Via email
March 22, 2017

California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: California Air Resources Board Staff Questions for Utilities Regarding Medium- and Heavy-Duty Transportation Electrification

The California Electric Transportation Coalition (CalETC) appreciates the opportunity to provide responses to questions from California Air Resources Board (CARB) staff regarding transportation electrification, specifically relating to medium- and heavy-duty vehicle electrification, as listed in staff's email dated February 27, 2017 (attached).

CalETC is a non-profit association promoting economic growth, clean air, fuel diversity and energy independence, and combating climate change through the use of electric transportation. CalETC is committed to the successful introduction and large-scale deployment of all forms of electric transportation including plug-in electric vehicles, transit buses, port electrification, off-road electric vehicles and equipment, and rail. Our board of directors includes: Los Angeles Department of Water and Power, Pacific Gas and Electric, Sacramento Municipal Utility District, San Diego Gas and Electric, Southern California Edison, and the Southern California Public Power Authority. Our membership also includes major automakers, manufacturers of zero-emission trucks and buses, and other industry leaders supporting transportation electrification.

Although California is leading the nation in EV adoption, our state still has a long way to go to reach the goals in the Governor's Executive Order B-16-2012: 1.5 million zero-emission vehicles on California roads by 2025 and zero-emission vehicle infrastructure able to support 1 million vehicles by 2020. In addition, the state must implement SB 1275 (De León) [Chapter 530, Statutes of 2014] and SB 1204 (Lara) [Chapter 524, Statutes of 2014], which set targets for the deployment of zero-emission vehicles, access to these vehicles by disadvantaged and low- and moderate-income communities, and deployment of zero-emission medium- and heavy-duty vehicle technologies.

Battery-electric transit buses are commercially available today and there is broad consensus on their proven reliability.[1] Electric transit buses also provide a great opportunity for cleaning up the air and directly benefiting those in disadvantaged communities, and educating Californians about the benefits of zero-emission technology. Even with a higher upfront purchase cost as compared to a compressed natural gas (CNG) bus, an electric bus provides an opportunity to save an operator thousands of dollars on fuel and maintenance costs during its lifetime.[2] In addition, electric buses are up to four times more fuel efficient than diesel and CNG buses, which provides additional cost savings.[3]

[1] See, e.g., Electric Bus Analysis for New York City Transit, Columbia University; Foothill Transit Battery Electric Bus Demonstration Results, National Renewable Energy Laboratory.
[2] Delivering Opportunity: How Electric Buses and Trucks Can Create Jobs and Improve Public Health in California, Union of Concerned Scientists and Greenlining.
[3] Zero Emission Bus Benefits, U.S. Department of Transportation.

Grid Capabilities and Benefits

One concern that has been voiced in relation to electrification of the transportation sector is that the current electrical grid cannot handle increasing transportation electrification. Studies have shown that transportation electrification provides grid benefits for California and California's power grid can handle the additional load from increased transportation electrification.[4] Electric vehicles provide benefits to the grid because electric vehicles, when managed correctly, can shift load to off-peak periods and utilize generation, creating a more efficient grid and system load factor.

As an illustrative example, the peak load measured by the California Independent System Operator from 1998 through 2016 has been between 41,000 to 51,000 MW.[5] If 10,000 transit buses[6] in California were to charge at the same time, on peak (which is very unlikely), at 100 kW per bus, that would equal 1,000MW of load from transit. That's 2-2.4% of the statewide peak load. If transit-bus charging were to occur mostly off-peak (which is more likely), this load could provide a benefit to the grid, flattening out the overall load curve. Even if considering a much larger population of medium-duty vehicles, which would likely charge with lower power requirements, the additional load is still a fraction of peak system capacity.

At a local level, upgrades to distribution infrastructure may be needed as electric-vehicle load grows, but this is common utility work and would be done incrementally as load grows locally. Some of these costs are spread among rates. Assuming 10-15 buses equate to approximately 1 MW of demand, only a fraction of fleet operators would eventually require the 10-20 MW load that larger industrial customers require. In addition, customer-sited battery storage could be installed to lower peak demand and reduce the need for some upgrades.

Generally, flexible electric-vehicle charging, especially off-peak, can help balance the overall load on the grid, allowing utilities to operate assets more efficiently, and reduce the need to ramp generation resources quickly in response to large shifts in the demand curve. Longer term, increased kilowatt-hour (kWh) throughput on the grid can put downward pressure on rates for all customers, as fixed costs are spread across greater kWh units sold.

SB 350 Utility Transportation-Electrification Proposals

Senate Bill 350 (De León, 2015) directs the electric industry to "accelerate widespread transportation electrification to reduce dependence on petroleum, meet air quality standards, achieve the goals set forth in the Charge Ahead California Initiative, and reduce emissions of greenhouse gases to 40 percent below 1990 levels by 2030 and to 80 percent below 1990 levels by 2050." The three largest investor-owned utilities (IOUs) recently submitted proposals to the California Public Utilities Commission, detailing potential projects, including ones that focused on medium- and heavy-duty transportation electrification to support the goals of SB 350. The publicly-owned utilities (POUs) will propose programs in support of SB 350 as well,

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[4] See California Transportation Electrification Assessment, Phase 1; Phase 2; Phase 3:A, CalETC; see also, e.g., Transportation Electrification: Utility Fleets Leading the Charge, Edison Electric Institute.
[5] California ISO Peak Load History 1998 through 2016.
[6] There are approximately 9,908 transit buses in California. (CARB Staff Workshop Presentation.)

and these programs will be considered within the context of the POUs' Integrated Resource Plans, during the California Energy Commission's Integrated Energy Policy Report proceeding.

The IOU proposals are summarized below:

Southern California Edison (SCE): SCE is proposing a 1) Medium- and Heavy-Duty Vehicle Charging Infrastructure Project, 2) a new commercial EV rate structure and 3) three small pilot projects, summarized below. To support these segments, SCE is focusing on lowering the customers' upfront cost to charge (including infrastructure), helping to standardize charging technology, and proposing new rate designs to lower customers' ongoing cost to charge.

In January 2017, SCE published its vision on transportation electrification, which includes medium- and heavy-duty vehicle and non-road equipment electrification.[7] See below for an explanation on these proposals or see SCE's Testimony for Approval of its 2017 Electrification Proposals.[8]

1. Proposed Medium-and Heavy-Duty Vehicle Charging Infrastructure Program

The Medium- and Heavy-Duty Vehicle Charging Infrastructure Program follows the model developed for the Charge Ready pilot program, where SCE deploys, owns, and maintains the electric infrastructure needed to serve charging equipment for in-scope vehicles (up to and including the make-ready stubs). Through this program, SCE plans to install a separately-metered circuit together with utility transformer upgrades, service drop, panel, trenching, wiring, conduit, and step-down transformer, as needed. SCE also plans to provide a rebate to cover the costs of charging equipment that meets SCE's requirements and its installation. SCE also plans to follow the base cost methodology developed for the Charge Ready Pilot Program to set the rebate amounts. Participating customers will be responsible for procuring charging station equipment and installation (and paying any costs in excess of the rebate amount) and for maintaining the equipment in working order for the duration of the program. The program supports the acceleration of widespread TE for goods movement and mass transit by mitigating the cost and complexity of deploying charging equipment for medium- and heavy-duty vehicles for participating customers. Providing the charging infrastructure reduces two major barriers to TE adoption in non-light-duty market segments—the burden of upfront costs, and the complexity of installing charging infrastructure. Overcoming these barriers incents adoption of TE technologies, eliminates the use of fossil fuels, and decreases emissions of air pollutants that directly affect the communities located along goods movement and mass transit routes. By covering the cost of electrical infrastructure and providing a rebate on the charging equipment and its installation for participating customers, the program aims to remove a significant barrier to widespread deployment of charging equipment in SCE's service territory.

[7] http://www.edison.com/home/our-perspective.html
[8] http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/F5582C9D0A9A3659882580AE007F74A4/$FILE/A1701XXX-SCE%20TE%20Testimony%201-20-17.pdf

2. Proposed Electric Vehicle Rate Structure

The new commercial EV rate structure is designed to stimulate EV adoption and benefit the grid by using up-to-date time-of-use periods. In addition, the three proposed rates will have five-year introductory period during which SCE will not assess facility related demand charges; rather, a customer's bill will consist primarily of volumetric energy charges.

The proposed rates are:

- designed specifically for EVs in each commercial/industrial rate classes;
- include super off-peak daytime time-of-use periods added to help integrate renewables and encourage low-cost charging;
- a long-term solution to the demand charge barrier through a 10-year introductory period:
    - Yr1 – Yr5: facilities related demand charges are eliminated with super-off-peak daytime electricity price as low as 8 cents/kWh;
    - Yr6 – Yr10: facilities related demand charges are phased in incrementally over this five year period with super-off-peak daytime electricity price as low as 7 cents/kWh;
    - Yr11+: sustained facilities related demand charges are lower than otherwise applicable commercial rates of today with super-off-peak daytime electricity price as low as 6 cents/kWh.

The demand charge forgiveness feature associated with SCE's current EV rates will not be extended to customers newly taking service on the proposed EV rates. The rates shown above are designed on the January 1, 2017 revenue requirement and are subject to change during regularly scheduled rate changes and General Rate Cases (GRCs). The Excel file, "*Comparison of SCE current and proposed EV Rates*," explains the proposed rates in detail.

3. Priority Review Pilot Proposals

SCE proposes three one year programs:

a. The Electric Transit Bus Make-Ready Program will deploy make-ready infrastructure to serve in-depot and on-route charging equipment for electric commuter buses operating in SCE's service territory. SCE will also provide a rebate to participating customers to cover the cost of the charging equipment and its installation. SCE estimates that the program will cost $4M to complete, including deployment costs to serve up to 20 charge ports and customer rebates to offset the costs of qualified charging equipment and installation.

b. The Rubber Tire Gantry (RTG) Crane Project will deploy make-ready infrastructure to serve nine cranes at SSA Marine Terminal J at the POLB, currently fueled by diesel engines. SCE proposes to provide the electrical infrastructure to support the electric cranes and the POLB will secure funding from other sources (e.g., SCAQMD and the CEC) for the conversion costs of switching from diesel to electric power. RTG cranes are the second largest source of NOx emissions at the terminal and the technology could have a significant impact on emissions if adopted by other port operators in California. Traditional RTG cranes have electric lift and propulsion drives, with electric energy

generated by on-board diesel reciprocating engines. SCE's proposed project will support a customer pilot for a grid-connected electric conversion system that removes the diesel engine and adds power transformation and electronics fed by a motorized electric cable mechanism. The cable connects to a stationary grid connect mechanism which allows the RTG crane to disconnect from the cable when it has to transfer to the maintenance shop. The grid-connect mechanism ties to a high voltage utility connection (4,000 volts). The total estimated costs for this project are $3 million for the deployment of electric infrastructure.

c. The Yard Tractor Project will deploy make-ready infrastructure to serve the International Transportation Service (ITS) Terminal's fleet of yard tractors, currently fueled by diesel engines.

(See SCE Testimony, pp. 42-51.)

San Diego Gas & Electric (SDG&E): SDG&E's transportation electrification vision for its SB 350 projects was to maximize GHG reductions and minimize costs while continuing to provide safe and reliable power at reasonable rates. Each project was based on EV charging that is reliable, safe, widespread, affordable and easily accessible by providing a grid-optimization solution through enabling technology. Overall, SDG&E put forth a diverse proposal aimed to meet the needs of SDG&E's customer base. The proposal included six priority review projects and one standard review program. Of the six priority review projects, four will impact medium- and heavy-duty transportation electrification.

1. Airport Ground Support Equipment
    a. The Airport Ground Support Equipment (GSE) project proposes that SDG&E install charging ports, metering equipment and data loggers in partnership with the San Diego International Airport (SDIA) and its tenants.
    b. Key Learnings: Collect data from load research meters and charging equipment to better understand the impact of electric GSE adoption and the interaction of solar and EV charging behaviors, as well as educate stakeholders interested in electrifying GSE.
    c. Expected Outcomes: Increased electrification of GSE resulting in lifetime GHG reduction benefits of 25,130 $MTCO_2$. A load management plan for SDIA and its tenants that will educate them on mitigating grid impacts while fully utilizing the onsite solar generation facility.

2. Medium Duty/Heavy Duty (MD/H) and Forklift Port Electrification
    a. In collaboration with the San Diego Unified Port District (Port District) and the San Diego Port Tenants Association, the MD/HD and Forklift Port Electrification project will provide support to the MD/HD electric vehicles recently awarded through CEC and CARB grant funding and additional vehicles in this market segment at the Port District.[9] SDG&E proposes to install charging infrastructure, load research meters, and data loggers to collect consumption and operational data of this unique market segment of vehicles. Expedited approval of this

[9] Grants: CEC PON-14-605 MD and HD Advanced Vehicle Technology Demonstration, CARB AQIP-GGRF Zero Emission Drayage Truck Demonstration, CEC GFO-15-604 Freight Transportation Projects at California Seaports.

project is critical, as the first MD/HD vehicle awarded from this grant funding is expected to be delivered during the first half of 2017. Port tenant partners include Terminalift, LLC, CEMEX and Dole Food Company.

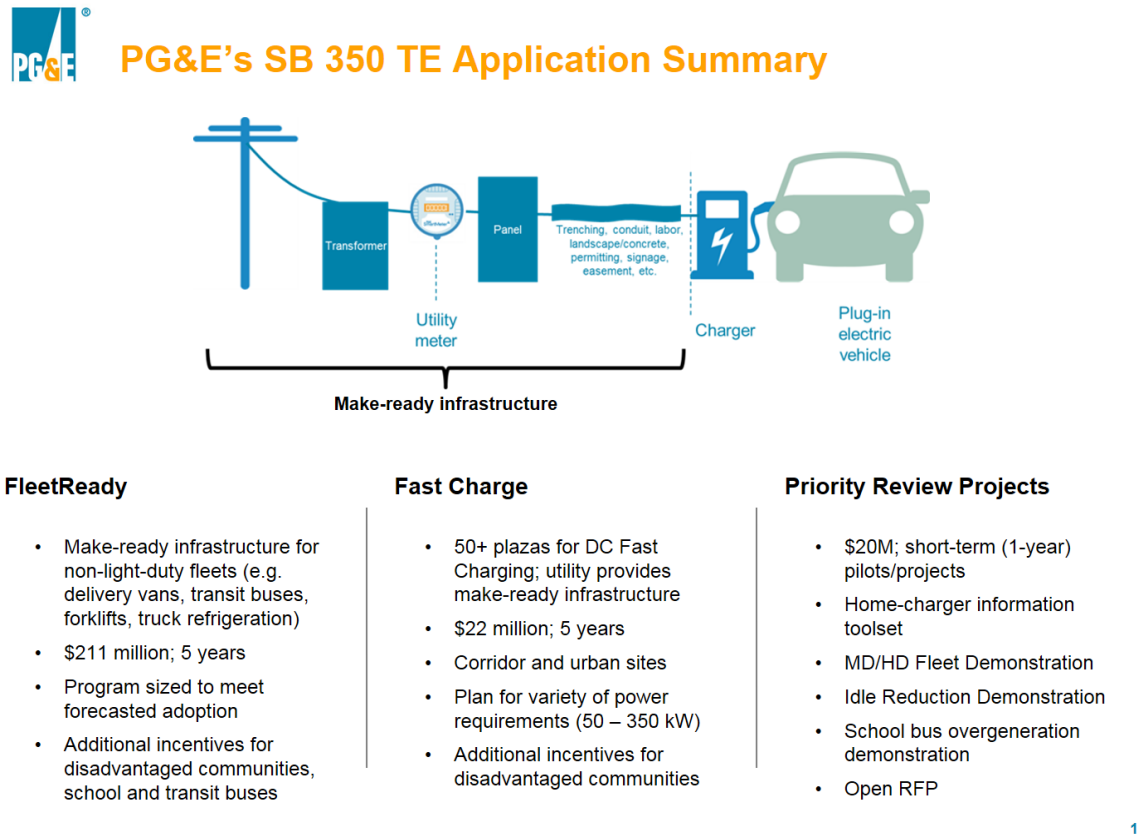
b. Key Learnings: Operational data will be collected and analyzed to better understand the operational needs and feasibility of modifying charging patterns in the MD/HD and off road markets for various commercial industries. This data will help identify the optimal number of chargers per vehicle and inform future grid integrated rate design. These learnings will maximize asset utilization while minimizing installation costs and also help enable and innovate technology for this market segment.
c. Expected Outcomes: Accumulation of an operational data set that will facilitate development of an optimized grid integrated solution in this nascent market. This project is estimated to provide lifetime GHG reduction benefits of 4,102 $MTCO_2$, resulting in air quality benefits for DACS and surrounding areas.

3. Fleet Delivery Services
    a. The Fleet Delivery Services project proposes to accelerate the electrification of regional delivery vehicles by providing infrastructure upgrades and utility owned charging facilities at approximately six locations for up to 90 electric delivery vehicles. SDG&E has already established a partnership with United Parcel Service (UPS). Specifically, UPS will utilize the infrastructure to electrify a portion of their fleet in the San Diego region and will provide access to three locations for SDG&E to install L2 and DCFC charging infrastructure to support electric delivery vehicles.
    b. Key Learnings: Gather data on usage patterns and operational needs that are specific to fleet delivery vehicles. The data will be used to analyze the usage patterns and effectiveness of DCFC and L2 chargers. The project will provide data to inform a fleet delivery total cost of ownership analysis. The project will also test grid integrated hourly pricing in the commercial domain. There is strong potential to scale up adoption statewide, nationally and potentially worldwide.
    c. Expected Outcomes: Annual accumulation of data to better understand the operational needs of this market segment and its capabilities. This project is estimated to provide lifetime GHG reduction benefits of 14,019 $MTCO_2$, resulting in air quality benefits for DACs and surrounding areas.
    d. Rates: Commercial Grid Integration Rate (GIR): applicable to participants on SDG&E's proposed Fleet Delivery Services project

4. Green Taxi/Shuttle/Rideshare
    a. The Green Taxi/Shuttle/Rideshare project proposes to partner with Taxi Companies (TC), Transportation Network Companies (TNC), and other transportation services such as shuttle bus companies to provide charging infrastructure along with fuel and vehicle incentives to stimulate this market. The Shuttle would be considered medium duty.

b. Key Learnings: This project will help inform SDG&E and vehicle operators to understand the total cost of ownership for each of these market segments, analyze the different charging patterns between DCFC and L2 chargers, and help inform the optimal number of chargers per vehicle. SDG&E will also examine the impact of providing incentives to use a public charging grid integrated rate.
c. Expected Outcomes: Increased transportation electrification in the taxi, rideshare and shuttle markets which will jump-start the widespread adoption of EV in future years This project is estimated to provide lifetime GHG reduction benefits of 12,032 $MTCO_{2,}$ resulting in air quality benefits for DACs and surrounding areas.
d. Rate: Public Charging GIR: applicable to participants on SDG&E's proposed Electrify Local Highways and Green Taxi/Shuttle/Rideshare projects.

Pacific Gas & Electric (PG&E): The info-graphic below overviews PG&E's three proposal components, with the majority of the proposal focused on make-ready infrastructure for medium- and heavy-duty electric vehicles. Make-ready infrastructure includes all infrastructure and equipment up to, but not including, the charging station. This program aims to address the barriers of upfront costs and complexity of installing charging infrastructure by rate-basing costs of all make-ready infrastructure design and installation. PG&E is also proposing a smaller make-ready infrastructure program for public DC fast charging infrastructure. This could potentially benefit more distributed fleets that need to rely on public infrastructure for their duty cycles.



Current Electricity Rates Available for Medium- and Heavy-Duty Electric Vehicles

SCE: Regarding SCE's existing rates, please see the attachment "Comparison of SCE current and proposed EV Rates.xlsx." In addition, a new rate called EV-6 is expected to go into effect June 1, 2017. A salient feature of the current EV-3, EV-4 and EV-6 rates is that there are no demand charges for EV accounts at addresses with associated facilities (e.g. office buildings, factories, warehouses) unless the EV demand is higher than that of the associated facility. In 2017, 4,500 distribution circuits will be posted online, which will help fleets and project developers in planning projects.

SDG&E: SDG&E's current commercial rates are not specific to medium- and heavy-duty electric vehicles. Commercial transportation is currently supported by SDG&E's commercial electric tariffs. All of these tariffs have time-of-use pricing and in some cases demand charges, service fees and/or critical peak pricing. Customers preparing to electrify their fleets can speak with an SDG&E account executive to identify an applicable rate and how to receive the lowest cost of operations. SDG&E proposed three new grid-integrated rates within its SB 350 proposal. Grid-integrated rates will help align EV charging load with grid conditions.

PG&E: PG&E does not currently have commercial rate schedules specific to electric vehicles. Commercial electric-vehicle charging would occur on the applicable commercial tariff, which is based on overall maximum demand and volumetric usage. CARB's rate calculator for buses does a good job at estimating potential costs for bus (or other vehicle) charging under different scenarios. PG&E has proposed updates to its commercial rates as part of its regular General Rate Case. If approved, these would likely go into effect in late 2018. The changes proposed alter demand charges (in some cases lower, in some higher), and shift the peak time-of-use periods to later in the evening instead of mid-afternoon.

Sacramento Municipal Utility District (SMUD): Entities operating electric vehicles in their fleet are eligible to use SMUD's EV Commercial rate, which is $0.23 /kWh without a demand charge.

Los Angeles Department of Water and Power (LADWP): LADWP offers a $0.025 per kilowatt-hour discount for electricity used to charge EVs during off-peak times.[10] LADWP also runs an EV charger-rebate program, "Charge Up L.A.!" to encourage the installation of EV charging stations at residential and commercial locations.[11] In addition to the EV discount for off-peak energy, LADWP's large industrial rate (A-3) does not have a monthly demand charge for off-peak usage. Off peak is 14 hours per weekday and 24 hours on weekends.

Other Publicly-Owned Utilities: Many of the other, smaller, POUs in California offer beneficial charging rates for their customers, which could be utilized by fleets adopting medium- and heavy-duty EVs. Similarly, some POUs offer rebates and incentives for EV chargers that are typically differentiated between residential and commercial applications, as well as level 2 versus DC fast chargers.

[10] More information available here: https://www.ladwp.com/ladwp/faces/ladwp/residential/r-gogreen/r-gg-driveelectric/r-gg-de-evncentives?_adf.ctrl-state=myvhjf77c_4&_afrLoop=688486529771370

[11] More information available here: https://www.ladwp.com/ladwp/faces/ladwp/commercial/c-savemoney/c-sm-rebatesandprograms/c-sm-rp-ev?_adf.ctrl-state=myvhjf77c_4&_afrLoop=688578277722955

Charging Infrastructure Installation Cost

IOU Cost Estimates

SCE: SCE's cost estimates, below, for the proposed Medium- and Heavy-Duty Charging Infrastructure Program relies on the TE adoption forecast. (See Appendix D of SCE's testimony[12] for details). Actual costs will vary based on customer demand and commitments to adopt the covered technologies. (See Appendix C of SCE's testimony[13] for covered technologies.) Thus, the costs below are proposed to be capped at $553.82 million (capital and expense). In addition, the amounts will depend on the mix of different electric vehicle technologies adopted. (The mix that SCE assumed is shown in table 2 in Appendix D of SCE's testimony.[14]) The capital cost of the proposed Medium- and Heavy-Duty Charging Infrastructure Program is $522 million is approximately 42% utility "obligation to serve" cost, 45% beyond-the-meter (customer site) costs and 13% is charging station rebates based on the assumed mix of technologies.

Customer-Side Costs: SCE developed cost estimates in consultation with internal subject matter experts, external electrical contractors, and using published costs from Electric Power Research Institute (EPRI) to estimate the customer-side costs. These costs include customer planning, engineering, construction (including trenching) labor, and materials. Since each customer site is unique with many factors influencing costs, SCE includes a 35 percent contingency in its cost estimates.

Rebates: The proposed rebate amounts cover 100% of the base cost of the charging equipment and its installation, and the base cost will be determined at a later date through a process (e.g., requests for information). Charging equipment in each of these vehicle segments is at different stages of market maturity and standardization. SCE is coordinating with EPRI to evaluate vendors and charging systems. Other Capitalized Costs - Other capitalized costs include easement related expenses, charging equipment testing to verify that charging stations meet requirements of the program, and all capitalized labor.[15]

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[12] http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/F5582C9D0A9A3659882580AE007F74A4/$FILE/A1701XXX-SCE%20TE%20Testimony%201-20-17.pdf

[13] *Ibid.*

[14] *Ibid.*

[15] Other costs include:
Labor: The forecast labor associated with the program will ramp up to roughly 7.2 new full-time equivalent employees or contractors in the Business Customer and CP&S divisions. An additional 21.7 new full-time equivalent employees or contractors need to be added to the Transportation Electrification Project Management organization to facilitate the design and construction of each participating customer site.
Other Non-labor: Other non-labor operation and maintenance expenses include the development of back-office software to manage the program, preparation of quarterly status reports, and maintenance of the electric infrastructure deployed through the program on the customer-side of the meter.

Table III-3
Annual Program Costs
(Thousands, 2016 $, not loaded)

O&M	Yr1	Yr2	Yr3	Yr4	Yr5	Total
Program Labor	884	816	850	986	1,062	4,598
Other non-Labor	4,334	2,694	2,842	3,431	4,227	17,527
Total O&M	**5,218**	**3,510**	**3,692**	**4,417**	**5,289**	**22,125**
Capital	Yr1	Yr2	Yr3	Yr4	Yr5	Total
Utility Costs	31,094	36,148	39,973	48,882	60,974	217,071
Site costs	34,372	40,087	43,226	52,650	65,414	235,749
Capitalized Labor	1,796	1,656	1,725	2,001	2,156	9,334
Rebate	10,815	12,410	12,726	15,161	18,432	69,544
Total Capital	**78,076**	**90,301**	**97,650**	**118,695**	**146,976**	**531,698**
						$ 553,823

SDG&E: SDG&E's charging infrastructure installation cost estimate for the proposed medium- and heavy-duty priority review projects is project specific, and depends on the type and quantity of charging equipment being proposed, as well as the length and capacity of the utility infrastructure required. The largest variable is the trench length and associated conduit and wire from the transformer to the meter pedestal and between the meter pedestal to the electric vehicle supply equipment (EVSE). The estimated costs for the priority review projects are outlined in Appendix A – Detailed Project Costs, in Chapter 3, of SDG&E's SB 350 proposal.[16]

PG&E: Generally, for utility-side upgrade costs, PG&E takes project inputs from the customer and estimates what the job will cost for any utility work. Then PG&E determines an allowance, based on expected utilization. If the allowance is greater than the project cost, the customer does not pay for utility upgrades. If the allowance is lower than the project cost, the customer is responsible for the difference. The actual site costs for non-light-duty electric-vehicle charging installations can vary widely due to the type, number of vehicles and charger technologies, as well as specific site conditions (distance from distribution service, transformer capacity, etc.)

For PG&E's SB 350 application, the following assumptions and utility-side cost numbers were used:

- For medium-duty and smaller buses: 12 chargers per site (mix of 7-19kW) serving 1 vehicle each. Utility-side costs modeled resulted in a weighted average around $76,000 per site; with a fairly wide range around that.
- For transit and heavy-duty trucks: 12 chargers per site (100kW) serving 2 vehicles each (24 vehicles per site). Average utility site costs for these were around $190,000.
- In both cases, PG&E assumes about 450 feet of trenching total for utility side work.

[16] http://www.sdge.com/regulatory-filing/20491/application-sdge-authority-implement-priority-review-and-standard-review

Example Customer Costs

The cost to a transit agency to install charging infrastructure for electric buses can vary widely. CalETC reached out to three California transit agencies currently operating electric transit buses to get example customer-side costs for installing transit-bus charging infrastructure. So far, we have received information from Foothill Transit, but we will update CARB staff with additional information we receive.

Foothill Transit – Azusa Charging Stations

Foothill Transit recently installed two new 500-kW fast chargers for its expanding electric-bus fleet at the Azusa station. Andrew Papson, Electric Bus Program Manager for Foothill Transit, provided the following information regarding these charging stations. The costs to install the fast chargers are as follows:

- Site work / underground infrastructure: $217,000
    - This work was done by their general contractor for the site.
- Installation of charge poles / charge heads: $115,200
    - Work done by Proterra contractors.
- Electric infrastructure costs: $8,600
    - Work done by the utility, Azusa Light and Water.

The station is located at a new park and ride facility, and Foothill Transit installed the station while constructing the park and ride. Because they put in the charging infrastructure during construction, they were able to save money. For example, they put in the underground work before the concrete pad was poured, so there was no need to trench through existing concrete.

However, the electric costs were higher than they would have been for another site because the work performed was for the entire facility (fast chargers plus park & ride).

In addition, while the costs of installing the charge posts (Proterra's component) is probably somewhat stable from site to site, the costs of site work will always vary greatly. Variables include where the chargers are located in relation to the grid equipment, what improvements need to be done on the site, how much materials are needed, how much labor is required, and other factors. There is also a shifting balance of what portion of work is paid by the fleet and what portion of work is paid by the utility, as depicted in the descriptions of the SB 350 proposals above.

Thank you for the opportunity to provide this information. Please do not hesitate to contact me should you have any questions.

Sincerely,

Hannah Goldsmith, Project Manager
California Electric Transportation Coalition

Attachments:

1. CARB staff email: "CARB Questions for Utilities on Electrification," February 27, 2017
2. SCE Document: "Comparison of SCE current and proposed EV Rates"