Control Number: 49125

Item Number: 24

Addendum StartPage: 0

PROJECT NO. 49125

RECEIVED

2020 FEB -3 PM 2:53

PUBLIC UTILITY COMMISSION
FILING CLERK

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

COMMENTS OF AUSTIN ENERGY

Austin Energy[1] (AE) files these comments in *Review of Issues Relating to Electric Vehicles*, Project No. 49125, in response to the Public Utility Commission (Commission) staff's request for comments, issued December 13, 2019. AE appreciates the opportunity to offer its perspective on the effects of the expected deployment of electric vehicles (EVs) in Texas over the next ten years as it relates to AE's knowledge and experience.

I. Introduction

As a customer-driven municipally owned utility with a defined service territory, AE focuses these comments on information specific to experience with its customers. Generally, over 80 percent of personal EV vehicles charge at home.[2] This has generally allowed AE to support EV charging at existing infrastructure levels without significant changes in investment or planning. AE continually reviews EV charging rate plans and programs to continuously improve and account for EVs on its electric system to ensure that the design is cost-effective, fair, and equitable to all customers.

II. Response to Specific Questions

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)

AE refers to ERCOT's Long Term System Assessment (LTSA) planning study for projections of expected deployment of EVs in the ERCOT region of Texas over the next ten years. AE has previously used regional Electric Power Research Institute (EPRI) and vehicle registration data to project overall EV growth in the Austin region, but is not endorsing a particular data source as "expected" values for projecting EV growth in Texas or the ERCOT region. There is an inherent challenge when relying on national or global forecasts as assumptions for the relative growth of EVs in Texas or ERCOT must be made. Additionally, some of these EV forecasts do not include detail on projections by vehicle class, which can also vary by state or region.

---

[1] City of Austin d/b/a Austin Energy.

[2] Department of Energy, Office of Energy Efficiency and Renewable Energy on Electric Vehicles Charging at Home. Located at: https://www.energy.gov/eere/electricvehicles/charging-home.

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 fleet and buses, and commercial long-haul electric vehicles).**

ERCOT's planning assumptions for the LTSA include a projection of demand attributed to personal EVs.

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.**

As noted above, AE has been able to support EV charging at existing infrastructure levels without significant changes in system investment or planning. AE anticipates that most personal EV charging will continue to occur at residential locations such as single-family homes and multi-family residential properties. However, public charging will continue to expand at workplaces and in areas primarily used for shopping, civic, and recreational use as EV demand increases. Additionally, direct current (DC) fast charging stations are anticipated to be located along major transportation corridors such as Interstate-35 similar to where gas filling stations are located today and may be utilized for both personal and commercial vehicles for longer distance travel that cannot be sustained on a single charge.

EV charging, particularly DC Fast charging stations, is also likely to be clustered in areas with industrial zoning to support commercial fleet stations and industrial warehouse complexes used for vehicle freight shipping. An example in AE's service territory is Capital Metro's planned transition to electric buses. This project, with an initial deployment of 10 electric buses, is currently in the design phase with initial findings that feeder upgrades will not be needed to serve the anticipated additional load. However, as with any new load on the system associated with major projects, expansion of the electric bus fleet may eventually necessitate electric system upgrades. AE continually reviews EV growth and charging infrastructure for future planning needs.

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).**

Level 1 charging refers to EV charging equipment that utilizes a common 120 Volt (V), alternating current (AC) plug. Personal EVs typically include portable Level 1 charging connection equipment used in standard household or commercial outlets. Depending on the battery technology used by the vehicle, Level 1 charging typically takes between 8 and 12 hours to charge when fully depleted. Most of the Level 1 charging in AE's service territory occurs overnight at the EV owner's residence. The power requirements (i.e., demand) of a Level 1 charger is similar to a hair dryer and thus is considered to have a negligible impact on the electric system.

Level 2 charging refers to 240V AC plugs that require installation at a residential home, commercial location, or public charging station. These units require a 40 amp circuit, but are compatible with all EV types using the same J1772 standard connectors used for Level 1 charging. Depending on the battery technology used by the vehicle, Level 2 charging typically takes between 4 and 6 hours to charge when fully depleted. Personal vehicle charging at both residential and public charging stations commonly use Level 2 charging at workplaces and public parking areas. Level 2 charging is also used for commercial short-haul, buses, and other commercial uses.

As with Level 1 charging, the majority of Level 2 EV charging at residential locations occurs overnight. For commercial uses, the load profile for Level 2 charging will vary, but much of the charging is still likely to occur at night for commercial vehicles, especially if a pricing structure is used to encourage off-peak charging. Workplace charging is unique in that charging will primarily occur during the day between 9:30 a.m. and 2:00 p.m. Workplace charging is the most common Level 2 charging behind residential charging. The demand associated with Level 2 charging is usually around 7 kilowatts (kW). However, Level 2 charging demand per vehicle can vary between 3 and 7 kW depending on the size of the on-board charger of the vehicle. For example, plug-in-hybrid EVs (PHEVs) sometimes have a small onboard charger that is about 3.3 kW demand while battery EVs can charge at the full 7 kW speed.

DC Fast charging refers to EV charging equipment that utilizes a 480V DC plug and is mostly used for high VMT (vehicle miles travelled) vehicles such as commercial long-haul or buses and long-distance highway trips in personal vehicles. The load profile can vary for DC Fast charging with a majority of users charging for less than 20 minutes for personal vehicles. DC Fast charging is more likely to occur during the day and will benefit from pricing structures that reflect the higher cost of generating electricity during certain times of the year and day. Most DC Fast chargers provide an 80 percent charge in about 30 minutes. DC Fast charging equipment is not currently compatible with all EVs and there is no industry standard for this level of charging. DC Fast charging equipment is currently much more expensive to install than Level 2 charging equipment and for this reason remains less common for personal and public charging. DC Fast charging station demand is typically between 50 and 120 kW and installed in clusters with multiple co-located stations. This allows for system redundancy in case a charging station is undergoing maintenance and improves the customer experience by increasing the availability of chargers at a particular location.

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?

EV-related technology continues to advance and mature as market demand increases. A few emerging technology trends that may impact the penetration rates for EVs for different vehicle classes and uses include:

- Inductive charging – Inductive charging is currently under development as a method that allows EV charging without being physically plugged in. This technology is currently available today, but sustains power losses. It is anticipated that this technology will continue to improve in efficiency and may become a viable charging method in the future.
- Smart charging and vehicle-to-grid optimization platforms – Various technology platforms are being developed that could enable aggregation, or "pooling" of EV charging

assets to ensure charging occurs primarily at off-peak periods, provide demand response services, and potentially operate as controllable load in the wholesale electricity market.

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;

As with any new load on the system, electric distribution equipment will need to be installed to provide electricity service to new commercial developments with EV charging stations. Charging station installation additions at existing properties may not require installation of new electric distribution equipment unless the additional charging station load is significant and requires a transformer or other system upgrade such as capacitor banks to provide additional load support. AE continually monitors its distribution feeder and circuit capacity to identify when system upgrades will be needed.

At higher levels of EV penetration, whether at residential or commercial locations, distribution system upgrades may be necessary over time to meet load growth on the circuit or feeder. Whether system upgrades are needed to meet EV load is dependent on the level of growth, existing capacity, and charging behavior. For example, it would require a sizeable number of residential customers in a single-family neighborhood to install Level 2 chargers with a demand of up to 7 kW per charger to have a measurable impact on the system. This is in part due to the majority of residential charging occurring at night in off-peak periods. Customer education and time-of-use pricing for EV charging is used to encourage off-peak charging, including encouraging residential customers to defer plugging in their vehicle until 7 p.m. when they return from work on the weekdays. AE has implemented various pilot projects that aim to mitigate costs and reliability impacts due to increased demand on the system from EVs. This includes developing a demand response pilot for EV charging at public stations and piloting an EV charging rate, referred to as "EV360", that incentivizes residential charging during off-peak periods (weekends and 7:00 p.m. to 2:00 p.m. on weekdays) rather than on-peak periods (2:00 p.m. to 7:00 p.m.).[3]

Level 2 charging stations at commercial locations such as workplaces, businesses, grocery stores, parks, and libraries are more likely to have an impact on peak demand on the feeder or circuit, but such charging is not anticipated to have a sizeable impact on circuit or feeder demand and can be accounted for when planning new commercial developments. Charging stations located along major transportation corridors are more likely to impact the distribution system during periods of peak demand. These stations are generally utilized for vehicles taking longer trips with expectations for users to be able to charge at any time of the day with short charging times. These stations will likely require DC Fast charging which has higher demand on the system per vehicle charge.

---

[3] AE prepared a white paper on this pilot rate schedule in 2019 titled, *EV 360 Whitepaper: Austin Energy's Residential "Off-Peak" Electric Vehicle Charging Subscription Pilot Approach, Findings, and Utility Toolkit.* This paper can be accessed here: https://austinenergy.com/wcm/connect/b216f45c-0dea-4184-9e3a-6f5178dd5112/ResourcePlanningStudies-EV-Whitepaper.pdf?MOD=AJPERES&CVID=mQosOPJ.

In addition to the pilot projects described above, AE continues to monitor and analyze the potential impacts of EV load growth on the system and opportunities to minimize associated costs. AE has staff engaged in various research projects related to EV interaction with the distribution system. For example, AE's Distributed Energy Resources (DER) integration project, referred to as SHINES (Sustainable and Holistic Integration of Energy Storage and Solar Photovoltaics), is evaluating the potential for vehicle-to-grid (V2G) applications in a DER optimization platform.[4] As part of SHINES, AE partnered with local research institute the Pecan Street Project to launch a V2G research and testing center. This center works on hardware and software innovations to enable connectivity between an EV and a home while supporting overall grid reliability and resilience.[5]

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

AE transmission planners work closely with ERCOT and developers to monitor growth in AE's service territory and the regional transmission system to determine potential transmission system needs. AE defers to ERCOT's LTSA planning study regarding potential impacts on the regional transmission system in the next ten years.

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.

AE works closely with ERCOT on regional transmission planning efforts and supports inclusion of a high EV penetration scenario in ERCOT's LTSA planning study. AE defers to ERCOT's LTSA planning study regarding potential impacts on the regional transmission system with high EV penetration.

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?

AE defers to ERCOT's response to this question based on the analysis conducted in the LTSA planning study. AE supports including EV projections in planning studies with longer-term outlooks such as the LTSA.

---

[4] AE prepared a white paper on this project in 2019 titled, *Distributed Energy Resource (DER) Strategy, Next Steps, and Preliminary Findings from Austin SHINES DER Integration Project.* This paper can be accessed here: https://austinenergy.com/wcm/connect/2c82614f-f6a6-474c-8706-722e8c07cc4f/DERStrategyWhitepaper.pdf?MOD=AJPERES&CVID=mR5D14j.

[5] Pecan Street, *Press Release: Pecan Street Launches Texas' First Grid-Connected Vehicle-to-Grid Research and Testing Center*. February 6, 2019. Located at: https://www.pecanstreet.org/2019/02/v2g-2/.

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

The response to Question 5 addresses the potential for optimization technologies to support V2G applications such as smart charging, demand response, and wholesale electricity market participation through aggregation. The potential for V2G utilization should become better known as further research is conducted, supporting technology matures, and market barriers such as impacts of V2G on EV manufactory warranties are addressed.

The response to Question 6 describes AE's involvement in various V2G research efforts. While this technology is promising, it is still early in development.[6] Increased EV penetration and prevalence of public EV charging stations may eventually accelerate the market for V2G utilization and lead to further research and demand for integration into the wholesale electricity markets through aggregation and optimization technologies. As this technology advances, it will be appropriate for ERCOT stakeholders to consider whether ERCOT protocol changes are necessary to enable V2G technologies to participate in the wholesale electricity markets. V2G technology may also provide opportunities for demand response and other applications that are applied outside of the wholesale electricity market to support electric distribution system reliability and manage costs. Additionally, it will be important to engage automakers on this technology. Currently, most automakers do not honor the car battery warranty when used in a V2G application.

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.

Siting of charging stations will differ depending on what type of charging station is installed. Commercial EV charging stations may use Level 2 or DC Fast chargers depending on location and associated purpose.

Level 2 public charging stations are typically sited at workplaces, grocery stores, fleet yards, libraries, shopping centers, and other locations where EV drivers can passively charge their vehicles for short durations or during the workday at low or no cost while participating in other activities such as shopping or working. As seen today, businesses, employers, and local governments are likely to continue to locate EV charging stations at these types of locations at low or no cost as an incentive to use that business or public service or as an incentive to work for a specific employer. These chargers are generally utilized by an EV driver for 1 to 3 hours. This provides an opportunity for EV drivers to "top off" their battery in between activities.

DC Fast public charging stations should be sited in transportation corridors such as major highways and heavily trafficked streets that provide opportunity for quick recharging for EV owners that drive long distances. The purpose of a DC Fast charger is to provide a quick recharging to enable the next leg of a longer trip or to allow for taxis and ride-sharing services to recharge and continue their high mileage business. The general assumption for DC Fast charging time is 15 to 30 minutes.

---

[6] For case study examples see Smart Electric Power Alliance (SEPA), *Utilities and Electric Vehicles: The Case for Managed Charging*, April 2017. Located at: https://sepapower.org/resource/ev-managed-charging/.

III. Conclusion

AE greatly appreciates the opportunity to offer its perspective on this project. We look forward to continuing to work with the Commission and other parties as this project moves forward.

Respectfully submitted,

By: _____

Andrew J. Perny
State Bar No. 00791429
Assistant City Attorney
Division Chief, Utilities & Regulatory Affairs
City of Austin Law Department
P.O. Box 1088
Austin, Texas 78767-1088
Tel: (512) 974-2274
Fax: (512) 974-6490