Control Number: 49125

Item Number: 21

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PROJECT NO. 49125

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

FILING CLERK

COMMENTS OF CPS ENERGY

I. Background

At the December 13, 2019 Open Meeting, the Public Utility Commission of Texas ("Commission") requested comments on a review of issues relating to electric vehicles. The City of San Antonio, acting by and through City Public Service Board ("CPS Energy"), submits the following in response to the Commission's request.

CPS Energy is a "municipally-owned utility" as defined in TEX. UTIL. CODE § 11.003, operating a transmission system as a member of the Electric Reliability Council of Texas ("ERCOT"). CPS Energy's transmission facilities are interconnected with the transmission facilities of other electric service providers that operate synchronously within the ERCOT region.

In 2011, the City of San Antonio ("San Antonio" or "City") amended its Electrical Code regulations to authorize electricians to install Level 2 chargers in homes for electric vehicles ("EVs"). CPS Energy worked closely with the City in developing the amended regulations and shortly thereafter began its own demonstration project to better understand the operational and planning issues related to the deployment of this new energy technology. In 2012, CPS Energy installed a network of Level 2 public charging stations at more than 30 locations throughout the community. In June 2018 CPS Energy installed public charging stations at the newest and largest park and ride facility located in far north San Antonio. CPS Energy is supportive of the continued development of EV charging technology and looks forward to productive and collaborative discussions with the Commission and industry stakeholders in this Project.

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II. Introduction

CPS Energy's comments are organized by vehicle classification in this document, as provided in Figure 1[1].

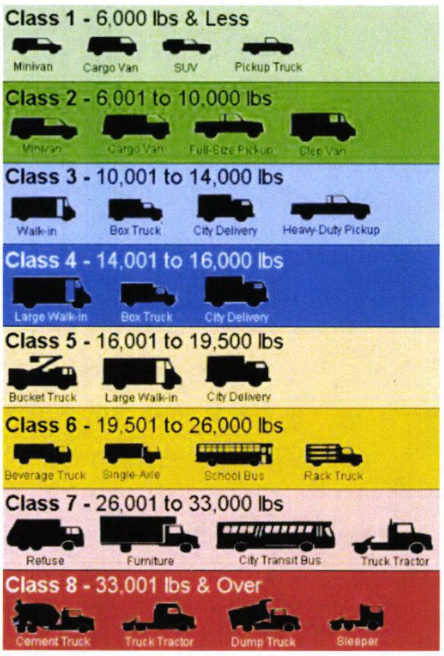

Figure 1. Illustration of Vehicle Classes

CPS Energy has developed internal forecasts for the potential deployment of light-duty vehicle (Class 1 & 2) electrification within its service area. We have performed internal assessments regarding the potential impacts of such forecasted growth as well, however, we have not commissioned any formal impact studies to date. We expect to see localized distribution impacts toward the end of the decade, especially in discrete residential and commercial districts of the service area where concentrations of electric vehicles are likely to be deployed, and we are developing EV charging programs and time-of-use ("TOU") rates to mitigate these impacts on our electric distribution system.

Medium Duty and Heavy Duty ("MD/HD") EVs, Class 3-8, represent a significant future electrical load and demand to the CPS Energy electric distribution system. Currently there are few industry forecasts for the adoption of MD/HD Plug-In Electric Vehicles ("PEVs"). Those that do

[1] Illustration of Truck Classes. U.S. DOE Office of Energy Efficiency & Renewable Energy. Retrieved on 1/30/2020 from https://www.energy.gov/eere/vehicles/fact-707-december-26-2011-illustration-truck-classes

exist are based on limited truck Original Equipment Manufacturers' ("OEM") projections, which are heavily dependent on the falling cost of energy storage.

During the period through 2030, CPS Energy expects the sales of MD/HD PEVs to be limited to technology demonstrations and pilots within our own fleet and to short-haul applications in transit, school buses, and distribution centers. These demonstrations and pilots and their associated charging stations will not represent wide-spread impacts to the transmission and distribution systems. There will, however, be the need for local transformer and substations upgrades to serve these new loads.

Toward the end of the ten-year period we anticipate that the availability and adoption of MD/HD PEVs to improve if cost parity between electric and conventional buses and trucks is reached or becomes closer. At this time, the actual impacts to the CPS Energy electric distribution system related to MD/HD PEV charging stations are projected to occur post 2030.

III. Responses to the Commission's Questions

1. General Data

Please 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).

Response

Light Duty Only (Class 1 & 2) PEV Forecasts

A. CPS Energy utilizes Electric Power Research Institute ("EPRI") for current and forecasted (low, medium and high) PEV counts for the CPS Energy service territory. The EPRI Low projection assumes no incentives, high battery costs and low infrastructure availability. The Medium projection is based on moderate assumptions for the availability of PEV incentives, battery cost declines and public charging infrastructure availability. The High projection, on the other hand, is best suited to Zero Emission Vehicle ("ZEV") states that have mandated PEV sales goals, incentives and infrastructure projects.

B. Based on our assessment of the descriptions provided above, we are projecting our PEV count to align with the EPRI medium scenario forecast. The forecast is for approximately 60,000 PEVs in our territory in the year 2030 (see Figure 2), which represents 4.1% of the light duty vehicle population of 1.4M in 2030 in Bexar County.

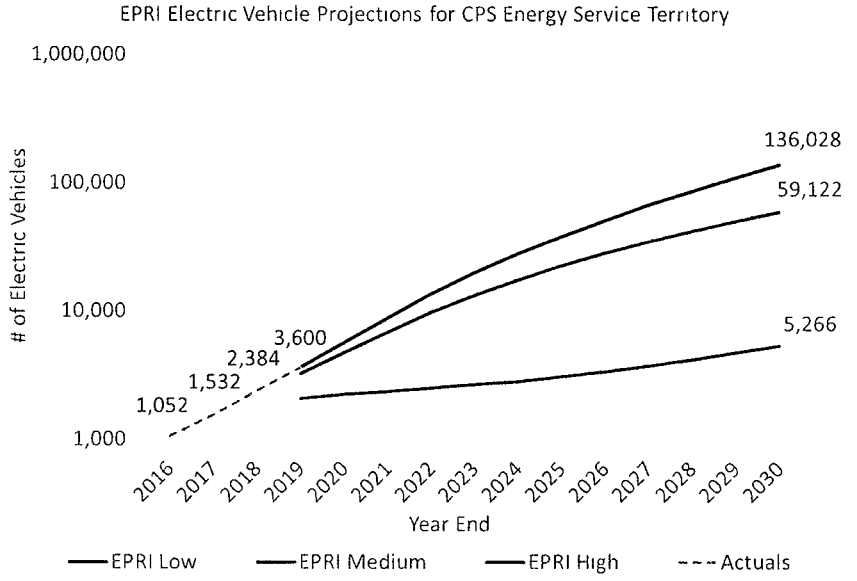

Figure 2. EPRI Electric Vehicle Projections for CPS Energy Service Territory

Medium & Heavy Duty (Class 3 -8) PEV Forecasts

A. Projections for MD/HD (Class 3 -8) are not available. CPS Energy is currently working with EPRI and other sources to develop Medium- and Heavy-Duty projections. The industry is currently planning pilots for MD/HD PEVs. However, the availability of these electric vehicles is limited at this time.

2. New Load Attributable to EVs

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).

Response

Light Duty Only (Class 1 & 2)

A. Figure 3 shows EPRI's forecast for electricity consumed from Light Duty ("LD") PEVs for each year, in the CPS Energy service territory. The model[2] includes the distribution of Battery Electric Vehicles (BEV) & Plug-In Hybrid Electric Vehicles ("PHEV") (10-, 20-, and 40-mile) and considers the effect that some PHEV miles will be gasoline. EPRI's model also factors in electric consumption reductions over the next 10-years due to the improvement in electric vehicle drive train efficiency.

B. Electricity consumed (Figure 3) is calculated by the following formula which is summed up for each LD PEV battery type:

$$\textbf{\textit{Number of PEVs} } \times \textbf{\textit{Vehicle Miles Travelled}} \times \textbf{\textit{kwh/mile}}$$

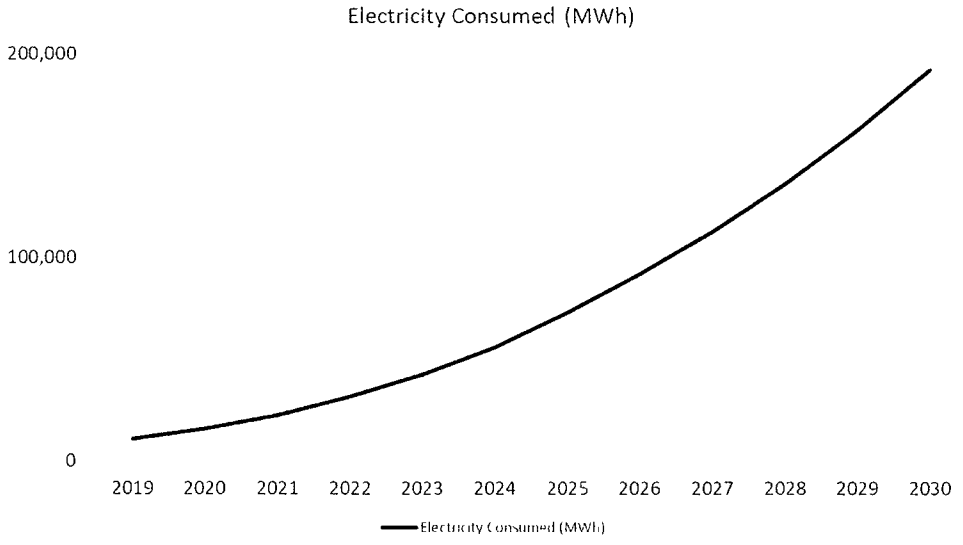

Figure 3. CPS Energy Projections of PEV charge MWh

Medium & Heavy Duty (Class 3 -8) Load Growth

A. Load impact from MD/HD PEVs is still being determined, however, in the short-term we expect to see very minor contributions to overall load growth in our service territory through 2030.

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[2] EPRI Report 3002011613, "Plug-In Electric Vehicle Market Projections: Scenarios and Impacts", Published December 18, 2017. Retrieved from: https://www.epri.com/#/pages/product/000000003002011613/?lang=en-US

3. **Load "Hot Spots"**

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.

Response

Light Duty Only (Class 1 & 2) PEV Hot Spots

A. At Home: CPS Energy expects that ~85% of PEV charging will occur at home. For this reason, we anticipate potential distribution transformer hot spots in residential areas where PEV adoption is high. We intend to mitigate these potential impacts by offering programs to encourage off-peak charging with programmable chargers, demand response ("DR") capable chargers, and an optional time of use ("TOU") rate program.

B. Public Charging: Additionally, consumers that do not have access to at-home charging options and those that are travelling to or from San Antonio will likely utilize Direct Current Fast Charging ("DCFC") stations. High throughput DCFC stations have the potential to create hotspots as well. To mitigate potential impacts CPS Energy is currently piloting a TOU rate for DCFC owners.

C. The City of San Antonio has commissioned a study[3] to identify promising areas in the city for DCFC charging based upon traffic counts at highway intersections, proximity of large employers and multifamily residences and proximity of amenities with short dwell times (Table 1). The results were summarized in a map where the DCFC Index (Figure 4) shows the block groups of highest priority as symbolized by the darker blue locations. These high priority locations have potential to become PEV charging hot spots. CPS Energy will be using such maps, along with customer information to ensure that distribution planning processes incorporate PEV charging needs.

[3] Reference document: City of San Antonio - Electric Vehicle Fleet Conversion and City-Wide Electric Vehicle Infrastructure Study

Table 1. Rational for DCFC Hot Spot Locations (City of San Antonio Study)

Factor	Weight	Rationale for Inclusion of Factor
DCFC Index		
Number of short- and medium- dwell time sites	40%	Assuming that DCFC users will likely charge at places with shorter average dwell times, such as grocery stores and gas stations
Number of existing DCFC ports	20%	New DCFC infrastructure is needed in places where it currently does not exist
Traffic counts (max) at highway exits	40%	Assuming that high average annual daily traffic values provide a good indicator of where people are driving and that it would be convenient for drivers to exit the highway to charge

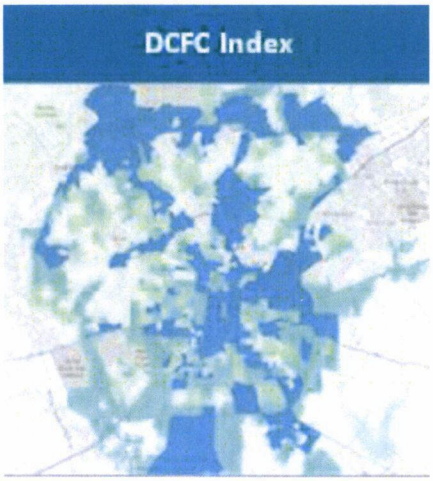

Figure 4. San Antonio PEV Charge Location DCFC Hot Spots (City of SA Study)

Medium & Heavy Duty (Class 3 – 8) PEV Hot Spots

A. CPS Energy anticipates that hotspots will occur near bus depots, school-bus barns, distribution centers, airports, and drayage ports.

B. Most MD/HD PEV charging will occur at the depots where the vehicles return daily, rather than on-route. Depending on the number of trucks at the depot, the charging load could be significant. While CPS Energy doesn't have enough information to make projections of the aggregated loads, Table 2 indicates what could be expected in terms of demand/energy per vehicle based on the expected physical characteristics of each truck type.

C. VIA Metropolitan Transit[4] received a federal grant to deploy an 8-electric bus pilot. VIA is currently in the procurement cycle for these buses and anticipates deployment in 2021 at their main bus depot near downtown San Antonio. VIA may potentially consider

[4] VIA Metropolitan Transit is the mass transit agency serving the City of San Antonio

additional Electric Buses by 2030 if the results are favorable.

Table 2. Estimated Characteristics of MD/HD PEV Charging by Vehicle Type

MD/HD PEV Type (Class)	Assumed charger kW	Assumed kWh (From miles)	kW/MWh (10 tucks)	kW/MWh (50 trucks)	kW/MWh (100 trucks)
Panel Truck (3/4)	15	100	150/1	75/5	1,500/100
Box truck (5/6)	50	200	500/2	2,500/10	5,000/200
Tractor (7/8)	75	300	750/3	3,750/15	7,500/300
Transit Bus	150	300	1,500/3	7,500/15	15,000/300

4. Load Profiles and Impacts

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).

Response

Light Duty Only (Class 1 & 2)

A. CPS Energy used published and private sources of information to identify anticipated load profiles for light-duty electric vehicles.

i. National Renewable Energy Research Laboratory ("NREL") created a nominal PEV charging load profile using EVI-Pro for home-dominant LD PEV charging behavior, factoring a multitude of electric vehicle types and charger types[5]. The load profile is illustrated in Figure 5.

[5] U.S. DOE Office of Energy Efficiency & Renewable Energy, Report 69031, "National Plug-In Electric Vehicle Infrastructure Analysis", published September 2017; Retrieved on 1/17/2019 from https://www.nrel.gov/docs/fy17osti/69031.pdf

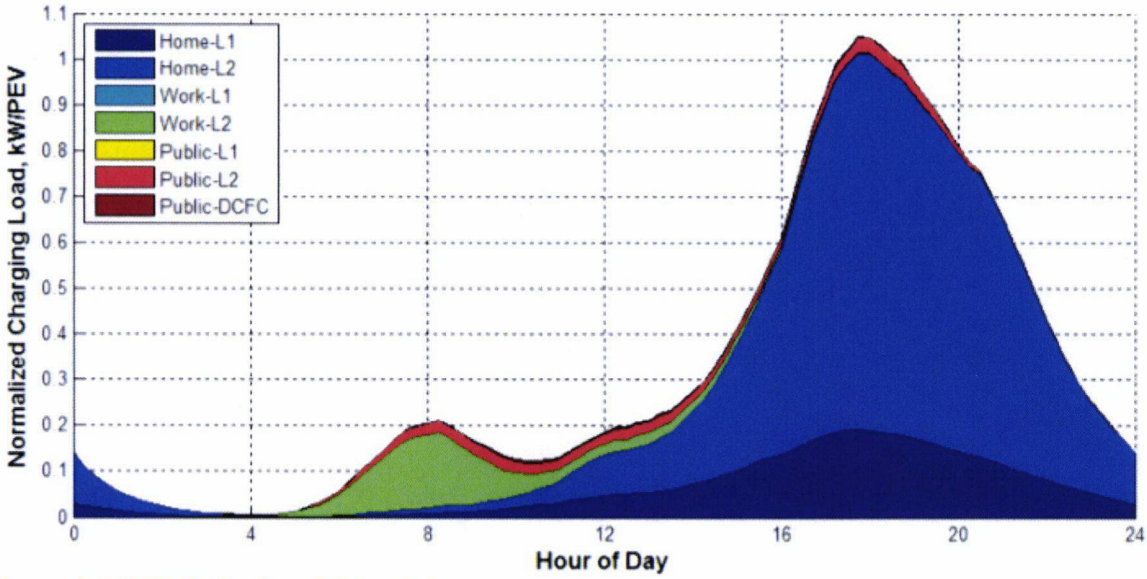

Figure 5. NREL light-duty EV load shape

ii. CPS Energy commissioned a study with Itron (CPS Energy's smart meter provider) for a residential vehicle load shape (See Figure 6). Their study indicates that 41% of all residential "unmanaged" EV charging will occur on-peak if CPS Energy does not provide incentives to shift charging off-peak.

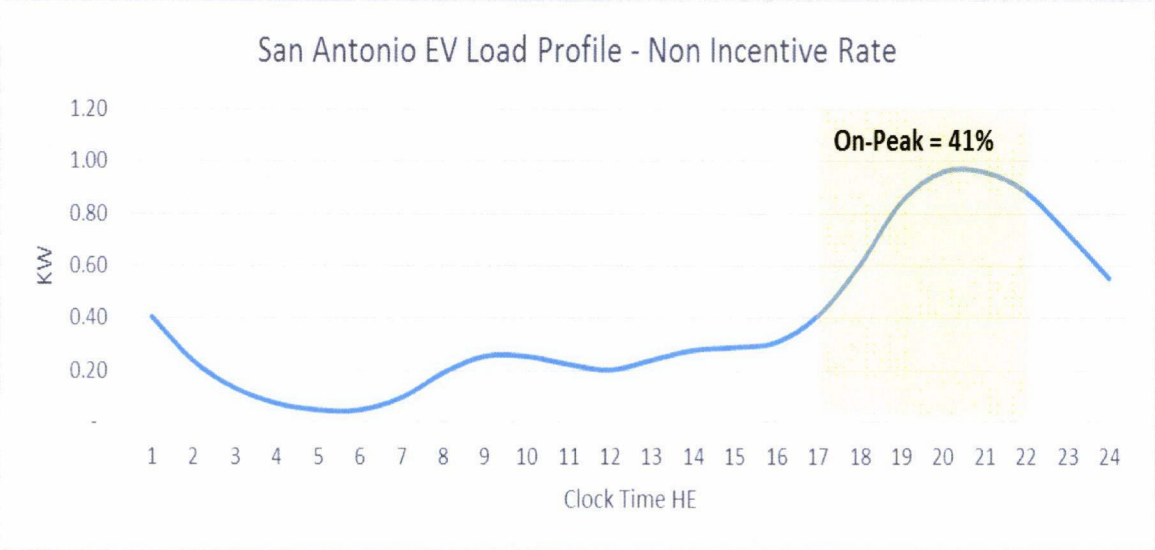

Figure 6. Light duty EV load shape being used by CPS Energy in Energy modeling.

iii. A third source of information used by CPS Energy to estimate load impacts upon

the grid is an EPRI study in the Salt River Project ("SRP") area where aggregated charging information was collected every 15 minutes for a one-year period on 70 vehicles.[6] Each vehicle in the pilot was participating in one of six SRP rate plans, as described in Table 3.

Table 3 Description of SRP Rate Plans for SRP EV Driver Test Pilot

Rate Plan Name	Description
E21-(3-6)EZ3	Avoid 3–6 p.m.
E23-Basic Plan	All charging times are the same
E25-(2-5)EZ3	Avoid 2–5 p.m.
E26-Res-TOU	Avoid 1–8 p.m.
E27-GEN-TOU	Solar Generation – Net metering
E29-EV-TOU	Avoid 1–8 p.m., Target 11 p.m. – 5 a.m.

As shown in Figure 7, this study showed that TOU rates were effective in shifting charging to later times of the day.

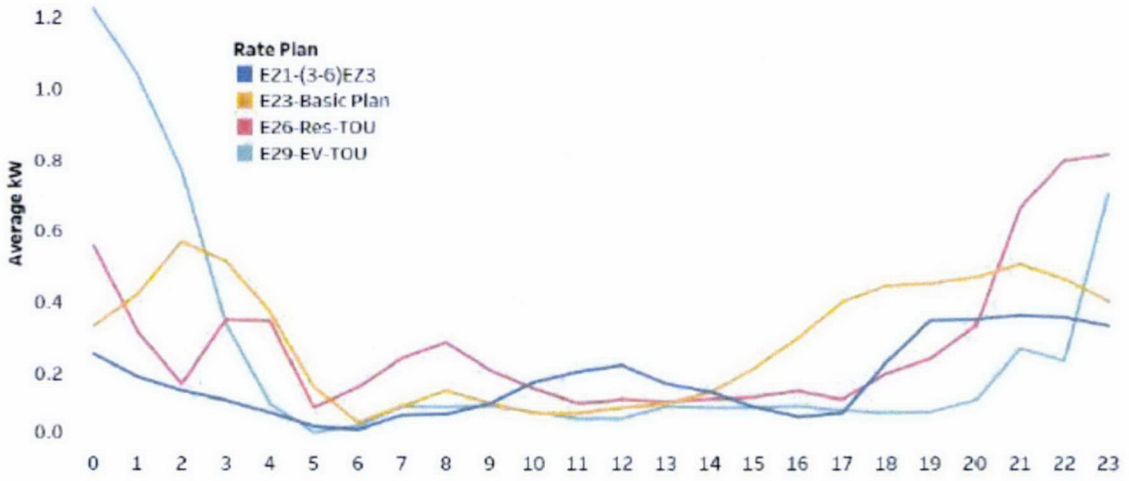

Figure 7. Weekday average load shape colored by four rate plans in the SRP service territory

Medium & Heavy Duty (Class 3 – 8) Load Shapes

A. Load shapes for MD/HD are not publicly available. It is CPS Energy's opinion that for short-haul daily use, most of the charging will be concentrated in the evening/night hours.

[6] Electric Vehicle Driving, Charging and Load Shape Analysis, Final Report 3002013754, J. Dunckley, July 2018; http://mydocs.epri.com/docs/PublicMeetingMaterials/ee/000000003002013754.pdf

5. Emerging EV Technologies

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?

Response

A. CPS Energy's opinion is that managed PEV charging is important to mitigating grid impacts. For this reason, CPS Energy is contributing to a research project at EPRI to field demonstrate a new device called an Intelligent Circuit Breaker. These products integrate metering and communications into the circuit breaker, giving the utility the ability to collect real time energy use data, as well as the ability to reduce power consumption or turn off power completely. These products may potentially significantly reduce the cost of installing smart charging infrastructure. EPRI, in collaboration with Eaton and 12 utilities, completed initial testing of these devices in 2018[7]. CPS Energy will be receiving demonstration devices in 2020.

B. CPS Energy does not have direct experience with the technologies listed below. Our opinion is that these products will be important to a managed charging strategy.

i. Smart panels/chargers. These products are available today. Smart panels/chargers can monitor the collective demand of a group of vehicles and keep the demand below limits applied to an entire circuit.

ii. Commercial aggregation services. These emerging products would help owners of light-duty EV fleets to manage demand to avoid peak demand charges but could also potentially allow owners of large fleets to respond to traditional DR events during peak utility hours.

iii. Charge management technologies. Focused on the charging of MD/HD fleets, these technologies are anticipated to grow in number and functionality in the next ten years.

6. Grid Impacts

The Commission requests that parties provide a detailed explanation on the following items:

[7] EPRI Journal How the Energy Management Circuit Breaker Can Benefit Utilities and Customers, May 17, 2018; Retrieved on 1/30/2020 from https://eprijournal.com/data-driven-insights-for-electricity-customers/

a. The anticipated impacts of electric vehicle charging, including residential and commercial charging stations on the distribution system in the next ten years.

Response

CPS Energy has not performed any formal impact studies of the effect of electric vehicle charging on the distribution system, nor have we experienced such impacts to date. The following comments represent our opinion of some impacts that might be expected.

Residential

A. Transformer Impacts. Residential transformers are typically sized with an expected load of 7 kW per home. Each Level 2 charger in the home can add loads from 6.6 to 19.2 kW for periods ranging from 1 to 16 hours. If EV charging occurs coincident with the peak load of the home, it is possible that the transformer could become overloaded. Transformers that experience intermittent overloading will require replacement and upgrade sooner than typically scheduled. Good methods to identify homes with EVs are needed to avoid distribution system reliability issues.

B. Circuit Level Impacts. As charger penetrations increase, capacity and reliability margins may be reduced; additional distribution system upgrades may be required to meet demand.

C. Impact Mitigation. CPS Energy is piloting a tariff for large DCFC chargers and will launch additional product offerings in 2020 to encourage off-peak charging to minimize grid impacts and understand and develop business models.

Commercial

A. Commercial charging station impacts will likely be related to the hotspots addressed in question 3. In general, distribution system impacts will likely occur with DCFC Plazas, Level 2 charging plazas sited in the same distribution circuit, and large commercial fleets. These impacts could necessitate transformer replacements/upgrades or require an entirely new substation to serve these large loads.

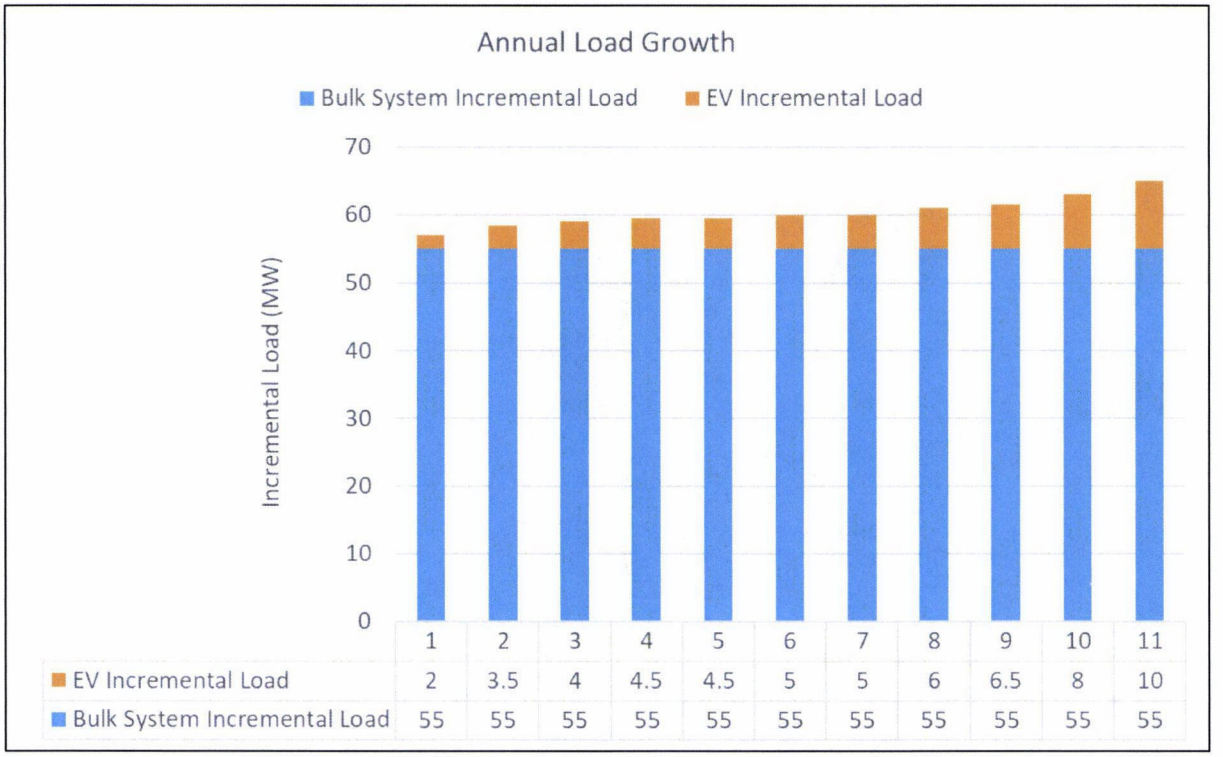

Figure 8. Annual Projected Load Growth with New PEV Contribution

b. The anticipated impact of electric vehicle charging stations on the transmission system in the next ten years.

Response

CPS Energy has not performed any formal impact studies of the effect of electric vehicle charging on the transmission system, nor have we experienced such impacts to date. The following comments represent our opinion of some impacts that might be expected.

Light Duty PEV Transmission Impacts

A. Figure 8 illustrates CPS Energy's transmission system annual load growth (in blue), as well as the incremental load growth each year due to EV adoption (in orange). Currently, new EV load represents less than 3 % of planned capacity growth. As an example: in 2030, new EV load would be a minimum of 16% of the required transmission line capacity growth. Impacts to the Transmission System are based upon a diversified average of ~1.0 kW demand per EV on the

system using the load shape provided by Itron in Figure 6, question 4.

Medium & Heavy-Duty PEV Transmission Impacts

A. During the next ten years, based on the MD/HD PEV adoption projections, the planning for delivery of the MD/HD charging load will need to be included in the load growth projections. These new MD/HD loads will be centrally located around distribution centers, bus depots, and drayage ports, requiring localized load growth projections for distribution/transmission feeding these typically industrial areas. As referenced in the question 3 response, the load growth associated with the charging of MD/HD vehicles will be significant.

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.

Response

Our regional transmission planning will be impacted by the ability to manage charging, the overall adoption rate, and location and size of fleet retrofits.

7. Energy and Peak Demand

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?

Response

The forecast of annual energy consumption and peak demand forecasts associated with LD PEV adoption in Bexar County are illustrated in Figures 9 and 10. Both forecasts are already integrated into CPS Energy's system planning forecast. CPS Energy will be adjusting PEV MWh and MW forecasts annually to factor in higher or lower adoption rates.

Figures 9 and 10 show that by 2030, CPS Energy expects annual energy consumption to reach 200,000 MWh using the PEV adoption rates presented in question 1. The peak demand using the load shape provided in Figure 6, question 4, is 60 MW. CPS Energy will

be running pilot programs beginning in 2020 to incent customers to charge off-peak. The revised load shapes and peak load reductions from these pilots will be rolled into future forecasts.

Our current system forecast shows that annual energy efficiency reductions more than offset new load from PEV's through 2030.

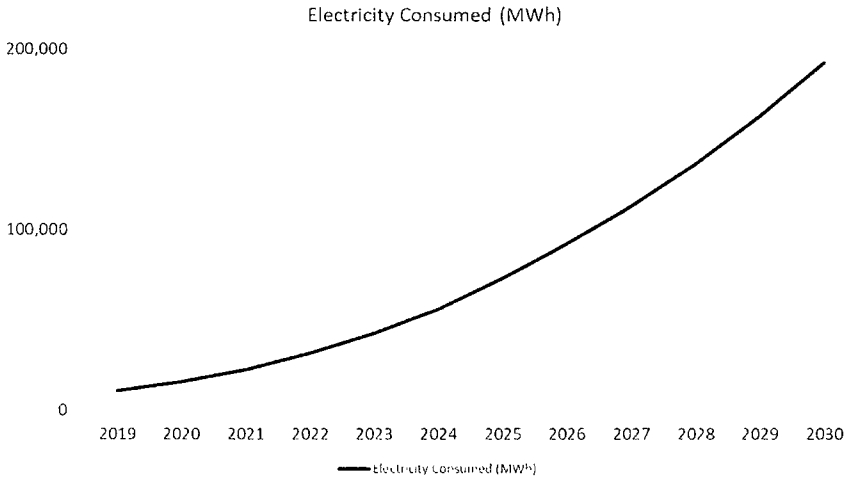

Figure 9. Total Forecasted Electricity Consumption for Light-duty PEVs

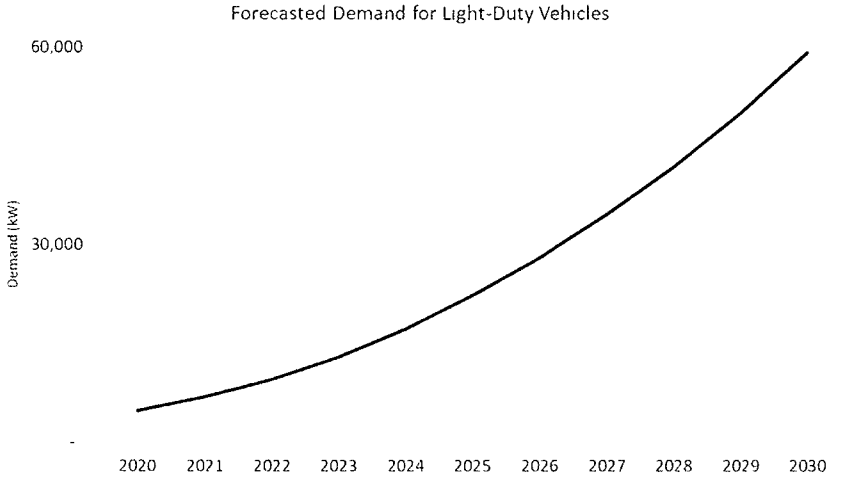

Figure 10. Total Forecasted Demand for Light-duty PEVs on CPS Energy's system

Due to the current low adoption rate of MD/HD electric vehicles, the impact upon energy and peak load growth is unknown. CPS Energy expects that there will be little impact of MD/HD

vehicle charging in the first half of the ten-year period. CPS Energy expects that toward the end of the ten-year period, sufficient numbers of MD/HD vehicles will have entered the market to begin pilots to establish load cycles and grid impacts.

8. Wholesale Electricity Market Participation

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

Response

CPS Energy is pursuing several pilot program opportunities to encourage PEV growth and mitigate impacts to the grid from vehicle charging. We believe the capabilities of electric vehicle related technologies are in the early stages of development. Our intent through pilot projects is to learn about the reliability, cost efficiency and flexibility of PEV chargers as a resource to mitigate impacts on our distribution system and overall system demand. CPS Energy will continue to monitor the industry for additional opportunities to utilize PEVs to manage the overall CPS Energy load shape.

9. Preferred or Best Practices

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

Response

CPS Energy, as an early adopter of EV charging infrastructure, has eight years of experience installing, operating, maintaining, and decommissioning Electric Vehicle Supply Equipment ("EVSE"). CPS Energy deployed a network of 120 EV chargers in 2012 as a participant of the ChargePoint America Program — a program led by ChargePoint as a grant recipient through the American Recovery and Reinvestment Act ("ARRA") Transportation Electrification Initiative and administered by the Department of Energy ("DOE"). Through these experiences, CPS Energy has the following specific recommendations:

A. Siting – The location of the Level 2 EVSE in parking lots should avoid intersections of high traffic areas and provide barriers/buffers between the traffic area and the

parking space. EVSE are more likely to be damaged by vehicular traffic at these intersections. Some method of providing protection/barriers from the vehicular traffic is recommended to allow EV drivers to safely maneuver around the vehicle.

B. Design – Utilities should have the right to make guidelines for EVSE installation that goes beyond the point of delivery. EVSE owners sometimes feel that utilities don't have the right to infringe upon requirements that are behind the meter. One example of a useful requirement is a disconnect switch (or the EVSE breaker box) within line of sight of the EVSE along with emergency procedures/contacts clearly posted near the EVSE. CPS Energy had an instance where one of our public EVSE was grossly damaged by a vehicle after normal business hours. We promptly responded to the issue and locked out/tagged out the EVSE. The number of third-party owned EVSE has been rapidly increasing over the past year. Uniform practices for these third-party owners in public spaces regarding safety and emergency procedures would benefit the public.

C. Charging Infrastructure Interoperability – Many of today's charging service providers require memberships to their network systems to receive charging services. The systems are often not interoperable. These systems need to become more like cell phone services where services are universally available, perhaps with roaming agreements. Drivers should not be stranded without an ability to charge when they need it.

D. Example Best Practices in Other Communities – Notable EVSE best practice manuals that cover siting and design practices beyond manufacturer installation manuals are referenced below:
   i. Hydro Quebec's EVSE Manual[8]. This comprehensive guide is useful because it provides uniform guidelines for the entire province (e.g. equivalent of a state). It contains useful siting instructions near water, flammable gas sources, workplaces,

[8] Hydro Quebec. Electric Vehicle Charging Stations Technical Installation Guide. Retrieved 1/17/2020 from http://www.hydroquebec.com/data/electrification-transport/pdf/technical-guide.pdf

and more. Other requirements include disconnect switches, and rates to minimize grid impacts.

ii. NACFE[9]'s research for fleets revealed the following best practices:

a. The focus of electric charging will be on private, "depot," or "return-to-base" charging.
b. Planning and permitting can be time-intensive.
c. Fleets should work closely with local utilities, regulators, cities, neighbors, OEMs, and charging system providers.
d. Fleets must develop a fairly sophisticated understanding of their existing electric infrastructure and demand, their electricity rates, and the types, number, duty cycles, and time available for charging of their vehicles.
e. Planning should be done on a site-by-site basis.
f. Programs to mitigate costs will speed the electrification process.
g. Fleets should consider investing in smart networked charging software and services.
h. Fleets should demand improvements from technology providers and utilities.
i. Fleets should not draw rash conclusions in the first year of operation.

IIV. Concluding Remarks

CPS Energy appreciates the opportunity to submit these comments and looks forward to working with the Commission and stakeholders in continuing to examine these issues.

Respectfully submitted,

THE CITY OF SAN ANTONIO, ACTING BY AND THROUGH CITY PUBLIC SERVICE BOARD ("CPS ENERGY")

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