

EV Charging Station Research Paper

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SUBJECT: EV Charging Final Report

BACKGROUND

Over the last 8 weeks, we looked into EV Charging Stations, specifically accountability of those stations. We were looking into how to maximize both the availability and accountability of public and residential stations, seeing how the state of Maryland could maximize constituent satisfaction.

Before we detail our work, we would like to clarify the meanings of “public charger” and “private charger.”

- **Public chargers** are available for use by anyone with an electric vehicle, regardless of where they live or whether they own the charging station.
 - They are owned and maintained by various entities, including government agencies, businesses, charging networks, and third-party operators. An example of a public charger would be Tesla Superchargers, though they are primarily intended for Tesla drivers.
- **Private chargers**, or residential chargers, are installed on private property, such as residential homes or workplaces, and are intended for use by the property owner and their invited guests.
 - They are owned by individuals, businesses, or property owners who install them on their property.

REPORT RECAPS

In our first report, we first looked at results within the state of Maryland. We [found out](#) that starting this January, tax credits will be available for businesses when purchasing EV's, with 15% of the vehicle purchase price covered by tax credits for plug-in hybrid electric vehicles and 30% of the vehicle purchase price for EVs. We also looked at quantitative findings. In a customer satisfaction survey by BGE, around a quarter of respondents reported broken equipment with about another quarter reporting unable to charge their EV, In another [study](#), Mr. Hartmann summarized the performance of public EV charging stations installed by BGE across Maryland, and found that around 3 out of 10 chargers had an issue ranging from malfunction to

low amounts of power being delivered to his car. We then looked into other states legislative attempts on EV charging transparency, including bills in California, New York, and Massachusetts. We also saw that Maryland does have [legislation, HB834](#), in the workings that's already been approved by the governor, effective at the beginning of October. It requires all electric companies who operate EV charging networks/stations to send in quarterly data reports about functionality, uptime, and repair dates. Their uptime is planned to have 97% or greater.

In our second report, we took a deeper look into [New York](#)'s and [California](#)'s EV charging legislations. New York's bill is requiring disclosure of data on charger reliability to the state departments, and this bill has resulted in a positive response from the public, causing the state as a whole to be more eco-friendly. We are looking forward to similar effect from the Maryland bill HB834. However, California's new EV transparency law is getting a more negative response as the bill gives companies the ability to withhold their data, completely contradicting the purpose of the legislation. We also took a look at issues faced by people who own residential EV chargers. We found that overall, they are upkept much better and are more operational on average. However, there are still issues with them, which we found through a [study](#) done by J.D. Power which saw that customer satisfaction, on a 1000 point scale, decreased from 643 in 2021 to 633 in 2022 due to issues in charger operation. One other problem is that many EV owners don't even know that their companies have programs to help them install home chargers. Thus, private chargers are still a significant issue, but public chargers are what is really holding the charging network back.

In our third report, we wanted to look into how other states have gotten more people aware of programs and incentives that encourage people from constructing residential EV chargers in their homes that lessen the strain on the public charging network. We saw how in [Connecticut](#) they have a lucrative incentive program with great outreach to their constituents through info on news and government sites. We talked about how Maryland could do something similar and build on top of their existing incentives simply by doing more outreach and letting people know of what they could do to easily install a residential EV charger. We also took a look at 3 other state's EV charging legislation, that of [Massachusetts](#), [Texas](#), and [North Carolina](#). We saw that both Massachusetts and Texas' laws are being passed really quickly, helping improve their own networks. Massachusetts plans on making a system to document charger status through specific criteria. And for qualifications, while Texas is trying to make sure its stations are as widely compatible and user friendly as possible. However, North Carolina's bill seems to be having some trouble as it's taking a much longer time to pass. Also, there has been news on people who are against [public EV charging stations](#) with counter-effort on another bill that cuts public charging stations creation out of the Department of Transportation's jurisdiction, likely making it much harder to write laws concerning them. Their issue is in fact that public stations require heavy usage of public funds for the stations and how charging stations only provide electric power for EVs, and how it's unfair to not also have free gasoline/diesel. This does seem to also in

part be a bit of a partisan issue, so it is something we recommend Maryland lawmakers to consider when drafting future legislation in order to incorporate all perspectives.

FURTHER INVESTIGATIONS INTO ANTI-PUBLIC EV CHARGING STANCES

However, in light of our previous findings regarding North Carolina's [anti-electric car proposal to ban free EV charging](#), we have discovered that its state government is actually working to install new EV charging stations along interstate highways. Like many states (including Maryland), North Carolina is hoping that easier accessibility to charging stations will motivate car owners to make the switch to hybrid or fully electric vehicles in the near future. As North Carolina Rep. Kathy Manning of the 6th Congressional District said in [this article](#), "North Carolina's comprehensive plan to utilize the Bipartisan Infrastructure Law funding will accelerate our state's shift toward clean energy while making electric vehicle usage more equitable, practical, and reliable." North Carolina also plans for the "Upgrade of existing and construction of new EV charging infrastructure" as well as the "Operation and maintenance costs of these charging stations." Notably, these objectives closely resemble Maryland's goals of improving the maintenance EV infrastructure.

There are still other reasons people are against public EV charging stations though, [Some](#) think that there will never be a proper well-functioning public EV charging network as people would prefer to use the free public charging instead of charging their EV's at home to avoid the electrical fees. This takes up valuable charging space for other people, especially since "some EVs actually take longer to charge from 80% to 100% than they do from 20% to 80%", and when people drive around in their neighborhoods and communities, they prefer a full charge. However, a simple fee or, better yet, a larger incentive for people to consider charging their EV at home should solve the issue.

Also, there have been [reports](#) of public chargers being hacked by third parties to cause issues. Some, as stated by the article, have been hacked such that their screens show irrelevant irreplaceable images, causing stations to become not operational and ruining any current efforts to maintain EV charger operability. Unfortunately, hacks can also do much more damage. This is a worrying issue that will only grow as the charging network expands. As Ken Munro of Pen Test Partners, a security research firm who investigated these flaws in the software of charging stations, found that "Such cracks [in the network] could conceivably permit hackers to access vehicle data or consumers' credit card information" or worse, shut a whole regional electric grid down if many were hacked simultaneously due to security issues allowing charging systems to be able to start or stop charging remotely. This issue was noticed last year by the federal government with some legislation being rolled out, but it remains an important, critical problem that we have to consider. We think it remains vital to do a couple checks on the

software of current existing charging stations in place across the state to make sure they aren't already compromised or that they don't have a security flaw.

We still believe that the current legislative efforts in Maryland are moving in a positive direction. EV charging station maintenance requires a substantial budget that the state must be willing to invest. Additionally, like we have also mentioned in previous reports, the bill that Maryland has passed must be strict enough for companies that own EV stations to take accountability – unlike the [California bill](#), which causes counterproductive issues as explained above.

PROCESS OF INSTALLATION

We are also looking into the general processes of installing EV charging stations. “Installing charging infrastructure can involve complex payment structures, data collection, ownership models, parking, and signage requirements, in addition to typical infrastructure considerations like cost, regulations, safety, efficiency, siting, and type of equipment. Some organizations may also need to issue a formal solicitation, such as a request for proposal,” as the U.S. Department of Energy has stated [here](#). Listed below is a general outline of the process:

- Planning and Site Selection
- Permitting and Regulations
- Electrical System Assessment
- Equipment Selection and Procurement
- Installation
- Networking and Communication
- Testing and Inspection
- Signage and Accessibility
- And (of course), Maintenance and Ongoing Monitoring

The installation process can vary based on factors such as the type of charging station, local regulations, and site-specific requirements. Those who are interested in a residential station must also check with local authorities or homeowner associations to determine whether permits are required. [This article](#) from the Department of Energy outlines other nuances in the process.

SUMMARY AND COURSES OF ACTION

All in all, Maryland's focus on EV charging station maintenance serves the goal of fostering a clean and healthy environment; Maryland is part of the nationwide push for hybrid/electric vehicles to replace traditional gas-powered cars. Ensuring that there is equitable access to working charging stations is one of the first steps our state must take in order to work towards environmental justice. Courses of action we can take as a community include raising awareness about clean infrastructure, staying up-to-date with current legislation, and voicing concerns of the general population.