

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

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Clean Energy Fund Investment Plan: Clean Transportation Chapter		
Revision Date	Description of Changes	Revision on Page(s)
August 1, 2016	Original Issue	Original Issue
June 23, 2017	Milestone 1 and Tables 1-5 for the Electric Vehicles initiative have been updated to reflect a shift in timing of budget and benefits.	Multiple
September 15, 2017	Added Public Transportation and Electrified Rail initiative. Updated second outcome for Electric Vehicle Rebate program in Table 3 to align wording with values included in the table.	Multiple
November 1, 2017	Updated the baseline values in Table 3 to reflect latest data available.	14
November 13, 2017	Chapter updated to include the previously approved Public Transportation and Electrified Rail initiative, which was inadvertently deleted from the November 1, 2017 filing.	Multiple
April 19, 2019	As part of the Annual Investment Plan & Performance Report (IPPR) process, NYSERDA has updated budget and benefit values to align with actuals for past years and adjusted budget and benefit forecasts for future years, as appropriate, based on experience to date. Budget and benefit tables have been moved to Appendix B of this chapter and output/outcome tables have been moved to Appendix C of this chapter. Updated rounding convention has been applied to budget and benefit tables. Combined indirect benefits for the EV Rebate and EV Innovation programs under the EV Rebate program for reporting purposes (see Appendix B).	Multiple
June 15, 2020	As part of the Annual Investment Plan & Performance Report (IPPR) process, NYSERDA has updated budget and benefit values to align with actuals for past years and adjusted budget and benefit forecasts for future years, as appropriate, based on experience to date.	Multiple within the plan. Appendix A, B, & C
April 14, 2021	Added funding to the Electric Vehicle initiative for a project to be selected through the New York Clean Transportation Prizes program. Other Chapter initiatives unaffected.	Multiple
May 7, 2021	As part of the Annual Investment Plan & Performance Report (IPPR) process, NYSERDA has updated budget and benefit values to align with actuals for past years and adjusted budget and benefit forecasts for future years, as appropriate, based on experience to date. The investment plans have been updated to provide a bridge between committed and acquired planning. Committed budget and benefits summaries have been added to plan text, while Appendix B has been updated to reflect expenditure & acquired benefits plans. The Verified Gross Savings Specification for EV Rebate was updated.	Appendix B 14-15, 25-26, Appendix B 28-29

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. This initiative was updated in November 2017 to provide current data on the number of EVs and charging stations, to update the timing of Milestone 1 to reflect actual launch date of the EV Rebate Program, and to update the timing of the committed budget and direct benefits to account for the later than anticipated launch of the EV Rebate Program. In April 2021 NYSERDA revised the EV initiative to add additional EV Innovation funds for a project to be selected through the New York Clean Transportation Prizes program, a program supported through other non-CEF Commission-allocated funds. This reflects shared goals between NYSERDA's CEF initiatives related to medium- and heavy-duty (MD/HD) EVs and the Make-Ready Order, which both aim to demonstrate innovative ways to remove barriers to EV adoption. It is also a recognition that the CEF goals can be advanced by taking advantage of the attraction of the prize competition and format to attract larger, more transformative projects than are likely to be funded under a typical NYSERDA solicitation.

The second initiative described in this Chapter is Public Transportation and Electrified Rail, which will invest in the development and demonstration of new energy-efficient products and operating

strategies for New York State’s public transportation system. The program’s goal is to advance products and strategies that can reduce energy use from subway and commuter rail traction power, enable electric transit bus service, and improve transit agency operations and ridership statewide. The program seeks to achieve these goals by bringing new products to market, conducting in-service testing, and removing key financial, logistical, and bureaucratic barriers to adoption. Coordination with transit agencies and NYS Department of Transportation will help NYSERDA focus on priority system needs and realistic solutions.

Potential additional initiatives under consideration include:

- 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	<ul style="list-style-type: none"> • 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 NYS 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 NYS’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: <ul style="list-style-type: none"> ○ To encourage EV sales, NYS Department of Environmental Conservation (DEC) regulations call for automakers to sell up to 40,000 EVs by 2018 and over 750,000 by 2025.
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	<ul style="list-style-type: none"> ○ 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 NYS Department of Public Service (DPS) and utilities are exploring how utilities can support greater charging infrastructure investment. ○ Other NYS 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.
<p>Intervention Strategy</p>	<p>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.</p> <p><u>Electric Vehicles - Rebate</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.</p> <p><u>Electric Vehicles - Innovation</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 NYS, key elements of the strategy will include:</p> <ul style="list-style-type: none"> ● 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. <p>NYSERDA will further promote advances in the MD/HD EV market by supporting a project selected through the Electric Truck and Bus Challenge, one of three prizes established by the Public Service Commission’s July 2020 Make-Ready Order. The New York Clean Transportation Prizes offer a highly visible platform for attracting strong proposals from global leaders in transportation electrification and its goals are closely aligned with the goals of this CEF investment plan. Per the New York Clean Transportation Prizes implementation plan filed with DPS in November 2020, the Electric Truck and Bus Challenge (formally known as the Clean Medium- and Heavy-Duty Vehicle Innovation Prize) “aims to identify and demonstrate ways to reduce the cost, system and operational challenges of further deployment of MD/HD EVs, including minimizing the costs of charging and grid integration infrastructure for MD/HD EVs; improve health, the quality of life and the quality of opportunity in affected communities, as a co-benefit, with a preference for improvements in disadvantaged communities; and demonstrate clear potential for replication and scale.”</p>

	<p>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.</p> <p>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.</p> <p>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.</p> <p>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Electric Vehicles,” which can be found in Appendix A.</p>
Goals	<p>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.</p>
State Energy Plan/Clean Energy Standard Link	<p>The State Energy Plan identifies transportation as a major user of energy and the source of approximately 40 percent of fossil-fuel based GHG emissions in the State. The Plan recognizes that EVs are one of the most promising opportunities to decarbonize 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.</p>

13.1.2 Target Market Characterization

Target Market Segment(s)	<p>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.</p>
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	<p>The other aspects of the EV Innovation Program will each target specific market segments.</p> <ul style="list-style-type: none"> • 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 • The Electric Truck and Bus Challenge will target teams of applicants that consist of a combination of technology providers, fleet operators, community representatives (with a preference for projects in disadvantaged communities), and other related stakeholders
<p>Market Participants</p>	<p>Key market participants will in large part be similar for both the EV Rebate and EV Innovation Programs. They include:</p> <ul style="list-style-type: none"> • Auto manufacturers control large advertising budgets, develop new models based on consumer preferences, and decide which models to sell in NYS; 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 NYS; 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 • Disadvantaged communities¹ and their representatives are disproportionately impacted by transportation emissions and are actively seeking low- and zero-emission solutions to transportation challenges in their communities

¹ <https://www.nyserda.ny.gov/ny/disadvantaged-communities>

	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Market demand for EVs and efficient vehicles is growing, backed by both new market offerings and policy drivers. The number of EVs in NYS has grown from under 1,000 in 2012 to over 16,000 in December 2016. • NYS has adopted the California ZEV regulations, requiring increasing EV sales in NYS through 2025. To facilitate these increasing sales, NYS 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: <ul style="list-style-type: none"> ○ Automakers have made nearly 20 EV models available in New York State. ○ Federal income tax credits of up to \$7,500 are available for EVs. NYS currently offers EV drivers access to high-occupancy vehicle lanes and reduced Thruway and PANYNJ tolls. ○ NYSERDA offers up to \$60,000 vouchers for qualifying electric medium- and heavy-duty trucks and buses (using federal funding through at least 2016). ○ Public and workplace charging stations are eligible for a 50% NYS tax credit, up to \$5,000. Public and private entities have installed over 1,600 charging stations in New York State through December 2016. More than 25 NYS workplaces have signed up for the Department of Energy’s Workplace Charging Challenge, recognizing their leadership in providing workplace charging for employees. ○ 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. ○ Six Clean Cities Coalitions in NYS work at the grassroots level to support the adoption of EVs and other alternative fuel vehicles. ○ 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	<p><u>EV Rebate Program</u></p> <ul style="list-style-type: none"> • 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 NYS would generate tens of millions of dollars per year in ZEV credits for automakers. • Car dealers want to be able to move cars off 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.

	<p><u>EV Innovation Program</u></p> <ul style="list-style-type: none"> • 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.
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13.1.3 Stakeholder/Market Engagement

<p>Stakeholder/Market Engagement and Customer Discovery</p>	<ul style="list-style-type: none"> • 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 NYS agencies, federal agencies, and other states. • NYSERDA has discussed the challenges to MD/HD vehicle electrification, especially within disadvantaged communities, with industry participants, utilities, and community-based organizations. Stakeholders have raised concerns about barriers such as charging infrastructure expenses and operating expenses that can be exacerbated if charging is not closely managed, high incremental prices of EVs, higher-than-anticipated operating costs, and availability of financing (especially for smaller locally owned fleets). • 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.
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13.1.4 Theory of Change

<p>Market and Technology Barriers Addressed</p>	<p><u>EV Rebate Program</u></p> <ul style="list-style-type: none"> • 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)
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	<ul style="list-style-type: none"> • Car dealers have a harder time selling EVs because of the added time needed to educate consumers and the newness of the technology <p><u>EV Innovation Program</u></p> <ul style="list-style-type: none"> • Lack of NYS 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) • Few vehicle electrification projects of a large scale have been conducted in New York, which would provide greater understanding of the grid and operational impacts of large-scale electrification
Testable Hypotheses	<p><u>EV Rebate Program</u></p> <ul style="list-style-type: none"> • 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 NYS. • 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 NYS. <p><u>EV Innovation Program</u></p> <ul style="list-style-type: none"> • 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 NYS 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. • If market participants find and test solutions that reduce the cost of charging equipment and grid upgrades associated with MD/HD vehicle electrification, then electric truck and bus projects will be more easily financed by the private sector and more widely adopted by fleet operators. • If MD/HD fleet operators join with innovative solution providers and members of their communities to conduct large-scale transportation electrification projects, then they will identify replicable strategies for MD/HD vehicle electrification that are relevant to fleets statewide.
Activities	Administer EV Rebate Program

- NYSERDA will administer an EV rebate program that offers consumer rebates for ZEVs at the point of sale. Per NYS 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
- NYSERDA will provide funding for one project selected through the Electric Truck and Bus Challenge, which targets projects that will address the operational barriers to MD/HD EV deployment, especially regarding the costs associated with charging. The competition is further described in the New York Clean Transportation Prizes implementation plan² NYSERDA submitted to DPS in November 2020.

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

² State of New York Public Service Commission, Case 18-E-0138, Transportation Prizes Implementation Plan, November 13, 2020.

	<p>Sponsor Aggregate Purchasing and Cost Reduction for EVs and EV Charging Stations</p> <ul style="list-style-type: none"> • NYSERDA will institute a purchasing collaborative that negotiates bulk rates for any NYS 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 NYS 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 <p>Support State and Local EV Policy Development and Implementation</p> <ul style="list-style-type: none"> • NYSERDA will work with other states and other NYS 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
<p>Key Milestones</p>	<p><u>Milestone 1 (2017)- Complete</u></p> <ul style="list-style-type: none"> • EV Rebate Program Launch. <p><u>Milestone 2 (2017)- Complete</u></p> <ul style="list-style-type: none"> • Support the launch of new business offerings for charging station leasing. <p><u>Milestone 3 (2017)- Complete</u></p> <ul style="list-style-type: none"> • Issue first competitive solicitation for the development and demonstration of EV-enabling technologies. <p><u>Milestone 4 (2017)- Complete</u></p> <ul style="list-style-type: none"> • Contract with projects awarded in first competitive solicitation for the development and demonstration of EV-enabling technologies. <p><u>Milestone 5 (2017) - Complete</u></p> <ul style="list-style-type: none"> • Initiate aggregation pilots for EVs and EV charging stations, which will begin engaging customers and facilitating initial bulk purchases. <p><u>Milestone 6 (2018)- Complete</u></p> <ul style="list-style-type: none"> • Issue second competitive solicitation for the development and demonstration of EV-enabling technologies.

	<p><u>Milestone 7 (2018)- Complete</u></p> <ul style="list-style-type: none"> • Contract with projects awarded in second competitive solicitation for the development and demonstration of EV-enabling technologies. <p><u>Milestone 8 (2018)- Complete</u></p> <ul style="list-style-type: none"> • Completion of first collaborative consumer awareness activities. <p><u>Milestone 9 (2020)- Complete</u></p> <ul style="list-style-type: none"> • Complete bench-scale prototypes of economically viable technologies that enable smart charging. <p><u>Milestone 10 (2020)</u></p> <ul style="list-style-type: none"> • Issue awards for third competitive solicitation for the development and demonstration of EV-enabling technologies. <p><u>Milestone 11 (2020)- Complete</u></p> <ul style="list-style-type: none"> • Fast-charging station network expanded to 30 locations statewide along major interstate corridors. <p>Milestone 12 (2021)</p> <ul style="list-style-type: none"> • Complete studies projecting future charging needs and grid impacts associated with anticipated future levels and types of EV adoption <p>Milestone 13 (2022)</p> <ul style="list-style-type: none"> • Issue award for Electric Truck and Bus Challenge <p>Milestone 14 (2024)</p> <ul style="list-style-type: none"> • Identify successful strategies for managing charging profiles and reducing the cost of grid upgrades associated with electric trucks and buses
<p>Goals Prior to Exit and Potential Impact</p>	<p>NYSERDA will have accomplished its goals with the EV Rebate program when:</p> <ul style="list-style-type: none"> • 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 NYS • More than 75% of new car dealers in NYS sell EVs • The cost of EVs falls to be competitive with gasoline-powered vehicles given a three- to five-year ownership period <p>NYSERDA will have accomplished its goals with the EV Innovation program when:</p> <ul style="list-style-type: none"> • Groups of stakeholders (industry, municipalities, employers, etc.) host regular (at least quarterly) EV education and awareness-building events in NYS'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 NYS 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 <p>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</p>

	<p>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.</p> <p>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 GSP (through less money leaving the State from petroleum purchases), and improving local air quality and health outcomes.</p>
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13.1.5 Relationship to Utility/REV

<p>Utility Role/Coordination Points</p>	<ul style="list-style-type: none"> • 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 NYS 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. The utilities will support the New York Clean Transportation Prize awards through existing transportation programs, services and tariffs. The utilities will also work with DPS Staff if issues or barriers arise that prevent or delay the implementation of prize awards. The utilities will leverage insights and recommendations identified in the replication and scalability report(s) to be completed following the implementation of the prize awards.
<p>Utility Interventions in Target Market</p>	<ul style="list-style-type: none"> • 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 NYS 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.

	<ul style="list-style-type: none"> 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.
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13.1.6 Budgets

The commitment budget for all activities related to *EV Rebate* is as follows:

Funding Commitments		----- Commitments Plan -----						
Budget	Plan Total	Previously Committed	2020	2021	2022	2023	2024	2025
Incentives and Services	36,675,830	20,372,110	14,505,051	1,798,669	-	-	-	-
Implementation	2,824,170	2,309,170	143,390	371,610	-	-	-	-
Research and Technology Studies	-	-	-	-	-	-	-	-
Tools, Training and Replication	-	-	-	-	-	-	-	-
Business Support	-	-	-	-	-	-	-	-
Total	39,500,000	22,681,280	14,648,441	2,170,279	-	-	-	-

The commitment budget for all activities related to *EV Innovation* is as follows:

Funding Commitments		----- Commitments Plan -----						
Budget	Plan Total	Previously Committed	2020	2021	2022	2023	2024	2025
Incentives and Services	8,000,000	-	-	-	8,000,000	-	-	-
Implementation	1,892,648	1,137,648	535,511	219,489	-	-	-	-
Research and Technology Studies	9,675,356	6,125,637	1,512,136	2,037,583	-	-	-	-
Tools, Training and Replication	281,996	181,995	32,552	67,448	-	-	-	-
Business Support	-	-	-	-	-	-	-	-
Total	19,850,000	7,445,281	2,080,199	2,324,520	8,000,000	-	-	-

Annual expenditure budgets for all activities included in this investment plan are shown in Appendix B for both Rebate and Innovation components of this plan. Budgets 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 Appendix B 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 in Appendix B, 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. The \$8 million in CEF funds for a project resulting from the Electric Truck and Bus Challenge are supplementing an additional \$85 million in non-CEF funding approved by the PSC as part of its July 2020 Make-Ready Order. More detail on the uses of the \$85 million can be found in the New York Clean Transportation Prizes implementation plan.

13.1.7 Progress and Performance Metrics

The anticipated *EV Rebate* commitment benefits totals with respect to CEF Order target metrics is as follows:

Benefit Commitments

Direct Benefit (2016-2025)	Plan Total
Energy Efficiency MWh Annual	-
Energy Efficiency MMBtu Annual	1,471,601
Renewable Energy MWh Annual	-
CO2e Emission Reduction (metric tons) Lifetime	647,446
Participant Bill Savings Lifetime	374,589,685
Leveraged Funds	857,185,000

Indirect Benefit (2016-2030)	Plan Total
Energy Efficiency MWh Annual	-
Energy Efficiency MMBtu Annual	15,661,943
Renewable Energy MWh Annual	-
CO2e Emission Reduction (metric tons) Lifetime	6,663,698

The anticipated *EV Innovation* commitment benefits totals with respect to CEF Order target metrics is as follows:

Benefit Commitments

Direct Benefit (2016-2025)	Plan Total
Energy Efficiency MWh Annual	-
Energy Efficiency MMBtu Annual	-
Renewable Energy MWh Annual	-
CO2e Emission Reduction (metric tons) Lifetime	-
Participant Bill Savings Lifetime	-
Leveraged Funds	49,141,886

Indirect Benefit (2016-2030)	Plan Total
Energy Efficiency MWh Annual	-
Energy Efficiency MMBtu Annual	-
Renewable Energy MWh Annual	-
CO2e Emission Reduction (metric tons) Lifetime	-

Benefits summarized in Appendix B represent the plan for acquiring impacts through completed projects or activities.

Benefits labeled as direct, 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. Appendix B shows all metrics associated with the entire EV Rebate program, including both CEF and non-CEF funding, and also shows prorated metrics associated only with CEF funding. Appendix B also contains metrics associated with the EV Innovation program, which is funded by CEF. All CO2e emission reduction totals in Appendix B are based on a net analysis of emissions, accounting for lower emissions from reduced gasoline use and higher emissions from increased electricity use. Appendix B also shows program participation associated with the entire program, including both CEF and non-CEF funding.

Benefits shown in Appendix B, labeled as indirect, 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 in

Appendix B are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

Appendix C 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.

In addition, 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
- Growth in the MD/HD EV market, including expansion of electrification projects to new truck vocations
- Expansion of electric MD/HD fleets in disadvantaged communities

13.1.8 Fuel Neutrality

Fuel Neutrality	<ul style="list-style-type: none"> • 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 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 lifetime 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 lifetime 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. <ul style="list-style-type: none"> ○ 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 using electricity stored in their
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	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.
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13.1.9 Performance Monitoring and Evaluation Plans

<p>Performance Monitoring & Evaluation Plan</p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> • 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 regarding goals, metrics, outputs and outcomes. <p><u>Market Evaluation/Impact Evaluation</u></p> <ul style="list-style-type: none"> • 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 NYS. 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. • NYSERDA will rigorously track the results of the projects funded through the Electric Truck and Bus Challenge. Data collection for M&V will be
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	<p>conducted by awardees, while a third-party evaluator will be procured to consolidate and verify data, as well as assist in data collection. More details on measurement and verification, data collection, and program evaluation for this program can be found in the New York Clean Transportation Prizes implementation plan, and may include emissions reductions, total cost of ownership of EVs, charging station costs, vehicle and infrastructure utilization and performance metrics specific to vehicle duty cycles.</p>
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13.2 Public Transportation and Electrified Rail

13.2.1 Overview

Present Situation	<ul style="list-style-type: none"> • New York State has more public transportation ridership than any other state, both overall and per capita. Efficiency improvements could generate millions of dollars in savings annually. • NYS transit agencies have identified areas where energy efficiency improvements are needed, as well as opportunities to improve transit ridership through better service, especially upstate. To date, many of these opportunities have not been undertaken because of technical and operational hurdles, including a lack of a dedicated research and development (R&D) budget for product development and demonstration, procurement challenges, financing challenges, and logistical hurdles. • Transit ridership has been increasing in recent years, especially in the New York City area. New investments are needed to keep up with demand, and transit agencies are looking for ways to serve more people more efficiently. Energy efficiency solutions are necessary to help transit agencies control their costs while continuing to provide high levels of service for their customers.
Intervention Strategy	<ul style="list-style-type: none"> • NYSERDA will work with transit agencies and technology providers to develop and demonstrate new public transportation and electrified rail technologies that reduce energy use and peak load, helping transit agencies make tangible improvements to their operations while achieving real energy savings. The program is focused on developing and demonstrating new solutions, rather than providing incentives for deployment. NYSERDA’s strategy will include three main elements: <ul style="list-style-type: none"> ○ Supporting new technology and product development that solves specific problems transit agencies have identified. ○ Testing and validating the benefits, identifying the value streams, and exploring new delivery business models of new or new-to-New York products. ○ Supporting transit agencies with finding alternative products that meet their needs and produce energy savings, helping transit agencies develop specifications for buying new products, and coaching potential vendors on how to adapt their products to specific NYS transit operators’ needs. • There is currently little pilot-scale research and testing being conducted on ways to improve smaller public transportation networks to reduce greenhouse gas (GHG) emissions. NYSERDA will support research into options for increased energy efficiency and lower-cost approaches to increasing ridership and achieving cost savings, such as aggregate purchasing of energy-saving technologies, technologies supporting bus rapid transit, behavioral science-informed marketing, and making data available to private app developers.

	<ul style="list-style-type: none"> Initial focus areas have been identified with input from NYS transit agencies. 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. This initiative is part of NYSERDA's coordinated intervention strategies to develop and deploy energy storage products and remove market barriers to their adoption. This program will demonstrate new storage technologies in public transportation use cases and will be coordinated closely with NYSERDA efforts to develop new energy storage technologies and products. It will also leverage the insights gained from activities conducted under the "Reducing Barriers to Deploying Distributed Energy Storage" initiative to use energy storage in reducing grid impacts from electrified rail. For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Public Transportation and Electrified Rail," which can be found in Appendix A.
Goals	<p>The goal of this program is to develop and demonstrate innovative technologies and operational approaches that are required for New York's public transportation agencies, to contribute to the State's energy and GHG reduction goals. Areas of need include:</p> <ul style="list-style-type: none"> Reducing traction power energy use Increasing the efficiency of transit buses Developing new hardware and software technologies that enable operational improvements to make transit access more widespread and economically viable <p>This is critical because very little research is conducted on transit operations nationally, so NYSERDA's efforts fill a gap in federal and private research.</p>
State Energy Plan/Clean Energy Standard Link	<ul style="list-style-type: none"> The 2015 State Energy Plan identifies transportation as a major user of energy and source of GHG emissions in the State. The Plan recognizes that New York's extensive public transportation system is the reason that New York State is the most transportation fuel-efficient state in the nation on a per capita basis, and that to further reduce transportation emissions the State must invest in more energy efficient ways to move people, including further investment in public transportation. The 2015 State Energy Plan also discusses the need to manage electricity demand to ensure efficient and reliable operation of the grid. The Metropolitan Transportation Authority's (MTA's) electricity use is in the area of the state with the highest electricity prices and most congested electric grid. Consistent with the Reforming the Energy Vision (REV) agenda, reductions in MTA electricity use could help alleviate pressures on the electric grid.

13.2.2 Target Market Characterization

Target Market Segment(s)	The target market for the proposed activities will primarily be product vendors and developers, researchers, and transit agencies (which will participate primarily as partners).
Market Participants	<p>Key market participants include:</p> <ul style="list-style-type: none"> Private sector technology and service providers, including: <ul style="list-style-type: none"> Rail car and bus manufacturers, component manufacturers, and third-party solution providers Energy storage companies and the New York Battery and Energy Storage Technology consortium (NY-BEST) Financial sector organizations and energy service companies Software developers Researchers and inventors

	<ul style="list-style-type: none"> • NYS public transit agencies • Public transportation riders • Federal, State, local and regional transportation agencies, including United States Department of Transportation (USDOT), Federal Transit Administration (FTA), New York State Department of Transportation (NYSDOT) and the state’s metropolitan planning organizations (MPOs) • Utilities
Market Readiness	<ul style="list-style-type: none"> • Transit agencies across New York State have seen increases in ridership in recent years and demographic trends point toward a continued increase in ridership in coming years.³ This is in part because of an increase in people moving back into urban centers, high gas prices in the early 2010s, and the Great Recession. Transit agencies are looking for ways to meet this increased demand through new operating strategies and investments that have low operating costs. Making sure that there are energy efficient options for transit agencies to choose from when making investment decisions is critical if New York is going to meet its State Energy Plan goals for reduced transportation energy use. • Transit agencies have taken some initial steps. For example, MTA has implemented a number of energy efficiency upgrades, including improved rail switch heaters and LED lighting. MTA and other transit agencies have adopted compressed natural gas (CNG) and hybrid-electric buses for about 25% of their fleets to date, but these options have only had incremental impacts on energy use and GHG emissions. • Transit agencies have plans to make extensive capital investments in the next 10 years, including buying thousands of transit buses. Because many of these equipment investments will be in place for 10 or more years, delays in technology availability will mean that less efficient equipment is purchased, which would result in a long delay before adoption of more efficient technologies.
Customer Value	<ul style="list-style-type: none"> • Transit agencies are looking for reliable vehicles and technologies that offer low operating costs, are durable, and can fit into their agencies’ operational needs. NYSERDA’s development and demonstration activities will result in new and rigorously tested products and services that reduce transit agency operating expenses, allowing budgets to stretch further, and help transit agencies offer better services to their riders. • NYSERDA’s program has the potential to help transit agencies create value for their riders by reducing operating costs, allowing for lower-cost service or service expansion. With respect to MTA in particular, the program has the potential to create value for ratepayers, utilities, and grid operators through reduced system costs. • If the technologies and associated energy savings anticipated in this plan are fully realized, MTA alone could save more than \$50 million per year in operating expenses from reducing its traction electricity use (which makes up about 75% of MTA’s total electricity use) by about 750 million kWh and its peak load by about 100 MW. This would reduce its greenhouse gas emissions by 400,000 metric tons annually. Similarly, broad deployment of electric transit buses could reduce GHG emissions by more than 250,000 metric tons per year. Revenue increases from increased ridership that could result from improved operations could amount to \$20 million per year and reduce GHG emissions from more efficient buses and fewer automobile trips by more than 50,000 metric tons annually. • New product developers are looking for both working capital in support of product development and, often more importantly, facilitation of product demonstrations

³ MTA ridership in 2016 hit the highest level since 1948. <http://web.mta.info/nycct/facts/ffsubway.htm>, accessed 8/8/17
 NYPTA has stated that “Ridership is up almost everywhere in the state,” according to a 12/31/16 news article: http://www.pressrepublican.com/news/local_news/as-ridership-grows-public-transit-looks-to-state-for-money/article_130bde0f-b0b2-5fdc-b68e-e4858b886dee.html, accessed 8/8/17

	with transit agencies, which often lead directly to sales. As New York State accounts for about 40% of all transit ridership in the United States, proving a product that meets the needs of New York State transit agencies can be the cornerstone of a multi-million-dollar product launch.
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13.2.3 Stakeholder/Market Engagement

Stakeholder/Market Engagement and Customer Discovery	<ul style="list-style-type: none"> • NYSERDA has already begun working with MTA to identify its operating divisions' greatest needs and possibilities for energy saving products. MTA staff is eager to work with NYSERDA in an expanded capacity and has already shared many ideas for collaborations that can start in the next year. NYSERDA is familiar with many technology developers and vendors who have worked with MTA and has talked to them to better understand obstacles involved. NYSERDA will also reach out to other transit agencies in other parts of the US and world to try to identify best practice technologies and their manufacturers that are not currently in use in NYS. • NYSERDA recently completed a survey of technology use in small- and mid-sized NYS transit agencies that has informed its program development. Findings include significant opportunities to improve energy use and service provision through joint purchasing, driver feedback software, technologies that reduce travel times, better data use and software development, and a general need for in-service demonstration funding. • NYSERDA has met with and continues to develop its relationships with other NYS transit agencies, including Capital District Transportation Authority (CDTA), Niagara Frontier Transportation Authority (NFTA), Westchester Bee-Line, and others, to identify their largest obstacles to improved energy efficiency and increased ridership and how NYSERDA might help them address these obstacles. NYSERDA also intends to work closely with NYSDOT and the New York Public Transit Association (NYPTA) to coordinate activities and identify opportunities that span multiple transit agencies. • MTA has an existing program that works with companies with technologies that offer promising energy savings potential. They do not provide funding to these companies but often provide feedback and advice. MTA generally refers these companies to NYSERDA to learn about potential funding opportunities. Continuing to work with these companies will help ensure that NYSERDA programs are addressing appropriate targets.
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13.2.4 Theory of Change

Technology Opportunities and Barriers Addressed	<ul style="list-style-type: none"> • Lack of dedicated budget and process for product development and demonstration. Large investments are required to develop, demonstrate and deploy new public transit innovations. Transit agencies have few opportunities to develop and test new technologies and approaches to improving energy efficiency and enhancing operations to serve more riders and reduce GHG emissions from transportation. They have limited data on actual performance of new technologies, which stifles their willingness to invest. Federal agencies have limited budgets for R&D and do not often focus on the R&D needs of NYS transit agencies. Facilitating demonstrations of efficiency measures and developing technologies and tools that improve efficiency, reliability and customer experiences will help transit agencies justify investing in these innovative approaches to generating GHG emission reductions. Reducing the cost of developing products and establishing faster, easier demonstration project protocols will bring down the cost and time to introduce new products. Generating reliable data from in-service demonstrations will help
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	<p>transit agencies become confident enough in the technologies' benefits to make further investments.</p> <ul style="list-style-type: none"> • Logistical hurdles. Electric buses are beginning to be introduced in transit fleets around the country but NYS transit agencies are unlikely to invest until they are shown to address their technical and logistical needs and charging infrastructure is standardized. Demonstrated, validated, and cost-effective electric buses and associated charging infrastructure will lead to NYS adoption. • Technology integration and procurement challenges. Subway cars, rail cars and buses do not currently incorporate the state of the art technologies in areas such as vehicle light weighting, efficient drivetrains, and traction power technologies, causing them to use more energy than similar subway cars and buses in other transit systems. Procurement practices that favor energy-efficient solutions, new technical breakthroughs, and the integration of existing efficient technologies in use elsewhere into NYS agencies' standard operations will help achieve NYS's goals. • Operational and partnership/financing challenges. Administrative barriers that could be overcome through either operational adjustments or public-private partnerships stop many activities and technologies that might make economic sense from making it into transit operations. Few demonstrations of innovative approaches to transit agencies' operational challenges (such as new approaches to vehicle automation or partnerships facilitated by third-party ownership of energy efficiency assets) are conducted and there are few sources of funding for this research. Successful pilots of operational changes and innovative partnership and financing relationships will lead to larger rollouts of these approaches.
Testable Hypotheses	<ul style="list-style-type: none"> • If NYSERDA engages public transit agencies' operations divisions in product development and demonstration efforts from the start, then it will result in easier logistics for demonstration projects, shorter development timelines, and more successful product adoptions. • If NYSERDA works with partners to design well-planned, rigorous demonstrations of new technologies, then transit agencies will be more likely to accelerate adoption. • If projects conduct in-service demonstration and validation of the benefits and ease of operation of transit technologies that are in use elsewhere, such as electric buses and lightweight train cars, then they will be able to find more willing buyers at NYS transit agencies and increase adoption in NYS. • If NYSERDA supports product refinements by technology providers who have products that need to be adapted to specific and unique procurement requirements of NYS transit operators, then this will help them introduce the products into NYS more quickly and at a more competitive price. • If transit agencies try alternative REV-like business models for the purchase and operation of energy-saving transit investments, such as third-party ownership of assets that can provide outside revenue streams or participation in microgrids/power delivery on transit agencies' rights of way, then this will reduce payback periods and eliminate operational obstacles for energy efficient technologies. • If NYSERDA supports the development of innovations that increase bus reliability and convenience through introducing new technologies and improving system performance, then transit agencies that implement these innovations will increase their per-bus ridership rate and generate GHG emission reductions.
Activities	<ul style="list-style-type: none"> • Solicit and support new product development and demonstration opportunities <ul style="list-style-type: none"> ○ NYSERDA will work with transit agencies to identify their core needs and barriers, performance and price targets, operational and maintenance requirements, and key opportunities they see for improvements in their operations and energy use

- NYSERDA will develop a prioritized list of promising technologies that may benefit from support or in-service demonstration partners
- NYSERDA will work with transit agencies and product developers to establish an approved demonstration protocol to streamline administrative burdens around demonstration projects
- NYSERDA will fund product development projects that advance and commercialize new technologies that help NYS transit agencies become more energy efficient. NYSERDA will also fund demonstration projects to test new and underutilized energy-saving transit products in operation in NYS.
- NYSERDA will fund product “adaptation” projects to customize energy-saving products for NYS transit operators’ special operational requirements.
- **Provide expert consultations to transit agencies**
 - NYSERDA will work with transit agencies to develop procurement specifications for new products that encourage competition and open-source standards wherever possible.
 - NYSERDA will advise transit agencies directly or contract with experts to help the agencies find solutions to logistical and operational barriers to new technology adoption.
- **Develop new public/private business models**
 - NYSERDA will work with MTA, the New York Power Authority (NYPA), Con Edison, and third-party service providers to study and demonstrate alternative ownership/financing models and revenue streams for MTA assets, such as energy storage and microgrids, which would make it easier for MTA and its partners to invest in energy-saving technologies.
 - NYSERDA will support transit agencies to identify private financiers who are willing to finance large-scale implementation of successfully demonstrated products.
- **Facilitate broad acceptance of demonstrated technologies and support their adoption into regular deployment channels**
 - NYSERDA will share information with NYPA, NYSDOT, and FTA about successfully demonstrated products and to inform them in their development of financing packages and project implementation support for transit agencies to broadly deploy products.
 - NYSERDA will investigate opportunities to provide aggregate purchasing opportunities for transit agencies that can use similar energy-saving technologies.
 - NYSERDA will develop case studies and “how to” materials to share amongst transit agencies to facilitate replication of successful demonstrations and encourage project partners to present at conferences to support information sharing and technology transfer.
- **Support the use of new technologies and services**
 - NYSERDA will support the implementation of operating technologies, such as data collection and communication systems, and system performance improvements, such as reconfiguring bus routes to improve travel times, that improve rider experiences and increase utilization of existing assets.
 - NYSERDA will work with transit agencies statewide to pilot behavioral approaches that make taking transit easier, faster, and more cost-effective.

Projects will be selected through competitive solicitations. Co-funding is required for technology development and demonstration projects, and proposers are responsible for identifying sources of co-funding at the time they submit proposals. All projects will seek to advance technologies and strategies that can be replicated at a larger scale and

	<p>in a cost-effective manner. Target technologies and operational strategies will be evaluated regularly and adjusted, with input from partners, as needed based on a “test/measure/adjust” approach.</p>
<p>Key Milestones</p>	<p><u>Milestone 1 (2017)- Complete</u></p> <ul style="list-style-type: none"> • Issue first competitive solicitation for the development and demonstration of public transportation technologies. <p><u>Milestone 2 (2018)- Complete</u></p> <ul style="list-style-type: none"> • Contract with projects awarded in first competitive solicitation for the development and demonstration of public transportation technologies. <p><u>Milestone 3 (2018)- Complete</u></p> <ul style="list-style-type: none"> • Issue second competitive solicitation for the development and demonstration of public transportation technologies. <p><u>Milestone 5 (2019)- Complete</u></p> <ul style="list-style-type: none"> • Issue awards for second competitive solicitation for the development and demonstration of public transportation technologies. <p><u>Milestone 6 (2019)- Complete</u></p> <ul style="list-style-type: none"> • Issue third competitive solicitation for the development and demonstration of public transportation technologies. <p><u>Milestone 7 (2020) - Complete</u></p> <ul style="list-style-type: none"> • Issue awards for third competitive solicitation for the development and demonstration of public transportation technologies. <p><u>Milestone 8 (2021)</u></p> <ul style="list-style-type: none"> • Issue awards for fourth competitive solicitation for the development and demonstration of public transportation technologies.
<p>Goals Prior to Exit</p>	<p>NYSERDA will have accomplished its goals with this program when:</p> <ul style="list-style-type: none"> • Technology providers have performed successful in-service demonstrations of products that achieve the efficiency gains targeted through this program (25% or more improvements in rail and bus efficiency) • These energy-efficient products are cost-competitive with other products as part of regular transit agency procurements and are commercially available • One or more transit agencies have been able to integrate these new technologies into their operations and logistics such that there is still a reasonable return on investment for the transit agency • NYPA or other third-party financiers are willing to finance transit agencies’ purchases of the demonstrated energy-efficient products <p>NYSERDA’s program will bring products through the demonstration phase. This program’s involvement is expected to be completed before the products are fully adopted and deployed. The program will try to facilitate future adoption of technologies beyond initial successful demonstrations beyond NYSERDA’s involvement through three main channels:</p> <ul style="list-style-type: none"> • Sharing information with NYPA, NYSDOT, and FTA to support the development of financing packages and project implementation support for transit agencies to deploy successfully demonstrated products on a large scale. These other organizations, not NYSERDA, would facilitate product deployment. • Helping transit agencies identify private financiers who are willing to finance large-scale implementation of successfully demonstrated products.

	<ul style="list-style-type: none"> Helping transit agencies identify third party partners willing to act as service providers who, through arrangements that generate benefits for both partners, agree to fund, own, and/or operate a large-scale implementation of successfully demonstrated products.
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13.2.5 Relationship to Utility/REV

Utility Role/ Coordination Points	<ul style="list-style-type: none"> NYSERDA’s work with MTA will include close collaborations with utilities, primarily NYPA and Con Edison. Many elements of the program, in particular wayside energy storage, electric rail efficiency, electric buses, and microgrids, will create joint value for MTA and its utility partners by generating valuable services for both the MTA and the utility. Con Edison also works closely with MTA, as MTA’s electricity use is one of the largest loads on its distribution wires. Con Edison has partnered with NYSERDA in MTA’s initial feasibility studies and demonstration projects in wayside energy storage, electric buses, and microgrids and intends to continue its involvement. To date, they have provided partial funding (to match NYSERDA funds) for select projects and have served as advisors. They do not fund product development work and they do not have a dedicated program to fund demonstrations, as NYSERDA is proposing to do. NYPA has a very limited R&D budget that it has used for transit-related projects. NYPA will be involved primarily as an advisor in product demonstration projects, particularly those involving electric transit buses. NYPA is currently co-funding a project with MTA on overcoming barriers to incorporating electric buses into its fleet but has a limited budget for these types of research projects. NYPA’s main role has been funding the deployment of energy-efficient technologies for electrified rail that have been developed by NYSERDA, and they will continue to do so. They primarily provide financing and operational support to roll out proven technologies that make MTA’s operations more energy-efficient, including rail heaters, lighting products, wayside energy storage, and other advances. NYSERDA and NYPA will continue to explore opportunities for collaboration and co-funding to develop and deploy innovative technologies and strategies in this critical NYC load pocket.
Utility Interventions in Target Market	<p>NYPA and Con Edison have worked with MTA in the past and continue to work with MTA, although their focus has typically been on deploying commercially available energy efficient products to reduce MTA’s energy use in its facilities, not on their traction power energy use. NYSERDA’s High Performing Grid program awarded funds to MTA to do a wayside energy storage project in April 2017, in partnership with Con Edison.</p>

13.2.6 Budgets

The commitment budget for all activities included in this investment plan is as follows:

Funding Commitments		----- Commitments Plan -----						
Budget	Plan Total	Previously Committed	2020	2021	2022	2023	2024	2025
Incentives and Services	-	-	-	-	-	-	-	-
Implementation	1,155,161	105,853	141,107	400,000	400,000	108,201	-	-
Research and Technology Studies	17,344,839	6,015,172	4,329,667	2,500,000	4,000,000	500,000	-	-
Tools, Training and Replication	-	-	-	-	-	-	-	-
Business Support	-	-	-	-	-	-	-	-
Total	18,500,000	6,121,025	4,470,774	2,900,000	4,400,000	608,201	-	-

An annual expenditure budget for all activities included in this investment plan is shown in Appendix B alongside expected acquired benefits. Budgets 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 Appendix B is intended for informational purposes only. While no specific breakdowns can be provided at this time because of the uncertainty around technical and commercial progress in the various activity areas, it is anticipated that most of the budget will be put toward research related to electrified rail and electric bus systems.

13.2.7 Progress and Performance Metrics

The anticipated commitment benefits totals for the initiative with respect to CEF Order target metrics is as follows:

Benefit Commitments

Direct Benefit (2016-2025)	Plan Total	Indirect Benefit (2016-2030)	Plan Total
Energy Efficiency MWh Annual	-	Energy Efficiency MWh Annual	-
Energy Efficiency MMBtu Annual	-	Energy Efficiency MMBtu Annual	-
Renewable Energy MWh Annual	-	Renewable Energy MWh Annual	-
CO2e Emission Reduction (metric tons) Lifetime	-	CO2e Emission Reduction (metric tons) Lifetime	-
Participant Bill Savings Lifetime	-		
Leveraged Funds	43,891,757		

Benefits summarized in Appendix B represent the plan for acquiring impacts through completed projects or activities.

Benefits labeled as direct, are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of the activities, estimating energy savings impacts at this stage is difficult because the specific technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

Appendix C 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.

In addition, NYSERDA will also qualitatively track progress toward the following broad outcomes:

1. Demonstration of cost-effective strategies to increase rail efficiency by 25%:
This is done by reducing the weight of rail cars, improving the traction power system, and capturing energy from regenerative braking with wayside energy storage
2. Demonstration of cost-effective strategies to improve bus efficiency by 25%:

This is done through advances including, but not limited to, more efficient drivetrains and light weighting

3. In-service demonstration and initial purchases of electric transit buses by NYS transit agencies
4. Improved bus system energy use and GHG emissions per passenger mile
5. Demonstration of novel financing and partnership models to accelerate implementation of new and improved technologies

13.2.8 Fuel Neutrality

Fuel Neutrality	<ul style="list-style-type: none"> • The proposed initiative will focus on electric energy efficiency for rail, electrification of bus service, and improved efficiency and use of traditional buses that run on diesel and natural gas. Savings for all three of these components are anticipated to be provided at approximately \$5 of NYSERDA spending per lifetime ton of carbon. • Expanding the focus to include bus GHG emission reductions allows the program to take a statewide approach, as electrified rail only has a significant footprint downstate. With regard to bus electrification, the switch to electric buses will generate substantial greenhouse gas emission reductions compared to the use of diesel buses. While electric transit buses present a strong opportunity for GHG emission reductions, they will result in greater electricity consumption. However, electric buses can provide benefits to the electric grid despite this increased usage. Ideally most electric bus charging can occur overnight, which means electric buses have the potential to level load curves and increase load factors by adding electricity demand during off-peak times. • Moreover, replacing diesel buses with electric buses and expanding transit use can substantially reduce emissions of carbon dioxide, particulate matter, black carbon, and methane, resulting in significant air quality improvement leading to health and climate benefits. Expanded, more affordable transit options can also benefit New Yorkers' access to jobs, improve public health, and contribute to economic development.
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13.2.9 Performance Monitoring and Evaluation Plans

Performance Monitoring & Evaluation Plan	<p>NYSERDA's approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> • NYSERDA will monitor standard activity/output metrics including number of projects initiated and completed by type, private investment, etc. • Additional program-specific metrics include new vendors selling to transit agencies, public-private partnerships for energy services, ease-of-ridership tools available for transit riders, potential operational cost savings • 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 for each project in the portfolio. <ul style="list-style-type: none"> ○ Examples – technical impasse, pivot point, critical milestone. • NYSERDA will assess the portfolio of projects annually with regard to goals, metrics, outputs and outcomes to determine whether projects should continue to the next phases, how much promise their research and similar research continues to show, and whether the program should continue on the same trajectory or refocus. <p><u>Market Evaluation</u></p>
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	<ul style="list-style-type: none"> • 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 outputs and outcomes listed above will follow initiative approval and will address indicators including transit ridership and financial investment levels in transit. 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. <p><u>Impact Evaluation</u></p> <ul style="list-style-type: none"> • A broad demonstration project impact evaluation 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 savings will be quantified as part of this study.
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Verified Gross Savings Specifications

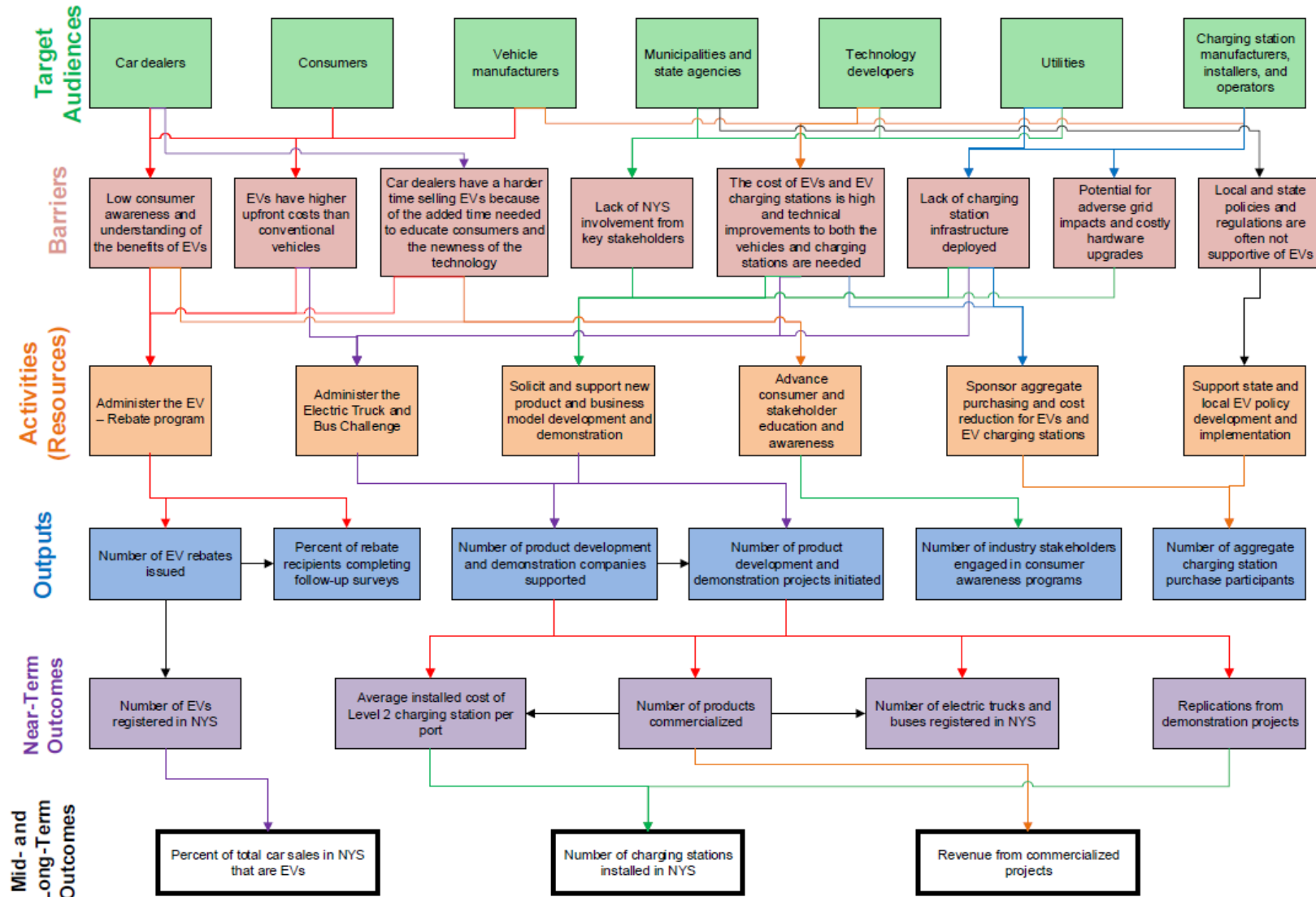
Verified Gross Savings Specification	
Date of CEF filing: See cover page	
CEF Chapter Name	Clean Transportation
Initiative Name	Electric Vehicles - Rebate
Initiative Description	NYSERDA will implement a point-of-sale Electric Vehicle (EV) rebate program for new EV buyers that will help to reduce the 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.
Gross Savings Methodology	The initiative uses three indicators to calculate gross energy savings: average MPG by class (e.g., personal vehicle) for internal combustion engine (ICE) vehicles in New York state, average vehicle miles traveled (VMT) in New York state (see US Dept. of Transportation, Indicator Data: New York ⁴), and miles per gallon equivalency (MPGe), estimated by the initiative for each rebate eligible vehicle. Gross energy savings are estimated by multiplying state average VMT by the difference between the rebated vehicle's estimated MPGe and the corresponding ICE vehicle class average MPG. Initiative-wide savings are determined by summing the

⁴ <https://www.transportation.gov/transportation-health-tool/indicators/detail/ny/state/new-york#indicators>

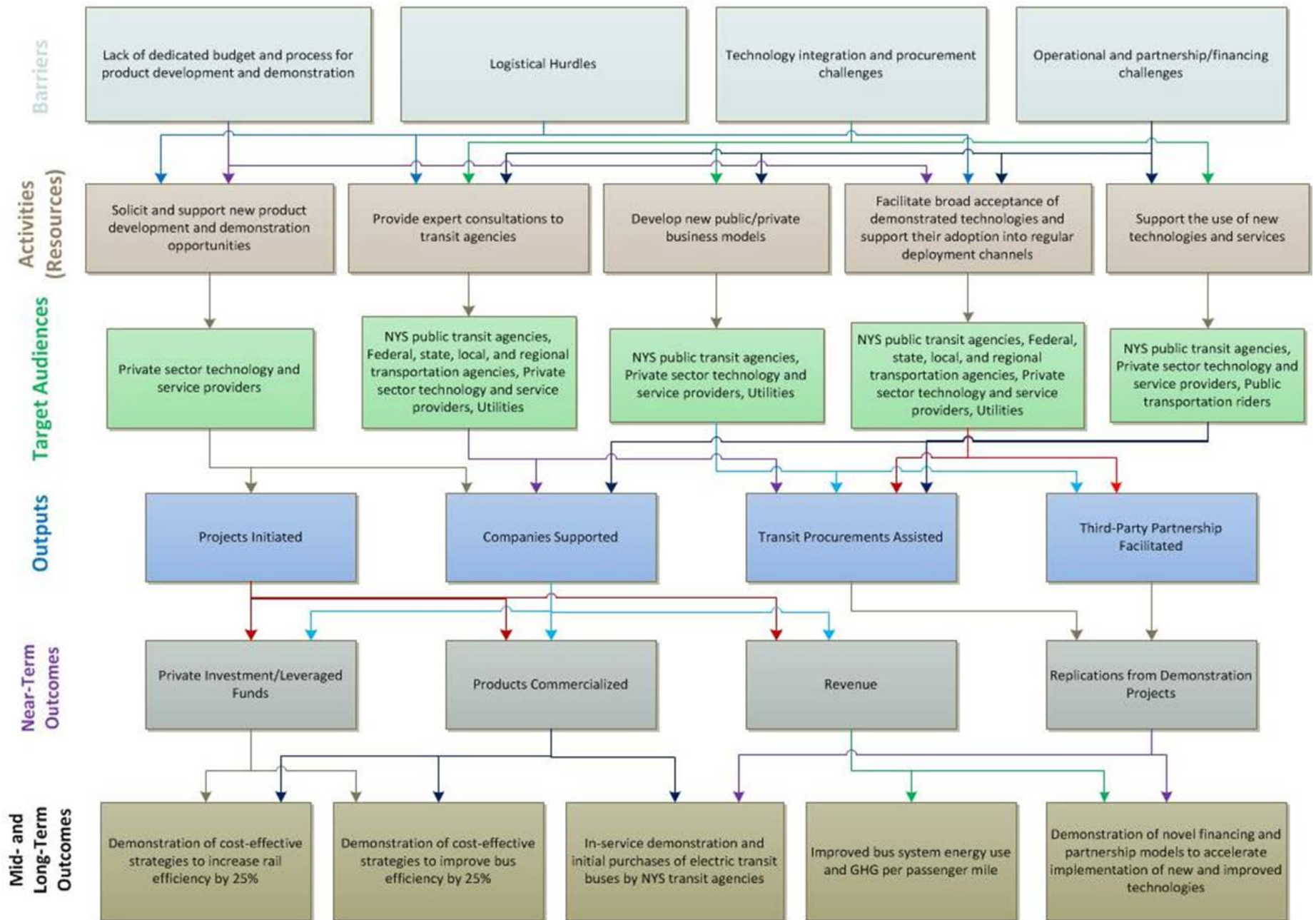
	savings for vehicles rebated through the initiative. Gross energy savings accrue from the date the rebate is issued.
Realization Rate (RR)	No realization rates have been determined for this initiative within the preceding five-year time frame.
Planned VGS Approach	<p>Gross Savings Analysis for this initiative is currently underway. An independent evaluation contractor has been competitively procured by NYSERDA to perform these analyses. The estimated completion of the Gross Savings Analysis Report is by Q3 2021. Impact evaluation activity is planned to include surveys of rebate recipients to determine the counterfactual vehicle that would have been purchased had the rebate not been available and to verify VMT for the population of program rebate recipients. Data from Drive Clean Adoption and Ownership surveys administered by the program and used in the Gross Savings Methodology will not be utilized as part of the VGS Approach.</p> <p>The ratio of the Verified Gross Savings to the Gross Energy Savings, above, will represent the VGS Realization Rate, with any discrepancies being attributable to the difference in efficiencies of replaced vehicles and counterfactual vehicles as well as assessed VMT.</p> <p>The EV – Rebate program is funded with CEF and non-CEF funds. The GSA will treat all funding equally and will produce a single final report and VGS RR for the Electric Vehicles initiative as a whole, as deviations in impacts between funding sources is not anticipated. The VGS RR will be applied to the gross savings estimated for each portfolio.</p>
Exemption from EAM Status	N/A

Appendix A – Logic Models

LOGIC MODEL: Electric Vehicles



LOGIC MODEL: Public Transportation and Electrified Rail



Appendix B | Initiative Budget and Benefits Summary

Electric Vehicles - Rebate

[CEF + RGGI]

Benefits Acquisition Plan

Direct Benefit	Plan Total
Energy Efficiency MWh Annual	-
Energy Efficiency MWh Lifetime	-
Energy Efficiency MMBtu Annual	1,838,531
Energy Efficiency MMBtu Lifetime	18,385,308
Renewable Energy MWh Annual	-
Renewable Energy MWh Lifetime	-
Renewable Energy MW	-
CO2e Emission Reduction (metric tons) Annual	82,279
CO2e Emission Reduction (metric tons) Lifetime	822,806
Participant Bill Savings Annual	37,458,969
Participant Bill Savings Lifetime	374,589,685
Leveraged Funds	857,185,000

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	265,669	438,445	522,417	540,000	72,000	-	-	-	-	-	-	-	-	-
-	2,656,691	4,384,449	5,224,168	5,400,000	720,000	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	12,420	20,134	23,374	23,191	3,159	-	-	-	-	-	-	-	-	-
-	124,211	201,352	233,746	231,908	31,588	-	-	-	-	-	-	-	-	-
-	4,866,840	8,086,467	8,985,021	13,688,800	1,831,840	-	-	-	-	-	-	-	-	-
-	48,668,404	80,864,679	89,850,203	136,888,000	18,318,400	-	-	-	-	-	-	-	-	-
-	112,455,000	191,625,000	196,105,000	315,000,000	42,000,000	-	-	-	-	-	-	-	-	-

Indirect Benefit	Plan Total
Energy Efficiency MWh Annual	-
Energy Efficiency MMBtu Annual	15,661,943
Renewable Energy MWh Annual	-
Renewable Energy MW Annual	-
CO2e Emission Reduction (metric tons) Annual	666,370
CO2e Emission Reduction (metric tons) Lifetime	6,663,698

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	590,625	738,281	922,852	1,153,564	1,441,956	1,802,444	1,802,444	1,802,444	1,802,444	1,802,444	1,802,444
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	22,629	29,074	37,296	47,774	61,113	78,081	78,080	78,080	78,080	78,080	78,081
-	-	-	-	226,289	290,741	372,961	477,739	611,132	780,807	780,805	780,805	780,805	780,805	780,807

Energy Usage	Plan Total
Direct Energy Usage MWh Annual	(81,392)
Direct Energy Usage MWh Lifetime	(813,921)
Direct Energy Usage MMBtu Annual	-
Direct Energy Usage MMBtu Lifetime	-
Indirect Energy Usage MWh Annual	(911,600)
Indirect Energy Usage MWh Lifetime	(9,116,000)
Indirect Energy Usage MMBtu Annual	-
Indirect Energy Usage MMBtu Lifetime	-

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
-	(9,776)	(16,878)	(19,738)	(31,000)	(4,000)	-	-	-	-	-	-	-	-	-
-	(97,762)	(168,783)	(197,376)	(310,000)	(40,000)	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	(39,375)	(47,644)	(57,649)	(69,755)	(84,404)	(102,129)	(102,129)	(102,129)	(102,129)	(102,129)	(102,129)
-	-	-	-	(393,750)	(476,438)	(576,490)	(697,550)	(844,040)	(1,021,286)	(1,021,290)	(1,021,290)	(1,021,290)	(1,021,290)	(1,021,286)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Participants	Plan Total
Participants	24,491
-	-
-	-
-	-
-	-
-	-
Total	24,491

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
-	3,213	5,475	5,603	9,000	1,200	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	3,213	5,475	5,603	9,000	1,200	-	-	-	-	-	-	-	-	-

Table Notes:
 * With the May 2021 IPPR filing of all investment plans, each Appendix B table that accompanies an investment plan was transitioned from yearly commitment-based budget and benefit plans to plans that forecast expenditures and acquired benefits.

- a. Assumes a 10-year measure life. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSEDA's programs. Energy Efficiency values represent gasoline savings from use of electric vehicle; electricity required to charge vehicles 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.
- b. Leveraged funds from non-CEF programs are not collected for this initiative, thus CEF-only values are shown here for both actual and planned values.
- c. Participants are those receiving a rebate.

Appendix B | Initiative Budget and Benefits Summary

Electric Vehicles - Innovation

		Benefits Acquisition Plan														
Direct Benefit	Plan Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Energy Efficiency MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MMBtu Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MMBtu Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Participant Bill Savings Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Participant Bill Savings Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leveraged Funds	49,141,886	-	-	722,288	842,437	770,723	1,500,000	5,000,000	9,000,000	9,000,000	9,000,000	9,000,000	3,000,000	1,306,438	-	-

Indirect Benefit	Plan Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Energy Efficiency MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MMBtu Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MW Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy Usage	Plan Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Direct Energy Usage MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Direct Energy Usage MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Direct Energy Usage MMBtu Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Direct Energy Usage MMBtu Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MMBtu Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MMBtu Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Participants	Plan Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Participants	59	-	-	1	9	3	16	15	10	3	2	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	59	-	-	1	9	3	16	15	10	3	2	-	-	-	-	-

		Budget Expenditures Plan														
Budget	Plan Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Incentives and Services	8,000,000	-	-	-	-	-	-	1,000,000	4,000,000	2,000,000	1,000,000	-	-	-	-	-
Implementation	1,892,648	-	120,541	171,662	336,719	233,087	350,000	350,000	300,000	30,640	-	-	-	-	-	-
Research and Technology Studies	9,675,356	-	1,000	475,158	929,401	863,136	1,200,000	2,000,000	2,000,000	1,200,000	400,000	606,661	-	-	-	-
Tools, Training and Replication	281,996	-	31,692	20,000	90,590	37,549	35,000	67,164	-	-	-	-	-	-	-	-
Business Support	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	19,850,000	-	153,233	666,820	1,356,710	1,133,772	1,585,000	3,417,164	6,300,000	3,230,640	1,400,000	606,661	-	-	-	-

Table Notes:

* With the May 2021 IPPR filing of all investment plans, each Appendix B table that accompanies an investment plan was transitioned from yearly commitment-based budget and benefit plans to plans that forecast expenditures and acquired benefits.

- a. Assumes a 10-year measure life. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.
- b. Participants are those awarded contract.

Appendix C | Initiative Outputs and Outcomes Summary

Electric Vehicles - Rebate

	Indicators	Baseline (Before/Current)	2019 (cumulative)	2022 (cumulative)
			Target	Target
Outputs	Number of rebates issued	N/A	33000	46000
	% of rebate recipients completing follow-up surveys	N/A	20%	25%
Outcomes	Number of EVs registered in NYS	16,131	52,000	150,000
	EV market share (EV sales as a percentage of total car sales in NYS)	0.6%	2%	5%

Table notes

- 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.
- b. Updated baseline metrics reflect the final Clean Transportation Market Characterization study located here: <https://www.nyscrda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2017ContractorReports/Clean-Transportation-Market-Characterization-Study-Vol2.pdf>. Additional volumes of this study, including the Executive Summary, Electric Vehicles and Transportation Demand Management Market Characterization and Baseline Assessments and report appendices can be found under the Clean Transportation Market Characterization Study heading here: <https://www.nyscrda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/Evaluation-Contractor-Reports/2017-Reports>.

Appendix C | Initiative Outputs and Outcomes Summary

Electric Vehicles - Innovation

	Indicators	Baseline (Before/Current)	2019 (cumulative)	2022 (cumulative)	2025 (cumulative)
			Target	Target	Target
Outputs	Number of product development and demonstration projects initiated	0	28	50	50
	Number of product development and demonstration companies supported	0	18	30	30
	Number of industry stakeholders engaged in consumer awareness programs	0	20	50	50
	Number of aggregate charging station purchase participants	0	150	400	400
Outcomes	Number of charging stations installed in NYS	1,639	3,000	10,000	24,000
	Avg. installed cost of Level 2 charging station per port	\$8,774	\$7,500	\$6,500	\$6,000
	Products commercialized	0	2	4	4
	Revenue (\$millions)	0	\$1	\$5	\$8
	Replications from demonstration projects	0	2	6	12
	Number of electric trucks and buses registered in NYS	100	N/A	150	1,000

Table notes

a. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

b. Updated baseline metrics reflect the final Clean Transportation Market Characterization study located here: <https://www.nysersda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2017ContractorReports/Clean-Transportation-Market-Characterization-Study-Vol2.pdf>. Additional volumes of this study, including the Executive Summary, Electric Vehicles and Transportation Demand Management Market Characterization and Baseline Assessments and report appendices can be found under the Clean Transportation Market Characterization Study heading here: <https://www.nysersda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/Evaluation-Contractor-Reports/2017-Reports>.

Appendix C | Initiative Outputs and Outcomes Summary

Public Transportation and Electrified Rail

	Indicators	Baseline (Before/Current)	2019 (cumulative)	2022 (cumulative)
			Target	Target
Outputs	Number of projects initiated	0	18	47
	Number of companies supported	0	14	28
	Number of transit procurements assisted	0	2	5
	Number of third-party partnerships facilitated	0	2	5
Outcomes	Private Investment/ Leveraged Funds (\$ millions)	\$0	\$16	\$42
	Products Commercialized	0	1	4
	Revenue (\$ millions)	\$0	\$0.5	\$5
	Replications from demonstration projects	0	2	10

Table notes

a. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.