EV Procurement Review for Public Fleets

Final Report | Report Number 18-07 | Revised January 2018

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EV Procurement Review for Public Fleets

Final Report

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NYSERDA Report 18-07 NYSERDA Contract 66272 August 2017
Revised January 2018

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Abstract

States and cities have set bold goals for increasing EV adoption in their public fleets. Meeting these goals requires addressing several challenges, including reducing the upfront cost of EVs compared to conventional vehicles. This report explores several procurement models for lowering EV procurement costs in New York State fleets. While a single, best practice model for procuring public fleet EVs has yet to emerge, several models show promise for New York. These models may not eliminate the cost premium of EVs compared to conventional vehicles, but they can provide a pathway for increasing adoption ease and enabling fleets to experiment with new vehicle technologies. In combination with smart incentives, such as a per-mile EV subsidy, they can help successfully move New York State towards its EV goals and position fleets for long-term success in a rapidly evolving market.

Keywords

Electric vehicles; procurement; fleets; leasing; upfront cost barrier

Acknowledgments

This report would not have been possible without the insights shared by fleet practitioners and EV experts in interviews. We sincerely thank them for their time and expertise. A full list of interviewees can be found in the Appendix.

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Acronyms and Abbreviations

BEV	Battery electric vehicle
CGC	Coalition for Green Capital
DEC	Department of Environmental Conservation
DOT	Department of Transportation
EV	electric vehicle
ICE	internal combustion engine
MSRP	manufacturer's suggested retail price
MY	model year
NYSERDA	New York State Energy Research and Development Authority
OGS	Office of General Services
PHEV	plug-in hybrid electric vehicle
ZEV	zero-emissions vehicles

Executive Summary

New York, like many states and cities around the country, has set bold goals for increasing overall EV adoption and public fleets in particular. Meeting these goals requires addressing several challenges, including reducing the upfront cost of EVs compared to conventional vehicles. The cost differential between EVs and conventional vehicles is higher for public fleets, who are unable to directly take advantage of the federal EV tax credit.

This report explores several procurement models for lowering costs and increasing the number of EVs in New York State fleets. From interviews with fleet practitioners and EV experts, it is clear that a single, best practice model for procuring EVs for public fleets has yet to emerge. While fleets have historically been able to command competitive vehicle prices through volume, the data suggest there is limited room to drive savings in EVs through volume orders. The analysis of procurement models suggests that, especially in a low gasoline price environment, these models will face challenges in delivering lower cost of ownership to public fleets.

As a result, the choice of EV procurement model for New York State fleets may be driven largely by public fleet preferences and operating constraints rather than financial calculations. This report finds value in several potential procurement models for New York, especially:

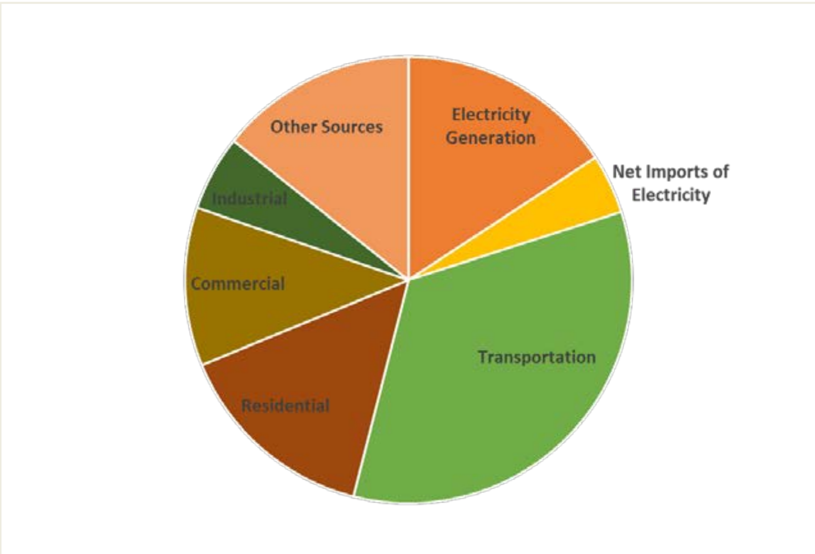
- Supporting EV adoption by State employees for personal vehicles
- Creating a statewide procurement process for leasing EVs
- Continuing support for aggregate purchasing

While these models may not eliminate the cost premium of EVs compared to conventional vehicles, they can provide a pathway for increasing adoption ease and enabling fleets to experiment with new vehicle technologies. In combination with smart incentives, such as a per-mile EV subsidy, they can help successfully move New York State towards its EV goals and position fleets for long-term success in a rapidly evolving market.

1 Introduction

In New York State, the transportation sector is the largest source of greenhouse gas emissions, representing a third of total emissions (Figure 1).[1] In addition, emissions from vehicles create particulate matter and other forms of pollution that impact human health and the natural environment.

Figure 1. New York State Greenhouse Gas Inventory (MMtCO2e)[2]



Spurred by economic and environmental concerns, states and cities across the country have committed to increasing the number of EVs. Increasing the adoption of a new vehicle technology is a complex policy challenge. In a 2015 report, Coalition for Green Capital (CGC) detailed the gap between current EV adoption in New York State and the State's goals.[3] New York signed the Multi-State ZEV Memorandum of Understanding, which aims to put 3.3 million ZEVs[4] on the road in participating states by 2025. Although the goal is not specifically broken down by state, using a per capita allocation would make New York State responsible for 25% of the total goal. This represents approximately 800,000 EVs on the road in New York State by 2025. As of November 2017, there were approximately 23,000 BEVs and PHEVs registered in New York State.[5] In order to meet the ZEV goal, New York State needs to add an average of approximately 80,000 EVs annually through the end of 2025—a significant acceleration from historical growth.

Increasing EV adoption in public fleets has emerged as one avenue for states to support broader EV growth. Public fleets are a significant opportunity for increasing EV adoption, both in terms of size and accessibility. Public fleets with greater than 25 vehicles represent more than 1.2 million automobiles nationally.[6] Assuming each vehicle travels 15,000 miles a year, the total would be 19 million miles annually. Public fleets can also often be more easily targeted with mandates and/or incentives and provide an opportunity to develop insights about EV adoption that can be applied to the mass market.

The Multi-State ZEV Action Plan recommends that states "lead by example through increasing ZEVs in state, municipal, and other public fleets." The ZEV Action Plan recommends a target of 25% of new, light-duty state fleet purchases and leases be ZEVs by 2025.[7] States have followed this recommendation with lofty commitments to increase the number of EVs in their fleets. California has set a goal of having ZEVs comprise 25% of light-duty public agency purchases by 2020—a goal they are on track to meet.[8] Governor Andrew M. Cuomo announced a goal of having at least 50% of new, administrative-use vehicles at the DEC, NYSERDA, and the New York Power Authority be ZEVs by 2016 as part of the NY Clean Fleets initiative, a policy those agencies implemented and continue to follow.[9]

In addition to state-level activity, cities have also been leading the charge to incorporate EVs in their public fleets. Indianapolis previously committed to purchasing 425 EVs by 2016.[10] New York City set a goal of adding 2,000 EVs to its fleet by 2025, giving New York City the largest EV fleet of any U.S. city.[11] In September 2016, Mayor De Blasio announced the city's electric fleet had grown to more than 500 vehicles and that all orders in fiscal year 2017 of nonemergency sedans would be EVs.[12] The focus on sedans is telling—sedans are typically considered the most attractive market for fleet EVs due to a greater availability of models and the operational needs of fleets. Many of the case studies discussed here draw upon the experience of municipal fleets.

1.1 The Upfront Cost Barrier in EVs

There are several challenges to increasing EV adoption in public fleets: lack of charging infrastructure, funding constraints, limited operational experience with EVs, and others. One critical barrier, however, is the upfront cost differential between conventional sedans and EVs. While it is difficult to compare different vehicle models on a consistent basis, EVs generally demand a higher purchase price relative to similar, conventional vehicles. For example, the base model 2016 Nissan Leaf's suggested retail price is $29,000, while the Nissan Versa SL starts at $18,700. Studies have estimated the incremental upfront price premium of a Nissan Leaf and Chevrolet Volt at around $10,000.[13]

Public fleets have often benefited from the ability to command lower vehicle prices through large volume orders. While volume discounting also has potential in the EV market, there are unique challenges. Dealer and manufacturer margins are frequently thin for EVs. EV experts and trade press comments have speculated that manufacturer margins are thin-to-nonexistent (i.e., manufacturers may lose money) on EV models typically used in public fleets.[14] In such an environment, it is difficult for dealers or others to offer substantial discounts on EVs, even for fleets that are procuring many vehicles.

Compounding the problem of higher upfront costs for public fleets is the inability of states to directly take advantage of the $7,500 federal tax credit available for EVs.[15] This is because states lack a tax liability to offset with the credit. There are options for public fleets to capture the value of the tax credit. Dealers can claim the tax credit on EV sales to tax-exempt organizations, passing on a portion of that value to the public purchaser. Leasing models also open opportunities for taking the tax credit. Nissan's commercial lending arm, Nissan Motor Acceptance Corporation (NMAC), extends financing for tax-exempt entities like state or city governments. The arrangement allows for the pass-through of the federal tax credit, so the lender can claim the credit against its own federal tax liability and possibly offer a lower lease price.[16] Fleet management companies may also be able to take advantage of the tax credit in lieu of their public customers. While these options exist, they are unevenly applied. Dealers and management companies may be unfamiliar with the tax credit process or unable to claim the tax credit themselves.

While a potentially large source of savings, it should be noted that the federal tax credit begins to phase out once a manufacturer has sold 200,000 EVs in the U.S. After this milestone, a year-long phase-out period begins. Vehicles are eligible for 50% of the credit if acquired in the first two quarters of the phase-out period, and 25% if acquired in the third or fourth quarter. Vehicles are not eligible for a credit if acquired after the phase-out period.[17] Some EV manufacturers are beginning to approach the phase-out period. By the end of 2017, Chevrolet and Tesla sold more than 150,000 EVs,[18] while Nissan sold more than 100,000 EVs in the U.S.[19] Given the historical sales trajectory and the introduction of new, lower cost models such as the Chevrolet Bolt, it seems reasonable that manufacturers could hit the 200,000-vehicle milestone in 2018–2019. The federal government may also choose to modify the tax credit's terms.

1.2 Procurement Solutions

New York, like other states, has historically addressed the upfront cost barrier through grant programs. The "Climate Smart Communities ZEV and Infrastructure Municipal Rebate Program," administered by DEC, provides municipalities with support for EV and EVSE adoption. Through May 2018, municipalities were eligible for reimbursement of up to $5,000 per vehicle for purchase or lease of qualified vehicles, and up to $250,000 for eligible infrastructure projects.[20] A total of $3 million was available in the grant on a "first come, first served" basis. The New York State 2016–2017 fiscal year budget also includes a $2,000 rebate for purchased EVs.[21] Municipalities will be able to draw upon both this source of funding and the municipal rebate program.

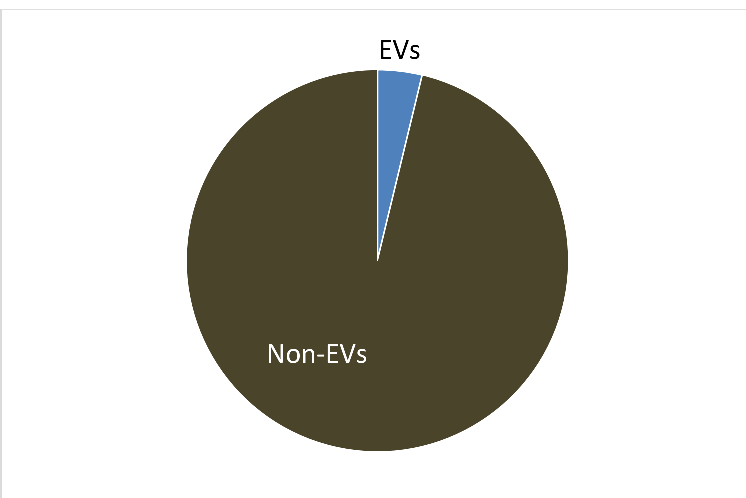
In addition to subsidies, procurement practices may also be able to help fleets address upfront cost and other barriers associated with EV adoption. For example, EVs may be able to make up for higher vehicle costs through operational savings (e.g., lower maintenance or fueling costs). Procurement models, in turn, may be able to use lifetime savings to lower the upfront cost. This report explores several procurement models, including the potential to use lifetime savings to drive overall lower costs for New York State. While the focus of this report is on New York State agencies, many of the findings may be applicable to public fleets in other geographies.

2 EVs in the New York State Fleet

New York has 100 State agencies and fleet needs for individual agencies are diverse. To manage these needs, New York State adopted a largely decentralized fleet system, with agency fleet managers leading purchasing, operational decisions, and data collection. As a result, aggregate data on the New York State fleet is difficult to assemble. This report is based on interviews with fleet managers, federal and State government data, and industry and other third-party reports. It is not intended as a fully comprehensive report on the New York State fleet.

According to an estimate from June 2014, New York State has an inventory of 23,853 vehicles, most of which were special purpose vehicles such as snow plows.[22] The remaining 6,700 were classified as cars and light-duty trucks, referred to here as the "New York State light-duty fleet." The U.S. Energy Information Administration estimates there were 253 BEV and PHEV passenger vehicles[23] in State agencies in 2015, up from 172 vehicles reported in 2014.[24] Using these estimates, it appears that more than 95% of the New York State light-duty fleet is composed of non-EVs (Figure 2). While the number of EVs in the fleet may have risen more recently, it is clear there is still significant headroom for converting State fleet light-duty vehicles to EVs.

Figure 2. Estimated Composition of New York State Light-Duty Fleet



In addition to State-owned or managed vehicles, employees may use personal vehicles for travel. Travel in employee vehicles represents a significant portion of overall travel for State business. Assuming each vehicle averages 15,000 miles per year, the entire light-duty fleet travels 100.4 million miles. In the fiscal year 2013–2014, the State spent $14.2 million on mileage reimbursements for employee use of personal vehicles.[25] Using a standard reimbursement rate of $0.56 per mile,[26] this is equivalent to 25.4 million miles driven in employee vehicles during the fiscal year. In other words, travel in employee vehicles represented approximately 20% of total miles traveled for business. Data on the characteristics of employee vehicles was not available, but based on broader state numbers, it is likely that the majority of these miles were not electric.

2.1 Vehicle Procurement Process and Costs

Outright purchase of vehicles by agencies is the most common model for vehicle adoption in New York State fleets. This is driven by budgetary priorities and an interest in owning assets. Some agencies such as DOT use lease models for passenger vehicles, which has been considered as a potential option for the adoption of EVs within fleets.[27]

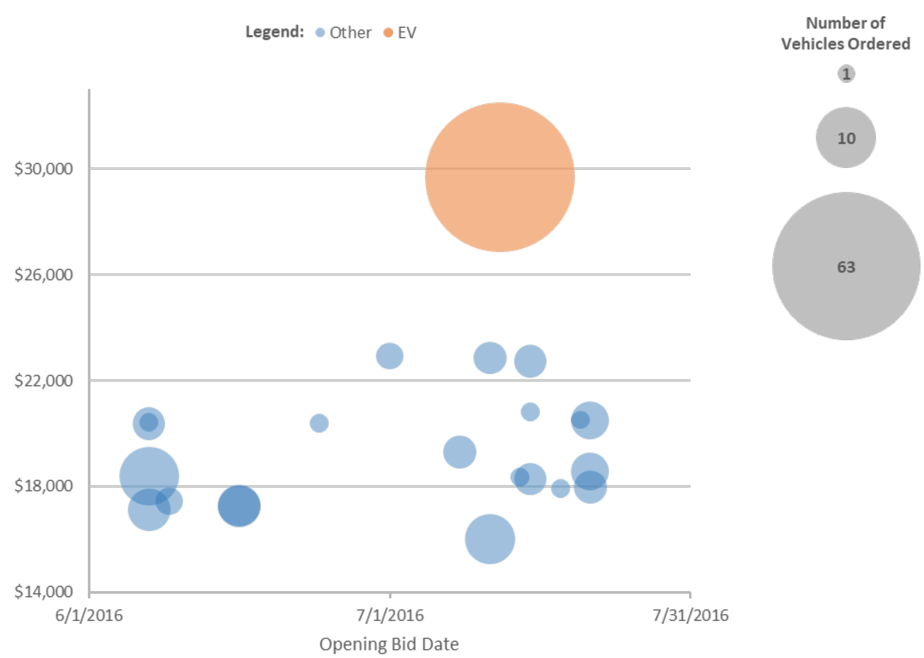
The OGS Vehicle Marketplace ("the Marketplace") is the only statewide award for purchasing light-duty vehicles. The Marketplace was launched in November 2014 and provides a standardized process for State agencies to purchase vehicles. Prior to the launch of the Marketplace, the State offered only one contracted dealer per vehicle model. This procurement model is similar to those used by other states, but it presents limitations. There was no opportunity for price competition among dealers after the contract was awarded and buyers were limited to the vehicle specifications in the contract. There was no contract for alternative fuel on-road vehicles, either due to lack of bids or because they were not included in the solicitation.[28] As a result, agencies were required to procure alternative fuel vehicles on their own.

In contrast, the Marketplace is a "continuous recruitment contract area." Multiple dealers are on contract at one time and submit competitive responses to bids. Bids on the Marketplace typically come from a single agency or municipality, so the number of vehicles in a single order is typically small (i.e., fewer than 10 vehicles). The process begins when agencies submit a business case for vehicle purchase to OGS. Once approved, the agency's request is posted on OGS's website (a "Mini-Bid"). Car dealers who are on contract with OGS can then respond to the request within a specified time period. Once the Mini-Bid closes, the agency determines whether it will go through with the purchase. The Marketplace is active, with multiple Mini-Bids appearing on a typical day. It has significantly increased the number of dealers and vehicle models available on a statewide contract. As of mid-2015, the average reduction in vehicle prices compared to MSRP was 24%.[29]

Certain specialty vehicles, such as school buses and heavy construction equipment, cannot be purchased through the marketplace. In addition, authorized users in agencies may make discretionary arrangements with dealers outside of the OGS contract. However, the Marketplace offers benefits over one-off contracts by fostering competition and reducing administrative burden for requesting vehicles. Interviews suggest it is the preferred procurement method for sedans.

Based on a review of sedans[30] purchased on the OGS Vehicle Marketplace in June and July 2016, the average price of a State fleet sedan is approximately $19,000 (Figure 3).[31] This represented an approximate 20% discount from the MSRP for models that CGC examined, which is in line with the earlier estimates of cost reductions. Higher volume orders often appeared able to command a greater discount for the same make and model.

Figure 3. Price per Sedan on OGS Marketplace (June–July 2016)



Excluded from the previous analysis was a Mini-Bid for 63 Chevrolet Volts, which were priced at approximately $30,000 per vehicle. As expected, the purchase price for EVs was above other sedans reviewed. However, this purchase price still represented a significant discount (11%) on the suggested retail price of a Volt. It is worth noting that a large aggregate purchase of many EVs received less of a bulk discount than smaller one-off purchases of ICE cars in the OGS Marketplace. Aggregate purchasing will be explored in greater depth in the next section on EV procurement models.

2.2 Vehicle Use and Distribution

The mix of vehicles in the light-duty fleet varies significantly by agency. In interviews with fleet managers, the estimated percentage of sedans in their light-duty fleets ranged from 50% to less than 5%. Non-sedan vehicles are a mix of SUVs, pickups, and light-duty vans. Agencies with off-road needs will trend towards higher percentage of non-sedan vehicles. While State data on vehicle type by agency was not available, New York City publishes data on the breakdown of vehicle types in its agencies. This data set highlights the amount of variability in fleet compositions (Figures 4 and 5). The New York City Police Department has the largest number of sedans. However, public safety sedans are typically classified as "emergency," and not considered by fleet managers as best suited for replacement by EVs due to greater operational demands.[32] After the Police Department, the Department of Citywide Administrative Services, the Department of Environmental Protection, Department of Sanitation, and the Department of Transportation have the largest number of sedans in the city—roughly half of the light-duty vehicles in the State fleet are sedans. Applying this ratio to the number of light-duty vehicles yields an estimate of approximately 3,400 sedans in State agency fleets.

Figure 4. Breakdown of City Agency Fleets by Weight Classification[33]

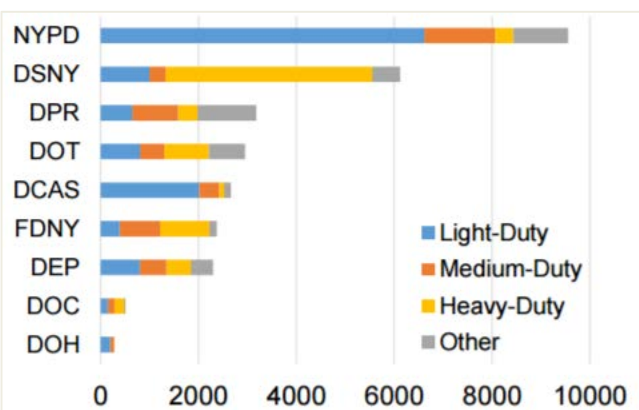
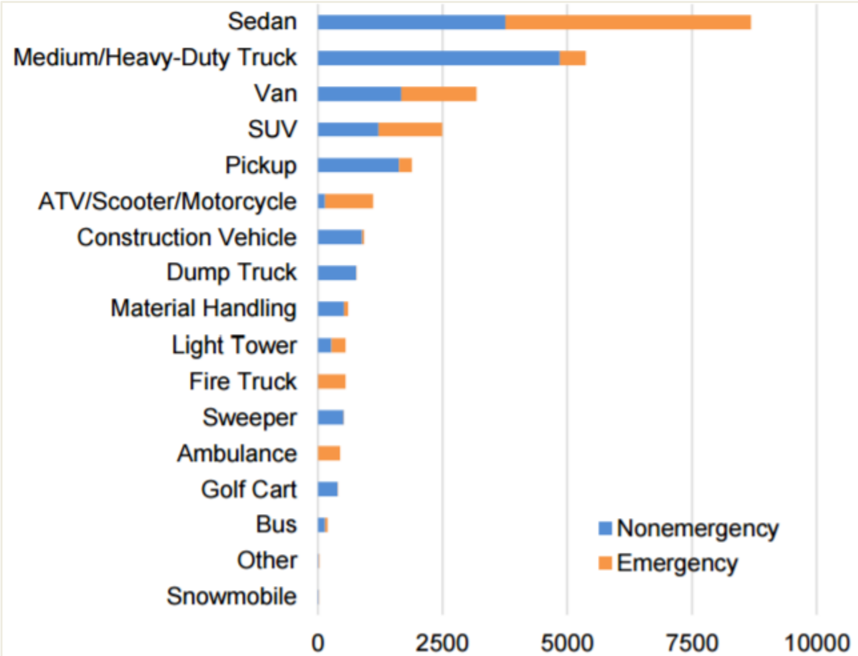


Figure 5. Largest Categories in New York City fleet[34]



A typical light-duty vehicle in the fleet travels approximately 15,000 miles per year, although this number could be below 10,000 miles for vehicles in urban areas such as New York City, and above 25,000 miles in other areas. Vehicles are typically replaced at the end of their useful life (approximately 10 years) and have limited to no residual value remaining at the end of that time period.

Different systems exist for assigning fleet vehicles to users. According to the State Vehicle Use Policy, vehicles are assigned to employees on an as-needed basis and only to specific employees in "extraordinary circumstances."[35] Interviews suggest these circumstances are primarily limited to emergency response personnel. These cases are less relevant for EVs, which are typically targeted at nonemergency applications. It appears the most common system is for vehicles to constitute a shared pool, clustered at agency offices around the State.

2.3 Cost of Ownership Model

2.3.1 Base Case

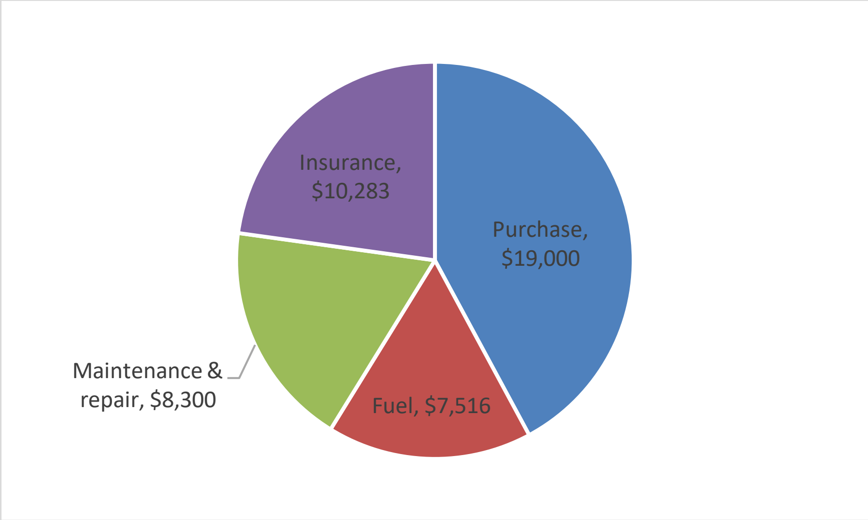
Creating a cost of ownership model can help improve the understanding of the base case cost of ownership of an ICE fleet sedan. The base case should be viewed as a tool for understanding potential opportunities to capture value through the conversion to EVs, rather than an average total cost of ownership of a sedan. This is not intended as a substitution for analysis of telematics vehicle data or a similar exercise.

The model assumes vehicles are purchased outright (the most common case for State agencies) and does not include financing costs. Based on interviews, the vehicle lifetime is assumed to be 10 years, with no residual value at the end of its lifetime. Since purchases by State agencies are generally exempt from sales tax,[36] it is not included in the model. License, registration, and opportunity costs are also omitted. While operating costs such as maintenance and repair will be variable over a vehicle's lifetime, operating costs were straight-line projected in the model. The model uses an annual discount rate of 1.5%, which is the approximate 10-year yield on AA-rated municipal bonds.

A base case lifetime cost for a New York State sedan was created using the assumptions previously mentioned,[37] specifically that the vehicle travels 15,000 miles per year. Like other parts of the U.S., New York State has seen historically low gas prices in recent years. The average price of gas in New York State was $2.24 per gallon (including taxes) in 2016, the lowest nominal price of gas in the past decade.[38] Based on fleet manager interviews, the price of gas paid by the typical State fleet is around $1.63 per gallon.

The average purchase price from the OGS Marketplace of $19,000 was used in the model.[39] Additional inputs on maintenance and insurance costs were generated based on industry reports. The base case was discounted at an annual rate of 1.5% over the 10-year lifespan discussed above. This yields a cost of ownership of a fleet sedan of approximately $45,000 (Appendix A).

Figure 6. Lifetime Cost of Sedan (Base Case)



Examining Figure 6 highlights that operating costs are a significant driver of total lifetime costs of an ICE. For example, fuel represents approximately $7,500 of costs in present value terms in the base case. Maintenance and repair (including tires) represents $8,000 in costs. Collectively these two categories represent more than $15,000, or a third of total lifetime costs.

It is possible that both fuel and maintenance costs would be lower for EVs. Reducing these cost categories could substantially offset the upfront price premium of EVs. Reducing these costs by half, for instance, would be roughly equivalent to the value of the federal tax credit for EVs.

2.3.2 Sensitivity Analysis

The base case was tested against several scenarios (Appendix B). This analysis identified tradeoffs that can result in similar costs of ownership. First, cost of ownership is fairly sensitive to number of miles driven per year. Increasing annual mileage by 5,000 miles increases cost of ownership by $5,000 over the vehicle's lifetime, holding all other variables in the base case equal. The price of a vehicle is also a significant driver of costs. A modest increase in vehicle purchase price (e.g., from $19,000 to $22,000) needs to be offset by a reduction in gas prices (e.g., $1.63 per gallon to $1.00 per gallon). Figure 7 reproduces key sensitivity analyses.

Figure 7. Selected Sensitivity Analysis of Total Cost of Ownership

Fuel Efficiency vs. Annual Mileage

Avg. miles per gallon	Miles per year: *10,000*	*15,000*	*20,000*	*25,000*
22	$41,649	$47,832	$54,015	$60,198
26	$40,598	$46,255	$51,913	$57,570
30	$39,827	$45,099	$50,371	$55,643
34	$39,237	$44,215	$49,192	$54,169
38	$38,772	$43,516	$48,261	$53,006
42	$38,395	$42,951	$47,508	$52,064

Gas Price vs. Vehicle Purchase Price

Dollars / gallon gas	Sedan Price: *$13,000*	*$16,000*	*$19,000*	*$22,000*	*$25,000*
$1.00	$36,194	$39,194	$42,194	$45,194	$48,194
$1.25	$37,347	$40,347	$43,347	$46,347	$49,347
$1.63	$39,099	$42,099	$45,099	$48,099	$51,099
$2.00	$40,805	$43,805	$46,805	$49,805	$52,805
$2.50	$43,110	$46,110	$49,110	$52,110	$55,110
$3.00	$45,416	$48,416	$51,416	$54,416	$57,416
$3.50	$47,722	$50,722	$53,722	$56,722	$59,722

2.3.3 Areas of Potential Savings from EV Adoption

The analysis suggests there is an opportunity for EVs to make up for higher purchase prices through operational savings. The purpose of this section is not to definitively identify the savings achieved through a fleet conversion to an EV, but rather to reasonably size the opportunity. This analysis will be useful in understanding the purchase price premium an EV can command while still delivering similar lifetime costs.

2.3.3.1 Fuel Savings

A straightforward way of sizing the lifetime savings opportunity from EVs is to examine the savings from lower fueling costs. The typical fueling cost for an EV is approximately $0.03 per electric mile driven.[40] This is less expensive than the fueling cost of fleet sedans driving on gasoline, which is estimated at approximately $0.05 per mile in the base case. To understand the maximum size of the fuel savings opportunity, CGC assumed that 100% of the miles an EV travels will be in electric mode. Figure 8 shows the impact of this on fueling costs for various mileages.

Figure 8. Potential Annual Fuel Savings vs. Annual Mileage

Lifetime Potential Fuel Savings of an EV, 100% miles driven in electric

		Miles per year			
Dollars / gallon gas		*10,000*	*15,000*	*20,000*	*25,000*
	$1.00	$307	$461	$615	$769
	$1.25	$1,076	$1,614	$2,152	$2,690
	$1.63	$2,244	$3,366	$4,488	$5,610
	$2.00	$3,381	$5,072	$6,763	$8,454
	$2.50	$4,918	$7,378	$9,837	$12,296
	$3.00	$6,456	$9,683	$12,911	$16,139
	$3.50	$7,993	$11,989	$15,985	$19,981

Holding all other features of the base case constant, replacing a gasoline-fueled sedan with an EV on 100% on electric miles will result in lifetime fuel savings of approximately $3,400. Lifetime savings increase with both higher gas prices and higher annual mileage. It is important to note that this number represents the high-end of the savings for PHEVs, which can be driven on both gasoline-powered and electric drives. Studies have found that Volt drivers, for example, travel roughly 75% of their miles on electric drive.[41]

The cost of charging is assumed to be $0.10 per kWh, which is based on the average price of electricity for transportation.[42] Actual prices for charging can vary significantly. Some manufacturers offer free charging. In an earlier report, CGC noted that fast chargers would need to charge significantly above the retail price of electricity in order to recoup their costs of investment. The impact of various charging prices on fuel savings is shown in Figure 9.

Figure 9. Impact of Charging Price on Fuel Savings

Lifetime Potential Fuel Savings of an EV, 100% miles driven in electric, $1.63 / gallon gas

		Miles per year			
$ per kWh for charging		*10,000*	*15,000*	*20,000*	25,000
	$0.00	$5,011	$7,516	$10,021	$12,527
	$0.05	$3,627	$5,441	$7,255	$9,068
	$0.10	$2,244	$3,366	$4,488	$5,610
	$0.25	-$1,906	-$2,859	-$3,812	-$4,765
	$0.35	-$4,673	-$7,009	-$9,345	-$11,681
	$0.55	-$10,206	-$15,309	-$20,412	-$25,515

2.3.3.2 Maintenance and Repair

Fuel savings are not the only source of potential operating cost savings. Studies have noted that electric-drive motors typically require less maintenance than others.[43] This was supported in interviews with fleet and EV practitioners, where per mile maintenance costs for EVs were estimated at as much as 30% lower than conventional vehicles. Applying this 30% number to the maintenance costs in the base case yields total lifetime savings of approximately $2,500.

However, estimates of lower maintenance costs typically do not include the cost of replacing EV batteries. Current estimates are that an EV battery needs replacement every 100,000 miles. Over a 10-year lifetime, an EV that travels 15,000 miles per year will need replacement at least once. The replacement battery cost is currently $180-$200 per kWh.[44] For a typical 30 kWh battery, this yields a cost of around $5,500.

The actual battery costs paid by EV end-users over a 10-year lifespan are unclear. Battery technology and business models are changing rapidly. The oldest vehicles in this generation of EV models is just beginning to replace their batteries. Manufacturers such as Chevrolet, Nissan, and Tesla currently offer battery warranties for the first eight years and/or 100,000 miles. Given the uncertainty of battery costs, maintenance and repair were not counted as a source of savings for EVs in this model.

2.3.3.3 Insurance

Reviews of insurance rates for EVs have reported mix results on costs. Some have found modest savings (e.g., 15%),[45] while others have found modest premiums[46] versus similar sedans. Identifying comparable vehicles is frequently a challenge in these studies and is not appropriate at this juncture to include insurance as a source of savings for EVs.

2.3.4 Conclusion

A sedan lifetime cost of ownership of $45,000 is a starting point for analyzing the attractiveness of EV procurement models. Holding all other factors constant, the fuel savings from adopting an EV reduces the lifetime cost of the base case by $3,400. This does not include the cost of charging station infrastructure.

3 Review of Fleet Procurement Models

From interviews with public fleet practitioners and EV experts around the country, it is clear that a single, best practice model for procuring EVs for public fleets has yet to emerge. Instead, public fleets are taking a range of approaches to EV procurement. This section outlines of four of the most common procurement models.

3.1 On-going Purchase Contracts

CGC reviewed procurement contracts for EVs in several states outside of New York State. These states were selected because they, like New York State, were signatories of the ZEV MOU and their procurement information was readily accessible. Procurement options and practices for vehicles vary across states. However, the most common model of public EV procurement is to purchase vehicles from in-State dealers via an existing contract.

The process of establishing a contract with a dealer begins when the applicable state office announces a public solicitation for bids. The State will provide vehicle specifications, contract terms, and details for placing bids. These solicitations are made publicly available through state procurement websites or similar forums. Dealers then submit their applications. At the end of the bidding process, a single dealer is typically selected for each vehicle model available on state contract. A single dealer may win the rights to provide multiple vehicle models, and multiple dealers may be ultimately selected to provide the full range of vehicles available on the contract. These exclusive contracts are in effect for a set period (typically 24-36 months). Once the contract has been awarded and the start date has passed, "users" (i.e., authorized purchasers in state agencies or municipalities) can purchase vehicles through the contract. Purchases are usually allowed on an on-going basis, which mirrors standard state procurement practices for a variety of goods and services beyond vehicles.

To gain an understanding of the economics of this model, data was gathered on the base cost of EVs on several state contracts (Figure 10). The two EV models examined were the Chevrolet Volt and the Nissan Leaf, which are among the most common public fleet sedan EVs.

Figure 10. EV Prices on State Contracts, Selected States

State	Chevrolet Volt		Nissan Leaf	
	Base Price	*vs. MSRP*	*Base Price*	*vs. MSRP*
Massachusetts (MY'16)[47,48]	$32,446	-2%	$23,336	-20%
Oregon[49]	$29,648	-11%	-	-
Rhode Island (MY'16)[50]	$29,277	-12%	$32,429	-
Vermont[51]	-	-	$19,996	-35%
Washington[52]	$30,584	-8%	$21,982	-28%
Average	$30,489	-8%	$21,771	-28%

Unless otherwise noted, prices refer to 2017 model years. Final purchase prices may be higher than the numbers listed here, depending upon add-ons selected.

Vehicle prices are consistent for a given model year, although there are some exceptions (e.g., the Nissan Leaf in Rhode Island, which was excluded from the average calculation). The stability of these prices suggests they represent a good approximation of the base case cost of EV procurement. However, these prices should be considered a snapshot of the current situation; prices can change dramatically between model years. For example, the 2015 Nissan Leaf was listed on the Washington State Contract Automobile Request System for $27,772. EV experts interviewed noted that the purchase price of Leafs across the country has fallen rapidly in recent years. Interviewees cited rising competitive pressures, the evolution of EV technology, and the growth of dealer financing capabilities as reasons for this decline, although they cautioned that low prices may not persist as the market continues to evolve.

Comparing across models, discounts from MSRP are much greater for the Nissan Leaf than the Chevrolet Volt. The discount on the Nissan Leaf exceeded 30% in some states, while the Chevrolet Volt discount was less than 15%. In terms of absolute dollar amounts, the average discount from MSRP on the Volt is slightly over $2,000, which is less than a third of the value of the federal tax credit. There may be a variety of drivers of differing discounts between models including dealer margins, manufacturer incentives, pricing strategies, and so on. A discount that is less than the value of the federal tax credit may also suggest that dealers are unable or unwilling to pass on the value of the tax credit to public fleet customers. Procurement models that help dealers take the tax credit may result in significant reductions for certain vehicle models, but not others.

Finally, while it is difficult to directly compare an EV with a non-EV model, it should be noted that EVs on State contracts are more expensive than similar ICE sedans. The MSRP of many ICE sedans is below the price of EVs on contract. Factoring in the discounted price states receive through contracts increases the cost differential between EVs and non-EVs. For example, the Nissan Versa S Plus is on contract in Massachusetts starting at $14,784. That is over $8,500 less than the starting price of a Nissan Leaf on contract in the same state. This underscores the comparatively high upfront costs of EVs.

3.2 Aggregate Procurement

Aggregate procurement (sometimes called "collaborative procurement") refers to a process where multiple entities consolidate their EV procurements into a single process or bid request. NYSERDA's Clean Energy Fund Investment Plan commits to "support[ing] the demonstration of models for aggregate EV purchases, such as Solarize-style[53] grassroots campaigns that use community ambassadors to raise awareness of EVs."[54]

Multi-state collaboration on aggregate procurement of EVs have gained increasing traction. In 2013, the governors of eight states—including New York—signed a memorandum of understanding committing to coordinated action on their state ZEV programs.[55] In 2015, West Coast Electric Fleets was founded with 22 public and private fleet partners in California, Oregon, Washington, and British Columbia to make ZEVs 10% of new public and private fleet vehicle purchases by 2016.[56]

Multi-state models have found support at the federal level. DOE's Clean Cities program has a project category for "Alternative Fuel and Advanced Vehicle Procurement Aggregating Initiatives." In 2016, DOE awarded two projects a total of $2.9 million to support aggregate procurement models.[57] These projects are set to explore several models for aggregate procurement, including leasing and purchase. The grants are for 24 months, starting in March 2016. The projects both target a 15% reduction in EV prices. One project specifies a goal of creating a replicable procurement model, including a straightforward way to monetize the tax credit. While 16 states are initially involved in this project, the model will ultimately be open to all public fleets.[58] Orders have not yet been placed and will likely begin toward the end of the two-year grant.[59]

Due to policy changes, auto manufacturers may be particularly interested in models that increase EV sales volumes in particular states. Under the Clean Air Act, California can issue vehicle emission standards that are stricter than the federal vehicle standards. Other states can adopt California's standards at their discretion. Nine states, including New York, have done this. These standards require auto manufacturers to earn credits from the sale of ZEVs, PHEVs, fuel cell, and hybrid vehicles. These credits are proportional to the manufacturer's total sales in the state.

Historically, vehicle manufacturers were able to apply credits from sales of vehicles in California towards meeting goals in other states. However, beginning with model year 2018, manufacturers will no longer be able to "travel" credits from California to other states for any vehicle sales other than fuel cells. In addition, the percentage of credits required to come from ZEVs will rise to 45% by 2018. Auto manufacturers may ultimately need to increase sales of EVs in states like New York in order to meet the new regulatory requirement. This may result in lower costs for procurements that could spur a large number of vehicle sales in a particular geography. However, it should be noted that the program allows manufacturers to store (or "bank") credits between years, and manufacturers have a considerable accumulation of credits. The Union of Concerned Scientists estimates that manufacturers currently have sufficient credits to comply through 2021, even without an increase in percentage of ZEV sales.[60] In addition to meeting new Clean Air Act standards, vehicle manufacturers also need to meet rising fuel efficiency standards (i.e., "CAFE" standards), which are set to rise to 54.5 miles per gallon by 2025.

3.2.1 Case Study: New York State

As discussed earlier, New York State's OGS Vehicle Marketplace differs from ongoing state contracts described in the previous section. Rather than having a contract with one dealer, approved users can respond to solicitations (i.e., place bids) on an ongoing basis.

Mini-Bids for EVs have previously appeared on the OGS Marketplace. These bids are typically for one to two EVs, which may not attract dealer attention; some Mini-Bids for EVs did not receive any opening bids.[61] In contrast to those approaches, in 2016 the New York State Department of Environmental Conservation (DEC) and the Office of General Services (OGS) have coordinated the aggregate purchase of Chevrolet Volts for State agencies, authorities, and municipalities. The DEC campaign included several education and outreach events to build awareness about EVs, including EV "ride and drive" events for state fleet managers, direct outreach to state and local fleet managers, and webinars through DEC's Climate Smart Communities program.

Once final order numbers were gathered, the Mini-Bid was placed on the OGS Marketplace. The Mini-Bid specified "all standard equipment on Chevy Volt LT [the entry-level Volt model]."[62] In July 2016, the Mini-Bid results were posted on the OGS Marketplace. Seven dealers submitted bids, with top bidders coming in very near one another. Only $2,000 (or about $34 per vehicle) separated the total price for the first and second lowest bidders, implying a highly competitive marketplace. The winning bid was for a 2017 model Volt, with an average price of $29,698 per vehicle, which was similar to, or better than, the price of base model Volts on other state contracts reviewed in this study. The vehicles were ultimately delivered to 18 agencies, authorities, and municipalities in the State by February 2017. The largest number of vehicles delivered to an individual entity was 10 vehicles. This quantity was ordered by both the New York Power Authority and the New York City Department of Transportation.

Since this purchase, two more aggregate bids have run through the Mini-Bid process on the OGS Marketplace. One was for 20 PHEVs and the other was for five BEVs.[63,64] Both bids received multiple responses from dealers. As in the earlier purchase agreement, the winging bids were similarly priced to vehicles on contracts in other states. For example, the winning bid for the five BEVs was a bid for 2017 Nissan Leafs, at an average cost of $21,980.

3.2.2 Discussion

One source of potential value from aggregate procurement is the ability to drive cost savings through volume. An important question to consider is what level of volume is needed to achieve maximal cost reductions in EVs. Interviews with auto industry representatives suggest that, at a purchase level of around 60 vehicles, New York State would receive most, if not all, of the cost reductions possible through volume discounts. This is supported by the data on the State aggregate bid for Volts, which saw a final purchase price near the best prices available on other state contracts.

Cost reductions from aggregation may extend beyond volume discounts. Aggregate procurement efforts can develop new, repeatable mechanisms for dealers or others to capture federal or other tax credits. This is especially valuable for the dealers who currently lack the capacity for doing this. We are unaware of a current aggregated procurement that offers a mechanism for dealers or others to capture the tax credit, although it is an area of active exploration for multistate collaborations. Decreasing the price of the Volt by the value of the federal tax credit would result in a purchase cost of around $25,700, which is below current contract prices.

Finally, it is important to note that aggregate procurements also address other barriers to EV adoption beyond vehicle cost. First, participants can pool resources for EV market development activities. Market development activities can include stakeholder engagement, marketing campaigns, education outreach (e.g., "ride and drive" events), and so on. Collaboratives also provide a natural venue for sharing data and best practices among members, further accelerating adoption. This report focuses on the economics of EV procurement, thus these activities are beyond the scope of the evaluation. However, the importance of these activities in increasing the adoption of an emerging technology like EVs should not be overstated.

3.3 Closed-End Leasing

Public fleets surveyed in this project tended to prefer owning vehicles outright. However, closed-end leasing of EVs is a model in use in several states. In a closed-end lease, the lease term and monthly payments are fixed. The lessor sets restrictions on mileage and wear, and maintenance and repairs are typically built into the lease contract. At the end of the term, the lessee is under no obligation to make additional payments, provided the vehicle didn't exceed the maximum mileage or other terms. lessor then assumes responsibility for the vehicle. These leases are the typical model for consumer vehicle leases as well.

Open-ended leases tend to be more common in private fleets. Open-ended leases are estimated to represent 70% of the total business at large fleet rental companies.[65] A key difference between the two is that open-end leases place the risk for fluctuations in the vehicle's value on the lessee. At the end of the lease, if the vehicle sells for less than the vehicle's depreciated value, the lessee must pay the difference.

A significant determinant of costs for both open- and closed-end leases is the value at the end of the lease term. All else being equal, a vehicle that sells near its original purchase price will be less expensive to lease than one that depreciates more quickly. Since EV models are still fairly new, there is not a long history of resale prices to draw upon for comparison. However, initial data indicate that EVs generally depreciate more quickly than ICE vehicles. A three-year-old Nissan Leaf is currently selling for just 22% of its original MSRP, while a similarly aged Volt sells for 31% of its original value. Meanwhile, the average resale price for three-year-old compacts is 47% of original value.[66]

3.3.1 Case Study: New Bedford, MA

The City of New Bedford is currently leasing 19 Nissan Leafs, which represents more than 25% of the city's "general use" fleet. Four additional Leafs are set to be ordered.[67]

The vehicles are leased through a dealer already on the state contract who offers a three-year lease term. Scott Durkee, Director of the Energy Office in New Bedford, highlighted this model of working through existing contracts as key benefit, because it reduces administrative burden for local governments.

New Bedford's monthly lease cost is very low—an average of $60 per vehicle month—due to the application of state grants towards EV procurements.[68] State grants helped decrease New Bedford's out of pocket share of the lease cost. The Massachusetts Department of Environmental Protection provides incentives to entities that acquire (through purchase or lease) EVs and/or acquire and install Level 2 charging stations. Massachusetts provides $7,500 per BEV, such as the Nissan Leaf.[69] Amortizing the $7,500 grant over the 36-month lease, plus the $60 cost paid by New Bedford, yields an "all-in" monthly lease cost of approximately $268. In addition to grant dollars, federal tax credits may have
also improved the dealer's lease economics. According to Durkee, the dealer was able to take advantage of the federal tax credit for EVs.

The city now has 25 Level 2 charging stations, and two "fast charging" stations. Ten of the Level 2 stations are open to the public, and both fast charging stations (which were donated by Nissan) are open to the public. The public can use Level 2 stations for free, but fast charging stations require a credit card. New Bedford also received state grants to cover the cost of its charging stations, most recently receiving $13,500 to cover the infrastructure and unit costs associated with the implementation of nine charging stations.[70]

3.3.2 Case Study: Los Angeles Police Department, CA

In June 2016, the Los Angeles Police Department (LAPD) announced that BMW won the contract to provide it with 100 EV sedans. The model selected was the BMW i3 (MSRP $42,400) with a lease term of three years. The vehicles will be part of the LAPD's non-emergency vehicles (i.e., non-pursuit vehicles). Los Angeles Police Administrator II, Vartan Yegiyan, said the total cost of the lease was

$400 per month, which included maintenance and telematics.[71] The bid process was managed through the City of Los Angeles's purchasing protocols, and elicited responses from several companies. Yegiyan said the bid process left it open to dealers as to how they want to manage the tax credit for EVs. The dealer applied all the credits to reduce the cost of the vehicle, resulting in a more favorable leasing cost.

While the LAPD is eligible for some grant funding for procuring EVs, Yegiyan emphasized that the grant was not part of the department's calculations when examining the business case for EV conversion. According to Yegiyan, total cost for the EV lease was calculated to be lower than purchasing conventional vehicles.

In a separate procurement, LAPD is spending $1.5 million to procure 100 Level 2 and four fast charging stations. This funding was initially earmarked for vehicle purchases.[72] While details are still being worked out, there will be some partial public access to some of these stations.

3.3.3 Discussion

Leasing models have enabled the rapid adoption of EVs by public fleets with limited upfront capital costs. All else being equal, closed-end leasing tends to be more expensive than outright purchasing a vehicle. However, the cost differences may not be enormous. Leasing a Leaf for 10 years at $268 per month (the estimated monthly cost of lease in New Bedford) represents a total, present value cost of approximately $29,700.[73] The purchase price of a Leaf on the Massachusetts contract is $23,336. A closed-end lease typically includes some maintenance and repair costs, potentially bringing these two numbers even closer together. Assuming a cost of $0.05 per mile for maintenance and repair,[74] and 10,000 miles per year, the comparable cost of an owned Leaf over the 10-year period is $27,700 (Figure 11).

Figure 11. 10-Year Cost Comparison of Nissan Leaf in Massachusetts

Cost to lease	$29,700	Based on 120 payments of $268 per month, discounted at 1.5%
Cost to own	$27,700	Based on an upfront purchase price of $23,336, and yearly maintenance costs of $468

Ultimately, the decision to procure EVs through lease or purchase may be driven by fleet preferences rather than financial calculations. Several fleet managers emphasized the rapidly changing nature of EV technology as a reason to prefer leases to outright ownership. EV performance and price points are expected to improve in coming years. The 2017 Chevrolet Bolt, for example, has a range of greater than 200 miles on a single charge.[75] This rapidly changing technology makes closed-end leasing (compared to purchasing or an open-ended leasing model) particularly attractive, as it limits technology lock-in. On the other hand, mileage and other usage restrictions in closed-end leases may be a poor fit for certain fleet segments. In addition, many public fleets have a history of owning their vehicles and have built up operational practices to support that model.

3.4 EVs as a Service

A new, comprehensive service model for EV deployment emerged in recent years. While technically this model is a lease of EVs to public fleets, the model incorporates other elements of vehicle operations (e.g., charging station deployment, telematics, fueling costs) into a single price and service contract. The idea is to provide a turnkey way for public fleets to adopt EVs for a fixed or predictable price. We refer to this model as "EVs as a service."

This model draws upon and resembles other forms of financing and procurement that accelerated clean energy deployment in other markets, such as power purchase agreements and energy performance contracts. For example, an energy performance contract typically provides a customer with complete implementation of an energy efficiency project. This includes technical assistance, installation, monitoring, project financing and guaranteed savings.[76] The gathering and analysis of fleet data (or "fleet telematics") is key to the success of this model. Data allow vendors to select the most well-suited vehicle to convert, ensuring that savings are ultimately realized and fleets are credited appropriately. Service providers can also offer additional features, such as right-sizing the fleet, resulting in fleet cost savings not directly related to the conversion to EVs.

A service model for public EV deployment is still new and emerging. We identified only one vendor that provided this type of service in the U.S.: Evercar. Several vendors, however, provide telematics data to aid the adoption of EVs in public fleets, and other vendors may enter this space in the future.

3.4.1 Case Study: Indianapolis, IN

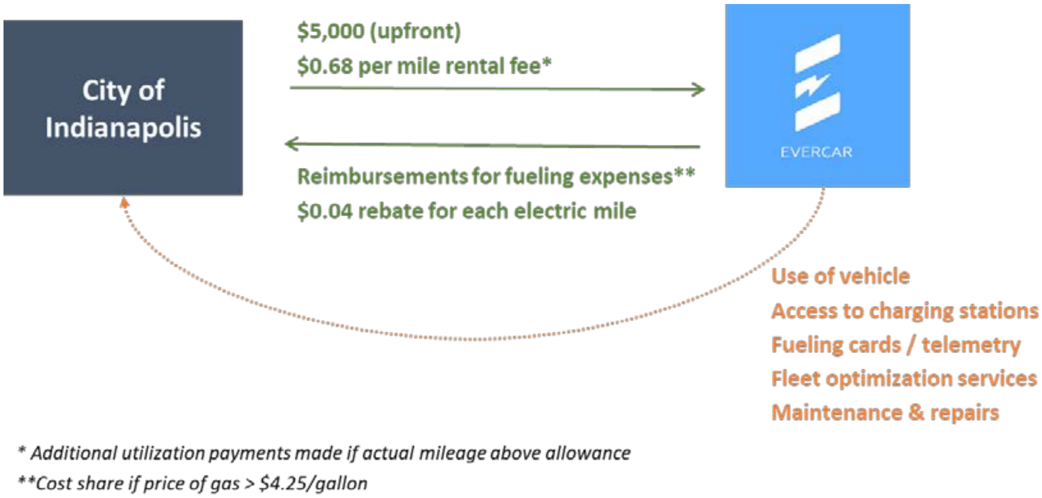
In 2012, an executive order by the mayor of Indianapolis outlined an EV procurement program for the city. The program was presented as a model to reduce dependence on foreign oil and lower overall fleet costs. Following this, a consulting group performed an initial fleet analysis. That consulting group (initially called Indy-Vision Funding, renamed Evercar) was contracted to implement the program in "the form of a lease agreement to supply vehicles, related hardware, and certain fleet management services to the city."[77] Indianapolis contracted with Evercar to deploy 425 EVs in October 2014, becoming the first city to use an energy performance-like contract to convert its public vehicle fleet to EVs. In the summer of 2015, the City Council sued the mayor's office, freezing the deal at the 212 vehicles that had already been deployed.[78] The contract was renegotiated, shortening the lease terms from seven to four years, and removing references to the specific number of vehicles to be leased.

Evercar's contract with the city includes "all capital expenses (i.e., vehicles, vehicle monitoring technologies, and charging infrastructure) and all recurring operational expenses (i.e., fuel, electricity, and vehicle maintenance)" related deployment of the EVs.[79] Evercar also provides support on vehicle selection, telematics and performance optimization, driver training, maintenance scheduling, infrastructure site selection, and car-sharing implementation.

Evercar offered a choice of EV models: Chevrolet Volt, Ford Fusion or C-Max Energis, and Nissan Leafs. Of the 139 vehicles deployed by Evercar in the first year of the program, the vast majority (95%) were Volts.[80]

To procure a vehicle, the city makes both an upfront payment and pays a per-mile rental rate. In the renegotiated contract of 2015, the upfront cost of a PHEV is $5,000, and the upfront cost of a BEV is $3,000, with additional costs of 68 cents per mile.[81] Four cents per mile is rebated back to the city for every mile a PHEV drives on electric rather than gas. This is an important difference from other EV models as it incentivizes fleets to maximize the number of electric miles driven (rather than maximizing EV adoption). Figure 12 sketches out the procurement payments and services associated with a PHEV under this model.

Figure 12. Summary of PHEV Procurement Process in Indianapolis[82]



It is estimated that, under this contract, an EV will cost the city approximately $8,000 per year—or about $670 per month—in addition to the upfront cost. [83] This is significantly more than the monthly lease costs for vehicles discussed in the prior section, even for a more expensive model like the BMW i3. However, because this contract includes charging infrastructure and other services, it is difficult to directly compare costs.

In 2016, an audit of the Evercar contract and investigation by the Indianapolis City Council led to further discussion of changes in the contract. As of late 2016, Evercar suspended some of its operations outside of Indianapolis, but was set to remain servicing the Indianapolis contract under the Vision Fleet brand.[84]

3.4.2 Discussion

Service models are a promising avenue for simplifying the EV adoption process for public fleets. Public fleets should continue to monitor developments of this model, but should proceed with caution. There are operational challenges with outsourcing aspects of fleet management to an outside vendor. The 2016 Indianapolis audit of Evercar highlighted that the lack of a centralized fleet management system or manager in Indianapolis was “problematic” for the model’s success. The lack of centralization created an inability to implement consistent operating standards or track contract violations by Evercar, especially since the city receives all program and vehicle data from Evercar. This lesson is relevant for New York, which operates a similarly decentralized fleet management system. In addition, the State fleet managers interviewed said they already implemented many of the optimization practices that a third-party vendor might provide, reducing the business case for an all-in-one service provider.

An important innovation of the service model is the creation of incentives to increase the number of EV miles driven. To date, most policy interventions offered incentives on a per-vehicle basis. The federal tax credit and recent State grants, for example, are provided on a per-vehicle basis. Incentivizing fleets to increase the number of electric miles driven, whether through increasing utilization of EVs or driving PHEVs more frequently in electric mode, is a way to ensure that the adoption of EVs achieves the desired benefits of lower carbon emissions and other forms of air pollution.

4 Promising Models

Several of the models highlighted in the previous section were able to drive significant reductions in vehicle cost from MSRP. However, the realized price for public fleet EVs was still typically above that of conventional sedans. Before factoring in grants, this price premium still typically exceeded the estimated $3,400 in fuel savings from switching to an EV in the base case.

With this background, this section identifies potential models to increase electric miles driven for State business. The goal of these models is not to necessarily guarantee a lower cost of EV ownership compared to conventional fleet sedans—such a goal would be challenging to achieve given the low gas prices and competitive sedan pricing offered by the State Marketplace. Instead, the aim is to lower switching costs and increase ease of adoption. This will enable fleets to achieve the EV goals set out in the State as well as experiment with a new vehicle technology. This section offers three primary approaches to consider and discusses other models that the State may wish to consider as it expands it EV offerings.

4.1 Suggested Approaches

This section outlines three ways that, in this analysis, are the most promising for the State to improve EV adoption ease and potentially lower EV costs. These approaches were selected based on the following criteria:

- Fit with current State fleet management and procurement needs and practices
- Impact on the number of electric vehicle miles traveled for State business
- Impact on the cost of EV acquisition

This was informed by the review of existing State fleet characteristics, procurement strategies and preferences, and public fleet case studies from around the country.

4.1.1 Supporting EV Adoption by State Employees

In examining opportunities for the State fleet to increase electric vehicle miles traveled, it may be useful to extend the boundaries of the fleet to include vehicles not necessarily owned or leased by the State. As discussed earlier in this report, an estimated 20% of light-duty vehicle miles traveled for State business occur in employee-owned vehicles. Increasing the number of employees who drive EVs as their personal vehicles represents a significant opportunity to increase electric miles traveled for state business.

Direct subsidy of vehicles for state employees is likely not a viable option for a variety of reasons including budgetary constraints and concerns about equity among employees. However, supporting EV adoption by employees need not necessarily come in the form of the financial incentives. Education and outreach events specifically targeted at employees could help eliminate EV misperceptions and increase familiarity with this technology. These efforts could be targeted at employees who are the heaviest users of personal vehicles for business.

Increasing access to charging at State workplaces is another way to support employee EV adoption. There is a potentially timely opportunity to do this with disbursement of the Volkswagen settlement funds. New York State will receive $127.7 million from the settlement in its Environmental Mitigation Trust. Due to the terms of the settlement, a maximum of 15% of trust funds ($19.2 million) can be used for light-duty EVSE infrastructure. The settlement also creates mandatory cost shares that vary by application. These cost shares represent floors; states may choose to elevate them. New York has yet to release its Mitigation Plan, but in its proposed Mitigation Plan, the Connecticut offered trust funding for up to 100% of the cost of publicly accessible light-duty EVSEs on government property, and up to 60% of the cost of non-public EVSEs at workplaces or apartments.[85]

There is some debate about the implications of providing public employees with charging stations for personal vehicles. For example, the New York State Constitution prohibits “gifts of public funds for a private purpose.” Some have questioned whether providing access to charging stations free of charge may constitute a violation of this prohibition. There is considerable precedent for providing charging to public employees at State offices. California passed legislation clarifying that “the use of electricity by state government and other government entities … for the charging of an electric vehicle in a department maintained or joint use motor vehicle parking facility is not a gift of public funds.”[86] The Washington State Legislature expressly authorized the provision of free charging at state office locations. The code revision noted: “It is in the state's interest and to the benefit of the people of the state to encourage the use of electrical vehicles in order to reduce emissions and provide the public with cleaner air.”[87] At the federal level, the Fixing America’s Surface Transportation Act (FAST Act) of 2015 gave explicit authorization for federal agencies to install charging stations for the use of employees charging personal vehicles.[88] At the very least, New York could offer charging opportunities to employees and charge employees enough to cover costs.

4.1.2 Creating a Statewide Procurement Process for Leasing EVs

Much of the EV procurement activity in New York to date has been focused on purchasing. This is in line with the general preference for owning vehicles in the State.

Leasing can be an attractive option for adding EVs to public fleets. One of the most important benefits of leasing is that it mitigates technology risk. This is especially important for EVs, where the offerings on the market are changing rapidly. The pace of change is evident both within specific models and availability on the market overall. The 2014 Leaf had an electric battery range of 84 miles, while the 2017 model had a range of 107 miles, an increase of 27%, and the 2018 model has a range of 150 miles, a further increase of 40%. The Chevrolet Bolt was released in 2017 and has a range of more than 200 miles.

When available, other public fleets outside of the State have found the ability to rely on statewide contracts for leasing useful in easing the EV procurement process. Like the aggregate purchasing process discussed below, this is particularly useful for smaller fleets, such as at the municipal or county level. Some fleet managers in the State already expressed interest in leasing EVs. The OGS Marketplace is designed to support vehicle purchasing, not leasing. However, a statewide award for leased EVs would be possible to create in New York. As of the writing of this document, a leasing option for EVs was under exploration.

4.1.3 Continuing Support for Aggregate Purchasing

While leasing EVs offers several benefits, it is important that the State continues to provide pathways for fleets that either must own or prefer owning vehicles outright. Aggregate purchasing of vehicles proved to be a popular model for driving EV adoption in the State and elsewhere. Aggregate purchasing bids attracted interest from both users and dealers on the OGS Marketplace.

Regardless of the ability of aggregation to drive significant pricing discounts, aggregation is a useful tool for funneling demand and concentrating outreach efforts to potentially interested public fleet partners. This may be a particularly useful for both driving and meeting demand for EVs below the statewide agency level. In the last two aggregate purchasing bids, all vehicles were set to be delivered to counties, cities, towns, or villages in the State, rather than agencies. While large cities, such as New York

City, operate at such a scale where bilateral procurement relationships can make sense, this is challenging for smaller cities. This parallels the findings from interviews with fleet managers at smaller cities, who noted the advantages of being able to utilize a state procurement contract rather than run their own procurement process in adopting EVs. New York may consider focusing its outreach for future aggregate bids to these types of users.

Multistate aggregate purchasing efforts remain promising, particularly to the extent they can facilitate EV market development activities like marketing and education. However, as noted in the earlier case studies, New York is already achieving attractive pricing through in-state volumes alone. Given this, the State should not delay aggregate purchasing agreements if there is sufficient interest in the hopes of realizing better pricing through a multistate process.

4.2 Additional Approaches

This project explored additional options for achieving the goals of lowering EV cost and increasing ease of adoption. While it is believed that the pathways presented in the prior section represent the most promising avenues for further work in the State, there is no single solution that can meet all the challenges associated with EV procurement. New York may wish to further pursue the opportunities outlined in this sector to add increased diversity to its EV strategy.

4.2.1 Facilitating Tax Credit Offtake

As discussed earlier, a challenge for public fleets is their inability to directly take advantage of the $7,500 federal tax credit for EVs. At the scale of a State fleet, this can represent a significant source of value. Procuring 1,100 EVs (roughly a third of the estimated sedans in the State fleet) represents over $8.2 million of tax credits.

To date, public fleets have not focused on ensuring the full value of the tax credit is passed on to end users. Public fleets have preferred to rely on dealers and manufacturers to take the tax credit, meaning realizing the benefit of the tax credit has been outsourced to dealers and manufacturers. Information about the status of the tax credit is conveyed indirectly to public fleets through a lower procurement cost or informal conversations.

The benefit of this approach is that it significantly lessens the procurement complexity for fleets. However, it also opens the potential that fleets are leaving significant value on the table. A review of fleet procurement approaches suggests there is mixed record of dealers and manufacturers being willing and/or able to take the tax credit and pass the value of the savings on to fleets. This project explored the viability of creating a way for public fleets to more directly ensure the capture of this value stream.

An option for ensuring consistent capture of the tax credit is to create a tax equity structure for procuring vehicles. This model has been used extensively in other markets, notably renewable energy. Tax equity markets are large; solar tax equity volume was around $5 billion in 2016.[89] There are many different potential structures for a tax equity investment, but three of the most common models are sale-leasebacks, partnership flips, and inverted leases.[90] These structures can be complex, involving multiple parties and sources of capital. This complexity can create high transaction costs. However, creating such a structure could allow the State to capture value that is potentially being lost in the current procurement structure.

Figure 13 has a simplified, hypothetical model of how a sale-leaseback structure could work for public fleet EVs. This model is meant to highlight the advantages and challenges of a tax equity investment structure for this market.

Figure 13. Hypothetical Tax Equity Structure for Public Fleet EVs

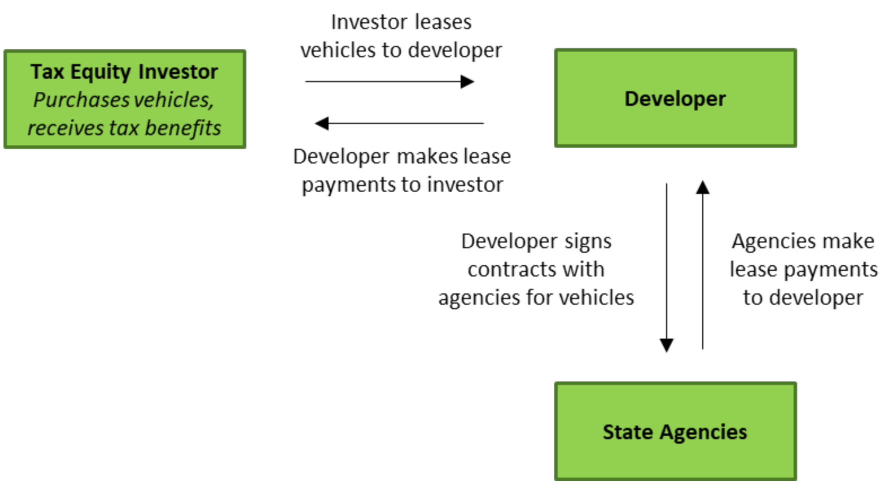


Figure 13 shows the tax equity investor would purchase the EVs. The investor would then take advantage of the tax credit and lease the vehicles at a reduced price to a developer. The developer would then lease the vehicles to state agencies. As a result, the developer takes on the operating risk of lack of uptake or non-payment by fleets. The developer may decide to raise debt or other sources of capital to cover monthly payments to the investor. The developer may also opt to purchase the vehicles from the investor at some point in the future. According to IRS rules, in order to be eligible for the tax credit EVs must be "must be acquired for use or lease and not for resale."[91] As a result, the investor may not be able to sell vehicles to the developer immediately.

A sale-leaseback structure is comparatively simpler than other tax equity models. A disadvantage of this structure is the tax equity investor owns the assets at the end of the term. The sponsor must purchase the assets if they desire to continue owning them. Another disadvantage is that tax equity investors tend to have a high cost of capital compared to other sources, increasing project costs—especially since investor capital is used to purchase the vehicles.

Some of these disadvantages could be addressed in different tax equity structure, such as a partnership flip. However, before determining the optimal structure for a tax equity investment, several foundational questions should be first answered:

- Would fleet managers be comfortable leasing vehicles, rather than owning them outright?
- Is there sufficient demand for EVs to create the necessary deal size to attract investors and justify transaction costs?
- Who will play the developer role for public fleets?

As discussed earlier, the most common procurement model in the State and elsewhere is ownership of vehicles. A tax equity structure would necessitate a shift towards leasing, with the potential for agencies to own the vehicles down the line. There is some emerging interest in leasing EVs in particular, but it remains to be seen if there is sufficient demand to justify this structure.

Demand also drives deal size. Tax equity deals need to achieve sufficient size in order to attract investors and cover their deal costs. Interviews suggest that a minimum size of $10 million of tax benefits would be necessary to attract interest and cover the fees associated with structuring a deal. In theory, the size of the State fleet could create such a deal size. However, this would require a rapid and substantial movement by public fleets towards EV procurement. A more likely pathway to create the necessary scale would be to allow the developer to lease in multiple states. The viability of this could be explored through existing multistate procurement efforts.

Finally, there is a question of who will play the role of the developer. Some private companies already participate in the public fleet financing market and may be willing to fill this role going forward. As a single data point, one financing company surveyed in this project offers public fleets the equivalent of $6,000 in vehicle cost reduction for the tax credit, while the company gains $7,500 in tax credits. Public entities may be better positioned to offer more attractive rates, but also may lack the expertise to create such a structure. However, given the complexity of the transaction and the relatively small size of the market, it may be difficult to generate interest from the private sector.

Given the complexity of tax equity structures, New York may choose other avenues for ensuring more of the EV tax credit is monetized. This could include a dealer education campaign, especially targeted at vendors who sell many EVs on the OGS Marketplace. Fleets could also require dealers or other bidders to show how the tax credit is or is not being factored into the purchase price of the vehicle. Increasing education and transparency could result in more consistent treatment of the federal tax credit.

4.2.2 Bundling of EV and EVSE Offerings

As discussed earlier, EVs and EVSEs are currently procured separately. There are potential operational advantages of bundling EVs and EVSEs into a single procurement process: correctly sizing the number of charging stations and vehicles; illuminating the full cost of EV adoption; and realizing cost or time savings compared to running two separate procurement processes. Bundling could be accomplished either through a joint bid or a bid to a third-party provider of “EVs as a Service.”

4.2.2.1 EVs as a Service

The “EVs as a Service” model discussed earlier, where one vendor provides both vehicles and charging stations infrastructure, is a way of gaining access to both vehicles and charging infrastructure through a single vendor relationship. Since the end of Evercar’s offerings, we are not aware of a similar service currently available in the US, although some models are in development. In general, these models combine turnkey EV/EVSE services with technology that optimizes the size and operations of the fleet. As discussed in earlier reports, it is challenging to achieve a lower cost of ownership with EVs in the current environment. The cost savings offered by these vendors is also difficult to verify without solid baseline data on fleet costs and performance. In preparation for potential exploration of service offerings, New York State may consider consolidating fleet operations data in order to better understand the potential for savings offered by future bidders.

4.2.2.2 Joint EV/EVSE Procurement

Interviews with EV and EVSE manufacturers did not uncover examples of bundled services or bid submissions for public fleets. Interviewees suggested that cost savings would be difficult to achieve through such a model given the disparity in the business.

While a single procurement process may present challenges, a closer integration of vehicle and infrastructure planning and procurement could help achieve many of the same goals. A statewide procurement process for EVSEs can enable this, and there has been recent movement in this direction. In late March 2017, the National Joint Powers Alliance (NJPA)[92] released an RFP for EVSE and services. The RFP includes a range of tiers of charging station hardware, site installation services, and on-going operational support (including billing).[93]

4.2.3 Purchasing Used EVs

As discussed in an earlier report, EVs appear to depreciate more quickly than comparable passenger vehicles. A three-year-old Nissan Leaf is currently selling for just 22% of its original MSRP, while a similarly aged Volt sells for 31% of its original value. Meanwhile, the average resale price for three-year-old compacts is 47% of original value.[94] While more rapid vehicle depreciation can increase the price for lessees, the upshot is that agencies have the opportunity for purchase used EVs at a low cost.

Currently, State fleets primarily or exclusively procure new sedans. However, purchasing used EVs is an opportunity for fleets in State to experiment with a new vehicle technology at a significantly discounted cost.

5 Conclusion

The EV market is changing rapidly. Costs for some models have fallen rapidly in recent years. Manufacturers are introducing new models with better performance characteristics and facing new regulatory requirements to increase sales in New York State. Without subsidies, there are challenges to achieving a lower cost of ownership with an EV compared to a new, conventional sedan in the State fleet. There are, however, a range of potential tools that the State could use to improve the ease of EV adoption in the near term, enabling fleets to experiment with new vehicle technologies and meet mandates. This could be especially powerful when combined with grants that incentivize fleets to drive more electric miles. In the longer term, fleets should continue to monitor vehicle and vendor developments for the emergence of new models that may ultimately result in lower cost of ownership.

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Appendix A – Base Case, Lifetime Cost of Sedan

INPUTS

		Unit	Source
Cost of vehicle	$19,000	dollars	Avg. price of sedans purchased on OGS Marketplace, Jun-Jul 2016
Miles per year	15,000	miles / year	Based on fleet manager interviews
Miles per gallon	30	miles / gallon	Estimate form US DOT Table 4-23
Price of gasoline	$1.63	dollars / gallon	Based on current NYS public fleet fuel costs
Maintenance and repair	$0.06	dollars / mile	AAA, 2015 Your Driving Costs; Automotive Fleet 2015 Fleet Passenger Car Maintenance
Insurance	$1,115	dollars / year	AAA, 2015 Your Driving Costs
Lifetime of vehicle	10	years	Based on fleet manager interviews
Residual vehicle value	$0.00	dollars	Based on fleet manager interviews
Discount rate	1.5%	%	10 year muni bond, AA+

BASE CASE

Upfront Costs	
Purchase	$19,000
Financing	$0
Taxes	$0
Total	**$19,000**

Operating Costs	Annual	Lifetime (PV)
Fuel	$815	$7,516
Maintenance & repair (incl. tires)	$900	$8,300
Insurance	$1,115	$10,283
Total	**$2,830**	**$26,099**

Cost of Ownership (discounted)	**$45,099**

Appendix B – Sensitivity Analysis of Base Case

SENSITIVITY ANALYSIS

Base Case: **$45,099**

Cost of Gas vs. Annual Mileage

		Miles per year			
		10,000	*15,000*	*20,000*	*25,000*
Dollars / gallon gas	*$1.00*	$37,890	$42,194	$46,497	$50,801
	$1.25	$38,659	$43,347	$48,035	$52,722
	$1.63	$39,827	$45,099	$50,371	$55,643
	$2.00	$40,964	$46,805	$52,646	$58,486
	$2.50	$42,501	$49,110	$55,720	$62,329
	$3.00	$44,038	$51,416	$58,794	$66,171
	$3.50	$45,575	$53,722	$61,868	$70,014

Fuel Efficiency vs. Annual Mileage

		Miles per year			
		10,000	*15,000*	*20,000*	*25,000*
Avg. miles per gallon	*22*	$41,649	$47,832	$54,015	$60,198
	26	$40,598	$46,255	$51,913	$57,570
	30	$39,827	$45,099	$50,371	$55,643
	34	$39,237	$44,215	$49,192	$54,169
	38	$38,772	$43,516	$48,261	$53,006
	42	$38,395	$42,951	$47,508	$52,064

Fuel Efficiency vs. Vehicle Purchase Price

				Sedan Price		
		$13,000	*$16,000*	*$19,000*	*$22,000*	*$25,000*
Avg. miles per gallon	*22*	$41,832	$44,832	$47,832	$50,832	$53,832
	26	$40,255	$43,255	$46,255	$49,255	$52,255
	30	$39,099	$42,099	$45,099	$48,099	$51,099
	34	$38,215	$41,215	$44,215	$47,215	$50,215
	38	$37,516	$40,516	$43,516	$46,516	$49,516
	42	$36,951	$39,951	$42,951	$45,951	$48,951

Appendix C – Interview List

The findings in this report were informed by conversations with fleet and EV experts around the country. We thank them for their time and insights.

Adam Ruder – NYSERDA

Alistair Clark and Jason Moore – NY Green Bank

Bill Zeller – City of San Francisco

David Peterson – Chargepoint

Erin Russell-Story – US Department of Energy

Everett Chamberlain – New York State Department of Environmental Conservation

Jasna Tomic and Kristian Jokinen – CALSTART

Jay Ferraro – General Motors

Jean Gough – Nissan

John Gilbrook – Chargepoint

Justine Sears – Vermont Energy Investment Corporation

Kate Zylan and Matthew Goetz – Georgetown Climate Center

Kathy Kinsey – NESCAUM

Keith Kerman and Jonathan Ells – New York City Department of Citywide Administrative Services

Leslie Wollack – NARC

Mike Matthews, Sandra Law, and Tiffany Moore – New York State Office of General Services

Nick Nigro – Atlas Public Policy

Pam Hadad-Hurst and Brendan Woodruff – New York State Department of Environmental Conservation

Ryan Daley – Electrification Coalition

Scott Durkee – City of New Bedford, MA

Scott Fisher – Evgo

Shane Gilchrest – New York State Department of Transportation

Tim Weick and Brian Matuszewski – ARI

Vartan Yegiyan – Los Angeles Police Department

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[14] Ayre, "Bob Lutz Thinks Chevy Bolt Will Lose GM Money."

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[17] IRS. "Plug-In Electric Drive Vehicle Credit (IRC 30D)."

[18] Includes Chevrolet Bolt, Volt, and Spark sales and Tesla Model S and Model X sales

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[27] CGC interviews

[28] DEC. "Electric Vehicle Procurement: Guidance and Models for Municipalities."

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[30] Twenty-one mini-bids were reviewed for the following models: Chevrolet Impala, Chevrolet Malibu, Ford Fusion, Hyundai Elantra, Nissan Altima, and Toyota Camry.

[31] CGC analysis of Mini-Bid results

[32] CGC interviews

[33] City of New York. "NYC Clean Fleets."

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[35] Office of the State Comptroller. "Passenger Vehicle Fleet Management."

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81 Per the average of 12,000 miles driven a year

82 Based on “Master Fleet Agreement Between Indy-Vision Funding I, LLC, and The Consolidated City of Indianapolis”

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NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

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