

# **Clean Transportation Market and Impact Evaluation: Market-Level and Cross-Cutting Insights**

*Final Report*

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# 1 Introduction

NYSERDA's Clean Transportation Program is part of a state-wide suite of efforts to transform transportation and mobility in New York State (NYS), all in the contexts of the ambitious 2019 Climate Leadership and Community Protection Act (CLCPA) that codifies New York State's previous goal of 100 percent emissions-free electricity production by 2040, as well updating other aspects of the Governor's Clean Energy Jobs and Climate Agenda. Almost 40 percent of New York's estimated 205 million metric tons of annual greenhouse gases (GHGs) are currently estimated to come from transportation-related sectors and activities (New York State Greenhouse Gas Inventory 1990-2016); dramatic changes in transportation and mobility technologies and behavior will be needed to achieve NYS's goals.

Two elements of NYSERDA's Clean Transportation Program include the Electric Vehicle (EV) Initiative and the Public Transportation and Electrified Rail Initiative, which are both funded by the Clean Energy Fund (CEF).<sup>1</sup> NYSERDA's CEF Electric Vehicles initiative consists of two programs, an Electric Vehicle (EV) Rebate program and an EV Innovation program. Combined, the primary goal for both programs is to expand market adoption of EVs. The rebate program encourages the sale of passenger EVs by providing tiered point-of-sale rebates to reduce the price differential between EVs and conventional internal combustion vehicles. The innovation program supports the development and demonstration of new products and policies supporting and advancing EV adoption. The Public Transportation and Electrified Rail Initiative's goal is to advance products and strategies that increase the energy efficiency of subway, commuter rail, and bus systems and improve transit agency operations and ridership statewide.

This report summarizes and discusses results from a suite of Clean Transportation market and impact evaluations conducted 2020-2021, including the following:<sup>2</sup>

- 1) *EV Rebate Program Market Evaluation* – describes results from the 2021 Personal Vehicle Customer (PVC) Market Survey, distributed to PVCs across New York State who are not currently EV owners, and compares them to findings from the 2021 EV Driver Survey to provide market insights.

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<sup>1</sup> These initiatives operate alongside and intersect with other initiatives such as Charge NY, Charge Ready NY, and EVolve NY, as well as the New York Truck Voucher Incentive Program (NYTVIP).

<sup>2</sup> Also included is the following report, cited in each of the three listed evaluations here: IEc. 2021. *Clean Transportation Market and Impact Evaluation: Early Findings Report*. Prepared on behalf of NYSERDA. To request a copy of the Early Findings Report, please contact [evaluation.questions@nyserdera.ny.gov](mailto:evaluation.questions@nyserdera.ny.gov).

- 2) *EV Rebate Program Impact Evaluation* – describes direct and indirect impacts from NYSERDA’s Drive Clean EV Rebate program, including the number of rebated EV and PHEVs on the road and their associated MMBtu savings, as well as forecasted vehicles on the road by 2030 as a result of the program.
- 3) *EV Innovation and Public Transportation and Electrified Rail Market Characterization* – describes results from interviews with EV Innovation partners and EVSE installers to characterize EV and EVSE innovations funded by NYSERDA investments. In addition, this report includes findings from a 2021 NYS Transit Operators survey and a series of follow-up interviews aimed at describing a new, post-COVID baseline for transportation.

The three evaluation efforts were conducted concurrently, and drew on a coordinated set of primary and secondary data collection efforts, including:

- **Surveys:** 2021 EV Driver Survey (4,302 complete responses), 2021 PVC Market Survey (429 complete responses), and the 2021 NYS Transit Operators Survey (24 responses)
- **Interviews:** a series of discussions with NYSERDA Program Staff (4), interviews with EV Innovation Partners (14) and EVSE installers (2), interviews with Transit Operators (5).
- **Secondary data:**
  - NYSERDA project data from Salesforce (e.g., CEF EV Projects data, CEF Transit Projects data, and Innovations Projects data), and Charge Ready NY invoice history.
  - Existing survey data (Drive Clean Adoption Survey (2018 and 2020), Drive Clean Ownership Survey (2020), and the EV Market Insight Survey (2016 and 2020))
  - Publicly available state and federal data, including Department of Motor Vehicle (DMV) data, Federal Transit Administration (FTA) National Transit Database (NTD) data, US Census data, U.S. DOE Alternative Fuels Data Center (AFDC), EvaluateNY,<sup>3</sup> municipal policy documents, and prior studies as applicable.
- **Mobilyze.ai** proprietary analytical tool, which aggregates data from the AFDC and EvaluateNY for spatial analysis.

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<sup>3</sup>EvaluateNY. 2021. *Atlas Public Policy*. Accessed online Aug. 2021: <https://atlaspolicy.com/rand/evaluateny/>.

The Market Evaluation Team used the data across the evaluation efforts to: a) validate findings, b) expand on explanatory information, and c) inform broader strategic questions that have emerged since the design of program and evaluation objectives in 2017. There have been two key changes to the program universe since the Clean Transportation objectives were initially designed: the COVID-19 pandemic and the promulgation of the 2019 Climate Leadership and Community Protection Act, which outlines an explicit focus on equity and climate change readiness across the State of New York.

To provide NYSERDA with an integrated assessment of the its programs, this report presents a summary of the findings and recommendations generated by the three concurrent evaluation efforts (**Section 2**), and a discussion of the key crossover and strategic issues that were informed by the combined research (**Section 3**).



## 2 Market-Level Summary of Results

This section of the report provides a high-level summary of findings by evaluation. Metrics are discussed in more detail in each of the associated evaluation reports.

### 2.1 EV Rebate Program Market Evaluation

This evaluation relies primarily on data from the 2021 Personal Vehicle Customer (PVC) Market Survey. This survey was designed and distributed by the Market Evaluation Team to PVCs across New York State who are not currently EV owners. This report also utilizes data collected from the 2021 EV Driver Survey (a survey aimed directly at EV owners in New York State that was also implemented by the Market Evaluation team), data from NYSERDA's existing data collection efforts, and external datasets from the U.S. Census Bureau, and New York Department of Motor Vehicle (DMV).

Although responses were divided relatively evenly across region, income level, and tenure (renters vs. owners), these did not align directly with the demographics across New York State; thus, responses were weighted based on the proportion of the population of New York with access to a vehicle using U.S. Census data.<sup>4</sup> While the decision to limit the population to those with vehicle access only likely increased the accuracy of the survey results to PVCs, it also diminished the weights of low-income respondents, who were less likely to have access to a vehicle compared to the full statewide population.

#### Information and Awareness about EVs

The PVC Market Survey results indicate that a slight majority (55 percent) of respondents have not sought out information about PHEV or BEV vehicles. Of the 45 percent of respondents who have searched for materials about these types of vehicles, online reviews were the most common source of information (72 percent), which may indicate that customers are relying primarily on anecdotal evidence from other current and former EV owners to inform themselves about EVs. Customers self-report confidence in their EV awareness (67 percent report that they could name at least one PHEV model), but only 28 percent were successfully able to correctly identify at least one PHEV model (a correct response included both make and model). This pattern is consistent for BEVs: 54 percent of customers self-reported that they could name at least one BEV model), but fewer survey respondents could definitively

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<sup>4</sup> U.S. Census Bureau. 2021. Explore Census Data: Custom Tables. <https://data.census.gov/cedsci/>. Accessed Jun. 2021.

identify at least one BEV make and model (40 percent, though most of these respondents only identified a Tesla BEV).

### **Personal Experience with EVs**

According to results from the PVC Market Survey, over two-thirds of PVCs reported having some experience with PHEVs (69 percent) or BEVs (61 percent). Seeing a vehicle in the community was the most frequently reported experience with both PHEVs (35%) and BEVs (30%). Respondents reported speaking with friends or family about a PHEV and riding in a PHEV as the next most common types of experiences (22% each, respectively). Other experiences include seeing and learning about the EV on an infomercial, taking a vehicle for a test drive, visiting a dealer, participating in a virtual test drive, renting the vehicle, or attending a promotional event. When asked to rate their level of satisfaction with EV experiences, respondents indicated high levels of satisfaction across all experiences and technologies. These experiences, particularly direct experiences such as test drives, contributed to PVCs' self-reported likelihood of purchasing a PHEV or BEV. Over 60 percent of respondents reported that they were "likely" or "extremely likely" to purchase an EV after having a given experience with a vehicle of that technology type. Respondents who engaged with PHEV or BEVs through virtual test drives were the most likely to express interest in adoption; 97 percent of respondents that had a PHEV virtual test drive experience and 88 percent of respondents that had a BEV virtual test drive experience reported that they were likely to purchase an EV for their next vehicle.

### **Demographics and Likelihood of Future EV Purchase**

To better understand survey respondents' self-reported likelihood of EV purchase, the Market Evaluation Team explored the influence of key demographic variables, including age, gender, geographic area (upstate or downstate), and whether the respondent currently owns a PHEV or BEV.

- *Age:* A majority of younger respondents reported that they were likely to purchase an EV (67 percent of 30-34-year-olds, 65 percent of 35-39-year-olds), where respondents 55 and older were the least likely to consider EV purchase. A high level of interest from younger PVCs in the market survey compared to actual ownership numbers suggests that market barriers are preventing additional adoption: 77 percent of PHEV owners who received a rebate through

NYSERDA and completed the EV ownership survey were forty years of age or older, while 71 percent of BEV owners were at least forty at the time of purchase.<sup>5</sup>

- *Gender:* More males expressed an interest in PHEV purchase (48 percent) as compared to females (27 percent). This division is also true for interests in BEV purchase (45 percent for males, 23 percent for females).
- *Geography:* Downstate residents were twice as likely to indicate that they are “likely” or “extremely likely” to purchase a PHEV (44%) or BEV (41%) compared to their upstate counterparts (27% and 23%, respectively).<sup>6</sup> Over half of all New York City residents participating in the survey indicated that they are likely to purchase a PHEV (54%) or BEV (53%), the highest of any New York State region. Downstate areas and Long Island tended to have higher interest in adoption than their upstate, central, and western New York counterparts. Importantly, income and geography are likely somewhat correlated.
- *Ownership:* The Market Evaluation Team explored the phenomenon of EV discontinuance (where owners return to internal combustion engine vehicles) in the 2020 EV Ownership survey by asking EV owners about both vehicle satisfaction and their likelihood of making a future EV purchase. Both PHEV and BEV owners reported that they were “very” or “extremely” satisfied with their vehicles (92 percent and 94 percent, respectively); however, only 63 percent of owners rate their likelihood to purchase another EV as “91-100 percent”.

## 2.2 EV Rebate Program Impact Evaluation

For the *EV Rebate Program Impact Evaluation*, the Impact Evaluation Team estimated both direct and indirect impacts. Direct impacts encompass the rebate-assisted (program-induced) market adoption. Indirect impacts, or “market effects that are expected to accrue over the longer term from follow-on market activity that results from NYSERDA’s investments” from the EV Rebate program were estimated based on NYSERDA’s Indirect Benefits Evaluation Framework (IBEF). Direct impacts, verified gross savings, reach their final level at the end of the program and remain constant from that point forward.

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<sup>5</sup> See: IEC. 2021. *Clean Transportation Market and Impact Evaluation: Early Findings Report*. Prepared on behalf of NYSERDA. To request a copy of the *Early Findings Report*, please contact [evaluation.questions@nyserda.ny.gov](mailto:evaluation.questions@nyserda.ny.gov). Note that the survey was administered within two weeks of purchasing an EV so differences between age when completing the survey and purchasing the vehicle are likely minimal.

<sup>6</sup> For purposes of this study ‘Downstate’ refers to Long Island, New York City, and the Mid-Hudson regions; ‘Upstate’ refers to the Southern Tier, Capital Region, Mohawk Valley, North Country, Central NY, Finger Lakes, and Western NY regions.

Indirect impacts develop during or immediately after the program and will continue to grow for several years determined by the overall shape of the adoption curves with and without the program. Indirect impacts are projected annually from 2020 through 2030 (as outlined in the Clean Transportation Investment Plan).<sup>7</sup> Indirect impacts are first estimated in terms of number of additional vehicles and then MMBtu savings is calculated based on the direct impact analysis of verified gross savings per rebated vehicle. New York public vehicle registration data including vehicle identification numbers (VINs) for registered vehicles was used to identify counts of BEV and PHEV vehicles in New York, as well as their proportions of the total number of vehicles.

### **Direct Impacts**

The direct impact analysis identifies the number of rebated EV and PHEVs on the road and their associated MMBtu savings. The direct impacts include verified gross savings (VGS) estimates that use the 2021 EV Driver Survey to estimate rebated vehicle miles driven, miles per gallon equivalents (MPGe) for rebated vehicles and average fleet vehicle MPG. In addition, direct impacts include an alternative estimated net savings with program influence that uses an estimate of a participants' counterfactual vehicles MPG (the vehicles that they would have purchased in the absence of the Drive Clean program), identified through the participant surveys.

### **Self-Reported Attribution**

The Impact Evaluation Team finds that zero attribution participants (those that would have acquired the same vehicle, or the same model with less features) account for an estimated 63.5 percent of BEV program participants and 54.9 percent of PHEV program participants (cumulative 2017-2020). Both BEV and PHEV participants are likely to have purchased the exact same vehicle without the rebate, but the proportion is higher for BEV than for PHEV. Accordingly, the proportion of customers that would have purchased a less expensive version of the same vehicle is higher for PHEV than for BEV. Attribution findings do not affect VGS estimates but do inform the estimated net savings (ENS) measure with program attribution.

### **Counterfactual Vehicle Findings**

In 40 percent of the cases where participants would have acquired a different vehicle, the counterfactual is from the same make as the rebated vehicle. Among PVCs that replaced an existing vehicle with a rebated

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<sup>7</sup> Clean Energy Fund Investment Plan: Clean Transportation Chapter. Revised May 27, 2021.  
<https://www.nyscrda.ny.gov/-/media/Files/About/Clean-Energy-Fund/CEF-Clean-transportation.pdf>

vehicle, 73 percent did not acquire a vehicle of the same make as the existing vehicle, while 27 percent did. Of those that acquired a vehicle of a different make, the most common makes are Tesla (27 percent of replacements) and Toyota (10 percent of replacements). Of those that acquired a vehicle of the same make as the replaced vehicle, the most common makes are Toyota (9 percent), Ford (5 percent), and Honda (3 percent).

### **Vehicle Miles Traveled (VMT)**

This evaluation estimates the average VMT of Drive Clean participants to be 10,571 miles per year for BEV, and 11,086 for PHEV. These miles driven estimates are 30% and 26% lower than the program assumption of 15,000 VMT per year. Overall, the difference between BEV and PHEV miles traveled is statistically significant. We estimate that, across all program years, PHEV vehicles are driven about 5% more miles per year than BEV vehicles. However, BEV and PHEV rebated vehicles with no savings have approximately the same miles traveled, whereas there is a substantial difference for rebated vehicles with savings, of approximately 10 percent more miles driven for PHEV than for BEV.

MPGe and MMBtu savings estimates for replacement vehicles, along with verified gross savings realization, are discussed in detail in the *EV Rebate Program Impact Evaluation*.

### **Indirect Impacts**

The indirect impact analysis assesses the number of additional vehicles that will be on the road by 2030 and beyond as a result of the Drive Clean program. The analysis provides estimates of savings related to “follow-on market activity that results from NYSERDA’s investments,” outside of vehicles that receive rebates. The Impact Evaluation Team developed vehicle adoption curves for a counterfactual scenario without the Drive Clean program (naturally-occurring market adoption or NOMAD), and compared this to total market adoption with the program. The difference between these curves represents the overall program impacts, and indirect impacts are the remaining difference once directly rebated vehicles are accounted for. The analysis employs a range of scenarios that reflect different levels of program attribution, different percentages of vehicle markets accessible to EVs and different approaches to modeling adoption trajectory through time.

Indirect impacts are modeled using a Bass diffusion curve approach for several different adoption scenarios, consistent with the IBEF, to ground the modeling process in a widely accepted framework for understanding how a population adopts a new technology. Indirect impact curves for NYS total market adoption are compared to examples of empirically estimated curves for European countries with the

highest EV adoption rates. Total market adoption curves estimated for NYS indicate slower adoption than any of the European countries but still reach 100 percent adoption by 2050. If, in reality, the NYS Total Market Adoption curves prove to be closer to even the least aggressive European countries, the indirect impacts will be higher than those calculated by this analysis. Conversely, if adoption, particularly in the early years, is slower than modeled, then the indirect impacts will be lessened.

The analysis incorporates stringent attribution findings from the ENS analysis as well as numerous assumptions that are likely to lead to conservative estimates of impacts – no increase in miles driven, no increase in accessible market percentage, etc. While indirect impact forecasts are, by definition, highly contingent, this analysis demonstrates that projected impacts were reasonable given a set of reasonable assumptions and scenarios.

### **2.3 EV Innovation Program Market Characterization and Public Transportation and Electrified Rail Baseline**

For the *EV Innovation and Public Transportation and Electrified Rail Market Characterization*, the Market Evaluation Team conducted primary data collection interviews with NYSERDA Program Staff, EVSE installers, and Clean Transportation funding recipients, including technology developers, non-profits, one municipality, and one utility. Secondary data used for evaluation include web and electronic documents about Clean Transportation-funded projects, as well as electronic documents and NYSERDA program data.

Primary data collection interviews address the following:

- Understand how the EV Innovation partners define the market.
- Understand EV Innovation partner efforts to address equity.
- Understand follow-on business decisions.
- Charging station logistics.
- Influence of utilities on innovation.
- EVSE installation permitting.

For Public Transportation and Electrified Rail baseline, primary data collection included a web survey of transit operators in NYS and follow-up interviews conducted with transit operators who indicated their willingness to participate in follow-up discussions in the survey. Interview questions focused on goals for NYSERDA funding, current operations, and transit agency plans for new technology and future

operations. Secondary data included the U.S. Department of Transportation Federal Transit Administration (FTA) National Transit Database (NTD) dataset.

### 2.3.1 EV Innovation

#### **EV Chargers and Accessibility**

Charging stations are clustered in urban centers. Due to the structure of communities living in New York's urban centers (excluding New York City), EV chargers are well-positioned to provide access to communities that are predominantly renters, low-to-moderate income (LMI) households, and historically underserved communities (Black, Hispanic/Latinx). The total number of accessible chargers (an average of 11 percent of people living in urban areas have access to public chargers across New York State) is high compared to other states, but lower outside of New York City (approximately five percent of people in urban areas).

Overall costs for EV charger installation remain high, and charger lifetime profitability hinges on port turnover (cars per port per day), and as a result, rebates or other subsidies continue to be critical in supporting charger purchase. Even stronger incentives (i.e., secondary revenue streams, like California's Zero Emissions Vehicle Infrastructure Credits under the LCFS) may be necessary to motivate would-be charger owners to expand EV charging infrastructure until EV penetration reaches some defined threshold, especially in rural areas of the state.

In addition to charger accessibility, vehicle accessibility for LMI customers remains a problem. In NY, the secondary car market for EVs does not yet provide meaningful access to vehicles for LMI customers. There is limited used EV stock in some of New York's more rural regions (e.g., North Country), and interviewees pointed out that affordability is still a barrier. Existing incentives are for new car purchases, and dealerships are not motivated to develop the secondary EV market further. Interviewees did not seem to think they were in a position to develop the secondary car market, but suggested incentives for customers purchasing used EVs as a way to motivate market growth.

Car share programs, where customers can sign up for access to a local vehicle on an hourly basis for personal use such as grocery runs and other errands, job interviews, or childcare drop off, may not reach intended populations, even with subsidies provided for LMI customers. This is especially true where car share programs rely on free market uptake after the demonstration or pilot project ends. While these programs reportedly reach users without easy access to public transportation (e.g., older customers), often

grantees do not track populations served, thereby limiting the evaluation of equity impacts while the program is fully funded.

In addition to addressing lingering sources of customer concern about EVs (range anxiety, concerns about public charger access, and battery life cycle impacts), there are hurdles to EV adoption in LMI communities. Meeting LMI EV needs may require more attention to the available technology (e.g., proximity to public access charging, and chargers for wall outlets), developing secondary EV markets, and supporting car share programs past their funding expiration (i.e., adoption of non-profit models for operation). Relatedly, charging infrastructure is not suited to the needs of Uber and Lyft drivers, who could reduce operating costs by switching to an EV.

### **Customer Engagement**

Grant recipients reported that customers across all demographics still have misperceptions of EV charging networks as spotty or lacking (despite empirical evidence otherwise). Multiple grantees sought to address the issue of customer hesitation toward EV adoption using strategies such as ride and drive events, brand-neutral marketing campaigns, and needs assessments. Grant recipients also indicated that outreach and market development to LMI communities was still nascent, reflecting efforts to bolster the primary market. Other areas identified for further work included electrifying medium and heavy-duty fleets, as well as re-engaging with dealerships, especially with regard to strengthening the secondary market.

### **Stakeholder Outreach**

The “hub and spoke model” of stakeholder outreach was raised several times throughout interviews. In this model, grantees serve as the convener to bring together various players to draw on multiple and diverse partner strengths, leveraging skills and resources for greater overall impact. However, this type of outreach model seems to exist only within individual projects. The Market Evaluation Team finds there is low evidence of cross-stakeholder coordination of EV outreach activities for encouraging adoption of standardized policies and programs between the various projects. Several interviewees mentioned that they were not directly involved, encouraged, requested to coordinate with related programs, despite knowing that the other programs were in operation. Overlap and coordination among projects could help to strengthen the overall EV ecosystem and rapid uptake and adoption of electric vehicles.

### **Standardized Policy Adoption**

Lack of standardized policies presents a major non-financial barrier to EVSE infrastructure development. Several interviewees reported municipal ordinances and coordination with multiple utilities as issues in



the way of EV charger installation. One EV Innovation Partner reviewed barriers to EV direct current fast charger permitting and identified a few key strategies for standardizing EV permitting. These best practices were published in a 2020 guidebook entitled *DC Fast Charger Streamlined Permitting Guidebook*.<sup>8</sup>

### 2.3.2 Public Transportation and Electrified Rail Baseline

The survey reached a representative cross-section of transit agencies in NYS, with service areas in rural and urbanized areas, employee counts ranging from two to 1,000, and multiple types of routes/service offered: fixed route and schedule, on demand and variable route, paratransit, and other. Interviewees similarly represented a cross-section of transit agencies. An overwhelming majority of transit agencies surveyed (86 percent) plan to purchase or replace their fleets with new (as opposed to used or refurbished) vehicles in the next five years.

COVID-19 impacted public transportation ridership in a significant way: ridership fell by a reported average of 46 percent in 2020 (significantly less than the national). Perspectives on long-term impacts are mixed; some agencies surveyed anticipate the pandemic's effects on ridership to be short-lived, while other foresee longer-term repercussions. In response to COVID impacts, several agencies are looking to increase marketing and outreach efforts, particularly regarding new safety measures. Others mentioned re-evaluating routes and service frequency based on changing passenger needs.

Other survey findings include:

- Operators serving urban areas are more likely than rural operators to offer a combination of both fixed route/scheduled and variable route/on-demand service.
- Standard buses dominate the surveyed inventory, representing 70 percent of the total transit fleet. Minibuses are the most ubiquitous, with three-quarters of transit agencies having at least one.
- Diesel, followed by CNG/LNG, is the most common fuel source for standard buses. Respondents reported that all smaller fleet vehicles are gasoline-powered, including: minibuses, standard vans, and minivans.

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<sup>8</sup> NYSERDA. 2020. *DC Fast Charger Streamlined Permitting Guidebook*. Accessed online August 2021: <https://www.nyseda.ny.gov/-/media/Files/Programs/clean-energy-siting/DC-Fast-Charger-Guidebook.pdf>

- Only 17 percent of fleet inventory is electric vehicles, and all of these are buses. Three agencies use electric standard buses, and one agency utilizes electric articulated buses.<sup>9</sup>
- Gasoline-powered automobiles make up almost three-quarters of the reported support vehicles not included in the agencies' transit fleet counts.
- Most agencies plan to purchase new standard buses and/or minibuses within the next five years. Approximately one-quarter plan to buy or lease an electric vehicle.
- Respondents voiced significant concern regarding fleet electrification, including physical and electrical capacity constraints, lack of dedicated maintenance staff trained for electric motor maintenance, and vehicle/charger costs.
- Potential NYSERDA measures considered most beneficial to agencies include technical support, fleet and facility management strategies, strategies to increase rural access and strategies to improve equity/affordability.

Interviews suggest that planning for fleet electrification is challenged by some additional barriers including:

- Buyer's anxiety over performance limitations. Operators reported hearing anecdotes from other transit operators suggesting that vehicle mileage capacity on electric buses is less than advertised, especially in cold weather. One interviewee mentioned clearance under the vehicle as a concern for rural transit operations on bumpy roads.
- Cost justification. The high cost of an EV bus was identified as a major constraint to fleet electrification, especially under a limited transit budget. When the replacement cost of a comparable vehicle is significantly lower, EV bus purchase is difficult to justify.
- Limited staffing resources. EV technology requires research, grant applications or procurement RFPs, and process management. Transit operators of all sizes and service areas expressed concern over the need to reallocate staffing resources to manage the EV bus purchasing.

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<sup>9</sup> While the survey of transit operators did not distinguish between battery electric, plug-in hybrid electric, and non-plug-in hybrid electric, NYSERDA program staff indicate that these electric vehicles are likely non-plug-in hybrid electric vehicles (i.e., gasoline-electric hybrid).

- Fueling uncertainties. Transit operators are unsure about the cost of charging at night compared with discounted gas costs (bulk pricing), as well as the lost flexibility in refueling at locations outside the central depot.

There are also possible opportunities. Interviewees identified electrification of the support fleet as lower-hanging fruit than the electrification of transit vehicles, in terms of logistics, research, and cost.

## 2.4 Key Findings and Recommendations Summary

Importantly, NYSERDA can provide additional value beyond investments in research, development, and outreach. The Market Evaluation team identified several potential roles for NYSERDA, including:

- Providing follow-on funding for successful technology development and/or early-stage demonstration projects to scale up.
- Encouraging widespread deployment and equitable access.
- Coordinating with other actors to address key regulatory policy barriers.
- Engaging with utilities.
- Publicizing the results of successful technology demonstrations or otherwise conducting outreach to improve consumer awareness.
- Publicizing best practices to disseminate knowledge acquired through NYSERDA-funded projects.

The Market Evaluation Team also developed a series of recommendations for NYSERDA, compiled from each of the three evaluations and arranged in **Table 1** for comparison. **Table 1** is intended to set up the discussion of crossover findings in **Section 3**, so there is some redundancy between bullet points where recommendations align closely with or otherwise reinforce one another. In **Section 3**, these recommendations are discussed together in the context of cross-market and strategic insights, thematic findings that overlap across the areas of examination.

**Table 1.** Compiled recommendations, organized by source.

Recommendations from 2020-2021 Evaluations
<i>EV Rebate Program Market Evaluation</i>
<p><b>Update the EV rebate amount and eligibility to better target consumers that are less likely to purchase an EV in absence of significant subsidy.</b> In the near term, consider ways to restrict eligible recipients to further reduce the rebate amount available for EVs with MSRP &gt;\$42,000.</p> <p><b>NYSERDA Response to Recommendation:</b> Pending. This recommendation is under review for feasibility of implementation.</p>
<p><b>Better address informational barriers on EV costs.</b> NYSERDA should supplement standard information provided at dealerships, and online, with simple messaging comparing total cost of ownership between the EV and a similar ‘average’ new vehicle.</p> <p><b>NYSERDA Response to Recommendation:</b> Rejected. There is already a lot of information about electric vehicles. NYSERDA will not add anything novel to the readily available existing materials.</p>
<p><b>NYSERDA should utilize online resources to better educate PVCs about EV technology:</b> To improve upon NYSERDA’s existing Electric Vehicle Calculator, NYSERDA should advertise this tool to all PVCs interested in purchasing a new vehicle, not just those explicitly interested in EVs; this may also include building in the opportunity to compare to specific non-EV vehicles. To address concerns about range anxiety, NYSERDA should also include reference to their Electric Vehicle Station Locator tool in their Electric Vehicle Calculator tool.</p> <p><b>NYSERDA Response to Recommendation:</b> Pending. This recommendation is under review for feasibility of implementation.</p>
<p><b>Increase access to charging stations and increase awareness of access to charging stations:</b> NYSERDA should coordinate with ongoing Federal efforts to increase the number of charging stations in geographies where drivers rely on street parking or larger, shared facilities for their “at home” parking, and improve the prominence of charging stations in public spaces. Increasing prominence of charging stations in public places through better signage and location provides an opportunity to inform non-EV drivers of the accessibility of charging stations in their community.</p> <p><b>NYSERDA Response to Recommendation:</b> Pending. This recommendation is under review for feasibility of implementation.</p>
<i>EV Rebate Program Impact Evaluation</i>
<p><b>NYSERDA should study future program influence levels to monitor the program influence trend as well as to attempt to better identify reasons behind changes.</b> There was a slight upward trend in vehicle miles traveled (VMT) for vehicles purchased from 2017 through 2019. Year 2020 ended that trend with a decrease that may not be entirely due to COVID-related changes, as participants from all program years responded to the survey at the same time. This may be an anomaly, or the start of a downturn in VMT for participating vehicles. Tracking VMT can help NYSERDA’s evaluators to better understand and quantify program influence.</p> <p><b>NYSERDA Response to Recommendation:</b> Pending. This will be discussed for the next impact evaluation.</p>
<p><b>NYSERDA should include additional VMT questions in future studies, with the objective to determine whether program VMT is changing, why, and in what direction.</b> This may include questions about how the household uses the program vehicle compared to their other vehicles and transportation alternatives.</p> <p><b>NYSERDA Response to Recommendation:</b> Rejected. This recommendation seems unlikely to improve data quality.</p>

## Recommendations from 2020-2021 Evaluations

**Explore improvements to future evaluation methodology:** A persistence study, designed to gauge whether the rebated vehicles are still in New York, can be used to determine what percent of vehicles continue to benefit the state and what percent may have moved out of the jurisdiction. Such a study could consist of a very short survey (do you still own this vehicle, is the vehicle still in the state, how many miles per year) or, if the Department of Motor Vehicles allows it, it may be possible to submit the list of VINs and have the DMV verify whether the vehicle is still active and domiciled in the state. EvaluateNY provides counts of EVs by vehicle age and county or other information that can help the evaluation team assess how many vehicles are purchased outside of the program.<sup>10</sup>  
**NYSERDA Response to Recommendation:** Pending. The program team supports this recommendation, but has not yet discussed how to implement this recommendation.

## *EV Innovation and Public Transportation and Electrified Rail Market Characterization*

**Determine what role NYSERDA can play to further support Innovation Partners:** NYSERDA should determine what role they can play to further support EV Innovation partners. For example, coordination with other actors to address non-financial barriers and disseminate project findings and best practices would support grantees in continuing their important innovation and outreach work after NYSERDA project funding runs out, so if NYSERDA can take on even one additional role (e.g., developing procurement and proposal blueprints for transit agencies) the agency could provide significant additional value to the Clean Transportation EV Innovation Program and Public Transportation and Electrified Rail initiative.  
**NYSERDA Response to Recommendation:** Pending. This recommendation is being considered on a number of different collaborations.

**Streamline the pipeline of project development:** NYSERDA should streamline the pipeline of project growth and development by providing support for grantees to help them to move past the “funding cliff,” where grantees may find it unclear how or with which funding source a successful project could be continued.  
**NYSERDA Response to Recommendation:** Pending. This recommendation is being considered on a number of different collaborations.

**Improve data collection and tracking:** In future requests for proposals, NYSERDA should require applicants to submit a plan for data collection and monitoring efforts from stakeholder engagement (who did they engage with the project?) to project outcomes (how many customers were reached by educational outreach or ride-and-drive events?).  
**NYSERDA Response to Recommendation:** Pending. This will be implemented when the Clean Transportation team releases a new PON.

**Extend charging station access:** NYSERDA should consider a structured approach to fostering coordination between EV Innovation partners and utilities, especially around streamlining interconnection applications, which is important to planning and managing charging station infrastructure expansion.  
**NYSERDA Response to Recommendation:** Implemented. The Clean Transportation has done this more frequently through their Clean Transportation Prizes than they have in the past.

**Consider enlisting third party transit planning support:** NYSERDA should make available third-party planning or technical assistance to provide transit agencies with the help they need to make fleet replacement decisions.  
**NYSERDA Response to Recommendation:** Implemented. The Clean Transportation team has provided this kind of assistance to transit operators often.

<sup>10</sup> See NY State EV Registration Data at <https://www.nyserdera.ny.gov/All-Programs/ChargeNY/Support-Electric/Data-on-Electric-Vehicles-and-Charging-Stations>

### 3 Cross-Market and Strategic Insights

Three major external factors influence the cross-market thematic analysis and inform strategic insights: 1) the COVID-19 pandemic, which impacted public transit, passenger vehicle purchases, and NYSERDA programs; 2) the focus on equity under the Climate Leadership and Community Protection Act (CLCPA), which implies a need for more strategic investment and realignment of requirements for grantees; and 3) the advancement of EV and EVSE technology.

Under the CLCPA, NYSERDA is charged with explicitly considering the equity impacts in program design. Specifically, the CLCPA “requires state agencies, authorities, and entities to direct funding in a manner designed to achieve a goal for disadvantaged communities to receive forty percent of overall benefits of spending on clean energy and energy efficiency programs.” Because equity and funding for projects in disadvantaged communities was not an explicit design priority for NYSERDA’s current Clean Transportation Program investments, program metrics and evaluation questions do not target a comprehensive assessment of the equity-related effects of the current programs, and project and program data on equity-related impacts are limited. However, in the design of these evaluations, the evaluation team designed both primary and secondary research and analysis to provide specific strategic insights into both the equity impacts of current investments, and how NYSERDA can focus on the needs of low-income and disadvantaged communities as part of a thoughtful reconfiguration of key aspects of the program, its requests for proposals, and requirements for grantees. Equity is discussed in relation to several of the cross-market insights subsections that follow.

In addition, the COVID-19 pandemic’s impacts to the transportation sector have been staggering. Across the U.S., public transit experienced a 79 percent decrease in ridership from 2019 to 2020.<sup>11</sup> Changes to public transit since the beginning of the pandemic have been significant (decreased budgets, personal protective equipment requirements, increased personnel training) and have strained municipal planning for fleet electrification. Not surprisingly, impacts from the pandemic have complicated the implementation and measurement of NYSERDA’s Clean Transportation efforts, particularly the EV Innovation Program (particularly projects related to public outreach and mobility) and the Public Transportation and Electrified Rail Initiative, but also the market for passenger cars and the EV Rebate Program. In addition, pandemic impacts have exacerbated existing inequalities, raising the priority of

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<sup>11</sup> EBP US, Inc. 2021. The Impact of the COVID-19 Pandemic on Public Transit Funding Needs in the U.S. Prepared for the American Public Transportation Association. Accessed online: <https://www.apta.com/wp-content/uploads/APTA-COVID-19-Funding-Impact-2021-01-27.pdf>

NYSERDA's consideration of equity implications for technology deployment and public transportation funding going forward. Additionally, the pandemic, and refocused efforts toward equitable distribution of state funds, have revealed a real need for more and better data collection. NYSERDA and its funding recipients need to improve tracking of program/initiative/project participation to develop lessons learned and accurately inform future funding disbursement.

Finally, transportation technologies continue to advance. EVs and EVSE now have more structured, recognizable technologies and substantial market penetration, attributable (to some extent) to NYSERDA's Drive Clean EV Rebate, Charge Ready, and EV Innovation programs. EV technology advances and price changes have decreased the reported impact of NYSERDA's rebates among current purchases, and new smaller EV transit options are part of evolving approaches to transit in several agencies. The novelty of EV technology itself is becoming less of a barrier; instead, barriers to further adoption and wider market uptake appear to be related to the cost and accessibility of both vehicles and charging infrastructure, and to charging capacity and pricing for fleets. Emerging issues of equitable access to charging and EV affordability suggest that the Clean Transportation Program should focus investments on providing access to people who do not yet have access, such as LMI customers and neighborhoods with street-only parking. Alignment of policies, regulations, and utility pricing schedules is critical to expanding access to EVs and EV charging.

Looking across the data collected for the evaluation efforts, including primary data collection and previous analysis of existing data, the Market Evaluation Team notes a series of cross-market insights that can potentially inform NYSERDA's Clean Transportation programs and strategies in the future.

### **3.1 Consider Reconfiguring the EV Rebate to focus on Low-Income Buyers and Secondary Markets**

The Market Evaluation Team finds that most EV owners (59 percent) would have purchased the same model vehicle in the absence of the Drive Clean rebate, suggesting that the current rebate, while having an impact, is not targeted at the buyers who need the specific price reduction NYSERDA provides. This may in part reflect a natural evolution of purchasing patterns as drivers become more interested in EVs, but it suggests that future rebates should be reconfigured and targeted differently. Specifically, the EV rebate does not, as currently structured, address populations that are not typically new-car buyers (e.g., young drivers), including low-income populations. For example, young drivers expressed interested in purchasing EVs, but are not well-represented in populations of PVCs with registered EVs. Similarly, LMI populations do not have sufficient support to purchase an EV. Even the used EV market (where vehicles are priced ~\$10,000) is a stretch for low-income drivers. Ideally, the rebate would be increased, although

the Market Evaluation Team acknowledges that the maximum dollar amount is not controlled by NYSERDA. In the near term the Market Evaluation Team suggests means testing to target consumers that are far less likely to purchase an EV in absence of significant subsidy. Currently the eligibility requirements for the rebate to limit the rebate amount to electric cars with MSRP > \$42,000 to a \$500 rebate. These changes may better enable the incentive to better reach drivers that need it, including LMI drivers. Directing program resources and incentives to the used EV market will also be important since many drivers never consider new vehicles due to income limitations.

### **3.2 The Need for Continuity of Service and Investment**

While the “Valley of Death” is typically used to refer to the gap between pilot testing/demonstration and commercialization for technology products, interviews with Innovations project managers have identified a similar “Valley of Death” dynamic for community-based pilots and programs, and even outreach and engagement. In particular, community-based programs that rely on private-sector adoption of program models to serve disadvantaged communities and populations may require a reimagined business model to achieve sustainability after NYSERDA funding.

The general investment model upon which NYSERDA and other agencies support innovations is based on the assumption that early-stage support for demonstration or technology development projects will enable technology developers to generate private investment resources to scale up technology production for broader deployment when a NYSERDA-funded project ends, in part by reducing the risk for investors. However, this does not always happen on its own; the “valley of death” is well documented, both because investors have priorities and time horizons that may not align with specific technologies, and because barriers such as policy hurdles can create costs and reduce market access. Interviews with Innovations project leads focused on program design suggests that project continuity is still an issue for early-stage research and development of technological innovations and may need more explicit focus in program investments. Examples could include clear programmatic attention to connecting successful projects to next-stage financing options and/or focusing on removing market adoption barriers related to policies and regulatory structures. Conversations with NYSERDA program staff suggest that project continuity planning is often supported through the Technology-to-Market (T2M) Team at NYSERDA.

Moreover, particularly for community access initiatives and services targeting resource-constrained populations and markets, the assumption that a demonstration project will show that “the market” can readily provide these services after the demonstration ends may not hold. NYSERDA’s current Clean Transportation investments address both innovation and LMI deployment as areas requiring temporary and targeted investment to enable private sector markets to find value. It may be the case, however, that



LMI-targeted initiatives will require ongoing subsidies to improve equity. For example, carshare or rideshare initiatives designed to provide access for LMI communities that do not have a long-term plan for continuity demonstrate a disconnect between the intention of the approach used (e.g., a carshare program designed to mimic other similar programs that have had success in the market) and the reality of program (i.e., who will pay the subsidies for LMI customers when the funding ends?). The LMI initiative may be innovative, but if it is focused on deployment and LMI access, the continuity of incentives through an uptake of the program design by a non-profit organization or long-term commitment from a government agency (state, municipal) is critical. The current structure of NYSERDA's EV Innovation program is not aligned to address this issue, but a solution that either builds a longer-term investment option into the current EV Innovation program structure, or aligns a set of investments from different sources (e.g., NYSERDA, New York State Department of Transportation, and/or private sector investments) that enable a staged approach to investments could be an important step.

This disconnect points to a need to reconsider whether LMI initiatives in the portfolio should be designed to explicitly consider (and perhaps require) commitments from other organizations or market actors to ensure continued services once a model demonstrates a sufficient level of success. The NY Clean Transportation Prizes Program may provide an opportunity to test this type of continuity requirement, particularly within the Clean Neighborhoods Challenge and Electric Mobility Challenge, both of which are aimed at addressing transportation and pollution reduction needs in disadvantaged communities.

### **3.3 Charging Access is Expanding Across Regions and Demographics Progressing, but Specific Access Challenges Remain**

Data collection and analysis to support the Clean Transportation EV and Innovation market characterizations found that NYS's programs focused on advancing placement of and access to EVSE has been largely successful, and a spatial and demographic analysis of walksheds around EVSE reveals that the distribution of charging locations appears generally equitable, though location-specific access limitations may persist (e.g., if charging stations are in paid parking garages or locations with restricted access hours).

However, survey data also flag concerns about access to and availability of charging options as a continuing barrier to EV adoption, particularly for residents without access to off-street parking. This confirms the importance of NYSERDA's focus on accessible EVSE as a critical element in the market adoption of EVs.

Other barriers to improved charging access identified in the literature and interviews conducted for the EV Innovations evaluation include: policy hurdles and soft costs related to zoning, permitting, accessibility requirements, visibility of chargers, a need for appropriate incentives for expanding infrastructure, and a need for coordination with utilities around installation and rates, particularly related to fleets and transit agencies. Program design implications for NYSERDA in addressing this include:

- **Continued and expanded emphasis on standardization of permitting, installation, and utility rate policies.** Policy hurdles occur at the local level (municipal ordinances and permitting) and at the utility level (how is the utility handling interconnection?). Municipalities often have different permitting costs and requirements, which can challenge installers working across multiple jurisdictions. Importantly, utilities should be encouraged to support charging station infrastructure expansion to better streamline and coordinate charger deployment, geographic siting, and interoperability. The deployment of EV chargers remains uncoordinated across the U.S., where chargers of all levels or proprietary systems are being installed inconsistently and without much thoughtful planning other than siting stations near rest stops and city centers.
- **Ensuring accessibility and visibility of NYSERDA-supported chargers.** Because EV drivers typically have access to charger location information, visibility of chargers may be most important as a market signal for non-EV drivers who may be considering a future EV purchase. The survey responses suggests that this market signal is still needed. In addition, ensuring that chargers are publicly accessible to EV owners without payment or hours restrictions is critical to EV owners, particularly those without the resources for off-street parking.
- **Considering incentives that result in rapid expansion of EV charging station infrastructure,** such as California’s Zero Emissions Vehicle Infrastructure Credits. This type of incentive creates a secondary revenue stream to motivate EV charging infrastructure expansion efforts in the short-to-medium term. Such incentives for expanding EV charging infrastructure are expensive and may be beyond the purview of the Clean Transportation Program but are worth considering in the larger context of what NYSERDA can propose for state-level policymaking.
- **Emphasize technologies that enhance public charging access and affordability.** NYSERDA is well positioned to support targeted technological and business model innovations that focus on public charging accessibility, including:
  - Residential street charging for EVs: For residents who park on the street, lack of public charging availability is a critical barrier to EV ownership. Examples of efforts to address

this include a partnership by Siemens (one of the EV Innovation partners interviewed in the current evaluation) and ubitricity, a UK company, aimed at converting lampposts to street EV charging with ubitricity’s “SmartSocket” technology.<sup>12</sup>

- Home charging innovations, such as Siemens’ “integrated charger” that combines a charger, meter socket, and meter into a single wall charger unit.
- Incentives for community charging, such as credits for CEC communities developing street EV charging for residents to motivate and encourage further charging infrastructure expansion.

### **3.4 The COVID-19 Pandemic will Require Program Adaptation and Long-range Planning**

Public transit in particular has been heavily impacted by the COVID-19 pandemic, and it remains unclear whether changes to operations (e.g., sanitization, increased operator training in public health and safety procedures, and budget cuts) will be short or long-term. As a result, post-COVID needs for public transportation are uncertain, which poses challenges to transportation planners and transit operators across the State of New York. If transit agencies are to successfully transition their fleets to EVs, technical assistance for procurement planning and/or transportation energy analysis will be important to informing adoption of EVs. Transit operator interviewees suggested that templates for EV transit systems or blueprints for procurement and proposal planning documents would be helpful to their fleet conversion efforts. This may be especially true in the wake of the COVID-19 pandemic, as transit agencies have limited funding and do not have the resources to do the research on EV buses. Similarly, one of the transit operator interviewees suggested that NYSERDA-funded pilot programs to support agencies in route optimization efforts would be well received by municipalities across the state. Route optimization operations analysis would reduce vehicle miles traveled, as well as energy consumption, in the near term. Optimization may allow transit agencies to make strides in reducing their GHG emissions immediately and provides an opportunity to work on designing routes that would maximize charges on EV buses as agencies procure new vehicles and replace old ones.

Most EV Innovation Partners interviewed by the Market Evaluation Team also identified some negative impacts to their projects from the COVID-19 pandemic. While some interviewees had to adapt their

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<sup>12</sup> Siemens. 2021. “Electric Avenue, W9”. *Press release*. Accessed online: <https://new.siemens.com/uk/en/company/topic-areas/sustainable-energy/smart-ev-charging-infrastructure-for-cities.html>

public outreach efforts to the digital space, other projects were stalled or altogether disrupted due to the pandemic. Municipal project partners experienced budget cuts and had to sell back EVs, customer engagement plans that included ride-and-drive events were limited due to social distancing guidelines, and stakeholder outreach moved online, a practice that can hinder rapport-building and networking. NYSERDA might consider requiring scenario-based contingency planning in applicant proposals for outreach and engagement into the future; for example, plan A and plan B scenarios for strategies that rely heavily on customer outreach and stakeholder engagement.

Even the EV Rebate program experienced impacts from COVID – car sales decreased during the early stages of the pandemic, as did use of EV Rebates. While data suggest that this downturn in demand may have been temporary, it adds uncertainty to attempts to measure the direct impacts of the program, and to predict the indirect and market-wide impacts of NYSERDA’s programs. One clear outcome of the pandemic has been the increased household wealth disparity, which will affect future automobile purchases and increases the need for focus on incentives that expand access to EVs beyond new car buyers.

### **3.5 Program and Market Tracking Data Remain a Challenge**

Tracking of outreach and engagement for customers and project partners is critical to monitoring, evaluation, and information dissemination about project outcomes. Currently, no consistent record of the types and numbers of participants in various programs supported by NYSERDA exists (more information on this in Appendix C – EV Innovations and Public Transportation and Electrified Rail). As NYSERDA increases focus on issues related to equity, in particular, it will be important to for projects to track stakeholder participation, customer engagement, and barriers encountered in a way that can rapidly inform NYSERDA’s efforts.

For an in-depth, coordinated, and effective EV transition, NYSERDA would benefit from the systematic collection of data about which stakeholders and customers their investments reach and the result, particularly for customer engagement and stakeholder-outreach-oriented investments, i.e., learn from advocacy campaigns, especially candidate campaigns and build a database of stakeholders, when the last time they were hit, and what was their response. This effort should depend on grantee reporting, but NYSERDA should also keep their own records of customer and stakeholder engagement and outreach for impact reporting.

Finally, EV customer surveys are a regular data collection effort (e.g., the annual EV Driver Survey), improvements to which could add value to future evaluations. For example, data on maintenance and

function of EV charging infrastructure (broken or out-of-order plugs) could be a useful datapoint in assessing existing customer perceptions of charging infrastructure accessibility and upkeep. Additionally, a small, regular or semi-regular survey to all PVCs regarding vehicle ownership and persistence (is the vehicle still in the state, how many miles driven per year) could be matched with demographic data and VIN information from the DMV can help identify how many vehicles are purchased outside rebate programs.

### **3.6 Work with Other Agencies to Develop a Global Strategy**

New York’s Climate Action Council’s Transportation Advisory Panel Recommendations hinge around four topic areas: electrification of light, medium, and heavy-duty vehicles; modernization and expansion of public transportation and mobility offerings; smart growth and transportation-oriented development; and market-based policies and financing.<sup>13</sup> It is important to note that almost all strategies outlined in the preliminary Clean Transportation Roadmap require collaboration/cooperation from other NYS, federal, and/or local government agencies. Some of these include: NY Department of Environmental Conservation (DEC), NY Department of Transportation (DOT), U.S. DOT, New York Power Authority (NYPA), transit agencies and operators, regional economic development councils, and Empire State Development. The preliminary Roadmap also outlines key stakeholders whose engagement may facilitate some of the recommendations. These include EV and EVSE manufacturers, car dealers, taxi service owners, rideshare/ride-hailing companies, utilities, local businesses, fleet owners and operators, port operators, freight operators, charging station developers, and construction companies.<sup>14</sup>

There is a clear need for cross-agency collaboration and stakeholder engagement and coordination to address the behavioral, financial, and policy barriers that come with the above Roadmap recommendations; these priorities have also been highlighted in the evaluation data collection. The Clean Transportation Program has been successful at expanding its “innovation” focus beyond specific technologies and technical barrier, and as EV and EVSE technologies mature, the need to focus on solutions to behavioral, financial, and policy barriers to broader market uptake of EVs and transit options will increase. Stakeholder engagement and coordination with other entities as a part of a more global

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<sup>13</sup> New York Climate Action Council. 2021. Transportation Advisory Panel Recommended Strategies. Transportation Advisory Panel Meeting 13. April 9, 2021. Accessed online, September 2021: <https://climate.ny.gov/-/media/CLCPA/Files/2021-04-09-Transportation-Advisory-Panel-Presentation.pdf>

<sup>14</sup> New York Climate Action Council Transportation Advisory Panel. 2021. Transportation Advisory Panel Meeting 13. April 9, 2021. Accessed online, September 2021: <https://climate.ny.gov/-/media/CLCPA/Files/2021-04-09-Transportation-Advisory-Panel-Presentation.pdf>

strategy for development is critical where policy and behavioral barriers are more critical to project longevity than funding.

NYSERDA's focus on promising technological and program innovations should therefore emphasize the feasibility of clear and thoughtful business models, and predict the alignment of agency and community actions to resolve barriers to deployment. Interviews with EV Innovation partners and review of projects with NYSERDA Program Staff suggest the market feasibility of some business models or project plans for continuity requires more long-term input and support than the EV-Innovation program cycle has allowed (e.g., rideshares targeting LMI communities with subsidies with no long-term plan for non-profit contracting). Coordination with NYS and federal agencies in identifying short, medium, and long-term goals for the electrification transition; prioritizing actions in terms of technical, economic, and policy feasibility; and leveraging the strengths of different entities and existing efforts to address low-hanging fruit first is critical to a successful transition, and NYSERDA is well positioned to guide this type of effort.