

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO**

Docket No. 17I-0692E

RESPONSE OF THE ALLIANCE OF AUTOMOBILE MANUFACTURERS, BOULDER COUNTY, BYD NORTH AMERICA, CHARGEPOINT, CITY AND COUNTY OF DENVER, EMOTORWERKS, EVBOX, EVGO, GENERAL MOTORS, GREENLOTS, NATIONAL CAR CHARGING, THE NATURAL RESOURCES DEFENSE COUNCIL, PROTERRA, REGIONAL TRANSPORTATION DISTRICT, ROCKY MOUNTAIN INSTITUTE, SIERRA CLUB, SIEMENS, SOUTHWEST ENERGY EFFICIENCY PROJECT, VOTE SOLAR, AND WESTERN RESOURCE ADVOCATES TO QUESTIONS POSED BY STAFF TO PARTICIPANTS IN THE COLORADO PUBLIC UTILITIES COMMISSION ELECTRIC VEHICLE WORKING GROUP

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I. INTRODUCTION

The Alliance of Automobile Manufacturers, Boulder County, BYD North America, ChargePoint, City and County of Denver, Conservation Colorado, eMotorWerks, EVBox, EVgo, General Motors (GM), Greenlots, National Car Charging, Natural Resources Defense Council (NRDC), Proterra, Regional Transportation District (RTD), Rocky Mountain Institute (RMI), Sierra Club, Siemens, Southwest Energy Efficiency Project (SWEEP), Vote Solar, and Western Resource Advocates (WRA) jointly submit this response to the questions posed by staff to participants in the Colorado Public Utilities Commission (Commission) Electric Vehicle (EV) Working Group. In addition to the above-listed participants in the Working Group, this joint statement is also supported by: eGo CarShare, EVmatch, Inc., and Sustainable Action Consulting PBC.

There are three primary barriers to EV adoption: 1) incremental vehicle cost; 2) the lack of charging infrastructure; and 3) the lack of consumer awareness. Electric utilities are uniquely situated to help overcome these barriers and meaningfully accelerate the adoption of light-, medium-, and heavy-duty EVs. Colorado's utilities should develop programs and rate options that increase fuel cost savings, speed the deployment of EV charging infrastructure, increase consumer awareness of the benefits of EVs, and improve the utilization of the electric grid to the benefit of all customers.

The successful implementation of these programs and rate options can both accelerate transportation electrification and lower the cost of integrating renewable energy by leveraging the energy storage inherent in EV batteries to manage an increasingly dynamic grid. Done right, widespread transportation electrification will benefit all utility customers and Colorado generally. MJ Bradley and Associates estimate that a mass market for EVs consistent with meeting long-term greenhouse gas (GHG) reduction goals could provide cumulative benefits of \$43 billion to the state of Colorado.¹ Of these total net benefits:

¹ MJ Bradley and Associates, *Electric Vehicle Cost-Benefit Analysis Plug-in Electric Vehicle Cost-Benefit Analysis: Colorado*, April, 2017 (hereinafter the "MJ Bradley Report").

- \$4.1 billion would accrue to electric utility customers in the form of reduced electric bills;
- \$29.1 billion would accrue directly to Colorado drivers in the form of reduced annual vehicle operating costs; and
- \$9.7 billion would accrue to society at large, as the monetized value of reduced GHG emissions.²

Colorado's utilities should propose programs that make it more likely the state will realize that \$43 billion in potential benefits sooner rather than later. The potential \$4.1 billion in reduced electric bills resulting from improved utilization of the grid is squarely within the Commission's traditional regulatory purview. However, there are other important categories of benefits, including the much larger \$29.1 billion in reduced fuel and maintenance costs, which will accrue to people who are also utility customers.

The electric industry and its regulators have a long history of advancing energy efficiency programs and bill-assistance programs to help utility customers who spend a disproportionate share of their income on electric bills, but the average American household spends twice as much on gasoline annually as it does on electricity. Electrifying the transportation sector provides utility regulators an opportunity to offer households more comprehensive relief, cutting their transportation fuel bill at least in half (and potentially more if customers charge during off-peak hours on properly designed time-variant rates). Likewise, the electrification of the transportation sector in Colorado provides the Commission with a singular opportunity to leverage an increasingly clean electric grid to drive reductions in emissions of GHGs in the transportation sector, benefiting all Coloradans in the process, to the tune of \$9.7 billion in net benefits.

Widespread transportation electrification will also contribute to significant reductions in criteria pollutant emissions, including nitrogen oxides (NOx) and volatile organic compounds (VOCs), the two major precursors to ozone formation. The Denver metro area and North Front Range are currently out of compliance with the federal ozone standard, and are classified as a moderate nonattainment area. These regions are likely to be bumped up to serious nonattainment

² *Id.*

status due to the significant violations that took place in Summer of 2018. Source apportionment conducted by the Regional Air Quality Council (RAQC) has found that the two major sources of ozone precursors are oil and gas extraction and on-road vehicles.³ An analysis conducted for the RAQC and the City of Denver in 2017 found that by 2025 the emissions from a battery electric vehicle operating under the Xcel grid mix would emit 84 percent lower NOx emissions and 99 percent lower VOC emissions than a new gasoline vehicle meeting Tier 3 emissions standards.⁴

II. RESPONSES TO QUESTIONS FOR EV WORKING GROUP PARTICIPANTS

1. Rate Design - Residential

1. What are the key components of a EV TOU/TVR for residential customers (best practices from across the country)?

Time-of-use (TOU) rates are a foundational tool to manage EV load. When properly designed, TOU rates create effective and efficient price signals for energy consumers.⁵ EVs on TOU rates in California consume less than five percent of their total kilowatt-hours (kWh) during system peak hours.⁶ Ensuring EVs charge on TOU rates is critical to minimize long-term distribution system impacts. Additionally, by encouraging EV drivers to charge in off-peak times when energy production costs are lower, well-designed TOU rates maximize the immediate fuel cost savings, which a survey of nearly 20,000 EV drivers reveals are the single biggest motivator of EV purchase decisions.⁷

³ Regional Air Quality Council, Moderate Area Ozone SIP, 2016, Table ES-2,

https://raqc.egnyte.com/dl/q5zyuX9QC1/FinalModerateOzoneSIP_2016-11-29.pdf/

⁴ Salisbury et al, Opportunities for Vehicle Electrification in the Denver Metro Area and Across Colorado, RAQC/City of Denver, 2017, p 68, available at

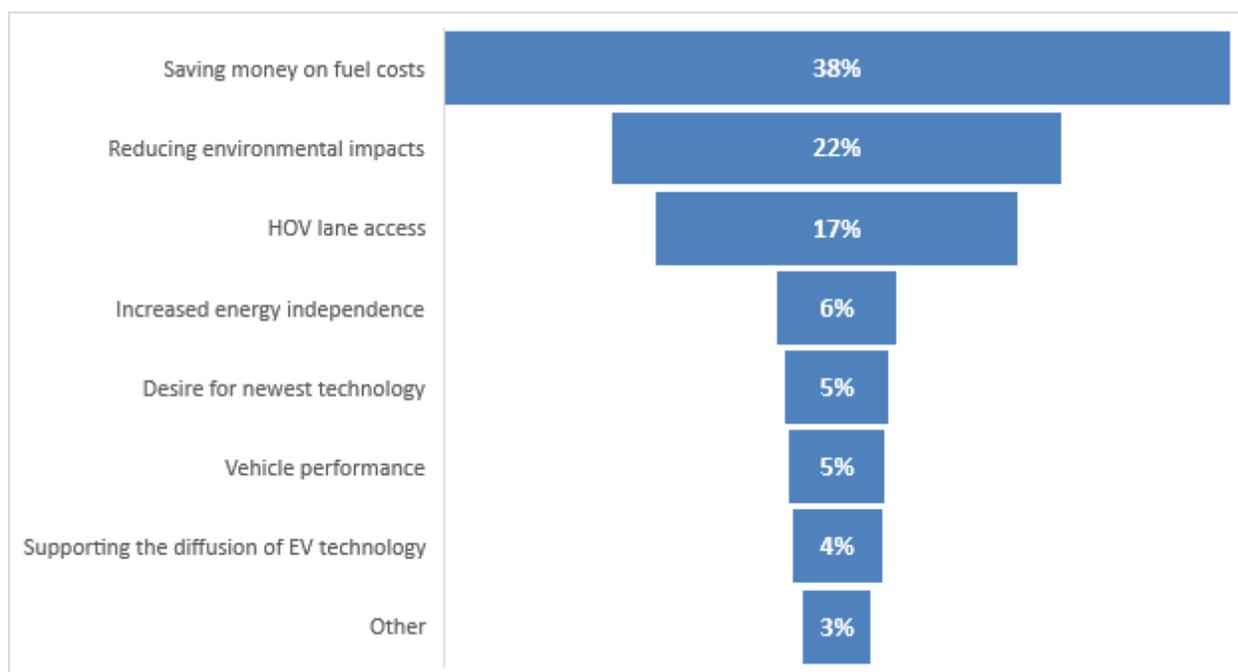
<http://www.swenergy.org/data/sites/1/media/documents/publications/documents/CORRECTED%20Denver%20Electric%20Vehicle%20Report.pdf> (hereinafter “Denver EV Report”).

⁵ See, for example, The Department of Energy’s EV Project, which has tracked the charging behavior of thousands of EVs since 2011, has shown that in areas with time-of-use (“TOU”) rates and effective utility education and outreach, the majority of EV charging occurs during off-peak hours. This was not the case in areas without TOU rates, where EV demand generally peaked in the early evening, exacerbating early-evening system-wide peak demand. See Schey, et al., *A First Look at the Impact of Electric Vehicle Charging on the Electric Grid, The EV Project at EVS26* (May 2012).

⁶ *Id.*

⁷ California Clean Vehicle Rebate Project, EV Consumer Survey Dashboard (available at <https://cleanvehiclerebate.org/eng/survey-dashboard/ev>, visited Oct. 24, 2018).

Figure 1: Most Important Reason to Acquire an EV⁸



To both ensure EV customers are adequately motivated to charge during off-peak hours and to maximize fuel cost savings relative to gasoline, we suggest rates with at least a 2:1 on-peak to off-peak price ratio, and no more than three TOU periods that remain constant throughout the year, even if the prices during those TOU periods vary to reflect differences in seasonal costs. Shifting time-periods or introducing new time-periods seasonally will confound consumer understanding and undermine the associated response. Off-peak periods should be of sufficient length to accommodate the regular charging needs of EV drivers, even at lower power levels, while on-peak periods should be concentrated into as few hours as possible, in order to ease the burden on customers, produce a better response, and actually track underlying increased costs, which are themselves concentrated into relatively few hours of the day and year.⁹ Customers should be able to internalize the price signal (e.g., avoid charging during a fixed time period that corresponds to evening peak demand) and should be able to program their EVs or their charging stations once to respond. It is unrealistic to expect customers to re-program their EVs or their charging stations every spring and every fall to accommodate a shift in the structure of the rate. They need to be able

⁸ Source: Center for Sustainable Energy, [California Plug-in Electric Vehicle Owner Survey Dashboard](#).

⁹ See, e.g., Regulatory Assistance Project, *Smart Rate Design for a Smart Future* (2015) at 44.

to “set and forget” to provide durable load-shifting that benefits all customers and maximizes fuel cost savings.

2. TOU whole house vs EV specific needing a separate meter (or submeter). How might potential benefits outweigh the cost of additional meter?

Whole house TOU rates that incorporate the rate design principles described above so that customers can “set and forget” lay the foundation for the successful management of EV load and encourage customers to shift non-EV load to off-peak hours as well. Such single-meter rates are a reasonable first step in Colorado, where default TOU are just now being explored. However, in the future, dedicated metering may be needed to reap additional benefits associated with more advanced load management strategies, including the use of more dynamic price signals to which EVs can respond (but to which other typical household loads are not yet capable of responding autonomously). Because separate utility revenue grade metering that requires a separate service is generally not cost-effective in the residential segment, utilities that are interested in pursuing this type of functionality should explore more cost-effective means of isolating EV load for purposes of implementing more advanced forms of load management, such as the use of sub-meters embedded in EV Supply Equipment (EVSE), EVs, or smart circuit-breakers.

3. Should the Commission encourage the adoption of Smart Charging technologies (i.e. allows for rebate programs or pilot projects)?

The Commission should encourage smart charging that takes advantage of the storage and flexibility inherent in EV batteries, but should be agnostic as to the technological pathway to achieve the result. Accordingly, the Commission and the utilities under its jurisdiction should look to leverage the “smarts” embedded in EVSE and/or EVs, allowing for the most cost-effective solutions to emerge that maximize the rewards returned to customers.

4. How should the Commission determine the impacts on non EV users and ensure that any EV focused rate complies with provisions under CRS 40-3-106. Further, should the Commission encourage the potential subsidization of EV charging in order to achieve potential benefits for all ratepayers in the future?

Rates optimized for EVs or other forms of beneficial electrification should generally not be subsidized, but should take into account the fact beneficial electrification represents

incremental¹⁰ revenue, should reflect underlying marginal costs, and should encourage EV drivers to charge in a manner consistent with grid conditions, which maximizes potential benefits for all ratepayers, while also maximizing the fuel cost savings that motivate EV purchases.

The Commission should encourage investments that accelerate transportation electrification so that Colorado utility customers realize the benefits quantified in the MJ Bradley Report sooner rather than later, and to maximize those benefits (e.g., by pushing load off-peak and lowering the costs of integrating variable renewables). As discussed below, the Commission should generally avoid subsidization via rate design, but should reform rates to account for different transportation electrification use cases¹¹ and should do so mindful of the fact that load represents incremental revenue.

2. Rate Design- C&I and Fleet

1. Should fleet/heavy duty rate design be prioritized by the Commission/ Utilities to maximize the early benefits to the electricity system?

Early benefits to the electricity system are more likely to accrue at scale in the residential segment where the majority of kilowatt-hours used for transportation electrification will be delivered, but that does not mean the Commission should not prioritize taking an inventory of commercial & industrial (C&I) rates and reforming or replacing those rates where necessary. In many cases, current C&I rate structures do not accurately reflect costs associated with transportation electrification use-cases and can undermine or erase the fuel cost savings upon which the economics of transportation electrification depend. As with residential rate design, C&I rate design should generally not subsidize transportation electrification¹², but should take into account the fact transportation electrification represents incremental revenue and encourage charging that is consistent with grid conditions, which will maximize fuel cost savings relative to

¹⁰ As discussed below, incremental revenue due to transportation electrification can put downward pressure on electric rates due to improved utilization of the grid.

¹¹ For example, transportation “use cases” might include (1) at-home charging of passenger EVs; (2) public charging at Level 2 or Direct Current Fast Charging stations; (3) charging of medium- and heavy-duty vehicles/fleets that are publicly or privately owned, among others.

¹² C&I charging however can be viewed through an economic development lens when it comes to rate design, and the principles of economic development rates could be considered as potentially applicable, on a temporary basis, to this market.

gasoline or diesel. Moreover, current rate structures were not designed with electric transportation in mind as a use case.

To illustrate the urgency of addressing C&I rates, consider that electric buses operated by RTD are subject to non-coincident demand charges based on their highest 15-minute period of demand during the month, regardless of grid conditions at the time that occurs. This provides RTD no incentive to avoid system-wide peak hours and to charge their buses when there is spare capacity on the system and the cost-of-service is lowest. Non-coincident demand charges do not reflect the actual cost of service; a customer's peak demand that occurs at 3AM when the grid is significantly underutilized is not equivalent to a peak demand that coincides with system-wide peak demand. Moreover, such charges can erase the fuel cost savings upon which the economics of a decision to purchase electric buses or other fleet vehicles depend.¹³

Existing C&I rates can also undermine the economics of operating public DC fast charging (DCFC) stations for passenger vehicles, which are necessary to enable a mainstream EV market.¹⁴ As researchers from Idaho National Laboratory note, “the availability of public infrastructure provides consumer confidence against ‘range anxiety,’ or the perceived fear by battery electric vehicle drivers of becoming stranded once the battery is depleted; however, this availability means that infrastructure must naturally precede the adoption of PEVs.”¹⁵ The downward pressure on electric rates that could result from widespread EV adoption that improves the utilization of the grid (primarily from overnight residential charging) is not likely to materialize unless a sufficient public charging network is established. Moreover, public DC fast chargers provide an important use case for residents of multi-unit dwellings who do not have a dedicated parking spot or garage where they may be able to charge their cars in the evening. Fast chargers will also be critical as transportation networking companies (TNCs) such as Uber and Lyft begin to electrify.

¹³ It should be noted that tariffs such as Xcel Energy's PG tariff that measures the peak demand for the generation and transmission demand charge during the non-holiday weekday peak period of 2-6 p.m. may provide a workable foundation for the development of DCFC rates for public transit and other fleets that can charge at night.

¹⁴ See, e.g., PlugShare, New Survey Data: BEV Drivers and the Desire for DC Fast Charging (March 2014) (finding that “lack of robust DC fast charging infrastructure is seriously inhibiting the value, utility, and sales potential” of typical pure-battery electric vehicles.”).

¹⁵ *Id.*

Unfortunately, until there is a mass market for EVs, public charging stations will often have very low load factors. A study conducted for the City of Denver and the RAQC in 2017 found that the average DCFC in Colorado is used 1.4 times per day, with most used about once and a handful used about four times per day.¹⁶ At these low levels of usage, energy charges make up a very small part of the costs of operating DCFC, with demand charges often exceeding 90 percent of the total cost. Traditional demand charges designed for commercial and industrial buildings with much higher load factors that allow for costs to be spread over more kilowatt-hours make little sense for such low load factor uses and are not cost-reflective. Until the market for EVs matures such that public DCFC experience substantially higher utilization rates, it may be necessary for utilities to offer special tariffs, or variations on existing tariffs, that are more conducive to profitable DCFC ownership.¹⁷

The annual cost to operate a DCFC station varies by a factor of 35 across different utility service territories in Colorado.¹⁸ Underlying costs-of-service do not vary by a factor of 35 across different service territories, suggesting that the economics of transportation electrification could be significantly improved simply by reforming C&I rates to be more cost-reflective.

2. Should the Commission and other State agencies explore means of subsidizing public fleet vs. private fleet?

The Commission and other state agencies should encourage investments in public and private fleet electrification, but should generally avoid subsidized rates that do not provide fleet operators appropriate long-term certainty upon which long-term investments in zero-emission vehicles depend.

3. What are some of the “creative” rate design tools available, such as Demand Charge holidays, Economic Development tariffs, etc.?

The Commission should be aware that DCFC operating in Xcel’s Minnesota territory are able to use a tariff structure that mitigates adverse bill impacts resulting from demand charges and low utilization. The tariff specifies: “In no month shall the billing demand be greater than the value

¹⁶ Denver EV Report at 15.

¹⁷ Fitzgerald, Garrett and Chris Nelder. [From Gas to Grid: Building Charging Infrastructure to Power Electric Vehicle Demand](#). Rocky Mountain Institute, 2017.

¹⁸ *Id.*, at Table 1-10 and Figure 1-2.

in kW determined by dividing the kWh sales for the billing month by 100 hours per month.”¹⁹ This naturally shifts the relative portion of the bill resulting from demand charges as utilization grows. To illustrate the point, a 50 kW DCFC with that is used once per day would result in a bill that is 70 percent lower than it would have been without this provision. By the time the same charger is used five times per day, the provision no longer has any effect upon the bill.

The Commission and the utilities should also look to more comprehensive efforts to optimize C&I rates for transportation electrification use-cases, including the suite of recently approved Southern California Edison (SCE) C&I rates that were refined in a stipulation between SCE, NRDC, Sierra Club, the Environmental Defense Fund, Siemens, the Coalition of California Utility Employees, and the Office of Ratepayer Advocates (which is housed in the California Public Utilities Commission).²⁰ Those rates are not subsidized, but have no demand charge component for the next five years, at which point demand charges will be phased in as utilization increases. Likewise, the Commission should examine a suite of C&I rates that Pacific Gas & Electric will very soon propose that will likewise not be subsidized, but will reflect the new costs and benefits associated with various transportation electrification use cases. Finally, rates that take into account varying, and growing, load factors should be part of the conversation to develop workable pricing for DCFC facilities.

4. What are the key metrics the Commission needs to have when evaluating the installation of DCFC vs Level II charging (i.e. costs and benefits, cross-subsidization issues, siting on distribution grid etc.)?

For purposes of rate design, the Commission should not vary its relevant principles or metrics according to the type of charging (e.g., DCFC vs. Level 2). Different rate options may be needed at various levels of demand, but rate design should be agnostic as to the type of EVSE resulting in that demand.

¹⁹ Northern States Power Company, Minnesota, Electric Rate Book, General Service rate structure (rate code A-14 on page 5-27 [here](#)),

²⁰ See Decision on the Transportation Electrification Standard Review Projects (D.18-05-040) at 110-17, A.17-01-020 *et al.*, California Public Utilities Commission (issued June 6, 2018).

3. Make-Ready

1. What are the biggest impediments for utilities to pursuing proposals to invest in EV charging make-ready infrastructure and how can the Commission address those impediments in this Report? Further, what are the costs and other barriers to make ready investments for different customers (i.e. residential, multi-family housing, workplace, commercial hosts, fleet charging, medium and heavy duty)?

The single-biggest impediment to utility investment in make-ready infrastructure in Colorado is the lack of regulatory certainty that could be immediately resolved if the Commission were to ratify the recommendations contained in a joint-statement recently submitted by 20 members of the EV Working Group (Alliance of Automobile Manufacturers; Alliance For Transportation Electrification; Boulder County; ChargePoint; City of Boulder; City of Denver; EVgo; Greenlots; National Car Charging; NRDC; Proterra; RTD; Siemens; Sierra Club; SWEEP; Summit County, Tesla, Inc.; University of Colorado, Boulder; Vote Solar; and WRA). That statement clearly defines the physical infrastructure that comprises “make-ready,” explains why utility investments in make-ready infrastructure may be approved under existing law, urges the Commission to act quickly to leverage funds that are available pursuant to the VW Environmental Mitigation Trust, and recommends the Commission, “invite utilities to submit Applications for EV make-ready infrastructure, including cost-recovery from ratepayers where appropriate.” The full statement is attached to these Comments for reference.

The second question as to the costs and barriers associated with “different customers (i.e., residential, multi-family housing, workplace, commercial hosts, fleet charging, medium and heavy duty)” cannot easily be answered, nor should the Commission or members of the EV Working Group be charged with answering that question completely. The impetus should be on the utilities to estimate those costs and benefits in applications to the Commission based on the best available data. The Commission, in turn, will need to evaluate each specific proposal on its merits. For now, the Commission should be aware that the costs and barriers vary significantly by segment and that the make-ready model may not be sufficient to overcome barriers in some segments.

2. How are make-ready infrastructure investments similar to other distribution system investments or line extension services and how have utilities in Colorado invested in this infrastructure up to now?

Make-ready infrastructure investments are very similar to other distribution system investments and line extension services, though make-ready installations also generally include

some electrical infrastructure on the customer-side of the meter (see diagram included in the attached joint statement on make-ready infrastructure). The rationale for line extension services largely applies here, although the benefits to the overall grid provided by the unique nature of EV load may justify a smaller portion of the costs being paid by the individual customer or site-host.

3. What should the utility include in an Application to the Commission for EV make-ready investments?

In addition to traditional components like program specifics and costs, a utility application for make-ready investments should include an explanation of how the program will: (1) accelerate transportation electrification in the target segment or segments; (2) improve the utilization of the grid, support the integration of variable resources; (3) increase access to the use of electricity as a transportation fuel; (4) deliver the cost-savings that motivate EV purchases; (5) interact and partner with competitive market and utility customer participants; (6) leverage other funding sources; and (7) collect data to inform Commission policy and program evaluation.

4. How should utility customers be made aware of the utility's EV make-ready investment program?

Utility account managers are well-positioned to make C&I customers aware of utility transportation electrification programs and tariff options. However, more general education and outreach, especially for residential customers will be needed to ensure adequate participation in utility programs. Utilities should leverage existing programs and platforms and should look to partner with state and local government, automakers, dealers, EV charging companies, non-profit organizations, academic institutions, and community-based organizations.

5. Should the Commission adopt current Interoperability and Communication standards, or establish a mechanism to quickly adapt to new standards?

The Commission should provide the utilities guidance as to the desired end result, but should generally allow utilities to determine which technologies or practices will best achieve that result. For example, the Commission could indicate that anyone should be able to use any public charging station deployed pursuant to a utility program and easily know what it will cost to charge without the need to enroll in a proprietary network or use proprietary smart phone applications. Likewise, the Commission could indicate that utility investments should use open standards and protocols for interoperability, but direct the utility to determine what standards and protocols meet those requirements.

4. Beneficial Electrification

1. Should the report reach a consensus on all the benefits and costs that could be identified as part of a Commission review of EV investments or programs? (Note: we would not go as far as reaching a consensus on how to evaluate these such issues).

The report should identify the three categories of net benefits quantified in the MJ Bradley Report: 1) reduced electric bills resulting from improved utilization of the grid and associated incremental revenue; 2) reduced expenditures on transportation fuel and vehicle maintenance; and 3) the societal value of emissions reductions of both GHG and criteria pollutants (see the “Introduction” section of this joint response).²¹ The Commission should note that report quantifies net benefits under a “Baseline Charging” and an “Off-Peak Charging” scenario (which could generally be achieved with the comprehensive use of TOU rates), but does not attempt to quantify additional net benefits that could accrue from more advanced or dynamic forms of load management.

An extensive review of literature on EV cost-benefit analysis conducted by the Rocky Mountain Institute in 2017 found that vehicle electrification has numerous benefits for drivers, utilities, communities, and society as a whole, including greenhouse gas reduction, gasoline savings, savings for all utility customers, savings in system investment, fuel and maintenance savings, and the potential for managed charging of EVs to deliver various grid benefits. That review concluded that vehicle electrification is overwhelmingly beneficial to society, and that the value of further cost-benefit analyses is negligible.²²

The Commission should not impose cost-benefit tests developed for energy efficiency programs upon transportation electrification programs and should avoid impossible counterfactuals related to attribution. Instead, the Commission should require the utilities to maximize benefits and minimize costs and should require the utilities to track and report on metrics

²¹ MJ Bradley and Associates, *Electric Vehicle Cost-Benefit Analysis Plug-in Electric Vehicle Cost-Benefit Analysis: Colorado*, April, 2017. Note: the Commission should be aware that a more recent analysis done for Minnesota using the same underlying tool also includes net benefits that could result from reduced emissions of NOx, which was not included in the Colorado report, but which could be significant, especially for medium and heavy-duty vehicle electrification.

²² Fitzgerald, Garrett and Chris Nelder. [*From Gas to Grid: Building Charging Infrastructure to Power Electric Vehicle Demand*](#). Rocky Mountain Institute, 2017.

that correspond to the three categories of benefits identified in the MJ Bradley report (e.g., percent of system-wide EV load occurring during off-peak hours, fuel cost savings, and emissions reductions).

2. How can the Commission identify the timing of short term and long term benefits and costs?

As documented in the MJ Bradley report, net benefits become more significant in the long term (i.e., the 2030-2050 timeframe). Accordingly, the Commission should encourage utility investments and programs that accelerate widespread transportation electrification so that utility customers realize those benefits sooner rather than later.

3. What are the potential up-front and ongoing costs to utilities and ratepayers (should use examples from across the country)?

Colorado can be assured that EVs do not pose a danger to the stability of its electric grid and that costs associated with integrating EV load will likely be insignificant in the short term. Even in California, which now has over 474,000 EVs on the road,²³ often clustered on specific distribution circuits, adverse grid impacts have been *de minimis*; only 0.17 percent of EVs have triggered the need for a distribution system upgrade.²⁴ In fact, costs associated with accommodating EV charging account for less than one hundredth of one percent of total distribution capital expenditures.²⁵

This is not to say, however, that the Commission and the utilities under its jurisdiction should not begin working now to ensure it minimizes longer-term costs and maximizes longer-term benefits. Widespread EV charging, if not properly managed, could result in significant distribution system upgrades in the future. Those costs can be avoided if the right policies and programs are put in place today, starting with the use of TOU rates as a foundational load management strategy upon which more advanced forms of load management can be built. This will help ensure benefits exceed costs. The Commission should consider the costs associated with

²³ Veloz, *Sales Dashboard*, October 5, 2018 (available at <http://www.veloz.org/sales-dashboard/>).

²⁴ Synapse Economics, *Electric Vehicles Still Not Crashing the Grid: Updates from California*, March 2018 (available at <http://www.synapse-energy.com/sites/default/files/EV-Not-Crashing-Grid-17-025.pdf>, visited Sept. 6, 2018).

²⁵ *Id.*

utility programs to accelerate transportation electrification as investments to maximize and to ensure utility customers realize those potential net benefits sooner rather than later.

4. What steps should the Commission begin to undertake to ensure that investments in charging are properly sited to maximize benefits to the system and minimize potential risks such as underutilized investments?

The Commission should consider the fact utilities will only install infrastructure at sites where there is a willing site-host who will generally be making a much more significant investment in a vehicle or multiple vehicles. This will naturally minimize the potential risk of underutilized investments. The utilities should identify how they will consider and prioritize potential applications from would-be site-hosts. For public DCFC sites, the utilities could develop publicly available siting tools akin to what researchers from the University of California at Davis developed in partnership with Pacific Gas & Electric.²⁶ Additionally, utilities should provide more visibility into available capacity on their electric distribution system for the purpose of siting EVSE.

5. Is there a potential for pilot projects on utilizing EV (fleets) for aggregated DR/DER and the integration of renewables? What steps does the Commission and the Utilities need to take before such a program could be launched?

Yes, and there is a rich body of pilots and full-scale programs that are being implemented in other states that could allow Colorado to avoid duplicative pilots and move more quickly toward full scale programs that leverage the flexibility and storage inherent in EV batteries to lower the costs of integrating variable renewable resources. The Commission and the utilities should prioritize programs that return the greatest value to both participating and non-participating customers. For example, researchers from Lawrence Berkeley National Laboratory estimate that using advanced smart charging (so-called “VIG”) as a means to comply with California’s energy storage procurement mandate would save utility customers \$1.5 billion, while also advancing the state’s zero emission vehicle goals by rewarding EV drivers for providing grid services.²⁷ This is especially important for Level 2 investments.

²⁶ “PG&E Launches New Tools to Support Electric Vehicle Adoption in Northern and Central California,” https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20161129_pge_launches_new_tools_to_support_electric_vehicle_adoption_in_northern_and_central_california

²⁷ Jonathan Coignard, Samveg Saxena, Jeffery Greenblatt, and Dai Wang, *Clean vehicles as an enabler for a clean electricity grid*, Environmental Research Letters, Volume 13, Number 5, May, 2018. Available at: <http://iopscience.iop.org/article/10.1088/1748-9326/aabe97>

5. Education and Outreach

1. How should the Commission prioritize creative rate design vs the need for simplicity for potential customers?

The Commission should pursue both simple rates that can be easily explained, understood, and acted upon, and more advanced forms of dynamic pricing and load management that rely upon technologies that optimize charging in response to evolving grid conditions without the need for continuous manual intervention. The Commission should avoid the dangerous middle ground of rates that are too complicated for people to understand easily, but that fall short of reflecting more dynamic marginal costs. For example, the Commission should avoid rates that includes a “super-off-peak” TOU period in one season but not in another because customers are not likely to re-program their cars or their charging stations twice-a-year every year at some arbitrary date of which customers would likely be oblivious. Instead, the utilities should offer TOU rates that allow customers to program their cars or their charging stations once and forget about it (e.g. simple TOU rates with at least a 2:1 on-peak to off-peak price ratio and no more than three TOU periods that are constant throughout the year even if the prices vary to reflect seasonal variation), while also pursuing more dynamic forms of load management that let customers specify certain parameters and rely upon algorithms to optimize charging to maximize customer value. See responses to questions 1.1 and 1.2.

2. How should the Commission and Utilities contribute to a state-wide information database on EV and EVSE?

The Commission and the utilities should be aware that utilities in at least California have been given access to Department of Motor Vehicles (DMV) vehicle registration data to inform service planning.²⁸ Other entities such as the Department of Energy, Plugshare, and Google are likely best situated to aggregate data on EVSE.

3. How should the Commission evaluate utility spending on potential rebate programs (EV or EVSE purchases) and marketing/outreach programs

The Commission should avoid impossible-to-answer counterfactuals regarding attribution and should instead evaluate measurable metrics related to the potential benefits upon which utility investments can be justified. Given that utility investments in make-ready infrastructure are

²⁸ See California Senate Bill 859 (Padilla, 2011).

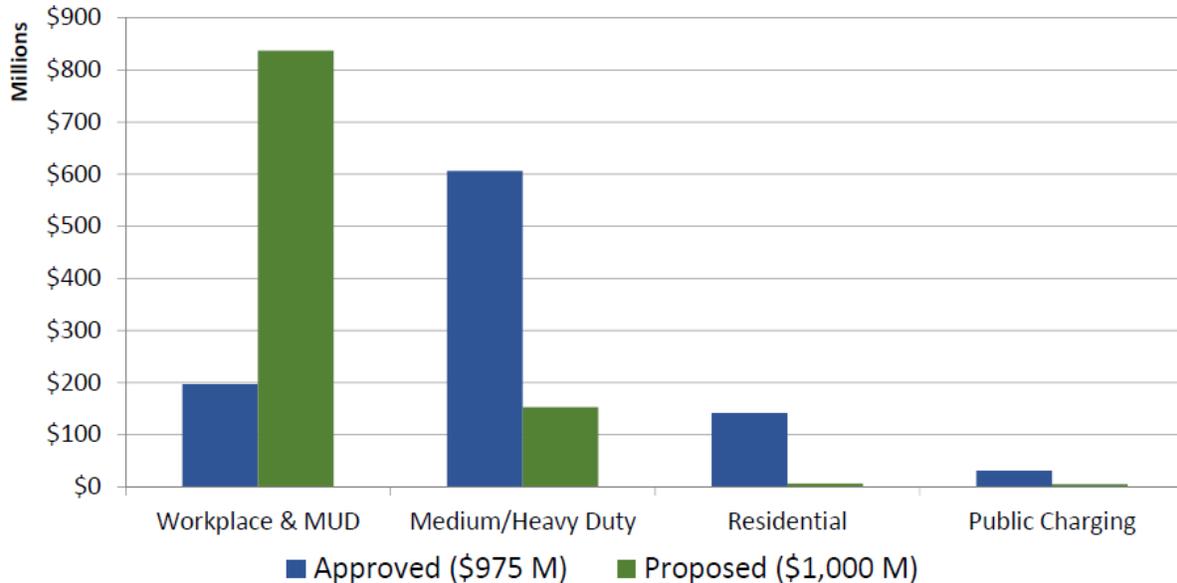
analogues to utility line-extension services, the Commission should note that utilities are not required to hire consultants to examine whether a new house would have been built but-for utility line extension policy. Similarly, when considering utility investments in transportation electrification programs (including marketing/outreach programs), the Commission should avoid attribution (asking impossible counterfactuals as to whether a given electric vehicle would or would not have been purchased but-for the utility investment) and the Commission should not impose cost-benefit tests developed for energy efficiency programs upon transportation electrification programs. Instead (as noted in our response to question 4.1, above), the Commission should require the utilities to track and report on metrics that correspond to the three categories of benefits identified in the MJ Bradley Report (e.g., percent of system-wide EV load occurring during off-peak hours, fuel cost savings, and total emissions reductions).

4. Should the Commission encourage the development of a low-income EV program?

The Commission should encourage the development of programs to serve low-income and underserved communities. Utility programs should not be limited to individually-owned light-duty vehicles, but should also accelerate the electrification of car-share and ride-share vehicles that serve these populations, and of medium and heavy-duty vehicles to reduce emissions of local air pollution that affects those communities disproportionately. Notably, of the nearly \$1 billion in utility transportation electrification programs that have been approved in California, the majority are for medium- and heavy-duty vehicles.

Figure 2: Approved and Proposed Investor-Owned Utility Investments in California (as of August, 2018)

[Source: California Public Utilities Commission]



The Commission should also be aware that at least \$300 million of the \$1 billion in approved programs will be invested in “disadvantaged”²⁹ and low-income communities and that, to this point, California’s utilities are exceeding their disadvantaged and low-income community deployment goals.

6. Next Steps and Policy Guidance

1. How should the Commission evaluate impacts to the distribution grid with increasing EV adoption?

The Commission could require the utilities to track impacts to the distribution grid associated with EV load, as the California Public Utilities Commission requires the utilities under its jurisdiction to do. However, the Commission should be aware that, even in California, those impacts have been *de minimis* (see response to 4.3).

²⁹ “Disadvantaged Communities” are identified using a mapping tool that documents various socio-economic and pollution-burden indicators. See: <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30>

2. Following the VW mitigation spending, how can the Commission help the State conduct an infrastructure gap analysis?

The Commission and the utilities, in cooperation with other state agencies such as the Colorado Energy Office and the Colorado Department of Transportation, should look to leverage the analytical tools being built by the California Energy Commission and the National Renewable Energy Laboratory to quantify infrastructure needs in multiple segments, analysis which is now required by California law.³⁰

3. How can performance-based incentives play a role in encouraging forward looking investment in EV infrastructure?

Utilities should earn their authorized rate-of-return on reasonable, Commission-approved capital investments undertaken to accelerate transportation electrification. To ensure utilities give non-capital-intensive programs such as rebate-based programs equal consideration, the Commission should consider the use of performance-based incentives. Thankfully, transportation electrification presents an opportunity to avoid the shortfalls associated with previous forms of performance-based ratemaking because the metrics the Commission should consider in this context can be easily measured and can be tied directly to the premise that supports the investment of utility customer funds.

Utilities will be unlikely to pursue transportation electrification programs at scale if those programs do not provide an appropriate earnings opportunity. The Commission should consider the example of the \$143 million San Diego Gas & Electric (SDG&E) residential charging program the California PUC authorized in May, 2018.³¹ The utility originally proposed a program that included end-to-end utility ownership, but the California PUC removed the utility ownership option, transforming the program into a rebate-based program and, in doing so, significantly reduced the associated earnings opportunity. To encourage the utility to accept the modified program and to do so in a manner that would maximize the resulting benefits, NRDC, the Coalition of California Utility Employees, the Greenlining Institute, Plug In America, Sierra Club, Environmental Defense Fund, Union of Concerned Scientists, Siemens, Greenlots, Electric Motor Werks, Inc. (eMotorWerks), American Honda Motor Co. Inc., General Motors LLC, and the

³⁰ See California Assembly Bill 2127 (Ting, 2018).

³¹ California PUC Decision 18-05-040 May 31, 2018.

Alliance of Automobile Manufacturers, jointly proposed a performance-based incentive mechanism that would allow the utility to earn its authorized rate-of-return upon rebates issued as part of the program if it delivered upon three, measurable metrics: (1) charging station deployment (including deployment in disadvantaged and low-income communities); (2) fuel cost savings (relative to a fixed forecast of gasoline prices); and (3) success in pushing EV load to off-peak hours.³² In response, the California PUC allowed for an advice letter process to layer on a performance-based incentive mechanism and SDG&E has proposed an incentive mechanism that is derivative of the mechanism proposed by the joint parties. In a related advice letter, SDG&E has stated: “If the Commission does not approve of the proposed incentive mechanism and associated modifications, then SDG&E will not implement the [residential charging program].”³³ Clearly, there is a need for innovative regulation to ensure utilities to consider programs that do not rely exclusively upon capitalized infrastructure to provide an earnings opportunity.

4. Should a collaborative, stakeholder approach continue past the issuance of this report and if so, where should its focus be?

Stakeholders should be engaged in the regulatory process to review proposals made by utilities related to the EV Working Group report. The utilities should also consider establishing working groups to discuss emerging issues and guide program implementation, similar to the stakeholder groups that arose out of the 2016 Tri-Proceeding settlement agreement approved in Consolidated Proceeding No. 16AL-0048E.

Policy Guidance:

5. When evaluating applications or EV plans, how should the Commission gather, measure and evaluate impacts to the electricity system?

See responses to questions 4.3 and 6.1.

³² Opening Comments of Natural Resources Defense Council, Plug In America, the Coalition of California Utility Employees, Sierra Club, Environmental Defense Fund, Union of Concerned Scientists, Greenlots, Siemens, and eMotorWerks on Proposed Decision Authorizing Standard Review Transportation Electrification Proposals, April 19, 2018, p. 11-15 (the Greenlining Institute joined in reply-comments) (available at <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M213/K120/213120434.PDF> visited Sept. 6, 2018)

³³ San Diego Gas & Electric, *Advice Letter 3236-E*, June 14, 2018.

6. How should utilities bring proposals to the Commission for investment in EV and EV infrastructure (i.e., applications, rate cases, CPCN, or should a Rulemaking be opened)?

Utilities should bring forward specific programs in the context of an Application proceeding. An Application proceeding would provide an opportunity for interested stakeholders and the Commission to evaluate each specific utility proposal.

7. Should the Commission request a Transportation Electrification Plan/Roadmap for each of the utilities in the future?

Yes. The Commission should also note that Xcel has published a similar plan in Minnesota. However, the Commission should also make it clear to the utilities that they are encouraged to bring proposed programs to the Commission in the near future, and do not need to wait until a comprehensive plan or roadmap is developed to begin investments in support of transportation electrification.

III. CONCLUSION

The Alliance of Automobile Manufactures, Boulder County, ChargePoint, City and County of Denver, Conservation Colorado, eGo CarShare, Emotorwerks, EVBox, EVgo, EVmatch, GM, Greenlots, National Car Charging, NRDC, Proterra, RTD, RMI, Sierra Club, Siemens, SWEEP, Sustainable Action Consulting PBC, Vote Solar, and WRA thank the Commission for the opportunity to engage in this effort.

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Respectfully submitted,

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