

New York State Regional Greenhouse Gas Initiative-Funded Programs

Semiannual Status Report through December 31, 2022

Final Report | July 2023



NYSERDA

NYSERDA's Promise to New Yorkers:

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

Our Vision:

New York is a global climate leader building a healthier future with thriving communities; homes and businesses powered by clean energy; and economic opportunities accessible to all New Yorkers.

Our Mission:

Advance clean energy innovation and investments to combat climate change, improving the health, resiliency, and prosperity of New Yorkers and delivering benefits equitably to all.

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Final Report

Prepared by:

New York State Energy Research and Development Authority

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Acronyms and Abbreviations

AHPwES	Assisted Home Performance with ENERGY STAR®
DEC	NYS Department of Environmental Conservation
CBO	constituency-based organization
CGC	Cleaner, Greener Communities
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalents
EEPS	Energy Efficiency Portfolio Standard
EFC	New York State Environmental Facilities Corporation
EPA	United States Environmental Protection Agency
ERP	Energy Reduction Plan
GHG	greenhouse gas
GJGNY	Green Jobs - Green New York
HPwES	Home Performance with ENERGY STAR®
kW	kilowatt
kWh	kilowatt-hour
LIPA	Long Island Power Authority
MMBtu	million British thermal units
MOU	memorandum of understanding
MPP	Multifamily Performance Program
MW	megawatt
MWh	megawatt-hour
NYPA	New York Power Authority
DOL	New York State Department of Labor
OBR	On-Bill Recovery Financing Program
PON	Program Opportunity Notice
PV	photovoltaic (also known as solar electric)
RFP	request for proposals
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable Portfolio Standard
SBC	System Benefits Charge
ST	solar thermal
WFD	Workforce Training and Development

1 Introduction

In New York State, the Regional Greenhouse Gas Initiative (RGGI) program has been implemented through two complementary regulations: The New York State Department of Environmental Conservation (DEC) established the State's Carbon Dioxide (CO₂) Budget Trading Program (6 NYCRR Part 242, 6 NYCRR Part 200, General Provisions) and the New York State Energy Research and Development Authority (NYSERDA) established the CO₂ Allowance Auction Program (21 NYCRR Part 507). This report is prepared pursuant to the State's RGGI Investment Plan (2022 Operating Plan) and provides an update on the progress of programs through the quarter ending December 31, 2022. It contains an accounting of program spending; an estimate of program benefits; and a summary description of program activities, implementation, and evaluation. An amendment providing updated program descriptions and funding levels for the 2021 version of the Operating Plan was approved by NYSERDA's Board in January 2022.

The State invests RGGI proceeds to support comprehensive strategies that best achieve the RGGI CO₂ emission reduction goals. These strategies aim to reduce global climate change and pollution through energy efficiency, renewable energy, and carbon abatement technology. Deploying commercially available renewable energy and energy efficiency technologies help to reduce greenhouse gas (GHG) emissions from both electricity and other energy sources in the short term. To move the State toward the goals enacted by the Climate Leadership and Community Protection Act (Climate Act) and a more sustainable future, RGGI funds are used to empower communities to make decisions that prompt the use of cleaner and more energy-efficient technologies that lead to both lower carbon emissions as well as economic and societal co-benefits. RGGI helps to build capacity for long-term carbon reduction by training workers and partnering with 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. All these activities use funds in ways that accelerate the uptake of low- to zero-emitting technologies.

2 Summary of Portfolio and Program Benefits

This section provides an overview of the expected quantifiable benefits related to carbon dioxide equivalent (CO₂e) reductions, energy savings, and participant energy bill savings with expended and encumbered funds through Q4 2022.¹ For more information on the methodology used to calculate CO₂e reductions and energy bill savings, see appendix A. For a list of former program names, reference appendix B. Appendix C shows the detailed benefit results.

NYSERDA begins tracking program benefits once project installation is complete and provides estimated benefits for projects under contract that are not yet operational (pipeline benefits). Estimated benefits are based on the expected lifetime benefits from installed and pipeline savings. The metrics presented in this section are estimates and not evaluated unless otherwise noted. Future evaluation and status reports will present the results as they are available. Program benefits may be reported prior to the financial reporting of funds spent, as fund transfers may lag behind the installation date. At this time, the program benefits include some projects that are jointly supported by other non-RGGI funding sources administered by NYSERDA.

The estimated cumulative annual and expected lifetime benefits as of December 31, 2022 at the portfolio and program levels are shown in Table 1 and Table 2, respectively.²

Table 1. Summary of Expected Cumulative Portfolio Benefits through December 31, 2022

Benefits through December 31, 2022^a	Net Greenhouse Gas Emission Savings^b (Tons CO₂e^c)	Total Net Fuel Savings (MMBtu)	Net Efficiency Electricity Savings (MWh)	Net Renewable Energy Generation (MWh)	Total Net Electricity Savings/Generation (MWh)	Energy Bill Savings to Participating Customers (\$ Million)
Cumulative Annual Installed Savings^d	1,639,859	9,710,368	1,252,109	533,849	1,785,957	\$550.2
Cumulative Annual Pipeline Savings^e	85,685	431,593	59,102	63,150	122,253	\$22.4
Cumulative Annual Committed Savings^f	1,725,544	10,141,961	1,311,211	596,999	1,908,210	\$572.6
Expected Lifetime Total Savings^g	30,566,589	158,792,783	24,610,890	12,556,815	37,167,705	\$9,813.1

- ^a Cross-program overlap for projects that received any combination of a Green Jobs - Green New York (GJGNY) assessment, a GJGNY loan, or a RGGI-funded incentive through the Home Performance with ENERGY STAR[®] Program, NY-Sun Program or Renewable Heat NY Program has been removed.
- ^b 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.
- ^c CO₂e stands for carbon dioxide equivalent and describes the amount of CO₂ that would have the same global warming potential as a given mixture of gases based on factors published by the Intergovernmental Panel on Climate Change.
- ^d Inclusive of savings from all currently operational projects installed since program inception.
- ^e Inclusive of savings from all projects under a signed contract and projects with an application received that are not yet operational.
- ^f The sum of savings from Installed Savings and Pipeline Savings.
- ^g The expected benefits over the lifetime of all operational projects, projects under a signed contract, and projects with an application received that are not yet operational. See Table A-4 in appendix A for the measure-life assumptions.

Table 2. Summary of Expected Cumulative Annual Program Benefits through December 31, 2022

Program	Costs (millions of dollars)		Net Energy Savings (Annual MMBtu)			Net Electricity Savings or Renewable Energy Generation (Annual MWh)			Net Greenhouse Gas Emission Savings ^a (Annual Tons CO ₂ e ^b)			Cost Benefit Ratio (\$/Ton CO ₂ e)	
	Total Incentives ^c	Total Associated Costs ^d	Installed Savings ^e	Pipeline Savings ^f	Total Committed Savings ^g	Installed Savings ^e	Pipeline Savings ^f	Total Committed Savings ^g	Installed Savings ^e	Pipeline Savings ^f	Total Committed Savings ^g	\$/Ton CO ₂ e Savings ^h	\$/CO ₂ e EXPECTED LIFETIME Savings ⁱ
Green Jobs - Green New York													
One- to Four-Family Residential Buildings Program Assessments	\$25.9	\$1.0	995,985	-	995,985	12,737	-	12,737	71,577	-	71,577	376	16
One-to Four-Family Residential Buildings Program Financing	\$118.9	\$31.8	1,965,229	4,633	1,969,862	203,143	2,949	206,092	216,668	1,776	218,444	690	33
Multifamily Performance Program Assessments	\$3.3	\$1.4	833,187	-	833,187	52,847	-	52,847	77,138	-	77,138	61	4
Small Commercial Energy Efficiency Program Financing	\$0.9	\$0.3	10,024	-	10,024	789	-	789	977	-	977	1,281	73
Energy Efficiency													
LIPA Energy Efficiency and Renewable Energy Initiative	\$269.6	-	35,035	-	35,035	1,251,996	-	1,251,996	645,585	-	645,585	418	23
Multifamily Performance Program	\$12.7	\$2.1	477,253	43	477,297	20,987	2	20,989	41,430	4	41,434	357	24
Multifamily Carbon Emissions Reduction Program ^j	\$5.7	\$0.2	-	-	-	-	-	-	45,151	-	45,151	129	10
EmPower New York	\$33.1	\$1.9	173,765	63,775	237,540	707	-	707	11,714	4,498	16,212	2,165	92
Home Performance with ENERGY STAR [®]	\$21.6	\$3.1	334,236	39,715	373,951	2,119	755	2,874	25,264	2,797	28,061	879	37
Green Residential Building Program	\$2.5	\$0.3	36,548	-	36,548	1,573	-	1,573	2,798	-	2,798	981	44
Solar Hot Water (Thermal) Program	\$4.1	\$0.1	14,217	-	14,217	22	-	22	959	-	959	4,407	220
Low-Rise Residential New Construction Program	\$0.6	-	8,914	-	8,914	-	-	-	550	-	550	1,146	48
Renewable Energy													
Renewable Heat New York	\$8.8	\$1.2	4,384	-	4,384	1,328	-	1,328	2,477	-	2,477	4,074	204
NY-Sun Initiative	\$86.0	\$1.4	-	-	-	234,999	47,622	282,621	119,648	23,826	143,474	609	24
NYSERDA Solar Electric	\$5.2	\$0.1	-	-	-	2,040	-	2,040	2,107	-	2,107	2,525	101
Community Clean Energy													
Regional Economic Development & GHG Reduction ^k	\$0.8	\$9.4	-82,448	-	-82,448	79	-	79	31,918	-	31,918	321	18
Clean Energy Communities ^l	\$2.1	-	20,136	-	20,136	8,975	-	8,975	5,722	-	5,722	365	24
Clean Energy Communities - LIPA ^m	\$1.7	-	1,231,967	-	1,231,967	205,424	-	205,424	172,798	-	172,798	10	1
Innovative GHG Abatement Strategies													
Charge NY ⁿ	\$70.1	\$2.8	3,882,929	-	3,882,929	-238,544	-	-238,544	158,935	-	158,935	458	46
Clean Energy Fund													
Clean Energy Fund ^o	\$67.2	\$25.7	599,554	328,086	927,640	88,191	61,200	149,391	94,240	48,246	142,486	652	40
Cross-Program Overlap ^p	N/A	N/A	-830,548	-4,659	-835,207	-38,246	-2,933	-41,179	-75,186	-1,795	-76,981	N/A	N/A
TOTAL Annual Cumulative Benefits^q	\$741.7	\$82.8	9,710,368	431,593	10,141,961	1,811,166	109,595	1,920,761	1,652,471	79,352	1,731,823	476	N/A
TOTAL Expected Lifetime Cumulative Benefits^q	\$741.7	\$82.8	151,109,040	7,683,743	158,792,783	35,272,740	2,208,735	37,481,475	29,173,779	1,549,795	30,723,574	N/A	27

Table notes are on the next page.

Table 2 continued

- ^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 CO₂e stands for carbon dioxide equivalent and describes the amount of CO₂ that would have the same global warming potential as a given mixture of gases based on factors published by the Intergovernmental Panel on Climate Change.
- ^c Inclusive of incentive dollars for expenditures, encumbrances, and contract pre-encumbrances.
- ^d Inclusive of all non-incentive expenditures.
- ^e Inclusive of savings from all currently operational projects installed since program inception.
- ^f Inclusive of savings from all projects under a signed contract and projects with an application received that are not yet operational.
- ^g The sum of savings from columns Installed Savings and Pipeline Savings.
- ^h The sum of figures in columns Total Incentives and Total Associated Costs divided by the columns Total Committed Savings.
- ⁱ The sum of figures in columns Total Incentives and Total Associated Costs divided by the expected lifetime committed savings. Inclusive of cross-program overlap.
- ^j The Multifamily Carbon Emissions Reduction Program is a fuel-switching program and does not claim any energy or bill savings.
- ^k The Regional Economic Development and GHG Reduction program consists of 15 unique projects. The costs for all 15 projects are included in this table although only a subset of these projects actually report quantifiable energy benefits. The negative MMBtu savings are due to a manufacturing project that switched from burning #6 residual oil to natural gas and a transportation project that switched from burning diesel fuel to compressed natural gas (CNG). CNG is slightly less efficient than diesel from an energy perspective but results in carbon emission reductions.
- ^l The Clean Energy Communities program is operated statewide with funding from multiple sources, namely RGGI and CEF, and the benefits reported here are associated with RGGI funding only. Historically, benefits have been attributed and reported in proportion to the funding contributed by each source, which has reflected an approximate 50-50 split. For reference, the (annual) benefits reported for RGGI through the close of 2018 were 127,945 MWh, 298,783 MMBtu, and 93,032 CO₂e. Late in 2019 NYSERDA introduced a modification to the CEF Clean Energy Communities program, significantly increasing the investment (from \$14.2M to \$81.3M) and fundamentally shifting the proportion between RGGI and CEF funding sources. As such, beginning with Q3 2019 reporting, NYSERDA will simplify the approach to benefits attribution by utilizing geographic data (e.g., the actual location of High Impact Actions and grant payments) to attribute all benefits for this program. Projects reported in LIPA/NYPA territories will be attributed to RGGI in order to align with the funding that supports these projects, while all other reported benefits in SBC territory will be attributed to CEF. This line includes only the portion of projects in NYPA territory.
- ^m Represents Clean Energy Communities projects reported in LIPA territory.
- ⁿ Net Energy Savings values represent MMBtu savings from the use of electric vehicles; the electricity required to charge the vehicles is removed from this table as this induced electricity consumption is the result of beneficial electrification. Expected emission reductions and customer bill savings are net, including both MMBtu that add to the benefits and the electricity required to charge the electric vehicles that subtract from the benefits.
- ^o These figures represent a proportional allocation of benefits relative to the percent of RGGI contributions to the total approved CEF budget.
- ^p Cross-program overlap accounts for projects that received any combination of a GJGNY assessment, a GJGNY loan, or a RGGI-funded incentive through the Home Performance with ENERGY STAR[®] Program, NY-Sun Program or Renewable Heat NY Program.
- ^q Totals may not sum exactly due to rounding.

3 Funds

3.1 Proceeds

As of December 31, 2022, New York State sold more than 451 million CO₂ allowances and received more than \$1,913 million in auction proceeds. In addition, more than \$22 million in interest was earned on the RGGI portfolio and more than \$3.5 million in interest was earned on the Green Jobs - Green New York (GJGNY) program. All RGGI interest earnings were allocated to the RGGI portfolio and more than \$2.6 million in interest earnings were allocated to the GJGNY program. The allocated interest earnings are reinvested for program implementation and distributed across various RGGI programs. Detailed auction proceeds and total funds for NYS RGGI are presented in appendix D and appendix E, respectively. Total NYS RGGI funds are listed in Table 3, and detailed auction proceeds for NYS RGGI are visually displayed in Figure 1.

Table 3. New York State's RGGI Auction Results and Funds through December 31, 2022

Source: RGGI, Inc. and NYSERDA

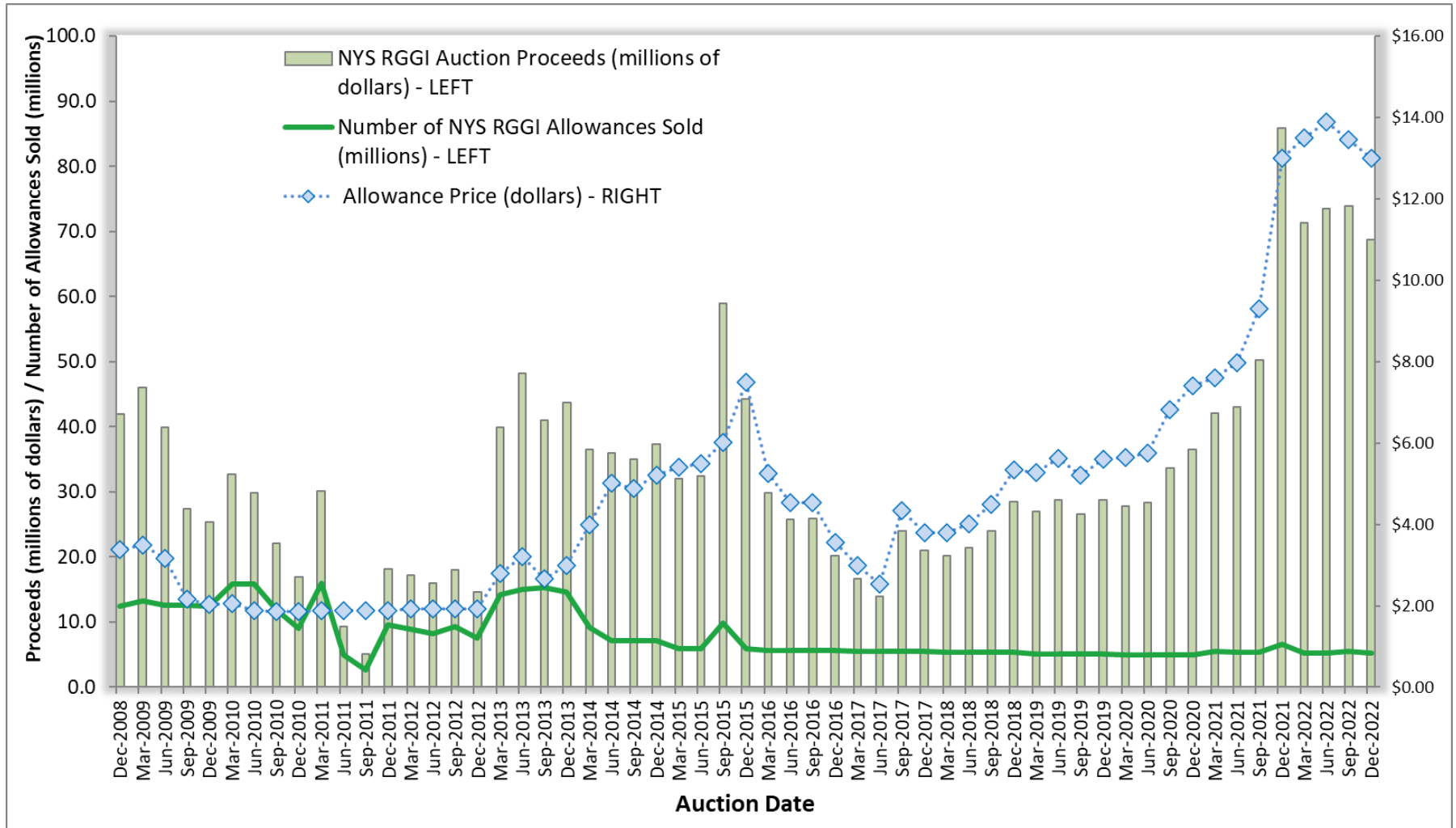
Fund Category	NYS Allowances Sold	Cumulative Funds
First Control Period Total	144,305,904	\$336,282,535
Second Control Period Total	128,764,643	\$391,950,232
Third Control Period Total	72,401,365	\$345,078,005
Fourth Control Period Total	61,594,969	\$332,217,018
Fifth Control Period Total	44,217,395	\$508,054,644
RGGI Auction Proceeds	451,284,276	\$1,913,582,434
RGGI Portfolio Interest Earnings		\$22,184,372
GJGNY Program Interest Earnings		\$3,517,108
TOTAL Funds		\$1,939,283,914

^a The first control period for fossil fuel-fired electric generators took effect on January 1, 2009 and concluded on December 31, 2011. The second control period took effect on January 1, 2012 and concluded on December 31, 2014. The third control period took effect on January 1, 2015 and concluded on December 31, 2017. The fourth control period took effect on January 1, 2018 and extends through June 30, 2021. The fifth auction control period took effect on June 1, 2021.

^b RGGI program budgets have been increased based on anticipated auction revenues from the approved FY 2022–2023 Operating Plan. These amounts have been allocated but have not been received due to the timing of receipt of the proceeds.

Figure 1. New York State's RGGI Auction Results through December 31, 2022

Source: RGGI, Inc.



3.2 Budget

Financial data for the approved RGGI programs through December 31, 2022 are presented in Table 4 and Table 5. Table 4 presents the current expended, encumbered, and committed funds for each program and reflects how the more than \$1,824 million of approved funds are distributed across the seven major program areas and other costs:

- Renewable Energy
- Energy Efficiency
- Innovation GHG Abatement Strategies
- Community Clean Energy
- GJGNY
- Clean Energy Fund
- Clean Energy Standard

Table 5 presents the financial data for the approved GJGNY program through December 31, 2022.

Table 4. Available Funding and Financial Status through December 31, 2022 (Millions of Dollars)

Source: NYSERDA

	Budgeted Funds ^a	Expended Funds ^b	Open Encumbrances ^c	Pre-Encumbrances ^d	Committed Funds ^e	Remaining Balance ^f
Renewable Energy						
Renewable Heat NY	10.3	9.6	0.5	-	10.1	0.2
NY-Sun	92.5	60.7	25.9	0.4	87.1	5.4
NYSERDA Solar Electric Programs	5.3	5.3	-	-	5.3	-
NY Generation Attribute Tracking	0.8	0.7	0.1	-	0.8	-
Advanced Renewable Energy	2.8	2.8	-	-	2.8	-
Community Heat Pump Systems	5.0	-	0.0	0.9	0.9	4.05
Total Renewable Energy	116.7	79.2	26.6	1.3	107.1	9.7
Energy Efficiency						
LIPA Energy Efficiency and Renewable Energy Initiative	269.6	264.6	5.0	-	269.6	-
Residential Efficiency Services	96.8	88.0	1.3	0.1	89.3	7.5
Municipal Water and Wastewater	1.2	1.2	-	-	1.2	-
Clean Energy Workforce Opportunity	15.0	15.0	-	-	15.0	-
Energy Storage	12.9	3.5	8.9	-	12.4	0.5
Building Electrification Pilot Projects	2.0	-	0.2	2.9	3.1	(1.1)
Disadvantaged Communities Schools/Buildings	21.6	0.1	15.2	5.4	20.8	0.8
Total Energy Efficiency	419.2	372.4	30.5	8.5	411.4	7.8
Innovative GHG Abatement Strategies						
Industrial Innovations	11.8	9.4	2.4	-	11.8	-
Climate Research and Analysis	8.7	8.7	-	-	8.7	0.1
Clean Energy Business Development	25.3	24.9	0.3	-	25.2	0.0
Charge NY	102.4	72.7	0.4	-	73.2	29.2
Transportation Research	3.8	3.8	-	-	3.8	0.0
Carbon Capture and Sequestration	1.0	1.0	-	-	1.0	-
Advanced Buildings	1.5	1.5	-	-	1.5	0.0
Competitive Greenhouse Gas Reduction Pilot	1.0	1.0	-	-	1.0	-
Brookhaven National Laboratory Ion Collider	25.0	25.0	-	-	25.0	0.0
Natural Carbon Solutions	2.0	-	-	1.2	1.2	0.8
Equity and Climate Transformation Research	0.8	0.0	0.2	-	0.2	0.6
Climate Mitigation and Resilience Research	1.0	0.7	0.3	-	1.0	0.0
Total Innovative GHG Abatement Strategies	184.3	148.7	3.6	1.2	153.5	30.8
Community Clean Energy						
Climate Smart Communities	7.7	5.6	1.7	-	7.3	0.4
Economic Development Growth Extension	7.2	7.0	-	-	7.0	0.3
Cleaner, Greener Communities	94.3	76.2	14.1	3.2	93.5	0.7
Clean Energy Communities	10.3	2.1	0.5	0.1	2.7	7.6
Regional Economic Development and Greenhouse Gas Reductions	10.2	10.2	-	-	10.2	0.0
REV Campus Competition	3.0	1.8	1.2	-	3.0	0.0
Renewable/Net-Zero Energy Demonstrations	7.5	5.0	-	-	5.0	2.5
Priority Population Workforce Development	4.0	1.8	0.5	0.1	2.3	1.7
Clean Energy Hubs	13.7	0.3	12.2	-	12.5	1.2
Healthy Homes New Design and Construction Challenge	1.0	-	-	-	-	1.0
Climate Action Consumer Awareness and Education	1.5	0.2	0.3	0.1	0.6	0.9
Air Quality Monitoring	8.0	3.0	5.0	-	8.0	-
Total Community Clean Energy	168.4	113.2	35.4	3.5	152.2	16.2
Other Costs ^g						
Deficit Reduction Plan (DRP) Transfer ^h	90.0	90.0	-	-	90.0	-
Con Edison Smart Grid Program ⁱ	21.9	21.9	-	-	21.9	-
Program Administration ^j	59.9	54.3	-	-	54.3	5.6
Metrics and Evaluations	10.2	6.6	0.1	-	6.7	3.4
RGGI Inc. Costs ^k	12.4	10.9	-	0.7	11.6	0.9
New York State Cost Recovery Fee	17.3	15.5	-	-	15.5	1.7
Unallocated Interest Earnings	-	-	-	-	-	-
Environmental Tax Credit	179.0	179.0	-	-	179.0	-
NYS Environmental Protection Fund	15.0	15.0	-	-	15.0	-
Electric Generation Facility Cessation Mitigation	50.0	45.1	0.9	0.3	46.3	3.7
OTHER COSTS TOTAL	455.7	438.3	1.1	1.0	440.3	15.3
SUBTOTAL	1,344.3	1,151.8	97.2	15.5	1,264.5	79.8
Green Jobs - Green New York						
Green Jobs - Green New York	298.4	238.5	2.7	0.0	241.2	57.2 ^m
Clean Energy Fund						
Clean Energy Fund	180.7	78.2	51.6	-	129.8	50.9
Clean Energy Standard						
Clean Energy Standard	0.7	0.7	-	-	0.7	-
TOTAL ⁿ	1,824.2	1,469.4	151.5	15.5	1,636.3	187.9

Table notes are on the next page.

Table 4 continued

- ^a Includes auction proceeds and allocated interest on the RGGI and GJGNY portfolios. The allocation is consistent with the budget presented in the RGGI Operating Plan.
- ^b Invoices processed for payment by NYSERDA.
- ^c Remaining funding obligated under a contract, purchase order, or incentive award.
- ^d Planned funding for contracts awarded and under negotiation; and planned funding under active development through open solicitations with upcoming proposal due dates, adjusted so that the sum of the project commitments does not exceed the figures in the Budgeted Funds column. NYSERDA's annual audited financial statements may reflect project commitments in excess of the figures in Budgeted Funds. These commitments are expected to decrease over time due to project attrition and differences in estimated versus actual costs.
- ^e The sum of figures in columns Expended, Encumbered, and Pre-Encumbered funds.
- ^f The difference between figures in columns Budgeted Funds and Committed Funds.
- ^g The values for figures in rows Program Administration, Metrics and Evaluation, and the NYS Cost Recovery Fee represent aggregate funds and commitments for RGGI-funded activities, NOT including GJGNY. For information on GJGNY finances, refer to Table 5.
- ^h On December 4, 2009, NYS enacted numerous deficit reduction measures that included the transfer of \$90 million in RGGI auction proceeds to the General Fund following the global financial crisis.
- ⁱ On December 22, 2009, NYSERDA's Board approved a proposed consent decree that resolves the legal challenge to the State's RGGI program. In October 2010, State Supreme Court Judge Thomas J. McNamara signed a Stipulation and Order of Discontinuance signed by all the parties, thereby formally ending the litigation. The parties to the consent decree presently estimate that the total commensurate benefit for the calendar years 2009–2017 is \$20.8 million and agreed to dedicate such funds for the development of smart grid technologies in the Con Edison territory. The budget reflects allocations that are intended to fund NYSERDA's estimated liability for each calendar year control period consistent with the timing of estimated cash payments due to Con Edison. NYSERDA is also responsible for certain additional costs that may be incurred through 2017. NYSERDA's annual audited financial statements show an amount expended of \$18 million to reflect these additional estimated costs that were required to be recorded. The litigation period ended December 31, 2016. This Plan Amendment notes that total paid by NYSERDA is \$21,900,366.
- ^j Includes NYSERDA's upfront administrative expenses related to the development and implementation of the CO₂ Budget Trading Program, the CO₂ Allowance Auction program, and the RGGI Operating Plan.
- ^k The first-year budget includes RGGI Inc. start-up costs and the State's share of ongoing RGGI Inc. expenses. RGGI Inc. is a nonprofit corporation created to support development and implementation of the CO₂ Budget Trading Program.
- ^l The Electric Generation Facility Cessation Mitigation Program was enacted in the 2015–2016 New York State Budget and is designed to support communities that are transitioning local economies that have been reliant on fossil fuel power plants as a source of financial support. See the Final 2016 RGGI Operating Plan Amendment at: <https://www.nyserda.ny.gov/Researchers-and-Policymakers/Regional-Greenhouse-Gas-Initiative/Useful-Documents> for more information.
- ^m The Residential Financing figures include certain loans issued where bond proceeds used to finance the pledged loans received subsequently. The Residential Financing figures also include pre-encumbrances for approved loans not yet issued, which will be funded from additional funds to be transferred to GJGNY and not yet reflected in the column Budgeted Funds shown in this table.
- ⁿ Totals may not sum exactly due to rounding.

Table 5. Green Jobs - Green New York Available Funding and Financial Status through December 31, 2022 (Millions of Dollars)

Source: NYSERDA

	Budgeted Funds ^a	Expended Funds ^b	Open Encumbrances ^c	Pre-Encumbrances ^d	Committed Funds ^e	Remaining Balance ^f
Workforce Development, Outreach and Marketing						
Workforce Development	7.3	7.3	-	-	7.3	0.07
Outreach and Marketing	15.8	15.8	-	-	15.8	-
Total Workforce Development, Outreach and Marketing	23.2	23.1	-	-	23.1	0.1
Residential						
Energy Assessment Incentive	25.9	25.9	-	-	25.9	-
Implementation Costs	1.0	1.0	-	-	1.0	-
Financing: Loans	192.5	444.2	-	-	444.2	
Financing: Loan Repayments	-	(71.0)	0.0	-	(71.0)	
Financing: Implementation Costs	-	28.3	0.3	-	28.6	
Financing: Bond Proceeds	-	(183.1)	0.8	-	(182.2)	
Financing: Bond Issue Costs	-	3.8	0.1	-	3.9	
Financing: Short Term Note	-	(30.0)	-	-	(30.0)	
Financing: Participation Sale Proceeds	-	(42.1)	-	-	(42.1)	
Loan Loss Reserve	10.0	0.1	0.1	0.0	0.2	9.8
Predevelopment	4.1	1.0	0.7	-	1.7	2.3
Total Financing	206.5	151.2	2.0	0.0	153.3	53.2^g
Total Residential	233.5	178.2	2.0	0.0	180.2	53.2^g
Multifamily						
Energy Assessments	3.3	3.3	-	-	3.3	-
Implementation Costs	1.4	1.4	-	-	1.4	-
Financing: Loans	0.3	3.9	0.0	-	3.9	
Financing: Loan Repayments	-	(3.9)	-	-	(3.9)	
Financing: Implementation Costs	0.3	0.2	-	-	0.2	
Total Financing	0.6	0.1	0.0	-	0.1	0.4
Total Multifamily	5.3	4.8	0.0	-	4.8	0.4
Small Commercial						
Energy Assessments	7.5	7.3	0.25	-	7.5	-
Implementation Costs	0.9	0.9	-	-	0.9	-
Financing: Loans	1.6	2.9	-	-	2.9	
Financing: Loan Repayments	-	(2.0)	-	-	(2.0)	
Financing: Implementation Costs	0.3	0.3	-	-	0.3	
Total Financing	1.9	1.2	-	-	1.2	0.7
Total Small Commercial	10.4	9.4	0.3	-	9.7	0.7
SUBTOTAL	272.2	215.6	2.3	0.0	217.8	54.4^g
Other Costs						
Program Administration	17.7	16.3	0.4	-	16.7	0.9
Program Evaluation	5.6	3.8	0.0	-	3.8	1.8
New York State Cost Recovery Fee	2.9	2.9	-	-	2.9	0.04
Unallocated Interest Earnings	-	-	-	-	-	-
OTHER COSTS TOTAL	26.2	23.0	0.4	-	23.4	2.8
TOTAL ^h	298.4	238.5	2.7	0.0	241.2	57.2^g

- ^a Includes auction proceeds and allocated interest on the GJGNY funds. The allocation is consistent with the budget presented in the RGGI Operating Plan.
- ^b Invoices processed for payment by NYSERDA.
- ^c Remaining funding obligated under a contract, purchase order, or incentive award.
- ^d Planned funding for contracts awarded and under negotiation; and planned funding under active development through open solicitations with upcoming proposal due dates, adjusted so that the sum of the project commitments does not exceed figures in the Budgeted Funds column. NYSERDA's annual audited financial statements may reflect project commitments in excess of figures in Budgeted Funds. These commitments are expected to decrease over time due to project attrition and differences in estimated versus actual costs.
- ^e The sum of figures in columns Expended, Encumbered, and Pre-Encumbered Funds.
- ^f The difference between figures in columns Budgeted Funds and Committed Funds.
- ^g The Residential Financing figures include certain loans issued where bond proceeds used to finance the pledged loans received subsequently. The Residential Financing figures also include pre-encumbrances for approved loans not yet issued, which will be funded from additional funds to be transferred to GJGNY and not yet reflected in the Budgeted Funds column shown in this table.
- ^h Totals may not sum exactly due to rounding.

4 Program Descriptions and Accomplishments

4.1 Renewable Energy

4.1.1 Renewable Heat NY

The Renewable Heat NY initiative was a long-term commitment to support the high-efficiency, low-emission, biomass heating industry. Renewable Heat NY program funding was fully allocated in August 2021 and the program stopped accepting new project applications. All pellet stove and small biomass boiler projects are complete and one large commercial pellet boiler project is undergoing commissioning and will be complete in 2023. The long-term market development strategy for Renewable Heat NY included the following objectives:

- Raise consumer awareness.
- Develop large-scale anchor customers to expand the wood pellet bulk delivery market.
- 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 New York State Wood Heat Report to accelerate the use of biomass for heating, using the most efficient low-emission technologies.
- Provide financial incentives to consumers for advanced efficiency and low-emission technologies to reduce upfront costs.
- Provide support so that sustainable forestry practices are available and followed by small and large landowners.

This initiative sought to develop and expand local clusters of activity, thereby meeting the overarching goal of supporting the high-efficiency and low-emission biomass heating industry in the State. Renewable Heat NY provided supply chain and service network development (i.e., workforce development, training, and research and development), along with consumer incentives and financing. NYSERDA is developing a report that summarizes the results of the Renewable Heat NY program, which is expected in early 2024.

A market evaluation of the Renewable Heat NY program was completed in the third quarter of 2020. For more information on this evaluation please refer to section F.2. Completed Evaluations in the appendix of this report. The report is available on the NYSERDA website.³

Key accomplishments as of this reporting period:

- To date, 25 full-day small biomass boiler trainings and 25 training webinars have been provided since the start of the program.
- A total of 655 installed projects.
- One large commercial pellet boiler project, participating in the Large Biomass Boiler program is undergoing commissioning.

After the Renewable Heat NY program funding was fully allocated in August 2021, pellet stove incentives for income-eligible customers were transitioned to NYSERDA's low- to moderate-income residential programs.

4.1.2 NY-Sun Initiative

The NY-Sun initiative is driving the growth of the solar industry and makes solar technology more affordable for all New Yorkers. The program provides declining incentives for the installation of systems and works to reduce solar electric balance-of-system costs through technology advancements, streamlined processes, and customer aggregation models. The goal is to achieve a sustainable solar industry that does not depend on incentives.

In August 2014, NY-Sun became a statewide program. RGGI funding enabled the participation of customers from the Long Island Power Authority (LIPA), New York Power Authority (NYPA), and municipal power companies. NY-Sun supports end-use solar installations for commercial, industrial, and residential customers as well as electric utility applications to improve the performance of distribution circuits and reduce peak electric load in critical load pockets. These projects assist New York State communities that empower clean energy, healthy communities, and economic development.

Key accomplishments as of this reporting period:

- The Affordable Solar and Storage Predevelopment and Technical Assistance program provides funding to support the development of community-led solar and/or storage projects serving low- and moderate-income households as well as solar-serving multifamily, affordable housing properties. As of Q4 2022, 40 project applications have been awarded funding. Three projects are located on Long Island and funded by RGGI with a focus on a range of multifamily affordable housing properties, including those managed by the Long Beach Housing Authority.

- The Solar Energy Equity Framework (SEEF), includes the Multifamily Affordable Housing Incentive and the Affordable Solar Residential Incentive. These incentives support solar photovoltaic (PV) projects on regulated multifamily affordable housing and single-family low- and moderate-income (LMI) homes. As of Q4 2022, a total of 3,693 kilowatts (kW) of affordable housing and single-family LMI PV (366 projects) were built through the MW Block program in PSEG-Long Island territory with RGGI funding.
- The final Megawatt Block for Long Island residential solar PV projects closed in April 2016. A total of 100.3 megawatts (MW) of residential PV (12,636 projects) were built through the MW Block program with RGGI funding.
- The final MW Block for Long Island nonresidential solar PV projects closed in February 2019. There have been 58.2 MW (424 projects) of small commercial PV built in Long Island through the MW Block Program with RGGI funding, and 9.6 MW are still in the pipeline.

An impact evaluation of solar PV projects installed under NYSERDA's NY-Sun program from May 1, 2016 through March 31, 2018 was completed in the third quarter of 2020. A subset of solar PV installations under the NY-Sun program benefitted from support by NY Green Bank (NYGB), a division of NYSERDA. Previous installations under the NY-Sun and predecessor programs were evaluated in the NYSERDA Solar Photovoltaic Program Impact Evaluation for 2008 and 2011–2016. The impact evaluation report is available on the NYSERDA website.⁴ An evaluation of SEEF is underway now; future reports will summarize results. In addition, a market evaluation, including an update to balance-of-system cost data, is also underway and future reports will summarize results.

4.1.2.1 NYSERDA Solar Electric Program

NYSERDA's Solar Electric Program focuses on reducing GHG emissions in the long term by helping to establish a sustainable market for solar energy statewide that includes targeted financial incentives. These RGGI funds supplement and do not supplant Renewable Portfolio Standard (RPS) funds, supporting installation of systems in regions that do not pay into the RPS.

Key accomplishments as of this reporting period:

- A total of 387 solar electric systems were installed outside Long Island using RGGI funding through December 31, 2022.

4.1.3 New York Generation Attribute Tracking

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluation for more information.

4.1.4 Advanced Renewable Energy Program

The Advanced Renewable Energy Program supports projects that foster the market introduction of a broad range of promising new and advanced renewable energy technologies, including advanced biomass, tidal, and offshore wind technologies.

Key accomplishments as of this reporting period:

- GridMarket LLC has completed a small research project to analyze the characteristics of building load profiles using 15-minute interval meter data in the Con Edison distribution area. The company has also evaluated potential benefits to customers and the grid when applying energy storage technologies to modify load and integrate with renewable generation. The final report has been received by NYSERDA and activity is complete.
- An Offshore Wind Cost Benefit Study was completed. It assessed the potential costs, ratepayer impacts, environmental benefits, and economic benefits and impacts (job and other macroeconomic influences) to New York State associated with plausible scenarios of future offshore wind energy deployment in the New York Bight through 2025.⁵
- The Offshore Wind Master Plan, funded through the Clean Energy Fund, will include cost studies that build on the work completed for the Offshore Wind Cost Benefit Study.

4.1.5 Community Heat Pump Systems

While heat pump technology has become a proven decarbonization solution, providing buildings with clean thermal energy for space heating, cooling, and domestic hot water. Existing heat pump programs to date have targeted customers on an individual building-by-building basis, but community heat pump systems use a network of pipes to share water heating among a cluster of buildings. RGGI funds will be used to implement community heat pumps systems as part of a statewide program. This program will also provide support for systems in State and local government facilities, as well as Affordable Housing Developments. A community-based program will develop the infrastructure for larger-scale distribution and accelerate the deployment of heat pump systems across the State.

4.2 Energy Efficiency

4.2.1 LIPA Energy Efficiency and Renewable Energy Initiative

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 toward 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 Long Island (PSEGLI). In 2016, LIPA, NYSERDA, and PSEGLI collaborated to launch new approaches envisioned under Reforming the Energy Vision (REV) to support market transformation objectives, while also achieving greater carbon emission reductions. Funding and reporting requirements are established through a memorandum of understanding (MOU) between NYSERDA and LIPA. The following are the results from the first half of 2022.

Rebate spending for the second half of 2022 totaled \$26 million supported by \$20 million in RGGI funds, resulting in 149,398 megawatt-hour (MWh) savings. The largest portion of the spending (\$10.6 million) consisted of payments to businesses through PSEGLI's Commercial Efficiency Program (CEP). PSEGLI's Home Comfort central air conditioner program and PSEGLI's Efficient Products program were among the residential programs that were supported. The Efficient Products program includes support of LED light bulbs, pool pumps, appliance recycling and room air conditioners. To date, over \$269 million in RGGI funds have been spent, resulting in a cumulative total savings of 1,228,710 MWh and 35,035 million British thermal units (MMBtu).

PSEGLI has implemented several initiatives in support of New York State's clean energy goals. Long Island has been recognized as the first region of the State where all 18 Clean Energy Community grant awards have been claimed, with each community earning the designation as a Clean Energy Community. PSEG Long Island will continue to coordinate with NYSERDA around supporting communities by promoting the grant projects that will result from these awards. In support of statewide goals related to beneficial electrification, PSEG Long Island has focused on cold climate heat pump solutions for residential and commercial customers. Additionally, the Home Energy Management program was launched in the third quarter of 2017. The program consists of Home Energy Reports that are sent to 440,000 residential customers and an interactive portal which provides a disaggregation of electric usage and savings tips. The program was enhanced in the fourth quarter of 2017 to include a Home Energy Analyzer which is open to all residential customers to input home profile information for a customized energy plan. Additionally, the online Marketplace, which offers customers a variety of energy efficiency products, has been enhanced to include the sale of electric vehicle chargers.

Key accomplishments for this reporting period:

- More than \$10.5 million in rebates were paid to Long Island businesses saving 41,960 MWh as part of PSEGLI's Commercial Efficiency Program as incentive for 982 energy-efficiency projects installing measures such as lighting, HVAC systems, and efficient motors.

- During the second half of 2022 PSEGLI Residential Efficient Products program resulted in savings of 103,376 MWh for total incentive payments of over \$6.5 million, including rebates of more than \$4.2 million to PSEGLI residential customers for the purchase of light bulbs at local retailers. The remaining incentives paid for efficient product measures, such as catalog LED light bulbs, pool pumps, appliance recycling, and room air conditioners.
- PSEGLI residential customers were provided with incentives of over \$5.7 million to install 1,531 energy-efficient central air conditioning projects as part of PSEGLI's Home Comfort (formally known as Cool Homes) program, saving 1,165 MWh in Q3 and Q4 of 2022.

4.2.2 Residential Efficiency Services

NYSERDA currently offers a suite of programs that provide comprehensive energy efficiency services for single and multifamily existing buildings and new construction, including low-income households. In addition to energy savings, these programs provide significant health and safety benefits through comprehensive testing and verification, improved air quality, and improved comfort. Previously, RGGI funds were used to fill gaps in residential energy efficiency services, offering incentives to implement energy efficiency measures related to petroleum fuel opportunities or opportunities on Long Island and municipal electric districts that were not supported through the Energy Efficiency Portfolio Standard (EEPS). However, the Clean Energy Fund initiatives are fuel neutral, and the Long Island Power Authority now administers more comprehensive residential energy efficiency programs; therefore, RGGI funds are used to support petroleum fuel opportunities for customers of municipal electric utilities. Coordination of RGGI funds with programs offered by municipal electric utilities allows efficiency contractors to provide comprehensive energy efficiency services to the home, expands the number of households served, and ensures that opportunities for carbon reduction measures are not lost.

4.2.2.1 Multifamily Performance Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.2.2.2 Multifamily Carbon Emission Reduction Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.2.2.3 EmPower New York

NYSERDA's EmPower New York (EmPower) program offers no-cost energy efficiency services to low-income (i.e., HEAP-eligible) homeowners and renters. These services include electric reduction and home performance measures such as appliance replacement, energy-efficient lighting, insulation, and air sealing. On-site energy education offers customers additional strategies for managing their energy costs. Participating contractors with certifications for the work they are performing provide services. Currently, 175 EmPower contractors are assisting in RGGI-funded projects.

Historically, EmPower used RGGI funding to serve low-income applicants that heat with oil and propane and were ineligible for EEPS funding. Currently, RGGI funds continue to support petroleum fuel-efficiency measures in households served by municipal electric utilities. These energy efficiency measures aid in the reduction of GHG emissions and provide long-term carbon reductions.

Key accomplishments as of this reporting period:

- Across New York State, 732 low-income households were served during Q3 and Q4 of 2022, bringing the total to 8,176 low-income households served under EmPower New York with RGGI funding through December 31, 2022.

An impact evaluation for this program was completed in Q2 2022 and is summarized in the evaluation section.

4.2.2.4 Green Residential Buildings Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.2.2.5 Home Performance with ENERGY STAR®

Home Performance with ENERGY STAR (HPwES) is a comprehensive energy efficiency services program for existing one- to four-family homes and low-rise⁶ residential buildings. On December 31, 2019, the market rate component of HPwES was sunset; however, the moderate rate component of HPwES, Assisted Home Performance with ENERGY STAR (AHPwES), which serves homeowners with incomes less than 80% of area median income, remains an active program offering.

The program uses a network of certified contractors to (1) perform diagnostic testing on the home, (2) recommend improvements, (3) determine the payback period for those improvements, and (3) install improvements selected by the homeowner. As of December 31, 2022, 175 contractors are active in AHPwES.

The program uses RGGI funds for municipal electric households for oil and propane efficiency measures, such as replacing inefficient oil and propane heating equipment, air sealing, insulation, and other measures that have a direct impact on reducing GHG emissions from oil and propane consumption. Income-qualified homeowners are eligible for incentives to make energy improvements. AHPwES applicants may also qualify for GJGNY assessment and financing programs.

Key accomplishments as of this reporting period:

- During Q3 and Q4 2022, 19 energy efficiency projects were completed at a contracted value of \$237,145, bringing the total to 9,766 energy efficiency projects completed at a contracted value of \$93.7 million.
- Of these recently completed projects, all were AHPwES, which serves homeowners with incomes less than 80% of area median income. As indicated above, the market rate component of HPwES ended in December 2019, and the remaining pipeline projects have been processed. In the future, it is expected that the only remaining project submissions will be AHPwES projects.

An impact evaluation for this program was completed in Q2 2022 and is summarized in the evaluation section.

4.2.2.6 Solar Thermal Incentive Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.2.2.7 Low-Rise Residential New Construction Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.2.3 Municipal Water and Wastewater Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.2.4 Building Electrification Pilot Projects

4.2.5 Disadvantaged Communities Schools/Buildings

This program will fund high-performance energy efficiency and electrification in affordable housing. NYSERDA has partnerships in place with NYS Homes and Community Renewal (HCR), NYC Housing Preservation and Development (HPD), and the New York City Housing Authority (NYCHA) and will continue supporting decarbonization projects with these agencies. In particular, this program will allow (1) HCR-regulated affordable housing located in non-SBC territories, including municipal electric territory or Long Island, to access building decarbonization grant funding as part of HCR's financing processes and (2) provide training, technical assistance, and strategic planning resources to support NYC HPD's development of a long-term, portfolio-wide decarbonization strategy. Additionally, this initiative will support work with public housing authorities, like NYCHA, to decarbonize building with an emphasis on advancing packaged heat pump systems to develop clean heat for all.

4.3 Innovative Greenhouse Gas Abatement Strategies

4.3.1 Industrial Innovations Program

The Industrial Innovations program is a longer-term program that supports development and demonstration of technologies with substantial GHG reduction potential and technologies relevant to New York State manufacturing industries and building systems. Funded projects will focus mainly on innovations that reduce the use of fossil fuels, have high-replication potential for the State's manufacturing base, and are likely to be cost-effective. Projects will focus on technical innovations, including thermal-efficiency improvements for fossil-fuel based processes and alternative processes that eliminate the use of fossil fuels directly and indirectly for technologies that bring about thermal destruction of byproducts. Projects also may include changes in material input and development of advanced controls, provided they directly bring about GHG reduction.

In 2014, two Manufacturing Innovations solicitations were issued: PON 2858 (Ultraviolet Light and Electron Beam Process Innovation and Market Transformation [UV/EB]) and PON 2927 (Transformative Technologies for Energy-Efficient Manufacturing [TTEEM]). These solicitations sought to advance the materials, methods, and machine tools used to mass-produce cleantech products, and thus reduce the GHG footprint of factories producing cleantech products, as well as reduce the cost of goods.

Key accomplishments as of this reporting period:

- A project with SulfCrete of Long Beach, NY continues to move forward—leveraging \$750,000 in federal funding from the United States Department of Energy (DOE) to supplement the \$400,000 NYSERDA funding award—and is benefiting from the involvement of Brookhaven National Labs for the commercial scale-up and demonstration of SulfCrete, a clean, energy-efficient alternative to conventional Portland cement concrete. The contract for this project is expiring at the end of 2023 but is expected to be extended to continue this project.
- A project with Sweetwater Energy involving building or installing manufacturing processes to supply cellulosic and lignin-based products made progress in previous quarters and came to a consensus to cease efforts in 2023. When active, the NYGB was engaged Sweetwater Energy.

4.3.2 Climate Research and Analysis Program

The Climate Research and Analysis Program supports research studies, demonstrations, policy research and analyses, and outreach and education efforts. Through these activities, the program addresses critical climate change related problems facing the State and the region, including the needs of environmental justice communities.

Key accomplishments as of this reporting period:

- The last RGGI-funded project in this program, on changes in hazardous algal blooms under future climate conditions, has been completed and the final report posted.⁷
- Over the years, the program has supported numerous research projects concerning climate change impacts and adaptation to assist policy- and decision-makers, through development of interactive tools, modeling, and reports. Research topics have included sea level rise, high-intensity precipitation, and extreme heat and health.
- Through the Community Risk and Resiliency Act (CRRA) process, the DEC previously adopted the NYSERDA-supported ClimAID projections for New York State as the official sea level rise projections for the State. NYSERDA staff continued to participate in an interagency working group to coordinate efforts on CRRA and the Climate Act. NYSERDA will continue to engage with this group, offering suggestions and support when appropriate.

4.3.3 Clean Energy Business Development

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.3.4 Charge NY

Charge NY will pursue three main strategies to promote plug-in electric vehicle (PEV) adoption by consumers across New York State. First, NYSERDA developed and implemented a rebate program for PEVs starting in 2017, accelerating purchases of PEVs by reducing higher upfront costs. Second, NYSERDA will invest in marketing and awareness-building activities to build interest in PEVs among the general public. 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. 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 also support the installation of PEV charging stations at workplaces and multifamily buildings—location types that have been seen to be effective motivation for PEV adoption, based on usage data reported from previous installations. Regions of the State that have seen faster PEV adoption will be identified for additional charging station support, which ensures investments in infrastructure support areas with the greatest potential for additional PEV drivers. Charge NY will also initiate the deployment of a network of direct current (DC), fast charge stations across the State.

Key accomplishments as of this reporting period:

- Through December 2022, NYSERDA has issued more than 86,000 rebates. The program reached new heights in 2022, with rebate applications 60% higher than the number from any previous year (32,000 in 2022). As of Q1 2021, the Drive Clean Rebate program was entirely funded with RGGI proceeds. Outreach for the program included booths at the New York International Auto Show in 2018, 2019, and 2022 which was done in collaboration with other NYS agencies, ConEdison, Northeast States for Coordinated Air Use Management (NESCAUM), and the Greater New York Auto Dealers Association (GNYADA).
- NYSERDA launched a brand-neutral PEV consumer awareness campaign, *Drive Change. Drive Electric.* in collaboration with other northeastern states and 16 automakers in March 2018. The campaign aims to inform potential car buyers about the benefits of driving electric vehicles. The partners have reached consumers through paid and organic social media marketing, earned media, and the website, DriveElectricUS.com.
- In September 2018 NYSERDA launched Charge Ready NY, a charging station deployment program that provides \$4,000 rebates for the installation of EV charging stations at public, workplace, and multiunit dwelling locations and \$4,500 rebates for stations installed in disadvantaged communities. The program has exhausted all of its funding and resulted in the installation of over 4,000 charging ports.

4.3.5 Transportation Research

The goal of the Transportation Research Program is to commercialize technologies, products, systems, and services that provide superior GHG reduction. Activities include product development, performance validation, field testing, policy development, and business assistance to help emerging technologies achieve successful commercialization. This program has not received new funding in several years and is winding down. Work on these contracts is coming to a close. For the final open project, Unique Energy Solutions is in the process of upfitting 12 electric delivery trucks for United Parcel Service (UPS), six of which are complete.

4.3.6 Carbon Capture, Recycling, and Sequestration

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.3.7 Advanced Buildings

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.3.8 Competitive Greenhouse Gas Reduction Pilot

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.3.9 Brookhaven National Laboratory Ion Collider

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.3.10 Natural Carbon Solutions

Achieving a net-zero carbon economy will require reducing emissions across all sectors. The agriculture and forestry sectors are looked upon to contribute carbon sequestration (i.e., negative emissions) as well as emissions reductions. The Natural Carbon Solutions program will catalyze technology and business

solutions and lay the foundation for an economically self-sustaining bioeconomy in New York State. By establishing a marketplace of natural emissions-lowering solutions the program will demonstrate pathways to support disadvantaged rural communities, economic development, existing agriculture, and forestry industries, while increasing jobs and revenue.

4.3.11 Equity and Climate Transformation Research

The Equity and Climate Transformation Research program will establish an engaged, participatory research framework to study the social dimensions of an equitable and inclusive transition in a manner that centers the lived experiences of underserved and overburdened communities and prioritizes beneficial outcomes for disadvantaged communities. The program will provide the investment necessary to develop both formal proposals for long-term funding as well as pilot initiatives. These pilot initiatives will aim to (1) test initial research hypotheses, (2) engage with a diverse set of NYS communities to understand how they would most benefit from this research and how they can be most effectively engaged in the process and (3) convene academics. The creation of an Equity and Climate Transformation Research Agenda will support scientifically rigorous inquiry that also advances transformative, inclusive solutions to climate action challenges in New York State. The work will inform strategies for effective climate awareness and consumer education initiatives.

4.3.12 Climate Mitigation and Resilience Research

RGGI funds will support additional work done by the Climate Action Council Integration Analysis team and leverage current research investment to expand on energy and environmental analyses. This will include additional sensitivity analyses on land-use and climate change impact scenarios. This research would map out the risks and vulnerabilities related to climate change impacts for both the business-as-usual energy system and the carbon neutral energy system.

4.4 Community Clean Energy

4.4.1 Climate Smart Communities

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.4.2 Economic Development Growth Extension Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.4.3 Cleaner Greener Communities

Former Governor Andrew M. Cuomo announced the Cleaner Greener Communities (CGC) program in his 2011 State of the State address. In coordination with the Climate Smart Communities program, the program provided support for development and implementation of a variety of sustainability strategies to help ensure that the State's ongoing investments in infrastructure aid in moving communities and New York State as a whole toward a self-sustaining, more environmentally sound future. The program encouraged communities to use public-private partnerships and develop regional sustainable growth strategies in areas such as energy efficiency, renewable energy, low-carbon transportation, and other carbon reductions. The program emphasized activities associated with smart growth, creation of green jobs, building green infrastructure, investing in environmental justice communities, and strengthening environmental protection.

Key accomplishments as of this reporting period:

- All contracts from the third round of funding have been previously executed. There are currently only 15 projects that remain open—the rest have been closed.

4.4.4 Regional Economic Development and Greenhouse Gas Reduction Program

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.4.5 Reforming the Energy Vision Campus Competition Program

The Energy to Lead Competition is a competitive solicitation issued by NYSERDA's REV Campus Challenge initiative. The program challenges colleges and universities across the State to develop and implement plans to advance building decarbonization and innovative, cost-effective clean energy solutions on their campuses and local communities. Institutions are encouraged to incorporate students, curriculum integration, and community engagement into their projects. Proposals with the best solutions to achieve deep energy savings and combat climate change through energy efficiency, renewables, or GHG emission reductions will win approximately \$1 million each to help implement their plans. There were three rounds of the Energy to Lead Competition, which is no longer accepting applications.

Proposals for the first round of the Energy to Lead Competition were due April 4, 2016. NYSERDA received 40 proposals from 33 institutions. The winning institutions and their proposed projects were announced on May 16, 2016, and included two awards funded through RGGI:

- 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 annually.
- The State University of New York 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.

In August 2017, NYSERDA launched a second round of the Energy to Lead Competition with proposals due January 29, 2018. NYSERDA received 24 proposals from 19 institutions. The winning institutions and their proposed projects were announced on October 22, 2018 and included one award funded through RGGI:

- Suffolk County Community College will implement net zero energy components during construction of its Renewable Energy and STEM Center. The project will showcase clean energy technologies to the broader community, promote student engagement in clean energy projects, and integrate curricula to develop a qualified workforce.

In September 2019, NYSERDA launched a third round of the Energy to Lead Competition with proposals due February 22, 2020. NYSERDA received 18 proposals from 17 institutions. The winning institutions were announced on June 8, 2021 and included one award funded through RGGI:

- The City College of New York Building Performance Lab will develop a control based, systematic process for facilities staff and building operators to increase their ability to effectively manage and properly commission major energy consuming systems on campus. The project will deploy, test, and document a systematic process to engage students and facility staff in implementing building automation, system-based procedures that offer control of electricity use.

Key accomplishments as of this reporting period:

- The State University of New York at Buffalo completed their project as of Q3 2022 with completing the installation of rooftop solar panels at four campus buildings. The on-site and off-site solar should enable the university to achieve their goal of 100% of purchased electricity to be renewable energy. In addition, the university's sustainable living learning lab (GRoW Home) supported through this project has been frequently leveraged by students and faculty as a learning and meeting space.

- Bard College filed an application with the Federal Regulatory Commission (FERC) on May 1, 2019 for an exemption from licensing for the micro hydropower project. Bard is still awaiting FERC approval, which is expected Q2 2023. A local law was passed that supports and eases the installation of micro hydropower facilities, so Bard has been able to proceed with design and purchasing. The micro hydropower dam is on schedule to be constructed and operational in Spring/Summer of 2023.
- Suffolk County Community College has been steadily moving forward with the construction of their net zero Renewable Energy & Science, Technology, Engineering, and Math (STEM) Center. The major construction aspects of the building are complete, and the certificates of occupancy and substantial construction of the building is expected to be complete Q2 2023 with classes beginning Fall 2023. The building's solar array and geothermal system are installed, and building commissioning is well underway.
- The City College of New York Building Performance Lab has been assessing building equipment use and operations as well as establishing baselines from energy-use data. The project staff and facility staff are coordinating together to find the most optimal improvements to their operations by integrating the new System Advisor Model (SAM) platform on the campus. The project team has been actively training facility staff and implementing energy reduction projects. Initial results from the project have been compiled, which show significant energy reduction and an avoided cost of \$279,000.

4.4.6 Clean Energy Communities

In the fall of 2015, NYSERDA, through the third and final round of the Cleaner, Greener Communities (CGC) program, awarded three contracts for regionally based outreach and technical assistance services to support NYSERDA's new Clean Energy Communities program. These services expand on the efforts undertaken previously through Climate Smart Communities (CSC) and Economic Development Growth Extension (EDGE). In addition, communities that receive the Clean Energy Communities designation will be eligible to apply for grants to implement innovative clean energy projects.

The statewide Clean Energy Communities program, which is co-funded through the Clean Energy Fund (CEF), supports local governments with a common platform and the coaching, facilitation, technical assistance, and expertise for implementing the local-level policies and planning needed to drive future clean energy market activities. These local-level actions accumulate and help to deliver the regional sustainable growth strategies encouraged by the CGC program, consistent with the regional sustainability and economic development plans. The Clean Energy Communities program also complements the New York State Department of Environmental Conservation's (DEC) Climate Smart Communities Certification Program by assisting communities working toward certification.

Key accomplishments:

- Clean Energy Communities Coordinators have helped 823 communities complete and submit 3,381 High Impact Actions, 3,168 of which were completed after the program launch, through the Clean Energy Communities program.
- Four hundred and seventy-one communities completed at least four High Impact Actions and became designated Clean Energy Communities.

A market evaluation of the Clean Energy Communities program was completed in the fourth quarter of 2019. For more information on this evaluation please refer to section F.2. Completed Evaluations in the appendix of this report. Additionally, an impact evaluation was completed in Q4 2021.

4.4.7 Community Energy Engagement

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.4.8 Priority Population Workforce Development

NYSERDA has committed more than \$127 million, including \$19 million in RGGI funds, to support workforce development and training initiatives. These efforts will help train and prepare more than 40,000 New Yorkers for growing clean energy job opportunities and assist clean energy businesses in recruiting, hiring, and training workers. More importantly, these efforts prioritize training programs for the State’s most underserved populations—low-income individuals, veterans, disabled workers, single parents, the formerly incarcerated, and individuals from disadvantaged communities—and will also help integrate displaced workers into the clean energy industry. NYSERDA has provided funding to support important partnerships with labor, colleges and universities, community-based organizations, not-for-profits, manufacturers, trade associations, and others, to ensure workers are trained through continuing education courses, certificate programs, degree programs, internships, apprenticeships, and on-the-job training. Additionally, NYSERDA supports clean energy businesses, transitioning fossil fuel workers, and new entrants into the workforce through the three initiatives summarized below. To date, the majority of RGGI funds are earmarked for these three programs which prioritize funding and, in some cases, offer higher incentives for individuals from disadvantaged communities and priority populations.

NYSERDA’s Internship and On-the-job Training programs provide a wage subsidy to clean energy businesses and organizations, helping reduce the risk of hiring and training new workers in many emerging fields, including high-efficiency HVAC and energy efficiency.

- **The Clean Energy Internship** program introduces the clean energy industry and relevant career experiences to students, recent graduates, and individuals from disadvantaged communities.
- **The On-the-Job Training** program, administered in partnership with the Department of Labor, provides higher incentive levels and flexible participation options for small businesses, minority- and women-owned businesses, businesses hiring heat pump workers, and businesses hiring members of priority populations and disadvantaged communities.
- **The Climate Justice Fellowship** program funds the professional development, training, and mentoring for 150 full-time fellows to work on climate justice initiatives, ensuring an equitable clean energy transition for all New Yorkers, but especially for those disproportionately burdened by environmental health hazards and those who could benefit the most from clean energy.

4.4.9 Clean Energy Hubs: Community and Stakeholder Engagement

NYSERDA will continue building local capacity within disadvantaged communities and improve stakeholder engagement through the Clean Energy Hubs program, which will increase engagement of residents and communities in New York City, support the participation of community-based and advocacy organizations in stakeholder meetings, and supporting local projects. NYSERDA will launch a network of Community Energy Hubs, which will build on the success of the Community Energy Engagement Program, in which community and locally based organizations across New York State provided outreach and education services to help low-income residents and small businesses make informed energy choices and access incentives and other resources to implement clean energy projects. The Hubs will be designed to enhance community-level engagement and capacity building by supporting clean energy concierge services. These services will be provided to residents, small businesses, nonprofits, and multifamily building owners in disadvantaged and underserved communities to increase awareness and adoption of clean energy programs and solutions, with the focus of creating a more inclusive clean energy economy.

In addition, NYSERDA will help to increase the capacity of organizations to advance clean energy projects at the local level. NYSERDA will advance a pilot effort to increase the potential for community-based organizations to plan for and develop community-scale clean energy projects that can benefit disadvantaged communities with capacity development grants. RGGI funds allocated to this program will allow for statewide activities alongside efforts supported through the Clean Energy Fund.

4.4.10 Healthy Homes New Design and Construction Challenge

This program will create a healthy home builder and developer network to get builders to design and offer carbon-neutral homes. Funding will also be used to run a healthy Neighborhood Design Challenge to support all electric sub-divisions and planned communities, as well as promote the benefits of healthy homes. Through this program, NYSERDA can accelerate the pivot to decarbonization of residential new construction and build market capability across (i.e., focus on Long Island area to complement existing activities already using Clean Energy Funds elsewhere in the state), which will support requiring decarbonized new construction via code and regulations on an accelerated five-year track.

4.4.11 Climate Action Consumer Awareness and Education

RGGI funding will be used to increase awareness and understanding of the critical need for and benefits of climate action in New York State. This investment will include an umbrella campaign to encourage broad engagement that is coordinated with a targeted marketing effort to impact the purchase decisions and actions that are needed to reach the State's goals. The targeted effort will address specific barriers across critical sectors and encourage adoption of new technologies that will improve quality of life and help decarbonize our buildings and economy.

4.4.12 Statewide Community Air Quality Monitoring

NYSERDA has allocated \$8 million in RGGI funding for community air monitoring. The statewide initiative, led by the New York State Department of Environmental Conservation, has been designed to monitor air quality in 10 disadvantaged communities, home to approximately five million New Yorkers living in areas historically overburdened by environmental pollution. Using air sensor-equipped, low-emissions vehicles on public roads, this initiative is measuring hyperlocal, community-based air pollution levels to screen for local sources of air pollution street-by-street in these communities for one year. The initiative is currently collecting this hyperlocal air pollution data to help identify sources contributing to disproportionate air pollution burdens and develop strategies to reduce air pollution within these communities, including greenhouse gas emissions contributing to climate change.

Key accomplishments as of this reporting period:

- Public engagement undertaken throughout the State. DEC held two community meetings prior to the start of the monitoring to help define the study areas. DEC continues to engage the public with project update meetings. Currently they have started the third round of project update meetings for each of the 10 communities.

- Ten communities have been selected for monitoring, which has commenced in:
 - July 2022: Bronx, Manhattan, Capital Region, Buffalo/Tonawanda/Niagara Falls.
 - September 2022: Brooklyn, Queens, Hempstead/New Cassel/Roosevelt/Uniondale/Westbury, Mount Vernon/Yonkers/New Rochelle, Syracuse, Rochester.
- An online system has been developed and launched to access the progress data, which is currently available to the DEC, NYSERDA, Climate Justice Working Group members, and relevant Community Based Organization identified by DEC.

4.5 Green Jobs - Green New York

Green Jobs - Green New York (GJGNY) provides funding for energy assessments, low-cost financing for energy upgrades, and technical and financial support to develop a clean energy workforce. GJGNY is a statewide effort to strengthen communities through energy efficiency and uses constituency-based organizations (CBO) to support program outreach in underserved communities. GJGNY enables New Yorkers to make a significant difference in homes, businesses, and neighborhoods—making them more comfortable, sustainable, and economically sound. GJGNY is administered by NYSERDA and made available by the Green Jobs - Green New York Act of 2009. The GJGNY 2021 Annual Report issued in October 2022, presents financial data for the approved GJGNY programs through June 30, 2022.⁸

The Green Jobs - Green New York Act allocated \$112 million in funding from the State’s share of RGGI to support GJGNY. In consultation with the GJGNY Advisory Council, NYSERDA sub-allocated the funding, including interest earnings, across the various program components prescribed by the GJGNY Act. In addition to the RGGI funds, NYSERDA received a U.S. Department of Energy Better Buildings grant in the amount of \$40 million, of which \$18.6 million supports GJGNY financing or outreach. On occasion, NYSERDA also supplemented the GJGNY program funding with additional RGGI funds where needed to ensure uninterrupted program services.

By far the greatest demand for GJGNY funding generates from the residential revolving loan fund, with issued loans totaling its original allocation in less than three years. The residential revolving loan fund is now maintained primarily through proceeds from the sale of bonds, along with limited RGGI funds. More details regarding the bond issuance process and sustainability of the loan fund are in the annual report.

Funding allocated to individual components of Green Jobs - Green New York is nearly fully committed or expended. In order to maintain required elements of the GJGNY Act, NYSERDA included GJGNY initiatives in the planning of the CEF.⁹ NYSERDA is working with stakeholders to incorporate lessons learned from GJGNY into CEF planning to ensure benefits from the initiatives continue, particularly those benefitting the LMI sector.

A measure adoption rate assessment of GJGNY residential energy audit-only projects was completed in the fourth quarter of 2020. For more information on this evaluation please refer to section F.2. Completed Evaluations in the appendix of this report.

4.5.1 Assessments

One- to Four-Family Residential Buildings Program Assessments

HPwES is a comprehensive energy efficiency services program for existing one- to four-family homes. As of January 1, 2020, the HPwES program is no longer active; however, the Assisted HPwES program (available to LMI one- to four-family homes) remains operational. Participating certified contractors conduct comprehensive home energy assessments and upgrades. Free and reduced-cost home energy assessments are available to homeowners in New York State through the GJGNY Act of 2009, which drives increased participation in this program and cuts additional GHG emissions.

Key accomplishments as of this reporting period:

- A total of 3 GJGNY funded assessments were completed in Q3 and Q4 2022, bringing the total to 99,951 residential GJGNY assessments completed with RGGI funds; 92,860 (93%) were provided at no cost to the customer.
- Of the program's cumulative 54,908 completed residential units that use a GJGNY assessment and/or GJGNY financing, 25,028 (46%) units are associated with income-qualified Assisted HPwES customers.
- Constituency-based organizations assisted with the completion of 3,177 units, or 6% of all completed GJGNY residential retrofits.

A summary of results from an evaluation of GJGNY audit-only projects can be found in section F.2. Completed Evaluations in the appendix of this report.

Multifamily Performance Program Assessments

This program is now closed. Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

Small Commercial Energy Efficiency Program Assessments

The GJGNY Small Commercial Energy Efficiency Program stopped accepting applications on December 31, 2016 and wrapped up all program activities in the first quarter of 2017. This program offered energy assessments and technical assistance to help small businesses and not-for-profit organizations improve their energy efficiency and reduce their energy costs to support the goal of increasing clean energy project adoption statewide. The program offered free energy assessments, along with technical assistance, to help identify economically viable improvements that could yield substantial annual energy savings. GJGNY offered energy assessments to small businesses and not-for-profits with an average electric demand of 100 kilowatt (kW) or less and 10 employees or fewer. Regional firms were competitively selected by NYSERDA to provide assessments and technical assistance in this program opportunity.

In Q1 2019, the GJGNY Energy Study offering was re-launched. This offering provides subsidized energy assessments and technical assistance to help small businesses (100 full-time employees or less) and not-for-profit organizations (any size) improve their energy efficiency and reduce their energy costs by identifying economically viable improvements that could yield substantial annual energy savings, including building electrification analysis. Eligible small-businesses and not-for-profits are not required to pay into the Systems Benefit Charge (SBC). A GJGNY Energy Study contractor was competitively selected by NYSERDA to provide these energy assessments.

Key accomplishments:

- During the initial program offering, a total of 3,367 GJGNY-funded assessments were completed.
- The 2015 Small Commercial Energy Efficiency Program Impact Evaluation reported 44% of the energy savings recommended through program audits were implemented, resulting in an estimated total of 1,481 GJGNY-funded completed projects through February 28, 2017.
- Since the re-launch in Q1 2019, a total of 30 GJGNY funded assessments have been completed.

4.5.2 Financing

One- to Four-Family Residential Financing

GJGNY financing is available to participants to finance the installation of recommended energy efficiency improvements with the possibility of reimbursement through energy savings.

Net-metered technologies, including solar electric systems, are also eligible for GJGNY financing.

The Smart Energy Loan, the Residential Renewable Energy Tax Credit Bridge Loan (Bridge Loan), and the innovative On-Bill Recovery (OBR) option are the three low-interest rate financing choices available through GJGNY, which enable more projects, resulting in greater reductions of GHG emissions.

Key accomplishments as of this reporting period:

- A total of 35,963 loans have been issued totaling \$441.2 million.
- Assisted HPwES and market rate customers make up 60.7% of all GJGNY loans issued as of December 31, 2022, representing 45.3% of the total loan funds.
- A total of 10,677 OBR Loans have closed, valued at approximately \$162 million, and 323 Bridge Loans, valued at approximately \$3.8 million.
- Of the total 35,963 loans closed, 12,692 are solar loans valued at approximately \$217.9 million.
- 280 ground source heat pump loans have closed, valued at nearly \$6.2 million.
- 1,061 air source heat pump loans have closed, valued at nearly \$16.5 million.
- There are 81 renewable heat loans of which 15% represent assisted customers.

Multifamily Performance Program Financing

This program concluded with the closing of the Multifamily Performance Program. Multifamily buildings may take advantage of the Small Commercial Energy Efficiency Program Financing to assist in the financing of energy efficiency or clean energy technologies improvements.

Key accomplishments as of this reporting period:

- 23 loans closed, totaling \$12.1 million. NYSERDA's share of the total loan value is \$3.9 million.

Small Commercial Energy Efficiency Program Financing

The GJGNY Small Commercial Energy Efficiency Program offers financing to help small businesses and not-for-profit organizations improve their energy efficiency and reduce energy costs to support the goal of increased clean energy adoption statewide. In June 2011, NYSERDA launched the Participation Loan product to small business and not-for-profit customers. NYSERDA provides 50% of the loan principal, up to \$50,000 at 2% interest and the participating lender provides the remaining loan principal at its market interest rate. In June 2012, NYSERDA launched the OBR Loan for small business and not-for-profit customers, making a NYSERDA loan available for up to \$50,000 at 2.5% interest to finance recommended energy efficiency improvements. Customers can then repay their loan through

a charge on their utility bill. In July 2019, NYSERDA increased its interest rate for both Participation Loans and OBR Loans to the Wall Street Journal Prime Rate of Interest + 200 basis points, fixed at closing. Twelve lenders have agreed to offer Participation Loans. NYSERDA is negotiating a contract with a single lender of originate OBR loans on a statewide basis.

Key accomplishments as of this reporting period:

- A total of 51 OBR Loans have been closed with a total value of \$1.6 million, which represents 94% of the total financing value of \$1.7 million.
- A total of 37 Participation Loans have closed with a value of \$2.1 million. NYSERDA's share of the total value is \$1.2 million.

Predevelopment Financing

In March 2021, NYSERDA provided \$3 million in GJGNY funding and entered into a direct contract with New York City Energy Efficiency Corporation (NYCEEC), a not-for-profit lender, to issue predevelopment loans (including Integrated Physical Needs Analysis [IPNA]), Investment Grade Energy Assessment [IGEA] studies, or similar predevelopment energy/engineering studies to assess energy efficiency improvements and renewable energy installations in eligible buildings located in New York State). NYCEEC will issue loans for which NYSERDA provides 100% of the loan principal, up to \$150,000, at zero percent interest and will also issue loans, which NYSERDA provides 25% of the loan principal, up to \$500,000, between zero and 5%. Though we expect most loans will be at zero percent to help reduce the interest rate to the borrower, NYCEEC provides the remaining loan principal and will set their rate.

Key accomplishments as of this reporting period:

- One new loan was issued by NYCEEC under the program, bringing the program total to 12 loans issued.
- One loan was paid off with a Maximum Commitment amount of \$60,000.
- Forty-six percent of the Maximum Commitment of the loans has been disbursed, with \$264,643 in funding provided toward the commitment.
- Average Principal Balance for all loans was \$22,054 at the end of 2022 Q4.

Loan Loss Reserve Financing

NYSERDA provided \$10 million of GJGNY funding to fund a Loan Loss Reserve (LLR) Program and launched an open solicitation accepting applications in December 2020. The Loan Loss Reserve/Credit Enhancement provides support for financing products which support clean energy improvements in

residential (1–4 unit) dwellings, small commercial (100 employees or less), not-for-profit and multifamily (5+ unit) buildings (eligible properties) located in New York State communities. The Loan Loss Reserve will provide reimbursement for defined losses on individual transactions.

Key accomplishments as of this reporting period:

- One new application is in the process of being approved, with four total program participants approved at this time.
- A total of \$2.5 million awarded through this reporting period, with the total awarded as follows: \$1.5 million for residential sector support and \$1 million for multifamily sector support.
- To date no funding has been used to reimburse losses.

4.5.3 Workforce Development, Outreach, and Marketing

Workforce Development

The GJGNY Workforce Training and Development (WFD) initiative complements other NYSERDA and New York State Department of Labor (DOL) programs targeted at preparing individuals for energy efficiency, solar thermal, and solar electric careers in New York State. WFD programs also help to build the State’s capacity for long-term carbon reduction and facilitate energy education programs that will help build a clean energy future. Specifically, WFD efforts under GJGNY seek to expand energy-specific content in State Registered Apprenticeship and third-party accredited building trades programs. Expectations are to increase access to technical training workshops for skills enhancement and certification. In addition, the WFD programs are expected to bridge the gap between training and employment through on-the-job training incentives for businesses seeking to hire and train new workers while reaching out to low-income communities to expand training opportunities. From the program’s inception through its conclusion in March 2019, a total of 4,184 New Yorkers were trained in a range of energy efficiency and renewable energy courses.

NYSERDA issued PON 3982 On-the-Job Training (OJT) for Energy Efficiency and Clean Technology Program Opportunity Notice, which includes approximately \$520,000 in GJGNY workforce training funds that will be made available to eligible New York State employers outside of the System Benefits Charge (SBC) service territory and to support additional new hires at all businesses statewide as a supplement to Clean Energy Fund funding. This program supports wages for new hires on a first-come, first-served basis for eligible clean energy businesses. The program includes higher wage subsidies for employers that hire workers with additional barriers to employment. To date, 71 people have been hired and approximately \$520,000 in wages and training subsidies have been awarded GJGNY funds.

Additional RGGI funding (\$2.25 million) has been added to the OJT program, supporting 115 additional hires with \$938,786 awarded for those new workers through the end of 2022.

NYSERDA's PON 4000 Clean Energy Internship Program also includes \$2.25 million in RGGI funding to support internships at eligible New York State employers outside of the SBC service territory and to support additional interns as a supplement to Clean Energy Fund funding. As of the end of 2022, 351 interns have been hired and approximately \$1,758,135 has been paid to employers to support these internships with RGGI funding.

Outreach and Marketing

GJGNY provided community-based outreach, enabled one-to-one assistance with the process of participating in the program to deliver services in underserved communities. GJGNY also provided outreach services in targeted communities through constituency-based organizations (CBO), which located residents, businesses, not-for-profits, multifamily building owners, and potential workforce candidates to participate in the program. The results of the outreach efforts were detailed in previous reports, which identified what strategies worked best for their teams. Although the GJGNY outreach funding is depleted and the CBO program is no longer active, community outreach and regional engagement utilizing constituency and other locally based organizations continue under the Community Energy Engagement Program (CEEP). For additional information about that program refer to section 4.4.7 Community Energy Engagement of this report.

4.6 NY Green Bank

The NY Green Bank has replenished its funding from the RGGI Portfolio and therefore will no longer provide programmatic updates in this report. Updates can be found in the metrics report filed quarterly with the Public Service Commission.¹⁰ Refer to Appendix F: Closed RGGI-Funded Programs and Completed Evaluations for more information.

4.7 Energy Storage

In April 2019, NYSERDA launched a deployment incentive program for bulk and retail energy storage projects on Long Island. NYSERDA made available approximately \$55 million in financial incentives.¹¹ Retail incentives for projects up to 5 megawatts (MW) were deployed for residential or commercial storage projects, and these funds continue to be committed. In 2021, NYSERDA agreed to transfer the remaining \$40 million of unallocated RGGI storage incentives to LIPA to support energy efficiency

in return for LIPA committing to have a minimum of 200 MW of energy storage deployed within their service territory by 2025. This includes storage procured through a bulk storage request for proposals (RFP) that the Public Service Enterprise Group–Long Island (PSEG-LI) issued to procure at least 155 MW of bulk storage.¹²

Programmatic updates are provided in the annual State of Storage Report.¹³

4.8 Program Evaluation

Several RGGI evaluation studies are underway or in the planning stages as of the fourth quarter of 2022. The study objectives and timing are discussed in the following sections. Other study plans are also in development and will be detailed in future quarterly reports. The following types of evaluation activities are being performed:

- **Impact Evaluation** measures the outcomes and benefits of a program, calculates the cost-effectiveness of the program, and compares the outcomes to the program goals.
- **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.
- **Process Evaluation** reviews oversight and operations, gauges customer satisfaction, and recommends process and efficiency improvements.
- **Logic Model Reports** inform evaluation work by documenting the relationships between program activities; activity outputs; and the short-, medium-, and long-term outcomes the program intends to induce.
- **Evaluation Readiness Reviews**¹⁴ help identify whether a program has various factors in place that will ensure an evaluation is justified, feasible, and likely to provide useful information.

In addition, building and facility stock studies receiving support from RGGI evaluation funds are described in sections 4.8.1 and 4.8.2.

4.8.1 Evaluation of Energy Efficiency and Other Deployment Programs

NY Green Bank Financial Market Evaluation: An evaluation to assess NY Green Bank (NYGB) market transformation activities is currently underway. This evaluation is the first update to the 2019 NY Green Bank Financial Market Transformation Baseline Study. In addition to updating baseline metrics from the 2019 study, this evaluation includes case studies showcasing achievements of NYGB. The results of this evaluation will be used to inform NYGB, NYSERDA, and the financial community

of the progress NYGB has made in achieving its goals, which include addressing market barriers and financing gaps, increasing investor confidence, and achieving scale in clean energy financing since the baseline activities in the 2019 NYGB Financial Market Evaluation. This evaluation is currently underway, and results are anticipated in the third quarter of 2023.

EmPower New York and Assisted Home Performance Impact and Process evaluation: The EmPower New York (EmP) and Assisted Home Performance (AHP) Impact and Process Evaluation (also referred to as the Single Family LMI Retrofit Programs Impact and Process Evaluation), is planned to begin in the second quarter of 2023. The evaluation will cover EmPower and Assisted Home Performance projects from April 1, 2022, to March 31, 2023. The evaluation will include a rigorous billing analysis with electric and natural gas utility and delivered fuel data, a survey of participants to understand energy use behaviors and their experience of the program, and a contractor survey to understand decision they make and their experience of the program.

4.8.2 Evaluation of Renewable Energy Programs

NY-SUN Solar Energy Equity Framework Evaluation: An evaluation of the NY-SUN Solar Energy Equity Framework is underway now and will assess market drivers influencing the equitable adoption of solar energy and determine impacts and market benefits of NYSERDA's solar efforts. Future reports will summarize results.

NY-SUN Market Adoption/Balance-of-System Evaluation: An evaluation encompassing solar adoption, system characteristics, barriers and drivers influencing adoption, as well as an update to balance-of-system cost data is underway now and future reports will summarize results.

4.8.3 Building and Industrial Facility Stock Studies

NYSERDA has undertaken major building stock studies to assess residential and commercial markets across a broad range of customer segments and energy measures. The goals of these studies have been to (1) 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 (2) use this information to estimate the technical, economic, and achievable energy

efficiency opportunities in New York State in the next three, five, and 10 years. These studies have been supported by the System Benefits Charge (SBC), Energy Efficiency Portfolio Standard (EEPS), CEF and RGGI funds; RGGI funds have supplemented the budget to allow for robust data collection on fuel measures.

A building stock assessment of the multifamily sector commenced in the first quarter of 2021. While this Multifamily Building Stock Study is funded through a separate funding portfolio, outcomes from the study will have broad applicability. The overall objective of the study is to evaluate and develop a baseline of the existing multifamily building stock and associated energy use, including the saturations of energy consuming equipment (electric, gas, and other fuels), the penetrations of energy-efficient equipment, renewables, and energy-management practices. Data collection is underway, and results of this study are expected in Q4 2023.

A team of evaluation consultants was competitively selected in Q1 2021 to conduct a comprehensive statewide industrial stock baseline study for key industry sectors. Work commenced in Q2 2022. While the work is funded through a separate funding portfolio, the outcomes from the study will have broad applicability. The Statewide Industrial Stock Baseline Study will help identify the industries, industrial facilities, and end uses that offer opportunities for greenhouse gas reductions, energy efficiency, beneficial electrification, and renewable energy for achieving the New York State Climate Leadership and Community Protection Act's (Climate Act) 2050 goals and beyond. Results from the secondary analysis phase of this work are anticipated in Q1 2023, while the comprehensive analysis, including a potential study, is anticipated Q4 2023.

An update to the Residential Building Stock Assessment is planned to be scoped in Q3 2023.

Appendix A. Savings Calculations Methodology

This appendix describes the general methods and assumptions used to calculate the energy savings, emission reductions, bill savings, and cost-effectiveness metrics presented in this report.

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 CO₂ Reductions

Emission factors translate the energy savings data into annual GHG emission reduction values. The GHG evaluated in the report include carbon dioxide, methane, and nitrous oxide. Because each of these gases has a different global warming potential,¹⁵ emissions for gases other than carbon dioxide are converted into carbon dioxide equivalent units (CO₂e) through multiplication with their appropriate Intergovernmental Panel on Climate Change (IPCC) global warming potential value,¹⁶ shown in Table A-1.

Table A-1. Global Warming Potentials

These values represent a 100-year time horizon.

Source: Intergovernmental Panel on Climate Change, 1995. Second Assessment: Climate Change.

Gas	Global Warming Potential
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	25
Nitrous Oxide (N ₂ O)	298

NYSERDA uses the emission factors shown in Table A-2 to calculate emissions from on-site fuel combustion derived from the U.S. Environmental Protection Agency (EPA) emission coefficients. The CO₂e values represent aggregate CO₂, CH₄, and N₂O emissions. If a program covers more than one sector, then the estimated reduction is based on a calculated average emission factor for the affected sectors.

Table A-2. Fuel Combustion Emission Factors by Sector

	Transport (lbs: CO ₂ e/MMBtu)	Residential (lbs: CO ₂ e/MMBtu)	Commercial (lbs: CO ₂ e/MMBtu)	Industrial (lbs: CO ₂ e/MMBtu)
Coal	N/A	224.8	211.4	203.7
Natural Gas	117.2	117.2	117.2	114.5
#2 Oil/Distillate/ Diesel	163.0	162.9	162.9	162.9
#6 Oil/Residual	N/A	N/A	166.0	166.0
Kerosene	N/A	161.2	161.2	161.2
Propane	136.1	136.1	136.1	136.1
Gasoline	158.0	N/A	N/A	N/A
Aviation Fuel	159.2	N/A	N/A	N/A
Wood	N/A	18.2	18.2	4.1
Steam	N/A	106.1	106.1	N/A

For projects installed prior to 2016, a marginal emission factor of 1,160 pounds of CO₂e/MWh is used to estimate emission reductions associated with electricity reductions for all sectors.^{17 18} When a project is installed and committed from 2016 onward, a marginal emission factor of 1,103 pounds of CO₂e/MWh is applied to estimate emission reductions associated with electricity use reductions for all sectors. Although electricity savings may not lead to near-term emission reductions under the RGGI CO₂ cap, savings will potentially reduce imports of electricity to NYS. The demand for CO₂ allowances, which could lead to a possible future reduction in the cap as well as reduce the carbon footprint of end users—as users will be responsible for a smaller percent of the emissions associated with electricity production.

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 A-3 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, excluding basic service charges.

Table A-3. Fuel Prices by Sector^a

Sector	Electricity (\$/kWh)	Natural Gas (\$/MMBtu)	Fuel Oil/ Distillate (\$/MMBtu)	Propane (\$/MMBtu)
Residential	0.18	8.57	27.54	37.01
Commercial	0.16	5.09	21.77	25.07
Industrial	0.12	5.09	22.74	31.04
Transportation	0.05	N/A	26.93	N/A
C&I	0.14	5.09	22.23	28.06

Sector	Residual (\$/MMBtu)	Kerosene (\$/MMBtu)	Wood (\$/ Cord)	Coal (\$/MMBtu)	Gasoline (\$/MMBtu)
Residential	N/A	29.84	7.83	N/A	N/A
Commercial	14.75	29.84	N/A	5.78	N/A
Industrial	14.75	24.64	N/A	4.24	N/A
Transportation	N/A	N/A	N/A	N/A	N/A
C&I	14.75	27.24	N/A	5.01	28.36

^a 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 2014 retail prices as reported in NYSERDA's Patterns and Trends- NYS Energy Profiles: 1997–2014 (NYSERDA 2016).

Table A-4. Program Measure Life Assumptions

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

Program	Electricity Measure Life	Fuels Measure Life
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
RGGI—Cleaner, Greener Communities	15	15
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
Charge NY	10	10

Appendix B. Former Program Names

Table B-1. Former Program Names

Current Program Name	Formerly Known As
Residential Efficiency Services	Residential Space and Water Heating
Municipal Water and Wastewater	Water and Wastewater Efficiency; Water and Wastewater Energy Efficiency
Industrial Innovations	Industrial Process Improvements; Advanced Building Systems and Industrial Process Improvements
Transportation Research	Advanced Transportation Development
Clean Energy Business Development	Clean Technology and Industrial Development
Power Systems	Advanced Power Technology Program (AFTP)

Appendix C. Summary of Portfolio Benefits

Table C-1. Summary of Portfolio Benefits

Visit: <https://data.ny.gov/Economic-Development/Summary-of-Portfolio-Benefits-from-RGGI-funded-Pro/euip-iahh> on OpenNY.

Table C-2. Summary of Fuel Savings by Type

Visit: <https://data.ny.gov/Energy-Environment/Fuel-Savings-by-Type-from-RGGI-Funded-Projects/3dbk-8jiw> on OpenNY.

Appendix D. NYS RGGI Auction Proceeds

Table D-1. NYS RGGI Auction Proceeds

Visit: <https://data.ny.gov/Energy-Environment/New-York-State-RGGI-Auction-Proceeds/vxtc-b4mv>
on OpenNY.

Appendix E. Total NYS RGGI Funds

Table E-1. NYS RGGI Funds

Visit: <https://data.ny.gov/Energy-Environment/New-York-State-RGGI-Funds/bkzt-72yv>
on OpenNY.

Appendix F. Closed RGGI-Funded Programs and Completed Evaluations

F.1 Closed Programs

F.1.1 New York Generation Attribute Tracking

NYSERDA established the New York Generation Attribute Tracking System (NYGATS) to record electricity generation attribute information in New York State as well as to process such information from energy imported and consumed as a basis for creating tradable generation attribute certificates. Through NYGATS, entities are able to verify and substantiate ownership of renewable energy certificates to either (1) support regulatory compliance, (2) validate environmental attributes in trading markets, or (3) substantiate the fulfillment and verification of voluntary green market product claims. NYGATS also characterizes the attributes of electricity imports and exports and has the capability to interface and exchange information with other certificate tracking systems. The system is used for (1) the creation of annual disclosure labels for New York Load Serving Entities (LSE) under the Environmental Disclosure Program (EDP), (2) generation projects to apply for eligibility under Tier 1 of the Clean Energy Standard (CES), (3) LSEs to substantiate compliance under the CES, and (4) CES progress reporting. Additionally, NYGATS certificates are the instrument to be received by the utilities in exchange for providing the environmental value component of the Value of Distributed Energy Resources (VDER) Phase 1 Value Stack tariff. As previously ordered by the Public Service Commission (PSC), this project is also supported with System Benefits Charge (SBC) environmental disclosure program funding.

Key accomplishments as of this reporting period:

- Executed the modification in NYGATS to accommodate the Competitive Tier 2 program approved by the Public Service Commission on October 15, 2020.
- As of April 1, 2021, NYGATS was extended an additional five years, but the funding source has changed and is no longer using RGGI funds.

F.1.2 Multifamily Carbon Emission Reduction Program

The Multifamily Carbon Emissions Reduction Program (MCERP) provided financial assistance and technical support to owners of multifamily buildings converting their heating systems from #6 fuel oil to cleaner fuel alternatives. Less carbon-intensive fuels include ultra-low sulfur #2 fuel oil, biodiesel and biodiesel blends, natural gas, and renewable energy (geothermal and solar thermal). MCERP was positioned to encourage early adoption of New York City's phase-out of #6 oil and, as such, has

contributed to an overall improvement in NYC's air quality. Converting #6 fuel oil-heated buildings to cleaner fuels reduces carbon emissions, improves air quality, and produces positive public health benefits. Citywide conversions have resulted in 69% reductions in airborne sulfur dioxide and 23% reductions in soot concentrations. These benefits are concentrated in low-income areas of NYC, where poor air quality leads to higher rates of asthma and other respiratory illnesses, especially in children and the elderly.

Key accomplishments:

- In total, 144 multifamily buildings have converted from burning #6 oil to cleaner alternatives, primarily natural gas, or a blend of natural gas, and #2 oil through the Multifamily Carbon Emission Reduction Program.

F.1.3 Multifamily Performance Program

The Multifamily Performance Program (MPP) serves residential buildings with five or more units. Funds are targeted at efficiency measures that help to reduce on-site oil, non-firm natural gas, steam, and propane energy demand in multiunit residential buildings. All buildings receive program support for energy assessments to determine cost-effective measures, expected energy savings, and installation costs. Projects also receive implementation incentives to support the installation of measures identified by program supported assessments.

Key accomplishments:

- Through program closure on June 3, 2020, 106 energy efficiency projects were completed, representing efficiency upgrades to 27,097 units.

A process/market evaluation and impact evaluation for the Multifamily Performance Program were completed in the third quarter of 2014 and the fourth quarter of 2015, respectively. For more information on this evaluation, please refer to section F.2. Completed Evaluations in the appendix of this report.

In the first quarter of 2021, a contractor was selected to conduct the Multifamily Building Stock Study. While this work is funded through a separate funding portfolio, outcomes from the study will have broad applicability. The overall objective is to evaluate and develop a baseline of the existing multifamily building stock and associated energy use, including the saturations of energy consuming equipment (electric, gas, and other fuels), the penetrations of energy efficient equipment, renewables, and energy management practices. This study is underway, and results are expected in Q4 2022.

F.1.4 Green Residential Buildings Program

The Green Residential Building Program (GRBP), established under Public Authorities Law 1872, was a market transformation initiative designed to change the building practices of the residential construction industry for single-family homes and multifamily homes with up to 11 dwelling units. The GRBP offered incentives to owners who obtain a certification stating that their newly constructed residences meet or exceed Leadership in Energy and Environmental Design (LEED®) or National Green Building Standard guidelines, as well as other GRBP program-specific energy efficiency and health and safety requirements. Buildings that meet GRBP requirements will help reduce energy use and GHG emissions, save water and other natural resources, use sustainable building materials, reduce waste, and improve indoor air quality. Sixty-nine contractors participated in this program. Per the enabling law, the application deadline was October 31, 2013; therefore, the program is now closed to new applications. The following data represent only those projects in which RGGI funded the incentive, representing 82% of the program activity.

Key accomplishments:

- Four hundred forty RGGI-funded projects were completed.

F.1.5 Solar Thermal Incentive Program

NYSERDA's Solar Thermal Incentive Program incentivizes the installation of solar thermal technologies to produce hot water to displace electric heated hot water systems. Approximately 100 contractors participate in this program. While funding from the Renewable Portfolio Standard (RPS) program displaces electrically heated domestic hot water, RGGI support for the Solar Thermal Incentive Program encourages the use of heating fuels other than electricity. GJGNY financing is also available for these projects.

The revised program, released on March 20, 2015, provides cash incentives for the installation of new solar thermal (hot water) systems by an eligible installer or contractor. Incentives are available on a first-come, first-served basis. Incentives are applied to the total project cost based on displaced kilowatt hours. The program allows combination systems (systems that provide domestic hot water and space heating); however, incentives are only provided on the portion of the solar thermal system output that offsets hot water production.

Key accomplishments:

- In total, 14,216 MMBtu have been saved through 180 projects and their solar thermal contribution to domestic hot water.

F.1.6 Carbon Capture, Recycling, and Sequestration

This program area aims to build the State’s capacity for long-term GHG emission reductions by researching strategies to prevent emissions from releasing into the atmosphere. The program focuses on the following:

- Assessing and demonstrating carbon capture, reuse, compression, and transport technologies.
- Characterizing and testing the State’s geological sequestration potential.
- Supporting the development of carbon capture and sequestration demonstration projects in NYS.

The program’s largest supported project was TriCarb, located in Rockland County, NY. TriCarb leveraged NYSERDA funding with more than \$8 million of U.S. Department of Energy funds to investigate the potential for geological sequestration in the Newark Basin.

Key accomplishments:

- The Newark Basin, extending through southeastern New York State, northern New Jersey, and into eastern Pennsylvania, could potentially be used for the sequestration of carbon dioxide in the region surrounding New York City.
- This project characterized geological formations of the Newark Basin to determine whether these formations represent an opportunity for large-scale sequestration of carbon dioxide, through seismic analysis and gathering geological data.
- The geological characteristics of some of the formations do offer some potential for sequestration. More research would be needed before such an operation was undertaken.
- The project was completed in Q3 2017 and has now been closed.

F.1.7 Advanced Buildings

Electricity and fossil fuel use in buildings are a major contributor of overall GHG emissions. The goal of the Advanced Buildings Program is to drive technology development and commercialization of innovative building technologies for existing buildings and new construction that offer greater energy efficiency, accelerate the integration of renewables into buildings, offer resiliency, and enable net zero energy building.

Key accomplishments:

- The final report for the Energiesprong/Transition Zero assessment has been completed. The report has been made public and will be used to drive interest in RetrofitNY.

F.1.8 Competitive Greenhouse Gas Reduction Pilot

The Clean Energy Business Development program seeks to support emerging business opportunities in clean energy and environmental technologies while maintaining the goal of carbon mitigation.

Key elements of the program include the following:

- Providing financial support to leverage private investment in early-stage and growth-stage clean energy companies in New York State and accelerate the market introduction of innovative energy efficiency, renewable energy, or carbon abatement technologies.
- Advancing the transition of clean energy technologies or technologies that improve the energy efficiency of industrial processes from the development/demonstration stage to the launch of commercial-scale manufacturing or application.
- Developing and supporting a portfolio of programs designed to translate clean energy technology research into commercially viable business enterprises.

As part of the effort to bring private investment to early-stage clean energy companies in New York State, NYSERDA is working with the impact investment group, Investors' Circle, to develop a local network in New York City branded as Investors' Circle New York (IC NY). The group held monthly meetings/events to bring together the impact/social investing community in the New York Metropolitan Area, introduced clean energy investment opportunities to IC NY members, and provided feedback to the clean energy companies on how to successfully pitch to the impact/social investing community. IC NY is working to form and grow an effective and sustainable local network that will foster early-stage and growth-stage impact/social investments in clean energy companies in NYS. Additionally, IC NY worked to create stronger ties to key segments of the impact/social investor community, including foundations, family offices, sovereign wealth funds, and high-net-worth individuals.

Energy storage is an enabling technology important to the market penetration and value of intermittent renewable energy resources such as solar and wind. Financial support for the New York Battery and Energy Storage Technology Consortium (NY-BEST) Test and Commercialization Center in Rochester is partially provided by RGGI. The center is a wholly owned subsidiary of NY-BEST and operated

by DNV, a technical advisory services firm. The lab's grand opening occurred on April 30, 2014, and it conducted the first test on May 28, 2014. In addition, in March 2015, the BEST Test and Commercialization Center BTCC received the American Association for Laboratory Accreditation for International Organization for Standardization (ISO) 17025 Lab Quality.

76West is an initiative focused on clean energy business development in the Southern Tier. As outlined in the 2015 State of the State address, this \$20 million investment will catalyze a clean energy business cluster that builds on the local strengths and assets of the Southern Tier.

The Photovoltaic Manufacturing Consortium (PVMC) is a \$5 million effort with more than 40 industrial collaborators as members or affiliates. Its goal is to accelerate the development, commercialization, manufacturing, field testing, and deployment of next-generation solar electric and lightweight photovoltaic systems.

Key accomplishments as of this reporting period:

- Investors' Circle New York continued to hold meetings for the impact/social investment community in metropolitan New York through the end of its contract in 2020. The project resulted in several startup pitches and two investments in New York State clean technology startups.
- The 76West Clean Energy Business Competition released its final batch of awards in Q3 2020 and the program is now concluded. There will be no further awards from this program.

F.1.9 Competitive Greenhouse Gas Reduction Pilot

This pilot program was initiated to support market-ready projects that reduce GHG emissions at electric generating facilities in the State. The projects selected were based on a combination of requested dollar-per-ton GHG emission reduction, expected level of GHG emission reduction, and the technical merit/replication of the project across the power plant fleet in NYS. It was anticipated that projects could include, but not be limited to, supply-side energy efficiency and advanced controls resulting in cost-effective GHG emission reductions.

Key accomplishments:

- Both projects awarded under this program continue operating with improved performance. The Con Ed East River Generating Station Competitive Greenhouse Gas Reduction (CGGR) project completed its third and final year of operation and resulted in a 453% improvement in emission rate reductions post modification. The project has also delivered emission benefits of 83% and 393% reductions in its first and second year of operation, respectively. The Caithness Long Island Energy Center CGGR completed its final year of operation and resulted in a -12% emission rate post modification. The result can be attributed to the degradation of the plant performance. In the first two years of operation, the modifications delivered emission reductions of 143% and 83%.

Due to historic poor participation in this pilot program, the program was terminated in Q4 2016 and no further requests for proposal will be sought. The two projects awarded under the first program RFP have continued to be managed to verify performance, and final results were reported in Q2 2020.

F.1.10 Low-Rise Residential New Construction Program

NYSERDA's Low-Rise Residential New Construction Program¹⁹ (LRNCP) includes the New York ENERGY STAR® Certified Homes Program and the New York Energy Smart designation for certain low-rise, multiunit buildings and gut rehabilitation projects. Funded primarily through the Energy Efficiency Portfolio Standard, this program is designed and intended to encourage the construction of new single-family homes and low-rise residential dwelling units that (1) operate more energy efficiently and reduce long-term GHG emissions, (2) are more durable, and (3) provide a healthier environment for their occupants. Starting in July 2013, RGGI funded the MMBtu-savings component of the LRNCP incentive for projects using propane or oil as the primary heating fuel. Although more than 165 builders participate in this program statewide, 24 builders have constructed homes eligible for RGGI incentives. RGGI funds were fully committed as of Q3 2015.

Key accomplishments:

- The cumulative total of new dwelling units constructed to date is 263.
- The total funds leveraged to date is \$1.04 million.

F.1.11 Municipal Water and Wastewater Program

The Municipal Water and Wastewater Program provided a unique opportunity to coordinate RGGI climate change goals and funding with American Recovery and Reinvestment Act (ARRA) along with the United States Environmental Protection Agency (EPA) goals and funding, while installing infrastructure to improve the environment and keep NYS waters clean and healthy. This program was co-managed by the NYS Environmental Facilities Corporation (EFC) and NYSERDA. EFC secured ARRA and Green Project Reserve funds from the EPA to bolster efforts to finance wastewater infrastructure via the Clean Water State Revolving Fund program. Wastewater plants installed through the program are energy efficient, thus minimizing carbon emissions and improving their economic and environmental performance.

Selected projects received RGGI-funded technical analyses to identify costs and savings associated with energy efficiency, process improvement, and carbon abatement opportunities in support of EPA-funded grants and financing for plant upgrades. The program was one of five national recipients of the States Stepping Forward Program Award for excellence by the American Council for an Energy-Efficient Economy.

Key accomplishments:

- Technical energy analyses completed for projects in 59 communities.
- Through January 2017:
 - Communities have installed systems resulting in annual savings of 19,503 MWh and 51,425 MMBtu.
 - New York City was still installing systems which will result in additional annual savings of 13,336 MWh.

F.1.12 Brookhaven National Laboratory Ion Collider

Cornell University (CU) and the Brookhaven National Laboratory (BNL) are designing, building, and commissioning the Cornell-BNL ERL Test Accelerator (CBETA), a four-pass, 150 MeV electron Energy Recovery Linac (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. BNL will manage all aspects of the initiative and serve as the project contractor. The contract cost to NYSERDA is \$25 million. 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.

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 of the eRHIC accelerator.

Energy Recovery Linacs (ERLs) recover energy from a used electron beam in order to accelerate more beam. The Cornell Brookhaven ERL Test Accelerator (CBETA) additionally saves energy by using permanent magnets rather than electromagnets, and by using superconducting accelerating structures. These energy-saving features enable far larger beam currents than in similar conventional accelerators. CBETA, funded by NYSERDA, achieved single pass beam energy recovery on June 24, 2019, a world-first for this kind of accelerator. CBETA then achieved Milestone 11: four-pass beam with energy recovery on December 24, 2019, with four accelerating passes followed by four decelerating passes in a single loop, making it the most energy efficient accelerator of its kind in the world.

In 2016 when the CBETA project was initiated, the purpose was to test new technologies that might be used for a future electron-ion collider (EIC), the next large particle accelerator in the U.S. Just after CBETA satisfied the final technical milestone (four-pass beam with energy recovery), the U.S. Department of Energy (DOE) announced the selection of Brookhaven National Laboratory in Upton, NY, as the site for a planned major new nuclear physics research facility. The Electron Ion Collider (EIC), to be designed and constructed over 10 years at an estimated cost between \$1.6 and \$2.6 billion, will ensure that the U.S. and NYS remain at the forefront of high-energy physics and particle accelerator technology for many years to come.

The CBETA project is now complete and is in an excellent position to study what it takes to make low-energy, high-current electron beams available to extend the capabilities of an EIC through a process called hadron beam cooling. Additionally, CBETA allows research and development (R&D) for many other accelerators with a wide range of high-current and high-brightness electron beams, including Ultrafast Electron Diffraction, hard X-ray production, and extreme ultraviolet (EUV) production

by a free-electron laser (FEL) for microchip lithography. NYSERDA's investment in CBETA will continue to pay dividends, enabling the study of accelerator physics for the new regime of beam parameters that are enabled by its groundbreaking technology.

F.1.13 Economic Development Growth Extension Program

The Economic Development Growth Extension (EDGE) program facilitated by Regional Outreach Contractors performs on-the-ground outreach, education, and marketing of NYSERDA program opportunities to residents, businesses, institutions, and local governments across the State to promote the value of energy efficiency, sustainable growth practices, clean energy technologies, and innovations using carefully constructed public-private partnerships. The program aligns with New York State's Regional Economic Development Council (REDC) initiative and provides direct support to advance the strategic priorities and regionally significant projects identified in each region. NYSERDA is providing a greater level of education and adoption of energy efficiency and renewable energy practices at the community level.

The EDGE Program concluded April 30, 2016. In August of 2016, NYSERDA launched the Clean Energy Communities Program, which builds upon the successes of the EDGE Program. The Clean Energy Community Program provides grants, direct technical support to communities, and recognition to local governments that demonstrate leadership in the area of clean energy.

Key accomplishments:

- A total of 1,102 partnerships were developed that may help to identify and assist in customer engagement.
- A total of 1,489 public outreach activities, such as events, presentations, or other speaking engagements were conducted.
- A total of 4,117 projects were referred to various NYSERDA programs.
- A total of 3,215 project referrals from partners were received.

F.1.14 Emerging Technology/Accelerated Commercialization Program

NYSERDA's Emerging Technology/Accelerated Commercialization (ETAC) initiative seeks to accelerate market uptake of commercially available but underused building technologies and strategies in the residential sector that will deliver significant and measurable energy savings, and GHG emissions reductions. NYSERDA recognizes the significant value in the ETAC program and its alignment with

RGGI investment objectives; however, funds previously allocated to this program were repurposed for other initiatives. The ETAC program continues to seek to identify and overcome barriers to full-market adoption of new and/or underutilized technologies through other NYSERDA program resources.

F.1.15 Climate Smart Communities

Established in 2009, the Climate Smart Communities (CSC) program is comprised of a network of local governments across the State that have committed, by adopting the Climate Smart Communities Pledge, to reduce greenhouse gas (GHG) emissions and better prepare for unavoidable changes in climate. In addition to NYSERDA, the CSC program works in partnership with five other State agencies the: DEC, Department of State (DOS), Public Service Commission (PSC), Department of Transportation (DOT), and Department of Health (DOH).

In March 2011, NYSERDA issued a competitive solicitation to select contractors for a three-year CSC Regional Coordinators Pilot Program. The goal of this pilot program is to create and implement a strategic plan for engaging local governments in the CSC program, producing measurable results for climate protection and adaptation in each region, and developing important elements of guidance for local governments. The main outreach and technical assistance components of the three-year pilot program ended in November 2015. NYSERDA will continue to offer similar outreach and technical assistance to communities through the new Clean Energy Communities program which launched in August of 2016. In the meantime, NYSERDA is working with utilities to ensure that communities have access to their aggregated energy-use data for clean energy and sustainability planning purposes.

Key accomplishments:

- NYSERDA is continuing to work with the Joint Utilities to build out the Utility Energy Registry, a statewide platform designed to collect aggregated energy-use data for communities on an ongoing basis. In April 2018, the Public Service Commission issued the Order: Adopting the Utility Energy Registry (Case numbers: 17-M-0315, 16-M-0411, and 14-M-0224). NYSERDA expects to make data available on its website in Q3 2018, with a full platform launch in Q4 2018.

F.1.16 GJGNY Multifamily Performance Program Assessments

Through GJGNY, the Multifamily Performance Program provides financing and co-funding for comprehensive energy assessments and the development of an Energy Reduction Plan (ERP), serving market-rate and low- to moderate-income residential buildings with five or more units to increase adoption of clean energy in the State. The needs of the multifamily sector are addressed by working with developers, building owners, and their representatives to improve the energy efficiency, health, safety, and security of multifamily residential buildings—targeting potential participants who are committed to the implementation of energy-related improvements. NYSERDA offers incentives to install eligible measures outlined in the ERP. Each incentive is subject to funding availability from the EEPS or RGGI. Per-unit incentives are available for projects predicted to achieve the 15% energy reduction threshold. Additional performance payments apply to eligible projects that predict and achieve savings of more than 20%.

Key accomplishments:

- A total of 316 assessments were completed through June 2019, of which 50% are associated with affordable housing.
- Of the program cumulative 61,795 residential units that were served with installed measures, 30,853 units (50%) are associated with affordable housing.

F.1.17 Regional Economic Development and Greenhouse Gas Reduction Program

The Regional Economic Development and Greenhouse Gas Reduction (REDGHG) program supported projects identified as priority initiatives consistent with the New York State’s Regional Economic Development Council (REDC) initiative and were not otherwise provided financial support by other NYSERDA programs or initiatives. REDGHG (1) provided cost-share funding for energy efficiency, clean and renewable energy, and/or innovative carbon abatement projects that address the regional priorities of the REDCs, (2) supplied results in strategic investments, and (3) built the capacity in the region to participate in the State’s clean energy economy. REDGHG focuses on several end uses, including transportation, manufacturing and industrial process, buildings, agriculture, municipal processes, renewable electric generation, and district energy.

Key accomplishments:

- Eight large-scale projects of varying types were completed. These included anaerobic waste-water treatment, battery manufacturing, transportation fuel-switching, and a zero-energy building.

F.1.17 Community Energy Engagement

In November of 2017, NYSERDA launched its Community Energy Engagement Program (CEEP), which is co-funded through the Clean Energy Fund (CEF), to build awareness and increase uptake of local renewable and energy efficiency solutions. Through this program, trusted, local organizations conduct energy awareness and education to residential, multifamily, and small business customers with an emphasis on increasing the amount of funding and financing leveraged for the completion of clean energy projects and solutions. Additionally, the initiative focuses on improving energy affordability and increasing deployment of distributed energy resources for community members of all income levels, with an emphasis on low- to moderate-income (LMI) households and communities.

Ten competitively selected organizations provide engagement services in each of the Economic Development Regions, as defined by Empire State Development. These organizations deploy trusted, local Community Energy Advisors (Advisors) who engage with residents, small businesses, and multifamily building owners on how to reduce energy use and greenhouse gas emissions. Advisors 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 low- to moderate-income residents and communities is a strategy to help ensure the Community Energy Engagement Program makes the greatest impact.

Key accomplishments:

- Community Energy Advisors have contacted 6,942 potential customers regarding clean energy opportunities, resulting in more than 10,194 opportunities for clean energy programs.
- Community Energy Advisors have conducted targeted program outreach focused on NYSERDA programs resulting in 2,740 opportunities for Assisted Home Performance with ENERGY STAR[®]; 2,856 opportunities for Empower New York; and 1,469 opportunities for Home Performance with ENERGY STAR[®].
- Community Energy Advisors contacted 374 low-income households that were able to receive a no cost solar subscription under the Solar for All program.
- Community Energy Advisors assisted 186 small business and nonprofit customers applying for the Green Jobs Green New York (GJGNY) Energy Study Program to obtain a reduced cost energy efficiency study and an energy study report detailing recommended energy efficiency measures.

CEEP concluded in June 30, 2022 and a similar service program funded by the Clean Energy Fund (CEF) was initiated with the launch of the new Regional Clean Energy Hubs.

F.1.18 NY Green Bank

NY Green Bank, a division of NYSERDA, is a \$1 billion investment vehicle established to attract private sector capital to accelerate clean energy deployment in NYS. NY Green Bank works to increase the size, volume, and breadth of clean energy investment activity throughout the State, expand the base of investors focused on NYS clean energy, and increase clean energy participants' access to capital. To do so, NY Green Bank collaborates with the private sector to develop transaction structures and methodologies that overcome typical clean energy investment barriers. NY Green Bank focuses on opportunities that create attractive precedents, standardized practices, and road maps that capital providers can willingly replicate and scale. As funders "crowd in" to a particular area in the clean energy landscape, NY Green Bank moves on to other areas that have attracted less investor interest.

To solve client problems in real-time and address capital provider needs, NY Green Bank operates comfortably in private sector time horizons and commercial norms. Visit NY Green Bank's website for more information on its growing portfolio and how industry participants and capital providers can do business with NY Green Bank.²⁰

Key accomplishments:

- Filed quarterly Metrics Report No. 19 on May 15, 2019 and No. 20 on August 14, 2019 with the Public Service Commission (PSC).
- NY Green Bank's overall investments to date reached \$786.7 million through June 30, 2019.
- Continued to grow NY Green Bank cumulative revenues.
- Through ongoing business development activities, achieved an active pipeline of potential investments progressing toward close at the end of the quarter of \$546.7 million.

F.2 Completed Evaluations

F.2.1. Green Jobs - Green New York Jobs Quantification Study

This study quantified the direct, indirect, and induced jobs created/retained from the GJGNY program, including those in disadvantaged communities. The study also examined changes in skill level and wages for workers resulting from GJGNY. NYSERDA issued the final reports for both phases of the study in November 2013. Both Phase 1 and Phase 2 reports are posted on NYSERDA's website.²¹ An update to the 2013 study was completed in two phases in the fourth quarter of 2016. This update is available on NYSERDA's website.²²

F.2.2. Multifamily Performance Program Process/Market Evaluation

A major Process/Market Evaluation of the SBC/EEPS-funded MPP was undertaken to assess the RGGI fuel efficiency incentive activity and GJGNY assessment/loan activity. This study was finalized in the third quarter of 2014 and published on the NYSERDA website.²³

F.2.3. Multifamily Performance Program Impact Evaluation

A major impact evaluation of the SBC/EEPS-funded MPP assessed the effects of RGGI fuel efficiency incentives. The work included measurement and verification of energy savings, and attribution analysis of projects completed from 2009 through 2011. The finalized study is available on NYSERDA's website.²⁴

F.2.4. Economic Development Growth Extension Process Evaluation

A process evaluation for this program was finalized in the third quarter of 2015 and published on the NYSERDA website.²⁵

F.2.5. Multifamily Carbon Emission Reduction Program

An impact evaluation for this program measured and verified the energy and emission effects attributable to the program. This evaluation was completed in the fourth quarter of 2015. The final report is available on NYSERDA's website.²⁶

F.2.6. GJGNY Small Commercial Energy Efficiency Program

NYSERDA conducted an impact evaluation to quantify the measure adoption rate over time and the degree to which the audit program influenced participants' decision-making regarding recommended measures that they have installed. The study was finalized in December 2015 and reported 44% of the recommended energy savings were implemented. The final report is available on the NYSERDA's website.²⁷

F.2.7. Cleaner Greener Communities Program

A process evaluation of NYSERDA's Cleaner Greener Communities (CGC) program was completed in two waves and finalized in the second quarter of 2016. Wave One of this evaluation research was completed revealing several opportunities for NYSERDA to help regions implement their Phase I plans and achieve their sustainability goals. Wave Two revealed opportunities for communities to

overcome common barriers to engaging in efficiency and sustainability activity and to encourage further investment in sustainability across the State's diverse regions. A summary of the findings from Waves One and Two are posted on NYSERDA's website.²⁸

F.2.8. GJGNY Constituency-Based Organization Program

The assessment of GJGNY Constituency-Based Organization (CBO)-related activities is complete. This assessment was coordinated with Home Performance with ENERGY STAR® (HPwES) process evaluation and includes surveys with CBO-affiliated HPwES participants, partial participants (GJGNY audit recipients), and contractors. This study was finalized in the fourth quarter of 2015 and is available on NYSERDA's website.²⁹

F.2.9. Home Performance with ENERGY STAR Program

A Process/Market Evaluation of the SBC/EEPS-funded HPwES was utilized to assess the RGGI fuel efficiency incentive activity and GJGNY assessment/loan activity. This Process/Market Evaluation study was completed in Q4 2015 and is available on NYSERDA's website.³⁰

Home Performance with ENERGY STAR® program: An impact evaluation of the Green Jobs - Green New York "assessment only" was completed in the fourth quarter of 2016. This evaluation assessed the impacts of those who received a GJGNY-funded audit and installed measures on their own in the absence of incentives.³¹

The impact evaluation of HPwES unregulated fuel³² projects was finalized in the fourth quarter of 2016 and published on NYSERDA's website.³³ The projects (completed in 2011 through 2013) encompassed cost-effective oil and propane efficiency measures, such as replacing inefficient oil and propane heating equipment and other measures that have a direct impact on reducing GHG emissions from oil and propane consumption.

An impact analysis of Home Performance GJGNY On-Bill Recovery projects was completed in Q4 2019. An analysis of pre- and post-retrofit energy bills was conducted on projects completed between January 2014 and September 2016 and found that evaluated savings as a percent of pre-install use are high in comparison to evaluated savings from other similar programs, particularly for natural gas, indicating that the program is achieving substantial savings. The report and comprehensive results of this evaluation are posted on the NYSERDA website.³⁴

F.2.10. Green Jobs - Green New York Jobs Quantification Study

Green Jobs - Green New York Jobs Quantification Study: An update to the 2013 study on this topic was completed in the fourth quarter of 2016. This study quantified direct, indirect, and induced jobs created or retained from the GJGNY program, including those in disadvantaged communities. The study examined changes in skill level and wages for workers resulting from GJGNY. The results of the two phases of this study are available on NYSERDA's website.³⁵

F.2.11. Advanced Transportation Research Program

A Logic Model for this program was completed in Q3 2015 and published on the NYSERDA website.³⁶ Six Impact/Market Impact case studies for a select group of program-supported technologies were completed in Q1 2017 and published on the NYSERDA website.^{37,38,39,40,41,42}

F.2.12. Community Solar NY Program

A Logic Model report for this program was finalized in Q3 2015 and published on the NYSERDA website.⁴³

F.2.13 Residential Non-Energy Impact Study

A study was conducted to identify and begin to quantify measurable non-energy effects from residential programs, including HPwES and the Green Residential Building Program. This study was jointly supported with RGGI and other NYSERDA funds. The major results show that insulation, ENERGY STAR home design, and air sealing measures are the readiest for cost-effective primary research efforts to further substantiate their related Non-Energy Impact (NEI) values for enhancing program design, marketing efforts, and cost-benefit analysis. The study was finalized in Q1 2017 and is posted on NYSERDA's website.⁴⁴

F.2.14. Wastewater Energy Efficiency Program

An impact evaluation of the Wastewater Efficiency Program was completed in the first quarter of 2017. The program provided objective and customized energy-related information and opportunities to customers that targeted the customer's specific energy and business needs. The impact evaluation confirmed the study-recommended savings that customers adopted. The study is available on NYSERDA's website.⁴⁵

F.2.15. Wastewater Energy Efficiency Program

An impact evaluation of the Wastewater: A Logic Model for this program was completed in Q3 2015 and is posted on NYSERDA website.⁴⁶

F.2.16. Advanced Transportation Research

A Market Characterization Assessment of the Transportation Program was completed in the second quarter of 2017. This assessment focused on three areas: electric vehicles, public transportation, and mobility management. “Mobility management” encompasses a variety of strategies designed to reduce transportation demand and congestion, including intelligent and adaptive transportation systems and transportation demand management. This market assessment includes a description of the current state of the clean transportation market in New York State and the identification of remaining barriers to adoption in key market segments that will be used for planning and strategy development by the Transportation Program. The findings of this assessment provided a five-volume market characterization analysis of clean transportation in New York State and available on the NYSERDA website.⁴⁷

F.2.16. Clean Energy Business Development

A Market Characterization of NYSERDA’s Clean Energy Business Development (CEBD) program was finalized in the second quarter of 2017. This evaluation research found that the NYS cleantech ecosystem is vibrant, with many active early-stage companies commercializing cleantech innovations, and a rich array of resources is available to support the NYS entrepreneurial ecosystem. While there are many early-stage companies, they face significant hurdles in growing at the speed and scale that may be possible. Access to resources is uneven and can be time-consuming, which can impede company growth. A summary of the findings from this research are posted on NYSERDA’s website.⁴⁸

F.2.17. Power Systems Program

An impact evaluation of the Clean Power Technology Innovation (CPTI) program, previously known as the Power Systems program, was completed in the second quarter of 2017. This evaluation was conducted in two phases. Phase 1 included a review of the contracts funded by CPTI to better understand the scope of funding recipients and to prioritize activities for Phase 2. The Phase 2 research consisted of an in-depth

investigation of three core product technologies identified during Phase 1: PV, wind, and energy storage. The maturation of the products funded by the program, as well as the grantees' perceptions of the value of NYSERDA funding, operational activities, and project support were evaluated. Findings from this research are posted on NYSERDA's website.⁴⁹

F.2.18. GJGNY On-Bill Recovery

An impact analysis of Home Performance GJGNY On-Bill Recovery projects was completed in Q4 2019. An analysis of pre- and post-retrofit energy bills was conducted on projects completed between January 2014 and September 2016 and found that evaluated savings as a percent of pre-install use are high in comparison to evaluated savings from other similar programs, particularly for natural gas, indicating that the program is achieving substantial savings. The report and comprehensive results of this evaluation are posted on the NYSERDA website.⁵⁰

F.2.19. Residential Building Stock Assessment

The Residential Baseline study was completed in the fourth quarter of 2014. The final report is available on NYSERDA's website, and the data set is available on Open NY.⁵¹ NYSERDA commenced an update to the Baseline study in 2018 that was completed in Q4 2019. The results of this update, the Residential Building Stock Assessment, is available on the NYSERDA website.⁵²

F.2.20. GJGNY Audit-Only Measure Adoption Rate Study

Home Performance with ENERGY STAR: The Green Jobs - Green New York (GJGNY) audit program was started in 2010 to provide homeowners in New York State free or reduced cost energy audits and encourage installation of energy efficiency measures through the Home Performance with ENERGY STAR (HPwES) program. Customers who choose to install measures suggested in the audit can elect to either use a NYSERDA Home Performance contractor through HPwES or to install measures on their own. This second type of customer, a GJGNY audit-only recipient who installs measures outside of the HPwES program, generates savings; however, these savings are not captured or recorded as contributing toward the State's energy goals. A Measure Adoption Rate study was launched in Q3 2019 and estimated energy savings from energy audits, conducted between 2016 and 2018.

This evaluation assessed (1) the adoption rate of the measures recommended in the energy audit report, (2) early retirement, (3) the customer interaction with the contractor that conducted the audit, and (4) the extent to which implemented projects recommended in the audits later received installation incentives from NYSERDA or other program administrators (e.g., utilities or other program overlap). Measure Adoption Rate (MAR) values as a function of measure type, fuel type, and other factors were examined to identify trends and opportunities for programmatic improvement.

The total program long-term MAR for the combination of all measures is 0.46. The total installed source-equivalent energy savings for the entire audit only population is 421,819 MMBtu, which amounts to an average savings value of 26 MMBtu per household with installed measures.

F.2.21. Renewable Heat NY

A baseline market evaluation of the Renewable Heat NY initiative was conducted in 2019. The results of this evaluation include mixed evidence that New York State sales of high-efficiency, low-emission biomass systems are increasing. Eight of the 12 participating installers thought that the sales of the high-efficiency, low-emission heating systems increased in the past year primarily due to the NYSERDA incentives. Yet the manufacturer representatives were divided on this question. Four of them said that demand for high-efficiency, low-emissions biomass units increased in the past year and three reported the demand decreased. Only a third of the 12 nonparticipating installers said that sales of these units increased in the past year.

Further, the market evaluation identified that the New York State market for biomass heating systems faces significant market barriers. All three groups of market actors interviewed by the Market Evaluation Team indicated that sales of biomass heating systems in the State—both the high-efficiency, low-emission models and standard systems were very limited. The manufacturers and installers cited several factors to explain this soft market including competition from cheaper fossil-based fuels, a lack of active biomass heating installers, and the high first cost of the biomass heating systems. The evaluation report may be accessed on the NYSERDA website.⁵³

F.2.20. Home Performance with ENERGY STAR and EmPower New York Impact Evaluation (Billing Analysis, 2012–2016)

An impact evaluation of the Home Performance with ENERGY STAR and EmPower New York programs was completed in Q2 2020 and is available on the NYSERDA website.⁵⁴

Similar to prior studies, realization rates for both programs were low, as seen in the table below. However, an update to this evaluation is currently underway and will reassess the realization rates in light of programmatic changes that occurred subsequent to the evaluation study period. This updated analysis is planned for Q1 2022.

Program	Electric Realization Rate	Natural Gas Realization Rate
EmPower NY	0.58	0.44
Home Performance with ENERGY STAR	0.51	0.42
Assisted Home Performance with ENERGY STAR	0.43	0.43

F.2.21. NY-Sun Solar Photovoltaic Program Impact Evaluation (PY May 2016–March 31, 2018)

An impact evaluation of solar photovoltaic (PV) projects installed under NYSERDA’s NY-Sun program from May 1, 2016 through March 31, 2018 was completed in the third quarter of 2020. While this study was funded through separate funding portfolios, the findings have broad applicability. A subset of solar PV installations under the NY-Sun program benefitted from support by NY Green Bank (NYGB), a division of NYSERDA. Previous installations under the NY-Sun and predecessor programs were evaluated in the NYSERDA Solar Photovoltaic Program Impact Evaluation for 2008 and 2011–2016.

The program realized an overall 12.6% capacity factor during the evaluation period, which is slightly higher than that of the 2008/2011–2016 evaluation result of 12.4%. Capacity factors for all groups but Long Island small purchase sites are below the planned capacity factor of 13.4% for the program. Additionally, the residential capacity factor of 12.4% is higher than the 2011–2016 NY-Sun residential impact of 12.1%. Small nonresidential sites show an increased capacity factor of 13.1% (previously 12.1%), while the overall nonresidential group performance has decreased from 13.2 to 12.7%. The report is available on the NYSERDA website.⁵⁵

F.2.22. Clean Energy Communities Market Evaluation

The baseline metrics for this program were collected when the program began in August 2016. The first market evaluation metrics update from the baseline measurement indicate that 1,178 communities had completed at least one High Impact Action, a substantial increase from the 467 that had completed one action at baseline. The full-market evaluation report including comprehensive results is available on the NYSERDA website.⁵⁶

F.2.23. Commercial Baseline Study

The Commercial Baseline Study was completed in the first quarter of 2020. Primary data collection took place between December 2018 and August 2019. The final report is available on NYSERDA's website⁵⁷ and the data set is available on Open NY.⁵⁸

F.2.24. Clean Energy Communities Impact Evaluation (2016–2018)

The Commercial Baseline Study was completed in the first quarter of 2020. Primary data collection took place between December 2018 and August 2019. The final report is available on NYSERDA's website⁵⁹ and the data set is available on Open NY.⁶⁰

F.2.25. Clean Energy Engagement Market Evaluation (2020)

The Clean Energy Engagement Program was successful in raising awareness of energy efficiency options and encouraging participation in clean energy programs by new customers, including LMI households. However, there are difficulties reaching multifamily buildings due to competing interests between tenants and landlords. There is room for program improvement by streamlining the application process across NYSERDA programs. The full report is available on NYSERDA's website.⁶¹

F.2.26. NYSERDA Residential Retrofit Impact Evaluation (2017–Q1 2019)

The results of the Residential Retrofit Impact Evaluation indicate that the CEF single-family retrofit program achieves energy savings for participants without fuel switching. Overall, low-income, moderate-income, and market rate participants reduced their electricity consumption by 357 kWh, 238 kWh, and 295 kWh, respectively. Low-income, moderate-income, and market rate participants reduced their natural gas consumption by 9 MMBtu, 11 MMBtu, and 5 MMBtu, respectively. However, the electric low-income program verified gross savings fell short of reported savings estimated for the program achieving 67% of the reported savings from the NYSERDA tracking database. The electric

moderate-income and market rate programs verified savings achieved 92% and 91% of NYSERDA-reported savings, respectively. Natural gas savings also fell short of the reported savings estimated for the program. For the relevant study period, natural gas savings for low-income and market rate programs achieved 68% and 63% of the reported savings listed in the NYSERDA program tracking database, respectively. Market rate natural gas savings achieved 42% of the savings reported in the tracking database. The full report is available on the NYSERDA website.

F.2.27. Home Performance and EmPower New York Impact Evaluation (2017 – 2019)

An update to the Home Performance and EmPower New York Programs evaluation was completed in the third quarter of 2022. The evaluation team first conducted a literature review to understand drivers of realization rates (RR), or the differences between reported and verified energy savings. The literature review identified the following potential drivers influencing ex-ante savings: accuracy of the engineering models, quality of program equipment installation, and end-user behavior and changes in occupancy.

The team also generated estimates of achieved program savings, or verified savings, for the CEF single-family initiatives. This impact evaluation focused on estimating the per-household, first-year energy savings for NYSERDA projects installed between 2017 through the first quarter of 2019. The electric realization rate analysis using NYSERDA-reported savings varied from a low of 0.62 for low-income participants to a high of 0.82 for market rate participants. The natural gas realization rate analysis using NYSERDA-reported savings varied from a low of 0.45 for market rate participants to a high of 0.73 for low-income participants. Overall, the results indicate that the CEF single-family retrofit program achieves energy savings for participants without fuel switching. Evaluated electric savings as a percent of the evaluated consumption baseline for low-income, moderate-income, and market rate participants were 4.66%, 2.94% and 3.06%, respectively. Evaluated natural gas savings as a percent of the evaluated consumption baseline for low-income, moderate-income, and market rate participants were 8.98%, 11.73%, and 5.54%, respectively. The evaluation report can be found on the NYSERDA website.⁶²

F.2.28. Charge NY / Drive Clean Rebate Market and Impact Evaluation (2021)

A recent market evaluation of the Electric Vehicles Rebate program found that 68% of newly registered electric vehicles (EV) in NYS received a NYSERDA rebate (funded jointly with CEF funds). As of Q1 2021, 59,828 EVs were registered in NYS indicating growth of EV popularity from the market baseline of 16,131. While EV market share represents 2.0% of all vehicles sold in the State, the market evaluation anticipates this proportion will rise significantly in the next few years.

The impact component of this evaluation found the realization rate for the EV Rebates initiative to be 0.72 for both fuel savings and electric usage. This realization rate was driven primarily by lower than projected average vehicle miles travelled (VMT). The impact evaluation measured 448,906 MMBtu of verified cumulative direct annual gasoline savings and -24,353 MWh of verified cumulative direct annual electric savings (usage) through Q1 2021 which can be attributed to RGGI funding. The evaluation report is available on the NYSERDA website.⁶³

Endnotes

- ¹ These metrics represent the benefits that can be discretely counted at this time and typically associated with traditional deployment programs. These programs include Green Jobs - Green New York, Residential Efficiency Services, NY-Sun, Renewable Heat NY, and LIPA Efficiency and Renewable Energy. These metrics do not reflect emission reductions, participant bill savings, and other possible benefits resulting from non-deployment programs such as Transportation Research and Clean Energy Communities. Therefore, the benefits associated with the overall RGGI portfolio are anticipated to be greater than the subset of programs represented here.
- ² Cumulative annual benefits are reflective of the annual impacts from all currently operational projects installed, projects under a signed contract and projects with an application received that are not yet operational since program inception. Expected lifetime benefits are reflective of the total impacts over the entire effective useful lifetime of the measures associated with all currently operational projects installed, projects under a signed contract and projects with an application received that are not yet operational since program inception. Please see Table A-4 in appendix A for the measure-life assumptions.
- ³ Baseline Market Evaluation of Renewable Heat New York, <https://www.nysersda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2020-Renewable-Heat-NY-Market-Evaluation-Report-Final.pdf>
- ⁴ Solar Photovoltaic Program Impact Evaluation for 2011-2016, <https://www.nysersda.ny.gov/-/media/Project/Nyserda/Files/Publications/PPSER/Program-Evaluation/2018-Solar-Photovoltaic-Impact-Evaluation-2011-2016.pdf>
- ⁵ Offshore Wind Policy Options, <https://www.nysersda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Biomass-Solar-Wind/Master-Plan/Offshore-Wind-Policy-Options-Paper.pdf>
- ⁶ HPwES low-rise buildings encompass buildings with three stories or less, with eight units or less, and are constructed using building techniques common to one- to four-family homes. They must be served by residential-scale heating equipment with a maximum rating of 300,000 Btu. Taller residential buildings that fit these criteria are also eligible. Examples include brownstones, row housing, and other urban-style buildings.
- ⁷ Climate Change Vulnerability of Eutrophication, <https://www.nysersda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/22-32-Climate-Change-Vulnerability-of-Eutrophication-acc.pdf>
- ⁸ Green Jobs Green New York Annual Report <https://www.nysersda.ny.gov/About/Publications/GJGNY-Advisory-Council-Reports>
- ⁹ The Clean Energy Fund (CEF), one of Reforming the Energy Vision's (REV) three strategic pillars, is designed to deliver on the State's commitment to reduce ratepayer collections, drive economic development, and accelerate the use of clean energy and energy innovation. It will reshape the State's energy efficiency, clean energy, and energy innovation programs. Visit <http://www.nysersda.ny.gov/About/Clean-Energy-Fund> for more details regarding CEF planning.
- ¹⁰ New York Green Bank Public Filings <https://greenbank.ny.gov/Resources/Public-Filings>
- ¹¹ This funding, originally allocated to the NY Green Bank, has been returned to the RGGI portfolio as the bank has recouped on the original investment.
- ¹² PSEG-Long Island 2021 Bulk Energy Storage Request for Proposals, <https://www.psegliny.com/aboutpseglongisland/proposalsandbids/2021bulkenergystoragefp>
- ¹³ State of Storage in New York, Annual Energy Storage Deployment Report, <https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={7137DCF7-178A-4D93-AC22-76301A071024}>
- ¹⁴ Formerly known as Evaluability Assessment.
- ¹⁵ A global warming potential is a measure that estimates how much a given mass of a GHG contributes to global warming. Calculations span over a specific time interval, which is 100 years for the IPCC Second Assessment Report values.

- ¹⁶ 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.
- ¹⁷ Per the Clean Energy Advisory Council (CEAC) Metrics, Tracking and Performance Assessment (MTPA) Working Group, NYSERDA has adopted a marginal electricity grid emission factor of 1,103 pounds CO₂e/MWh for projects completed after 2015 (<http://documents.dps.ny.gov/public/MatterManagement/MatterFilingItem.aspx?FilingSeq=190731&MatterSeq=50399>). Projects completed prior to 2016 will maintain the 1,160 pounds CO₂e/MWh previously used, based on analysis of grid emissions at that time. Carbon emissions reductions are now expressed in terms of metric tons. Reports published prior to August 2020 represented carbon emissions in short tons.
- ¹⁸ Beginning with Q4 2016, NYSERDA updated emission factors for natural gas, #2 oil, #6 oil, kerosene, propane, wood and steam to be consistent with emission factors used in the updated NYS Greenhouse Gas Inventory (<https://www.nyserdera.ny.gov/About/Publications/EA-Reports-and-Studies/Energy-Statistics>). These factors are derived from EPA’s February 2016 State Inventory Tool release (<https://www.epa.gov/statelocalclimate/state-inventory-and-projection-tool>). Steam emission factors have been updated to be consistent with New York City’s updated Greenhouse Gas Inventory http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC_GHG_Inventory_2014.pdf
- ¹⁹ Low-rise residential new construction is a dwelling unit(s) contained in residential buildings of not more than three stories in height. Additionally, residential buildings that are more than three stories in height and determined to be eligible to participate in the EPA’s ENERGY STAR® Certified Homes program are considered for eligibility on a case-by-case basis. Dwelling units “gut-rehabbed” or fully rehabilitated are also considered by NYSERDA for eligibility on a case-by-case basis.
- ²⁰ New York Green Bank www.greenbank.ny.gov
- ²¹ The GJGNY jobs quantification studies, Phase 1 and Phase 2, are on NYSERDA’s website: nyserdera.ny.gov/Publications/Program-Planning-Status-and-Evaluation-Reports/NYES-Evaluation-Contractor-Reports/2013-Reports/NMR-Group.aspx
- ²² Assessment of Job Impacts of the Green Jobs-Green New York Program (Phase 1), <https://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/GJGNY-Jobs-Analysis-Phase-I.pdf>
Economic Impacts of the Green Jobs-Green New York Program (Phase 2), <https://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/GJGNY-Jobs-Analysis-Phase-II.pdf>
- ²³ Multifamily Performance Program/Process Evaluation and Market Characterization, nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-MPP-Process-Evaluation.pdf
- ²⁴ Multifamily Performance Program Impact Evaluation (2009-2011), <https://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/2015-MPP-Impact-Eval.pdf>
- ²⁵ Economic Development Growth Extension Process Evaluation, nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/economic-development-growth-extension-process-evaluation.pdf
- ²⁶ RGGI Multifamily Carbon Emissions Reduction Program Impact Evaluation (2011–2012); http://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/MCERP_IMPT_RP_FINAL.pdf
- ²⁷ GJGNY Small Commercial Energy Efficiency Program, <http://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/2015-Small-Comm-Impact-Evaluation-July-2010-December-2013.pdf>
- ²⁸ Wave 1 Study: <https://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2016-Cleaner-Greener-Communities-Market-Evaluation-Wave1-Findings.pdf>
Wave 2 Study: <https://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/2016-Cleaner-Greener-Communities-Market-Evaluation-Wave2.pdf>
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**New York State
Energy Research and
Development Authority**

17 Columbia Circle
Albany, NY 12203-6399

toll free: 866-NYSERDA
local: 518-862-1090
fax: 518-862-1091

info@nyserda.ny.gov
nyserda.ny.gov



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