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SIERRA CLUB
LONE STAR CHAPTER

PROJECT NO. 49125

REVIEW OF ISSUES RELATED TO ELECTRIC VEHICLES	§ § §	**BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS**

Comments Filed by the Sierra Club

February 3, 2020

Public Utility Commission of Texas
1701 North Congress Avenue
P.O. Box 13326
Austin Texas 78711-3326

Please accept the following comments, submitted on behalf of the Sierra Club, in response to the Commission's request for information regarding important issues around vehicle electrification in Texas.

Sierra Club is the nation's oldest and largest grassroots environmental organization, with more than 3.8 million members and supporters nationwide and over 28,500 members in Texas. Sierra Club is dedicated to the protection of public health and the environment, and has long been a leading voice for clean vehicles. The Lone Star Chapter of the Sierra Club works to develop and promote climate solutions, collaborating with numerous stakeholders to ensure strategic and effective engagement on environmental and social justice issues. We are also a member of ERCOT, and our interim director serves as a voting member on the Reliability and Operations Subcommittee at ERCOT. Sierra Club has significant experience with issues at the intersection of electric vehicles (EVs) and utility regulation, and we have worked to resolve these issues in proceedings before state utility commissions across the country. Sierra Club is also a founding member of the Transportation Electrification Accord,[1] a set of guiding principles on EV regulatory

[1] https://www.theevaccord.com/.

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issues that has been joined by over 120 signatories representing labor, environmental, consumer, low-income, vehicle manufacturer, and EV technology company interests, among others.

The Lone Star Chapter has also recently joined as a member of the Texas Electric Transportation Resources Alliance (TxETRA), which is filing separate comments as part of this docket.

1. *The Commission requests that parties provide current data sources and projections for the expected deployment of electric vehicles in Texas over the next ten years. If available, the data sources should attribute the projections by vehicle class (i.e., personal, commercial short-haul including fleets and buses, and commercial long-haul electric vehicles).*

As shown in Figures 1-3, below, Sierra Club forecasts light duty vehicle (LDV) sales, sales percentage, and stock for battery electric vehicles (BEV) and plug-in hybrid electric vehicle (PHEV) in Texas based on four national projections for BEV and PHEV sales through 2030: Bloomberg New Energy Finance's (BNEF) 2019 projection,[2] the U.S. Energy Information Administration's (EIA) 2019 projection,[3] Energy Innovation's projection,[4] and Boston Consulting Group's (BCG) 2017 projection.[5] Note that all four projections used are national projections, which Sierra Club used, along with Texas specific sales data, to estimate Texas specific results for BEV and PHEV adoption in Texas through 2030. This response applies only to LDV and does not address adoption projections for medium duty and heavy duty vehicles.

Sierra Club incorporated historical Texas sales data indicating the number of EVs sold each year, and the fraction of EVs in total LDV sales from 2011 through 2018, sourced from Auto Alliance's Vehicle Sales Dashboard.[6]

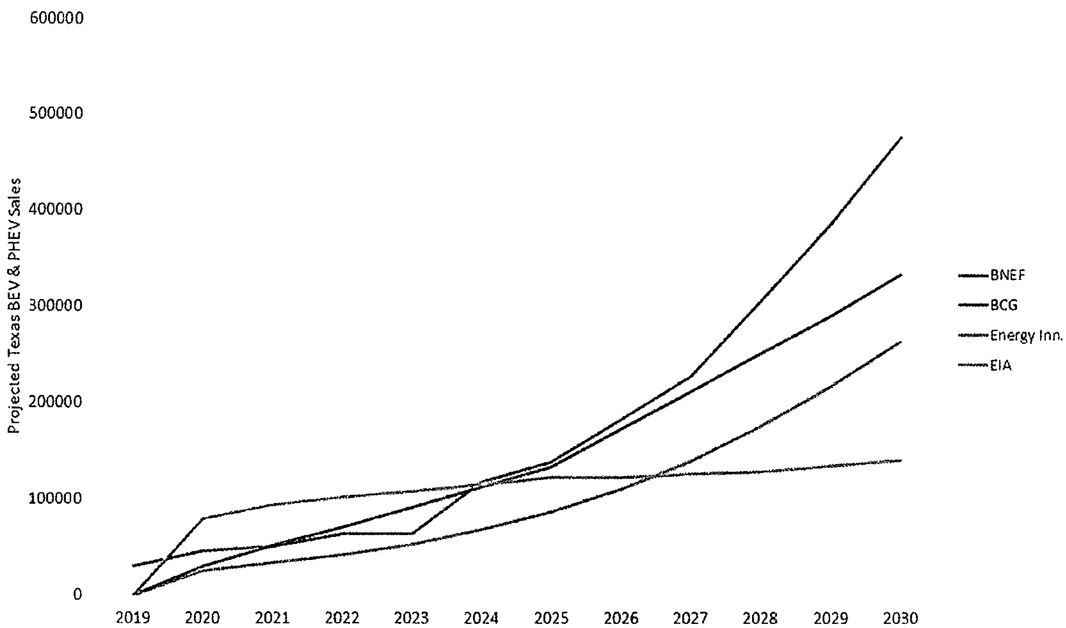
To calculate the Texas projections, Sierra Club utilized a proprietary model developed by Synapse Energy Economics. This model incorporates the four national EV adoption projections noted above (BNEF, BCG, EIA, and Energy Innovation) by taking each source's projections for national annual sales fraction (number of EVs sold out of total LDVs sold) and applying them to Texas. The model uses LDV sales data from EIA's Annual Energy Outlook 2019 "Light-Duty Vehicle Sales by Technology Type" with Auto Alliance's Texas-specific historic EV sales fractions to generate Texas-

[2] Bloomberg New Energy Finance. Electric Vehicle Outlook (2019), *available at* https://about.bnef.com/electric-vehicleoutlook/.
[3] U.S. Energy Information Administration, Annual Energy Outlook (2019), *available at* https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2019&cases=ref2019&sourcekey=0.
[4] Energy Innovation, Energy Policy Simulator, Version 2.0.0, *available at* https://us.energypolicy.solutions/scenarios/home.
[5] Boston Consulting Group. The Electric Car Tipping Point (January 2018), *available at* http https://www.bcg.com/publications/2018/electric-car-tipping-point.aspx.
[6] Auto Alliance, Advanced Technology Vehicle Sales Dashboard, *available at* https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/.

specific sales fractions for 2019 through 2030. This fraction is then used to estimate stock and sales based on EIA's West South Central Region LDV projections and a survivability factor based on Oak Ridge Laboratory data.[7]

Generally, EIA's EV adoption projections are the most pessimistic, while BNEF's projections show the most robust growth in the EV market.

Figure 1. Texas BEV & PHEV Sales Through 2030



[7] Stacy Davis & Robert Boundy, Oak Ridge National Laboratory, *Transportation Energy Data Book, Edition 37* (Aug. 2019), *available at* https://tedb.ornl.gov/wp-content/uploads/2019/03/TEDB_37-2.pdf.

Figure 2. Texas BEV & PHEV Stock Through 2030

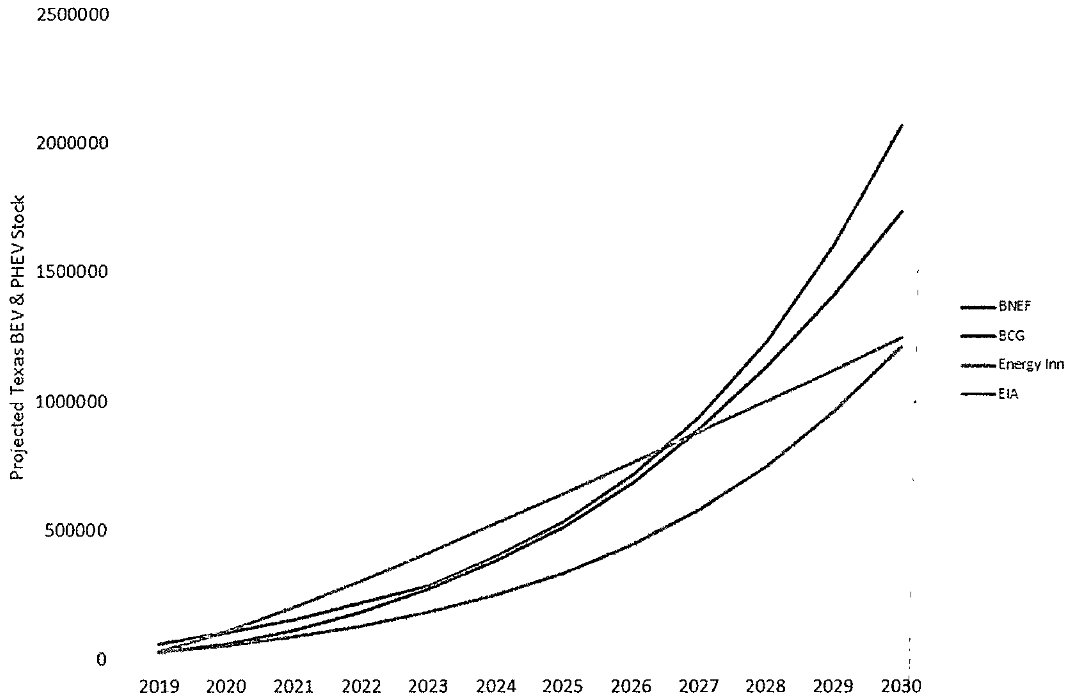
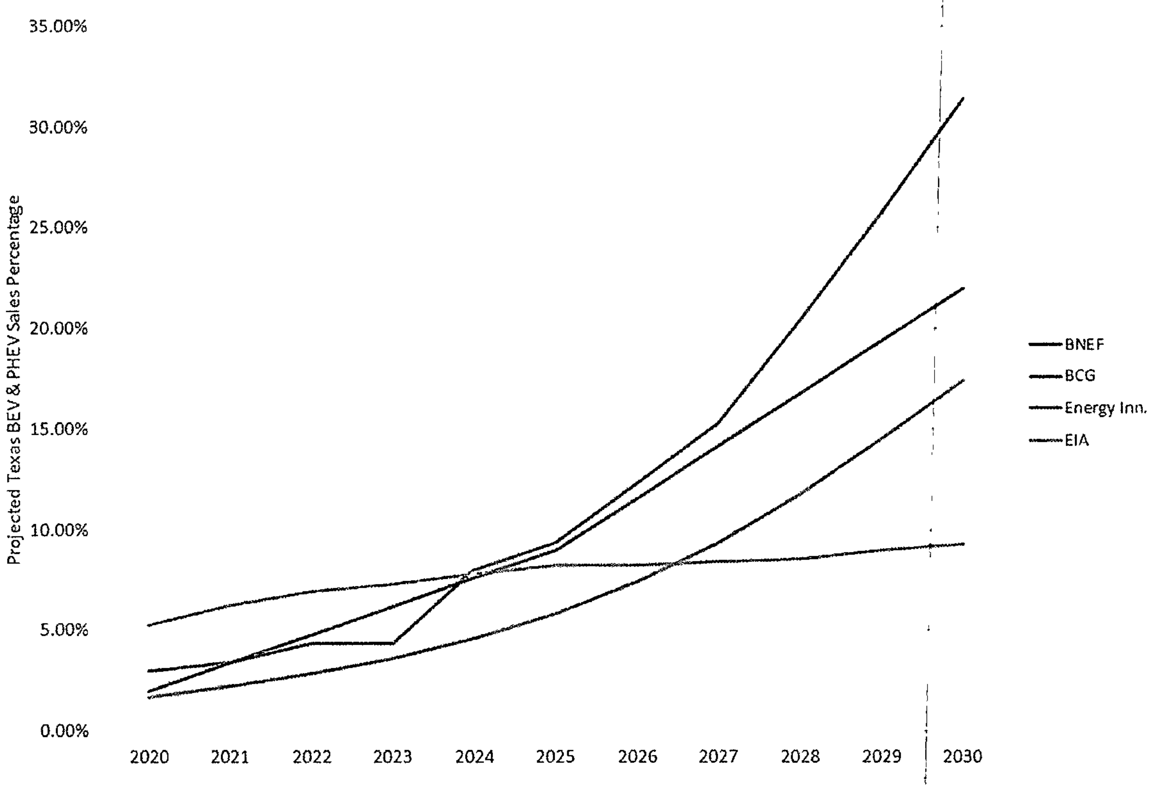


Figure 3. Texas BEV & PHEV Sales Percentage Through 2030



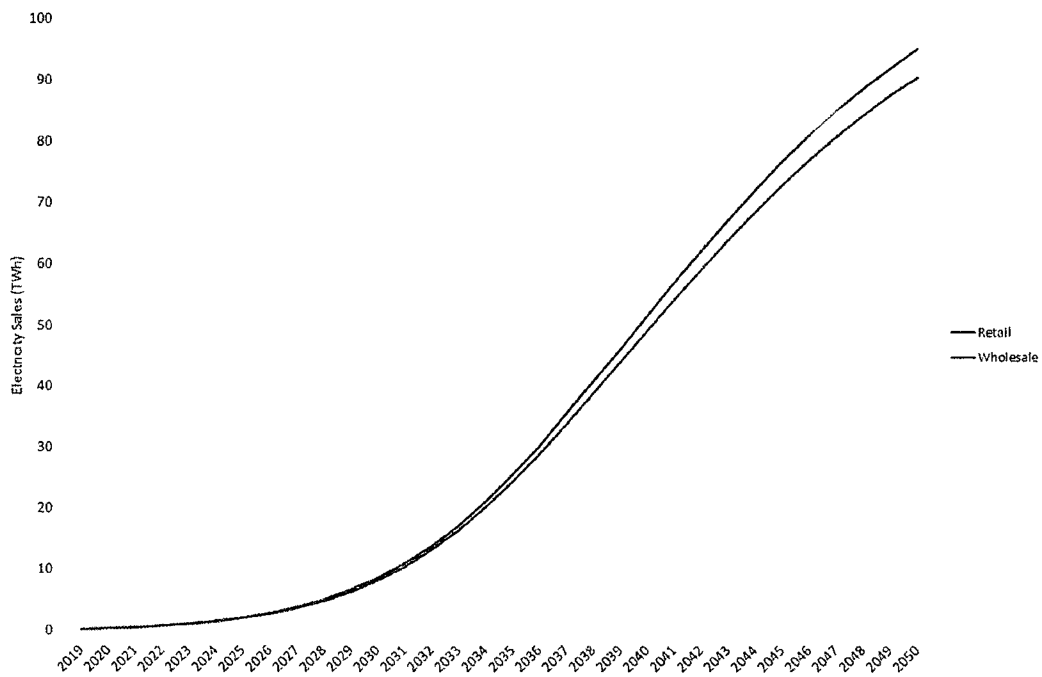
2. *Please provide any current data sources and information on the expected amount of new load attributable to electric vehicles over the next ten years. If available, the data sources should attribute this load by vehicle class (i.e., personal, commercial short-haul including fleets and buses, and commercial long-haul electric vehicles).*

Sierra Club examined the grid-related effects of increased EV adoption using the EV-REDI model (Electric Vehicle Regional Emissions and Demand Impacts), which was developed by Synapse Energy Economics. It is a tool that models EV adoption and resulting impacts at both the state and nation level. The model generates scenarios based on different inputs, goals (*e.g.*, stock, sales, carbon dioxide reduction), and timeframes.

For purposes of this analysis, Sierra Club utilized BCG's projection to model grid load projections through EV-REDI. BCG generally presents a middle-ground projection compared to the optimistic BNEF curve and the conservative Energy Innovation and EIA curves through 2030. This is true across stock, sales, and sales fraction projections.

This model outputs retail and wholesale energy sale projections in TWh from 2019 through 2050.

Figure 4. Projected Electricity Sales (TWh) Based on BEV Charging in Texas



EV-REDI relies on high-resolution data from publicly available sources to assemble state-specific information on the historical adoption of EVs and develop trajectories of future EV deployment. EV-REDI allows the user to apply a technology adoption curve to existing historical trends to understand the impacts of EVs if current trends in adoption are sustained over time.

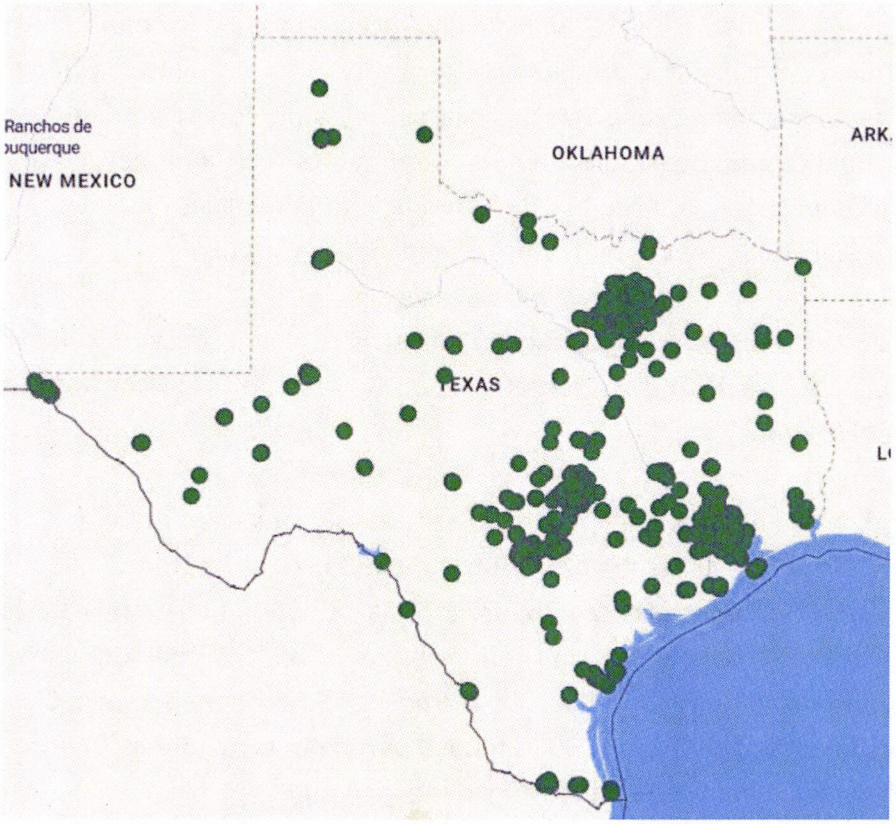
Alternatively, EV-REDI can be used to analyze specified future levels of electric vehicle sales in absolute terms or in percentage terms, or to set the total number of EVs (stock) in absolute terms or percentage terms. In doing so, EV-REDI can evaluate the incremental impacts of increasingly aggressive EV adoption to help guide policymakers and advocates in setting goals. Under either approach, EV-REDI can then quantify both conventional and electric LDV sales and stock, and the resulting impacts on electricity sales, tailpipe emissions, gasoline consumption, and other metrics through 2050.

For every state, EV-REDI accounts for: state- and province-specific trends in LDV stocks, sales, and driving patterns; vehicle ownership lifetime; electric vehicle miles travelled (eVMT) for both BEVs and PHEVs (although PHEVs were not used in modeling in this instance); changing efficiencies of both EVs and conventional vehicles; and changing trends in vehicle preferences. These factors affect the rate of EV adoption and the timing and magnitude of EV impacts on emissions and electricity demand.

3. *Please identify any anticipated load "hot spots" in the state for electric vehicle charging. Please specify whether these hot spots are expected to result from personal, commercial short-haul, or commercial long-haul electric vehicle deployment and charging.*

Figure 5 below illustrates the existing distribution of public EV charging in Texas. While EV growth continues to emerge over the next decade, it is reasonable to anticipate that the growth in EV-related charging load will concentrate in similar areas within the state.

Figure 5. Existing Location of Public Charging Stations in Texas



Source: Alternative Fuels Data Center, Alternative Fueling Station Locator

It is worth noting that the current level of publicly available EV charging infrastructure in Texas is far below the level necessary to adequately support anticipated EV adoption in the state over the next ten years. Figure 6, below, lists the current number of public charging stations and outlets (typically stations have multiple EV charging outlets) statewide and near four major cities.

Figure 6. Existing Public EV Charging Locations Statewide and Within 50 miles of Select Cities

	Public Stations	Public Outlets
Austin	326	1056
Houston	240	700
Dallas	399	1083
El Paso	25	62
Statewide	**1265**	**3717**

Data regarding existing charging stations and plugs (including the maps) comes from the Alternative Fueling Station Locator,[8] which allows users to search for public and private charging locations within a state or city or within a certain radius. According to the Department of Energy, the data in the Alternative Fueling Station Locator are gathered and verified through a variety of methods, including trade media, Clean Cities coordinators, a "submit new station" form on the Station Locator website, and through collaborating with infrastructure equipment and fuel providers, original equipment manufacturers, and industry groups.[9]

Figure 7, below, showing the public charging infrastructure necessary to support anticipated EV growth in the state, based on the Alternative Fuels Data Center's Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite.[10]

EVI-Pro uses detailed data on personal vehicle travel patterns, electric vehicle attributes, and charging station characteristics in bottom-up simulations to estimate the quantity and type of charging infrastructure necessary to support regional adoption of electric vehicles. The model takes vehicle stock in a state or city and generates an estimate of the number of charging plugs needed to support that number of EVs. For purposes of this analysis, Sierra Club utilized BCG's annual stock projections through 2030 as inputs, based on its middle-of-the-road projections compared to EIA on the low end and BNEF on the high end. Vehicle mix was scaled using the default setting across four options: 15% 20-mile range PHEVs, 35% 50-mile range PHEVs, 15% 100-mile range BEVs, and 35% 200-mile range BEVs. Sierra Club generated curves for two scenarios: 1) in which 50% of drivers have access to home charging and b) in which 100% of drivers have access to home charging. As with our prior responses, these projections address only LDVs rather medium- and heavy-duty vehicles and fleets.

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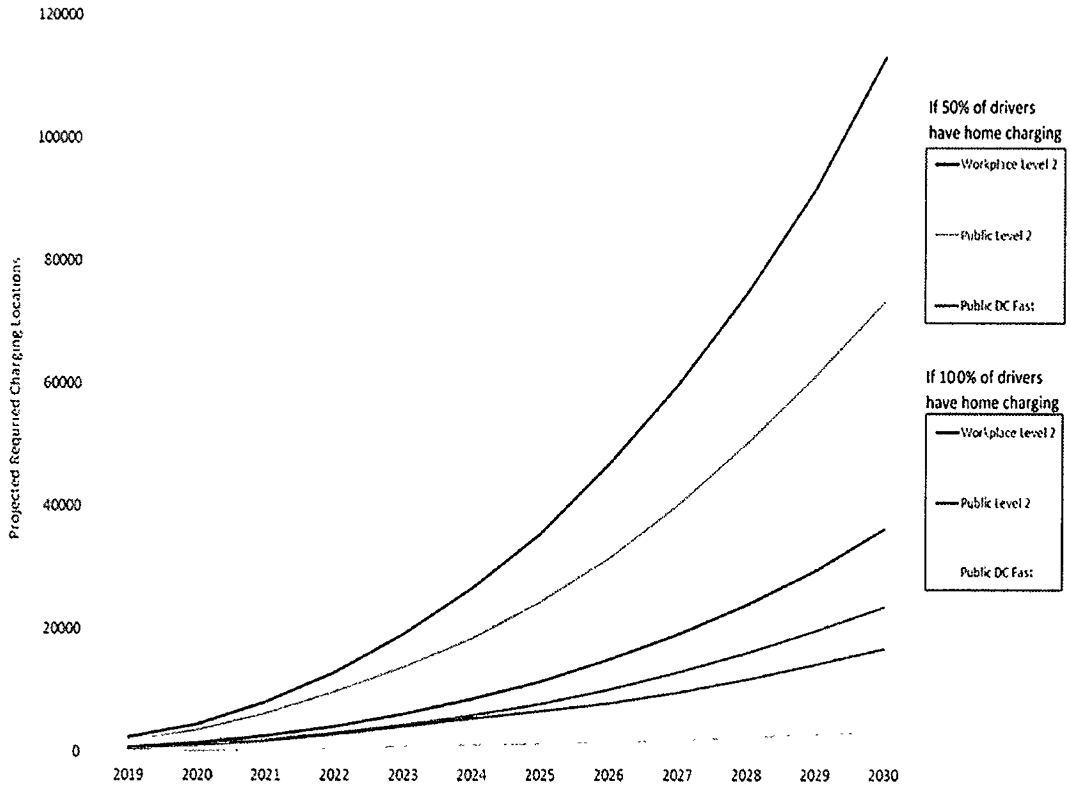
[8] U.S. Department of Energy, Alternative Fuels Data Center, Alternative Fueling Station Locator, https://afdc.energy.gov/stations/#/find/nearest.

[9] U.S. Department of Energy, Alternative Fuels Data Center, About the Alternative Fueling Station Data, https://afdc.energy.gov/stations/#/find/nearest?show_about=true.

[10] U.S. Department of Energy, Alternative Fuels Data Center, Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite, https://afdc.energy.gov/evi-pro-lite.

Figure 7. Public Charging Infrastructure Necessary to Support EV Growth Through 2030



As is evident comparing Figures 6 and 7, the state currently has far fewer public charging stations than will be necessary to support expected EV growth over the next decade.

4. *Describe the observed or anticipated load profiles and impacts of various types of electric vehicle charging stations (e.g., residential Level 1, Level 2, and Level 3 DC Fast charging) and the class of the vehicle charging (i.e., personal, commercial short-haul including fleets and buses, and commercial long-haul electric vehicles).*

Sierra Club reserves specific comment on this question. Please refer to the coalition comments submitted on behalf of the Texas Electric Transportation Alliance, of which the Lone Star Chapter of the Sierra Club is a member.

5. *What, if any, emerging vehicle charging technologies are anticipated to be commercially available in the next ten years that could impact electricity markets in Texas?*

Sierra Club reserves specific comment on this question. Please refer to the coalition comments submitted on behalf of _the Texas Electric Transportation Alliance, of which the Lone Star Chapter of Sierra Club is a member.

6. *The Commission requests that parties provide a detailed explanation on the following items:*
    a. *The anticipated impacts of electric vehicle charging, including residential and commercial charging stations on the distribution system in the next ten years;*
    b. *The anticipated impact of electric vehicle charging stations on the transmission system in the next ten years; and*
    c. *The anticipated impact of electric vehicle charging stations on long-term system planning at the regional transmission organization level, given a widespread adoption Scenario.*

Sierra Club reserves specific comment on this question. Please refer to the coalition comments submitted on behalf of the Texas Electric Transportation Alliance, of which the Lone Star Chapter of Sierra Club is a member.

7. *What is the overall anticipated impact of electric vehicle charging in the next ten years in terms of energy and peak demand? What changes, if any, should be made to energy and peak demand forecasts to incorporate this impact?*

When considering EV impact on peak electricity demand, it is critical to note that EVs provide the grid with a flexible, manageable load.[11] Most passenger vehicles are driven for only a fraction of a given day, and are otherwise sitting idle; for EVs, this means they can be plugged in and, with the right policies or programs in place, potentially deliver grid services that support grid reliability, flexibility and resilience. If charging is managed to occur during off-peak periods, EV load can "fill valleys" in load without increasing overall capacity requirements. Similarly, EV load can be shifted to facilitate the integration of variable generation from renewable sources.[12] By increasing usage of standing assets, smoothing and shifting loads, and improving reliability, EV charging can lower the marginal cost of electricity for all customers.

Flexible EV load can also be a critical tool to support the integration of increasing levels of variable generating resources that might otherwise be underutilized or go unused. As the Regulatory Assistance Project notes in 2016 Texas curtailed more than 800 gigawatt-hours of wind energy (equating to approximately 1.6 percent of its total wind generation that year).[13] Shifting EV demand to meet renewable production can limit such curtailment.

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[11] *See, e.g.*, Regulatory Assistance Project, *In the Driver's Seat: How Utilities and Consumers Can Benefit From the Shift to Electric Vehicles* at 4-7 (April 2015).
[12] *Id.*
[13] D. Farnsworth, *et al.*, Regulatory Assistance Project, *Beneficial Electrification: Ensuring Electrification in the Public Interest,* at 32 (2018), *available at* https://www.raponline.org/wp-content/uploads/2018/06/6-19-2018-RAP-BE-Principles2.pdf.

Appropriate planning at the state and utility level can ensure that EV growth provides grid and ratepayer benefits to EV drivers and non-EV drivers alike. "Time-of-use" (TOU) rates, which vary the rate charged for electricity on set schedules that correspond to daily electricity demand, are an effective form of foundational load management that can ensure EVs do not strain the grid and instead improve grid utilization by shifting load to off-peak hours.[14] A well-designed TOU rate encourages customers to consume electricity during times when there is available energy on the grid, instead of when electricity is in high demand. One analysis found that EVs on separately-metered TOU rates in California consume less than five percent of their total kilowatt-hours (kWh) during system peak hours.[15] Moreover, a national study funded by the Department of Energy found that, in locations with TOU rate options, EV demand spikes at the beginning of off-peak periods.[16] Such programs and incentives help to ensure that electricity is primarily being consumed at off-peak times of the day, which helps to minimize the marginal costs associated with EV charging.

Policies and incentives to encourage charging during off-peak hours can also reduce the operational costs of EVs that are able to charge during off-peak hours, thus reducing the financial barrier to adopting EVs.

In Texas, where the majority of electric demand is served by Retail Electric Providers through market competition, there is nothing that would prevent retailers from designing TOU products specific to EV drivers. Similarly, in those areas that are not subject to competition, municipally-owned utilities, electric cooperatives and investor-owned utilities (outside of ERCOT) could design similar programs.

8. *What are the capabilities of electric vehicle related technologies, such as vehicle-to-grid, to participate in wholesale electricity markets?*

Although the potential for EVs to transmit electricity back into the grid (often referred to as "vehicle-to-grid," or "V2G"), may exist at some point in the future, the necessary technology for that type of bi-directional power flow is not imminent.[17] We do believe there may be

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[14] *See, e.g.*, 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 Pro ject at EVS26* (May 2012).

[15] J. Frost, M. Whited, & A. Allison, "Electric Vehicles are Driving Electric Rates Down." Synapse Energy Economics (June 2019), *available at* https://www.synapse-energy.com/sites/default/files/EV-Impacts-June-2019-18-122.pdf.

[16] Schey, S., D. Scoffield, J. Smart, "A First Look at the Impact of Electric Vehicle Charging on the Electric Grid in The EV Project." EVS26 (May 2012), *available at* https://www.energy.gov/sites/prod/files/2014/02/f8/evs26_charging_demand_manuscript.pdf.

[17] *See* Citizens Utility Board, *The ABCs of EVs*, at 21 (2017) ("[Vehicle-to-grid] transactions are not imminent . . . however the systems to make it work are being developed."). *See also* Max Baumhefner, *et*

opportunities for "intelligent" charging stations to be used as a load resource, or demand response product, participating in short-term calls to reduce charging during peak periods.

9. *Please explain any preferred or best practice facilities siting and design standards for commercial electric vehicle charging stations and why such standards are recommended.*

Information regarding pricing for EV charging services should be clearly and plainly posted in order to support price transparency. EV drivers should be able to easily know what it will cost to charge without the need to enroll in a proprietary network or use proprietary smart phone applications. Additionally, there should be clearly marked phone numbers for technical assistance from the station operator and contact information for a consumer protection division within the state government.

Thank you for considering these critically important issues regarding EV adoption in vehicle electrification in Texas. Should you have any questions regarding the content of this letter, we can be reached at the contact information listed below.

Sincerely,

/s/

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al., Natural Resources Defense Council, *Driving Out Pollution: How Utilities Can Accelerate the Market for Electric Vehicles*, (June 2016) at 5 ("In the future, EV batteries could even put electricity back onto the grid when it is most needed."), and 13 ("Questions remain as to the willingness of automakers to allow their vehicles' batteries to be used for [vehicle-to-grid]. Likewise, the scalability of [vehicle-to-grid] remains to be seen.").