Priority Review Projects" by the East Yard Communities for Environmental Justice, Center for Community Action and Environmental Justice, Sierra Club, and Union of Concerned Scientists.[12] Likewise, ORA states:

> *ORA also agrees with NRDC's assessment that SDG&E's public GIR rate design is overly complex due to the combination of variable CAISO day ahead ("DA") pricing and two critical peak pricing ("CPP") adders, which creates a high degree of uncertainty, will be difficult for itinerant EV drivers to ascertain in advance and will limit customers' responsiveness. ORA proposes to have a rate structure consisting of a simple predictable time of use ("TOU") rate, which is more actionable for customers and will facilitate proper charging behaviors in response to grid conditions. Though there is merit in retaining the CPP adders for the residential and commercial GIRs, ORA agrees with NRDC that they could overcomplicate public charging and should be eliminated or reduced in the public GIR.* [13]

[12] *Reply Brief of the East Yard Communities for Environmental Justice, Center for Community Action and Environmental Justice, Sierra Club, and Union of Concerned Scientists on the Priority Review Transportation Electrification Proposals from San Diego Gas & Electric, Southern California Edison, and Pacific Gas and Electric*, A.17-01-020, et al., July 10, 2017, p. 33.
[13] *ORA Reply Brief*, A.17-01-020, et al., July 10, 2017, p. 36-37.

2. *The $0.51/kWh Dynamic Adder Adds Complexity and Encompasses Too Many Hours*

SDG&E's proposal would apply the system coincident peak adder of $0.51/kWh to 150 hours each year. Based on analysis of 201-2016 data, these peak 150 hours would be spread out over approximately 25 different days, introducing a level of complexity that, as with dynamic pricing, makes it inappropriate for public charging applications where itinerant EV drivers should be able to readily know what price they will pay before arriving at station they need to use to complete their trip.

While the simplest approach would be a TOU rate without an adder for peak hours, as recommended above, if the Commission decides to retain a dynamic adder, it should direct SDG&E to adopt a TOU rate with a critical peak adder that would apply during fewer hours per year. (This approach is the same as the common layering of critical peak pricing on top of a traditional TOU rate.) Under such a rate, the "critical peak price" would only apply during a limited number of events a year (e.g., 5 or 10 days per year for a total of 25 to 50 hours). As with SDG&E's proposal, these events would be called a day in advance. The key difference is that the number of hours would be far fewer than under SDG&E's proposal, making it less likely EV drivers at SDG&E's public charging sites would have negative experiences as a result of being forced to pay unexpectedly high prices that are well in excess of the equivalent cost of gasoline.

Data regarding system peak loads support the concept of having fewer critical peak hours than under SDG&E's proposal. Demand during the 150th hour tends to be approximately 20 percent less than demand during the single highest peak hour, meaning that the system benefit of reducing demand during the 150th highest hour is much less than reducing demand during the single highest peak hour. In contrast, demand during the 25th highest hour is only approximately 7 percent to 10 percent lower than the single highest peak hour.[14] Limiting the critical peak hours to the top 25 hours would limit the number of days with critical peak pricing to approximately 6 days per year.[15]

[14] Based on analysis of data provided in response to data request NRDC-02-01.
[15] *Id.*

Recommended Modification

SDG&E should offer a standard TOU rate, which would still address the vast majority of peak hours, as the simplest solution for public charging applications with itinerant users. If the Commission determines it is necessary to augment the standard TOU rate, a critical peak price could added to the TOU rate, but only be implemented for a limited number of days (e.g. 5 or 6) per year. Limiting the number of critical peak events would reduce the risk that customers would be frequently confronted with unanticipated extremely costly charging rates.

3. All Customers Offering Public Charging (i.e. Hosts of Public Charging Stations) Should Be Eligible to Take Service on the Public Charging Rate

At least as it relates to the "Green Taxi/Shuttle/Rideshare," SDG&E states in testimony the Public GIR "will be applicable only at project charging facilities."[16] However, in response to EVGo's protest, SDG&E points to another chapter of its testimony stating that tariffs included in its application will be made available to all customers.[17]

Recommended Clarification

In order to promote the expansion of public charging infrastructure, we support making the Public rate available to any customer (i.e. host of charging stations) who is offering charging to the public. Doing so would greatly simplify the payment arrangements for such charging stations who cannot easily recover the costs associated with monthly demand charges in volumetric user fees. It should also be clarified whether any commercial customer could take service on the Public rate, or that only customers offering charging to the public will be allowed to take service on the Public rate.

III. THE GROWING FAST CHARGING INFRASTRUCTURE GAP – WITNESS MAX BAUMHEFNER, NATURAL RESOURCES DEFENSE COUNCIL

DC Fast Charging stations will be increasingly important to expanding the EV market as more affordable longer range battery electric vehicles (BEVs) such as the Chevrolet Bolt EV and

[16] SDG&E, A.17-01-020, p. RS-63.

[17] *Reply of San Diego Gas & Electric Company (U 902 E) to Protests and Responses Regarding Application for Approval of Sb 350 Transportation Electrification Proposals*, A.17-01-020, March 13, 2017, p. 17: "Regarding EVgo's assertion that rates should be open to competitive market providers, SDG&E has in fact proposed such availability to all customers. (Direct Testimony of C. Fang (Chapter 5) at CF-4.)"

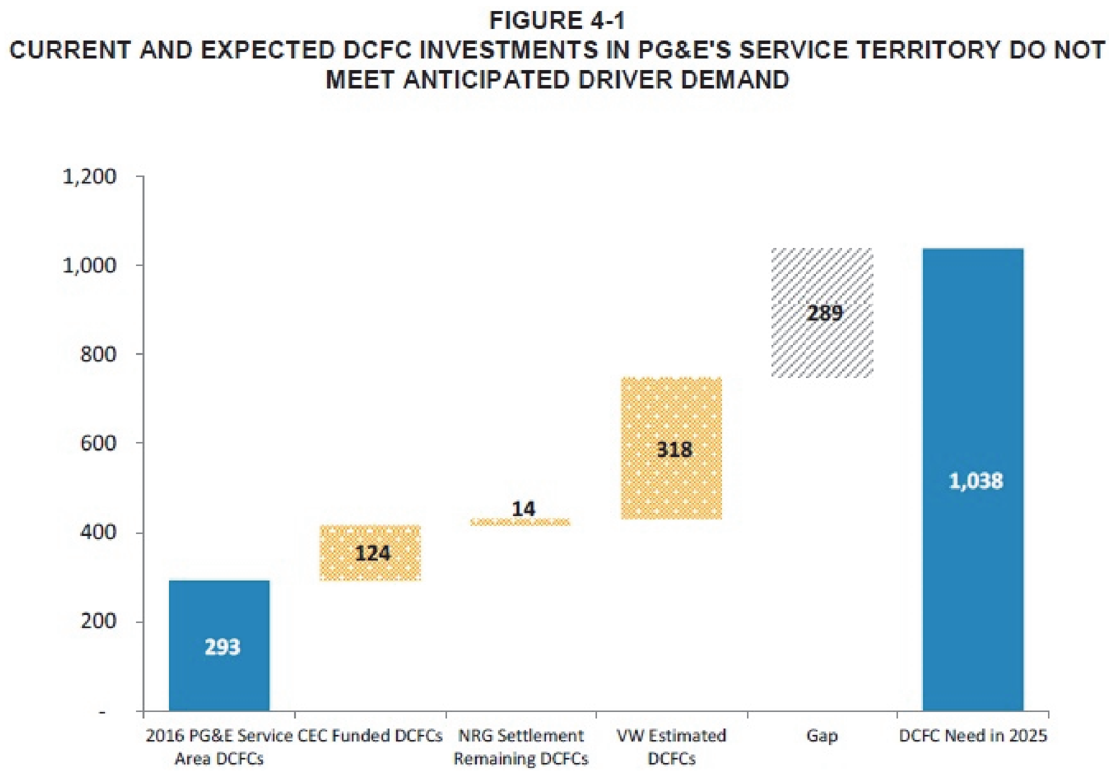
the Tesla Model 3, which have bigger batteries and are more capable of intercity travel, hit showrooms across California, with many more models to follow from other manufacturers. The impracticality of intercity travel remains a barrier to the adoption of first-generation, shorter range EVs. Consumer research shows the lack of "robust DC fast charging infrastructure is seriously inhibiting the value, utility and sales potential" of BEVs.[18] Even if a robust DC Fast Charging network were in place, most drivers of first generation vehicles with approximately 80 miles of range would be reluctant to undertake trips that would require multiple stops to recharge, with each stop taking about 30 minutes. The 200 plus mile range of second-generation affordable BEVs promises to remove a significant impediment to the expansion of the EV market, but that promise will only be partially realized absent a robust DC Fast Charging network. Unfortunately, PG&E's proposed DC Fast Charging program will not come close to filling the growing fast charging infrastructure gap.

1. PG&E's Proposed Make-Readies Will Support, Not Supplement Other Deployments

PG&E aims to deploy "make-ready" infrastructure to support 300 DC Fast Charging stations to meet an estimated need of 745 additional stations by 2025, assuming that other entities will fund make-readies and electric vehicle supply equipment ("EVSE," colloquially "charging stations") for the balance of 445 stations.[19]

[18] Norman Hajjar, *New Survey Data: BEV Drivers and the Desire for DC Fast Charging*, California Plug-in Electric Vehicle Collaborative, March 11, 2014.
[19] PG&E, A. 17-01-022, p. 4-7.

Figure 3: PG&E's Estimate of DCFC Need in 2025 and Remaining Gap



However, if those other entities make the seemingly obvious financial decision to install their EVSE on the make-readies PG&E intends to deploy, rather than funding those make-readies themselves, PG&E's make-readies will not be additive to what is already contemplated. In other words, the "Gap" identified in Figure 3 will persist as PG&E's make-readies will support, not supplement additional deployments. If a gap of 745 stations exists, PG&E's proposal for make-readies would need to be for 745 make-readies to ensure it would help close that gap. This is not to say that utility investment in make-ready infrastructure to support DCFC is not needed, only that it is not sufficient, and that even if the Commission were to approve PG&E's proposal as-is it would not meet the estimate of need included in PG&E's application.

2. The Real-World Need for DC Fast Charging Could Be a Dozen Times Greater than the Estimate Upon Which PG&E Relies

PG&E relies upon an estimate generated by UC Davis that 1,038 DC Fast Charging stations will be needed in PG&E service territory in 2025 (see Figure 3), but Tesla's real world example suggests the need could be closer to 12,000 DC Fast Charging stations. Without questioning the modeling and the assumptions of that underlying research (which also produced a very helpful interactive siting tool), the Commission should consider an alternative scenario, based upon the precedent of Tesla's existing DC Fast Charging network, which the automaker deployed to give prospective customers the confidence they need to purchase BEVs. At the time responses to the utility's applications were filed, Tesla's network consisted of 5,195 DC Fast Charging stations at 810 locations in North America, supporting approximately 115,000 Teslas on the road.[20] This results in an implicit "attach rate" of one DC Fast Charger to support 22 BEVs. ARB's modeling shows that to meet the air quality standards and state climate goals included in Public Utilities Code 740.12, 700,000 zero-emission vehicles (mostly BEVs with some FCEVs) will be required in 2025, growing to 1.7 million by 2030.[21] Assuming PG&E's current market share holds, that equates to roughly 280,000 zero-emission vehicles in PG&E service territory in 2025, the vast majority of which will likely be BEVs.[22] Accordingly, using Tesla's real-world attach rate, roughly 12,000 DC Fast Chargers would be required in 2025, with many more required to keep up with the exponential growth required to meet 2030 targets. In sum, the estimated need for 1,038 stations upon which PG&E sized its proposal could be a dozen times smaller than the real-world need.

3. <u>The Commission Should Not Expect Electrify America (VW's Newly Formed Entity) to Fill the Growing Need for DC Fast Charging but Should Seek to Leverage that Investment</u>

As the stated in the pubic guidance ARB has provided to inform VW's *ZEV Investment Plan:*

> *ARB's analysis estimates that if VW spent all of the investment funds of the first 30-month spending cycle on EV Charging only, this would contribute less than 15% of what is needed to reach the Governor's goal of enough EV infrastructure to support one million ZEVs by 2020. When combined with existing installed EV chargers, there would still be a $1.3 billion spending gap.* [23]

Furthermore, no one expects Electrify America to spend all of its investment on "EV Charging only," as the consent decree between ARB, U.S. EPA, and VW specifies three other important

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[20] *See* https://www.tesla.com/supercharger; estimate of on-road Tesla fleet given by Alan Baum & Associates.

[21] *See* footnote **Error! Bookmark not defined.**.

[22] *See* footnote **Error! Bookmark not defined.**.

[23] California Air Resources Board, *Guidance to Volkswagen on First 30 Month Electric Vehicle Infrastructure Investment Plan of the 2.0 Liter Diesel Engine Partial Consent Decree Settlement*, February 2017.

categories for investment (brand-neutral market education and outreach, programs or actions to increase public exposure and/or access to ZEVs, and a "Green City" initiative). In fact, VW's "Supply-Demand Gap Analysis" estimates Electrify America will "reduce the gap by only four to eight percent by 2020 with its own investments."[24]

Nonetheless, the consent decree presents the Commission with an opportunity to "leverage non-utility funding," as stipulated in the Commission's ruling to implement SB 350, by authorizing PG&E's DC Fast Charging make-ready program, which would both stretch utility customer dollars further by leveraging investments such as those that will be made by Electrify America and other companies.

IV. THE IMPORTANCE OF DC FAST CHARGING FOR EV DRIVERS – WITNESS KATHERINE STAINKEN, PLUG IN AMERICA

A. Consumer Mobility Needs Require a Significant Deployment of DC Fast Charging Stations Across All Service Territories

The EV drivers represented by Plug In America can testify to the fact that each of the three major categories of charging stations (Level 1, Level 2 and DC Fast Charging) have a role to play in facilitating widespread transportation electrification. EV driver charging behavior follows a "sip-and-gulp" pattern of slower charging and DC Fast Charging. Consumer driving behavior shows that a majority of the charging, around 85 percent, occurs at home and the next largest segment is at the workplace.[25] These locations represent long dwell-time opportunities, where vehicles are parked for usually around eight hours or longer each day or night. Slower charging on Level 1 or Level 2 stations at those long dwell-time locations represents the "sip" element of consumer charging behavior. A significant and growing charging infrastructure gap persists for these critical segments.

Drivers with daily commutes or driving patterns (e.g., Lyft or Uber drivers, who account for a rapidly increasing percentage of vehicle-miles travelled) that exceed the range of their vehicles, who do not have access to home charging, or who are undertaking the occasional longer trip, need reliable access to DC Fast Charging. Drivers can "gulp" electricity at fast

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[24] Electrify America, *Supplement to the California ZEV Investment Plan: Cycle 1*, June 29, 2017, p. 23.
[25] Source: U.S. Department of Transportation, Bureau of Transportation Statistics, Omnibus Household Survey (2014)

charging stations and fully charge batteries in 20-30 minutes, as opposed to the multiple hours required using the Level 1 or Level 2 stations. DC Fast Charging bypasses the vehicle charger and provides electricity directly into the battery. A standard DCFC provides a 50kW charge (as opposed to 1-7kW for typical Level 1 or Level 2 charging). The Tesla Supercharger provides 120kW, and even faster charging stations are beginning to emerge that could essentially replicate the gasoline station experience.

B. As the Market Moves Toward Longer Range, Affordable Battery Electric Vehicles, the Need for DC Fast Charging Will Continue to Grow

As of the date of this filing, GM's Bolt EV is the only BEV available with a range greater than 200 miles and a MSRP below $40,000 (before federal and state incentives), but the first production Tesla Model 3s will be delivered later this week, the second-generation Nissan LEAF is expected to go on sale in 2018, and these will be followed by other long-range BEVs from other manufacturers. A wide deployment of DC Fast Charging stations will be needed to unlock the market potential of these vehicles. As Tesla's real-world experience demonstrates, would-be EV buyers need to know there is a network of DC Fast Charging stations available to meet travel needs that cannot be satisfied with long dwell-time charging. The EV driver members of Plug In America are not alone in wanting reliable access to such a network, which does not exist today. According to surveys conducted at such locations in the San Francisco Bay Area by NRG's EVgo, when given the choice, drivers prefer DC Fast Charging 12-to-1 over Level 2 charging for public locations.[26] A wide deployment of DC Fast Charging is needed to remove this barrier to widespread transportation electrification and to increase electric miles driven, displacing greater amounts of pollution as a result.

C. A Significant Deployment of DC Fast Charging is Needed to Serve the Multi-Unit Dwelling Market Segment and Other Consumer Market Segments that Do Not Have Access to Charging at Home

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.[27] To-date,

[26] Charles Morris, *Given the choice, EV drivers prefer DC fast charging 12-to-1 over Level 2*, Charged EVs Magazine, November 12, 2015.
[27] Traut et al., US Residential Charging Potential for Electric Vehicles, (Transportation Research Part D), November, 2013.

almost 90 percent of EV drivers live in single-family detached homes.[28] As the National Research Council notes: "Lack of access to charging infrastructure at home will constitute a significant barrier to EV deployment for households without a dedicated parking spot or for whom the parking location is far from access to electricity."[29] It is essential for the EV market to move beyond single family detached homes to scale up to meet long-term climate and air quality goals.

Access to DC Fast Charging stations can provide those consumers in market segments who cannot charge at home, such as those who live in multi-unit dwellings, with the ability to purchase or lease EVs. Consumers purchase vehicles to meet mobility needs and will not be likely to purchase vehicles that cannot meet those needs. A more robust network of DC Fast Charging stations along with the expansion of Level 2 charging access and MUD and workplaces is needed to meet those mobility needs, especially for those who do not live in single-family homes.

D. Utility Investment in DC Fast Charging Infrastructure is Necessary

A recent report from the Department of Energy and Idaho National Lab focuses on DC Fast Charging stations and how they can be deployed to accelerate widespread transportation electrification. The report notes:

> *Numerous installation challenges have become apparent during past deployment activities, including the following: Private investment in public charging stations is often not profitable under current market conditions because the revenues earned from offering public charging services have not offset the costs of purchasing, installing, and operating the stations within a typically attractive payback period of 5 years.*[30]

The report further details case studies that led to the above conclusion and supports the fact utility investment in DC Fast Charging stations is necessary at this stage in the EV market, especially to address installation related-costs:

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

[29] 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.

[30] See the full report at: https://avt.inl.gov/sites/default/files/pdf/reports/DCFCChargingComplexSystemDesign.pdf

Many DCFC installations required new electrical service to be added to the host's site. The cost of these installations was significantly higher than those that did not require new service. The total cost increased due to fees charged by the local electric utility to extend the service from the grid to the host site and/or install new service equipment. For transportation corridors, charging sites sometimes need to be located in sparsely populated areas where existing electrical service is minimal. The cost to establish new electrical service may become a significant barrier for these types of installations.[31]

Unfortunately, private financing of the installation and operation of DC Fast Charging stations alone does not appear to be sufficient. A study commissioned for the state of Washington found that "charging station business models that rely solely on direct revenue from EV charging services currently are not financially feasible" and that viable business models must "capture other types of business value in addition to selling electricity."[32] The challenge is especially acute for DC Fast Charging stations, which have high capital costs.

Utilities are uniquely situated to capture the system-wide benefits of a comprehensive charging network. As noted in a recent National Academies of Science study, utilities can capture the "incremental revenue from additional electricity that EV drivers consume at home, where roughly 80 percent of the charging takes place" and use that revenue to both help deploy DC Fast Charging stations and still reduce rates and bills for all customers.[33]

V. CONCLUSION

With the modifications recommended in section (I) of this testimony, PG&E's DC Fast Charging project and SDG&E's Public rate meet the relevant statutory and regulatory criteria and should be approved.

Dated: July 25, 2017 Respectfully,

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[31] See the full report at: https://avt.inl.gov/sites/default/files/pdf/reports/DCFCChargingComplexSystemDesign.pdf

[32] Nigro, N. and Frades, M. *Business Models for Financially Sustainable EV Charging Networks*, Center for Climate and Energy Solutions, March 2015.

[33] Committee on Overcoming Barriers to Electric-Vehicle Deployment et al., *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*.

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Attachment A: Statement of Qualifications for Melissa Whited

Melissa Whited is a Principal Associate at Synapse Energy Economics, where she has worked extensively on issues related to utility regulatory models, rate design, and policies to address distributed energy resources (DER). In the rate design arena, Ms. Whited's work focuses on the development of rate designs that effectively balance the fundamental principles of revenue sufficiency, fair apportionment of costs, and efficiency of use. She has authored numerous reports and testimony regarding the impacts of fixed charges and demand charges on low-income customers, customers with distributed generation, and the ability of states to achieve their energy policy goals. Ms. Whited has testified on rate design matters before the Massachusetts Department of Public Utilities, the Texas Public Service Commission, and the Public Service Commission of Utah. In addition, she has filed testimony on performance-based regulation and market power before the Hawaii Public Utilities Commission and the Federal Energy Regulatory Commission, respectively. Ms. Whited holds a Master of Arts in Agricultural and Applied Economics and a Master of Science in Environment and Resources, both from the University of Wisconsin-Madison.

Attachment B: Statement of Qualifications for Max Baumhefner

Max Baumhefner is an attorney and expert in clean vehicles and fuels, within the *Energy and Transportation Program* of the Natural Resources Defense Council (NRDC) based in San Francisco. Since joining NRDC in 2010, his focus has been on policies to accelerate the electrification of the transportation sector and to ensure the efficient integration of electric vehicles into our nation's utility system. Mr. Baumhefner has testified and presented on energy issues before the California State Legislature, the California Energy Commission, the California Public Utilities Commission, and the California Air Resources Board. He holds a bachelor's degree from Pomona College and a Juris Doctor from Boalt Hall at the University of California, Berkeley.

Attachment C: Statement of Qualifications for Katherine Stainken

Katherine Stainken is the Policy Director with Plug In America, a non-profit that represents the voice of the EV driver. Her EV expertise on policies and EV driver needs is based on the first-hand knowledge from the thousands of Plug In America drivers and their decades of EV driving experience. Prior to her work at Plug In America, Ms. Stainken was a Director of Government Affairs at the Solar Energy Industries Association (SEIA), focused on policies to promote solar on the federal level as well as southeast and northeast regions, along with regulatory work at the DOE, EPA, CFTC, OMB, FHFA and other federal agencies. Ms. Stainken was also the lead staff on the Clean Power Plan and chief liaison to the solar heating and cooling and EH&S groups at SEIA. She received her Masters from American University in Global Environmental Policy and Bachelors from Boston College.