

A Regulator’s First Focus on Transportation Electrification Programs

The future of transportation is widely seen to be electric. Plug-in electric vehicles (PEVs) can provide significant benefits to ratepayers in utility service territories, the electric grid and to each state.¹ Given the number of benefits, it’s no surprise that states and utilities around the country are preparing for the accelerated growth of this market through supportive state level PEV policies and utility PEV programs. The American driver simply wants more of these convenient, clean vehicles that save consumers money today.

As the voice of the PEV driver, Plug In America offers a unique, non-business perspective on the areas a regulator should first focus on when evaluating transportation electrification (TE) programs. Ultimately, the TE programs should promote PEV adoption and the growth of the PEV market. Legislation on TE programs and TE goals can undoubtedly provide context and direction to regulators on what to approve.² In the absence of such legislation, we recommend that regulators adhere to the following best practice principles below.



Components of a TE Program

The electrification of the transportation sector is no small endeavor, as this requires investment in more charging infrastructure, development of appropriate charging rates and education of consumers. Therefore, it is important to appropriately evaluate a TE program in a manner that benefits the ratepayer - including the PEV drivers - and the citizens of the state, while permitting the scope of the program to be able to scale over time as the TE sector grows. Components of a TE Program may include the following:

1. Charging Infrastructure (EVSE) Deployment
2. Vehicle Grid Integration (VGI)
3. Education and Outreach (E&O)
4. Partnership and Stakeholder Engagement
5. Fleet Targets
6. Medium and Heavy Duty Vehicle, Buses Programs
7. Other products and services

Our recommendations for each program component are viewed through the lens of what the PEV driver actually needs as the market moves from the early adopter stage to the mass market phase.³

¹ Studies in the states of MA, MD, NY, MN, CT, PA were performed by MJ Bradley and Associates, all showing the state-wide costs and benefits of PEVs. The net present value of estimated total annual benefits in 2030 ranges from \$107-\$265 per PEV in the five northeast states. These annual benefits (NPV) are projected to increase to \$349-\$520 per PEV in 2050, as the cost of PEVs continues to fall, and the electric grid is further de-carbonized. See more at: <https://www.mjbradley.com/reports/mjba-analyzes-state-wide-costs-and-benefits-plug-vehicles-five-northeast-and-mid-atlantic> and <https://www.mjbradley.com/reports/electric-vehicle-cost-benefit-analysis-minnesota>.

² Some examples of legislation include MA H4781, which was passed in 2017 and authorizes electric utilities to propose EV-related investments and establishes the test that the state’s utility commission, the Department of Public Utilities, must use to review any proposed investments. California passed SB 350 in 2015, which finds that “widespread transportation electrification requires electrical corporations to increase access to the use of electricity as a transportation fuel.” The legislation directs the California PUC to order electric utilities to propose projects and programs to support electrification of California’s transportation sector.

³ Once mass adoption has occurred, the needs of PEV drivers will change to require more smart charging and managed charging programs. Battery technology will also evolve and charging station technology will also evolve, requiring modifications to TE programs. For now though, there is still a long road to travel to reach mass adoption.

1. Charging Infrastructure (EVSE) Deployment:

Plug In America supports utility investment in charging infrastructure. Whether through the “make-ready” model or full ownership model, more charging infrastructure leads to greater consumer confidence in having available and adequate levels of charging infrastructure, and therefore greater adoption of PEVs. The additional load from more PEVs on the road can make more efficient use of existing utility assets, which – especially through off-peak charging – puts downward pressure on electricity rates to the benefit of all ratepayers.⁴ Utilities should be allowed to recover the cost of this investment.

Plug In America supports the full utility ownership model of charging infrastructure, as utilities are well equipped to handle the repair and maintenance of the stations in a timely manner. A driver needs the certainty that when he/she pulls up to a charging station, the driver can get a charge. Utilities have the sheer manpower and operational capacity to repair charging stations quickly that provides this charging certainty. Utilities are also best equipped to know which distribution feeder lines can support a DCFC station or a highly utilized public Level 2 station.

The Plug In America charging infrastructure principles are as follows:

- **Charging infrastructure should include a mix of L1, L2 and DCFC, but is best installed in the following order to save costs: L1 and L2 at homes and workplaces, DCFC, and finally L2 in other public places.**

Consumers already have access to L1 charging and therefore an inexpensive source of electricity. Drivers should be encouraged to charge at home first. Most workplaces also already have L1 charging available through standard 120V outlets on exterior building walls and in parking garages, though these outlets will need a dedicated 15A or 20A circuit, with GFCI if outdoors.⁵ A more convenient way to implement Level 1 charging is with a charging station. Although marginally more expensive than a regular outlet, the additional expense is small when amortized over the lifetime of the installation and compared to the cost of electricity dispensed. A Level 1 charging station is more convenient and more secure for the PEV driver.

For some drivers, charging at work will be essential; for others occasionally necessary. Plug In America sees a major opportunity for the widespread use of L1 charging at workplaces, airport long-term parking, park-and-ride facilities, and anywhere else that will leverage longer term parking with the benefit of very low cost to install longer term charging. By first taking a survey of employees at the workplace, it is also possible to determine the proper types of charging infrastructure needed for employees.

Following L1 and L2 charging at homes and workplaces, DC Fast Charging (DCFC) stations should be installed, particularly where concentrations of PEV drivers live in multiple family dwellings without access to garage based home charging. In addition, siting DC Fast Chargers at locations along highway corridors approximately 50 miles from urban PEV concentrations will be advantageous for range extension opportunities.

⁴ Available here: <https://pluginamerica.org/wp-content/uploads/2016/11/PEV-Incentive-Review-October-2016.pdf>. See also “EVs are Not Crashing the Grid” available here: http://www.synapse-energy.com/sites/default/files/EVs-Not-Crashing-Grid-17-025_0.pdf and “Accelerating Investment in EV Charging Infrastructure” available here: https://www.mjbradley.com/sites/default/files/Ceres_PEVinfraAnalysis_120617.pdf and also reports done by MJ Bradley for the states of: PA, MA, NY, CT, MD available here: <https://www.mjbradley.com/reports/mjba-analyzes-state-wide-costs-and-benefits-plug-vehicles-five-northeast-and-mid-atlantic>.

⁵ The DOE also supports the installation of L1 charging first. See the report:

http://www.energy.gov/sites/prod/files/2016/07/f33/WPCC_L1ChargingAtTheWorkplace_0716.pdf

At the workplace, the combination of L1 (sip) and DCFC (gulp) allows for those drivers with short commutes to “top off” the battery after the morning commute, and “sip” a small amount of electricity to recharge the battery. Those drivers with longer commutes can utilize DCFC to “gulp” electricity to recharge the battery, due to the increased speed of recharge available. This “sip and gulp” approach can reduce the exposure to utility demand charges as well.

With third party charging companies very active in promoting L2 and DCFC, it is important to remember that on average, consumers drive about 40 miles per day.⁶ With the current size of batteries, a consumer can drive to the workplace and back on a single charge.

- **Consumers and workplaces need support for DCFC.**

The installation of DCFC stations are higher upfront investments than some small workplaces can likely afford. Therefore, investment in DCFC should be supported by utilities. These DCFC should be located along recently designated PEV Corridors, or at the edge of metropolitan areas. DCFC stations in close proximity to multi-unit dwellings or apartments that lack dedicated parking spaces are also encouraged.⁷

- **Include specific deployment goals for charging infrastructure.**

Setting specific targets for the deployment for charging infrastructure helps consumers to know that there will be adequate charging infrastructure available by a certain time frame. For example, installing 25 DCFC by 2020, and increasing to 50 DCFC by 2023 is an appropriate target that lets a potential EV driver know that there will be plenty of fast charging stations available.

- **Consumer protection principles should be adhered to.**

Key consumer protection issues include the following as listed below. These principles should be strictly adhered to:

- a) *Open Access* – This is defined as the ability to get a charge at any public charger - including L1, L2 and DCFC - either via a credit card swipe or mobile app to enable the charge. PEV drivers should never be stranded at a public charging location where they cannot actually charge.
- b) *Transparency* – The price of a charge should be clear when the PEV driver connects to the charger. This price should also be reported in mapping API so that drivers can select a charging station even before they reach a charging station.
- c) *Interoperability* - This is a key principle for the entire charging infrastructure ecosystem. Currently, many companies have their own card or key, which means drivers must either join multiple “clubs” or risk being unable to charge.
- d) *Mapping data* - all electric vehicle service providers (EVSPs) should provide mapping data for charging locations, including costs for charging (both in and out of network).
- e) *Signage* – There is a critical need for charging station signage, from highway visibility down to the last several hundred feet where the charging station is. While the charging station may be listed on a smartphone, car navigation, or web-based maps, the stations are still challenging to locate as the physical

⁶ Data collected in the US reveal an average of 29 miles daily driving. See: <http://newsroom.aaa.com/2015/04/new-study-reveals-much-motorists-drive/>

⁷ The Alternative Fuels Corridors can be found here: http://www.fhwa.dot.gov/environment/alternative_fuel_corridors/

hardware is not that large. Directional signage installed on streets around the stations would help immensely, and also reduce consumer range anxiety.

2. Vehicle Grid Integration (VGI)

Vehicle grid integration is an umbrella term that includes V1G, V2G, managed charging programs and PEV rate design and charging rates. The Plug In America VGI principles are as follows:

- **Charging rates should be kept low for ratepayers.**

In order to encourage more of adoption PEVs, PEV charging rates should be kept as low as possible. PEV only time-of-use (TOU) rates have been introduced in many utility service territories, and are thus far showing growing acceptance among PEV drivers. These TOU rates do not necessarily require an additional smart meter. Several options exist for determining the time of electricity use for charging the vehicles, such as the meters embedded in the vehicles or charging stations, or devices that interact with the car's telematics. Technological workarounds to encourage charging at off-peak times without the costs of installing a second utility meter have been used in states such as California, New York, Massachusetts, and Vermont.

- **The best rate design for incorporating PEV load will vary depending on grid conditions and renewable energy generation.**

Plug In America encourages the option of time-of-use pricing in order to encourage PEV charging when it is best for the grid, and when it is least expensive for the driver. For example, for a region with consistent solar generation and no battery storage, it might be best to encourage PEV charging at the peak solar generation, to best leverage the oftentimes surplus of solar generation. However, there may be regions where battery storage is in place to capture the excess solar generation – in which case, it may be best to defer PEV charging until nighttime hours to maintain consistent baseload. There may be other dynamic pricing schemes and time-of-use incentives which work best for the driver and grid as well. The Plug In America factsheet on rate design best practices goes into further detail.

- **Demand response programs should include PEVs, as a precursor to vehicle to grid (V2G).**

Utilities should be permitted to include PEVs within demand response programs. These programs can also be called V1G, as the utility or third party will simply turn the PEV charging on or off as needed. Programs can be set to still enable the driver to finish charging by a specified time.⁸ In a V1G program, there is no bidirectional flow of energy, just a start/stop of the power flow into the vehicle. These programs allow the charging to occur based on changing grid conditions, such as an excess of renewable energy generation, like solar.

- **The development of vehicle to grid (V2G) programs should not be a first focus for TE programs unless there is already a mass deployment of PEVs in a service territory.**

Going a step further than demand response with PEVs involves pulling energy from idle PEVs at peak load times via V2G. With V2G charging, PEVs can expand upon the benefits from including PEVs in demand response programs by serving as a generation source for utilities whenever needed, thus reducing ancillary service costs. By serving as literal movable

⁸ Tal, Gil. 2016. Plug-In Electric Vehicle Multi-State Market and Charging Survey

<http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=00000003002007495>. See also the BMW i ChargeForward project study done in the PG&E service territory in CA with 100 BMW i3 EVs: <http://www.pgecurrents.com/wp-content/uploads/2017/06/PGE-BMW-iChargeForward-Final-Report.pdf>

storage for the utility, PEVs can reduce grid congestion in areas of high demand and defer or altogether avoid investment in upgrades of new transmission lines.

While there may be significant opportunities for V2G programs to efficiently utilize grid assets and save ratepayers costs in the long term, creating the optimal V2G program should not be a first focus of a TE program for a utility. There are other areas of a TE program that a utility should focus first on, such as the deployment of charging infrastructure and education and outreach programs. In addition, V2G programs work best for large fleets and not the general light-duty PEV driver, since fleet vehicles are parked in a predictable pattern throughout the day and week. Given limited bandwidth and resources at state Commissions, V2G programs and pilots should be developed in the second phase of any TE program.

- **Demand charges from DCFC systems should be kept low or shifted to energy (kWh) based rate tariffs.**

Demand charges are particularly difficult for DCFC, which can have high peak power but low utilization. Numerous states have implemented rate relief for DCFC, shifting them on to tariffs with a higher cost per kWh but no demand charges, for a period of several years. Pilot programs in Hawaii and Connecticut have removed demand charges for DCFC five years. Pacific Power in Oregon removed them and installed a ten-year ramp to phase demand charges back in. Southern California Edison and the New York Power Authority have also proposed temporary phaseouts of demand charges. Plug In America strongly supports moving DCFC off of demand charge tariffs. Switching DCFC systems to non-demand-metered tariffs will maintain these systems' viability while the PEV market grows.

3. Education and Outreach (E&O)

- **Education and awareness about PEVs is severely lacking, and utilities are a natural fit to help educate customers on the benefits of PEVs and PEV charging rates, to the benefit of all ratepayers.**

PEV driver surveys show that even in areas with higher concentrations of PEV drivers, education and outreach is still critically needed.⁹ As noted above, the adoption of more PEVs in a service territory utilizing off-peak charging rates can lead to more efficient use of existing utility assets, and therefore downward pressure on electricity rates to the benefit of all ratepayers. Similar to education and outreach programs on energy efficiency technologies, which benefit the customer and the grid, utilities should educate their customers on technologies that will overall save the customer money, such as PEVs.

Utilities are also often a trusted voice in the community to provide reliable information, even for promoting PEVs.¹⁰ Utilities know their customers and have the best access to inform customers of new PEV rate information. Whether through emails, bill inserts, websites or social media, there are numerous channels that a utility can use to inform their customer on charging practices (i.e., time to charge, where to charge and how to charge), and about how the electricity they are using to charge their cars is becoming cleaner and greener.

⁹ For example, at a ride and drive event in September 2017 in San Diego, 53% of participants had never been in an EV yet. See more at: <https://pluginamerica.org/wp-content/uploads/2018/04/SDGE-EV-Day-Event-Report-2017.pdf>

¹⁰ One report showed that, "Consumers trust utilities to provide accurate information about EVs, more than they trust government and auto industry sources, according to research conducted by an unnamed EEI member utility. This credibility is reinforced by the fact that utilities promote EVs as a class, rather than try to sell any particular make or model." News article here: <http://www.utilitydive.com/news/got-evs-why-utilities-should-promote-electric-vehicles-to-consumers/417638/#.Vxey9rwikJQ.twitter> The full research is available here: Transportation Electrification: Utility Fleets Leading the Charge (EEI, 2014) http://www.eei.org/issuesandpolicy/electrictransportation/FleetVehicles/Documents/EEI_UtilityFleetsLeadingTheCharge.pdf

- **Utility education and outreach funding should include a series of ride and drive events.**

The best way for a consumer to make the switch to driving electric is to experience a test drive in a PEV. Ride and drive events expose customers to the technology and significantly increase interest and sales.¹¹ Utilities are uniquely poised to support ride and drive events organized at customer workplaces or at local community events that provide the best exposure and return on investment (ROI). Utilities can help by financially supporting local ride and drive events and hosting a booth to educate customers on PEV rates and other utility programs and offerings. One way to demonstrate ROI of the funds a utility spends is to partner with organizers of National Drive Electric Week events or Drive Electric Earth Day events.¹²

- **Utility education and outreach funding should include a dealer engagement program. Utilities are uniquely poised to work with dealers and retail stores to ensure customers sign up for the right PEV charging rate.**

Just as utilities routinely partner with retailers to facilitate sales of energy efficient appliances, programs that engage, support and reward auto dealers play an increasingly pivotal role in PEV adoption. Through ride and drive events or through a brand-neutral car-shopping website, utilities can relay key information to customers and refer interested customers directly to specially-trained retail points to purchase a PEV. The dealer can further refer customers back to the utility for support with preparing the home for PEV charging and to sign up for the right rate plan. Plug In America provides this service between dealers, utilities and potential PEV drivers through the PlugStar program.¹³



- **Utility education and outreach funding should include programs that encourage their own employees to drive electric.**

There are often thousands of employees at a utility who commute in vehicles. If half of these employees drove PEVs, the visibility and awareness of PEVs in its service territory would significantly increase. These employees would help to spur the “clustering effect” that happens with PEVs: one person drives a PEV, the neighbor sees the PEV and asks questions in a non-sales environment and decides to get one too, then the next neighbor purchases a PEV as well, etc. More importantly it will demonstrate to the community that their utility walks the talk of transportation electrification.

¹¹ A series of ride and drives in northern Colorado showed that after the ride-and-drive, those claiming to be “likely” or “very likely” to buy a PEV went from 42 to 57%. Furthermore, 78% had never driven a PEV before the event. Dealerships confirmed that sales rose after the event. See more at Drive Electric Northern Colorado: Creating a Model Deployment Community: <http://evroadmapconference.com/program/presentations15/RosemarieRusso.pdf> Other test drives show that people interested in purchasing a PEV went from 23% to 55%. See footnote 34 in Electrification Coalition: State of the Plug-In Electric Vehicle Market: http://www.electrificationcoalition.org/sites/default/files/EC_State_of_PEV_Market_Final_1.pdf

¹² See the National Drive Electric Week (NDEW) website here: <https://driveelectricweek.org/index.php>

¹³ See more at: <https://plugstardealers.com>

4. Partnership and Stakeholder Engagement

As utilities move forward with proposing TE programs, it is important to involve a number of stakeholders in both proposing the program and in periodic reviews of the program. The transportation sector is a wide encompassing field that utilities have traditionally not played a role in; however, as the future for transportation is widely seen to be electric, utilities will play a center role in transportation. Stakeholders to include in outreach activity include: consumer advocate groups, PEV driver groups, environmental groups, automakers, auto dealers and transportation planners. Approved utility TE programs should include an Advisory Council consisting of these stakeholder groups to provide feedback and offer helpful solutions to any challenges that arise. The approved utility TE programs should also include periodic program reviews.

5. Fleet Targets

The utility proposing the TE program should be leading by example and have internal fleet targets set for transitioning the fleet vehicles to PEVs. The increase of PEVs within a fleet will help the utility to reduce costs for maintenance and fuel, reduce carbon emissions, improve air quality and also demonstrate leadership by adopting the technology. In 2014, the Edison Electric Institute has partnered with its member utilities and requested that each utility dedicate 5% of its annual fleet purchase plan to PEVs.¹⁴ This fleet target should be increased to at least 15-20% of all fleet vehicles, if not higher.

6. Medium and Heavy Duty Vehicle, Buses Program

Many utility TE programs proposed today include electrification projects for the medium and heavy duty sectors. While Plug In America is mainly focused on the light-duty sector, Plug In America strongly supports the transition to electric buses.

- **Utilities should include support for electric bus infrastructure within TE programs.**

Electric buses not only serve to reduce tailpipe emissions and therefore improve air quality, but also serve to bring consumer awareness to electric technologies. In addition, many low-income and disadvantaged communities utilize bus services and live in areas that have the poorest air quality, making the switch to electric buses for these communities an even more compelling argument. Like light-duty PEVs, electric buses save the fleet operator thousands of dollars on fuel and maintenance costs. Furthermore, a study from the Union of Concerned Scientists found that electric buses are cleaner than diesel buses in all areas of the country, in terms of lifecycle emissions. They study found that the diesel bus has nearly 1.5 - 8 times the carbon emissions as an electric bus, depending on the region.¹⁵ These figures include the carbon emissions from charging the bus on the electric grid.

Utilities should look to include investment in electric bus charging infrastructure within TE programs, and should partner with local transit authorities to determine the best placement for the infrastructure.

¹⁴ See more at: http://www.eei.org/issuesandpolicy/electrictransportation/FleetVehicles/Documents/EEI_UtilityFleetsLeadingTheCharge.pdf

¹⁵ See the report at: https://blog.ucsusa.org/jimmy-odea/electric-vs-diesel-vs-natural-gas-which-bus-is-best-for-the-climate?_ga=2.226102682.1843563386.1532023761-1843342382.1531829971

7. Other products and services

As the adoption of PEVs becomes mainstream, and the transportation electrification sector evolves with new innovation, there are a number of programs that utilities could support and invest in. Some examples of such programs are listed below:

- Rebates to teachers and first responders for the purchase of a PEV¹⁶
- Rideshare program partnerships to transition rideshare fleets to PEVs
- EVSE maintenance programs
- Battery storage programs, battery recycling programs

The Transportation Electrification Accord

The Transportation Electrification Accord is an effort started by Plug In America and several other NGO groups to guide utility investment in TE programs, and serves as a starting place on principles for all stakeholders to align around.¹⁷ Utilities, environmental NGOs, automakers, EVSE companies and consumer advocates around the country have all signed on to the Transportation Electrification Accord. The Plug In America components of a TE program and principles for each component, as outlined in this factsheet, align with the broader principles of the Transportation Electrification Accord.

About Plug In America

Plug In America is the nation's leading independent consumer voice for accelerating the use of plug-in electric vehicles in the United States to consumers, policymakers, auto manufacturers and others. Formed as a non-profit in 2008, Plug In America provides practical, objective information collected from our coalition of plug-in vehicle drivers, through public outreach and education, policy work and a range of technical advisory services. Our expertise represents the world's deepest pool of experience of driving and living with plug-in vehicles. The organization conceived National Drive Electric Week and has advanced workplace charging by pioneering ride-and-drive events at such leading corporations as Google, Mattel and Paramount Pictures. We drive electric. You can too. www.pluginamerica.org

¹⁶ SDG&E offers a point-of-sale rebate of \$1k to teachers and first responders who work within the SDG&E service territory. Read more at: <https://www.sdge.com/residential/electric-vehicles/champions-clean-air-ev-rebate>

¹⁷See more at: <https://www.theevaccord.com/>