CPUC Docket: A.17-01-020 et al.
Witness: Eric Borden

PREPARED TESTIMONY OF
ERIC BORDEN

ADDRESSING THE PROPOSAL OF
SAN DIEGO GAS AND ELECTRIC COMPANY
FOR A RESIDENTIAL CHARGING STATION PROGRAM

Submitted on Behalf of

THE UTILITY REFORM NETWORK

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Table of Contents

I. Overview and TURN's Primary Recommendations

Pursuant to the April 13, 2017 "Scoping Memo and Ruling of Assigned Commission and Administrative Law Judges," TURN submits this testimony on SDG&E's proposed residential charging program. SDG&E proposes to install and own up to 90,000 Level 2 (L2) charging stations at a cost of $226 million.[1] The revenue requirement for the program is over $700 million through 2030.[2] The accompanying TURN testimony of Witness Jones and Marcus discuss cost recovery and the proposed Residential Grid Integrated Rate (GIR),[3] respectively.

TURN finds SDG&E's proposed residential charging station program does not comply with the basic goals of Senate Bill (SB) 350, to accelerate transportation electrification, or put another way, to increase electric vehicle (EV) adoption. This is because the program lacks guidelines to focus ratepayer investment on populations who face barriers to EV adoption. The program also needlessly wastes ratepayer funds for no corresponding benefit.

Under SDG&E's proposal, the vast majority of the program's participants will be predominately wealthy single family (SF) homeowners who would have purchased an EV regardless of whether SDG&E offers a charging station subsidy or not. This market segment comprises the majority of early EV adopters (Section II). Further, the proposed program imposes no cost discipline whatsoever and unduly burdens ratepayers, despite the fact this is unnecessary to accomplish program goals; utility shareholders stand to profit at the expense of ratepayers for no corresponding benefit. This clearly demonstrates a mis-alignment between allowing utility proposals to help achieve state environmental transportation goals and utility financial incentive to increase profits for its shareholders. For example, SDG&E's calculations show that additional utility revenues from the next 90,000 EVs are less than the cost of *just this program* (Section V(a)). This means if SDG&E's program is adopted, there can be no downward pressure on rates from additional EV load even when the number of EVs increases by more than 300%.[4] The notion that all ratepayers can financially benefit from increased EV adoption is in jeopardy due to SDG&E's costly and wasteful proposal.

[1] Prepared Testimony of Randy Schimka, January 20, 2017 ("Randy Schimka Testimony"), p. RS-27.
[2] DR TURN-01, question 5, "Residential Program Rev Req."
[3] Mr. Marcus also proposes an alternative TOU rate design.
[4] There are currently around 20,000 EVs in SDG&E's territory.

SDG&E attempts to mask the large costs of its program by promising load-shifting benefits due to its proposed Grid Integrated Rate (GIR).[5] TURN finds that these purported load-shifting benefits of SDG&E's program are not only speculative and unproven, but even if they are realized according to SDG&E's estimates, are not even close to exceeding program costs (Section V(a)). Ratepayers are much better off allowing drivers to charge on-peak than to bear the exorbitant costs of SDG&E's program. Further, there is no evidence that shifting load off-peak with a conventional TOU rate would not achieve the same amount of benefit at little to no cost to ratepayers.

Despite these fundamental flaws in SDG&E's proposal, TURN believes adoption of program modifications can focus investment on the populations who will be most influenced by a residential charging subsidy to purchase or lease an EV, decrease costs, and achieve load-shifting benefits. TURN thus recommends the following program modifications, discussed further in Section VII:

- SDG&E should provide rebates to subsidize the purchase of L2 charging stations over five years for up to 35,000 new EV drivers.
- Larger subsidies are warranted for low-income customers, residents of disadvantaged communities (DACs) and small multi-unit dwelling (MuD) residents[6] which are warranted given barriers to adoption for these communities.
- The program should have a participant income cap based on the Clean Vehicle Rebate Project guidelines[7] to partially address the high potential for "free riders" and equity concerns.
- Customers must be required to sign up for a TOU rate if they enroll with SDG&E to obtain a L2 charging station rebate.
- SDG&E must collect data on the effects of the program, including EV adoption pursuant to the program and EV charging patterns.

These recommendations are reflected in TURN's proposed budget as follows:

[5] TURN discusses SDG&E's rate design proposal in detail in the Testimony of William Marcus.
[6] Similar to SDG&E's proposal, TURN focuses some subsidies on small MuDs (up to 5 units) because they appear unlikely to be included in SDG&E's VGI Pilot program.
[7] Clean Vehicle Rebate Project (CVRP), https://cleanvehiclerebate.org/eng/income-eligibility.

Table 1. TURN's Proposed Budget

	Rebate	Vehicles/ Participants	Budget
Low-Income Customers (CARE/FERA) / DAC	$1,500	5,000	$7,500,000
Small MuDs	$1,500	5,400	$8,100,000
General Program	$700	24,600	$17,220,000
Total		35,000	$32,820,000

The development of this budget and an explanation of TURN's program design criteria is discussed in Section VII.

II. SDG&E's Program Does Not Comply with the Fundamental Goals of Senate Bill 350

In a comprehensive report by the National Academy of Sciences, the authors state "[h]ome-charging infrastructure is not a barrier to PEV deployment for households with a dedicated parking spot with an electric outlet nearby."[8] This is illustrated by data in California showing around 81% of early EV adopters reside in a single-family detached home (an additional 9% in an attached home such as a townhome).[9] Yet SDG&E's program is focused on the single family (SF) home market.[10] Further, the majority of EV drivers in California are relatively wealthy with 76% of surveyed drivers having a household income of more than $100,000 per year, compared to the average household income of $65,000 in California.[11] SDG&E has no provisions to ensure these successful segments of the EV market do not become the overwhelming recipients of ratepayer subsidy. These segments will be predominately "free riders" who participate in the program and receive ratepayer subsidy but would have bought or leased an EV regardless.

On the latter point, SDG&E provides absolutely no evidence its program will primarily result in EV adoption. The utility supports its application with the following:

> In a study that surveyed ZEV drivers, 3,881 respondents received a subsidized L2 EVSE, of which 60% were "very influenced" by the subsidy to move to a L2 EVSE. Thus, subsidizing the cost of the L2 EVSE and its associated charging infrastructure reduces the

[8] National Academy of Sciences *Overcoming Barriers to Deployment of Plug-in Electric Vehicles,* 2015, p. 84.
[9] Center for Sustainable Energy, *Infographic: What Drives California's Plug-in Electric Vehicle Owners*, September, 2016.
[10] Just 6% of the budget is budgeted for small MuDs ($6 million of installation costs), which TURN generally supports.
[11] CVRP, *Summary Documentation of the Electric Vehicle Consumer Survey, 2013-2015*, p. 49. California Department of Numbers, http://www.deptofnumbers.com/income/california/.

barriers for new customers to invest in a ZEV.[12]

The study referenced by SDG&E shows the results of a survey of EV drivers regarding the "importance of subsidy for decision to install a L2 charger."[13] These results show that a subsidy encouraged EV drivers to purchase a L2 charger rather than use Level 1 (L1), not to purchase the *electric vehicle*.

SDG&E thus targets tremendous subsidies for the portion of the market that has demonstrated the most success to-date for adoption of EVs in California. This data highlights TURN's primary concern that SDG&E's program will simply subsidize EV drivers who would have purchased a vehicle regardless of a charging infrastructure subsidy. This results in large and unnecessary costs to ratepayers and fundamentally undermines SDG&E's contention that its program will actually contribute to achieving state emissions reductions goals – as proposed, TURN finds that SDG&E's program will not.

III. Greater Adoption of Residential Level 2 Rather than Level 1 Charging is Not Necessarily in the Public Interest

SDG&E appears to believe that by simply providing greater incentive for customers to adopt a Level 2 charger there will be ratepayer benefits.

> The L2 EVSE has the ability to increase TE by tackling the barriers of a ZEV purchase, including cost and infrastructure, and at the same time fostering a more flexible load, benefiting the grid.[14]

Again, SDG&E provides no evidence that customers will purchase an EV because of a L2 charging station subsidy (see also Section II). A wealthy single-family home owner buying a $120,000 Tesla will be happy to take the $1,400 subsidy offered by ratepayers under SDG&E's proposal, yet this represents 1% of the vehicle purchase price and is essentially immaterial to the purchase decision. It makes little to no difference to the customer whether or not the utility has this program or not, particularly as the level of participant income rises. This is why TURN's recommendation for an income cap on program participation (Section VII) helps alleviate (but does not completely solve) the overarching problem with SDG&E's program, that it provides very little, if any, environmental or corresponding ratepayer benefits.

[12] SDG&E Chapter 4 Testimony, p. RS-9, lines 10-14.
[13] CVRP, https://cleanvehiclerebate.org/sites/default/files/attachments/California_PEV_Owner_Survey_3.pdf.
[14] SDG&E Chapter 4 Testimony, pp. RS-9-10.

Additionally, a study in Applied Energy examining actual driving patterns of US drivers and incorporating sensitivities finds that L1 charging is sufficient for "89% of U.S. drivers on a typical weekday and 85% of U.S. drivers on a typical weekend."[15] This is unsurprising given that most drivers travel around 30 or 40 miles a day and park their vehicle overnight.[16] Further, many customers that utilize Level 1 charging can shift load to off-peak times. For example, an EV driver who drives 20 miles a day can re-charge on level 1 in 4 or 5 hours overnight,[17] for example from midnight to 5am. They do not need SDG&E's proposed residential GIR to have the incentive to do so, but can simply sign up for a TOU rate.[18] SDG&E's own study shows TOU rates are quite effective at motivating EV drivers to shift load to off-peak times.[19] Further, TURN emphasizes that load shifting benefits must be greater than the cost to "procure" them – in the case of SDG&E's program, they are not, as demonstrated in the ensuing section.

The Commission must also recognize that L2 charging has a greater impact on the distribution grid which can result in costly distribution upgrades relative to L1, particularly if EVs are "clustered" in residential neighborhoods. EPRI modeling at the distribution circuit level finds that "PEV charge levels have a more dominant impact [on the grid] compared to charge time."[20] EPRI modeling suggests minimal impacts on distribution circuits from level 1 charging, even if charging occurs during peak times.

[15] Lawrence Berkeley National Laboratory, University of California at Berkeley, Saxena, Samveg et al., published in Applied Energy, *Charging ahead on the transition to electric vehicles with standard 120 V wall outlets*, p. 727.

[16] Travel of 40 miles per day would take around 8-10 hours of L1 charging to fully re-charge. Of course, with a 200 mile range vehicle, the car need not fully re-charge overnight. Charge rates of 4-5 miles per hour from National Academy of Sciences, *Overcoming Barriers to Deployment of Plug-in Electric Vehicles* (NAS Study), p. 2.

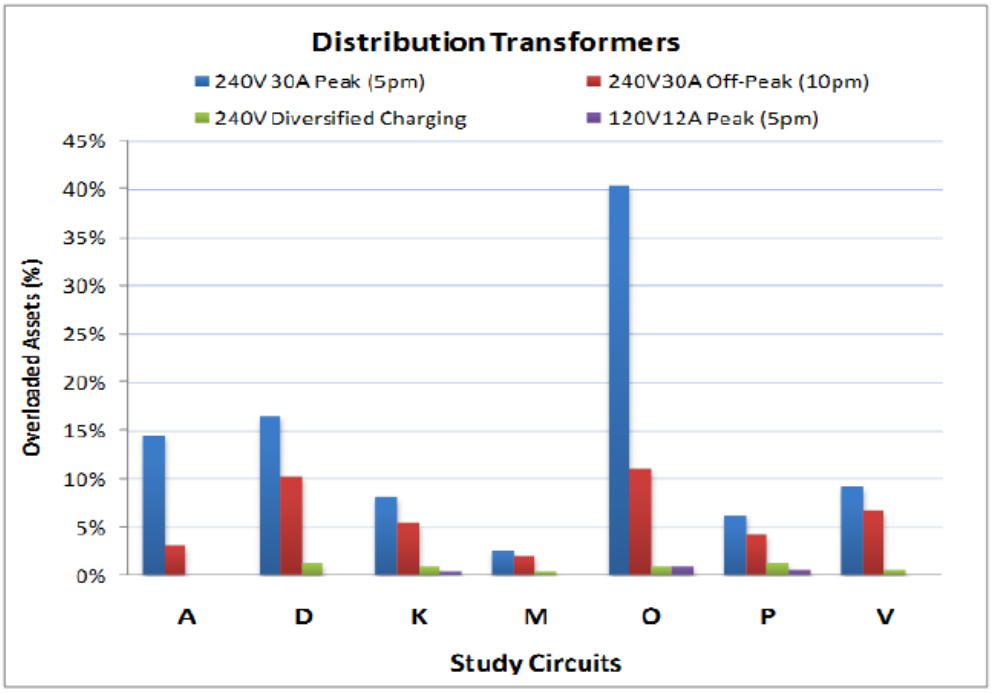
[17] Level 1 charging "provides about 4-5 miles of electric range per hour." NAS Study, p. 2.

[18] SDG&E, https://www.sdge.com/clean-energy/ev-rates. A customer may sign up for a whole house TOU rate but submetering should ultimately be accomplished using meters embedded in charging stations. Ultimately utilities may need to be required to utilize embedded submeters rather than build a separate meter for each EV. See accompanying Witness Marcus testimony at pp. 21-22 for TURN's alternative rate design proposals.

[19] See Nexant, *Final Evaluation for San Diego Gas & Electric's Plug-in Electric Vehicle TOU Pricing and Technology Study,* February 2014.

[20] EPRI, Dr. Arindam Maitra, "Preparing the Distribution Grid to Embrace Plug-in-Electric Vehicles," p. 10.

Figure 1. Level 1 Charging Has Less Impact on the Grid than Level 2



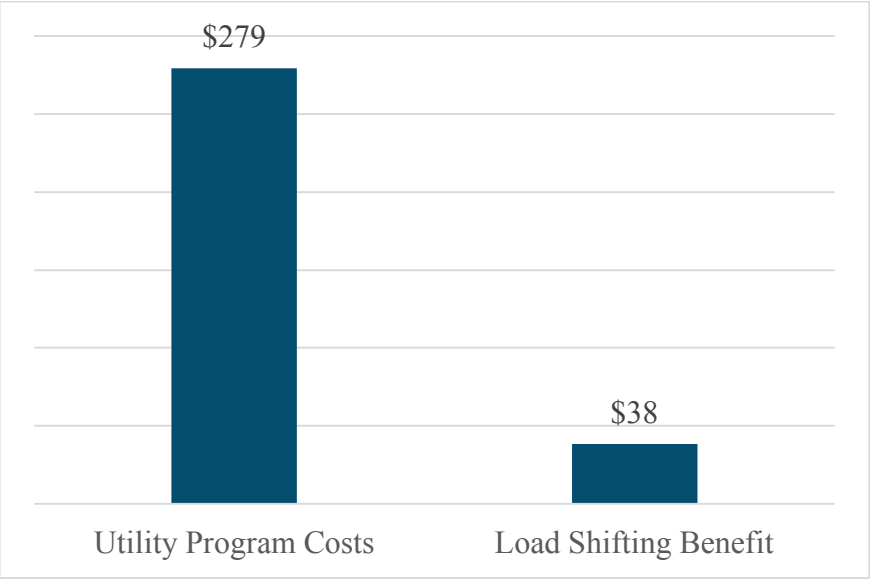
IV. The Claimed Load Shifting Benefits of SDG&E's Program Can be Achieved More Cost-Effectively and Are Significantly Less than the Cost of the Program

TURN urges the Commission to carefully examine SDG&E's claimed load-shifting benefits of its program. SDG&E provided TURN an estimate of the avoided costs to ratepayers due to the load-shifting benefits of its program. There are several flaws with the analysis that inflate the avoided cost estimate.[21] However, even if SDG&E's assumptions and analysis are taken at face value, the avoided energy and capacity costs (as well as an expected lower RPS premium and ancillary services cost) due to shifting charging from on-peak to off-peak times amount to a small fraction of the total program cost. Load-shifting benefits of the program (if

[21] These include the following: 1) that the residential GIR perfectly incents customers to shift load completely (100%) off-peak when the rate has never been tested; 2) the analysis does not reflect the fact that the Commission is moving towards default Time-of-Use (TOU) rates, so EV drivers will likely not be on tiered rates past 2020 as is assumed in the analysis 3) that shifting EV load to off-peak results in avoided generation capacity costs in all years beginning in 2020, when E3 calculates the Resource Balance Year (RBY, the year when long-term capacity is expected to be needed) is 2027 (E3, *Avoided Cost 2016 Interim Update*, p. 18). TURN understands that a Commission Decision (D. 16-06-007) set the RBY effectively to zero, but this was for cost-effectiveness calculator purposes and does not reflect the actual time period when there is an expected need for long-term capacity.

they occur) are undeniably smaller than the cost of the program.

Figure 2. Utility Program Costs Versus Claimed Load Shifting Benefit
(Present Value through 2039, $ Millions)[22]



Ratepayers are better off if the Commission rejects SDG&E's proposal even *if* customers expected by SDG&E to charge on-peak do so.

SDG&E ignores other more cost-effective ways to encourage customers to sign up for TOU rates which SDG&E's own studies show can effectively encourage drivers to charge off-peak.[23] Further, the utility does not account for the fact that the Commission has indicated it will default all customers onto TOU rates in the near future – though TURN opposes this decision due to the expected bill impacts for most (non EV-owning) consumers, it will likely incent EV drivers to shift load to off-peak times.

V. SDG&E's Proposed Program Costs Are Unnecessary, Burdensome to Ratepayers, and Excessive

In almost every aspect of its proposal SDG&E's program burdens ratepayers with excessive and unnecessary costs. This why TURN is able to propose a $33 million program

[22] Present value of benefits and costs through 2039 using weighted average cost of capital discount rate (7.79%). TURN-01, question 10, attachment "Res Results Scenario A with TURN DR1 Q10dc Analysis."
[23] Nexant, *Final Evaluation for San Diego Gas & Electric's Plug-in Electric Vehicle TOU Pricing and Technology Study,* February 2014. For example, SDG&E could offer a small financial incentive before the rollout of residential TOU rates (e.g. $100) to incent EV drivers to sign up for a TOU rate.

in lieu of SDG&E's $700 million proposal[24] while at the same time increasing the program's effectiveness with a simpler design and program criteria to enhance effectiveness.

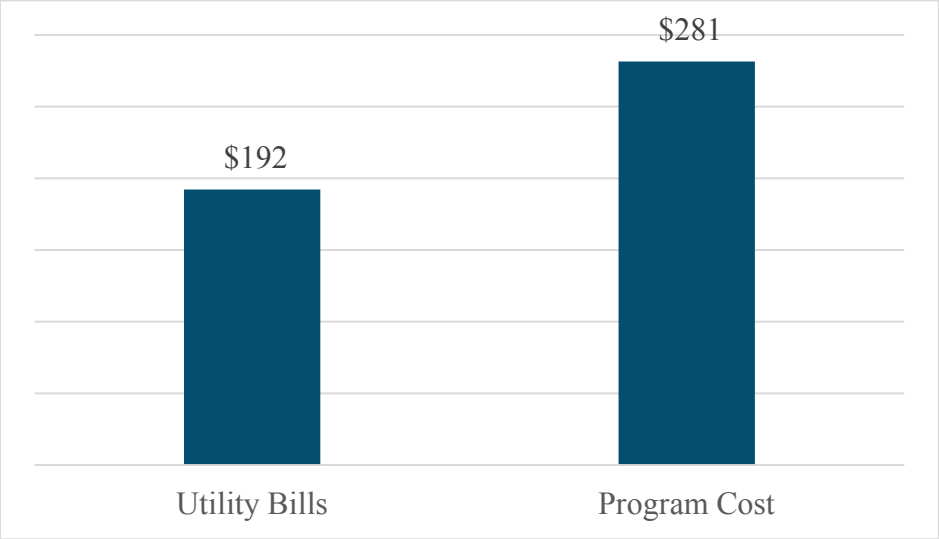
a. SDG&E's Program Would Unnecessarily Foreclose Non-Participating Ratepayers from Receiving the Financial Benefits of Electrification

TURN believes that if implemented in a smart, cost-effective, and prudent manner, utility EV programs can help decrease emissions *and* provide downward pressure on rates for all ratepayers due to increased electricity sales. However, this can only be accomplished if utility costs are also kept in check – in the case of the instant proposal, SDG&E appears to value shareholder profit over these financial ratepayer benefits by proposing a program that is so costly it would wipe out the financial benefits for non-participating ratepayers for the subsequent 90,000 EVs adopted, likely through 2025 or 2030. SDG&E's cost-effectiveness analysis (the "gross scenario") shows the present value (PV) of utility bill revenues for the next 90,000 vehicles. This is compared below to just *this program's* costs, if the program is adopted as proposed.[25]

[24] Revenue requirement for SDG&E's program, see TURN-01, question 5, attachment "Residential Program Rev Req." TURN's proposal is a "cost" rather than revenue requirement but since the $33 million is not capitalized, the revenue requirement should not be much different.

[25] TURN reminds the Commission that SDG&E ratepayers are already spending $45 million on the VGI pilot (this figure does not include the full revenue requirement, see D.16-01-045), potentially $20 million on SDG&E's priority review projects and will most likely be asked to fund further TE programs in the future, including future phases of the workplace and multi-unit dwelling "Power Your Drive" program. The sum of SDG&E's TE programs should be accounted for in each utility application.

Figure 3. Electric Vehicle Revenues (90,000) versus Program Cost (Present Value $2017 Millions)[26]



The costs proposed by SDG&E are not only unnecessary to achieve the stated goals of its program, they would foreclose the opportunity for all ratepayers in SDG&E's territory to reap the financial benefits of transportation electrification (TE). TURN strongly urges the Commission to consider the impacts of SGD&E's program on all ratepayers.

b. Utility Ownership of the Residential Charging Stations is Costly, Impractical, and Unnecessary

SDG&E proposes a full ownership model, including of the L2 EVSE, citing customer experience, installation standards, dynamic grid conditions, and stranded asset mitigation as benefits of this model.[27] Yet SDG&E does not cite a single instance, not to mention studies showing widespread prevalence, of safety or reliability issues with residential L2 charging. L2 residential charging is a relatively simple technology and especially in the case of private property parking such as a garage or carport, there is very little risk of damage or vandalism to the station that would require regular maintenance or repair. SDG&E does not need to own the

[26] The "gross" scenario of SDG&E's cost-effectiveness analysis calculates the costs and benefits for the full 90,000 vehicle population regardless of "free-ridership". It is irrelevant for this Table whether one uses "Scenario A" or Scenario B." The "Program Cost" is slightly more than the previous Table because it is the present value through 2050 rather than 2039. Discount rate is 7.79%. See TURN-01, question 2, "Res Results Scenario A."

[27] SDG&E Testimony Chapter 4, pp. RS-17-RS-19.

EVSE for vehicles to provide demand response, respond to TOU signals, or provide other grid benefits.[28] Further, a rebate program as recommended by TURN is administratively simpler and can be implemented more quickly than if all the installation goes through the utility.

Utility ownership of behind the meter (BTM) infrastructure is relatively rare, and past limits have in part served as a demarcation of the limit of services appropriately offered by a regulated monopoly from services more appropriately offered through unregulated competitors. Before permitting the regulated monopolies to gain such entry into a new market, the Commission should consider both the policy and factual issues necessary to ensure the benefits of this approach outweigh the costs. TURN can only support utility ownership if there are significantly increased benefits relative to third-party ownership and ratepayers are not placed at higher risk of stranded costs - this is certainly not the case for residential charging infrastructure.

Namely, there are significant practical and logistical concerns that will burden EV drivers, raise costs, and increase the likelihood of stranded assets. For example, if a driver sells his/her EV and buys a conventional vehicle, the charging station will be stranded. If a participating customer moves, ratepayers will have to pay to either move the charging station with the driver or potentially strand the asset (potentially at ratepayer cost). On this issue SDG&E states "If a participant is no longer using the L2 EVSE, SDG&E will remove the EVSE so that it can be refurbished and recommissioned in a timely manner."[29] In addition to the logistical mess this creates of having utility workers constantly removing items from private property and "recommissioning" charging stations throughout its territory for the life of the stations, costs of the program will balloon quickly and unnecessarily.

Further, there are significant anti-competitive concerns with utility ownership of residential charging stations. Particularly given the size of the program – 90,000 charging stations in comparison with 22,000 EVs today in the utility territory[30] - SDG&E will become the primary supplier of EVSE in its territory. Charging station companies in this market will be forced to vie for utility approval, and in the instances where they are not approved for whatever reason, they will be essentially shut out of the residential market. An electric utility should not

[28] See, for instance, the PG&E-BMW pilot whereby EVs were called for demand response using vehicle telematics. PG&E, http://www.pgecurrents.com/2017/06/08/pge-bmw-pilot-successfully-demonstrates-electric-vehicles-as-an-effective-grid-resource/. Further, EVs have timers that allow the driver to set when the vehicle should begin charging. TURN expects these vehicle functionalities will continue to improve over time.
[29] SDG&E Chapter 4 Testimony, RS-20, lines 1-2.
[30] SDG&E Chapter 4 Testimony, RS-23, line 12.

have monopoly power over the residential charging station market. SDG&E provides virtually no detail on how charging station companies will be selected, but its workplace and MuD "Power Your Drive," program, which incorporates utility ownership, appears to have just one vendor.[31] Instead, drivers should have freedom to select the residential charging station that best fits their need rather than have the electric utility decide for them.

The extra cost to ratepayers paying for the profit, debt, and taxes that come with utility ownership of residential charging stations has not been justified by SDG&E, nor the additional risk and added difficulty in program implementation. There is simply no legitimate justification for the utility to own residential charging infrastructure. The rebate program proposed by TURN (Section VII) is easier and faster to implement, as well as less costly and risky to ratepayers.

c. SDG&E's Estimated Installation Costs Are Inflated

One significant driver of SDG&E's cost estimate is the assumed cost of installation (the labor portion of which is capitalized in SDG&E's proposal).[32] Specifically, SDG&E proposes the following cost "caps," based on an average cost to install of $1,425[33] (these are in addition to $525 cost of the proposed subsidy for the EVSE itself):

- Customers residing in single family homes will have a cap of $1,000;
- Customers residing in two to four-unit MuDs will have a cap of $1,125; and
- Customers residing in a DAC will have a cap of $1,500.[34]

In addition to the fact that SDG&E's costs are almost all capital which burdens ratepayers with a full revenue requirement of $700 million, SDG&E has likely over-estimated the cost of installation for a single family (SF) home ($1,000 or $1,500 if living in a DAC). A L2 circuit is the same power level as a dryer, and one may be available in a customer's garage at virtually no installation cost. Of course, extenuating circumstances, such as a panel upgrade, may arise and incur additional cost, though SDG&E estimates this would occur for just 5-10% of cases.[35]

In response to a data request, ChargePoint, a charging station company with over 2,630 residential charging ports in California,[36] estimates the average cost of a L2 residential charging installation at $650 (rather than $1,425 per SDG&E) for a SF home (excluding the permit) and

[31] SDG&E, https://www.sdge.com/environment/power-your-drive-charging-station.
[32] DR TURN-01, question 1, attachment "ET – Total Cost – Rev Req Inputs," "Residential Costs" tab.
[33] SDG&E Testimony Chapter 4, p. RS-5, line 11.
[34] SDG&E Testimony Chapter 4, p. RS-6, lines 3 to 5.
[35] DR TURN-03, question 7.
[36] DR TURN-ChargePoint-01, question 1.

around $776 including the permit based on a recent project with the CEC (see below). SDG&E estimates a permit costs $206, so the effective average installation cost (not including permitting) was $570 for the CEC project in SDG&E's territory:

> ChargePoint itself does not directly provide installation services. However, we do from time to time engage with installers as well as our installer network provider, Qmerit. Based on anecdotal conversations with installers, we believe the average installation cost for California is around $650 excluding permit costs, assuming the charger is within 25 feet of the panel, the panel is in the garage, there is surface mounted conduit with no special coring, and no panel upgrade is required. Permit costs and processes are highly variable, so this number does not include the cost of acquiring a permit. Based on our conversation, about 80% of installs fall into this basic scope of work, with a minority being more expensive due to electrical upgrade requirements and particularly burdensome permitting processes. **Beyond anecdotal reports, we recently completed installation of around 30 charging stations for the CEC "*Next-Generation Grid Communication for Residential Electric Vehicles Pilot*" Program in SDG&E Territory, the average install cost, *including permitting* was $776.**[37]

Including SDG&E's estimated average charger cost of $525, the total average cost to procure and install a L2 charger in a residence is around $1,300 - $1,500, rather than SDG&E's estimate of $2,231.[38] TURN reflects these findings in our recommendations below.

d. SDG&E Incorrectly Calculates the Number of Vehicles Eligible for its Program

SDG&E calculates the number of vehicles its program should serve by subtracting the estimated number of vehicles in its territory in 2020 from the utility's share of the governor's 2025 ZEV goal (1.5 million vehicles).

> To calculate program size, SDG&E subtracted the projected 2020 ZEV population [29,691] from San Diego's share of the Governor's goal of 150,000 vehicles to get a remaining market of 120,309 additional ZEVs that need to be on the road by 2025. SDG&E has set the goal of obtaining a 75% participation rate through this program, which leads to the goal of 90,000 participants.

Aside from program design considerations that can better target ratepayer investment to encourage EV adoption (Section VII), there are four primary flaws with this calculation:

1) It is incorrect to subtract the number of vehicles forecast for SDG&E's territory in 2020 from the Governor's goal in 2025. The goal and vehicle forecast should both be for 2025.

[37] DR TURN-ChargePoint-01, question 2.

[38] SDG&E Testimony Chapter 4, p. RS-9, line 10. Despite stating in footnote 27 on this page that an average L2 EVSE is $600, SDG&E's budget estimates $525 for a L2 EVSE, which appears more reasonable. For example, ChargePoint's residential home product starts at $500, see TURN-ChargePoint-01, question 1, and a (quick) search on Amazon finds L2 chargers for $240-$600.

2) A 75% "participation rate" is large and unsupported. Ratepayers should not fund most of the residential charging infrastructure in SDG&E's territory. In practice, this will support almost all of the charging infrastructure in SDG&E's territory for the next 90,000 vehicles – the program has no way of distinguishing what is "incremental" versus "naturally occurring" EV growth. Such a large percentage of the hypothetical market is unsupported and potentially wasteful.

3) SDG&E assumes all EVs, including plug-in hybrid electric vehicles (PHEV), require a L2 subsidy. Though the vast majority of customers can use L1 (Section III), given that PHEVs have smaller batteries and can generally re-charge overnight on Level 1 even when the battery is "empty," ratepayers do not need to subsidize L2 residential charging for PHEVs as well as BEVs.[39]

4) SDG&E does not account for fuel cell vehicles which count towards the 2025 ZEV goal.

Even accounting for these flaws, it is not clear that California will not reach the Governor's goals by 2025 as SDG&E appears to assume. Given the state's ZEV mandate, which has increasingly strict mandates for automakers to sell PEVs, as well as rapidly improving economics of EVs and automaker interest, the goal may well be met. In fact, the "ZEV mandate" and affordability scenarios conducted for PG&E's EPIC 1.25 project forecasts 1.5 to 2.4 million ZEVs in California by 2025.[40]

Nevertheless, to err on the side of caution, TURN corrects SDG&E's calculation by incorporating an EV forecast assuming linear growth to 2025 (rather than 2020, see Appendix 3), the number of PHEVs (assumed to be 30% of the number of vehicles in 2025),[41] and a 50% market share (this is conservative from a ratepayer perspective as TURN does not believe generally that utilities should have this large of a market share if private funds can be leveraged as is the case for residential charging). This results in the following number of vehicles eligible for a residential charging subsidy:

Table 2. Vehicles Eligible for Residential Rebate Program

SDG&E Share of Governor's Goal	150,000
Less: Vehicles in 2025 (1)	66,667
Less: PHEVs (2)	20,000

[39] This should be considered for budget purposes but TURN does not object to PHEV drivers participating in the rebate program.

[40] PG&E, Electric Program Investment Charge (EPIC), *Develop a Tool to Map the Preferred Locations for DC Fast Charging,* p. 63.

[41] Currently, 46% of EVs in SDG&E's territory are PHEVs. DR TURN-02, question 13, attachment "SDGE TURN DR Car Count Data." (Confidential) This number may increase rather than decrease in the future meaning SDG&E could in fact need a smaller program than TURN's recommendation.

Less: Fuel Cell Electric Vehicles (3)	6,770
Subtotal	56,563
Less: SDG&E Market Share (4)	50%
Residential Rebate Vehicle Estimate	**28,281**

Notes/Sources:

(1) See Appendix 2 for TURN's forecast of PEVs in SDG&E's territory in 2025 which conservatively assumes linear growth of sales through 2025.
(2) Assumed to be 30% of the market in 2025. Again, a conservative assumption given that PHEVs are currently 46% of SDG&E's market, which may increase rather than decrease to 2025.
(3) 10% of the 67,700 fuel cell vehicles forecast in the "*EPIC 1.25 – Develop a Tool to Map the Preferred Locations for DC Fast Charging*" report for PG&E conducted by UC Davis. See page 11.
(4) Conservative estimate of reasonable market share only applicable if TURN's program modifications are adopted. If not, a much smaller market share should be applied. TURN stresses this market share estimate is only applicable to TURN's modified proposal for SDG&E's residential charging station program and should not be applied to other utility proposals.

TURN's recommended residential rebate program conservatively (from a ratepayer perspective) assumes rebates for 35,000 vehicles based on the calculation above and adopts multiple program design features that drastically improve SDG&E's proposal to maximize the benefits of ratepayer expenditures, decrease (in part) free-ridership, and partially alleviate equity concerns (Section VII). This number of vehicles is more than all of the vehicles in SDG&E's territory to-date and thus provides significant support to the EV market in SDG&E's territory.

VI. SDG&E's Cost-Effectiveness Analysis Demonstrates the Negative Ratepayer Impacts of its Program

SDG&E demonstrates that a cost-effectiveness test is possible for EV programs though their analysis contains flaws. TURN appreciates SDG&E's effort conducting such a test and believes a standardized cost-effectiveness analysis framework should be explored and eventually required for all utility EV applications to evaluate programs in a more quantitatively rigorous

fashion.

SDG&E's cost-effectiveness analysis is fundamentally flawed because the program will consist primarily of "free-riders," participants who acquire an EV, or would have acquired an EV, regardless of the program, as described in preceding sections. Due to the large amount of free-riders under SDG&E's proposal, the benefits of the program accruing to non-participating ratepayers, such as additional revenues (called "utility bills" in the analysis), cannot be attributed to the program. SDG&E does attempt to account for the "free-rider" issue by assuming a "net to gross" ratio similar to energy efficiency programs (EE) in California, whereby around 30% of EV drivers are assumed to be "free riders" (SDG&E assumes around 70% of the 90,000 vehicles by 2024 are added because of SDG&E's program).[42] There is absolutely no analytical or logical basis for assuming that net to gross ratios for EE programs in California (even if they are calculated correctly) are the same as a residential charging station rebate program, especially one devoid of any participation requirements designed to limit free-ridership. The analysis also errs by including low carbon fuel standard (LCFS) credits as a "benefit" in the ratepayer impact measure (RIM) test; this is incorrect because LCFS credits are returned to EV drivers, not non-participating ratepayers.

However, the analysis is still useful to examine the financial consequences of EV adoption in conjunction with SDG&E's wasteful program. For example, as illustrated in Section V(a), the additional revenues ("utility bills") provided from 90,000 vehicles over the next two decades (the "gross" scenario) are less than the cost of the proposed program.

The following observations can be made from the results of SDG&E's cost-effectiveness test:

- The Ratepayer Impact Measure (RIM) test shows that even if SDG&E's overly-optimistic "free rider" assumptions are accepted, electricity rates for non-participating ratepayers (non-EV drivers) will increase as a result of the program;
- The largest benefit accrues to EV drivers in the form of avoided gasoline cost;
- Participants (EV drivers) are the overwhelming benefiters of the program;
- The Societal Cost Test (SCT) is only positive under Scenario B because the scenario assumes higher gas prices – again, the "avoided gasoline cost" is the largest benefit, the financial beneficiary of which are EV drivers since charging off-peak is generally cheaper than gasoline, particularly with higher gas prices.

[42] SDG&E Testimony, Chapter 8, Appendix A, *Technical Appendix for E3 Analysis Documentation,* p. 8.

The analysis demonstrates that the Commission should only approve EV programs that can reasonably accelerate EV adoption in a cost-effective manner by maximizing benefits and minimizing costs, which SDG&E's proposal does not accomplish.

VII. TURN Recommendations to Decrease Cost and Increase Efficacy of SDG&E's Residential Charging Station Subsidy Program

Adoption of TURN's recommendations would result in a simpler, more streamlined, and more cost-effective residential charger subsidy program than SDG&E's proposal. TURN targets a portion of subsidies to low-income ratepayers and inhabitants of small multi-unit dwellings, as these classes of consumers continue to face barriers to EV adoption for multiple reasons. TURN's program criteria and proposed rebate levels help ensure non-ratepayer funds will be leveraged and ratepayer dollars will be spent more efficiently. For example, not factoring in the full revenue requirement, the utility seeks to spend about $2,500 per residential charger, while TURN's program costs around $940 per charger.[43]

TURN also proposes an income cap, per the guidelines described below from the Clean Vehicle Rebate Program which will help ensure ratepayer dollars are not simply wasted on wealthy single family homeowners who do not face the same barriers to EV adoption as other classes of consumers.

a. A Residential Charging Station Rebate Program is Simpler, Faster to Implement, and More Cost-Effective than SDG&E's Proposal

A rebate program to subsidize L2 charging infrastructure, coupled with TURN's program design criteria (below), can dramatically reduce the costs and increase the efficacy of SDG&E's residential charging station subsidy program. Under TURN's proposal, the utility becomes the administrator of ratepayer funds, rebated to eligible EV driver participants, rather than the owner and contractor for a majority of residential L2 stations in SDG&E's territory. This significantly speeds implementation and cuts costs. In addition to the logistical concerns of utility involvement (discussed above), this program design is infinitely simpler and more cost-effective than SDG&E's proposal to own and install 90,000 charging stations in its territory.

A residential rebate is also the favored program design of other utilities (municipal and CCA) in the state who do not have the shareholder incentive to increase ratebase but want to

[43] $226mm cost / 90,000 chargers vs $33mm / 35,000 chargers.

encourage EV adoption. These rebates are generally around $500 per charger - a summary of four California utilities' existing programs can be found in Appendix 2.

TURN recommends a rebate of $700 ($1,500 for low-income and DAC customers to encourage participation) per L2 charger. This is enough to both fully cover the cost of the charging station (around $525 per SDG&E's estimates) as well as a portion of the installation cost, but also ensures most participants contribute to the purchase and/or installation of the L2 charging station. This is critical for the following reasons:

- Participant financial contribution alleviates some of the burden on non-participating ratepayers;
- Ratepayer dollars can support more EV drivers by leveraging participant contributions;
- Participants who can charge at home on L1 may elect to forego purchasing a L2 charger (there is generally no incremental cost to L1) which may lessen required distribution upgrades from L2 charging;
- If a participant is a "free rider" (a driver who would have purchased an EV regardless of the subsidy) the subsidy is limited.

TURN's recommendation for a $700 L2 charging station rebate would likely be the highest in the state, and should decrease over time as the cost of equipment and EVs come down.

b. Program Design Criteria to Maximize Benefits and Minimize Costs

SDG&E's program lacks basic program and participant criteria that, if implemented, would increase the environmental and ratepayer benefits of a residential subsidy program. At a minimum, these criteria should include the following elements:

1) **An income cap above which an EV driver may not apply for the rebate.** In addition to helping alleviate the general equity concern of low and middle-income ratepayers subsidizing high-income ratepayers through a regressive fee on their utility bill, the cap also helps address the "free rider" issue - high-income EV drivers who participate in the program but would have purchased an EV anyway. In this instance, ratepayer funds are not being utilized to encourage EV adoption and provide zero incremental environmental benefit. Alternatively, if the Commission does not wish to completely exclude wealthy EV drivers, then they could be eligible for a reduced rebate, 50%-75% of TURN's recommended level. In order to maintain consistency with existing state EV programs, the income cap should follow the current Clean Vehicle Rebate Project (CVRP) income levels and implementation guidelines,[44] the caps are summarized here:

   - $150,000 for single filers;

[44] CVRP, https://cleanvehiclerebate.org/eng/income-eligibility.

- $204,000 for head-of-household filers;
- $300,000 for joint filers.[45]

The CVRP income cap is relatively high but would still alleviate some of TURN's equity and free-ridership concerns.

2) **Low-income customers and those living in disadvantaged communities should receive higher subsidies.** CARE/FERA customers are most likely to be influenced by a residential charging subsidy and need greater financial support to adopt EVs. California has a policy of increasing access to TE for DACs which TURN supports.[46] TURN thus recommends a $1,500 rebate for CARE/FERA customers and residents of DACs whereby at least 20% of the program budget be set aside for CARE/FERA and DAC customers to ensure they can participate.

3) **SDG&E should collect data on the effect of its program and provide semi-annual reports.** SDG&E should conduct surveys of project participants and monitor implementation of its program to determine the impact of the rebate program, the influence of the program on EV purchase decisions, the population of customers that participate (e.g. income levels, location, etc.), and other key data metrics. Of particular interest is how to better target rebates to populations where the subsidy drives EV adoption.

4) **TURN supports higher subsidies for small multi-unit dwellings (MuDs).** Unlike SF homes, MuDs do face barriers to access residential charging, which is key to EV adoption. SDG&E claims that its "Power Your Drive" program is focused on larger MuDs.[47] While TURN has not verified this claim nor is there a prohibition on small MuDs participating in SDG&E's currently approved Phase 1 program, TURN supports this aspect of SDG&E proposal due to the reason stated above. Accordingly, TURN recommends a $1,500 rebate for customers in small MUDs (2-5 units).

5) **The rebate level should substantially decrease or be limited to low-income and/or DAC customers in subsequent proposals depending on market conditions.** The EV and charging station market will develop substantially over the next five years. The same level of rebate provided today will not be necessary in the future. The Commission must monitor market developments in the sector to ensure programs are necessary and relevant, such that ratepayers provide subsidies only when necessary.

6) **Customers who receive a rebate must sign up for a time of use (TOU) rate per the recommendations of Bill Marcus in accompanying testimony.** Ratepayers can benefit when EVs shift load to off-peak times or participate in demand response programs. The Commission need not approve a costly program to achieve these benefits – by mandating customers who receive a rebate to sign up for a TOU rate, load-shifting benefits of the

[45] TURN believes a lower limit would also be justifiable to address free-ridership and equity concerns.
[46] For example see P.U. Code 740.12(a)(1)(C). For the purpose of this program TURN defines DACs as the top 25% most impacted communities statewide using the CalEnviroScreen 3.0 tool.
[47] SDG&E Chapter 4 Testimony, p. RS-5, line 9.

program can be realized, benefitting all ratepayers. Further, as residential customers are defaulted onto TOU rates they will have incentive to shift EV load to off-peak times.[48]

7) **SDG&E must verify that a participant has purchased or leased an EV after the program start date.**[49]

c. Summary of TURN Recommendations and Total Budget

In sum, TURN supports a L2 charging station residential rebate program[50] in SDG&E's territory at $700 per charger that incorporates an income cap, is limited to 35,000 EVs, ensures customer sign up for a TOU rate, incorporates higher subsidies for MuDs and low-income/DAC ratepayers (as well as a set aside to ensure funds are available) and provides data collection to understand the effect of the program. This results in the following total program budget for a five-year period:

Table 3. TURN Proposed Five Year Budget

	Rebate	Vehicles/ Participants	Budget	Notes
Low-Income Customers (CARE/FERA) / DAC	$1,500	5,000	$7,500,000	[1]
Small MuDs	$1,500	5,400	$8,100,000	[2]
General Program	$700	24,600	$17,220,000	[3]
Total		35,000	$32,820,000	

Notes:
(1) Assumed full installation cost of L2 charging station at SF home.
(2) SDG&E assumes 5,400 small Muds and a full cost cap, including EVSE, of $1,856 for small MuDs. TURN slightly adjusts this as it is likely inflated.
(3) 35,000 total vehicles less small Muds and low-income customers. See Section VII.

For low-income customers and MuDs, the amounts listed above must be "reserved" during the five-year program to ensure these customers have access to rebates when they purchase a

[48] TURN opposes the Commission's decision to move to default TOU rates. Should the Commission reverse its current position, TURN believes cost-effective programs such as a small financial incentive (e.g. $100) or targeted marketing to incent EV drivers to opt-in to an EV TOU rate may be worthwhile. This may be addressed if default TOU is not imposed by 2020.
[49] This is necessary to help screen out obvious free-riders. SMUD and Glendale Water and Power include even stricter recent purchase or lease eligibility limitations- see Appendix 2.
[50] The rebates should be expensed.

vehicle.[51] As discussed in greater detail in the testimony of Garrick Jones, a one-way balancing account for the total program amount is prudent and reasonable to ensure SDG&E does not overspend. Though TURN has not developed an annual budget, it may be reasonable to equally divide the line items above by five (the number of years for the program) and institute a two-way balancing account for each line item for the five-year period subject to the total budget cap.

VIII. Discussion of Utility Financial Incentives and TURN Alternate Recommendation for a Shareholder Incentive

TURN notes that its program consists solely of expenditures that will be "expensed" rather than capitalized, such that the utility does not earn any return on equity (profit) on the transaction. At the same time, the utility will not be at a "loss" as TURN has not proposed shareholder funding of the program. TURN's proposal is therefore a much lower cost than SDG&E's, and along with TURN's program design criteria, has a much greater chance of decreasing emissions and providing ratepayer benefits than SDG&E's proposed program. According to SDG&E's own statements, the utility should welcome a proposal that maximizes benefits and minimizes costs:

> In order to contribute to achieving the State's climate change and TE policies, SDG&E views its mission in this area as **maximizing GHG reductions and minimizing overall costs** while enabling the EV market and continuing to provide safe and reliable power at reasonable rates.[52]

TURN's proposal achieves SDG&E's stated mission. However, TURN recognizes that utilities are financially motivated by shareholder profits. TURN stresses that EV programs should be assessed at the "portfolio" level – on the other end of the spectrum from TURN's instant proposal which consists of non-capital expenses, SDG&E's existing "Power Your Drive" program is primarily capital expenditures that will increase the utilities' ratebase, including the stations themselves. SDG&E thus has sufficient financial incentive to participate in EV programs from this perspective.

However, should the Commission be convinced that SDG&E requires a financial incentive to administer its program, TURN believes a recent decision, and ongoing pilot, from the integrated distributed energy resource (iDER) proceeding provides a model that can be

[51] TURN notes that its budget proposal reserved 22.8% of the total budget for low-income and DAC customers, at a minimum, the Commission should require a reservation of 20% of program funds.
[52] Chapter 1, MMS-5, lines 8-10.

applicable in the instant proceeding. Namely, to incent utilities to procure third-party DERs which utilities would normally earn no rate of return on, the Decision found that,

> For purposes of the Incentive Pilot, we adopt a 4 percent pre-tax incentive, which will be applied to the annual payment for the distributed energy resources that are procured as an alternative to traditional distribution project investments.[53]

TURN recommends that if a shareholder incentive is found to be necessary by the Commission (we believe it is not), the Commission should similarly adopt a 4% pre-tax payment on *a portion of* the rebate expenditures spent by SDG&E in a given year.

IX. EV Adoption as SDG&E's Performance Accountability Metric to Share the Risk of SDG&E's Program Between Shareholders and Ratepayers

As TURN has stated in previous TE testimony, performance accountability metrics (PAMs) are required as part of SB 350 (P.U. Code Sec. 740.12(b)) and provide for a risk-sharing mechanism between utility shareholders and ratepayers. In this instance, TURN recommends a PAM only in the case where TURN's modifications for a simplified residential rebate program for around 35,000 vehicles is not adopted. If TURN's proposal is adopted the costs and risks to ratepayers are significantly reduced and accordingly TURN does not recommend any PAMs. If SDG&E's proposal or a proposal with similar high costs and risks to ratepayers is approved then PAMs are essential.

SDG&E claims that, due to its residential rebate program, an additional 59,322 EVs will be present in the utility territory by 2025 (see Table below). For the governor's goals to be met SDG&E also claims the utility will have 150,000 vehicles in its territory if the governor's 2025 goal of 1.5 million EVs is met.

[53] D. 16-12-036, p. 16.

Table 4. Assumed Number of EVs in SDG&E's Territory[54]

	Gross Program Impacts	Reference (Free Ridership) Impacts
PEV Adoption Trajectory	90,000 vehicles[1]	30,678 vehicles[1]
Retail Rates for PEV Charging	Residential Grid Integrated Rate	DR and EV-TOU-2 Tariffs
Charging Level	L2	L1

TURN recommends a PAM based on EV adoption in SDG&E's territory in 2025. SDG&E must meet the stated number of total vehicles in its territory, 90,000 by 2025[55] – if it does, the utility may keep the earned ROE over the period– if not, the utility should refund 50% of the ROE it earns over the course of the program back to ratepayers.

The estimate of EV adoption in SDG&E's territory is fairly conservative - even linear growth of EV sales in SDG&E's territory results in around 67,000 EVs by 2025 (see Appendix 3), and sales are likely to increase even further as costs decrease, the ZEV mandate becomes stricter, and more PEV models become available. Nevertheless, an accountability metric helps to ensure SDG&E shareholders share some of the risk of its program with ratepayers, and aligns SDG&E's stated benefits of its program with achieving these in reality. Where possible, TURN recommends similar accountability metrics be instituted for all TE programs to help align utility involvement in the TE sector with the goal of the programs, EV adoption and thoughtful stewardship of ratepayer funds.

[54] Table 11 on page 19 of the E3 Technical Appendix attached to SDG&E Chapter 8 Testimony. The footnote shown in the Table states "See Table 4 for breakdown of BEVs and PHEVs."
[55] This is conservative compared with the full 150,000 EVs projected if the Governor's goal is met in SDG&E's territory by 2025. SDG&E Chapter 4 Testimony, p. RS-7.

X. Appendix 1. Eric Borden Statement of Qualifications

I am presently an Energy Policy Analyst with The Utility Reform Network (TURN). I have provided testimony on behalf of TURN in prior utility applications for light-duty charging infrastructure. Prior to my position at TURN, I consulted for major utilities, an inter-governmental energy agency, and an energy services company. I have also conducted research and published reports on energy sector topics.

My Curriculum Vitae is detailed below.

EDUCATION

Master of Public Affairs, University of Texas at Austin, LBJ School of Public Affairs, 2010-2012
Specialization: Natural Resources and the Environment
Thesis: Electric Vehicles and Public Charging Infrastructure in the United States

B.S.B.A., Washington University in St. Louis, Olin School of Business, 2002-2006
Majors: Finance, Entrepreneurship
Minor: Psychology

PROFESSIONAL EXPERIENCE

Energy Policy Analyst **February 2015 – Present**
The Utility Reform Network (TURN)

- Prepare testimony, conduct analyses, and represent TURN in various proceedings at the California Public Utilities Commission (CPUC) related to electric vehicle charging infrastructure, utility procurement, rate design, demand response, and rate cases.

Senior Energy Analyst **June 2013 – January 2015**
4 Thought Energy LLC, Chicago, IL
4 Thought Energy specializes in designing, installing, and operating on-site natural gas combined heat and power (CHP) systems.

- Created financial models to forecast profits of potential site installations
- Researched state and regional public policy frameworks governing CHP
- Conducted analyses over electricity and natural gas price trends
- Developed presentations and marketing materials for investor meetings

Consultant **February 2014 – October 2014**
International Renewable Energy Agency (IRENA), Bonn, Germany

- Hired to write a report on worldwide electricity sector battery storage, including primary applications for renewable energy integration, market developments, trends, and case studies
- Conduct research, review literature, interview key industry players, develop case study material

- Travel to Bonn, company sites, and research facilities
- Written report will be sent to policymakers in 167 IRENA member countries

German Chancellor Fellow **July 2012 – November 2013**
Alexander von Humboldt Foundation, hosted by DIW Berlin, Berlin, Germany
Research Project Title**:** "Energy Storage Technology and the Large-Scale Integration of Renewable Energy"

- Investigated the role of energy storage in Germany for renewable integration through literature review, interviews with German energy experts, and analysis comparing public policy support in Germany and the U.S. for storage technologies
- Invited to hold a presentation at the International Renewable Energy Storage Conference and Exhibition (IRES 2013)
- Discussions with German businesses and governmental ministries; special visit to European Union and NATO headquarters in Brussels
- Attended energy conferences and workshops in Berlin

Senior Consultant **June 2008-July 2009**
The Kenrich Group LLC, Chicago, IL

- Consulted for multiple energy utilities in legal disputes with the Department of Energy (DOE)
- Performed detailed research and quantitative/qualitative analysis to analyze financial impact related to construction of coal-fired power plants, liquid natural gas facilities, and other types of construction
- Contributed to final reports and presentations submitted in arbitration, settlement, or court of law presenting KRG's expert opinion

Associate, Intellectual Property **July 2006 – May 2008**
Charles River Associates, Chicago, IL

- Developed complex financial models including discounted cash flow, lost profit, and regression analyses to support expert reports within the context of intellectual property and financial litigation in multiple industries
- Created valuation models and supporting materials to value business entities
- Contributed to final reports and presentations submitted in arbitration, settlement, or court of law presenting CRA's expert opinion

PUBLICATIONS

"Clean Energy Technology and Public Policy," LBJ Journal of Public Affairs, editor and contributor, 2011.
"Electric Vehicles and Public Charging Infrastructure: Impediments and Opportunities for Success in the United States," The University of Texas at Austin, 2012.
"Policy efforts for the development of storage technologies in the U.S. and Germany," DIW Discussion Paper, 2013.

"Expert Views on the Role of Energy Storage for the German Energiewende," DIW Berlin and BMU "Stores" project, online here, 2014.
"Germany's Energiewende," chapter 15 in Global Sustainable Communities Design Handbook, ed. Dr. Woodrow Clark, Elsevier Press, 2014.
"Battery Storage for Renewables: Market Status and Technology Outlook," International Renewable Energy Agency (IRENA), co-author with Ruud Kempener, 2015.

XI. Appendix 2 – Summary of Existing CCA and Municipal Utility Sponsored Residential Rebate Programs in California

	Sonoma Clean Power[56]	**Los Angeles Department of Water & Power**[57]	**Sacramento Municipal Utility District**[58]	**Glendale Water & Power**
Equipment Incentives	Customers receive an eligible[59] level 2 charging station for free - Customers responsible for all installation costs, sales tax and a $50 handling fee	Customers can receive a rebate of up to $500 toward their out-of-pocket expenses for an EV charger. -The rebate does not cover the cost of installation.	Customers can choose either a L2 EV charger or a $599 incentive to charge free for two years (more than covers the average cost to charge PEV vehicle for two years). - Charger option does not include installation and permit costs.	- Customers can receive up to $500 for installing a new L2 charging station. - The rebate amount is for equipment and/or installation only and cannot exceed the lesser of the purchase price or $500.
Charging Rates Incentives	After the charging station is connected to JuiceNet, (cloud-based smart grid network), customers can receive a $150 rebate in JuicePoints convertible to	Customers who choose to install an optional dedicated time-of-use (TOU) meter will qualify for the EV discount of 2.5 cents per kilowatt-hour (kWh), plus receive an additional $250 bonus.	See above, customers can choose either the charging credit or charger	None

[56] Program limited to 1,000 charging stations, Sonoma Clean Power, Drive Clean, Save Thousands, https://sonomacleanpower.org/drive-evergreen-charge-up/

[57] The $21.5 million rebate program will be in effect from March 1, 2016 through June 30, 2018, or until funds are exhausted, whichever comes first. EV Charge Rebate Program, https://www.ladwp.com/ladwp/faces/wcnav_externalId/r-sm-rp-ev?_adf.ctrl-state=1as8eld7j_4&_afrLoop=872821546065179.

[58] SMUD Drive Electric Incentive, https://www.smud.org/en/residential/environment/plug-in-electric-vehicles/drive-electric-incentive-application.htm.

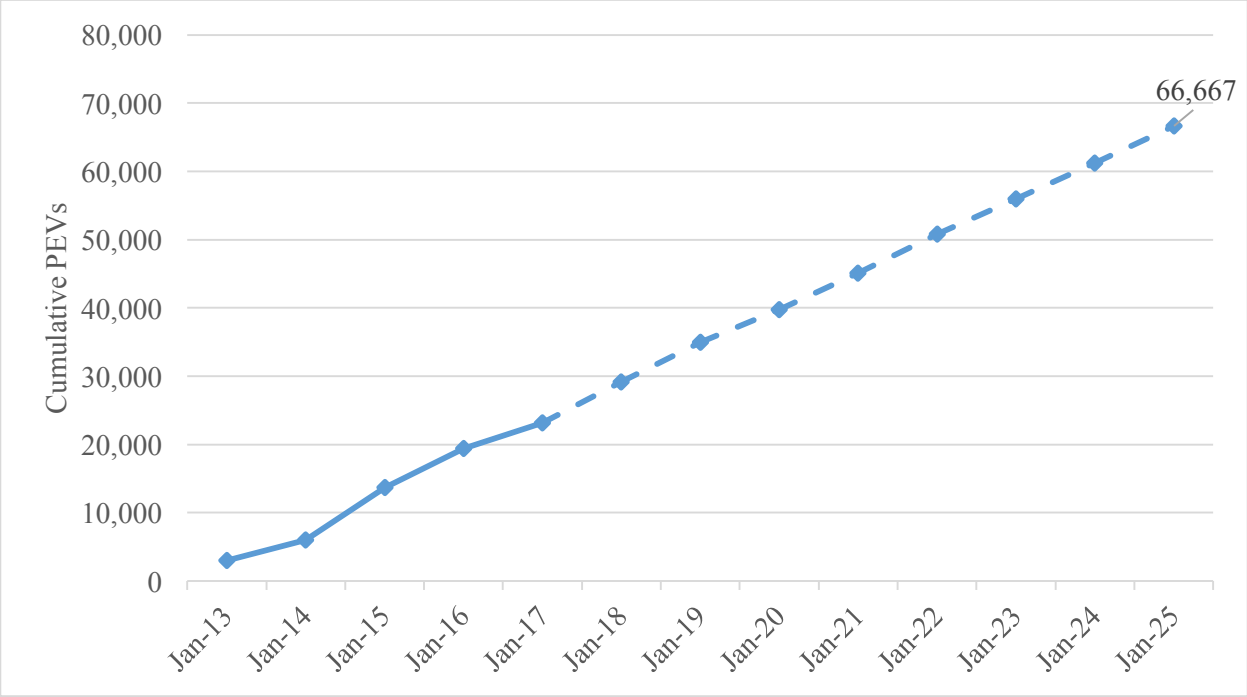
[59] Eligible L2 Stations are: - JuiceBox Pro 40 - 40-amp, 10kW; - Clipper Creek HCS-40PJuiceNet® Edition - 32-amp, 7 kW; AeroVironment EVSE-RS JuiceNet® Edition.

	cash via Paypal.	*No additional incentive to cover the additional cost associated with installing a second meter		
Eligibility Require-ments	- To receive $150 charging rate rebate customers must participate in SCP's CleanCharge Program: "When demand on the grid is high, your charging station automatically adjusts chargi ng levels until the grid pressure is relieved … ."	- New or used EV purchased on or after October 1, 2015. - Application must be submitted within six months of EV charger purchase and postmarked no later than June 30, 2018. -The qualifying L 2 EV charger must be: • New or unused, purchased on or after October 1, 2015. • Certified by Underwriters Laboratories Inc. (UL Listed), ETL Listed or approved by the Los Angeles Department of Building and Safety (LADBS) Test Lab. • Wall mounted and installed by a licensed contractor.	- Limited to new, first time purchase/lease, PEVs, purchased/ leased within 180 days of incentive application postmark date are eligible.	- Applications must be submitted no later than four months from the date of purchase. - The rebate is for a L2 EV charger and must utilize the SAE J1772 charging plug or Tesla's High Power Wall Connector and be UL or equivalent listed. - Charger must be new and have a purchase and installation date of July 1, 2016 or later. - The charger must be hardwired to the electrical service and have a final City of Glendale Building and Safety permit.
TOU Rate or DR Enrollment	Required to receive $150 charging rate rebate	Optional	Optional	No

XII. Appendix 3 – CONFIDENTIAL: TURN Forecast of Vehicles in SDG&E's Territory

Using recorded sales from IHS/Polk from January 2013 through January 2017,[60] TURN projects the number of EVs that will be in SDG&E's territory assuming a linear growth "trend" analysis.[61] TURN believes this is likely conservative, or low, because rapidly decreasing battery costs, increasing number of models on the market, and ZEV mandate regulation means potentially larger growth rates.[62] Nevertheless, this linear growth is displayed graphically below, resulting in 66,667 vehicles in 2025.

Figure 4. Projection of Vehicles in SDG&E's Territory in 2025



[60] DR TURN-02, question 13f, confidential attachment "SDGE TURN DR Car Count Data."
[61] The "trend" function in Excel fits a straight line (using the method of least squares) to the arrays known dependent and independent variables. See Microsoft, https://support.office.com/en-us/article/TREND-function-e2f135f0-8827-4096-9873-9a7cf7b51ef1.
[62] PG&E, Electric Program Investment Charge (EPIC), *Develop a Tool to Map the Preferred Locations for DC Fast Charging,* p. 63.