WHITE PAPER

Plan Now for Home EV Charging's Impact on Your Utility

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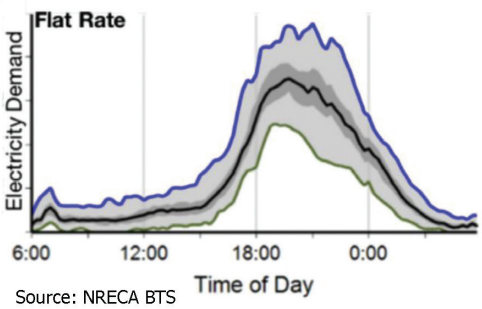
Consumer adoption of electric vehicles (EVs) is growing across the country. EV sales in 2022 represented a little more than 6 percent of all new car sales, an increase of 65 percent over 2021. That increase was during a year when overall car sales dipped by 8 percent. Looking ahead, changes in policy and legislation will continue to drive consumer adoption. In response, vehicle manufacturers are steadily increasing the number of EV models available at all price points. This trend will affect each utility at various times, but the question of "if" has now become a question of "when."

Even at modest adoption in rural areas compared to urban and suburban areas, advanced planning will be necessary to meet the challenges EVs can pose to the distribution grid. I was invited to discuss those challenges at the April 2023 Heartland Metering Conference in Kansas. I reviewed the projected changes EV adoption may have on distribution utilities and suggested some long-range steps utilities can take.

I emphasized that distribution utilities may bear a disproportionate cost of the EV transition because of the pressure vehicle charging will put on the localized grid. Studies show that of the three components – generation, transmission, and distribution – distribution has the toughest job ahead.

Uncontrolled EV Charging – Load Profiles



Source: NRECA BTS

Challenges from EV charging can come well before significant adoption

EV Charging

While rural EV adoption may lag, even a small number of EVs can make a big difference. Loading data shows, most EV charging happens during the evening at home. Considering existing consumer load profiles with evening peaks, a few vehicles could have significant effects on distribution equipment and wholesale demand costs. For instance, a typical level-2 charger can double the demand of a household while only increasing energy sales by about a third. The challenge is to provide enough additional capacity for the equivalent of another home without a substantial increase in offsetting energy sales.

As more rural-centric EV models become available, the effect may be an increase in home charger capacity. The Ford Charge Station Pro, for instance, which is featured in the commercial where the consumer comes home and finds the lights are out and uses the vehicle to provide backup power, is a 19.2KW charger, or roughly three households worth of additional demand.

Unlike planned load additions, where we can position equipment according to load, EV adoption across the service territory will be variable. Most consumers will not contact the utility before installing a charger. Nobody ever picked up the phone and called Shell Oil before they bought a car because they know fuel will be available when they need it. Without notice, your distribution system could experience unexpected increases in evening peaks.

Further compounding the issue is the potential for clusters of consumer chargers. EVs may appear in neighborhoods or specific areas with shared equipment, increasing the strain during peaks.

As with any disruption, there may not be a perfect solution, but there is an opportunity to plan.

Role of the Utility

When a consumer purchases an EV, the utility gains an opportunity to engage and educate. We can demonstrate how our business is changing and let EV owners know how they can work with us. Rural utilities can reinforce their status as a trusted partner in the community. To do so, we should train staff to understand consumer needs and about the effects EVs have on the utility. Staff should be able to guide consumers through programs and rates to and show them how to control costs.

Some utilities may wish to develop new consumer rate options specifically for EV owners. Each utility will have its own philosophy for how to allocate costs, approach cost changes and how to best collect from consumers. As adoption grows, the utility should have an ongoing evaluation of rate options and adjust as needed. Analyzing interval data provided by AMI systems is one of the more effective methods. You can use this data combined with a meter data management system to identify EV consumer charging behavior and trends.

The data also supports evaluation of system design. With a need to increase capacity and use capacity more efficiently, evaluation based on accurate system records leads to the overall objective of cost-effective mitigation strategies. Quality GIS data is critical to precise prioritization of system improvement projects, including improvements in reliability and resiliency. I recently wrote an article on this web site that goes into more detail about how to measure and improve reliability.

Having the right people and technologies in place will help with risk management and taking advantage of new opportunities. Key technologies like AMI, MDMS, SCADA and DERMS will help identify and manage EVs' effects. Leveraging these technologies, utilities can measure progress towards goals and objectives for supporting EV charging while providing reliable and affordable service to consumers. My colleagues at NRTC and I are ready to assist you with planning smart grid deployments that meet your goals.