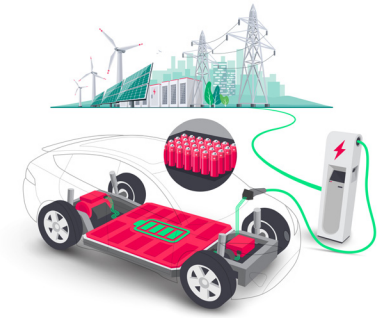
INTEGRITY INTO EVERYTHING

GETTING AHEAD OF THE CURVE ON EV CHARGING INFRASTRUCTURE

INTRODUCTION



In some parts of the country, electric vehicles (EVs) are increasing in number quickly on the roads. In other parts, growth is very slow, almost seemingly stagnant in some states. Regardless, now is the time for electric utilities to "gear up" for the coming growth in the number of EVs, all of which will need charging of some sort, via EV charging infrastructures.

In terms of auto manufacturers either already providing EVs or gearing up to provide them in the near future, it is virtually comprehensive, including: Acura, Audi, Bentley, BMW, Buick, Cadillac, Chevrolet, Chrysler, Dodge, Ford, GMC, Honda, Hyundai, Jeep, Kia, Lexus, Lincoln, Mercedes, Nissan, Porsche, Tesla, Toyota, Volkswagen, and Volvo.

Overall, U.S. auto manufacturers are in full support of the trend toward EV manufacturing and have declared bans on the manufacturing of internal combustion engine vehicles by 2035, with a goal of reaching 65 percent of that ban by 2030.

EV CHARGING INFRASTRUCTURE ON A REGIONAL BASIS

In general, it seems that, while EVs are gaining some traction in the Northeast and the Southwest (particularly California), growth and demand are quite a bit slower in most of the rest of the nation.

However, the growing number of incentives for consumers, such as manufacturer incentives, as well as an explosion of marketing programs, have caused a recent shift and although slow, is starting to promote growth in the Midwest and other areas. In fact, a couple of reports in specific address the projected growth of EVs and needed EV charging infrastructure in the Midwest.

One is a report from the Council on State Governments, titled "Power Up: How the Midwest is Planning and Preparing for the Rise of Electric Vehicles, which noted that, in 2021, state legislators have passed or were considering bills to boost EV manufacturing, institute fees for the owners of these vehicles to

share in road maintenance (since they don't pay any gas taxes), and encourage adoption of EV fleets and infrastructure. In addition, since January 2011, according to the report, EV sales nationwide have increased 364 percent nationwide, while, in the Midwest, they have jumped anywhere from 235 percent in Kansas to 430 percent in North Dakota.

Another is a document published in September 2021, noting that five Midwest states created the "Regional Electric Vehicle Midwest Coalition Memorandum of Understanding Between Illinois, Indiana, Michigan, Minnesota, and Wisconsin," According to the document: "The Regional Electric Vehicle Midwest Coalition ("REV Midwest"), established through this MOU, creates a regional framework to accelerate vehicle electrification in the Midwest. REV Midwest provides the foundation for cooperation on fleet electrification along key commercial corridors to safeguard economic security, reduce harmful emissions, improve public health, and advance innovation. REV Midwest will future-proof the region's manufacturing, logistics, and transportation leadership and position the region to realize additional economic opportunity in clean energy manufacturing and deployment."

The document went on to say:

"Participating states will develop a coordinated approach to advance electrification that is informed by industry, academic, and community engagement. Participating states will work together to enable an equitable transition to electric vehicles for all with specific consideration for communities that are historically disadvantaged. REV Midwest will position states in the Midwest region to leverage and collectively increase public and private investment in electric vehicles and electric vehicle infrastructure."

TYPES OF CHARGING STATIONS

What types of charging options will drivers have? There are several, including government-funded charging stations along the nation's highways, community- or business-funded charging stations within cities and communities, individual charging stations (home owners with charging stations in their garages), third-party ownerships of charging stations, and even consortiums.

EV INFRASTRUCTURE GROWTH IN THE FUTURE

One of the "energy drivers" of the growth of EVs and charging networks, which is causing movement in the marketplace, is the idea of zero pollution, provided that the vehicles are economically- and technically-viable. Economically-viable refers to price per car, while technically-viable refers to battery range.

Another "driver" that is "fueling" the movement is the increasing price of gasoline.

In fact, I know some people who are considering EV purchases now due to those factors. As manufacturers respond with more options and better prices, I believe growth in the market will continue.

About the only possible caveat – something that could slow the growth - is if battery repairs and/or costs, or other "horror stories," start to surface.

HOW UTILITIES CAN BENEFIT FROM THIS GROWTH

As noted in the introduction, regardless of how quickly or slowly the demand for EV charging infrastructure grows, utilities need to make plans now, and even take steps now, in order to facilitate the process for customers in their grid territories, and also find ways that they themselves can profit from it.

In this regard, utilities have both unique challenges, as well as opportunities, when it comes to the growth of the EV and charging infrastructure markets.

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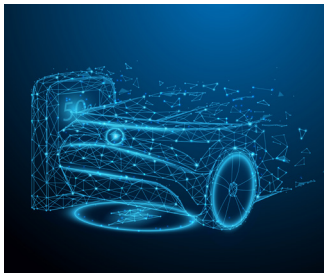

Challenges

Slow chargers (Level 1, overnight version) do not present much of a challenge to utilities as it relates to power demand. Even a handful of Level 2 chargers do not present much risk, but too many of them on a given distribution feeder could cause overloading concerns. If a distribution system operator does not take the time to properly model the new load growth and corresponding system protection changes needed to facilitate said upgrades, things will go awry in a hurry. Finley Engineering regularly helps utility entities with such study work, but, unfortunately, many utilities continue to "kick this can" down the road until such time as they will be forced into a reactionary state, rather than having the opportunity to proactively assess the state of systems to handle or forecast EV penetration, which is what Finley strongly recommends.

Opportunities

Due to the energy storage potential of EVs, many utility operators have the foresight to offer rate-based incentives for consumers who are willing to allow off-peak charging and possible energy storage reverse flow during peak times. This dynamic environment will require additional metering costs for a utility operator to deploy but could pay off with peak-shaving benefits to a utility looking to supplement a high energy cost structure.

A report from the Great Plains Institute stated that, "Generally, we found that it is less costly to operate a single 50 kW charger, and some of these chargers can break even with as little as 2 to 5 charging customers per day depending on the rates charged by the electric utility." However, in most other cases, it is very difficult for a DCFC (direct current fast charging) station to break even due to demand charges.

Here are a few examples of the findings in the report under different scenarios:

- If EV penetration eventually reaches the level for a charging station to see 10 charging customers per day, 50 kW stations will break even at nearly all electric utility rates that GPI studied.
- For 150 kW chargers (which could include three 50 kW chargers or a single 150 kW charger), a DCFC station will break even for about half of the electric utility rates studied.
- Increasing power capacity beyond 150 kW makes it nearly impossible for a station operator to break even, except in cases where the electric utility does NOT have a demand charge.

The findings, according to the report, clearly illustrate a barrier to investment in more DCFC stations, and, in turn, to increased EV adoption. "Today's economics and the average electric utility rates mean that nearly all DCFC scenarios lose money except for a single charger at the lowest 50 kW power level," said the report. "Furthermore, our research indicates that reaching 10 charges per day is not happening anytime soon, based on current EV penetration levels and forecasts."

The report sees this as a "chicken and egg scenario," in which access to DCFC charging stations will help accelerate EV adoption, but DCFC charging stations will currently lose money every year until increased EV adoption results in more charging customers each day.

The report added that, "Most stations that do NOT pay a demand charge can more easily break even. At 50 kW, demand charges account for 24 percent to 39 percent of a DCFC station's annual costs. If the station capacity is increased to 350 kW, the cost share of demand charges grows to 68 percent to 81 percent of total costs."

The report concluded by noting that demand charges exist for a reason, The heavy electric demand from large commercial and industrial customers does increase distribution infrastructure requirements and costs for electric utilities. "Compared to those facilities, perhaps a DCFC is not as impactful on the distribution system, and alternatives to demand charges could be used to account for this," said the report. "There are also multiple economic, environmental, and social benefits to increased adoption of EVs and charging stations. Plus, more EVs means more electric customers and demand for the electric utility to serve. Under certain policies, it's also possible for the utility to get credit for the greenhouse gas reductions of a customer switching from gasoline to electricity. Some utilities already offer to reduce or eliminate their demand charge for EV charging stations."

As Finley Engineering sees it, more generation could be needed from upstream suppliers to handle charging load, but off-peak pricing incentives metering may be a way to mitigate some of this.

Microgrids and localized storage could be a solution, but will probably not be considered as a viable economic consideration unless a specific "driver" is present, such as a large consumer need, aggregated loads due to large housing complex or other municipality, etc.

Strategy considerations could follow a proactive approach to electric system modelling and forecasted EV growth. However, we have found, many small utilities do not even have a model in place. This eventuality should also cause utility operators to evaluate construction work plans (typical four-year planning document) to incorporate both growth considerations and needed device/conductor upgrades, in addition to potential rate-based solutions, such as time-of-use or off-peak pricing.

CONCLUSION

When I look at the new-found traction behind the EV movement, it gives me pause knowing how far behind (in terms of system modelling, system protection, feeder capacity, and overall smart grid device adoption) many utilities have allowed themselves to fall.

In addition, smart grid adoption (i.e., smart device integration, renewable integration, distribution automation, etc.) has been slow for many smaller utilities, and the growing EV trend will cause many to hurriedly adopt changes in a reactionary fashion unless they heed the call to study, model, and evaluate their systems today. This is, in fact, a call to action.

For more information on this topic and other services, contact Finley Engineering at 800-225-9716 and ask for Sean Middleton, or visit FinleyUSA.com.

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As an accomplished Professional Engineer, sean brings more than 25 years of experience to Finley. His areas of expertise include electrical engineering, distribution system operations management, and design and maintenance of electrical systems. He consults with Finley energy clients on many of today's regulatory and compliance issues. With his background in the development of broadband networks, he can also assist in helping energy and telecom clients in meeting RUS requirements and standards, staying up to date on legislative funding, provide project management support and techniques, wireless, FTTP and consult on smart grid initiatives.

Sean is a member of the IEEE including the Power, Communication, and Photonic Societies and the National Society of Professional Engineers (NSPE). Middleton previously sat on the Cyber Security Member Advisory Group for the Cooperative Research Network (CRN/NRECA) and serves on the State Board of Professional Engineers for the IL Department of Financial and Professional Regulation.

RESHAPING EVERYDAY