



**NYSERDA**

# **New York State's Regional Greenhouse Gas Initiative Investment Plan**

**2017 Operating Plan**

**Final Report**

December 2017

## **NYSERDA's Promise to New Yorkers:**

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Advance innovative energy solutions in ways that improve New York's economy and environment.

### **Vision Statement:**

Serve as a catalyst – advancing energy innovation, technology, and investment; transforming New York's economy; and empowering people to choose clean and efficient energy as part of their everyday lives.

# **New York State's Regional Greenhouse Gas Initiative Investment Plan**

*2017 Operating Plan*

**New York State Energy Research and Development Authority**

Albany, NY

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# Acronyms and Abbreviations

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BNL	Brookhaven National Laboratory
BPI	Building Performance Institute
CBETA	Cornell-Brookhaven Energy Recovery Line Test Accelerator
CEBD	Clean Energy Business Development
CEF	Clean Energy Fund
CGC	Cleaner Greener Communities
CH <sub>4</sub>	methane
CIGS	copper indium gallium selenide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalent
CU	Cornell University
DC	direct current
DEC	New York State Department of Environmental Conservation
DOE	U.S. Department of Energy
EEPS	Energy Efficiency Portfolio Standard
EIC	electron-ion collider
EPA	U.S. Environmental Protection Agency
eRHIC	Electron Relativistic Heavy Ion Collider
ERL	Energy Recovery Line
ERP	Energy Reduction Plan
FY	fiscal year
GHG	greenhouse gas
GJ-GNY	Green Jobs-Green New York
GW	gigawatts
HPwES	Home Performance with ENERGY STAR®
IPCC	Intergovernmental Panel on Climate Change
kWh	kilowatt-hours
LIPA	Long Island Power Authority
LMI	low- to moderate-income
MCA	market characterization and assessment
MeV	mega-electron volt
MMBTU	million British thermal units
MPP	Multifamily Performance Program
MW	megawatts
MWh	megawatt hour
N <sub>2</sub> O	nitrous oxide
NYCRR	New York Codes, Rules, and Regulations

NYGATS	New York State Generation Attributes Tracking System
NYPA	New York Power Authority
NYS	New York State
NYSERDA	New York State Energy Research and Development Authority
PEV	plug-in electric vehicle
PM	performance management
PSC	New York State Public Service Commission
PSEG-LI	Public Service Enterprise Group – Long Island
PV	photovoltaic
PVMC	Photovoltaic Manufacturing Consortium
R&D	research and development
RE	renewable energy
REC	renewable energy certificate
REDC	Regional Economic Development Council
REDGHG	Regional Economic Development and Greenhouse Gas Reduction Policy
REV	Reforming the Energy Vision
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable Portfolio Standard
SBC	System Benefits Charge
SIT	State Inventory Tool
SUNY	State University of New York
W	watts
WAP	Weatherization Assistance Program

## Summary of Benefits

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The Regional Greenhouse Gas Initiative (RGGI) portfolio of programs will reduce and avoid greenhouse gas and other air pollutant emissions, demonstrate New York State's commitment to its environmental goals, and support the movement toward a national, multisector greenhouse gas reduction program. Specifically, program investments listed in this update of the operating plan are anticipated to result in significant CO<sub>2</sub>e emission reductions, energy savings, and bill savings as presented in Table 1.

**Table 1. Cumulative RGGI Benefits by Program**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Electricity Benefits or Renewable Energy Generation		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
<b>Green Jobs - Green New York</b>														
One- to Four-Family Residential Buildings Program Financing	\$49.1	\$6.6	308,764	7,101,564	180	8	27,300	518,692	2,040	107	38,374	819,266	1,451	68
<b>Energy Efficiency</b>														
LIPA Energy Efficiency and Renewable Energy Initiative	\$73.9	-	-	-	-	-	180,280	3,245,041	410	23	104,562	1,882,124	706	39
Multifamily Performance Program	\$5.7	\$0.7	208,376	3,230,730	31	2	3,732	48,513	1,705	131	17,712	271,176	359	23
Empower New York	\$5.8	\$0.3	35,930	862,319	169	7	-	-	-	-	2,659	63,819	2,283	95
Home Performance with ENERGY STAR <sup>®</sup>	\$5.3	\$0.5	85,437	2,050,481	68	3	495	8,909	11,695	650	7,159	170,088	809	34
Solar Hot Water (Thermal) Program	\$0.8	\$0.02	2,809	56,186	299	15	5	103	162,531	8,127	209	4,187	4,011	201
<b>Renewable Energy</b>														
Renewable Heat New York	\$7.2	\$0.73	4,755	95,097	1,677	84	165	3,291	-	-	413	8,263	19,301	965
NY-Sun Long Island	\$28.9	\$0.05	-	-	-	-	173,840	4,346,000	167	7	100,827	2,520,680	287	11
NY-Sun NYPA	\$19.9	\$0.03	-	-	-	-	69,606	1,740,150	286	11	40,371	1,009,287	493	20
<b>Innovative GHG Abatement Strategies</b>														
Charge NY	\$11.0	\$6.0	428,895	4,288,950	40	4	-	-	-	-	15,507	155,066	1,096	110
<b>Clean Energy Fund</b>														
Clean Energy Fund <sup>h</sup>	\$26.9	\$23.2	662,920	10,517,960	75	5	90,555	1,507,463	552	33	90,783	1,481,389	551	34
<b>TOTAL Annualized Cumulative Benefits<sup>i</sup></b>	<b>\$234.4</b>	<b>\$38.1</b>	<b>1,737,885</b>	<b>28,203,287</b>	<b>157</b>	<b>10</b>	<b>545,977</b>	<b>11,418,163</b>	<b>499</b>	<b>24</b>	<b>418,577</b>	<b>8,385,345</b>	<b>651</b>	<b>32</b>

Table notes are on the next page

- a These emission reductions are associated with both electric and fossil-fuel saving measures. Under a cap-and-trade system, the total number of emission allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, in the near term, electric efficiency projects may not decrease the overall amount of emissions going into the atmosphere. However, electric efficiency projects will reduce end-users' responsibility or footprint associated with emissions from electricity production.
- b Inclusive of incentive dollars for expenditures.
- c Inclusive of all non-incentive expenditures.
- d Savings from all operational projects installed.
- e Lifetime savings from all operational projects installed.
- f  $\frac{\text{Total Incentives} + \text{Total Associated Costs}}{\text{Total Annual Installed Benefits}}$
- g  $\frac{\text{Total Incentives} + \text{Total Associated Costs}}{\text{Lifetime Installed Total Benefits}}$
- h The CEF is a progressively built, 10-year investment portfolio, which is early in its implementation. The cost estimates used in this RGGI Operating Plan are based on the current proportion of incentive and associated costs of the CEF portfolio as of June 30, 2017, which is the 1.5-year point. As such, the proportion of incentive costs is expected to increase over time while the proportion of front-loaded, set-up costs decreases.
- i Totals may not sum exactly due to rounding.

The Summary of Benefits provides a quantitative estimate of the benefits associated with deployment programs. Green Jobs - Green New York, EmPower, Home Performance with ENERGY STAR®, Multifamily Performance Program, Long Island Power Authority (LIPA) Efficiency and Renewable Energy, Solar Thermal, Renewable Heat, Charge NY, Clean Energy Fund (CEF), and NY-Sun are the deployment program areas that are expected to realize savings during the current Plan timeframe.

Additionally, with the initiation of new program activities New York State Energy Research Development Authority (NYSERDA) is continually in the process of counting new benefits from new programs, and examining other metrics for measuring and assessing the benefits of the investment from RGGI proceeds. For example, the NY Green Bank is expected to deliver significant benefits, one of which is the leverage of private capital to augment the impact of public investments. The NY Green Bank is expected to realize a leverage ratio of 3:1, that is, for every \$1 of public funds invested, the Green Bank will bring in an additional \$3 of private investment.

Estimated benefits related to the community clean energy, campus challenge, workforce training, NY Green Bank, or other research and development (R&D) initiatives are not included in benefit calculations due to the uncertainty of project activities and associated savings at this time. Nevertheless, some benefits can be anticipated from these program areas, including long- and short-term job creation, economic development benefits, efficiency improvements, increased use of renewable energy, pollution prevention, abatement of fuel use, annual electric savings, and associated air emissions reductions. To the extent they are available, these benefits are described in greater detail in the program description sections of this report, or will be presented in future versions of the operating plan.

For the purpose of this report, cumulative lifetime benefits have been calculated for total program investments made through March 31, 2017 together with total program investments planned through March 31, 2018. The difference between these two shows the total anticipated lifetime benefits associated with the investments covered under this plan.

Benefit achievements are updated on a quarterly basis and can be found in New York State's RGGI-Funded Programs Status Report which are available on NYSERDA's website at: [nyserda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/RGGI-Reports](http://nyserda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/RGGI-Reports).

# 1 Introduction

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## 1.1 Background

Through the Regional Greenhouse Gas Initiative (RGGI), New York State and its partner states have pioneered the nation's first market-based, cap-and-invest program to help control the carbon dioxide (CO<sub>2</sub>) emissions that are contributing to global climate change. Just as the RGGI program serves as a model for a national greenhouse gas (GHG) emissions reduction strategy, New York State is also creating a national model through its RGGI Operating Plan, demonstrating how strategic investments across disciplines and across the economy can support comprehensive strategies that best advance the CO<sub>2</sub> emission reduction goals of the State.

New York State maintains a robust portfolio of clean energy programs, and proceeds from the sale of RGGI CO<sub>2</sub> allowances are used to supplement existing policies and programs. The plan is structured to result in immediate emission reductions, while building capacity for long-term carbon emissions mitigation action. In accordance with State regulations, this plan implements activities to reduce carbon emissions and pollution through energy efficiency, renewable energy, and support for innovative carbon abatement strategies.

Deep and persistent emission reductions will require changes in the energy consumption patterns of businesses and individuals, as well as systemic changes in all energy using sectors of the economy, including buildings and industrial processes, transportation, and power generation. Systemic changes will result from expanding partnerships with industries, education and outreach campaigns to generate clean energy demand from consumers, and continuation of sound government policy to achieve clean energy and emission reduction goals.

To realize both immediate GHG emission reductions, as well as create the needed platforms for long-term, self-sustaining changes in energy consumption patterns, the RGGI portfolio of programs will instigate the following:

- Provide substantial benefits to consumers and the environment, resulting in GHG emission reductions from both electricity and other energy sources. By deploying a range of energy efficiency and renewable energy technologies, New York State can realize GHG emissions reductions in the near-term and provide valuable information to consumers and supply-chain participants for self-sustaining markets in these activities.

- Empower communities to make decisions about energy usage that will lead to lower GHG emissions as well as economic and societal co-benefits. By supporting sustainability planning and implementation of those plans, communities and individuals can guide decision-making that improves localities and simultaneously reduce statewide GHG emissions.
- Employ innovative approaches to increase the adoption of clean energy alternatives in New York State. By using new financing strategies or program approaches targeting specific uses, the portfolio creates an opportunity to increase penetration of existing programs and expands the reach of clean energy programs to communities that may not traditionally take advantage of these options.
- Stimulate new technology development and create a strong clean energy business environment. By supporting entrepreneurial growth, RGGI can advance new economic development strategies for New York State that help to expand the economy and support innovative State products and services that can be exported across the country or around the world.
- Build capacity for long-term GHG reduction. By training workers and partnering with industry, the RGGI program portfolio enables transformative activities through implementation of carbon-reducing projects.

Historically, the investment of RGGI auction proceeds has been designed to complement existing programs, including the System Benefits Charge (SBC), Renewable Portfolio Standard (RPS), Weatherization Assistance Program, Energy Efficiency Portfolio Standard (EEPS), and various transportation programs funded by the federal Congestion Mitigation and Air Quality Improvement Program. The plan under discussion also reflects the transition of several RGGI-funded programs to the Clean Energy Fund (CEF), the successor to SBC, customer-sited RPS and EEPS. The use of RGGI funds complements activities articulated by CEF investment plans. RGGI-funded programs create synergies with existing efficiency and clean energy programs, and furthermore, advance the stated RGGI policies and intended outcomes. The statewide goals of reduced GHG emissions, reduced energy use, accelerated growth in the State's clean energy economy, increased energy efficiency, increased fuel diversity (measured by the overall proportion of renewable electricity generation), reduced criteria pollution and low-income home weatherization are therefore enhanced by these complementary resources. As such, the plan is not designed as a standalone portfolio of program activities, nor are RGGI proceeds relied upon as a sole source to achieve the State's contribution towards national or global carbon mitigation goals. Rather, the plan should be considered in context of the other policies and programs that help reduce greenhouse gas emissions, and has been designed

to strengthen and enhance the comprehensive statewide energy policy to best leverage the State’s collective resources to achieve the identified energy goals.<sup>1</sup> In short, RGGI will continue to complement NYSERDA’s future program activities aimed at reducing greenhouse gas emissions in New York State.

Building from the September 2015 version of the RGGI Operating Plan, this plan incorporates feedback and direction received during a public stakeholder meeting in December 2016,<sup>2</sup> and subsequent written comments from stakeholders. The plan was approved by NYSERDA's board in January 2017. Overall, the plan covers near-term program investments comprised of the following RGGI funds:

- Anticipated proceeds from auctions to be held during fiscal year 2016–17 and 2017–18
- Remaining program funds from prior auction proceeds.

The scope and approach for allocating the anticipated proceeds was approved by NYSERDA’s Board of Directors in January 2017. The use of previously-obtained proceeds that comprise remaining program funds was approved by the board at earlier meetings.

## 1.2 Regulatory Context

RGGI is a nine-state cooperative effort to reduce GHG emissions from electric power plants by means of a cap-and-trade system.<sup>3</sup> Under RGGI, the participating states initially designed cap-and-trade programs that cap CO<sub>2</sub> emissions from power plants through 2015 and then lower the cap by 10% by 2018. In January 2012, the RGGI states began a 2012 Program Review as called for in the Model Rule.<sup>4</sup> The program review included a comprehensive evaluation of program success, program impacts, additional reductions, imports and emissions leakage, and offsets. The regional RGGI Program Review was completed in early 2013 and on February 7, 2013, the participating RGGI states announced proposed program changes, including a more stringent CO<sub>2</sub> emission cap, and released an updated Model Rule. At the conclusion of the 2012 Program Review, the participating states agreed to a conduct another program review no later than 2016.<sup>5</sup>

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<sup>1</sup> See “The Energy to Lead: 2015 New York State Energy Plan” available at <http://energyplan.ny.gov>.

<sup>2</sup> The participating stakeholders represent a broad array of energy and environmental interests to advise NYSERDA on how to efficiently make use of proceeds from the sale of allowances consistent with the directives in the regulations.

<sup>3</sup> The RGGI-participating states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

<sup>4</sup> The RGGI Model Rule is a set of proposed regulations that form the basis for each RGGI State’s CO<sub>2</sub> Budget Trading Program.

<sup>5</sup> <https://www.rggi.org/design/2016-program-review>

Each state is implementing this initiative through individual CO<sub>2</sub> Budget Trading Programs that are linked through the regional cap-and-trade program. Additional background on the initiative can be found at <http://www.rggi.org>.

In New York State, the RGGI Program has been implemented through two complementary programs: The New York State Department of Environmental Conservation (DEC) has established New York State's CO<sub>2</sub> Budget Trading Program (6 NYCRR Part 242, 6 NYCRR Part 200, General Provisions) and NYSERDA has established the CO<sub>2</sub> Allowance Auction Program (21 NYCRR Part 507).

The CO<sub>2</sub> Allowance Auction Program has established the rules through which New York State will sell most of its CO<sub>2</sub> allowances. The CO<sub>2</sub> Allowance Auction Program [at 21 NYCRR Part 507.4(d)] also creates the parameters for use of the proceeds from the sale of allowances that will be used to “promote and implement programs for energy efficiency, renewable or non-carbon emitting technologies, and innovative carbon emissions abatement technologies with significant carbon reduction potential.” The plan is designed to be consistent with these regulatory requirements.

### **1.3 Program Goals**

New York State invests RGGI proceeds to support comprehensive strategies that best achieve the RGGI CO<sub>2</sub> emission reduction goals, which reduce global climate change and pollution through energy efficiency, renewable energy, and carbon abatement technology. Investments will be focused on a complementary mix of electricity-related GHG reduction opportunities and technologies, as well as strategies for reductions related to the use of petroleum and natural gas.

Deploying commercially-available renewable energy and energy efficiency technologies helps to reduce GHG emissions in the short term. To move the State toward a more sustainable future, RGGI-funded programs work to empower communities to make decisions about energy usage that lead to lower carbon emissions as well as economic and societal co-benefits. RGGI-funded programs also help to build capacity for long-term GHG reduction by training workers and partnering with the clean energy industry.

Using innovative financing, RGGI supports the pursuit of cleaner, more efficient energy systems and encourages investment to stimulate entrepreneurial growth of clean energy companies. These activities use funds in ways that accelerate the uptake of low-emitting technologies.

Funds will also be used to induce additional GHG reductions by establishing the commitments and capacity to curtail GHGs by municipal, institutional, and other public and private sector participants.

## **1.4 Program Focus and Geographic Scope**

RGGI funds have historically been used to support programs ineligible for funding from other sources. For instance, RGGI program funding has been used to complement current investments in the New York Energy \$mart<sup>SM</sup> program, which was part of New York State's SBC programs, the RPS, and the EEPS and other agency programs that supported the same goals. Similarly, today RGGI-funded activities complement and enhance CEF initiatives.<sup>6</sup>

Geographic equity of expenditures and benefits will be pursued across the portfolio of programs; however, not on a program-by-program basis. Certain programs may have a limited geographic focus; most will be statewide in scope. Outreach activities may be tailored to different regions. Program monitoring and evaluation may lead to adjustments in offerings, such as changes in incentive levels.

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<sup>6</sup> NYSERDA's CEF supplement is available at:  
<http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={FC3FBD53-FBAC-41FB-A40E-3DA0A5E0866A}>

## 1.5 Portfolio Development Criteria

The following criteria were considered in developing the portfolio of programs included in the plan:

- Cost-effectiveness measured by tons of carbon dioxide equivalence reduced per dollar invested.
- Long-range potential for the technology or investment to reduce GHG emissions in New York State.
- Potential to reduce the costs of achieving the RGGI emissions cap.
- Other benefits for New York State such as job creation, leveraging of capital investment to promote economic development, providing health and environmental co-benefits, and enhancing municipal capacity to further reduce GHG emissions.
- Opportunities to reduce the disproportionate cost burden and environmental impacts on low-income families and environmental justice communities.
- Need for funds based upon availability from other funding sources.

These criteria served as guidance for the development of the overall portfolio of programs. They are not weighted; rather, the intention is to qualitatively achieve a strong balance of programs. Furthermore, the minimum or “critical mass” funding level needed to run an effective program is also an important consideration. The diverse portfolio of initiatives presented in the plan will balance the achievement of near-term results with the investment in long-term strategies that will provide sustained, ongoing reductions of GHGs.

Consistent with Part 242-10.3(d)(3), projects that receive funds under a program covered in the plan are not eligible to pursue CO<sup>2</sup> Emissions Offset credits under the CO<sup>2</sup> Budget Trading Program, with the exception of agricultural methane projects. All entities, including compliance entities, may pursue projects under any of the proposed programs in the plan.

## 2 Overview of Program Funding

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This section provides an overview of program funding. Funds available for investment or commitment during the near-term planning period described in this plan are comprised of two components:

- Estimated future proceeds from fiscal year 2016–17 and 2017–18
- Remaining program funds

### 2.1 Assumptions about Auction Proceeds for Operating Plan

Estimated auction proceeds for fiscal years 2016–17 and 2017–18 are collectively anticipated to be \$245.6 million.

The average 2016 allowance price was \$3.91 per allowance, and for planning purposes it was assumed that the average 2017 allowance price would be \$7.00. The planning horizon for this operating plan is two fiscal years because it is difficult to reliably estimate proceed levels farther into the future due to market volatility, the uncertain impact of potential market speculation related to federal CO<sup>2</sup> regulations, and because the anticipated future leveraging of RGGI proceeds with proposed CEF activities is still under development, and changing market dynamics.

### 2.2 Summary of Proceeds Investment by Program

Table 2 provides a summary of proceeds investment by program and shows how the approximately \$1,180.8 million of program funds made available through RGGI auctions have been, or will be, allocated among programs and other costs through fiscal year 2017–18.

First, the table shows cumulative allocations through March 2016. Next, the table reflects the planned and actual allocations for fiscal years 2016–17 and 2017–18. Finally, the table summarizes the allocation of all current and planned proceeds through March 31, 2018.

Since the December 2016 version of the Operating Plan Amendment, funding allocations for fiscal years 2016–17 and 2017–18 have been refined based upon the actual level of auction allowance proceeds that were received through June 2017. Funding allocations may be further refined based upon actual level of auction allowance proceeds through March 2018, consistent with expectations outlined in the amendment.

**Table 2. RGGI Revenue and Funding Allocation Plan**

	Program	Cumulative Allocations through March 31, 2016	FY 16-17 Plan	FY16-17 Actual	FY 17-18 Plan	Cumulative Allocations through March 31, 2018
Proceeds	Number of allowances	306,280,950	22,604,117	22,604,117	21,909,983	
	Allowance price	\$3.02	\$4.52	\$3.91	\$7.00	
	RGGI Auction Proceeds	925,846,573	102,116,950	88,416,562	153,369,881	
	Interest Earnings	9,335,299	2,672,236	3,612,188	254,610	
	<b>Total Revenues</b>	<b>935,181,872</b>	<b>104,789,186</b>	<b>92,028,750</b>	<b>153,624,491</b>	
Renewable Energy	NY SUN NYPA Customer Incentives	20,000,000	-	-	-	20,000,000
	NY SUN Community Solar/K-solar	9,500,000	-	-	-	9,500,000
	NY SUN Long Island incentives	54,259,999	5,240,000	5,240,000	500,001	60,000,000
	Renewable Heat NY	10,800,083	(500,000)	(500,000)	-	10,300,083
	Advanced Renewable Energy	2,893,674	(37,600)	(37,600)	-	2,856,074
	NYS Generation Attributes Tracking System	1,509,357	-	(719,424)	-	789,933
	NYSERDA PV incentives	5,319,821	-	-	-	5,319,821
Energy Efficiency	Clean Energy Workforce Opportunity Program	-	15,000,000	15,000,000	-	15,000,000
	LIPA Efficiency and RE	88,450,000	34,600,000	34,600,000	30,600,000	153,650,000
	EmPower NY	25,925,726	1,204,422	1,404,422	-	27,330,148
	Home Performance with Energy Star	21,790,154	3,005,603	3,355,603	-	25,145,757
	Multifamily Performance Program	21,195,362	(2,830,257)	(2,830,257)	-	16,580,686
	Multifamily Carbon Emissions Reduction	6,330,988	(497,967)	(497,967)	-	5,833,021
	Solar Thermal incentive	4,634,197	(291,520)	(291,520)	-	4,342,677
	Municipal Water/Wastewater	1,245,242	-	-	-	1,245,242
	Green Residential Buildings	2,749,726	-	(5,125)	-	2,744,601
	Brookhaven National Lab-X-ray Beam for Energy Storage	-	-	-	-	15,000,000
Innovative GHG Abatement Strategies	Electric Vehicle/Charge NY	7,000,000	3,000,000	3,000,000	7,000,000	17,000,000
	Southern Tier Competition (76West)	6,187,500	250,000	250,000	4,250,000	6,437,500
	Brookhaven National Lab- ION Collider	-	25,000,000	25,000,000	-	25,000,000
	Advanced Buildings	4,638,574	(3,066,326)	(3,066,326)	-	1,572,248
	Industrial Innovations	13,043,987	-	-	-	13,043,987
	Climate Research & Analysis	11,623,787	(3,032,630)	(3,032,630)	-	8,591,157
	Competitive GHG Reduction Pilot	14,500,000	(13,486,467)	(13,486,467)	-	1,013,533
	Clean Energy Business Development	12,323,353	(4,065,429)	(4,065,429)	-	8,257,924
	Transportation Research	5,375,000	(87,650)	(87,650)	-	3,932,086
	PV Manufacturing consortium	8,500,000	-	-	-	8,500,000
	Carbon Sequestration	1,000,000	-	-	-	1,000,000

**Table 2 continued**

	<b>Program</b>	<b>Cumulative Allocations through March 31, 2016</b>	<b>FY 16-17 Plan</b>	<b>FY16-17 Actual</b>	<b>FY 17-18 Plan</b>	<b>Cumulative Allocations through March 31, 2018</b>
<b>Community Clean Energy</b>	Cleaner Greener Communities	106,067,115	(2,900,000)	(6,940,000)	-	99,127,115
	Clean Energy Communities			4,500,000		2,800,000
	Climate Smart Communities	7,346,999	328,000	328,000	328,000	7,674,999
	Community Energy Engagement	-		1,400,000		1,400,000
	Economic Development Growth Extension	8,455,517	(1,212,470)	(2,612,470)	360,000	5,843,047
	Energy to Lead	3,000,000	-		-	3,000,000
	NY Prize Phase 3 (Placeholder - Long Island Projects)					-
	Regional Economic Development & GHG Reduction	10,293,230	-		-	10,293,230
<b>CEF</b>	Transfer to Clean Energy Fund	6,250,000	25,000,000	25,000,000	25,000,000	56,250,000
	Transfer to NY Green Bank	52,926,434	-		-	52,926,434
<b>Directed</b>	Transfer to State - Env. Tax Credits	41,000,000	23,000,000	23,000,000	23,000,000	87,000,000
	Electric Generation Facility Cessation Mitigation Program	-	30,000,000	30,000,000	-	30,000,000
	Transfer to Green Jobs-Green NY- Original Legislation	112,000,000	-		-	112,000,000
	Transfer to Green Jobs-Green NY- Additional Funding	35,935,300	41,689,975	41,689,975	27,000,000	91,625,275
	Transfer to Clean Energy Standard	-		719,424		719,424
	NYS Budget Transfer	90,000,000	-		-	90,000,000
	NYS Temporary Budget Transfer	-	-		-	-
<b>Administration and Other Non-Program</b>	Program Administration	23,032,840	3,600,000	3,600,000	-	30,882,840
	Program Evaluation	13,909,052	(2,153,623)	(2,153,623)		11,755,429
	Commensurate Benefit/Litigation reserve	20,962,310	1,907,867	938,056	-	21,900,366
	RGGI Inc Start-up Costs	1,598,204	-		-	1,598,204
	RGGI Inc pro-rata costs	5,613,781	760,999	760,999	1,021,005	7,374,780
	State Cost Recovery	13,813,669	(5,088,186)	(4,209,393)	982,236	9,604,276
	<b>Total Funding Allocations</b>	<b>913,000,981</b>	<b>174,336,741</b>	<b>175,250,599</b>	<b>120,041,242</b>	<b>1,203,761,898</b>
	Surplus/(Shortfall) of Revenues over Funding Allocations	22,180,891	(69,547,555)	(83,221,849)	33,583,249	(86,126,914)
	<b>Cumulative Surplus (Shortfall)</b>	<b>22,180,891</b>	<b>(47,366,664)</b>	<b>(61,040,958)</b>	<b>(13,783,415)</b>	<b>(86,126,914)</b>

### 2.2.1 Program Funding Expansion Plan and Additional Funds

The RGGI Operating Plan Amendment addresses the potential for auction revenues to exceed the estimates being used to develop the operating plan for each year. Allowance auction proceeds may exceed the revenue estimates presented in this multi-year operating plan. Absent unforeseen circumstances, if additional revenue should become available, proceeds could be used to reduce the fiscal year 2017–18 deficit or expand funding for the existing portfolio of RGGI programs to the extent consistent with Part

242, the CO<sup>2</sup> Budget Trading Program regulation. Changes in actual program funding as a result of fluctuating auction revenues are accounted for in the RGGI Quarterly Program Status Reports, available on NYSERDA's website: [nyserdera.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/RGGI-Reports](http://nyserdera.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/RGGI-Reports)

The ensuing sections of this report provide the following information for each program that is anticipated to have near-term program investments:

- Program Description
- Benefits resulting from near-term program investments (measures of program benefits)

## **2.2.2 Other Fees and Expenses**

Additional information about other fees and expenses that are netted out from total auction proceeds are also shown and described in the table.

## **2.2.3 Repayment of SBC Funds**

The Public Service Commission issued an Order in Case 05-M-0090, dated August 27, 2007 authorizing up to \$3 million of interest earnings from unexpended SBC funds to be used to finance certain start-up costs of RGGI, Inc., subject to reimbursement of the SBC account. In October 2009, reimbursement of approximately \$1.6 million was made to the SBC account, which represented the amount of funds used to finance these start-up costs plus interest.

## **2.2.4 Ongoing New York Share of RGGI, Inc. Costs**

RGGI, Inc. is a non-profit corporation created to support development and implementation of CO<sub>2</sub> Budget Trading Programs in New York State and other participating states. NYSERDA has entered into an agreement for RGGI, Inc. to provide technical and support services for key elements of New York State's CO<sub>2</sub> Budget Trading program, that include the following:

- Developing and maintaining a system to report data from emissions sources subject to RGGI and to track allowances.
- Implementing a platform to auction CO<sub>2</sub> allowances.
- Monitoring the market related to the auction and trading of CO<sub>2</sub> allowances.
- Providing technical assistance to the participating states in reviewing applications for emissions offset projects.
- Creating and implementing a market monitoring program.

- Providing technical assistance to the participating states to evaluate proposed changes to the states' RGGI programs.

New York State's share of RGGI, Inc. costs was estimated to be approximately \$1,000,000 per year during the planning period. This estimate is approximately consistent with the budget approved by the RGGI, Inc. Board of Directors in their 2017 and 2018 RGGI, Inc. budgets.

### **2.2.5 State Cost Recovery Fee**

NYSERDA is assessed an annual State Cost Recovery Fee pursuant to Section 2975 of the Public Authorities Law to help support general governmental services provided to NYSERDA. The fee is assessed on all NYSERDA revenues, and NYSERDA allocates this obligation proportionately among all NYSERDA programs and funding sources. The RGGI budget includes an estimate based on the current annual assessment of the fee expected to be allocated to the RGGI funded programs.

### **2.2.6 Other Budget Components**

On December 4, 2009, New York State enacted deficit reduction measures that included the transfer of \$90 million in RGGI auction proceeds to the general fund. These actions were taken to improve New York State's long-term fiscal health.

In addition, on January 29, 2009, a lawsuit was initiated in the State Supreme Court against the Governor, NYSERDA, and other State entities, claiming that the RGGI regulations are unlawful and discriminatory. The original parties to the lawsuit as well as others that were joined as parties, including Consolidated Edison (Con Edison), entered into a settlement agreement resolving the litigation that was approved on October 1, 2010 by the court. Under the terms of the settlement, NYSERDA will use proceeds from RGGI auctions to meet its obligations to pay Con Edison in accordance with a formula set forth in the settlement agreement. Con Edison, in turn, will use the monies provided by NYSERDA to fund energy efficiency and renewable energy programs with significant carbon reduction potential within its service territory. The settlement period ended on December 31, 2016, with NYSERDA having paid Con Edison approximately \$21.9 million under this settlement.

### **2.2.7 Program Evaluation and Administration**

Program evaluation and administration costs have been budgeted for fiscal years 2016–17 and 2017–18 at \$3.6 million, combined. These figures are consistent with the rates necessary to evaluate and administer the energy efficiency and technology and market development programs funded through RGGI.

## **3 RGGI Programs and Benefits**

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### **3.1 NY-Sun**

#### **3.1.1 Program Description**

The NY-Sun initiative, a dynamic public-private partnership, will drive growth in the solar industry and make solar technology more affordable for all New Yorkers. The program provides incentives for the installation of solar systems, promotes solar technology advancements, and works to reduce balance-of-system costs for solar electric (also known as photovoltaic or PV) installations. The NY-Sun initiative brings together and expands programs administered by NYSERDA, LIPA, and New York Power Authority (NYPA) to ensure a coordinated, well-funded statewide solar energy expansion plan. RGGI funds will be used to support multiple components of the NY-Sun program including NYPA and LIPA customer incentives, and the NYSERDA-administered Community Solar program described below. NYSERDA, LIPA, PSEG-Long Island (PSEG-LI), and NYPA are collaborating to add more than 3 gigawatts (GW) of installed solar capacity in the State by 2023.

##### ***3.1.1.1 Community Solar NY and K-Solar***

Community Solar NY supports community projects across New York State that leverage aggregation, group purchasing, and other strategies to make solar more accessible and affordable. The program supports projects organized by school districts, municipalities, nonprofit organizations, and other community institutions. In coordination with NYPA, K-Solar offers targeted resources to help schools implement solar and act as hubs for community solar projects.

##### ***3.1.1.2 Long Island Incentives***

The NY-Sun Incentive Program provides solar electric system megawatt (MW) targets that vary by region and incentives that decline at a predictable rate over time. The program is managed by NYSERDA with local administration provided on Long Island by PSEG-LI. Long Island incentives aim to increase the number of solar electric systems by stimulating the marketplace, so that costs associated with installing solar electric systems for residents and businesses are reduced. Additional incentives for low- to moderate-income (LMI) residential customers will increase access to solar and generate energy cost savings for LMI households.

### 3.1.1.3 NYPA Customer Incentives

RGGI also makes available incentives for NYPA customers, which are mostly government buildings, municipalities, and schools across the State.

### 3.1.2 Program Benefits

The benefits associated with a total of \$5.7 million invested in FY2016–17 and FY 2017–18 for NY-Sun include increasing solar adoption, decreasing solar costs, integrating solar with other distributed energy resources, and building a sustainable clean energy economy in New York State with resulting GHG reductions.

The total lifetime benefits of program investments, including the \$5.7 million for NY-Sun in FY 2016–17 and FY2017–18, are presented in Table 3.

**Table 3. NY-Sun Expected Benefits**

Program	Costs (millions of dollars)		Net Electricity Benefits or Renewable Energy Generation (MWh)		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
NY Sun - NYPA	\$19.9	\$0.03	69,606	1,740,150	286	11	40,371	1,009,287	493	20
NY-Sun - LIPA	\$28.9	\$0.05	173,840	4,346,000	167	7	100,827	2,520,680	287	11

## 3.2 Renewable Heat NY

### 3.2.1 Program Description

Renewable Heat NY was announced by Governor Cuomo in his 2014 State of the State address as “a long-term commitment to help the high-efficiency and low-emission biomass heating industry reach scale.” The Governor identified specific near-term actions to be taken as part of the initiative, which include the following:

- Raise consumer awareness.
- Develop larger-scale anchor customers to expand the bulk delivery market for wood fuel.
- Promote supply-chain development, including workforce training and support for product development, manufacturing, laboratory and field testing, and equipment certification.
- Leverage NYSERDA’s issuance of the Wood Heat Roadmap for New York State to accelerate the use of the most efficient, low-emission technologies for biomass heating.

- Identify high profile demonstration projects in State and municipal buildings that are ideally suited for biomass conversion.
- Provide financial incentives to consumers (including residential, commercial, not-for-profit, and government) to reduce upfront costs, which will be phased down as the market achieves scale and upfront costs decrease.
- Provide support so that sustainable forestry practices are available and followed by landowners.

In many key respects, developing this market will inherently require capturing the benefits of scale, and particularly of local scale. Installation and pellet-supply economics will demonstrate an economic service radius effect; workforce development and customer awareness will show gains from local density. Consequently, this initiative will seek to develop clusters of activity in areas where wood is an economically attractive alternative to fossil fuels, rather than spread support evenly across all areas.

Renewable Heat NY provides supply-chain and service network development (i.e., workforce development, training, and research and development), along with consumer incentives and financing. These activities are not geared toward resource acquisition, but rather will position the market to become self-sustaining over the long term. As we continuously measure program success, our investments of incentives and staff resources will be reduced as the private market develops.

### **3.2.2 Program Benefits**

Renewable Heat NY will accomplish the mission of the RGGI selection criteria in the following ways: reduced GHG emissions relative to oil heat alternatives, increased energy bill savings, and the creation or retention of jobs in New York.<sup>7</sup> The program will reduce New Yorkers' energy bills while providing significant environmental benefits. Included among these benefits are GHG reductions that stem from the replacement of fossil-fuel heating devices, and public health benefits related to the replacement and recycling of outdoor and indoor wood boilers with advanced technology cord wood boilers and pellet boilers. Renewable Heat NY will also create and retain jobs in New York State's biomass industry by supporting New York State manufacturers of high-efficiency, low-emission wood heat technologies, and by providing needed training in hydronic biomass heating to qualify contractors and installers for the program.

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<sup>7</sup> Calculated reductions in GHG emissions considers both the fuel being avoided and the new fuel being consumed.

The total lifetime benefits of program investments, including the \$8.0 million for Renewable Heat NY in FY 2016–17 and FY 2017–18, are presented in Table 4.

**Table 4. Renewable Heat NY Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
Renewable Heat New York	\$7.2	\$0.73	4,755	95,097	1,677	84	413	8,263	19,301	965

### 3.3 NYS Generation Attributes Tracking System

#### 3.3.1 Program Description

The New York State Generation Attribute Tracking System (NYGATS) records electricity generation attribute information within the State, and processes generation attribute information from energy imported and consumed within the State, as a basis for creating tradable generation attribute certificates. Through NYGATS, entities will be able to verify and substantiate ownership of Renewable Energy Certificates (RECs) to either support regulatory compliance or to validate environmental attributes in trading markets. NYGATS also characterizes the attributes of electricity imports and exports, and has the capability to interface and exchange information with other certificate tracking systems. As previously ordered by the Public Service Commission, this project will also be supported with System Benefit Charge environmental disclosure program funding.

#### 3.3.2 Program Benefits

NYGATS is designed to serve the development of renewable markets and policies that deliver environmental and energy benefits to the State.

### 3.4 Clean Energy Workforce Opportunity Program

#### 3.4.1 Program Description

The Clean Energy Workforce Opportunity Program will dedicate \$15 million in one-time funding to workforce training that will support New York State’s advancement of its clean energy goals, including 40% reductions in greenhouse gas emissions by 2030. Run by the State University of New York (SUNY)

and available to both two- and four-year colleges, funds provided by this program may be used for the following:

- Creation or expansion of apprenticeships, certifications, internships, and mentoring for clean energy workers (including existing partnerships with applicable trades and unions).
- Purchasing or upgrading of necessary machinery and/or lab equipment to support clean energy workforce development.
- Hiring of faculty with expertise in clean energy.
- Creation of new or enhancements of existing course offerings in clean energy-related academic programs.
- Providing experiential learning opportunities for students in clean energy-related programs.

Of the \$15 million, \$5 million will be dedicated to SUNY community colleges. One million dollars of the community college allocation will be reserved for a Community College Regional Council award.

### **3.4.2 Program Benefits**

Statewide objectives for the Clean Energy Workforce Opportunity program are as follows:

- Better prepare New York State graduates for opportunities in the clean energy economy by tailoring curriculum to industry needs and providing equipment to support training.
- Grow the clean energy talent pipeline.
- Meet existing and projected clean energy workforce needs.
- Attract more clean energy companies to do business.

## **3.5 LIPA Efficiency and RE**

### **3.5.1 Program Description**

The RGGI funds provided to the Long Island Power Authority (LIPA) ensure that businesses and consumers on Long Island have access to similar clean energy and energy efficiency opportunities that are available throughout the State and to help advance statewide efforts towards achieving the clean energy goals of the 2015 New York State Energy Plan. The funds provided to LIPA have traditionally supported solar incentive programs consistent with the statewide NY-Sun program, but have more recently supported energy efficiency programs administered by PSEG LI. During 2016, LIPA, NYSERDA, and PSEG LI collaborated to launch new approaches envisioned under Reforming the Energy Vision (REV) to support market transformation objectives, while also achieving greater carbon emissions reductions. Funding and reporting requirements are established through a Memorandum of Understanding between NYSERDA and LIPA.

### 3.5.2 Program Benefits

Consistent with the RGGI program selection criteria, this program is designed to reduce customer electric bills while providing significant environmental benefits including reduction of GHGs.

The total lifetime benefits of program investments, including the \$65.2 million for LIPA Efficiency and Renewable Energy in FY 2016–17 and FY 2017–18, are presented in Table 5.

**Table 5. LIPA Efficiency and Renewable Energy Expected Benefits**

Program	Costs (millions of dollars)		Net Electricity Benefits or Renewable Energy Generation (MWh)		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
LIPA Energy Efficiency and Renewable Energy Initiative	\$73.9	-	180,280	3,245,041	410	23	104,562	1,882,124	706	39

## 3.6 EmPower New York

### 3.6.1 Program Description

EmPower New York provides energy efficiency services for low-income New Yorkers. RGGI funds are primarily targeted to households heating with oil, propane, kerosene, wood, or coal, but may also be applied to homes heating with natural gas, when EEPS-gas funding is not available. RGGI funds energy efficiency measures that reduce carbon emissions, such as insulation, air sealing, and heating system upgrades.

The RGGI-funded services are available statewide. Households served with RGGI funding are also provided with energy efficiency measures through EEPS-electric funding in the territories of utilities participating in SBC. Households may apply directly to the program, or may be referred through utilities, Offices for the Aging, Departments of Social Services, and other community-based organizations. NYSERDA will continue to coordinate services with the Weatherization Assistance Program (WAP) whenever possible to ensure effective use of both funding sources.

### 3.6.2 Program Benefits

Consistent with the program selection criteria, EmPower New York, similarly to other residential energy service programs, supports the following:

- The cost-effective reduction of GHGs.
- Other benefits to New York State by leveraging RGGI funds with existing electric reduction programs funded through SBC and other sources, participants will realize more annual energy bill savings than when only electric measures are installed.
- Opportunities to reduce the disproportionate cost burden and environmental impacts on low-income families and environmental justice communities.

The total lifetime benefits of program investments, including the \$1.4 million for EmPower New York in FY 2016–17 and FY 2017–18, are presented in Table 6.

**Table 6. EmPower New York Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
EmPower New York	\$5.8	\$0.3	35,930	862,319	169	7	2,659	63,819	2,283	95

## 3.7 Home Performance with ENERGY STAR<sup>®</sup>

### 3.7.1 Program Description

Home Performance with ENERGY STAR<sup>®</sup> (HPwES) is a comprehensive energy efficiency services program for existing one- to-four family homes. The program uses a network of service providers accredited by the Building Performance Institute (BPI) to perform diagnostic testing on homes, recommend improvements, determine the payback period for those improvements, and install improvements selected by the homeowner. RGGI funding will allow HPwES to target customers using oil and propane for space and domestic water heating purposes. The funds will offset part of the cost for consumers to replace inefficient oil and propane heating equipment and other measures that have a direct impact on reducing oil and propane consumption (e.g., insulation, air sealing). Income-eligible customers receive additional incentives, up to 50% of the cost of eligible measures, through Assisted HPwES.

Eligible electric measures for HPwES will be covered by EEPS funds within the SBC territory. NYSERDA is coordinating with LIPA, NYPA, and municipal electric service providers to offer these heating efficiency services to their customers. In the event gas funds are not available, NYSERDA may expand use of RGGI funds to heating equipment.

HPwES and Assisted HPwES are delivered in coordination with Green Jobs - Green New York, described later in this plan.

### 3.7.2 Program Benefits

Consistent with the program selection criteria and similar to other residential energy service programs, Home Performance with ENERGY STAR<sup>®</sup>, supports the following:

- The cost-effective reduction of GHGs.
- Other benefits to New York State by leveraging RGGI funds with existing electric reduction programs funded through SBC and other sources; participants will realize more annual energy bill savings than when only electric measures are installed.
- Opportunities to reduce the disproportionate cost burden and environmental impacts on low-income families and environmental justice communities.

The total lifetime benefits of program investments, including the \$3.4 million for HPwES in FY 2016–17 and FY 2017–18, are presented in Table 7.

**Table 7. Home Performance with ENERGY STAR<sup>®</sup> Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Electricity Benefits or Renewable Energy Generation (MWh)		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
Home Performance with ENERGY STAR <sup>®</sup>	\$5.3	\$0.5	85,437	2,050,481	68	3	495	8,909	11,695	650	7,159	170,088	809	34

## 3.8 Multifamily Performance Program

### 3.8.1 Program Description

The Multifamily Performance Program (MPP) serves buildings with five or more units. Existing MPP consulting firms, known as “partners” in the program, will use the program’s benchmarking tools, templates, and various auditing software packages to determine what energy improvements

are cost-effective, their expected energy savings, and the costs to install them. The energy audits that are developed, known as Energy Reduction Plans (ERPs) in the program, identify the measures needed to reduce energy use by at least 15%.

RGGI funding will be used to reduce non-firm gas, oil, and propane in multifamily buildings by providing incentives to repair and replace space and domestic water heating systems as well as installing insulation, air sealing, and other building shell energy efficiency measures. Electric reduction measures, including ENERGY STAR® lighting and refrigerators, will be provided using EEPS funding in buildings eligible for those services.

Electric customers of LIPA, NYPA, and municipal electric providers will receive services for oil efficiency, including heating and shell measures, if not provided by their utility. NYSERDA will consider providing gas efficiency services through RGGI funds once EEPS funding targeting gas measures have been exhausted. NYSERDA will coordinate closely with the Weatherization Assistance Program to ensure the most effective use of both funding sources.

Approximately one-third of the multifamily buildings in New York State are heated with fossil fuels. NYSERDA proposes to service an estimated 2,000 low-income units and about 13,200 market rate units over the three-year period, assuming EEPS funds are adequate to continue addressing the electric efficiency needs of those buildings.

### **3.8.2 Program Benefits**

Consistent with the program selection criteria and similar to other residential energy service programs, the Multifamily Performance Program supports the following:

- The cost-effective reduction of GHGs.
- Other benefits to New York State by leveraging RGGI funds with existing electric reduction programs funded through SBC and other sources; participants will realize more annual energy bill savings than when only electric measures are installed.
- Opportunities to reduce the disproportionate cost burden and environmental impacts on low-income families and environmental justice communities.

The total lifetime benefits of investments made for the Multifamily Performance program are presented in Table 8.

**Table 8. Multifamily Performance Program Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Electricity Benefits or Renewable Energy Generation (MWh)		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
Multifamily Performance Program	\$5.7	\$0.7	208,376	3,230,730	31	2	3,732	48,513	1,705	131	17,712	271,176	359	23

## 3.9 Solar Thermal Incentive Program

### 3.9.1 Program Description

RGGI funds will support incentives for the installation of solar thermal systems to replace fossil-fuel domestic hot water systems. RGGI funds may be used to support the installation of residential and nonresidential solar thermal systems. Incentives are applied to the total project cost based on displaced kilowatt-hours. Combination systems (systems that provide domestic hot water [DHW] and space heating) are allowed in the program; however, incentives are only provided on the portion of the solar thermal system output that offsets DHW production.

### 3.9.2 Program Benefits

Consistent with the RGGI program selection criteria, this program is designed to reduce reliance on fossil fuel for thermal applications, while providing significant environmental benefits including reduction of GHGs.

The total lifetime benefits of investments made for the Solar Thermal program are presented in Table 9.

**Table 9. Solar Thermal Incentive Program Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Electricity Benefits or Renewable Energy Generation (MWh)		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
Solar Hot Water (Thermal) Program	\$0.8	\$0.02	2,809	56,186	299	15	5	103	162,531	8,127	209	4,187	4,011	201

## **3.10 Charge NY**

### **3.10.1 Program Description**

With RGGI funding for Charge NY initiative, NYSERDA is pursuing three main strategies to promote plug-in electric vehicle (PEV) adoption. First, NYSERDA implemented a rebate program for zero emission vehicles. The program was launched in March 2017 and offers tiered rebates based on the electric range of eligible vehicles. This program is helping to accelerate purchases of PEVs by reducing their upfront cost, which will help to eliminate one of the remaining barriers to PEV adoption.

Second, NYSERDA is supporting a collaborative, partner-driven engagement campaign targeting employers, car dealers, retailers, and the general public to engender greater support for PEVs and educate potential PEV and PEV infrastructure buyers about their options. A focus on building greater public knowledge and awareness of the capabilities of PEVs is essential to spur more private investment in PEV purchases and PEV charging stations. The goal of the program will be to engage stakeholders to get involved with supporting PEV adoption in ways that support their interests and to demonstrate sustainable marketing strategies to the general public that are enhanced through partnerships. This work may also include other market development activities, such as policy and business model development studies that support new ways for critical stakeholders, such as utilities, local governments, and car dealers, to get involved in the PEV market.

Third, NYSERDA will initiate a program to bring down the price of installing PEV charging stations in NYS. This may include an aggregation strategy, whereby NYSERDA would negotiate favorable pricing with qualified vendors and installers and invite public and private site owners to take advantage of these reduced costs for charging stations. It will also include financial support for the installation of PEV charging stations at location types that have been seen to be effective drivers for PEV adoption based on usage data reported from previous installations, such as workplaces, municipal lots, and multi-family buildings. Charge NY will also support the deployment of a network of direct current (DC) fast charge stations across the State.

### **3.10.2 Program Benefits**

The Charge NY Program will provide significant environmental benefits including the reduction of GHG emissions through the displacement of petroleum use. The anticipated portfolio will have an array of projects dealing mainly with on-road transportation concentrating on PEVs and their associated charging

infrastructure. The increase in the installation of charging infrastructure across the State will help reduce the “range anxiety” for potential PEV owners thus spurring an increase in PEV acquisitions.

The total lifetime benefits of program investments, including the \$10 million for Charge NY in FY 2016–17 and FY 2017–18, are presented in Table 10.

**Table 10. Charge NY Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
Charge NY	\$11.0	\$6.0	428,895	4,288,950	40	4	15,507	155,066	1,096	110

### 3.11 76West Clean Energy Competition

#### 3.11.1 Program Description

As outlined in the 2015 State of the State address, 76West is a \$20 million clean energy business competition and business development program in the Southern Tier, whose purpose is to catalyze a clean energy business cluster that builds on the region’s technology, manufacturing, and natural resource assets. The program is configured as a business competition, open to early-stage clean energy companies from around the world that will award \$10 million in prizes over four years, or \$2.5 million annually, to winning companies that show the prospect for significant job creation in the Southern Tier. Two rounds of the competition have been held.

#### 3.11.2 Program Benefits

In addition to prize money that will catalyze a clean energy business cluster and grow high-quality jobs in the region, the remaining \$10 million will support regional programs in business incubation, entrepreneurial training, development and deployment of business mentors, relationship building with investors and corporate strategic partners, university-industry collaboration, and other activities designed to coalesce a supportive business community around start-up and early stage firms.

## **3.12 Brookhaven National Laboratory – ION Collider**

### **3.12.1 Program Description**

Cornell University (CU) and the Brookhaven National Laboratory (BNL) are designing, building and commissioning the Cornell-BNL Energy Recovery Linac Test Accelerator (CBETA), a 4-pass, 150 MeV electron ERL that is a prototype for advanced technology to be used in the future BNL eRHIC accelerator.

This pilot-scale facility is located at Cornell University where all field testing/validation will occur. The work is being conducted at Cornell to fully leverage an existing \$32 million facility located on Cornell's campus. This results in significant overall cost savings for the ERL project.

BNL will manage all aspects of the initiative and serve as the project contractor.

Timely and successful testing/validation of the pilot-scale ERL will allow BNL to submit a competitive proposal to the DOE to secure an award to build and operate an electron-ion collider (EIC) on BNL's campus that includes a full-scale ERL as a major sub-system component eRHIC accelerator.

The ERL will recover the energy that is typically lost during particle collisions. This recovered energy reduces the overall electric energy demand of the facility, obviates the need for electric utility infrastructure upgrades to accommodate the EIC, allows for higher electron beam intensities, and higher resolution of the sub-atomic particles created by the collisions.

### **3.12.2 Program Benefits**

The ERL has the potential to reduce the energy demand of the EIC facility by 35 MWe compared with more conventional technology and significantly enhance overall performance. The facility is intended to operate for approximately 4,000 hours per year over a 20-year period. Annual energy savings are approximately 140,000 megawatt-hours (MWh). Assuming a State carbon dioxide emission profile of 1,000 # CO<sub>2</sub>/MWh, this translates into a lifetime CO<sub>2</sub> savings of 1,400,000 tons. This peak demand reduction allows BNL to utilize PSEG-LI's existing electric power infrastructure and reduce the capital cost of the overall EIC. This cost savings will further increase the competitiveness of BNL's proposal.

## **3.13 Community Clean Energy**

### **3.13.1 Program Descriptions**

#### ***3.13.1.1 Clean Energy Communities***

Local governments are critical partners in achieving a new energy vision for New York State. As such, municipal leaders play a critical role in effectuating energy choices in their communities, both in terms of government operations, and across homes, businesses, and community institutions. The Clean Energy Communities Program encourages localities to pursue a list of ten High-Impacts actions.<sup>8</sup> Communities that pursue at least four of these actions receive the Clean Energy Community designation are eligible for a grant of up to \$250,000.

#### ***3.13.1.2 Climate Smart Communities***

Established in 2009, the Climate Smart Communities Program is comprised of a network of local governments across the State. In 2014, Governor Cuomo introduced a Climate Smart Communities certification program to guide climate actions and provide recognition to those communities demonstrating leadership. Managed by the Department of Environmental Conservation, this State program works in partnership with five other State agencies: NYSERDA, the Department of State, the Public Service Commission, the Department of Transportation, and the Department of Health.

#### ***3.13.1.3 Community Energy Engagement Program***

In summer of 2017, NYSERDA launched its Community Energy Engagement program, which is cofounded through the Clean Energy Fund to build awareness and increase uptake of local renewable and energy efficiency solutions. The program will deploy trusted, local organizations to conduct energy awareness and education with residential, multifamily, and small business customers. Local organizations will be competitively selected for each of the 10 Regional Economic Development Councils, as defined by Empire State Development to act as Community Energy Advisors. The program will place an emphasis on increasing the amount of funding and financing leveraged for the completion of clean energy projects. Additionally, the initiative will focus on improving energy affordability and increasing deployment of distributed energy resources for community members of all income levels, with a focus on LMI households and communities. By

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<sup>8</sup> List of Clean Energy Community High-Impact Actions may be found here: <https://www.nyscrda.ny.gov/All-Programs/Programs/Clean-Energy-Communities/Action-Items>

engaging directly with residents, small business, and multifamily building owners, Community Energy Advisers will help increase energy literacy and local understanding of the value of clean energy and reduced energy use. The face-to-face approach and focus on LMI residents and communities will ensure the Community Energy Engagement program makes the greatest impact.

### **3.13.2 Program Benefits**

Because these Community Clean Energy programs are being co-funded with Clean Energy Fund (CEF) and RGGI funding, all metrics associated with implementation of the program will be split proportionately per the level of funding coming from each source. These benefits will be quantified and reported on a quarterly basis.

#### ***3.13.2.1 Clean Energy Communities Program***

The benefits associated with the Clean Energy Communities Program will be positively reflected in the following:

- Number of Designated Clean Energy Communities
- Number of Communities that have completed one or more High Impact Actions
- Number of total High Impact Actions completed
- Number of High Impact Actions completed after program launch
- Energy Savings Metrics associated with High Impact Actions and completed grant projects (MW, MWh, MMBtu)

#### ***3.13.2.2 Community Energy Engagement***

The Community Energy Engagement program will drive benefits not directly captured by the CEF and RGGI metrics, including bringing participants into existing programs at a faster rate, as well as bringing in participants from populations that wouldn't have been reached otherwise. NYSERDA will also track additional efforts beyond NYSERDA's own activities spurred by this work, including funding leveraged from foundations and other sources, as well as energy savings efforts that originate outside of existing programs, such as challenges and campaigns driven directly by locally based organizations.

The benefits associated with the Community Energy Engagement Program will be positively reflected in the following:

- Number of residents, small businesses, and multifamily building owners assisted with clean energy applications (audit, grant, and finance applications)

- Number of new partnerships developed with other locally based organizations as well as activities completed with these local partners
- Number of completed (closed) loans
- Number of projects completed with NYSERDA, NYSERDA plus other, or other funding
- Amount of funding received by customers (NYSERDA, NYSERDA plus other, or other funding)

## **3.14 Energy to Lead**

### **3.14.1 Program Description**

Governor Cuomo’s Energy to Lead Competition challenges colleges and student-led coalitions across the State to develop and implement plans to advance clean energy on their campuses and in their local communities. Submitted project plans were required to demonstrate innovations in one or more of the following:

- **Business model:** A new way of paying for a project, lowering costs, or creating new revenue streams.
- **Community engagement:** An approach to building an on-campus project to advance clean energy in the surrounding community.
- **Curriculum integration:** A model for integrating project construction, implementation, or operations into student coursework, workforce training, or internships.

The three groups that proposed the best solutions for an innovative clean energy project in energy efficiency, renewables, or GHG emissions reduction were awarded \$1 million each to help implement their plans. In the first round, NYSERDA received 40 proposals from 33 institutions. The three winning institutions were as follows:

- Bard College’s “Micro Hydro for Macro Impact” project will use local dams to develop micro hydropower. The project is expected to avoid 335 metric tons of GHG emissions annually, equivalent to taking 70 cars off the road.
- The University at Buffalo will implement the “Localizing Buffalo’s Renewable Energy Future” project, which will install 100 MW of clean solar power throughout the city. The implementation involves partnership with the City of Buffalo and several not-for-profit and educational partners.
- Broome Community College’s “Geothermal Learning Laboratory” project includes installing a closed loop geothermal system that uses the heat energy stored in the earth; real-time, public data-sharing about the system’s operations; and development of hands-on, geothermal material for secondary schools.

### **3.14.2 Program Benefits**

Collectively the three winning college projects are expected to reduce greenhouse gas emissions by the equivalent of taking 17,000 cars off the road each year. The University at Buffalo's project is expected to result in the avoidance of 82,000 metric tons of greenhouse gas emissions annually. SUNY Broome Community College's project is expected to result in the avoidance of 135 metric tons of greenhouse gas emissions annually.

## **3.15 Clean Energy Fund**

### **3.15.1 Program Description**

Reforming the Energy Vision (REV) is the State's comprehensive energy strategy aimed at building a next generation energy system that is clean, more resilient and affordable for all New Yorkers. As approved by the NYS Public Service Commission (PSC), the CEF serves as one of the essential pillars to advance REV. To deliver on its primary goals to reduce greenhouse gas emissions, increase renewable energy generation, increase energy efficiency, and attract greater private investment in clean energy, the CEF investment portfolios are designed to achieve scale in clean energy markets. These key CEF objectives dovetail with the RGGI investment parameters, creating a unique opportunity to leverage CEF and RGGI funds to help achieve overall REV objectives.

Historically RGGI funds have been implemented alongside certain existing energy efficiency programs (e.g., Home Performance with ENERGY STAR<sup>®</sup>, EmPower New York, and Multifamily Performance Program) to allow customers in those sectors to address energy efficiency opportunities as they exist in their homes or buildings, capturing opportunities for on-site electric, natural gas or petroleum fuel efficiency. By integrating RGGI funds with ratepayer-supported programs, the energy efficiency industry has been able to develop business models and service packages that offer consumers 'whole building' services, often capturing the highest-value energy savings and greenhouse gas emission reduction opportunities.

The CEF was authorized by the PSC on January 21, 2016. The identified \$25 million of RGGI funding dedicated annually to the CEF will be allocated to support the initiatives outlined therein.

### **3.15.2 Program Benefits**

By directing a level of RGGI funds to the CEF, RGGI will continue to leverage ratepayer supported activities, including clean energy market development under the CEF on a 'fuel neutral' basis.

The total lifetime benefits of program investments, including the \$50 million for CEF in FY 2016–17 and FY 2017–18, are presented in Table 11.

**Table 11. Clean Energy Fund Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Electricity Benefits or Renewable Energy Generation (MWh)		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
Clean Energy Fund	\$26.9	\$23.2	662,920	10,517,960	75	5	90,555	1,507,463	552	33	90,783	1,481,389	551	34

## 3.16 Green Jobs - Green New York

### 3.16.1 Program Description

The Green Jobs - Green New York (GJGNY) Program, created under the Green Jobs - Green New York Act of 2009, provides New Yorkers with access to energy assessments, installation services, low interest financing, and pathways to training for various green-collar careers. The GJGNY program was originally funded with \$112 million of RGGI funds, of which \$26 million was allocated to a residential revolving loan fund to provide low-interest financing for residential energy efficiency improvements, residential solar electric systems (effective April 2014), solar thermal systems, and high efficiency pellet stove heating systems (through the Renewable Heat NY program). An additional \$34 million was subsequently added to the revolving loan fund through March 31, 2016. For FY 2018–19, NYSERDA proposes to transfer an additional \$13.8 million to the revolving loan fund. NYSERDA proposes to continue with transferring this amount in FY 2019–20 and FY 2020–21.

The revolving loan funds are used to fund program loans until they are financed with the proceeds of bonds and notes. Energy efficiency “Tier 1” loans (using traditional loan underwriting standards) are financed through financing assistance through the New York State Environmental Facilities Corporation Clean Water State Revolving Fund program. Tier 1 PV loans are financed through bonds issued under a current credit facility provided through M&T Bank. However, due to the program loan interest rates currently offered, to meet bond debt service coverage requirements, the bond proceeds are less

than the principal amount of loans issued, requiring additional funds to be added to fund the depletion of the revolving loan fund. Other “Tier 2” energy efficiency and PV loans issued (using slightly more flexible loan underwriting criteria, serving consumers not likely eligible to access traditional financing) are funded from the revolving loan fund and must be held for a period of time until their performance allows them to be financed.

### 3.16.2 Program Benefits

The GJGNY Program often serves as a point of entry into existing energy efficiency programs for prospective projects through the audit and financing offerings. It is anticipated that a portion of these projects will proceed through a GJGNY-funded audit or loan and without additional incentives from NYSERDA or another program administrator. It is extremely difficult to predict how much implementation of audit recommended measures will go through incentive programs previously identified and to quantitatively identify attribution to each source of funding or support provided. Therefore, reporting on each respective portfolio of coordinating programs such as RGGI/GJGNY and EEPS will show the full benefits contributed to by each funding source, and NYSERDA-wide reporting will ensure there is no double counting. Therefore, the plan does not attempt to disaggregate savings by funding source.

The total lifetime benefits of program investments, including the \$55.6 million for GJGNY in FY 2016–17 and FY 2017–18, are presented in Table 12.

**Table 12. Green Jobs - Green New York Expected Benefits**

Program	Costs (millions of dollars)		Net Energy Benefits (MMBtu)		Cost Benefit Ratio (\$/MMBtu)		Net Electricity Benefits or Renewable Energy Generation (MWh)		Cost Benefit Ratio (\$/MWh)		Net Greenhouse Gas Emission Reductions <sup>a</sup> (Tons CO <sub>2</sub> e <sup>b</sup> )		Cost Benefit Ratio (\$/Ton CO <sub>2</sub> e)	
	Total Incentives <sup>b</sup>	Total Associated Costs <sup>c</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MMBtu Annual Benefits <sup>f</sup>	\$/MMBtu Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/MWh Annual Benefits <sup>f</sup>	\$/MWh Lifetime Benefits <sup>g</sup>	Annual Installed Benefits <sup>d</sup>	Lifetime Installed Benefits <sup>e</sup>	\$/Ton Annual CO <sub>2</sub> e Benefits <sup>f</sup>	\$/CO <sub>2</sub> e Lifetime Benefits <sup>g</sup>
Green Jobs Green New York	\$49.1	\$6.6	308,764	7,101,564	180	8	27,300	518,692	2,040	107	38,374	819,266	1,451	68

See the monthly and annual GJGNY reports for additional program metrics ([nyserdera.ny.gov/About/Green-Jobs-Green-New-York/GJGNY-Advisory-Council-Reports](http://nyserdera.ny.gov/About/Green-Jobs-Green-New-York/GJGNY-Advisory-Council-Reports)).

## **4 Program Evaluation and Reporting**

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The overarching goals of the RGGI program evaluation effort are to provide objective and credible information that supports optimum program operation and outcomes, and provides program accountability. The evaluation effort will assess progress toward meeting stated program and public policy goals, as well as progress in moving markets toward behaviors that result in emissions reductions and increased energy efficiency and use of renewable energy.

The evaluation and reporting activities outlined herein will be applied to the portfolio of RGGI programs described in this plan, including GJGNY. RGGI program evaluation and status reports will address the portfolio of programs, funding, and benefits included in this plan.

### **4.1 Evaluation Budget**

The budget for RGGI program evaluation is based on need and continues to be consistent with the level of funding provided for evaluation of NYSERDA's ratepayer-funded programs, historically at a rate of 5% of program funding or less. The evaluation budget will support overall evaluation design and planning, implementation of plans by third-party contractors, and NYSERDA's management of the evaluation activities. Implementation of the evaluation plans will involve collection and analysis of primary and secondary data by independent contractors. Primary data collection activities that may be undertaken by evaluation contractors include on-site verification; metering and monitoring of installed measures; and conducting in-person, telephone, email, and other types of surveys and interviews. NYSERDA will use its best efforts to leverage existing evaluation experience and staffing to maximize economies of scale.

### **4.2 Evaluation Approach**

NYSERDA customizes evaluation to the specific types of RGGI programs and their approach to achieving CO<sub>2</sub>e reductions. Individual programs will receive varying levels of evaluation depending on need. The focus of the evaluation work will be on assessing program impacts, namely CO<sub>2</sub>e reductions. Process and market evaluations are also planned, particularly in coordination with other funding sources such as CEF, EEPS and Technology and Market Development. Each of these three main areas of program evaluation—impact, market, and process—is described briefly in this section.

The types of programs presented in this plan are expansive in terms of the sectors and fuels covered and the ways in which they reduce CO<sub>2</sub>e. NYSERDA has divided programs into two broad categories for purposes of evaluation:

- Market Development Programs that provide direct emission reductions through on-site electric or fossil-fuel efficiency measures, or on-site generation that displaces grid electricity.
- Innovation Programs that provide less direct, longer-term benefits in advancing information, technologies and markets.

These two categories of programs present different evaluation needs, especially in the area of impact evaluation, as described in the following section.

#### **4.2.1 Impact Evaluation**

Impact evaluation measures the outcomes and co-benefits attributable to a program, calculates the cost-effectiveness of a program, and compares the outcomes to the goals set forth for the program. Key metrics for evaluating impacts of the RGGI programs include, but may not be limited to, the following direct outcomes and co-benefits: CO<sub>2</sub>e reductions, electricity and fuel savings, customer bill savings, program cost per ton of CO<sub>2</sub>e reduced, and job creation.

For Market Development Programs that provide direct emission reductions through on-site electric and fossil-fuel efficiency projects, NYSERDA first plans to measure and verify the electric and fossil-fuel savings attributable to the programs, and then apply emission factors to determine CO<sub>2</sub>e reductions. Measurement, verification and attribution analysis will be conducted on a sample of completed projects according to industry best practices and will build on NYSERDA's experience in program evaluation. Similar approaches may be appropriate as well for on-site generation projects that are displacing electricity otherwise purchased from the grid. Once the evaluation of electric and fossil-fuel savings is complete, NYSERDA plans to apply default emission factors available from secondary sources. Default factors are commonly used in lieu of source testing due to the time and cost of such testing.<sup>9</sup> Evaluations will ensure that appropriate emission factors, taking into consideration the technology, timing, and location of projects, are applied to fossil-fuel savings.

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<sup>9</sup> U.S. Environmental Protection Agency. 2007. National Action Plan for Energy Efficiency. *Model Energy Efficiency Program Impact Evaluation Guide*. Prepared by Steven R. Schiller, Schiller Consulting, Inc. ([www.epa.gov/andeeactionplan](http://www.epa.gov/andeeactionplan)), Chapter 6

Evaluation strategies for Innovation Programs (i.e., those programs that do not provide emission reductions through on-site energy efficiency and generation projects) will be explored in detail by NYSERDA and contractors procured to aid in this area. Specific evaluation plans will take into consideration the level of rigor necessary for the program-reported, emission-reduction estimates to apply an appropriate level of rigor in the evaluations. For example, programs involving detailed and project specific technical studies of expected emission reductions may require less emphasis by evaluation than other programs.

NYSERDA recognizes the importance of providing information on the geographic distribution of program funding and benefits, and will examine how best to present this information within available technical capabilities. Impacts for specific populations, such as low-income and environmental justice communities, will be examined for programs expected to address such populations. Additionally, some co-benefits such as job creation will be addressed at the portfolio level in the evaluation.

Several impact evaluations have been completed and those evaluations underway (or planned for the current cycle) include, but are not limited to, the following. As the RGGI portfolio evolves, evaluation plans will as well.

- Home Performance with ENERGY STAR® Program: NYSERDA is reviewing the cost effectiveness and overall added value of conducting a second assessment of measure adoption among Green Jobs - Green NY “audit only” participants (i.e., those who may have installed measures on their own in the absence of incentives) with possible assessment of energy and emission impacts from those measures. In addition, a billing analysis of Home Performance GJGNY On-Bill Recovery projects is in the planning phase; results will be made available as appropriate.

#### **4.2.2 Process Evaluation and Market Evaluation**

Process evaluation reviews oversight and operations gauge customer satisfaction and recommends process, and efficiency improvements. Formative process evaluations, conducted early in the program development, can offer actionable recommendations to help improve program efficiency and effectiveness and optimize the desired program outcomes.

Market evaluation develops an understanding of markets and market actors, provides information to support program design and delivery, and tracks changes in markets over time. This area of evaluation provides “market intelligence” to help target programs to best achieve their goals.

Though not every program may receive evaluation, both process and market evaluation will be performed on all types of programs within the RGGI portfolio. Several process and market evaluations have been completed, with an upcoming study listed below. As additional studies are planned they will be described in upcoming quarterly RGGI reports. Further, as the RGGI portfolio evolves, evaluation plans will as well.

- Renewable Heat NY Market Baseline (in coordination with CEF): Baseline and longitudinal measurements of key indicators of programmatic and broader market success including, but not limited to, sales of NYSERDA-qualified biomass boilers compared to sales of all-biomass boilers statewide; percentage of installations in the market that were completed by Renewable Heat NY installers; and customer satisfaction with installers and equipment.

### **4.2.3 Baseline Studies**

Within the evaluation, NYSERDA completed a Residential Statewide Baseline Study in 2015 and an update to the study is currently in the planning phase. A Commercial Baseline Study is underway and includes four separate market assessments on HVAC, Energy Management Systems/Building Management Systems, Energy Services and Customer Decision Making. These baseline studies and subsequent updates are designed to assess Residential and Commercial markets across a broad range of customer segments and energy measures. The goals of these studies are to better understand building stock and associated energy use, including saturations of energy-consuming measures, penetrations of energy-efficient equipment, building characteristics and energy management practices; and use this information to estimate the technical, economic, and achievable energy efficiency opportunities in New York State in the next three and five years. Though these large studies are being supported by rate-payer funding, RGGI funds are supplementing the budget to allow for robust data collection on fuel measures.

### **4.2.4 Use of Evaluation Results**

The evaluation and program implementation activities described in this Plan will be integrated with the ultimate goal of “real time” feedback from the evaluation effort being used to help inform and improve programs. Early evaluation results will be used to help identify possible issues with program performance and provide recommendations to NYSERDA as to how those issues might be rectified. Reports will be made publicly available so interested parties can review any programmatic recommendations that are made. NYSERDA will use evaluation data and information to make programmatic changes in the annual plan updates, or as needed.

## **4.3 Evaluation Implementation**

### **4.3.1 Staff and Contractor Resources**

Evaluation of New York's RGGI programs will be managed by NYSERDA's Performance Management (PM) group. PM is organizationally separate from NYSERDA groups that administer programs. PM staff has been responsible for managing evaluation of NYSERDA's major energy efficiency, electric demand reduction, renewable energy, and research and development programs for over 15 years. The staff and knowledge base within PM will be leveraged to provide effective, efficient evaluation management of the RGGI programs. Stakeholder input will be sought to inform evaluation of the RGGI programs.

NYSERDA recently qualified three separate pools of consultants to assist PM staff in conducting impact evaluation, market evaluation and survey data collection, respectively. This represented a departure from NYSERDA's previous evaluation structure where one contractor team was competitively selected for each evaluation area with a lead contractor coordinating and leading the work. Establishment of these pools of consultant resources will provide NYSERDA with ready access to consultant assistance and expertise to develop tactical and cost-effective approaches to evaluation and market research and ensure effective and timely feedback on performance and market impacts. This framework is currently in place and will apply to all aspects of NYSERDA's evaluation effort moving forward.

Evaluation plans will be developed by PM staff and NYSERDA program staff in consultation with the qualified consultant(s) and the consultant(s) will, in most cases, implement the evaluation in conjunction with PM staff.

The RGGI evaluation will be closely coordinated with NYSERDA's existing evaluation efforts for CEF and other programs. This coordination will be especially important on programs that receive CEF and RGGI funding to ensure that the evaluation does not become overly burdensome for participants and issues associated with survey respondent fatigue are minimized. Such coordination will also aid in achieving greater efficiency and cost-effectiveness of the evaluation overall.

## 4.4 Reporting

NYSERDA will prepare an annual RGGI program evaluation and status report using progress tracking, findings and inputs from the independent evaluation contractors. The annual report will include for each prior year (1) an accounting of all sales of CO<sub>2</sub> allowances and the funds generated, (2) a summary description of program activities, (3) a quantification of benefits, and (4) an accounting of the administration costs and expenditures. The annual report will also provide information on the geographic distribution of program funding across the State.

Quarterly, NYSERDA will prepare a RGGI program status report updating progress made in each major program area. The reports will include an estimate of benefits and an accounting of the costs and expenditures.

Metrics and targets presented in this document (e.g., dollars per ton) were established for early comparison purposes to facilitate program selection. They are subject to modification in the event that changes are made to the discounting rate, discounting approach, evaluation methods, emissions factors, and budget levels. Previous RGGI Operating plans assumed each program's longest-lived measure life as an input for the expected lifetime benefit calculations. Beginning with the 2013 RGGI Operating Plan, each program's savings-weighted average end of useful-measure life was used as an input for the expected lifetime benefit calculations. Using the savings-weighted average end of useful-measure life provides a more realistic lifecycle for the persistence of energy, bill, and emission savings. Furthermore, at the time of development of this plan, the extent to which program participants will leverage complementary RGGI program support as well as other non-RGGI program support is unknown.

Quarterly status reports will quantify and report all such cross-program overlap, and the reported actual benefits and outcomes of the RGGI programs in this operating plan will be inclusive of such quantified cross-program overlap.

## **5 Administration**

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Included in program administration are direct salaries and benefits for program staff, as well as a proportionate allocation of salaries and benefits for support staff (e.g., contracts, finance, information technology, legal, and marketing and outreach), facilities and equipment costs, travel, supplies, etc. Fixed costs are applied proportionally across all funding sources, using program staff salary costs as a percentage of total salary costs, and therefore reflect economies of scale. These estimates are based on historical experience with the ratepayer-funded programs, and considered administrative efficiencies.

# Appendix A

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This appendix describes the general methods and assumptions that are used to calculate the energy savings, emission reductions, bill savings and cost-effectiveness metrics presented in the Operating Plan (Plan) for Investments in New York State under the CO<sub>2</sub> Budget Trading Program and the CO<sub>2</sub> Allowance Auction Program.

## A.1 Energy Savings

Annual energy savings values are based on the past performance of publicly funded energy efficiency programs and information obtained from various sources of technical literature.

## A.2 CO<sub>2</sub>e Reductions

Emissions factors are used to translate the energy savings data into annual GHG emissions reduction values. The GHGs evaluated in the Plan include carbon dioxide, methane, and nitrous oxide. Because each of these gases has a different global warming potential,<sup>10</sup> emissions for gases other than carbon dioxide are converted into carbon dioxide equivalent units (CO<sub>2</sub>e) through multiplication with their appropriate Intergovernmental Panel on Climate Change (IPCC) global warming potential value,<sup>11</sup> shown in Table 13.

**Table A-1. Global Warming Potentials**

These values represent a 100-year time horizon.

Source: Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report: Climate Change 2007.

Gas	Global Warming Potential
Carbon dioxide (CO <sub>2</sub> )	1
Methane (CH <sub>4</sub> )	25
Nitrous oxide (N <sub>2</sub> O)	298

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<sup>10</sup> A global warming potential is a measure that estimates how much a given mass of a GHG contributes to global warming. It is calculated over specific time intervals as gases vary in lifespan and radiative efficiency, e.g., 100 years. The IPCC also provides 20 and 500-year GWP values.

<sup>11</sup> IPCC, 2007. Fourth Assessment: Climate Change 2007. This inventory uses potentials from the IPCC Fourth Assessment Report, rather than values from more current assessments. The Fifth Assessment Report was released in 2014–15. New York DEC regulation Part 242 1.2 (49) uses the Third Assessment values, while the EPA GHG Reporting Rule and the NY GHG Inventory and Forecast use the Fourth Assessment. Reconciliation between methodologies will be investigated as part of the program implementation and evaluation process.

Table 14 shows the emission factors used in the Plan to calculate emissions from on-site fuel combustion, which are derived from U.S. Environmental Protection Agency (EPA) emission coefficients. The CO<sub>2</sub>e values represent aggregate CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions. If a program in the Plan covers more than one sector (e.g., the Commercial and Industrial Program), then the estimated reduction is based on a straight average emission factor.

**Table A-2. Fuel Combustion Emission Factors by Sector**

*Sources: U.S. EPA State Climate Energy Program's State Inventory Tool (SIT) Modules, February 2013 release. City of New York, Inventory of New York City Greenhouse Gas Emissions, November 2014, by Cathy Pasion, Mikael Amar and Michael Delaney. Mayor's Office of Long-Term Planning and Sustainability, New York, 2014.*

	<b>Transport (lb CO<sub>2</sub>e/MMBtu)</b>	<b>Residential (lb CO<sub>2</sub>e/MMBtu)</b>	<b>Commercial (lb CO<sub>2</sub>e/MMBtu)</b>	<b>Industrial (lb CO<sub>2</sub>e/MMBtu)</b>
Coal	N/A	224.8	211.4	203.7
Natural Gas	117.4	117.4	117.4	114.7
#2 Oil/Distillate/Diesel	163.0	163.8	163.8	162.2
#6 Oil/Residual	N/A	N/A	166.3	166.0
Kerosene	N/A	162.1	162.1	161.8
Propane	136.1	136.9	136.9	136.9
Gasoline	155.0	N/A	N/A	N/A
Aviation Fuel	159.3	N/A	N/A	N/A
Wood	N/A	15.8	15.8	3.9
Steam	N/A	132.2	132.2	N/A

An average emission factor of 625 lb. CO<sub>2</sub>e/MWh is used to estimate emission reductions associated with electricity use reductions for all sectors. This value includes emissions from in-state electricity generation as well as emissions associated with net-imports of electricity.<sup>12</sup> While electricity savings may not lead to near-term emission reductions under the RGGI CO<sub>2</sub> cap, savings will potentially reduce imports of electricity to New York State; the demand for CO<sub>2</sub> allowances, leading to a possible future reduction in the cap; and the carbon-footprint of end-users, as they will be responsible for a smaller percent of the emissions associated with electricity production.

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<sup>12</sup> The emission factor for electricity is based on data from Patterns & Trends- New York State Energy Profiles: 1997–2011 (NYSERDA 2013) and methodology from the GHG Inventory and Forecast prepared for the 2015 New York State Energy Plan.

### A.3 Bill Savings

Annual bill savings values for each program are estimated by multiplying the energy savings by sector specific fuel price data. Table 15 shows fuel prices by sector. Electricity and natural gas prices represent average values for six service territories weighted by the percentage of RGGI projects located in each utility area; basic service charges have been excluded.

**Table A-3. Fuel Prices by Sector**

*Source: For electricity and natural gas, prices are an average of July 2012 and January 2013 prices as reported by the NYS Department of Public Service billing data. (<http://www3.dps.ny.gov/W/PSCWeb.nsf/All/C56A606DB183531F852576A50069A75D?OpenDocument>) For all other fuel types, prices reflect 2011 retail prices as reported in NYSEDA's Patterns and Trends- New York State Energy Profiles: 1997–2011.*

<b>Sector</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Transportation</b>	<b>C&amp;I</b>
Electricity (\$/kWh)	0.18	0.16	0.12	0.05	0.14
Natural Gas (\$/MMBtu)	8.57	5.09	5.09	N/A	5.09
Fuel Oil / Distillate (\$/MMBtu)	25.59	24.51	23.39	27.58	23.95
Propane (\$/MMBtu)	34.21	26.04	30.32	N/A	28.18
Residual (\$/MMBTU)	N/A	17.41	17.41	N/A	17.41
Kerosene (\$/MMBTU)	28.13	28.13	24.56	N/A	26.35
Wood (\$/Cord)	7.83	N/A	N/A	N/A	N/A
Coal (\$/Ton)	N/A	5.78	4.74	N/A	5.26

## A.4 Program Measure Life

Average savings-weighted measure life, shown by program, is used to calculate expected lifetime benefits.

**Table A-4. Program Measure Life Assumptions**

<b>Program</b>	<b>Electricity Measure Life</b>	<b>Fuels Measure Life</b>
GJGNY – Single-Family Residential Assessment Component	18	24
GJGNY – Single-Family Residential Loan Component	19	23
GJGNY – Multifamily Residential Assessment Component	13	15
GJGNY – Small Commercial Loan Component	13	21
RGGI – Multifamily Performance Program	13	15
RGGI – Multifamily Carbon Emissions Reduction Program	N/A	13
RGGI – EmPower New York	N/A	24
RGGI – Home Performance with ENERGY STAR®	18	24
RGGI – Green Residential Building Program	18	24
RGGI – Solar Thermal Incentive Program	N/A	20
RGGI – Low-rise Residential New Construction Program	18	24
RGGI – NYSERDA Solar Photovoltaic Initiative	25	N/A
RHNY – Boilers	20	20
RHNY – Pellet Stoves	20	20
LIPA Efficiency	18	NA
LIPA Photovoltaic and Efficiency Initiative	25	N/A
Regional Economic Development and GHG Reduction	18	18



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