October 2, 2020

Florida Public Service Commission
Office of Commission Clerk
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Submitted electronically via https://secure.floridapsc.com/ClerkOffice/EfilingPublic

Re: Undocketed File, Docket No. 20200000-OT / SB 7018

Dear Clerk,

Please accept for filing the attached comments submitted on behalf of Sierra Club in the above-referenced docket. These comments are submitted in response to the Public Service Commission's September 2, 2020 Memorandum inviting the public to comment on the development of a master plan for electric vehicle (EV) charging station infrastructure on the state highway system. Specifically the memorandum calls for comment on three categories of issues: (1) projections for growth in EV ownership in Florida over ten and twenty years, and the corresponding need for charging infrastructure necessary to support that level of growth in the EV market; (2) strategies to increase the supply of EV charging infrastructure; (3) regulatory structures and the role of utilities in the growth of the EV and EV charging infrastructure marketplace.

If you have any questions about our comments, please do not hesitate to contact me.

Respectfully submitted,

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SIERRA CLUB COMMENTS

Undocketed File	**)**
Docket No. 20200000-OT / SB 7018	**)**
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INTRODUCTION

Sierra Club is pleased to have the opportunity to comment on important legal and policy questions regarding electric vehicles (EVs) and EV charging infrastructure along the state highway system in Florida in response to SB 7018. Sierra Club recognizes that SB 7018 specifically calls for a master plan for EV charging infrastructure along the state highway system, and accordingly we focus many of our responses on policies related to direct current fast charging (DCFC) that is necessary to allow long-range travel along highway corridors. However, we also urge the Commission to create a broader process to address the full range of legal and policy-related EV issues, including barriers to EV adoption, solutions to address those barriers, the benefits of well-managed EV growth, and equity considerations in the state's transportation electrification planning processes. Additionally, we note that adequate EV charging infrastructure is necessary to support all EV use cases, including those outside of the state highway system such as home charging, workplace Level 2, public Level 2 charging in long dwell-time locations, and charging for multi-unit dwellings and Floridians who may not have access to dedicated off-street parking at their homes. Addressing these issues in a single process, encompassing a range of stakeholders, would provide the state with ample information on which to make informed decisions on how best to integrate a growing EV charging load onto its grid.

Many states and utility commissions are prioritizing transportation electrification as a key strategy to improve air quality, reduce the reliance on fossil fuels, and achieve state climate objectives. As summarized in a 2017 paper by the Georgetown Climate Center, a well-managed increase in EV charging "has the potential to provide numerous benefits to the electric grid and customers: reducing all customer rates by spreading fixed distribution maintenance costs over more electricity demand; reducing emissions of greenhouse gases and local air pollutants, including around low- and moderate-income communities that are disproportionately burdened by vehicle pollution; lowering the cost of transportation and increasing equitable access to mobility; and providing grid management services that can help integrate renewables and other distributed and customer-located generation resources."[1] Sierra Club therefore provides direct responses to the Commission's request for comments on EV charging infrastructure, with a focus on DCFC along the state highway system, and we encourage the Commission to create a broader opportunity for the state, the public, utilities, and other relevant stakeholders to come together to address the full suite of EV and EV charging-related issues in a comprehensive and transparent stakeholder process.

SIERRA CLUB'S INTEREST IN THE PROCEEDING

Sierra Club is the nation's oldest and largest grassroots environmental organization, with more than 3 million members and supporters nationwide and more than 40,000 members in Florida. For decades, Sierra Club has used organizing, lobbying, and public education to support policies that seek to reduce emissions of pollutants that harm public health and the environment. Sierra Club works before utility commissions nationwide, including in Florida, to

[1] Georgetown Climate Center and M.J. Bradley, "Utility Investment in Electric Vehicle Charging Infrastructure," at 4 (2017).

help resolve utility regulatory issues related to transportation electrification and is a founding signatory of the Transportation Electrification Accord,[2] a set of guiding principles on EV regulatory issues that has been joined by over 120 signatories representing labor, environmental, consumer health, utility, low-income, vehicle manufacturer, and EV technology company interests. Sierra Club has intervened and/or provided briefing or comments on a range of similar EV related issues before utility regulatory bodies in a number of states across the country, including California, Connecticut, Georgia, Illinois, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Ohio, Oregon, Utah, Vermont, Washington, and Wisconsin, among others.

In February 2020, Sierra Club released a new accord together with consumer and utility interests that explains how utility EV programs can and must deliver benefits to all customers, particularly those in communities most impacted by air pollution and facing burdensome household energy costs.[3] In particular, the statement supports well-structured utility engagement in accelerating transportation electrification in ways that reduce transportation costs for disadvantaged communities and puts downward pressure on electric rates for all utility customers, including those that do not drive an EV. Consistent with these principles, in Florida Sierra Club has advocated for strong transportation electrification policies, including public transit electrification, and supported the creation of Duke Energy Florida's 2018 EV pilot program, through which the company committed to invest up to $8 million in programs related

[2] https://www.theevaccord.com/.
[3] This joint statement is available at: https://www.eei.org/resourcesandmedia/newsroom/Pages/Press%20Releases/2.11_Joint%20Statement_TransportationElectrification.pdf.

to EV charging infrastructure in a variety of EV "use cases," including multi-unit dwellings, workplaces, long-dwell public locations, and highways.[4]

I. PROJECTED EV GROWTH IN FLORIDA

A. 10-year and 20-year projections for EV growth in Florida

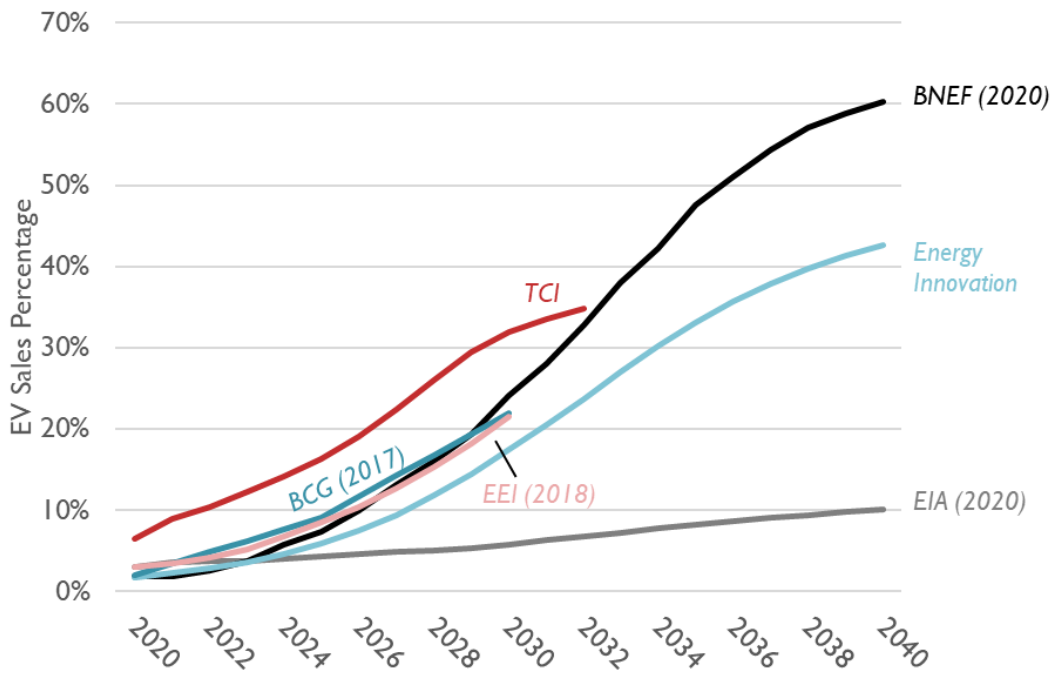
As explained in the attached report from Dr. Erin Camp at Synapse Economics, there are several nationally recognized EV sales projections for the United States.[5] Sierra Club recommends the Commission base any policy recommendations for Florida, and specifically those regarding the need for the adequate supply of EV charging infrastructure on the state's highway system, on the Bloomberg New Energy Finance's (BNEF) 2020 Electric Vehicle Outlook.[6] As explained below and in the attached report of Dr. Camp, using BNEF's national forecast for light duty EV sales percentages, and Florida's existing EV stock, Sierra Club estimates that there will be approximately 1.4 million EVs on the road in Florida in 2030 and 7.2 million EVs on the road in Florida in 2040.

Figure 1, below, shows six projections of national EV sales percentages (light duty EV sales as a percentage of light duty vehicle sales nationally) from 2020 to 2040. Figure 1 includes projections from the BNEF 2020 EV Outlook that Sierra Club recommends the Commission use as a reference point, the Transportation and Climate Initiative Reference Case for the

[4] https://content.sierraclub.org/evguide/blog/2018/10/sierra-club%E2%80%99s-work-launches-groundbreaking-electric-vehicle-pilot-duke-energy-florida.
[5] Erin Camp, Synapse Energy Economics, Comments for EV Workshop/SB 7018, at 2-3 (Oct. 2, 2020). Attached as Exhibit 1. Hereafter cited as "Dr. Camp Comments."
[6] Bloomberg New Energy Finance. 2020. Electric Vehicle Outlook 2020. https://about.bnef.com/electric-vehicle-outlook/.

Northeastern and Mid-Atlantic states,[7] U.S. Energy Information Administration's (EIA) 2020 Annual Energy Outlook projection,[8] Energy Innovation's Energy Policy Simulator business as usual projection,[9] Boston Consulting Group's (BCG) 2017 projection,[10] and Edison Electric Institute's (EEI) 2018 projection.[11] Note that the TCI, BCG, and EEI projections were not developed out to 2040.

Figure 1. Comparison of national EV sales forecasts, 2020–2040[12]



[7] Transportation & Climate Initiative. Reference Case Results Webinar. August 8, 2019. https://www.transportationandclimate.org/sites/default/files/20190808%20-%20TCI%20Webinar%20-%20Reference%20Case%20Results.pdf.

[8] U.S. Energy Information Administration. 2020. Annual Energy Outlook 2020. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2020&cases=ref2020&sourcekey=0.

[9] Energy Innovation. Last accessed December 4, 2019. *Energy Policy Simulator*. Version 2.0.0. https://us.energypolicy.solutions/scenarios/home.

[10] Boston Consulting Group. 2017. https://www.slideshare.net/TheBostonConsultingGroup/the-electric-car-tipping-point-81666290.

[11] Edison Electric Institute. 2018. Page 2. https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_EEI-EV-Forecast-Report_Nov2018.ashx.

[12] Dr. Camp Comments at 3.

Several facets of the BNEF forecast make it suitable for the Commission's use as a reference point in Florida. First, of the national projections examined, BNEF's estimate of 2020 EV sales aligns closely to Florida's historical EV sales. BNEF estimates that EV sales by the end of 2020 will be 1.8 percent of light-duty vehicle sales, whereas Florida's EV sales percentage in 2018 was 1.03 percent. Second, BNEF's forecast for 2018 EV sales proved true: BNEF forecasted EV sales would rise to roughly 2 percent from 1.2 percent in 2017, and actual sales in 2018 were approximately 1.95 percent nationally.[13] Third, this projection falls in the middle of the other projections between 2020 and 2030 and serves as a reasonable consensus estimate for the first decade. Fourth, BNEF annually surveys the EV industry and produces an estimate of the most recent cost of lithium-ion batteries for EVs, which is used to inform BNEF's EV sales projection and its annual EV Outlook report, ensuring that the BNEF sales projection is based on the most recently available data.[14] Finally, the BENF forecast, like the EIA and Energy Innovation forecasts, extend to 2040, providing an additional advantage over estimates based on TCI, BCG, and EEI forecasts.

To translate projections for EV sales percentages into EV stock projections, Dr. Camp multiplied EV sales percentages for each year by the projected number of light-duty vehicle sales in the state.[15] The projected number of light-duty vehicle sales was derived by applying the EIA's projection of year-over-year, light-duty vehicle sales growth to the number of light-duty vehicle sales in Florida in 2018. Dr. Camp then calculated the total number of registered

[13] Bloomberg New Energy Finance. July 2017. "Electric Vehicle Outlook 2017: Executive Summary." Page 3. Available at: https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF_EVO_2017_ExecutiveSummary.pdf.
[14] Additional drawbacks of the other national models cited are explained in Dr. Camp's Comments at 3-4.
[15] Dr. Camp Comments at 4-5.

EVs on the road in Florida in each year by summing all EVs sold in prior years and subtracting out the number of EVs expected to be retired. To conservatively estimate the fraction of EVs that will remain on the road after a given number of years, Dr. Camp applied the Vehicle Survivability function for cars developed by the U.S. Environmental Protection Agency (EPA).[16]

As shown in Table 1, below, Dr. Camp estimates that Florida will have 1.41 million EVs will be on the road in 2030 and 7.21 million EVs on the road in 2040. In recent petitions before the Commission, Tampa Electric Company cited EEI forecasts for EV growth through 2030 to explain the need for utility investment.[17] EEI's 2030 projections are similar to BNEF's 2030 national sales forecasts but do not extend to 2040. Similarly, Florida Power & Light's petition for its proposed EV Charging Pilot for Level 3 DC Fast Chargers forecast it would have nearly 600,000 EVs in its service territory by 2030, accounting for approximately 5 percent of all registered vehicles in its territory.[18]

Table 1. Conversion of BNEF EV sales forecast into EV stock estimate for Florida, 2021-2040[19]

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
EV Sales Fraction	1.79%	2.52%	3.75%	5.80%	7.29%	9.96%	13.11%	15.96%	19.33%	24.09%
EV Sales	23,370	32,741	49,129	76,653	96,975	132,934	175,609	214,307	260,302	324,183
LDV Sales	1,303,380	1,297,719	1,309,747	1,321,837	1,330,975	1,334,273	1,339,502	1,342,778	1,346,621	1,345,717
EV Stock	86,059	118,077	166,229	241,490	336,416	466,433	637,843	846,321	1,098,651	1,412,082

[16] U.S. Environmental Protection Agency. July 2016. "Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025." EPA-420-D-16-900.

[17] Florida Public Service Commission, In re: Petition of Tampa Electric Company for Approval of Electric Vehicle Charging Pilot Program, Docket No. 20200220-EI, at 3 (Sept. 25, 2020).

[18] Florida Public Service Commission, Petition of Florida Power & Light for Approval of Optional Electric Vehicle Public Charging Pilot Tariffs, Docket No. 20200170-EI, at 6 (June 19, 2020). FPL's petition does not indicate what it forecasts for an EV sales percentage in 2030, which BNEF forecasts at roughly 24 percent in 2030.

[19] Dr. Camp Comments at 5.

Year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
EV Sales Fraction	27.96%	32.86%	38.07%	42.23%	47.58%	51.00%	54.42%	57.10%	58.88%	60.22%
EV Sales	375,771	441,568	511,192	567,079	640,569	689,718	739,779	781,187	809,475	831,105
LDV Sales	1,343,961	1,343,785	1,342,767	1,342,835	1,346,299	1,352,388	1,359,389	1,368,103	1,374,787	1,380,114
EV Stock	1,773,252	2,195,710	2,681,943	3,216,098	3,814,074	4,449,105	5,119,035	5,811,980	6,511,360	7,206,595

B. Estimate of the number of charging stations needed to meet EV growth

1. Summary of conclusions

As detailed in Dr. Camp's report, Sierra Club estimates that based the Department of Energy's EVI-Pro Lite tool and the projected growth in EV ownership in Florida described above, Florida will need approximately 22,000 workplace Level 2 EV charging stations, 14,000 public Level 2 EV charging stations, and 4,000 DCFC stations by 2030 to support 1.4 million EVs on its roads. By 2040, when we estimate Florida will have more than 7 million EVs on the road, the state would need approximately 110,000 workplace Level 2 stations, 67,000 public Level 2 stations, and 23,000 DCFC stations.[20]

2. Methodology and sources

The Department of Energy's EVI-Pro Lite tool is a reputable resource for estimating the number of EV charging stations needed to meet the needs of a certain number of EVs for a given state, given a specified level of anticipated EV growth.[21] The user selects the state of interest, inputs the number of EVs in the passenger vehicle stock, the ratio of battery electric vehicles (BEV) to plug-in hybrid electric vehicles (PHEV), and the percentage of drivers with access to home charging. The tool outputs the number of stations and plugs needed for each of three types of charging stations: Public Level 2, Workplace Level 2, and DCFC stations.

[20] Dr. Camp Comments at 7.

[21] Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. U.S. Department of Energy Alternative Fuels Data Center. Accessed September 25, 2020. https://afdc.energy.gov/evi-pro-lite.

To use the EVI-Pro Lite tool, Dr. Camp recommends relying on the 2020 BNEF Electric Vehicle Outlook report to furnish the assumed ratio of BEVs to PHEVs for 2030 and 2040. BNEF estimates that EV stock will be 66 percent BEVs in 2030 and 80 percent BEVs in 2040.[22] Additionally, Dr. Camp recommends using the U.S. Census Bureau's American Community Survey (ACS) data to furnish the assumed percentage of drivers with access to home charging. The 2018 ACS 5-year Estimates data indicate that about 33 percent of Florida homes are large multifamily (five or more units) dwellings.[23] Renters and residents of multi-family dwellings often lack dedicated off-street parking spots, which makes home charging difficult. In cases where residents of multi-family dwellings do have dedicated parking spots, the parking spots are often far from access to electricity or the vehicle owners do not have the ability to modify parking areas to install charging stations. As a result, Dr. Camp recommends assuming that only 66 percent of Florida drivers have access to home charging.

3. Existing EV charging infrastructure (2020)

According to the Alternative Fuels Data Center's Fueling Station Locator, there are 195 existing DCFC stations (with a total of 776 plugs), 1,334 existing public Level 2 stations (with a total of 3,472 plugs), and 189 private (e.g., workplace) Level 2 stations (with a total of 509 plugs) as of September 2020.[24] Dr. Camp's calculations estimate that Florida has about 63,200 registered EVs across the state in 2020. According to EVI-Pro Lite, Florida currently needs about

[22] Bloomberg New Energy Finance. 2020. Electric Vehicle Outlook 2020. https://about.bnef.com/electric-vehicle-outlook/.

[23] American Communities Survey. 2018 5-Year Estimates. Accessed September 30, 2020. https://data.census.gov/cedsci/table?q=Housing%20Units&g=0400000US12&tid=ACSDP5Y2018.DP04&hidePreview=false.

[24] Alternative Fueling Station Locator. United States Department of Energy Alternative Fuels Data Center. Accessed September 25, 2020. https://afdc.energy.gov/stations/#/analyze.

189 DCFC stations and 6,216 Level 2 stations to support its existing stock of EVs. This means that, at present, Florida has about the right number of DCFC stations, but has only about 1/6th the amount of Level 2 stations to appropriately support its existing EV stock.

4. Future EV charging infrastructure needs in 2030 and 2040

Sierra Club estimates that Florida will have about 1.41 million EVs on the road by 2030. Based on this expected growth trajectory, the EVI-Pro Lite tool estimates that Florida would need approximately 22,000 workplace Level 2 stations, 14,000 public Level 2 stations, and 4,000 DCFC stations by 2030. In 2040, when we project Florida will have more than 7 million EVs on its roads, the state will need approximately 110,000 workplace Level 2 charging stations, 67,000 public Level 2 stations, and 23,000 DCFC stations.[25]

II. STRATEGIES TO DEVELOP THE SUPPLY OF EV CHARGING STATIONS IN FLORIDA

A. Strategies to develop the supply of charging stations, including methods of building partnerships between charging station installers, governmental entities, electric utilities, the business community, and the public.

Recognizing that SB 7081 directs the Commission to specifically address EV charging infrastructure – and to do so only with respect to the state highway system – Sierra Club urges the Commission to open a broader EV investigation docket to explore ways in which the state, utilities, and the Commission specifically, can effectively support the growth of the EV marketplace in Florida, encourage development of sufficient EV charging infrastructure of all types throughout the state, to ensure that the integration of a large numbers of EVs onto the grid is effectively managed to maximize grid and ratepayer benefits, and to ensure that the benefits of transportation electrification reach low- and moderate-income communities and

[25] Dr. Camp Comments at 5-7.

communities of color as quickly as possible. Sierra Club recognizes that there are currently several proceedings in Florida that will address certain issues regarding EVs and EV charging infrastructure, including this proceeding; Tampa Electric Company's recently proposed EV Charging Pilot Program, PSC Docket No. 20200220-EI; Florida Power and Light's proposed EV Pilot for DCFC stations within its service territory, PSC Docket No. 20200170-EI; and the ongoing Florida Department of Agriculture's EV Roadmap process, which presents a series of "business-as-usual" evaluations of various EV-related issues but by design is not intended to address the need for particular policy or regulatory solutions related to EVs or EV charging infrastructure.[26]

Sierra Club urges the Commission to create a single docket that will explore these issues by bringing together state agencies, public utilities, cities, vehicle manufacturers, EV charging service providers, public interest organizations, and other stakeholders. A wide ranging process would allow the state to identify barriers to EV adoption specific to Florida, establish key areas of consensus on solutions to address those issues, and provide recommendations to the state legislature and state agencies on appropriate next steps. Such an EV investigation docket is a common approach to identifying barriers to EV adoption and ensuring states have regulatory policies in place that will maximize the benefits of EVs to the grid, EV drivers, and ratepayers—including those that do not drive an EV.

[26] Florida Department of Agriculture, "Interim Report – Emergency Evacuation of Florida Electric Vehicles," at 2 (July 30, 2020).

B. Examples of strategies adopted or being considered in other states that could be implemented in Florida

1. Stakeholder processes in other states

As noted above, Sierra Club urges the Commission to create a single, comprehensive EV investigation stakeholder process in order to bring together relevant stakeholders, including state agencies, public utilities, EV charging service providers, vehicle manufacturers, and the public. These types of EV investigations have taken place before utility regulatory commissions in numerous states, including Washington, Michigan, Minnesota, Missouri, California, Arizona, Colorado, Massachusetts, New York, Kentucky, Illinois, Vermont, Wisconsin, and Virginia. As just one example, earlier this year, the Virginia State Corporation Commission convened a broad EV regulatory docket that entailed various state offices, EV charging service providers, the public, public utilities, and other interested members of the public.[27] Another approach the Commission could take, as other states have done, is to direct utilities to develop and submit for approval strategic plans to integrate EV load in a manner that improves the utilization of the grid, facilitates the use of renewable generation, and provides fuel cost savings (relative to gasoline and diesel) for EV drivers that charge during off-peak hours.

2. Rate design should be a central focus of the state's planning efforts

As part of any broad stakeholder process, Sierra Club recommends the Commission focus particular attention on rate design issues, which are essential for properly managing EV charging loads. When properly managed, EVs can provide the grid with flexible, manageable

[27] Virginia State Corporation Commission, Docket No. PUR-2020-00051, Electrification of Motor Vehicles (Mar. 24, 2020) (inviting public comment on sixteen specific questions addressing EV growth in Virginia, rate design, storage issues, public charging, and the role of public utilities).

load.[28] 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. Light duty EVs, which are primarily charged at home, typically sit idle for the overwhelming majority of the day; this flexibility allows for a large share of EV charging to occur at off-peak times when the grid is underutilized and when marginal costs to serve additional load are low. Thus, if charging is managed to occur during off-peak periods, EV load can "fill valleys" in load without increasing overall capacity requirements. The most effective way to do this is through the use of clear price signals that are passed through as actual costs to the person making charging decisions. Absent such price signals, the EV owners would have no reason – and likely no awareness of the need – to avoid charging at high load times.

Sierra Club recommends the Commission, with input from stakeholders across the state, engage in a review of current utility rates for compatibility with transportation electrification use cases, and, where rates are not optimized to support transportation electrification, the Commission should direct or lead a process to develop new rates. Core issues to address should include time-variant electricity rates for Level 2 charging of conventional EVs at long-dwell time locations, particularly at home, and demand charges in the context of DCFC and medium- and heavy-duty electrification. Given the focus of SB 7081 on DCFC along state highways, it is worth noting here that to varying degrees, new tariffs with limited or suspended demand charges for high-power charging of light-, medium- and heavy-duty electric vehicles have been

[28] *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 (2015); CAISO, *California Vehicle-Grid Integration (VGI) Roadmap: Enabling Vehicle-Based Grid Services* (2014).

implemented in California, Oregon, Hawaii, New York, Rhode Island, Maryland, Connecticut, and Washington, D.C.[29]

Rate design can and should be structured to incentivize EV adoption by ensuring rates provide fuel cost savings to EV drivers and fleet operators, relative to gasoline and diesel,[30] though the steps to ensuring fuel cost savings will depend on the use case.[31] Rate design includes both the volumetric ($/kWh) fees, any fixed charges (such as demand charges or distribution charges) as well as non-avoidable surcharges that do not vary with the amount of energy consumed. Taken together, these comprise a customer's bill and send price signals to customers about how and when to consume energy. Effective rate design will send clear price signals to consumers and can lead to dramatic changes in consumer charging behavior, thus ensuring that increased EV adoption can be integrated into the grid without the need to build additional electricity generating capacity.

When properly managed to ensure off-peak charging, increasing levels of EV adoption will drive down rates for all utility customers, including those that do not drive an EV and thus avoid any concern over cost shifting to non-EV drivers. There are two primary functions of rate design as it relates to EVs: (1) manage EV load to maximize benefits to customers, drivers, and the grid; and (2) develop rate structures that reflect the unique characteristics of the EV use case and load in order to support the development of a robust EV charging network and to

[29] Three of these examples are described in more detail below in section III.D.
[30] The Department of Energy estimates that an "e-gallon," which it defines as "the cost of fueling a vehicle with electricity compared to a similar vehicle that runs on gasoline" is $1.07 in Florida, compared to $2.09 for regular gasoline in the state. https://www.energy.gov/maps/egallon (data and methodology updated Sept. 26, 2020).
[31] Examples of "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 fleets that are publicly or privately owned, among others.

ensure that assets developed under this program are used and useful. At a basic level, electricity rates are determined by dividing the total amount of electricity sold by the total costs associated with delivering the electricity. If total electricity sales increase while costs remain relatively stable, rates will decline.[32] Supporting EV adoption in Florida with a well-designed utility transportation electrification program will increase total electricity sales (due to increased EV charging) with minimal additional cost.[33] This would put downward pressure on rates for all Floridians—including both EV owners and non-EV owners alike.[34]

A report by Synapse Energy Economics, "Electric Vehicles are Driving Electric Rates Down," updated in June 2020 to reflect the most recent information, analyzed data from the two utility service territories with the highest number of EVs in the country, Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE), and found that EVs put downward pressure on rates for all ratepayers, including those that do not drive an EV. As depicted in Figure 2, below, Synapse compared the revenue the utilities collected from EV drivers with the cost of the energy required to charge those vehicles, along with the costs of the utility EV programs such as any associated upgrades to the distribution and transmission grid. Synapse found that EV drivers in these two utility territories contributed nearly $600 million

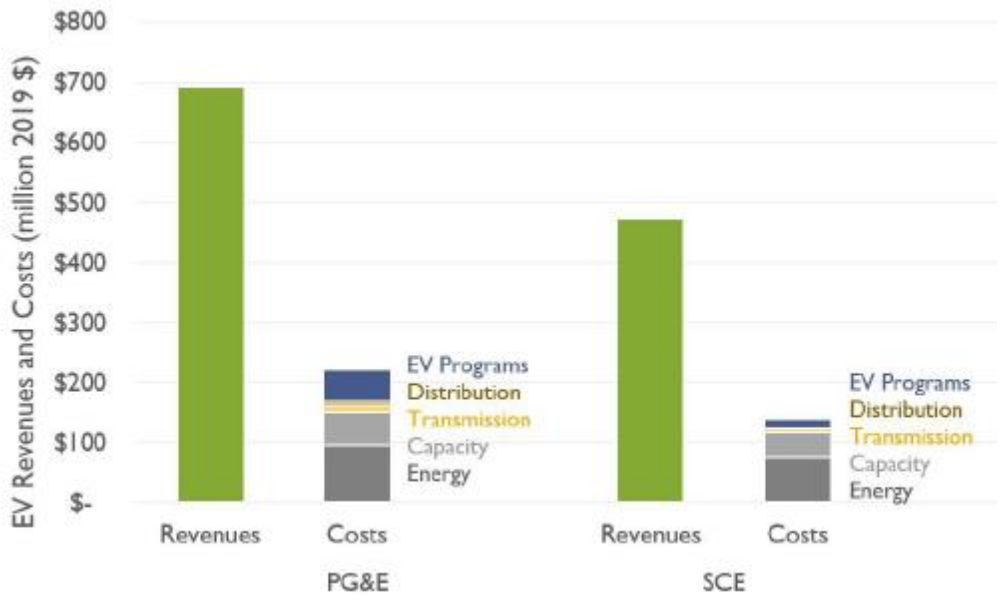
[32] Frost, J., M. Whited, A. Allison. "Electric Vehicles are Driving Electric Rates Down," Synapse Energy Economics (June 2020). https://www.synapse-energy.com/sites/default/files/EV_Impacts_June_2020_18-122.pdf.

[33] Knight, P., E. Camp, D. Bhandari, J. Hall, M. Whited, B. Havumaki, A. Allison, N. Peluso, T. Woolf, "Making Electric Vehicles Work for Utility Customers: A Policy Handbook for Consumer Advocates," Synapse Energy Economics (2019). https://www.synapse-energy.com/sites/default/files/Making-Electric-Vehicles-Work-for-Utility-Customers.pdf.

[34] M.J. Bradley has prepared formal cost benefit analyses of EV adoption in more than a dozen states, including Florida, with consistent results supporting transportation electrification on financial grounds, even without quantifying benefits of reductions of greenhouse gas emissions or public health improvements from lower levels of smog and other transportation related local pollution. *E.g.*, M.J. Bradley & Associates, "Electric Vehicle Cost-Benefit Analysis: Plug-In Vehicle Cost-Benefit Analysis: Florida," at ii-iii (2019). https://www.mjbradley.com/sites/default/files/FLPEVCBAnalysis07jan19.pdf.

more than the necessary costs to serve those customers, and thus that "EVs offer a key opportunity to reduce harmful emissions and save customers money at the same time."[35]

Fig. 2. PG&E and SCE Revenues and Costs of EV Charging, 2012-2019[36]



III. REGULATORY STRUCTURES AND PARTICIPATION OF PUBLIC UTILITIES IN THE EV CHARGING MARTKETPLACE

A. Regulatory structures necessary for delivery of electricity to EV charging station infrastructure

A utility investment in public infrastructure should work to address barriers to EV adoption and maximize EV charging benefits. Rather than focusing on any particular ownership or investment model (such as incentives, make-ready, or utility ownership of charging infrastructure), utility EV program effectiveness should be measured by the Commission establishing simple goals for such programs. The Commission should consider whether a proposed utility investment to deploy EV charging is: (a) strategic and supports deployment in

[35] Frost, *et al.*, "Electric Vehicles are Driving Electric Rates Down," at 1.
[36] *Id.* at 4.

key market segments; (b) equitable—reaching presently underserved market segments, supporting deployment of varied vehicle types to improve access to clean transportation for all utility customers, and addressing sources of transportation air pollution that disproportionately burden certain communities; (c) designed to ensure EV load is well-integrated with the grid, by including time-variant rates, demand response, or leveraging other technology; (d) supportive of an innovative and sustainable EV technology market; and (e) complementary to other sources of clean vehicle or charging infrastructure funding to maximize use of utility customer dollars. Each of these goals can be achieved under any program design or ownership model, and we urge the Commission to avoid pre-ordaining one utility program model or design.[37] There is value in testing different solutions to different EV infrastructure needs, and below we address some considerations that are particularly relevant to public charging.

1. Load management and consumer protection

Whether an EV charging station under a utility program is owned by the utility or not, regulators should pay special attention to how pricing is structured for EV drivers that will plug in at that station. Where utilities own a charging station, prices should be set consistent with Commission-approved rates. Where a third-party owns a station that is fully or partially funded by utility ratepayers, the Commission should approve program terms that include reasonable oversight of that pricing. A common approach has been for Commissions to require that site

[37] State utility commissions have embraced the importance of exploring a variety of business models and ownership structures. For example, in 2017 the Washington Utilities and Transportation Commission found that "[t]here is no consensus on the 'right' model to accomplish market transformation, and flexibility is essential at this early stage." *Policy and Interpretive Statement Concerning Commission Regulation of Electric Vehicle Charging Stations,* Docket UE-160799*,* In the Matter of Amending and Adopting Rules in WAC 480-100 Rulemaking to consider policy issues related to the implementation of RCW 80.28.360, electric vehicle supply equipment (filed June 14, 2017), Washington Utilities and Transportation Commission.

hosts pass-through the relevant Commission-approved rate as a default, but to allow site hosts to set their own pricing to reflect on-site needs as necessary, and for site hosts to report all prices charged to EV drivers.

2. Overall program cost and utility incentives

Program design considerations are far more consequential than ownership model type. Specifically, the use of site host contribution payments in a utility ownership model can offset a chosen portion of the cost of utility ownership, while ensuring that site hosts have a meaningful financial stake in stations they are hosting.[38] Site host contributions can be structured such that different program models (i.e., utility ownership, rate, or make-ready) have the same ratepayer impact. Focus should therefore be on costs relative to program goals rather than on ownership model per se. Likewise, the Commission should consider developing appropriate performance incentive metrics to connect utility financial incentives to tangible, desired outcomes rather than capital expenditures.

B. Competitively neutral policies in the EV charging marketplace

In Sierra Club's view, there is ample space in the emerging EV charging market for both utilities and private third-party providers. Utility investments in EV charging can overcome the market coordination problem that results from high upfront costs of charging infrastructure, and advance the market for EVs and EV service providers alike, particularly in certain market segments such as multi-unit dwellings. For example, state utility commissions in Washington,

[38] By way of illustration, Rhode Island National Grid proposed a site host cost share for utility owned stations that would equalize the cost proposition for site hosts between the utility's make-ready offering and its full utility ownership offering. The Narragansett Electric Co. d/b/a National Grid, Testimony and Schedules of: Power Sector Transformation Panel, Book 1 of 3, Rhode Island Pub. Utils. Comm'n Dkts. 4770/4780 (Nov. 27, 2017), Ch. 5 at 6.

Michigan, Ohio, Massachusetts, Florida, Oregon, Utah, Nevada, California, and Kentucky, among others, have provided guidance and/or authorized utility investment in aspects of EV charging and cost recovery in the normal course of utility regulation.

Particularly as the EV charging market develops and EV adoption continues to grow at this early stage, the experience around the country has been that utility investments in EV charging has supplemented rather than supplanted private investment. Although there may be some concern that allowing utilities to own or operate EV charging stations or related EV supply equipment could have a chilling effect on private investment and innovation, those concerns are largely not shared by charging providers themselves. For example, EVGo, which operates a large public EV fast charging network, explained in 2018 comments submitted to the Illinois Commerce Commission in an EV investigation docket, that, "utilities have been, and are, a critical partner in the EV charging space."[39] At the commission level, the Maryland Public Service Commission led a stakeholder process (similar to the one Sierra Club recommends the Commission undertake here) and found that the process "unveiled the near-consensus that allowing some level of utility involvement in the build-out of EVSE [electric vehicle supply equipment] could catalyze the private market, as well as electric vehicle ownership generally."[40] The California Public Utilities Commission reached the similar conclusion following a lengthy rulemaking process, finding that parties to the case represented "near unanimity that the

[39] EVGo Comments at 1, Illinois Commerce Commission, Docket No. 18-NOI-01 (October 23, 2018).
[40] Maryland Public Service Commission, Case No. PC 44, *In the Matter of Transforming Maryland's Electric Distribution Systems to Ensure that Electric Service Is Customer-Centered, Affordable, Reliable and Environmentally Sustainable in Maryland*, Notice at 8 (January 31, 2017).

utilities should have an expanded role in EV infrastructure support and development in order to realize the potential benefits of widespread EV adoption."[41]

In order to guard against concerns that utility participation could negatively impact private investment in a still emerging EV charging marketplace, several states have folded consideration of competitive concerns into public interest tests for utility investments in this space. For example, Oregon law allows regulators to approve utility programs or proposals to further transportation electrification where, *inter alia,* the programs are "[a]re reasonably expected to stimulate innovation, competition and customer choice in electric vehicle charging and related infrastructure and services."[42]

C. Participation of public utilities in the EV charging marketplace

Utilities are uniquely situated to address infrastructure challenges related to EV charging deployment and facilitate grid integration of EV charging to maximize the benefits of transportation electrification. Common avenues for utility participation include providing rebates, participating in make-ready designs, and directly owning EV charging stations. Given their customer connections, utilizes are also well-positioned to provide education and outreach related to EV benefits and programs to help address lack of consumer awareness. Across the U.S., more than $1.4 billion in utility-driven EV infrastructure investment has been approved by regulators.[43] Every one of the more than two dozen state utility regulatory commissions and

[41] California Public Utilities Commission, Rulemaking 13-11-007, *Order Instituting Rulemaking on the Commission's own motion to consider alternative-fueled vehicle tariffs, infrastructure and policies to support California's greenhouse gas emissions reduction goals,* Decision 14-12-079 at 5 (December 22, 2012).
[42] Oregon SB 1547 § 20(4)(f).
[43] Connor Smith, "Modifications Required for More Than 85 Percent of Approved Utility EV Investments," Atlas EV Hub (Jan. 13, 2020), available at:

state legislatures to consider the role of utilities in the EV charging infrastructure has concluded that utilities can play a role that is complementary to and collaborative with the EV technology market. These regulatory commissions have authorized—or even required—utilities to develop programs to invest in EV charging infrastructure in partnership with EV technology companies, and those regulators can then review utility investments for consistency with relevant public interest or prudency standards.[44] To support an innovative market, it is critical for regulators to take early action to set the expectations for proposed utility investments, announce the standards by which they will be judged, and to resolve related regulatory uncertainty (for example, by clarifying that third party, non-utility owners and operators of EV charging stations will not be subject to regulation as public utilities).

This common regulatory approach that embraces utility and private investment reflects a close look at the EV charging market, which must be viewed in terms of technology for EV charging and the business case for deploying it. First, it is critical to understand that there is a diverse and robust market for the development of the hardware, software, and networking solutions for EV charging stations, and that EV charging stations are the locus of innovation in the EV infrastructure marketplace. Any investment in EV charging—whether by a utility or

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https://www.atlasevhub.com/data_story/modifications-required-for-more-than-85-percent-of-approved-utility-ev-investments/.

[44] *See, e.g.*, *Order Making Findings and Requiring Filings*, In the Matter of a Commission Inquiry into Electric Vehicle Charging and Infrastructure, Docket No. E-999/CI-17-879, Minnesota Public Utilities Commission (issued February 11, 2019); *Order Adopting Guiding Principles and Commencing a Second Technical Conference,* U-18368, Michigan Public Service Commission (issued December 20, 2017); *Power Forward: A Roadmap to Ohio's Electricity Future*, Public Utilities Commission of Ohio; *Policy and Interpretive Statement Concerning Commission Regulation of Electric Vehicle Charging Stations,* Docket UE-160799*,* In the Matter of Amending and Adopting Rules in WAC 480-100 Rulemaking to consider policy issues related to the implementation of RCW 80.28.360, electric vehicle supply equipment (filed June 14, 2017); Massachusetts Department of Public Utilities, DPU 13-182-A, Investigation by the Department of Public Utilities upon its own Motion into Electric Vehicles and Electric Vehicle Charging (filed August 4, 2014); California S.B. 350; Oregon S.B. 1547; Colorado S.B. 19-077; New Mexico H.B. 521.

private actor—is entirely reliant on that EV charging technology market. As such, when considering whether a proposed utility investment will support a sustainable and innovative market for EV technology providers, it is critical to assess the nature of the utility's procurement of those charging station components.[45] The common standard is for commissions to consider whether EV investments are, *inter alia*, "reasonably expected to stimulate innovation, competition and customer choice in electric vehicle charging and related infrastructure and services"[46] and to place the onus on utilities to explain how their program meets that standard in any program proposal.[47]

Second, the deployment of EV charging stations often faces a chicken-or-the-egg market coordination problem: would-be EV owners are reluctant to buy an EV without access to comprehensive charging infrastructure; and prospective hosts and funders of EV charging see a challenging business case with a limited number of EVs on the road. This market coordination problem is acute for critical public charging infrastructure like DC Fast Charging stations, which have high upfront costs and require significant revenues for the owner-operator to achieve

[45] For example: Is the utility's request for information and/or request for proposal process open and transparent? Has the utility taken stakeholder input on minimum technology or communications specifications? Does the utility state *what* specifications must be met but not *how* charging solution providers should meet those specifications?

[46] *See* Oregon SB 1547 § 20(4)(f); Colorado SB 19-077 §40-7-105(2)(e); New Mexico H.B. 521 §1(b)(4). The Massachusetts Department of Public Utilities articulated a test for approval of EV-related investments that considered whether proposals were in the public interest, met a need regarding the advancement of electric vehicles in the commonwealth and did not hinder the development of the competitive electric vehicle charging market. Massachusetts Department of Public Utilities, DPU 13-182-A, Investigation by the Department of Public Utilities upon its own Motion into Electric Vehicles and Electric Vehicle Charging (filed August 4, 2014). That test was later codified into law, and the DPU has approved some $65M worth of EV investments for Eversource and National Grid.

[47] *See, e.g.*, *Order Making Findings and Requiring Filings*, In the Matter of a Commission Inquiry into Electric Vehicle Charging and Infrastructure, Minnesota Public Utilities Commission (issued February 11, 2019) (requiring utilities to include a discussion of "market competitiveness/ownership structures" in utility program proposals).

profitability. As a result, there is often a shortage of needed charging stations. Conversely, as charging stations are built out, the value of owning an EV increases and the EV market grows, in turn creating a virtuous cycle that supports continued infrastructure investment. These trends are supported by researchers at Cornell University who analyzed network effects associated with quarterly EV sales in 353 metro areas and found, "the increased availability of public charging stations has a statistically and economically significant impact on EV adoption decisions."[48] This conclusion is further borne out by real-world experiences,[49] demonstrating that building out EV charging infrastructure is a highly effective tactic for increasing EV ownership, and thus implementing policies that encourage EV infrastructure development to the fullest extent possible will help speed EV ownership in Florida.

Utilities are well-positioned to help surmount the market coordination challenges related to infrastructure deployment through rebates and/or direct investment and ownership of some or all infrastructure. Regulators have approved many different program "models" or "designs," ranging from full utility ownership to pure rebate programs, with many models that fall in-between (the most common being a "make-ready" program) and different models can be better suited to certain needs.

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[48] Li et al., *The Market for Electric Vehicles: Indirect Network Effects and Policy Design*, Cornell University, (May 2016) (finding that "a 10% increase in the number of public charging stations would increase EV sales by about 8% while a 10% growth in EV stock would lead to a 6% increase in charging station deployment"); Springel, *Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives,* University of California, Berkeley, (Nov. 1, 2016) (finding that, in Norway, subsidies for electric vehicle charging stations were more than twice as effective at spurring EV purchases as equivalent subsidies for EVs themselves between 2010 and 2015).

[49] *See* Dory Smith, "KC Metro leads the nation in EV adoption," Kansas City Business Journal (June 7, 2017) available at https://www.bizjournals.com/kansascity/news/2017/06/07/kc-metro-electric-vehicle-adoption.html (last visited June 18, 2020) (noting that utility's rapid EV charging infrastructure build out resolved both consumer awareness and range anxiety barriers leading to rapid growth in EV ownership).

D. Examples of regulatory structures adopted, or being considered, in other states regarding electricity supply to EV charging station infrastructure, including examples of competitively neutral policies and the participation of public utilities in the marketplace, that could be implemented in Florida

As explained above, rate design is central to the effective management of increased EV electricity load in ways that benefits the grid, EV drivers, and all ratepayers, including those that do not drive EVs. Below we address three specific scenarios where utility investment and rate design can play a key role in better serving EV drivers and helping to ensure equitable access to clean transportation options. Ultimately, ratemaking design and review of cost recovery for potential utility programs should provide for flexibility; there is no consensus on what single utility program model works best, as different program solutions will be appropriate for different infrastructure challenges. From Sierra Club's perspective, utility investment in EV charging infrastructure should support the competitive market and robust management of new EV load in order to deliver the grid benefits that justify utility investment.

1. Demand charge relief for DCFC stations – California and Oregon

Rate design should be optimized to account for the intended use cases. Because demand charges often do a poor job of reflecting actual distribution system costs, and because energy costs are better reflected in time-varying volumetric rates, reforming demand charges in general is good policy.[50] Demand charges create a disincentive for private investment in DCFC stations, particularly in the early years of the market where EV adoption is lower than the number of vehicles that can be supported by the fast charging infrastructure market.

[50] *See Borenstein, Severin*, *The Economics of Fixed Cost Recovery by Utilities*, Energy Institute at Haas Working Paper 272R (July 2016).

Many demand charges over-collect by including non-facilities-related costs that should be collected in volumetric rates. Likewise, non-coincident demand charges are not generally cost-based. "Time-of-use" rates with a sufficient on-peak to off-peak price ratio can send nearly the same price signal to reduce peak demand as a rate with a coincident demand charge, but without the complexity associated with charging for both kilowatt-hours and kilowatts. In contrast to purely volumetric rates, rates with demand charges can also frustrate the ability of a DCFC site-host to recover electricity costs from itinerant EV drivers because the site-host cannot know what their ultimate bill will be until the end of a billing cycle and cannot therefore recover those costs in advance.

Many states have taken steps to minimize the impact of demand charges by instituting some form of demand charge relief. Here we briefly describe three examples. First, in 2019 the California Public Utilities Commission ("PUC") approved a request by Pacific Gas & Electric Company to replace demand charges with monthly subscription and energy charges.[51]

Second, in 2017, the California PUC approved Southern California Edison's ("SCE's") commercial TOU rates designed for DC Fast Charging, and medium and heavy-duty fleet electrification, which will phase in demand charges over time as utilization improves.[52] SCE's proposed rates cover a wide range of potential users, with one rate for customers with peak demand between 21 and 500 kW (TOU-EV-8) that would likely serve public DC Fast Charging

[51] California Public Utilities Commission, Decision 19-10-055, Decision Approving Application for Pacific Gas and Electric Company's Commercial Electric Vehicle Rates, at 5 (Oct. 24, 2019) ("There are no demand charges or fixed charges proposed for the [commercial electric vehicle] rates. Costs normally collected by such charges would instead be collected through the subscription charge and energy charges."), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M318/K552/318552527.PDF.

[52] California Public Utilities Commission. SDG&E, SCE, and PG&E Standard Review Proposals for Transportation Electrification Investments Pursuant to SB 350 (2017), www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442453911.

station operators and smaller electrified fleets and another rate for customers with peak demand greater than 500 kW (TOU-EV-9).[53]

Third, in 2017 Pacific Power received approval from the Oregon Public Utility Commission for a special tariff (Schedule 45) rate that replaces a portion of demand charges with higher on-peak energy charges for a nine-year period.[54] At the end of this nine-year period, DC Fast Charging station operators would return to Pacific Power's regular demand charge tariff. Energy charges would increase by $0.107 per kWh in the first year of the program, and the rate would fall by ten percent each year for nine years; demand charges would be discounted by 90 percent, with the discount falling by ten percent in each subsequent year. DC Fast Charging operators are estimated to reduce electrical bills by up to 59 percent in the first year under this tariff.[55] This special tariff is only available to DC Fast Charging station operators who provide charging to the public and have up to 1,000 kW of peak demand.[56]

2. Multi-unit dwellings and equity considerations – California

With regard to equity and ensuring benefits to underserved market segments, there is a particularly compelling case to allow a utility ownership option for utility programs targeting multi-family dwellings. Based on initial data from utility EV program implementation in California using different ownership models, there is some evidence that a full utility ownership model may be valuable in helping to reach this presently underserved market. Specifically, as of

[53] *Id.*

[54] Pacific Power, Advice 16-020 – Schedule 45–Public DC Fast Charger Delivery Service Optional Transitional Rate–Supplemental Filing (2017), http://edocs.puc.state.or.us/efdocs/UAB/adv485uab161812.pdf.

[55] Public Utilities Commission of Oregon, Order Number 17 172 (2017). http://edocs.puc.state.or.us/efdocs/HAU/adv485hau12343.pdf.

[56] *Id.*

March 5, 2018, San Diego Gas & Electric, which utilized a full utility ownership model, had 40 percent of its contracted charger installations (101 of 253) located at multi-unit dwellings and 38 percent of its contracted charger installations (96 of 253) located in disadvantaged communities.[57] By contrast, as of the end of January 2018, Southern California Edison, which used a make-ready model, had deployed charging installations only at three multi-unit dwellings, representing approximately seven percent of completed installations.[58] Another option for encouraging EV ownership among people who live in multi-unit dwellings and may not have dedicated off-street parking is to provide rebates for public fast charging located near high concentrations of apartment buildings.

3. Whole-home and EV-specific "time of use" rates – Minnesota

Time-varying rates have long been recognized as a foundational form of load management to ensure that transportation electrification does not strain the grid and instead improves grid utilization to the benefit of all utility customers. Since TOU rates send expected, pre-defined price signals, they encourage regular and prolonged behavior modifications that benefit the overall grid. Both "EV-only" TOU rates, which utilize a separate or sub-meter, and "whole-home" TOU rates, where all electricity use is billed by time-of-use on a single meter, are viable options. Whole-home time-varying rates designed with EV load in mind can provide a

[57] Electric Vehicle-Grid Integration Pilot Program ("Power Your Drive") Fourth Semi-Annual Report of San Diego Gas & Electric Company (U902-E), California Public Utilities Commission Rulemaking 13-11-007 (Mar. 20, 2018), at 31.
[58] Southern California Edison, Charge Ready Advisory Board Meeting (Feb. 28, 2018), at Slide 45.

foundation for successful load management, but may not provide the price transparency of EV-specific TOU rates and involve uncertainty regarding net benefits.[59]

As one example, in Minnesota, Xcel Energy recently released an annual report on its EV pilot, which includes an EV TOU rate that require a second meter, and a TOU rate that uses a single meter and utilize the EV's smart charger to report EV energy consumption that gets billed on a TOU rate.[60] This latter option, which can be used in conjunction with a whole-home TOU rate, saves customers an average of $2,196 in up-front meter and installation costs.[61] Overall, Xcel reports that 93% of EV consumption occurs during off-peak hours.[62]

CONCLUSION

Thank you for the opportunity to comment on these critically important issues regarding transportation electrification in Florida. Sierra Club looks forward to working with the Commission, staff, and other stakeholders to support the growth of EVs and EV charging infrastructure in Florida in a manner that lowers barriers to EV adoption, supports innovation in the EV service provider marketplace, and maximizes environmental, grid, and ratepayer benefits of EVs.

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[59] MJ Bradley & Associates, *Electricity Pricing Strategies to Reduce Grid Impacts from Plug-in Electric Vehicle Charging in New York State* at 8 (2015) (recommending that whole-home TOU rates should be designed to be revenue neutral for the majority of customers when compared to the standard rate, but result in a lower bill for the EV driver who charges during off-peak hours but does not shift any non-EV electricity load).

[60] Xcel Energy, Minnesota Public Utilities Commission, Compliance Filing Residential Electric Vehicle Charging Tariff Docket No. E002/M-15-111, E002/M-17-817, AND E002/M-19-186 (June 1, 2020), https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={004B7572-0000-C2B4-B383-456C902F125F}&documentTitle=20206-163660-06.

[61] *Id.* at 10-12.

[62] *Id.* at 6.

Respectfully submitted,

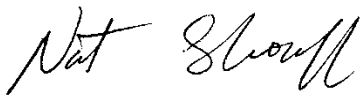

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EXHIBIT A

Memorandum

TO: STATE OF FLORIDA PUBLIC SERVICE COMMISSION

FROM: ERIN CAMP, PHD OF SYNAPSE ENERGY ECONOMICS, ON BEHALF OF SIERRA CLUB

DATE: OCTOBER 2, 2020

RE: COMMENTS FOR EV WORKSHOP/SB 7018

Introduction

As required by state law, the Florida Department of Transportation is required to develop an electric vehicle (EV) charging station infrastructure master plan ("the master plan") for the State Highway System, together with the Public Service Commission (PSC) and the Department of Agriculture and Consumer Services. The PSC is responsible for the development of certain goals and objectives within the master plan, and it is seeking comments from interested parties on three topics: projecting EV growth in the state of Florida and ensuring adequate supply of chargers; strategies to developing charging station supply in the state; and regulatory structure to support the growth of EVs in Florida.

On behalf of the Sierra Club, Erin Camp, PhD, of Synapse Energy Economics, Inc. is providing comments below on the first topic: projecting EV growth and ensuring an adequate supply of chargers.[63] Dr. Erin Camp is a consultant with nearly a decade of experience in the energy field. Her areas of expertise include electrification of transportation and buildings, distributed energy resources, renewable energy siting and economics, and electric rate design. She recently authored expert witness testimony to the Virginia State Corporation Commission regarding the topic of electric vehicle sales and stock projections and charging station requirements.[64] Dr. Camp holds a PhD in Geological Sciences from Cornell University.

We appreciate the opportunity to provide comments on this important topic. The comments of Dr. Camp follow.

[63] Synapse Energy Economics (Synapse) is a research and consulting firm specializing in electricity and gas industry regulation, planning, and analysis. Our work covers a range of issues, including economic and technical assessments of demand-side and supply-side energy resources; energy efficiency policies and programs; integrated resource planning; electricity market modeling and assessment; renewable resource technologies and policies; and climate change strategies.

[64] Direct Testimony of Erin Camp, PhD regarding Application of Virginia Electric and Power Company for approval of plan for electric distribution grid transformation projects. On behalf of Sierra Club. December 13, 2019.

Florida Electric Vehicle Projection

An EV charging station network with sufficient chargers in diverse, well-balanced locations (e.g., multi-unit or multi-family dwellings, workplaces, highways, and transit routes) is critical to mitigate range anxiety and support EV adoption. Ensuring that the charging station network is expanded early and often to support expected EV growth will prevent natural growth in the EV market from being stifled.

Estimating the number of EV charging stations needed in Florida by 2040 requires an estimate of the forecasted EV stock in Florida in each year between 2020 and 2040. To calculate an estimate of EV stock in Florida by 2040, I recommend translating national EV *sales* projections into EV *stock* values for each year between 2020 to 2040. Below I provide an overview of national EV sales forecasts, a reasoning for which forecast I believe is most reliable, and a calculation of a 10- and 20-year EV projection for Florida using the selected EV sales forecast.

Selecting an Accurate EV Sales Projection

There are several nationally recognized EV sales projections for the United States. These include the Transportation and Climate Initiative Reference Case for the Northeastern and Mid-Atlantic states,[65] Bloomberg New Energy Finance's (BNEF) 2020 Electric Vehicle Outlook,[66] the U.S. Energy Information Administration's (EIA) 2020 Annual Energy Outlook projection,[67] Energy Innovation's Energy Policy Simulator business as usual projection,[68] Boston Consulting Group's (BCG) 2017 projection,[69] and Edison Electric Institute's (EEI) 2018 projection.[70] Figure 1 shows these six projections of EV sales from 2020 to 2040. Note that the TCI, BCG, and EEI projections were not developed out to 2040.

As the PSC develops goals and objectives for the Florida EV infrastructure master plan, I recommend using the projection based on the BNEF EV sales forecast for several reasons. First, of the five national projections examined, BNEF's estimate of 2020 EV sales aligns closely to Florida's historical EV sales. BNEF estimates that EV sales by the end of 2020 will be 1.8 percent of light-duty vehicle sales, whereas Florida's EV sales percentage in 2018 was 1.03 percent. Second, BNEF's forecast for 2018 EV sales proved true: BNEF forecasted EV sales would rise to roughly 2 percent from 1.2 percent in 2017, and

[65] Transportation & Climate Initiative. Reference Case Results Webinar. August 8, 2019. https://www.transportationandclimate.org/sites/default/files/20190808%20-%20TCI%20Webinar%20-%20Reference%20Case%20Results.pdf.

[66] Bloomberg New Energy Finance. 2020. Electric Vehicle Outlook 2020. https://about.bnef.com/electric-vehicle-outlook/.

[67] U.S. Energy Information Administration. 2020. Annual Energy Outlook 2020. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2020&cases=ref2020&sourcekey=0.

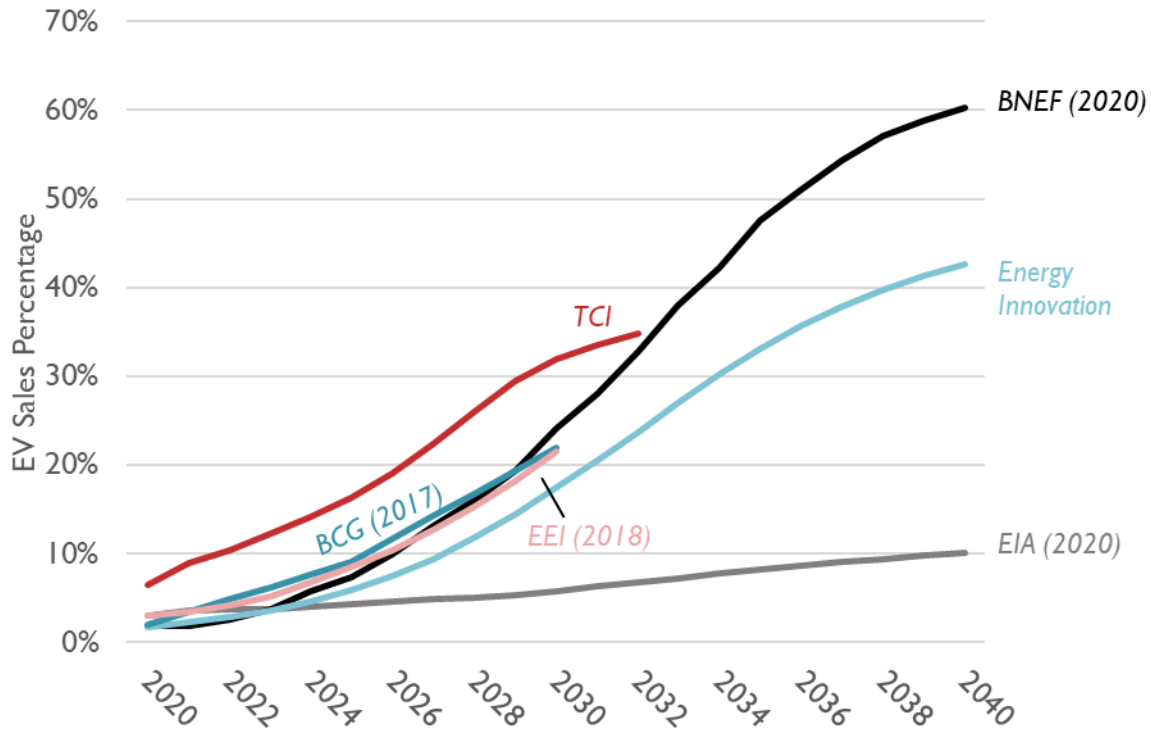
[68] Energy Innovation. Last accessed December 4, 2019. *Energy Policy Simulator*. Version 2.0.0. https://us.energypolicy.solutions/scenarios/home.

[69] Boston Consulting Group. 2017. https://www.slideshare.net/TheBostonConsultingGroup/the-electric-car-tipping-point-81666290.

[70] Edison Electric Institute. 2018. Page 2. Available at: https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_EEI-EV-Forecast-Report_Nov2018.ashx.

actual sales in 2018 were approximately 1.95 percent nationally.[71] Third, this projection falls in the middle of the other projections between 2020–2030 and serves as a reasonable consensus estimate for the first decade. BNEF annually surveys the EV industry and produces an estimate of the most recent cost of lithium-ion batteries for EVs, which is used to inform BNEF's EV sales projection. BNEF also releases an Electric Vehicle Outlook annually, so the BNEF sales projection is based on the most recently available data.

Figure 2. Comparison of national EV sales forecasts, 2020–2040



Further, there are drawbacks to using the TCI, BCG, EIA, and Energy Innovation projections. The EIA forecast, which was developed using EIA's National Energy Modeling System (NEMS) model, relies on outdated battery cost projections. Battery costs are a key component of EV prices; and until about 2017, the battery comprised over half of the total price of an EV.[72] For the 2018 EIA forecast, which produced a similar rate of EV adoption as the 2020 forecast, battery prices were assumed to remain above $200/kWh in 2015 dollars through 2025. In its most recent survey, BNEF found that the cost of batteries

[71] Bloomberg New Energy Finance. July 2017. "Electric Vehicle Outlook 2017: Executive Summary." Page 3. Available at: https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF_EVO_2017_ExecutiveSummary.pdf.

[72] Bullard, N. April 2019. "Electric Car Price Tag Shrinks Along With Battery Cost." Bloomberg New Energy Finance. Available at: https://www.bloomberg.com/opinion/articles/2019-04-12/electric-vehicle-battery-shrinks-and-so-does-the-total-cost.

in 2019 had already fallen to $156/kWh in 2019 dollars, significantly lower than EIA's 2018 projection of what batteries will cost in 2025.[73]

The TCI forecast is another reputable forecast of EV adoption. However, this forecast is specifically for the Mid-Atlantic and Northeastern states of Virginia up to Maine; therefore, this forecast may not be robustly applicable to Florida. The TCI states also leveraged EIA's NEMS model to develop their forecast, but they used updated input assumptions (most notably lithium-ion battery prices) that were identified through a rigorous stakeholder process, to create a more reasonable Reference Case scenario. On the other hand, TCI forecasts substantially more EV adoption than the other forecasts. It also includes high levels of EV sales in the near term, which would represent a substantial increase in adoption relative to recent historical data from Florida. Finally, this forecast does not extend through 2040, which would make long-term EV charging station planning more difficult.

The Energy Innovation forecast is from the Energy Policy Simulator, an online tool that can be used to examine the effects of energy sector policies. The simulator focuses almost exclusively on vehicle cost, assuming that the lowest cost vehicles available will be purchased. This is a simplistic view of EV adoption in the light-duty vehicle market, which is likely to be influenced by many other factors (e.g., customer desire to drive a zero-emission vehicle, performance advantages of an all-electric vehicle, etc.). The Energy Innovation battery cost forecast is also higher than BNEF's, reaching $96/kWh compared to $62/kWh in 2030 measured in 2018 dollars.

The BCG forecast is the oldest forecast presented, as it dates to 2017. Because battery costs have been falling substantially in recent years, the BCG forecast may include outdated lithium-ion battery cost forecasts for the long-term. This forecast also does not extend through 2040, which would make long-term EV charging station planning more difficult.

The EEI forecast is a consensus forecast based on five projections: BNEF's 2018 Electric Vehicle Outlook, BCG's 2017 forecast mentioned above, Energy Innovation's 2018 forecast mentioned above, EIA's 2018 Annual Energy Outlook, and Wood Mackenzie's 2018 Electric Vehicle Outlook. Though this consensus-based approach relies on several reputable sources, this forecast is now several years out of date. As mentioned above, recent battery price declines alone are enough to impact EV sales trajectories. Lastly, the EEI forecast does not extend through 2040, which would make long-term EV charging planning more difficult.

Calculating EV Stock by 2030 and 2040

Using the EV sales forecast from BNEF, I recommend translating the national EV sales projections into EV stock values for each year.[74] To do this, I multiplied the EV sales percentage for each year (2020–2030)

[73] Bloomberg New Energy Finance. December 3, 2019. "Battery Pack Prices Fall As Market Ramps Up With Market Average At $156/kWh In 2019." Available at: https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/.

by the projected number of light-duty vehicle sales in the state. The projected number of light-duty vehicle sales was derived by applying the EIA's projection of year-over-year light-duty vehicle sales growth to the number of light-duty vehicle sales in Florida in 2018. I calculated the total number of registered EVs on the road in Florida in each year by summing all EVs sold in prior years and subtracting out the number of vehicles expected to be retired. To conservatively estimate the fraction of EVs that will remain on the road after a given number of years, I applied the Vehicle Survivability function for cars developed by the U.S. Environmental Protection Agency (EPA).[75] This methodology provides a conservative estimate of the number of EVs on the road because cars tend to last for fewer years than light trucks based on the EPA data. As a result, using the distribution for cars tends to underestimate the number of EVs remaining on the road in the future.

This approach leads to an estimate of 1.41 million EVs in Florida by 2030 and 7.21 million EVs in Florida by 2040 (Table 1).

Table 2. Conversion of BNEF EV sales forecast into EV stock estimate for Florida, 2021-2040

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
EV Sales Fraction	1.79%	2.52%	3.75%	5.80%	7.29%	9.96%	13.11%	15.96%	19.33%	24.09%
EV Sales	23,370	32,741	49,129	76,653	96,975	132,934	175,609	214,307	260,302	324,183
LDV Sales	1,303,380	1,297,719	1,309,747	1,321,837	1,330,975	1,334,273	1,339,502	1,342,778	1,346,621	1,345,717
EV Stock	86,059	118,077	166,229	241,490	336,416	466,433	637,843	846,321	1,098,651	1,412,082

Year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
EV Sales Fraction	27.96%	32.86%	38.07%	42.23%	47.58%	51.00%	54.42%	57.10%	58.88%	60.22%
EV Sales	375,771	441,568	511,192	567,079	640,569	689,718	739,779	781,187	809,475	831,105
LDV Sales	1,343,961	1,343,785	1,342,767	1,342,835	1,346,299	1,352,388	1,359,389	1,368,103	1,374,787	1,380,114
EV Stock	1,773,252	2,195,710	2,681,943	3,216,098	3,814,074	4,449,105	5,119,035	5,811,980	6,511,360	7,206,595

Calculating EV Charging Station Needs

The Department of Energy's EVI-Pro Lite tool is a reputable resource for estimating the number of EV charging stations needed to meet the needs of a certain number of EVs, for a given state.[76] The user selects the state of interest, inputs the number of EVs in the passenger vehicle stock, the ratio of battery electric vehicles (BEV) to plug-in hybrid electric vehicles (PHEV), and the percentage of drivers with access to home charging. The tool outputs the number of stations and plugs needed for each of three types of charging stations: Public Level 2, Workplace Level 2, and Direct Current Fast Charging (DCFC) stations. Note that this tool has an input limit of 10 percent of existing light-duty vehicles registered in

[74] Note that the impacts of COVID-19 are not included in this analysis, as they are not anticipated to have significant long-term effects on EV adoption.

[75] U.S. Environmental Protection Agency. July 2016. "Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025." EPA-420-D-16-900.

[76] Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. U.S. Department of Energy Alternative Fuels Data Center. Accessed September 25, 2020. https://afdc.energy.gov/evi-pro-lite.

the selected area. For Florida, this limit is about 1.7 million based on an estimate of 17.1 million registered vehicles in the state as of 2018.[77]

To use the EVI-Pro Lite tool, I recommend relying on the 2020 BNEF Electric Vehicle Outlook report to furnish the assumed ratio of BEVs to PHEVs for 2030 and 2040. BNEF estimates that EV stock will be 66 percent BEVs in 2030 and 80 percent BEVs in 2040.[78] Additionally, I recommend using the U.S. Census Bureau's American Community Survey (ACS) data to furnish the assumed percentage of drivers with access to home charging. The 2018 ACS 5-year Estimates data indicate that about 33 percent of Florida homes are large multifamily (five or more units) dwellings.[79] Renters and residents of multi-family dwellings often lack dedicated off-street parking spots, which makes home charging difficult. In cases where residents of multi-family dwellings do have dedicated parking spots, the parking spots are often far from access to electricity or the vehicle owners do not have the ability to modify parking areas to install charging stations. As a result, I recommend assuming that only 66 percent of Florida drivers have access to home charging. This is a conservative estimate because it is based on the percentage of housing without access to charging, rather than the percentage of potential EV drivers without access to charging.

I am aware that the PSC has requested estimates for DCFC stations only; however, we have also provided estimates for public and workplace Level 2 chargers, as those station types are also important to support EV adoption. Below I present the results of the EVI-Pro Lite tool for Florida's EV infrastructure needs in 2020, 2030, and 2040.

Existing EV Infrastructure (2020)

According to the Alternative Fuels Data Center's Fueling Station Locator, there are 195 existing DCFC stations (with a total of 776 plugs), 1,334 existing public Level 2 stations (with a total of 3,472 plugs), and 189 private (e.g., workplace) Level 2 stations (with a total of 509 plugs) as of September 2020.[80] My calculations estimate that Florida has about 63,200 registered EVs across the state in 2020. According to EVI-Pro Lite, Florida currently needs about 189 DCFC stations and 6,216 Level 2 stations to support its existing stock of EVs. That means that, at present, Florida has about the right number of DCFC stations, but does not have sufficient Level 2 stations, for its existing EV stock.

Future EV Infrastructure Needs (2030 and 2040)

As mentioned above, I estimate that Florida will have about 1.41 million EVs on the road by 2030. The EVI-Pro Lite tool estimates that Florida would need approximately 22,000 workplace Level 2 stations, 14,000 public Level 2 stations, and 4,000 DCFC stations by 2030.

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[77] Auto Alliance. Accessed September 25, 2020. https://autoalliance.org/in-your-state/FL.

[78] Bloomberg New Energy Finance. 2020. Electric Vehicle Outlook 2020. https://about.bnef.com/electric-vehicle-outlook/.

[79] American Communities Survey. 2018 5-Year Estimates. Accessed September 30, 2020. https://data.census.gov/cedsci/table?q=Housing%20Units&g=0400000US12&tid=ACSDP5Y2018.DP04&hidePreview=false.

[80] Alternative Fueling Station Locator. United States Department of Energy Alternative Fuels Data Center. Accessed September 25, 2020. https://afdc.energy.gov/stations/#/analyze.

I estimate that Florida will have about 7.21 million EVs on the road by 2040. This value exceeds the 10 percent light-duty vehicle share limit of the EVI-Pro Lite tool. However, if I apply a similar ratio of EVs to stations from the output for 2030, but change the BEV to PHEV ratio for 2040, the EVI-Pro Lite tool estimates that Florida would need approximately 110,000 workplace Level 2 stations, 67,000 public Level 2 stations, and 23,000 DCFC stations by 2040.[81] Because the necessary station requirement per vehicle goes down as EV stock increases, and because access to home charging may increase over time, these values may be slightly overestimated.

Summary of EV Infrastructure Master Plan Recommendations

I recommend the following regarding the development of DCFC station goals in the EV infrastructure master plan:

1. The use of the 2020 BNEF Electric Vehicle Outlook report in the calculation of Florida's EV stock forecast out to 2040.

2. The use of EVI-Pro Lite, or a similar tool, in calculating the number of necessary DCFC stations along the Florida state highway system by 2030 and 2040. The inputs for this tool should be furnished by reputable sources of data, such as the 2020 BNEF Electric Vehicle Outlook and the U.S. Census American Community Survey.

Furthermore, I strongly recommend a broader docket that explores other charging station types (besides DCFC stations) that will be necessary to fully support the growth of the EV market in Florida, including workplace Level 2 chargers, public Level 2 chargers, as well as charging stations located at large multi-family dwellings. At present, Florida does not have sufficient public and workplace Level 2 chargers to support its existing EV stock, according to the EVI-Pro Lite tool. This existing imbalance may stifle near-term growth of the EV market in Florida. Further, Level 2 chargers are better for vehicle battery life and can provide grid services that DCFC stations cannot.

As mentioned above, lack of access to charging infrastructure presents a key barrier to EV adoption for residents of multi-family dwellings, who tend to be lower income. Promoting EV adoption across a wide variety of customer segments will promote equity, better encourage EV adoption, and help to ensure that EV infrastructure will be well utilized. I strongly encourage the PSC to consider a docket to explore strategies and regulatory structures to support the development of a Level 2 charging station network with sufficient chargers in diverse, well-balanced, long dwell-time locations.

[81] The ratio applied factors in the assumed difference in the ratio of BEVs to PHEVs in 2040.