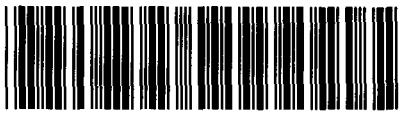

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PROJECT NO. 49125

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

SOUTHWESTERN PUBLIC SERVICE COMPANY'S INITIAL COMMENTS ON QUESTIONS REGARDING ELECTRIC VEHICLES

On December 13, 2019, the staff of the Public Utility Commission of Texas ("Commission") ("Staff") requested comments on questions regarding this project. Southwestern Public Service Company ("SPS") offers for the Commission's consideration the following responses and comments, which are, for the most part, based on SPS's service territory.

SPS is dedicated to advancing the electrification of the transportation sector and supporting electric vehicle adoption by our customers. To that end, we have set forth our strategy on electric transportation to lead the clean-energy transition, enhance the customer experience, and keep bills low.

Utilities are well-positioned to support the electrification of transportation. Electric vehicle adoption can deliver benefits to utility customers and the public at large through decreases in transportation-related emissions and downward rate-pressure created by an increase in electric sales. Utilities can provide components of charging infrastructure and thereby help reduce upfront costs for customers. Utilities also have well-established relationships with customers, providing an opportunity for education and outreach about the benefits of electric vehicles. Through time-varying rate offerings and managed charging programs (i.e., "smart charging"), utilities can encourage and enable customers to move charging off-peak.

General Data

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

   SPS's electric vehicle estimate is for light-duty personal vehicles only, which is assumed to be primarily residential customers. Commercial long-haul and short-haul, buses, and fleet vehicles have not been estimated. Data sources utilized in the forecasting process and estimates for the SPS Texas service territory for the next ten years can be found in Exhibit 1.

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

   SPS's electric vehicle estimate is for light duty personal vehicles only, which is assumed to be primarily residential customers. Commercial long-haul and short-haul, buses, and fleet vehicles have not been estimated. Estimated new load attributed to electric vehicle growth for the SPS Texas service territory for the next ten years can be found in Exhibit 2.

3. **Please identify any anticipated load "hot spots" in the state for electric vehicle charging. Please specify whether these hot spots are expected to result from**

personal, commercial short-haul, or commercial long-haul electric vehicle deployment and charging.

SPS is starting to think about where electric vehicles may be adopted in the SPS service territory. In such a nascent market, it is difficult to predict where electric vehicles may be deployed. More mature markets could use years of historical data to more accurately predict geographic adoption. In a nascent market, factors such as policy and tax credits, manufacturer and dealer marketing strategies, or customer interest could influence adoption. There are simply too many variables to accurately identify areas where higher concentrations of electric vehicle adoption will occur. We are doing some preliminary work to help identify where more localized adoption would occur. The commercial short-haul market is burgeoning, and long-haul vehicles are only operating on a test case basis. If SPS's commercial customers are deploying larger fleets, SPS would expect they would be contacting us through the normal process when their energy requirements start to exceed their limitations. In areas with higher electric vehicle penetration, such as Xcel Energy Inc.'s Colorado service territory, where there are already approximately 20,000 electric vehicles, there have not been significant distribution upgrades to date as a result of electric vehicle charging.

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

Please refer to Exhibit 4 for the anticipated load profile and the impact of residential electric vehicle charging stations. SPS does not have information for the other classes of charging.

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

   SPS anticipates smart charging technologies to become increasingly commercially available. These smart charging technologies include hardware and software that enable customers to respond to both time-varying rates and participate in load management programs that utilities may offer. In other service territories, Xcel Energy Inc. is piloting smart charging technologies utilizing charging equipment and vehicle on-board charging systems. Further, there could be more high-powered charging equipment (100 kW+) to power medium-and-heavy duty transportation vehicles (e.g., buses and semi-trailers) as well as some public fast charging. In these cases, smart charging could mitigate some of the impacts that these systems have on markets and the grid.

Grid Impacts

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

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

      Electric vehicle impacts will vary by feeder, based on a feeder's current loading, its ability to tie with other feeders, and the operating parameters of the electric

vehicle charging stations. Faster charging and medium- and heavy-duty vehicles may introduce more impacts and variability into the power system, due to intermittent and large amounts of energy consumption. While electric vehicle adoption is increasing, as discussed in other parts of these comments, current SPS forecasts do not show a significant load increase due to electric vehicles to be significant in its Texas service territory. This could change, and SPS will continue to monitor its growth and forecasts.

At higher adoption levels, with the likelihood that many electric vehicles will cluster in neighborhoods and cities, electric vehicles could require extensive upgrades to the equipment that is close to the customer, such as transformers and service conductors. SPS also believes managed charging and rates, such as SPS's approved Time of Use rate options, could help minimize this impact. SmartCharging capabilities continue to mature in this market as well.

SPS is currently working with the National Renewable Energy Laboratory ("NREL") to model and analyze the impacts of higher penetrations levels of electric vehicles on Xcel Energy's Minnesota distribution system. This project is part of a widespread Department of Energy research effort in this area.[1] The project will be modeling 15 feeders on the distribution system with varying adoption levels of electric vehicles on each feeder. The NREL model will compare distribution impacts for both unmanaged and managed charging scenarios. The research project is underway, and results are expected to be

[1] See DOE Announces $80 Million invested in Advanced Vehicle Technologies Research, https://www.energy.gov/articles/department-energy-announces-80-million-investment-advanced-vehicletechnologies-research

available likely later in 2020. SPS looks forward to additional industry analysis and collaboration with other utilities in this area to complement the work that SPS is doing directly.

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

SPS does not expect the load increase from electric vehicles to have a significant impact to the transmission system. As identified in the response to 6(a), SPS does not expect the distribution system, which is served by the transmission system, to see significant load growth. Additionally, SPS does not expect widespread adoption across its service territory due to a limited number of large cities or metropolitan areas that are the main demographic for sizable load increases due to electric vehicles so any impacts to the transmission system should be localized situations due to clustered electric vehicle loads. In those cases, thermal constraints on the transmission system would be due to older conductors, clearance limits, or substation limitations such as current transformers, jumpers, or switches. Those type of situations would typically result in replacement of existing facilities, not the expansion of the transmission grid.

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.

SPS is a member of the Southwest Power Pool ("SPP"). SPP conducts an annual analysis, the Integrated Transmission Planning ("ITP") study, that incorporates electric vehicle charging in the "Future 2: Emerging Technologies" models. The

load profile in those cases reflects primarily electric vehicle charging in the evening and night time. Due to this being a typically "off-peak" timeframe, there are not a lot of long-term transmission issues expected due to the electric vehicle charging load.

In March 2018, the SPP Board of Directors created the Holistic Integrated Tariff Team ("HITT") comprised of representatives from member companies of SPP to take a holistic look at issues facing SPP. The final recommendations from the HITT team in April 2019 did not identify any initiatives directly associated with electric vehicle loading.

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

The electric vehicle impact on SPS's peak is forecasted to be less than 1% through 2029. Please refer to Exhibit 7 to see the overall anticipated impact of electric vehicle charging in the next ten years in terms of energy and peak demand in Texas. In Column B, the "Total EV Sales Impact (MWh)", shows the electric vehicle sales that include the historical sales impact. Column C, "Total EV Peak Demand Impact (MW)", shows the Demand at the peak. The electric vehicle impact on peak demand is calculated by applying the load shape in Exhibit 4 to the average daily sales in the month of July for each year. The peak is forecasted to occur at hour 17.

Xcel Energy already includes electric vehicle energy and demand in its forecasts.

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

As discussed previously, there could be opportunities for smart charging, including load management of electric vehicle charging, and, in the future, discharging via vehicle-to-grid systems that could participate in wholesale electricity markets. These technologies and approaches would be subject to the rules in the wholesale electricity market.

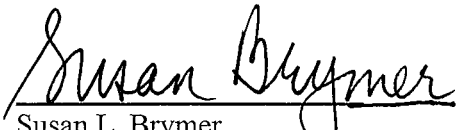
Based upon the structure and current status of the SPP market, there's no practical way for electric vehicles to directly participate in the wholesale market. The integrated system serving customers does not have features, such as in ERCOT, that might facilitate demand-side resources, such as advanced meter systems and more developed demand response market mechanisms. However, if these technologies reach sufficient scale, demand-side participation will require establishment of metering, communications, and control systems to ensure that utilities can operate efficiently and reliably with the new participation and manage the costs to support it (including protection of other customers from undue costs). In the meantime, electric vehicle drivers can take advantage of available TOU rates, such as SPS's approved TOU rate options, to charge during lower cost periods and this could have an indirect (and potentially beneficial) impact on the wholesale market by improving load factors; that is, charging on off-peak periods

better optimizes overall system resources and in particular wind generation (robust in our region) that frequently is heavy during off-peak periods.

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

SPS currently has not designed or operated charging stations; however, SPS remains open to opportunities to serve its customer in new ways. A third party who seeks to install a charging station would be considered a customer of SPS, and SPS would work with them to comply with SPS's existing policies and standards for new service requests.

Respectfully submitted,



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SOUTHWESTERN PUBLIC SERVICE COMPANY

Data Sources

Historical zip code level EV sales	IHS Markit
Battery price forecast	Bloomberg New Energy Finance
Average miles driven per year	Bureau of Transportation Statistics
Historical gasoline prices - TX	EIA - Energy Information Administration
Gasoline price forecast - TX	IHS Markit
# of households forecast - TX	IHS Markit
# of households forecast - Xcel Energy territory	Xcel Energy
# of new annual vehicle registrations - TX	IHS Markit
Residential electricity rate forecast (per kWh)	Xcel Energy

Electric Vehicle Estimates

Year	Annual EV Sales			Annual EV Sales as a % of New Car Sales			Cumulative EV Sales			as a % of Registered Vehicles		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
2019	38	685	2,850	0.1%	2.2%	9.1%	747	1,394	3,559	0.2%	0.3%	0.8%
2020	45	460	2,175	0.1%	1.5%	6.9%	792	1,854	5,734	0.2%	0.4%	1.3%
2021	66	676	2,908	0.2%	2.2%	9.4%	858	2,529	8,641	0.2%	0.6%	1.9%
2022	102	996	3,867	0.3%	3.2%	12.6%	960	3,526	12,509	0.2%	0.8%	2.8%
2023	159	1,413	5,092	0.5%	4.6%	16.5%	1,119	4,939	17,601	0.2%	1.1%	3.9%
2024	173	1,596	6,267	0.6%	5.1%	20.2%	1,292	6,535	23,868	0.3%	1.4%	5.2%
2025	155	1,340	6,413	0.5%	4.3%	20.8%	1,446	7,874	30,281	0.3%	1.7%	6.6%
2026	185	1,549	8,006	0.6%	5.0%	26.1%	1,632	9,423	38,286	0.4%	2.0%	8.3%
2027	229	1,850	10,133	0.7%	6.1%	33.1%	1,861	11,273	48,419	0.4%	2.4%	10.5%
2028	313	2,539	13,620	1.0%	8.3%	44.7%	2,173	13,812	62,039	0.5%	3.0%	13.4%
2029	429	3,430	17,861	1.4%	11.2%	58.5%	2,603	17,242	79,900	0.6%	3.7%	17.2%

Forecasted New Load from Electric Vehicles

	MWh [1]		
	Low	**Mid**	**High**
2019	650	2,198	7,379
2020	200	2,740	12,025
2021	266	2,718	12,163
2022	401	4,001	16,213
2023	625	5,766	21,439
2024	794	7,201	27,182
2025	785	7,025	30,343
2026	814	6,913	34,504
2027	991	8,134	43,405
2028	1,296	10,502	56,841
2029	1,776	14,283	75,334

[1] Reflects the incremental new load attributable to EVs

Percent of Charging by Hour

Hour Ending	Assumed Charging Profile for Residential
0	6.2%
100	6.7%
200	6.1%
300	4.5%
400	1.6%
500	0.8%
600	0.9%
700	1.5%
800	2.1%
900	2.3%
1000	2.4%
1100	2.4%
1200	2.6%
1300	2.8%
1400	3.1%
1500	3.7%
1600	4.7%
1700	5.8%
1800	7.2%
1900	7.9%
2000	7.8%
2100	6.8%
2200	5.5%
2300	4.5%
	100%

Impact of EV Charging

Year	Total EV Sales Impact (MWh)	Total EV Peak Demand Impact (MW)
2020	7,791	1.2
2021	10,509	1.7
2022	14,510	2.3
2023	20,276	3.3
2024	27,477	4.4
2025	34,502	5.6
2026	41,414	6.7
2027	49,548	8.0
2028	60,050	9.7
2029	74,333	12.0