Matter Number 16-00681, In the Matter of the Clean Energy Fund Investment Plan

Clean Energy Fund Investment Plan: Clean Transportation Chapter

Portfolio: Innovation & Research

Submitted by:

The New York State Energy Research and Development Authority

August 1, 2016

13 Clean Transportation

In Clean Transportation, NYSERDA seeks to support the development and demonstration of new technologies and strategies to reduce greenhouse gas emissions from the transportation sector and to gain market traction for these products to advance their use to the point at which the market no longer requires NYSERDA's interventions. Activities are designed to harness stakeholders' creative solutions to New York State's transportation energy use challenges, facilitate the development of these solutions into products or services that are commercially viable, demonstrate their benefits to critical stakeholders, and research, identify solutions for and resolve any barriers to adoption that might prevent these solutions from being adopted. The program focuses on reducing energy use from personal vehicles, commercial vehicles, and public transportation. The broad objectives of the program include:

- Accelerate transportation electrification and decarbonization in New York State;
- Increase the energy efficiency of electrified rail, which uses a significant portion of the State's electricity;
- Improve the efficiency of the transportation system and encourage the use of more efficient transportation modes where possible; and
- Work with New York State stakeholders and other public sector entities to identify new market opportunities and facilitate the adoption of new technologies, strategies, and policies.

The first initiative described in this Chapter is the Electric Vehicles initiative, which consists of two separate programs: an Electric Vehicle (EV) Rebate program and an EV Innovation program. The primary goal for both programs is expanding market adoption of EVs to the point where the market does not rely on consumer financial incentives. The programs seek to achieve this by growing consumer awareness, reducing the initial cost of EVs, making EV charging more widely available, engaging critical stakeholders, and overcoming technical and cost hurdles. Due to the market development and market adoption activities of the EV Rebate program, it will be supported by CEF Market Development funds.

Potential additional initiatives under consideration include:

- A program focused on developing and demonstrating new energy-efficient products and operating strategies for public transportation and electrified rail, especially products and strategies that reduce energy use from rail traction power and enable electric transit bus service; and
- A program focused on developing, improving, and testing options for mobility management services in New York State. Mobility management services include transportation demand management (providing additional options for travel other than driving alone), shared-use services (such as bike-sharing and car-sharing), intelligent transportation systems that provide advanced information to drivers to reduce congestion, and emerging smart mobility technologies including connected and autonomous vehicles and smart infrastructure solutions.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

13.1 Electric Vehicles

13.1.1 Overview

Present Situation	• There are 11 million vehicles registered in New York State (approximately 8.5 million light-duty, 2.5 million medium- and heavy-duty), but only about 14,000 electric vehicles (EVs). EVs have only really been available since 2011, and have seen strong initial adoption, but New York aims much higher. Gov. Cuomo established the ChargeNY initiative in 2013, which sets ambitious goals for EV and EV charging station deployment, regulatory reforms, and consumer education. New York has also adopted the California Zero Emission Vehicle (ZEV) regulations, which require automakers to sell an increasing number of EVs in New York State. In 2013 New York joined with seven other states that have adopted these regulations to collaborate on measures that will advance the EV market in those states. Collective action is critical for advancing EVs, because the market is so much larger than New York State and vehicle costs, styles, and features depend on many market forces beyond New York State's influence. • EV adoption is held back by low consumer awareness, price differentials with gasoline vehicles, and a lack of fueling infrastructure, among other barriers. EVs will play a critical role in achieving New York's greenhouse gas (GHG) reduction goals and present an opportunity to provide significant benefits to ratepayers and utilities. • New York State is taking a broad approach to accelerating EV market growth: o To encourage EV sales, New York State Department of Environmental Conservation (DEC) regulations call for automakers to sell up to 40,000 EVs by 2018 and over 750,000 by 2025. o To expand charging station installations, NYSERDA, New York Power Authority (NYPA), and DEC have been and will continue to work with workplaces, multi-family buildings, and municipalities to bring down the cost of stations, and New York State Department of Public Service (DPS) and utilities are exploring how utilities can support greater charging infrastructure investment. o Other New York activities to date, and moving forward, target consumer acceptance of EVs, regulatory restrictions that hamper EV adoption, and the development and demonstration of new technologies, policies, and business models that can enable greater EV adoption.
Intervention Strategy	NYSERDA's intervention strategy consists of two distinct parts: an EV rebate program and a set of activities intended to develop new technologies, policies, and business models that will lead to an expansion of the EV market. <u>EV Rebate Program</u> NYSERDA will implement a point-of-sale EV rebate program for new EV buyers that will help to reduce the price differential between EVs and conventional vehicles. The program, modeled after successful programs in states like Connecticut and Massachusetts that also offer tiered rebates for new EV buyers, will help accelerate EV sales, raise consumer awareness of EVs, and encourage auto manufacturers and car dealers to invest more time and effort in selling EVs in New York State.

	<u>EV Innovation Program</u> NYSERDA will promote further private sector investment in the EV market by implementing data-driven EV policies and demonstrating the value of EVs to industry participants. To generate a critical mass of stakeholders invested in growing the EV market in New York, key elements of the strategy will include: • Reducing upfront costs and increasing the user experiences of EVs and EV charging stations through new product and business model development; • Working with DPS and utilities to assess the potential benefits broad EV adoption could bring to ratepayers, utilities, and the electric grid, and using this analysis to help inform utility plans for appropriate EV market interventions; • Piloting public-private partnerships that test cost-effective ways to expand EV adoption through actions such as incentives, purchasing partnerships, and consumer awareness campaigns; and • Expanding stakeholder participation in EV adoption efforts by demonstrating the value of EVs to their businesses and by making their entry into EV activities less risky through co-funding their initial efforts. Initial Innovation focus areas have been identified with input from a wide range of stakeholders. The initial scope is broad and focuses on a number of topic areas, but is expected to narrow as the program advances and certain research projects show more promise than others. NYSERDA may not complete all the activities listed below; they represent the likely range of activities but may be adjusted or narrowed depending on EV market needs, technical and commercial opportunities available, and other considerations. Innovation projects are typically selected through competitive solicitations. Co-funding for projects is usually required, and proposers are responsible for identifying sources of co-funding at the time they submit proposals. All projects will seek technologies and strategies that can be replicated at a larger scale and in a cost-effective manner. Target technologies and operational strategies will be evaluated not less than annually and adjusted, with input from partners, as needed based on a "test/measure/adjust" approach. This strategy is timely because New York State has committed to greatly accelerating the growth of its EV market in the next five years. Generating consumer acceptance of EVs and finding ways to help private industry participants develop business models that work for them will be critical to meeting these targets. For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Electric Vehicles," which can be found in Appendix A.
Goals	Both elements of NYSERDA's EV program support the same end goal: NYSERDA seeks to expand market adoption of EVs to the point where it does not rely on consumer financial incentives by growing consumer awareness, reducing the initial cost of EVs, making charging more widely available, engaging critical stakeholders, and overcoming technical and cost hurdles. This will reduce petroleum dependency, GHG emissions, and criteria pollutant emissions and save EV drivers, and possibly all ratepayers, money.
State Energy Plan/Clean Energy Standard Link	The State Energy Plan identifies transportation as a major user of energy and the source of approximately 40% of fossil-fuel based GHG emissions in the State. The Plan recognizes that EVs are one of the most promising opportunities to de-carbonize the transportation sector, and that to further reduce transportation emissions the State must invest in more energy efficient ways to move people, including further investment in EVs. The State Energy Plan includes a section on

	ChargeNY that anticipates approaches to EV adoption that are aligned with the approaches advanced in this plan, including reducing upfront costs and engaging the private sector. Additionally, EVs could help support the Clean Energy Standard by providing additional energy storage and ancillary services in support of intermittent renewables.

13.1.2 Target Market Characterization

Target Market Segment(s)	The target market for the EV rebate program is consumers who purchase and lease light-duty vehicles and are willing to consider EVs. Over the term of this plan (6 years), that will mostly consist of early adopters, but will increasingly include a wide range of New Yorkers who see opportunities to increase their convenience, reduce their environmental impact, drive an exciting car, and save money by owning an EV. This is already beginning, but will accelerate in the next two to three years as more models of EVs become available and car buyers get more comfortable with the technology. The other aspects of the EV Innovation Program will each target specific market segments. • Product development and demonstration efforts will target technology and business model innovators • Consumer engagement efforts will work with major industry participants, such as utilities, auto manufacturers, charging station manufacturers, and car dealers, as well as advocacy groups, employers, and municipalities, • EV infrastructure expansion efforts will include charging station manufacturers, utilities, municipalities, and site owners
Market Participants	**Key market participants will in large part be similar for both the EV Rebate and EV Innovation Programs. They include:** • **Auto manufacturers** control large advertising budgets, develop new models based on consumer preferences, and decide which models to sell in New York; these groups will be involved with marketing and consumer awareness efforts • **Car dealers** decide which models to carry, how aggressively to sell them, serve as a main educator of consumers; dealers will be involved with marketing and consumer awareness efforts • **Charging station manufacturers, operators, and installers** are developing new technologies and business models for EV charging and expanding the EV charging infrastructure in New York; these entities will be involved in research and development projects and consumer awareness efforts • **Utilities** are interested in EVs' potential to align with their business models. EVs offer opportunities to increase their sales in a major market segment (transportation), improve system utilization, and balance load shapes and create new revenue opportunities, but are concerned about the potential for EVs to add to peak loads and overload local distribution systems if not managed effectively; utilities will be very involved with technology and policy research activities and demonstrations, as well as consumer awareness efforts • **Technology developers and academic researchers** look for support for technology development and commercialization and can use help identifying paths to market; these entities will be program participants in the EV Innovation Program • **Potential charging station site owners** (e.g. employers, municipalities, multi-family building owners, retailers, developers, etc.) operate highly visible sites for EV charging that drivers frequently visit, but have not installed charging infrastructure to date. They often have poor returns on their investments for installing charging stations because of high costs and low current usage rates. These entities will be

	involved in demonstration projects and business model development projects, and will be participants in aggregate purchases. • **Municipalities** own popular parking lots, control many of the regulations that impact EV charging station installations, and can establish local EV incentives; municipalities will be involved with both consumer awareness efforts and aggregate purchases • **Environmental advocates** are mounting campaigns to encourage the adoption of EVs in New York and elsewhere; advocates will be involved with consumer awareness efforts • **Other state agencies, federal agencies, and other states** have complementary programs that offer opportunities for collaboration and learning best practices; these entities will be part of broad-based multi-state and multi-agency efforts with New York, where there is a clear benefit to broader action
Market Readiness	• Market demand for EVs and efficient vehicles is growing, backed by both new market offerings and policy drivers. The number of EVs in New York has grown from under 1,000 in 2012 to about 14,000 in 2016. • New York has adopted the California ZEV regulations, requiring increasing EV sales in New York through 2025. To facilitate these increasing sales, New York has been working with the auto manufacturers and the other ZEV states to create the right market conditions for EV adoption. Current policies and market activities include: o Automakers have made nearly 20 EV models available in New York State. o Federal income tax credits of up to $7,500 are available for EVs. New York State currently offers EV drivers access to high-occupancy vehicle lanes and reduced Thruway and PANYNJ tolls. o NYSERDA offers up to $60,000 vouchers for qualifying electric medium- and heavy-duty trucks and buses (using federal funding through at least 2016). o Public and workplace charging stations are eligible for a 50% New York tax credit, up to $5,000. Public and private entities have installed over 1,500 charging stations in New York State through June 2016. More than 25 New York workplaces have signed up for the Department of Energy's Workplace Charging Challenge, recognizing their leadership in providing workplace charging for employees. o Utilities have been directed to propose ways they can encourage greater EV market expansion by late 2016 as part of the Distributed System Implementation Plan (DSIP) process. o Six Clean Cities Coalitions in New York work at the grassroots level to support the adoption of EVs and other alternative fuel vehicles. o NYSERDA has developed best practices for EV-friendly municipal permitting, zoning, and building codes and NYSERDA's Cleaner, Greener Communities program offers municipalities up to $5,000 for adopting these permitting and zoning rules.
Customer Value	<u>EV Rebate Program</u> • Many car buyers are looking for reliable yet exciting cars that are reasonably priced. Electric vehicles offer drivers a low total cost of ownership in a fun-to-drive, convenient, low-maintenance car. Drivers can save as much as $800 per year on fuel alone by driving an EV (at current prices), and can save hundreds of dollars more in maintenance costs. • Automakers want state support to help meet their ZEV regulation requirements and recoup their large research and development investments. A robust EV market in New York would generate tens of millions of dollars per year in ZEV credits for automakers. • Car dealers want to be able to move cars off of their lots quickly, keeping customer acquisition costs down.

	• Employers and commercial- and multi-family building owners are always in search of new ways to attract and retain top employees and tenants. • Similarly, retailers are looking for ways to attract new customers to their stores and have current customers spend more with them. • NYSERDA's program can improve the value proposition of buying EVs, increase the rate of EV sales, and offer site owners new, trendy ways to attract and retain employees/tenants/customers. <u>EV Innovation Program</u> • The innovation elements of the EV program offer similar value propositions to many of the same actors as the EV rebate program does, because the EV innovation program is also focused on expanding the market for EVs. • In addition to the value discussed above, innovators and product developers are looking for both working capital in support of product development and lower-risk opportunities to test new business models that may just be emerging in a rapidly evolving market like EVs. NYSERDA will offer cost-shared opportunities to develop and demonstrate new products and new approaches to selling EVs and EV-related products in New York State, reducing the risk and capital needs for program participants and accelerating their time to market. • Moreover, many partners are simply looking for guidance on ways to make money by participating in the EV market. NYSERDA will support cost-shared pilots of innovative business models and approaches to EV market participation that are economically beneficial to stakeholders and can be readily replicated, reducing the risks associated with trying these new tactics.

13.1.3 Stakeholder/Market Engagement

Stakeholder/Market Engagement and Customer Discovery	• NYSERDA has met with a wide range of stakeholders to discuss both specific program concepts and general approaches to the EV market. NYSERDA has strong relationships with key stakeholders, including auto manufacturers, charging station manufacturers and operators, charging station installers, auto dealer groups, utilities, non-governmental organizations (NGOs), Clean Cities Coalitions, municipalities, other New York State agencies, federal agencies, and other states. • NYSERDA regularly works with other peer states to learn about best practices and program designs that they have tried. Studies currently being funded include research comparing different approaches to EV market development, research on different methods for car dealer engagement, and research into battery second-life feasibility. Staff meets with market participants and other stakeholders, such as NGOs, on a regular basis to get input and advice on program development.

13.1.4 Theory of Change

Market and Technology Barriers Addressed	<u>EV Rebate Program</u> • Low consumer awareness and understanding of the benefits of EVs • EVs still have higher upfront costs than conventional vehicles (from $2,500 to $10,000 higher) • Car dealers have a harder time selling EVs because of the added time needed to educate consumers and the newness of the technology

	EV Innovation Program • Lack of New York State involvement from key stakeholders, including utilities, automakers, car dealers, employers, and municipalities • The cost of EVs and EV charging stations is still high and technical improvements to both the vehicles (range) and charging stations (speed, ease of use) are needed • Lack of charging infrastructure deployed, especially at workplaces and multi-family buildings, because of a current poor ROI and lack of driver demand • Potential for adverse grid impacts and costly hardware upgrades due to high penetrations of EVs charging at peak times, or even at off-peak times on specific feeder circuits • Local and state policies and regulations are often not supportive of EVs (building codes, planning and zoning, fleet purchases, utility rates designs)
Testable Hypotheses	EV Rebate Program • If NYSERDA provides rebates for EV purchases that bring the upfront costs closer to those of gasoline vehicles, then more consumers will purchase EVs. • If NYSERDA supports an EV rebate program, then auto manufacturers and car dealers will devote more resources to selling EVs in New York State. • If NYSERDA supports an EV rebate program, then EV charging station investments will become more attractive because of higher utilization rates due to more EVs on the road in New York State. EV Innovation Program • If NYSERDA supports the development and demonstration of new products and business models that make EVs easier to use and more grid-friendly, then market participants, including utilities, will expedite deployment of these offerings. • If NYSERDA and stakeholders successfully demonstrate new, collaborative consumer outreach strategies for EVs, then key stakeholders, including auto manufacturers, will see greater value in investing in consumer outreach in New York State and make a sustained investment in consumer outreach here. • If NYSERDA quantifies and demonstrates ways that utilities (and generators, NYISO, other electricity market participants) can benefit from greater EV adoption, then these stakeholders will urge their customers to buy EVs more aggressively and possibly invest greater resources in supporting EV adoption. • If NYSERDA can aggregate EV charging station purchases to lower prices and simplify purchasing, then average hard and soft costs of the equipment will fall and more installations will be completed, leading to further EV market expansion. • If new technologies and policies that enable easier, cheaper off-peak EV charging are offered to consumers, then more drivers will shift charging to off-peak hours.
Activities	**Administer EV Rebate Program** • NYSERDA will administer an EV rebate program that offers consumer rebates for ZEVs at the point of sale. Per New York State legislation instructing NYSERDA to implement a rebate program, the incentives will be up to $2,000 per vehicle. The details of the program are still under development, however the program is anticipated to have a similar structure to incentive programs in other states, with incentive levels varying based on the electric range of the vehicle. The program will be monitored and adjusted based on evolving market conditions. Note that CEF funds will only be used for EVs, but the rebate program will include all ZEVs. • NYSERDA will hire an implementation contractor to process rebates, collect survey data from participants, and inform future adjustments to the program • NYSERDA will work with stakeholders to jointly market the program and raise awareness of EVs through both local and statewide program outreach

	Solicit and Support New Product and Business Model Development and Demonstration • NYSERDA will fund product development projects aimed at improved technical performance and reduced costs for EV-related products, primarily targeting charging technologies and unique EV component technologies • NYSERDA will fund demonstrations and business model development for innovative financing approaches that focus on battery leasing and second-life battery uses • NYSERDA will support the development of innovative financing and/or leasing models for EV charging stations • NYSERDA will fund product development and demonstration projects on viable options for smart charging technologies and policies • NYSERDA will work with utilities to identify ways EVs can facilitate their operations and provide benefits to ratepayers, and advise them on the design of new approaches and business models that they might adopt that both support EV adoption and enhance grid operations • NYSERDA will develop case studies and "how to" materials to share amongst stakeholders to facilitate replication of successful demonstrations and encourage project partners to present at conferences to support information sharing and technology transfer **Advance Consumer and Stakeholder Education and Awareness** • NYSERDA will initiate pilot consumer engagement programs with industry stakeholders to support consumer awareness building. This program will feed data collected from initial efforts back to industry to support their further independent investment in outreach, either through matching grants or jointly managed projects. • NYSERDA will work with other states and US Department of Energy on developing and possibly jointly funding regional or national EV awareness campaigns • NYSERDA will work with contractors to engage employers and car dealers to encourage them to expand their involvement in EV promotion and recognize leaders amongst these groups to encourage participation, possibly including a pilot sales incentive for car dealers that generate EV sales **Sponsor Aggregate Purchasing and Cost Reduction for EVs and EV Charging Stations** • NYSERDA will institute a purchasing collaborative that negotiates bulk rates for any New York State site owner who wants to install a charging station to bring down costs and lower customer acquisition costs for vendors/installers. It will be paired with targeted incentives for specific installation site types, including workplaces, multi-family buildings, and municipalities. • NYSERDA will fund additional installations of fast-charge stations to support longer distance EV travel within New York State and to other states • NYSERDA will support the demonstration of models for aggregate EV purchases, such as Solarize-style grassroots campaigns that use community ambassadors to raise awareness of EVs **Support State and Local EV Policy Development and Implementation** • NYSERDA will work with other states and other New York State agencies to coordinate EV policies and programs to support the continuation of ZEV regulations and region-wide EV travel, such as public fleet EV purchasing and fast-charging infrastructure planning • NYSERDA will collaborate with utilities and DPS to develop solutions for problems that may arise from EV adoption, such as clustering of EVs on distribution circuits and high demand charges for fast-charging stations, through the design, demonstration, and adoption of technologies and policies that encourage off-peak charging and/or utility-controlled charging.

	• NYSERDA will work with utilities and DPS to quantify the benefits utilities and ratepayers may derive from EV adoption and support utilities in developing their plans for involvement in the EV market by providing information about possible utility strategies for EV market participation and offering research on New York-specific EV opportunities for utilities where possible. • NYSERDA will continue to work with municipalities to encourage the adoption of EV-friendly permitting and zoning and will expand to focus on building codes and the planning approval process • NYSERDA will continue to engage with industry stakeholders, thought leaders, and policymakers, to better understand customer motivations, evolving technology trends, and policy best practices, and to get ideas for future EV activities
Key Milestones	<u>Milestone 1 (2016)</u> • EV Rebate Program Launch. <u>Milestone 2 (2018)</u> • Complete bench-scale prototypes of economically viable technologies that enable smart charging. <u>Milestone 3 (2017)</u> • Support the launch of new business offerings for charging station leasing. <u>Milestone 4 (2017)</u> • Issue first competitive solicitation for the development and demonstration of EV-enabling technologies. <u>Milestone 5 (2017)</u> • Contract with projects awarded in first competitive solicitation for the development and demonstration of EV-enabling technologies. <u>Milestone 6 (2018)</u> • Issue second competitive solicitation for the development and demonstration of EV-enabling technologies. <u>Milestone 7 (2018)</u> • Contract with projects awarded in second competitive solicitation for the development and demonstration of EV-enabling technologies. <u>Milestone 8 (2019)</u> • Issue third competitive solicitation for the development and demonstration of EV-enabling technologies. <u>Milestone 9 (2018)</u> • Contract with projects awarded in third competitive solicitation for the development and demonstration of EV-enabling technologies. <u>Milestone 10 (2017)</u> • Initiate aggregation pilots for EVs and EV charging stations, which will begin engaging customers and facilitating initial bulk purchases. <u>Milestone 11 (2018)</u> • Fast-charging station network expanded to 30 locations statewide along major interstate corridors.

	Milestone 12 (2018) • Completion of first collaborative consumer awareness activities.
Goals Prior to Exit and Potential Impact	NYSERDA will have accomplished its goals with the EV Rebate program when: • EV sales meet or exceed the pace required under ZEV regulations for at least four straight quarters and achieve at least a 3% market share • Auto manufacturers offer all EV models for sale in New York State • More than 75% of new car dealers in New York State sell EVs • The cost of EVs falls to be competitive with gasoline-powered vehicles given a three- to five-year ownership period NYSERDA will have accomplished its goals with the EV Innovation program when: • Groups of stakeholders (industry, municipalities, employers, etc.) host regular (at least quarterly) EV education and awareness-building events in New York State's major metropolitan areas • At least 40% of drivers report having had some personal experience with an EV, either through test drives, family, friends, neighbors, or co-workers • Smart charging technologies are introduced into the consumer market and one or more New York State utilities encourage customers to use them • Charging station owners can reasonably achieve a three to five year return on investment for installing a charging station (an improvement of at least 50% from current conditions) and have multiple options for ways to purchase, finance, or lease a charging station EVs have the potential to capture a large market share in the light-duty vehicle market, and a small but significant share of medium- and heavy-duty vehicles. Cars generally are in service for 10 to 15 years, so virtually the entire vehicle fleet will turn over by 2030, providing a real opportunity to drive EV adoption. Many use cases will still not be appropriate for EVs, so the addressable potential is smaller, but EVs could meet the needs of more than half of all drivers in New York State. If successful, this program (when paired with other initiatives from other state agencies, primarily NYSDEC and NYPA) could help EVs account for 5% to 15% of annual new car purchases and number over 750,000 on the road by 2025, reducing CO2 emissions by 3.5 million metric tons per year, while also saving consumers money, reducing the State's petroleum use, generating additional gross state product (through less money leaving the State from petroleum purchases), and improving local air quality and health outcomes.

13.1.5 Relationship to Utility/REV

Utility Role/Coordination Points	• EVs have the potential to support REV goals by serving a load-balancing function for utilities and may be able to be used as a distributed energy resource. They may also enable new business models for utilities to generate additional revenue. • Utilities have participated in a series of NYSERDA-funded policy studies investigating new utility approaches to EVs. Through this work, NYSERDA has expanded their interest in EVs and suggested potential new business models for encouraging more EV use that enhances utility operations. • NYSERDA will continue to work closely with utilities to inform them about EVs' benefits to utilities and ratepayers, to share information about where EVs are commonly charged to help utilities' planning efforts, and to demonstrate EV technologies that can help support broader grid benefits. • In April 2016, the PSC encouraged utilities to develop proposals for how they can enable greater EV adoption, to be submitted in their supplemental

	DSIP filings in late 2016. Utilities are examining a number of models for action, including the models for providing EV charging stations that the three California investor-owned utilities are pursuing. If New York State utilities and the PSC choose a similar path to utility involvement in EV charging station provision, NYSERDA will work to inform utilities about the most promising opportunities and business models for EV charging. NYSERDA's proposed programs are complementary to this type of approach, as they are focused on increasing EV sales and awareness through the EV rebate, advancing the state of technology, bringing down the installed cost of charging stations, and providing limited incentives for charging station installations in specific market segments.
Utility Interventions in Target Market	• NYPA has worked closely with NYSERDA on a wide variety of EV-focused projects, including technology development, charging station installations, and grid-interactive vehicle pilots. • Most of the utilities in New York State have been engaged in EV activities to date in a limited fashion. Some, including Con Edison, National Grid, and Long Island Power Authority/PSEG-LI, have proposed new rates or programs that would encourage greater EV use. Some utilities have also shown interest in EV-related REV demonstration projects. • Some examples of EV interventions include Con Edison's proposed special EV time-of-use rates for residential customers and National Grid's ownership of more than 60 public EV charging stations. • Once utilities submit their supplemental DSIP filings, NYSERDA will have a better understanding of the types of EV market interventions they will pursue, which will help NYSERDA coordinate and collaborate further with the utilities.

13.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

To ensure the success of the EV Rebate program statewide, including in areas that do not pay into the System Benefits Charge, such as Long Island, non-CEF funding (primarily RGGI funding) is being used to supplement CEF activities. In addition to the budget outlined below, approximately $15 million of non-CEF funding will be used for the rebates. In addition, the EV Innovation program will supplement the CEF funds with approximately $5 million in additional existing non-CEF funds that may only be used for infrastructure projects. This money will be used for EV charging station installations.

Table 1: Annual Market Development and Innovation & Research Budget Allocation – Commitment Basis (CEF Only)

Commitment Budget		2016	2017	2018	2019	2020	2021	Total
EV Rebate Program (CEF only)	Direct Incentives and Services	$1,500,000	$9,500,000	$14,500,000	$9,000,000	$3,000,000	$-	$37,500,000
	Implementation Support	$-	$500,000	$750,000	$500,000	$250,000	$-	$2,000,000
	Sub-Total	$1,500,000	$10,000,000	$15,250,000	$9,500,000	$3,250,000	$-	$39,500,000
EV Innovation Program	Research and Technology Studies/ Development/ Demos	$100,000	$2,750,000	$3,000,000	$2,250,000	$2,250,000	$1,500,000	$11,850,000
	Sub-Total	$100,000	$2,750,000	$3,000,000	$2,250,000	$2,250,000	$1,500,000	$11,850,000
Total		$1,600,000	$12,750,000	$18,250,000	$11,750,000	$5,500,000	$1,500,000	$51,350,000

Table 2: Annual Expenditures Projection (CEF Only)

Expenditures	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Total	3%	20%	34%	23%	11%	3%	2%	2%	1%	100%

13.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

Table 3. Initiative Specific Metrics

Indicators[1]		Baseline (Before/Current)	2019 (Cumulative)	2022 (Cumulative)
EV Rebate Program				
Activity/Outputs	# of rebates issued	N/A	38,000	46,000[2]
	% of rebate recipients completing follow-up surveys	N/A	75%	80%
Outcomes	# of EVs registered in New York	14,000	52,000	150,000
	EV market share (EVs as a percentage of total number or registered vehicles in New York)	0.4%	1.5%	4%
EV Innovation Program				
Activity/Outputs	# of product development and demonstration projects initiated	0	21	33
	# of product development and demonstration partners supported	0	15	22
	# of industry stakeholders engaged in consumer awareness programs	0	20	50
	# of aggregate charging station purchase participants	0	150	400
Outcomes	# of charging stations installed in New York	1,500	3,000	4,500
	Avg. installed cost of Level 2 charging station per port	$12,000	$9,000	$7,500
	Products Commercialized	0	2	4
	Revenue ($ millions)	0	$1	$5
	Replications from Demonstration Projects	0	2	6

[1] N/A denotes that NYSERDA has not previously administered a similar program, so no baseline is available. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

[2] Note that the rebate program is currently anticipated to end by 2020, not 2022. This limits Activity/Output metrics, while Outcome metrics are anticipated to continue growing beyond the end of the rebate program because of momentum generated in the EV market.

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Geographic availability of charging stations, especially DC fast charging stations that enable greater intercity EV travel
- Growth in consumer awareness and experience with EVs, including growth in consumer understanding of the value proposition of EVs
- New partnerships formed to encourage consumer awareness and local EV adoption, which may include participation from automakers, car dealers, utilities, charging station manufacturers, advocacy groups, employers, municipalities, and other stakeholders
- Introduction of new products that enable smart EV charging that benefits both EV drivers and utilities/grid operators
- New business models that monetize second-life battery uses and enable charging station financing

Benefits shown in Tables 4 through 7 are direct, near term benefits associated with this initiative's projects. Because the EV Rebate program is being co-funded with CEF and non-CEF funding, all reported metrics associated with implementation of the program will be split proportionately according to the level of funding coming from each source. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. The first table shows all metrics associated with the entire EV Rebate program, including both CEF and non-CEF funding, and the second table shows prorated metrics associated only with CEF funding. The third table shows all metrics associated with the EV Innovation program, which is funded by CEF. All CO2e emission reduction totals in Tables 4 and 5 are based on a net analysis of emissions, accounting for lower emissions from reduced gasoline use and higher emissions from increased electricity use. Table 7 shows program participation associated with the entire program, including both CEF and non-CEF funding.

Table 4. Direct Impacts – EV Rebate Program – CEF + Non-CEF (entire initiative)

Primary Metrics[3]		2016	2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	--	--	--	--	--	--
	MWh Lifetime	--	--	--	--	--	--
	MMBtu Annual	85,300	536,000	841,000	512,000	171,000	2,144,000
	MMBtu Lifetime	853,000	5,360,000	8,410,000	5,120,000	1,710,000	21,440,000
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MW	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		4,580	28,800	45,100	27,500	9,160	115,100
CO2e Emission Reduction (metric tons) Lifetime		45,800	288,000	451,000	275,000	91,600	1,151,000
Customer Bill Savings Annual ($ million)		-	-	-	-	-	-
Customer Bill Savings Lifetime ($ million)		-	-	-	-	-	-
Private Investment ($ million)		$61.30	$385.00	$604.00	$368.00	$123.00	$1,540.00

[3] Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs. Energy Efficiency values represent gasoline savings from use of electric vehicle; electricity required to charge vehicles (158,000 MWh cumulative annual and 1,580,000 MWh lifetime in Total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both gasoline savings which add to the emission benefits and additional electricity required to charge electric vehicles which subtract from the benefits.

Table 5. Direct Impacts – EV Rebate Program – CEF only

Primary Metrics[4]		2016	2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MMBtu Annual	58,500	366,000	548,000	341,000	116,000	1,430,000
	MMBtu Lifetime	585,000	3,660,000	5,480,000	3,410,000	1,160,000	14,300,000
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MW	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		3,140	19,600	29,400	18,300	6,210	76,730
CO2e Emission Reduction (metric tons) Lifetime		31,400	196,000	294,000	183,000	62,100	767,300
Customer Bill Savings Annual ($ million)		-	-	-	-	-	-
Customer Bill Savings Lifetime ($ million)		-	-	-	-	-	-
Private Investment ($ million)		$42.00	$263.00	$394.00	$245.00	$83.10	$1,026.00

Table 6. Direct Impacts – EV Innovation Program

Primary Metrics[5]		2016	2017	2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-
	MMBtu Annual	-	-	-	-	-	-	-
	MMBtu Lifetime	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-	-	-
Customer Bill Savings Annual ($ million)		-	-	-	-	-	-	-
Customer Bill Savings Lifetime ($ million)		-	-	-	-	-	-	-
Private Investment ($ million)		$0.20	$7.00	$7.50	$6.50	$6.50	$4.00	$31.70

[4] Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs. Energy Efficiency values represent gasoline savings from use of electric vehicle; electricity required to charge vehicles (106,000 MWh cumulative annual and 1,060,000 MWh lifetime in Total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both gasoline savings which add to the emission benefits and additional electricity required to charge electric vehicles which subtract from the benefits.

[5] Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

Table 7. Annual Projected Initiative Participation

	2016	2017	2018	2019	2020	2021	Total
Rebate Recipients – EV Rebate Program (CEF + Non-CEF)	1,250 to 2,250	8,000 to 14,000	12,500 to 22,000	7,500 to 13,500	2,500 to 4,500	-	31,750 to 56,250
Rebate Recipients – EV Rebate Program (CEF only)[6]	900 to 1,500	5,500 to 9,500	8,000 to 14,500	5,000 to 9,000	1,750 to 3,000	-	21,150 to 37,500
Program Participants Receiving Awards – EV Innovation Program	2	7	8	6	6	4	33

Benefits shown in Tables 8 through 10 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. Because the EV Rebate program is being co-funded with CEF and non-CEF funding, all reported metrics associated with implementation of the program will be split proportionately according to the level of funding coming from each source. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

Table 8. Estimated Indirect Market Impact – EV Rebate Program (CEF + Non-CEF)

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		80,000	450,000	800,000

Table 9. Estimated Indirect Market Impact – EV Rebate Program (Prorated with CEF funding only)

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		53,333	300,000	533,333

[6] For the purposes of the summary tables in the Budget Accounting and Benefits Chapter, an average of the range provided was used.

Table 10. Estimated Indirect Market Impact – EV Innovation Program

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		25,000	150,000	450,000

13.1.8 Fuel Neutrality

Fuel Neutrality	• The proposed initiative will focus on the expanded use of electric vehicles instead of gasoline-powered vehicles in New York State. This switch to EVs will generate substantial greenhouse gas emission reductions, both directly and indirectly.
	• If all of the direct lifetime savings from the EV Rebate program are achieved, the program could provide GHG emission reductions at approximately $50 of NYSERDA spending per ton, which is in line with other CEF programs.
	• If the EV Rebate and EV Innovation programs achieve the potential GHG reductions noted above (in Goals Prior to Exit and Potential Impacts), the program will have achieved emissions reductions at approximately $20 of NYSERDA spending per ton, which compares very favorably to other CEF programs.
	• While EVs present a strong opportunity for GHG emission reductions, they will result in greater electricity consumption. However, EVs can provide benefits to the electric grid despite this increased usage.
	  ○ First and foremost, as most EV charging can occur overnight, EVs have the potential to level load curves and increase load factors by adding electricity demand during off-peak times. This can potentially reduce electric rates for all ratepayers.
	  ○ EVs also have the potential to serve as distributed energy resources that can provide ancillary services to the grid through the use of electricity stored in their batteries. This would provide benefits to both the electric grid and to EV owners, who could realize a new source of revenue to offset their operating costs.

13.1.9 Performance Monitoring and Evaluation Plans

Performance Monitoring & Evaluation Plan	NYSERDA's approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below. **<u>Test-Measure-Adjust Strategy</u>** • NYSERDA will monitor standard activity/output metrics including number of projects initiated and completed by type, private investment, etc. • For any new technology developments launched under the program, on a yearly basis, NYSERDA staff and contractor will reassess the Technology and Commercialization Readiness Levels (criteria by which to measure a

	new product's technical and commercial development) for each product development project in the portfolio. • Examples – technical impasse, pivot point, critical milestone. • NYSERDA will assess the portfolio of projects annually with regard to goals, metrics, outputs and outcomes. **<u>Market Evaluation/Impact Evaluation</u>** • Market Evaluation draws on the theory of change of the related logic model and will include baseline and longitudinal measurement of key indicators of success. • Baseline measurements of key performance indicators will occur within one year following initiative approval and will further refine baseline estimates including number of charging stations installed, consumer awareness, and number of electric vehicles registered in New York. In these areas, NYSERDA will first utilize existing information and will fill gaps in information as needed and feasible for appropriate baselining. • Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway. Sources of data include public and commercially available data, and primary data collection through surveys of key market actors. • A broad demonstration project impact evaluation starting no sooner than 2018 will include projects from this area and will examine benefits of demonstration projects, rate of and success factors associated with replication, and benefits of replication projects. Cost and energy savings will be quantified as part of this study. • Specific to the rebate program, NYSERDA will collect information from consumers through surveys. Consumers will fill out an initial survey when they purchase an electric vehicle and will be asked to complete a follow-up survey 6-12 months after the purchase to provide information on the factors that drive electric vehicle purchases and how they are being used. • NYSERDA will continue to gather information on at least an annual basis about electric vehicle usage and charging patterns in terms of timing and location to help inform utilities, prospective charging station owners, and other market actors.

Appendix A – Logic Model