

Electric Vehicle Adoption: Focus on Charging

The electric vehicle (EV) market is developing and changing rapidly, as evidenced by charging infrastructure deployment and the increasing number of EV models available to consumers. While EVs are being positioned to comprise a significant share of the American light-duty vehicle market in the long-term future, there are notable near-term hurdles that will temper large-scale EV growth, including battery prices, charging infrastructure and model availability, federal policy outlook, and consumer awareness levels. However, it is not a question of if but when these barriers will be addressed. This report focuses on the demand for and the installation and operation of EV charging infrastructure. The report also presents detailed map-based charging infrastructure analyses and in-depth case studies on charging infrastructure deployment for diverse, representative metropolitan markets.

EV COST OF OWNERSHIP

The total cost of ownership (TCO) continues to be a challenging area for EVs—despite the potential for lifetime savings, consumers continue to struggle with the upfront vehicle costs. The expiration of federal tax credits for vehicle purchases will become more acute over the next one to three years as certain manufacturers approach the initial limit (200,000 EVs sold) before the credit phases out. However, there are many market analysts predicting significant battery price reductions in the near-term future (e.g., by 2023), enabling a lower price for most EVs, which will be essential to offset the potential loss of the federal tax credit.

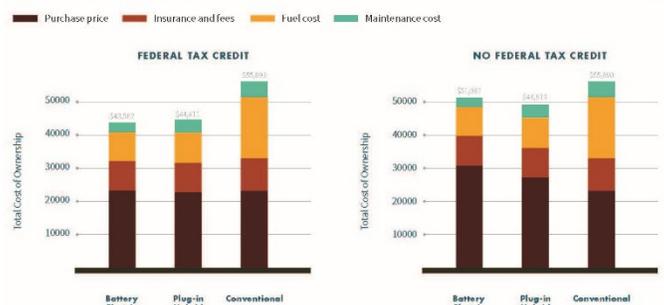
The example presented in this brief demonstrates the influence of the federal tax credit on TCO. With the current federal tax credit (as of January 2020), the purchase price of a midsize BEV in New Hampshire is comparable to that of a conventional vehicle but delivers a 22% reduction in TCO. However, if the federal tax credit is eliminated or phased out, the purchase price for a BEV increases and the savings in TCO decreases to 8%.

EV CHARGING INFRASTRUCTURE REQUIREMENTS

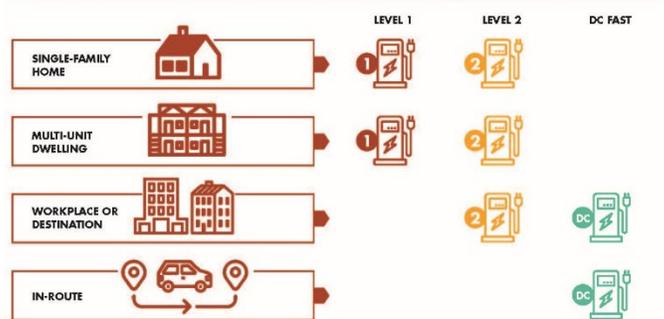
The transition to mass adoption of EVs will likely require a mix of EV charging solutions, with a focus on convenient and ubiquitous access to EV charging. Most market analysts find that residential charging accounts for about 70% - 90% of EV charging. The remaining 10% - 30% of charging occurs at a combination of workplace and opportunity or destination charging locations. These statistics are likely to change as the EV market grows and more drivers who reside in multi-unit dwellings purchase EVs and need access to publicly available chargers.

The initial phases of EV charging infrastructure deployment myopically focused on volume, with little attention to utilization or convenience. Furthermore, the initial focus was on getting Level 2 charging at both residential and non-residential locations while there was less focus on DC fast charging infrastructure deployment. Now stakeholders are beginning to focus on DC fast charging equipment and corresponding demand charges, smarter charging, and deployment with respect to anticipated demand. But there is still disagreement over the amount, location, and type of equipment that is needed to satisfy EV charging demands in different markets.

TCO FOR A MIDSIZE BEV AND A CONVENTIONAL VEHICLE IN NEW HAMPSHIRE WITH (L) AND WITHOUT (R) THE FEDERAL TAX CREDIT



ICF CONCEPTUALIZATION OF EV CHARGING INFRASTRUCTURE REQUIREMENTS BY CHARGING LOCATION



There are many ways to consider demand for EV charging, including site type (residential, workplace, and public) and user type (likely EV driver, multifamily dwelling residents, and mature EV market drivers). In addition to these factors, site hosts should consider their goals in installing EV charging. Charging stations can be installed to support the current EV market or built for a future EV market. Charging stations installed to meet current needs are in areas with high demand and are more likely to be immediately utilized. Charging stations that are installed with the intent of building the EV market are installed in areas that may not have high demand but where the absence of charging stations is a barrier to potential EV drivers.

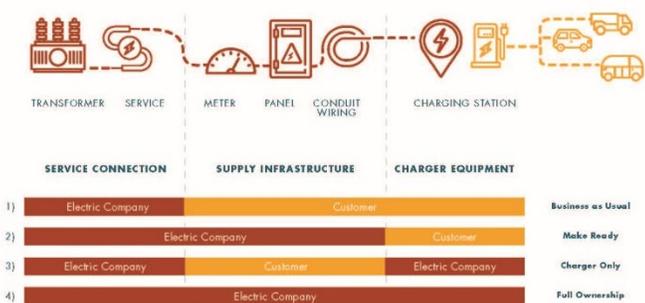
One of the biggest issues associated with charging infrastructure requirements remains a sustainable business model. The value proposition of EV charging infrastructure, absent subsidies, or other investments hinges upon the ability of a site host to re-sell electricity, which is already an inexpensive commodity. Some site hosts may also offer charging as an amenity and a means to increase revenue from the site host's core business.

An additional challenge is the fact that the EV charging market is plagued by a lack of interoperability and standardization, and this has helped contribute to an overall failure to deliver on the convenience required to make EV charging as consumer friendly as possible. Recent investments by various entities, including public agencies and utilities, have led to a rapid expansion of EV charging infrastructure in some areas. In many markets the quantity of charging stations is likely adequate; however, there is a mismatch between the convenience of charging station locations and where EV drivers seek to charge.

ROLE OF UTILITIES

Utilities are submitting filings to make investments in EVs and EV charging infrastructure. EV charging creates new electricity demand, which can increase utility revenues, and EV charging during off-peak hours can increase system load factors and create a more efficient grid, which can lower rates for all customers. Like the rest of the EV industry, utilities do not know the best model for funding charging stations, but utility investment can be considered a complement to the growth of the EV charging services market. In many cases utilities are only providing a fraction of the infrastructure needed to support widespread transportation electrification and EV charging service providers generally view utilities as partners in supporting infrastructure investment and creating opportunities for competition among EV charging service providers where it did not exist before.

UTILITY INVESTMENT OPPORTUNITIES IN EV CHARGING INFRASTRUCTURE



Source: Edison Electric Institute, Accelerating Electric Vehicle Adoption, February 2018

CHARGER SITING ANALYSIS

This study includes a charger demand analysis (ecosystems.azurewebsites.net/fuelsinstitute/) designed to determine where and what type of chargers might be useful based upon a flexible methodology that can be used to understand where EV drivers will likely live, work, and visit within different metropolitan regions. The model can also be updated to determine how charger demand might change as a result of different assumptions regarding EV ownership. The following 10 regions were analyzed, and interactive maps are available online: Atlanta, GA; Austin, TX; Chicago, IL; Columbus, OH; Denver, CO; Des Moines, IA; Los Angeles, CA; Orlando, FL; Philadelphia, PA; and Portland, OR.

CASE STUDIES ON EV CHARGING INFRASTRUCTURE DEMAND

While there is an understanding of how people travel and use conventional vehicles today, there is very little understanding about how people will drive EVs, including where they will charge, when they will charge, and for how long. These case studies provide an opportunity to explore how the deployment of EV charging infrastructure might change as a function of various parameters across different geographies. The authors reviewed the current market for EVs in five metropolitan regions: Atlanta, GA; Austin, TX; Des Moines, IA; Los Angeles, CA; and Philadelphia, PA. These regions were selected because of their diversity, not only in terms of geography but also in terms of EV market readiness and penetration. This mixed portfolio of metropolitan areas allows audiences to better understand how varying conditions in different markets will affect the development of EV charging infrastructure networks and EV adoption at large.

SUMMARY

In short, the EV market is facing near-term challenges, but the industry is undergoing rapid change. Many consumers will rely on conventional petroleum-based fuels for the foreseeable future, but electricity will become an increasingly important transportation fuel that drivers will depend on for their mobility needs. Although there is ample time for the fuels community to prepare for a landscape with widespread transportation electrification, relevant stakeholders should take a proactive approach to assess how they can continue to serve future fueling needs and evaluate opportunities to incorporate electricity into an increasingly diverse suite of modern transportation fuels.

About the Fuels Institute

Founded by NACS in 2013, the Fuels Institute is a nonprofit tax-exempt social welfare organization under section 501(c)(4) of the Internal Revenue Code. We are dedicated to evaluating issues affecting the vehicles and fuels markets. We commission comprehensive, fact-based research projects that are designed to answer questions, not advocate a specific outcome. Our reports address the interests of industry stakeholders—from business owners making long-term investment decisions to policymakers considering legislation and regulations that affect these markets.

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