Operating Plan for Investments in New York under the CO_2 Budget Trading Program and the CO_2 Allowance Auction Program

Draft

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EXECUTIVE SUMMARY

New York has an opportunity to create and implement a comprehensive approach to carbon dioxide (CO_2) and other Greenhouse Gas (GHG) mitigation from the sale of CO_2 allowances from the Regional Greenhouse Gas Initiative (RGGI). Proceeds from RGGI can simultaneously be used to augment existing policies and programs to advance strategic needs in New York, including the transition to a Clean Energy Economy. The Operating Plan (Plan) was structured to help launch a sustainable, continuing carbon mitigation plan while meeting the short-term needs of a healthy economy. The Operating Plan is also designed to help build the capabilities required for an economy to thrive by incorporating climate mitigation strategies and creating and promoting advanced energy technologies necessary to advance those strategies.

This draft Operating Plan builds on a Concept Paper developed and discussed at an open public meeting of the Advisory Group.[1] Feedback from those discussions and subsequent written comments from stakeholders were considered in the development of the draft Plan. Feedback on the draft Plan will be obtained at another open meeting with the Advisory Group in March 2009, and a final version of the Plan will be provided to NYSERDA's Board of Directors for review in the spring of 2009.

Overall, the draft Plan covers a three-year planning horizon[2] and articulates how approximately $525 million dollars of CO_2 auction proceeds will be invested among twenty unique programs. The investments seek to advance the State's broad energy goal of moving toward a clean energy economy by providing reductions in greenhouse gases in the near term and positioning New York to make additional reductions in GHGs over the longer term. While almost three-quarters of the program budget will be directed at cost effectively reducing GHGs in the near term, approximately one quarter of the anticipated funds will address areas that require longer investment horizons.

The following criteria were considered in selecting the programs included in the Plan:

1. The program is cost-effective and maximizes the quantity of carbon equivalents reduced per program dollar invested.
2. The technology and investment has long-range potential to reduce GHG emissions in New York.
3. The program has the potential to reduce the cost of achieving the emission reduction goals of the CO_2 Budget Trading Program.
4. The program creates other benefits for New York, *e.g.*, creates jobs, leverages capital investment in New York to promote economic development, provides health and environmental benefits, and enhances municipal capacity to further reduce GHG emissions.
5. The initiative can help reduce the disproportionate cost burden and harmful environmental impacts on low-income families and environmental justice communities.
6. The relative need for these funds based upon availability of other funding sources for the targeted activities.

[1] The Advisory Group consists of stakeholders representing a broad array of energy and environmental interests to advise NYSERDA on how to best utilize proceeds from the sale of allowances consistent with the directives in the regulations.
[2] Covers NYSERDA's fiscal years 2009-10, 2010-11 and 2011-12. Each fiscal year commences on April 1.

OVERVIEW OF PROPOSED PROGRAMS

An overview of the proposed programs and breakdown, by sector, over the three-year planning horizon is provided in Table ES-1 below.

Table ES-1. Breakdown of Three-Year Program Budget by Sector ($000)

Sector	Three-year Program Funding	Percent of Funding
Residential, Commercial, and Industrial	$230,620	43.9%
Transportation	$93,000	17.7%
Electric Power Supply and Delivery	$103,400	19.7%
Sustainable Agriculture and Bioenergy	$10,000	1.9%
Multi-Sector*	$87,979	16.8%
Grand Total**	**$524,999**	**100%**

* Approximately $40 million of these funds are dedicated to a competitive GHG reduction bidding program that is open to projects from all sectors.
** See Section 2. for details.

This budget assumes, for planning purposes, that allowances from the first compliance period are sold at $3 per allowance. (See Section 2. Budget Overview for more details.) If New York allowances are sold in the regional auction at values above $5 per ton, the incremental revenue would be used to support the achievement of a 30 percent Renewable Portfolio Standard (RPS) goal.

As noted in Table ES-1Table 4 above, programs in the Electric Power Supply and Delivery target area have a proposed three-year funding stream of $103.4 million. However, other programs[3] using RGGI funding will bring the proposed funding for electric generation improvements to $167.4 million or 32 percent of the three-year budget. A number of projects being submitted under the Competitive Greenhouse Gas Reduction Bidding Program are also expected to involve electricity related GHG reductions.

The selected programs build upon NYSERDA's existing electric-focused programs (*i.e.*, System Benefits Charge, Energy Efficiency Portfolio Standard (EEPS), and Renewable Portfolio Standard). The programs are designed to demonstrate how RGGI funds can fill program gaps in all sectors and address all fuels by integrating various funding resources to capture additional efficiencies and GHG reduction and energy bill savings opportunities not currently available to New Yorkers and New York businesses.

The Residential Space and Water Heating; Commercial and Industrial Efficiency; and Workforce Development programs and the Water and Wastewater Efficiency component of the Municipal and Institutional Climate Change program constitute a subset of the overall program portfolio that was included in an Early Action Plan approved by NYSERDA's Board on January 26, 2009. These programs were also incorporated in the Operating Plan.

A discussion of the entire portfolio of programs, organized by sector, is provided below.

RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL

The purpose of the Residential, Commercial, and Industrial sector programs is to reduce energy used by end users through energy efficiency improvements, enhanced operating practices, and reduced on-site emissions. Because these sectors are served by established electricity energy efficiency and renewable resource initiatives and programs, the initiatives included in the portfolio are designed to fill critical gaps by targeting fuels not adequately addressed through System Benefits Charge, Energy Efficiency Portfolio Standard, and Renewable Portfolio Standard activities. The programs included under the Residential, Commercial, and Industrial Sector are: Commercial and Industrial Efficiency, Residential Space and Water Heating

[3] $20 million has been allocated to the Water and Wastewater Efficiency component of the Municipal and Institutional Climate Change Program, and $44 million has been budgeted for the Electrified Rail Efficiency program in the Transportation sector programs.

Efficiency, Municipal and Institutional Climate Change Program, Water and Wastewater Efficiency, and Advanced Building Systems and Industrial Process Improvements.

Commercial and Industrial Efficiency

The Commercial and Industrial Efficiency program offers a set of coordinated initiatives designed to achieve cost-effective CO_2e[4] reductions by providing technical support and implementation assistance to existing facilities and new construction. The majority of the targeted activities under the program integrate fossil fuel incentives into SBC- and EEPS-funded programs that currently focus on electricity savings. The program will also include incentives for solar ventilation preheating, a technology that heats air before it enters a building. This technology is an efficient means to reduce energy costs and associated carbon impacts while relying on a clean, renewable resource. Facilities from all sectors are eligible (*i.e.*, commercial, industrial, transportation, agricultural, and municipal and institutional facilities including schools and hospitals).

Residential Space and Water Heating Efficiency

This initiative targets fossil-fuel-based measures and renewable energy measures not eligible for SBC and EEPS incentives. This funding will expand the number of households served and increase opportunities for carbon reduction measures. Approximately 46 percent of this program's funds will be used to support energy efficiency improvements in low-income homes and multifamily housing, including market-rate homes, and will address environmental justice. In addition, the program includes incentives for solar ventilation preheating and supports the installation of 1,833 solar thermal domestic hot water systems over the next three years. The incentives support the achievement of a recommendation of the Governor's Renewable Energy Task Force. Consistent with the Residential Green Buildings program established in Public Authorities Law 1872, financial incentives will be provided to builders and homeowners who decide to "go green" when building new homes or extensively renovating existing homes.

Municipal and Institutional Climate Change

Local governments (*i.e.*, cities, towns, villages, and counties) and institutions, including state and local entities, schools, colleges, and universities, are important partners in climate change mitigation and adaptation. This initiative offers a variety of resources and tools including analytical and technical support related to data gathering and tracking, planning assistance, training, and implementation of carbon reduction plans with a particular emphasis on opportunities to improve water and wastewater treatment efficiencies. Assistance, support, and referrals are available to existing programs related to reducing carbon from operational (*e.g.*, procurement) and planning perspectives (*e.g.*, land use planning, codes, permitting). NYSERDA also expects to initiate a low- and no-interest revolving loan fund pilot program to reduce barriers to entry into this program.

Water and wastewater treatment uses three billion kilowatt-hours of electricity per year in New York. The initiative is designed to capitalize on the opportunity presented by the proposed federal economic stimulus package that is expected to focus on improving infrastructure. Incorporating energy efficiency into water and wastewater infrastructure projects will pay dividends over the decades-long lives of these facilities.

A recognition program for municipalities and institutions that achieve a specified level of carbon reductions will be offered. Qualifying technologies may include installation of "marquee" efficiency and renewable projects (*e.g.*, high profile photovoltaic systems, hybrid vehicles). Recognition is intended to publicly acknowledge achievements in energy efficiency and GHG emissions reductions.

[4] CO_2e stands for carbon dioxide equivalent and describes the amount of CO_2 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. Throughout this document references to CO_2 are equivalent to CO_2e.

This program also includes funding for the development of a new competition specifically for colleges and universities within New York. The competition will focus on technologies with promising climate-change-mitigation potential, such as smart-grid software design and innovative energy storage ideas. Support also will be provided for integrating climate change issues into K-12 curricula in New York schools to develop understanding and interest in the area among youth.

Advanced Building Systems and Industrial Process Improvements

This program will support development and demonstration of technologies having significant GHG reduction potential from New York manufacturing industries and building systems. Funded projects will focus mainly on innovations which reduce the use of fossil fuels, have high replication potential by New York manufacturers, are likely to be cost-effective, and are not at the present time supported under SBC programs. Building-related projects will focus on technical innovations which improve the thermal performance of building envelopes and windows, efficient heating and cooling systems, clean, biofuel technologies that displace the use of fossil fuels, and cost-effective, efficient combined heat and power systems for residential applications. Industrial projects will target thermal efficiency improvements for fossil fuel-based processes and alternative processes that eliminate the use of fossil fuels. Projects may also include changes in material inputs and development of advanced controls that directly result in GHG reductions.

POWER SUPPLY AND DELIVERY

The objective of the Power Supply and Delivery programs is to help reduce GHG emissions from the electric power sector in New York. The initiative will support a broad portfolio of projects that reduce greenhouse gas emissions from electric power generation, transmission, and distribution.

Statewide Photovoltaic Initiative

NYSERDA currently administers a photovoltaic (PV) incentive program with funds provided through the Renewable Portfolio Standard (RPS) program. The program involves more than 100 system installers that, in many cases, work for small companies that have been in operation for only a few years. Using RGGI funds, NYSERDA will expand this program statewide to include customers who do not pay into the RPS program, including customers on Long Island. The initiative will focus on communities with high peak electric demands, customers of non-regulated utilities, and off-grid applications. The funding will be provided using programs that are already underway in the state. For example, the funds could be used to expand the reach of the Long Island Power Authority's photovoltaic programs and NYSERDA would expand the current photovoltaic incentive program to make any residence, business, or institution in New York eligible to participate. Given current pricing, the program is expected to share the cost of installing approximately ten megawatts of photovoltaic power over the three-year period, which will help achieve the State's goal of installing 50 megawatts of photovoltaic power on Long Island. In addition, this program will install 100 photovoltaic systems at public and private schools in three years. The systems are designed as teaching tools and will allow each school's data to be uploaded into public web sites.

Advanced Power Technology

The Advanced Power Technology Program (APTP) is focused on reducing greenhouse gas emissions in the long term. The initiative will focus on three areas: advanced renewable energy, advanced power delivery, and carbon capture, recycling, and sequestration (CCS).

The advanced renewable energy component of the program will support site-specific pre-development activities that will foster the market introduction of a broad range of promising renewable energy technologies in New York, including advanced biomass, tidal, and off-shore wind technologies.

The advanced power delivery portion of the program will support the demonstration of advanced technologies that promote widespread adoption of renewable resources and demand-management strategies. The initiative will focus on applied demonstrations of advanced technologies that promote statewide interconnection of renewable resources, smart-grid capability, advanced meters, energy storage systems,

innovative demandside management strategies, and high efficiency power delivery technologies including superconducting cables.

Projects under the carbon capture and sequestration component of the program will focus on assessing and demonstrating carbon capture, reuse, compression, and transport technologies, characterization and testing the state's geological sequestration potential, and support the development of carbon capture and sequestration demonstration projects in New York. Large-scale demonstrations of sequestration technologies and processes will require significant leveraging of funds from the Federal government and the power sector.

TRANSPORTATION

The objective of the Transportation sector programs is to reduce greenhouse gas contributions from the transportation sector by reducing petroleum use consumption and increasing the efficiency of electric powered mass transit. This objective will be achieved by improving the efficiency of vehicles and transportation infrastructure, expanding the use of electricity and renewable fuels, and encouraging behavioral changes and smart growth policies that reduce vehicle miles traveled (VMT).

Transportation Efficiency

The objective of this program is to improve vehicle and system efficiency through measures that reduce total vehicle miles traveled and improve the efficiency of New York's diesel fleet with retrofits, replacements, and electrification.

Electrified Rail

Electrified rail is a key mode of mass transit in New York's largest metropolitan areas and uses more than two billion kilowatt-hours of electricity each year. Substantial opportunities exist to increase the efficient use of electricity in significantly load-constrained areas and to reduce the greenhouse gas footprint of operations in these areas. The program will be coordinated with utility companies, primarily the New York Power Authority and Consolidated Edison of New York, Inc., and transit authority units, primarily Metropolitan Transit Authority Headquarters, the New York City Transit Authority, the Metro North Railroad, and the Long Island Railroad.

Advanced Transportation Development

The goal of the long-term Advanced Transportation Development program is to increase the availability of improved technologies, products, systems, and services that provide substantial cost-effective GHG reductions. The program will support the development of advanced on-board chargers for plug-in hybrid electric vehicles (PHEVs), the development and demonstration of emerging technologies that improve electric rail efficiency, and the development of products such as hybrid-electric and hydraulic launch assist drive trains, efficient alternators, and idle-stop systems for urban duty vehicles (*e.g.*, taxis, delivery trucks, and buses). A key goal of the program is to reduce vehicle miles traveled by commercial and light duty, non-commercial vehicles.

SUSTAINABLE AGRICULTURE AND BIOENERGY

The Sustainable Agriculture and Bioenergy Initiative will foster efficiency and innovation and promote sustainable resource management techniques to reduce the lifecycle carbon intensity of the agriculture and bioenergy sectors in New York. The program will include a climate-friendly farming demonstration, develop methods to expand the supply and distribution chain for non-food feedstocks, and conduct research in biomass conversion technologies. The potential for carbon sequestration in New York's terrestrial ecosystem will be explored. Program priorities will be guided by findings and recommendations from the ongoing *Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply Study for New York.*

MULTI-SECTOR PROGRAMS

Multi-Sector initiatives seek to leverage auction proceeds and build the capacity to develop and implement new climate change mitigation and risk management solutions and realize a clean energy economy in New York.

Workforce Development

NYSERDA has established partnerships with many organizations throughout the state to begin training technicians, students, and professionals in energy efficiency and renewable energy technologies. These partnerships will be expanded to address proposed new RGGI initiatives and will focus on heating efficiency, solar thermal systems, and carbon benchmarking and tracking.

Competitive Greenhouse Gas Reduction Bidding Program

This program will develop an innovative multi-sector greenhouse gas reduction bidding program to identify and fund the most cost-effective market-ready mitigation options in New York. The program will be open to all sectors.

Clean Technology Industrial Development

The Clean Technology Industrial Development program seeks to create, attract, and grow industries in New York that can exploit emerging business opportunities in clean energy and environmental technologies while supporting the goal of carbon mitigation. Key elements of the program include advanced technology development, procurement of risk capital, business assistance, and cluster development.

The Clean Technology Industrial Development program also seeks to take advantage of the state's leading academic resources by establishing one or two Clean Energy Advanced Research Centers (CLEAR Centers) at universities in New York to advance and commercialize technologies relevant to carbon mitigation. CLEAR Centers are expected to conduct world-class industrial, applied, and translational research and development and to support industrial activity in New York through the commercialization of technologies.

Each CLEAR Center will be dedicated to one specific technology area; the areas will be selected based on their relevance to the reduction and mitigation of CO_2 emissions, the opportunity they offer New York to lead in developing the technology, and their potential to develop business and industry in New York. Examples of potential technology areas include:

- Carbon mitigating, clean energy technologies, *i.e.*, advanced photovoltaics
- Energy efficient technologies, *e.g.*, solid-state lighting
- Enabling technologies for renewable energy and efficiency, *e.g.*, energy storage, smart grids
- Environmental technologies for greenhouse gas mitigation, *e.g.* measurement and validation technologies

Climate Research and Analysis

This multidisciplinary initiative will increase understanding and awareness of the impacts of climate change on energy choices and provide a scientific, technical foundation for formulating effective, equitable, energy-related environmental policies and resource management practices. Research will be undertaken to assess the potential ecological, public health, infrastructure, and economic impacts of climate change in New York, investigate how risks associated with climate change can be managed and minimized in the state, determine key parameters to be monitored to establish baselines and assess climate change impacts, and explore emerging climate change mitigation and adaptation strategies pursuit by New York researchers and policy makers. The climate change research and analysis component of the Operating Plan will prioritize the assessment of potential new carbon-offset areas and policy initiatives and will address other critical areas and issues relating to climate change.

ADMINISTRATION

NYSERDA will administer the RGGI-funded programs in a transparent, open manner, using principles, policies, and procedures which have proven successful in administering similar programs in the past. NYSERDA emphasizes stakeholder collaboration, initially to design programs that can best meet the State's energy and environmental goals and, on an ongoing basis, to monitor results and make necessary changes. NYSERDA uses an open, transparent process for awarding and reporting on contracts: external reviewers serve on evaluation panels which provide recommendations for project selection; projects are approved for funding by a multi-disciplinary internal committee; and contracts are awarded and reported in detail to the public through quarterly and annual procurement reports.

NYSERDA's principles reinforce the objective of responsible fiscal stewardship. The funding provided in the Operating Plan for program administration costs will provide funds sufficient to meet NYSERDA's responsibilities, including costs for personnel and fringe benefits and direct and indirect program administration costs. NYSERDA has traditionally operated its programs with a relatively low overhead, attempting to strike a balance between keeping program administration costs low while ensuring appropriate safeguards and protections.

PROGRAM EVALUATION

The overarching goals of the RGGI program evaluation are to: provide a credible evaluation of the RGGI program portfolio and individual programs and provide timely information to all stakeholders that includes: progress toward program and public policy goals; progress in moving markets toward behavior that results in emissions reductions, increased energy efficiency, and use of renewable energy; and measuring efficiency and effectiveness of program implementation and administration. Program evaluation will ensure accountability in terms of the use of RGGI funds to meet overall program goals.

The budget for RGGI program evaluation activities is based on the program evaluation budget established for NYSERDA's current SBC-funded energy efficiency programs, which is limited to not more than five percent of total program funding. The five percent evaluation budget will support overall design and planning, implementation of plans by third-party contractors, reporting, and NYSERDA's management of evaluation activities.

NYSERDA plans to procure consultant services to assist with further design and development of the RGGI program evaluation approach. Up to $200,000 of the five percent will be allocated to the consultant for these early evaluation design and development activities. Final design and implementation of program-specific evaluation efforts will be undertaken by a separate third-party evaluation contractor competitively selected by NYSERDA. Most of the evaluation budget will be allocated to independent, third-party contractors for design and implementation of the evaluation efforts.

NYSERDA will prepare an annual RGGI program report based on findings and inputs from the evaluation contractors. The report will include for each prior year: an accounting of all sales of CO_2 allowances and the funds generated by such sales, a summary description of program activities, an evaluation of the results and impacts of such program activities and program accomplishments, and an accounting of program administration costs and expenditures.

The RGGI evaluation will be closely coordinated with NYSERDA's existing evaluation efforts for SBC and other programs. This coordination will be especially important for programs that receive SBC and RGGI funding to ensure that the evaluation does not become overly burdensome for program participants and to help minimize issues associated with survey respondent fatigue. Equally important, the evaluation efforts will also ensure proper accounting of benefits from separate funding sources.

HIGHLIGHTS OF BENEFITS

An overview of the quantifiable benefits that are expected to be achieved through this portfolio of programs is presented below. In general, the selected programs will:

- Provide substantial consumer benefits through a range of energy efficiency and renewable initiatives.
- Invest in new technologies to reduce the carbon footprints associated with power supply and delivery in New York including smart-grid technologies, advanced renewables in support of a 30 percent RPS goal, and carbon capture and sequestration methods.
- Pave the way to transforming the transportation system in New York, invest in energy-efficient mass transit, plug-in hybrid electric vehicle technologies and infrastructure, and introduce new strategies for transportation demand management.
- Stimulate a clean energy economy and support advanced research centers, clean energy industrial development, and workforce development in New York.
- Build capacity for action, partnering with municipalities, schools, communities, institutions, and businesses through a variety of programs, including a solar schools initiative, climate-friendly farming, and a climate-smart community challenge.
- Employ an innovative multi-sector greenhouse gas reduction bidding program to identify the most cost-effective market-ready mitigation options for New York.
- Reduce and avoid GHG and co-pollutant emissions, demonstrate New York's commitment to its environmental goals, and support a national, multi-sector GHG reduction program.

ENERGY BILL SAVINGS

The estimated three-year bill savings related to the six deployment programs[5] in the Operating Plan is $196 million. The savings are broken down by fuel type in Figure ES-1 below. Extrapolating the savings over the lifetime of each measure will result in an estimated $1.27 billion in total non-discounted lifetime savings. Estimated savings related to the Municipal and Institutional Climate Change program and the Competitive Greenhouse Gas Reduction Bidding Program are not included due to uncertainty with respect to project activities and associated savings.

ENERGY SAVINGS

The estimated three-year fuel savings related to the six deployment programs in the Operating Plan is 10,640,000 mmBtu across all fuels. These savings are broken down by fuel type in Figure ES- 2 below. Extrapolating the savings over the lifetime of each measure would result in an estimated 69,620,000 mmBtu in total lifetime fuel savings. Electricity savings would account for approximately 1,840,000 megawatt-hours of additional lifetime savings. Estimated savings related to the Municipal and Institutional Climate Change program and the Competitive Greenhouse Gas Reduction Bidding Program are not included due to the uncertainty in project activities and associated savings.

[5] Commercial and Industrial Efficiency, Residential Space and Water Heating Efficiency, the Water and Wastewater Efficiency component of the Municipal and Institutional Climate Change Program, Transportation Efficiency, Electrified Rail Efficiency, and the Statewide Photovoltaic Initiative.

Figure ES-1. Three-Year Bill Savings by Fuel Type ($Million)

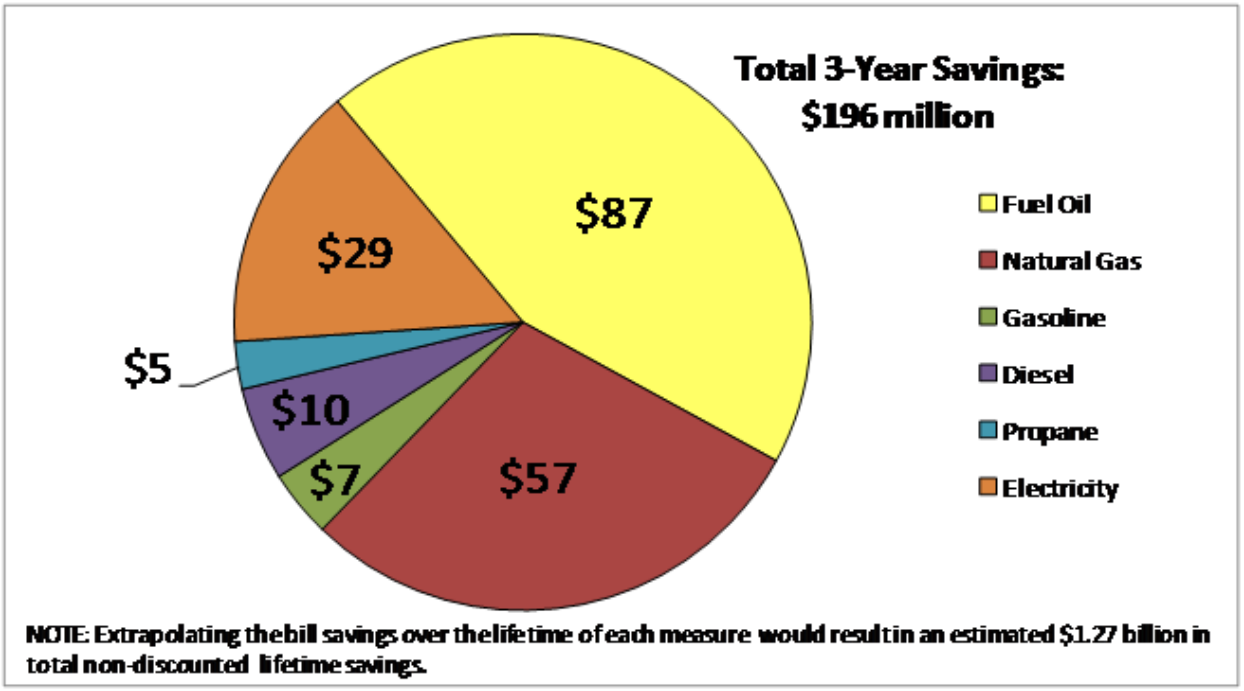
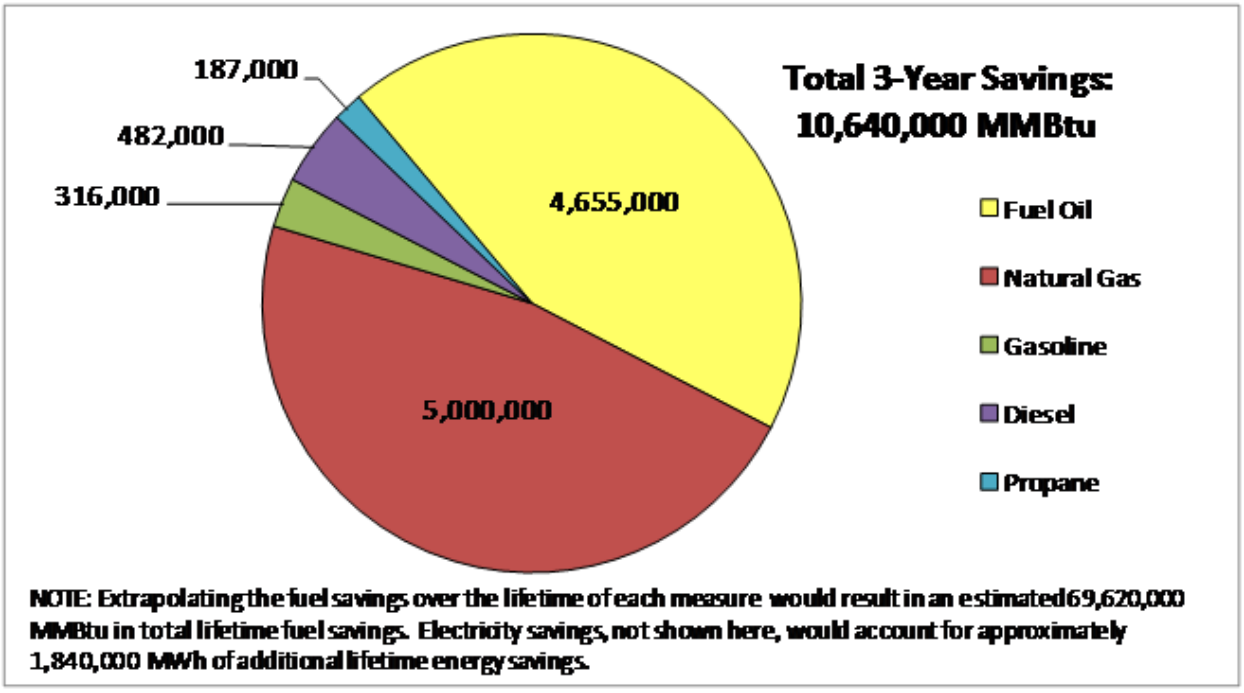


Figure ES- 2. Three-Year Energy Savings by Fuel Type (mmBtu)



EMISSIONS REDUCTIONS

Over a three-year period, the six deployment programs would reduce approximately 1.1 million tons of CO_2[6] emissions, which is equivalent to taking approximately 100,000 vehicles off the road. This portfolio of programs will save 17,369,280 gallons of diesel, 223,748,068 gallons of fuel oil, and 12,648,000 gallons of gasoline, which translates to a lifetime value of approximately 6.4 million barrels[7] of crude oil displaced. Extrapolating these results, the emissions reductions over the lifetime of the measures and practices would total approximately 7.3 million tons of CO_2. If the Competitive Greenhouse Gas Reduction Bidding Program provides emissions reductions that cost between $20 and $30 per ton of CO_2, the lifetime reductions associated with the overall portfolio of programs would range from approximately 8.6 to 9.3 million tons of CO_2.

JOB CREATION

Historical data and modeling on NYSERDA's **New York Energy $mart**^{SM} electric efficiency programs indicate that for every million dollars of total program expenditures, 5.2 sustained jobs are created or retained. The RGGI portfolio includes a mix of programs; however, if job impacts are similar to the **New York Energy $mart**^{SM} Program, full expenditure of the $588 million in RGGI funds, including administrative and evaluation costs, could create or help retain approximately 3,000 sustained jobs. Actual job impacts from the RGGI program may differ from this initial estimate and will be examined as part of the evaluation activities.

[6] These emission reductions are associated with both electric and fossil fuel saving measures. Under a cap-and-trade system, the total number of CO_2 allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, electric efficiency projects may not decrease the overall amount of CO_2 being emitted into the atmosphere by New York entities. However, electric efficiency projects will reduce the end-users' carbon-footprint since they will be responsible for a smaller percent of the emissions associated with electricity production.

[7] This estimate does not account for the full lifecycle costs for producing and distributing crude oil and petroleum products.

INTRODUCTION

New York has an opportunity to create and implement a comprehensive approach to carbon dioxide (CO_2) and other Greenhouse Gas mitigation from the sale of CO_2 allowances from the Regional Greenhouse Gas Initiative (RGGI). Proceeds from RGGI can be used to simultaneously augment existing policies and programs to advance strategic needs in New York, including the transition to a Clean Energy Economy. The Operating Plan has been structured to help launch a sustainable and continuous carbon mitigation plan while meeting the short-term needs of a healthy economy. The Operating Plan is also designed to help build the capabilities needed by an economy in order to thrive by making it easier to incorporate climate mitigation strategies and adopt advanced necessary energy technologies.

The Operating Plan represents a first step towards addressing carbon mitigation for all energy fuels and by all sectors of the economy. The approach outlined in the Operating Plan has gained wide acceptance among climate mitigation experts as exemplifying the steps necessary to adequately address the dramatic carbon emissions reductions needed to maintain carbon concentrations at current levels and avoid catastrophic climate change consequences. The Operating Plan has been organized according to primary economic sectors and identifies current opportunities that, if acted upon, can result in near-term carbon emissions reductions and that will build infrastructure and expertise to promote the systemic changes necessary for widespread, long-term mitigation.

By adopting this comprehensive approach, New York hopes to provide a successful template for the design of carbon mitigation strategies that can be implemented within the state and support a possible national climate change platform.

Identifying emissions reductions opportunities in four primary sector areas — Residential, Commercial, and Industrial; Electric Power Supply and Delivery; Transportation; and Agriculture and Bioenergy — can help decision makers identify and target program activities in two key ways. First, identifying areas for potential carbon reductions can direct programs toward cost-effective, near-term opportunities within each sector. Second, identifying long-term needs within sectors can help direct resources toward developing technology potentials and support the advancement of New York's innovation economy. As programs are designed in the four primary sectors, opportunities will be presented for short-term emissions reductions gains and for long-term next-generation technology research and development benefits. This sector and temporal approach to program identification will also help foster a more robust clean energy and innovation economy in New York.

The Operating Plan, however, is not intended to represent the totality of program activities and funding requirements that are necessary to achieve ultimate carbon mitigation goals. Rather, the Operating Plan should be considered in light of the many existing, and newly created, policies and programs that are designed to provide energy services to New Yorkers and help them achieve programmatic goals while simultaneously reducing carbon emissions. The Operating Plan has been designed to fill program gaps resulting from unmet funding needs, identify existing opportunities that have not received adequate resources, and target emerging opportunities that will feed the next generation of energy technologies that will be needed to meet ultimate targets.

In addition, despite the generous level of total funding across all government programs, incentive programs alone will not achieve deep emissions reductions over the long term. Deep emissions reductions will require systemic changes in government operations, buildings and infrastructure, and the energy consumption patterns of businesses and individuals. Systemic changes will only result from education campaigns and the capability of governmental resources to provide information and strategic planning to achieve energy efficiency and emissions reduction goals. Building the capability within private markets for energy services and the continued development of energy technologies must also be fostered so that market responses and customer choices can incorporate climate mitigation concerns. To add formal structure to the nascent

development of governmental and market-based climate mitigation capabilities, the Operating Plan targets support for "capacity building" and recognizes that research and analysis must continue to ensure the evolutionary change towards a reduced-carbon economy is pursued.

The Plan is designed to meet the following objectives, to be achieved through the identified program activities:

- Provide substantial consumer benefits through expanded energy efficiency and renewable energy activities that complement existing programs. Expanded efforts will not supplant existing programs nor limit those programs' economic development opportunities.
    - Commercial and Industrial Efficiency
    - Residential Space and Water Heating Efficiency
- Invest in new technologies to reduce the carbon footprint of the electric power supply and delivery sector.
    - Statewide Photovoltaic Program
    - Advanced Power Technology Program
        - Advanced Renewable Energy
        - Advanced Power Delivery
        - Carbon Capture and Sequestration
- Create a new program and investment strategy designed to result in a transformed transportation system.
    - Transportation Efficiency
    - Electrified Rail Efficiency
    - Advanced Transportation Development
- Stimulate a Clean Energy and Innovation Economy.
    - Workforce Development
    - Clean Technology Industrial Development
- Build capacity for sustainable energy efficiency and emissions reductions programs in State, regional, municipal, and other government institutions.
    - Municipal and Institutional Climate Change Program
- Use new program strategies and ideas to develop innovative approaches to carbon reductions in the marketplace.
    - Multi-Sector Competitive Bidding Program

Section 1. The RGGI Program and Greenhouse Gas Policy Context in New York

RGGI is a cooperative effort by ten Northeastern and Mid-Atlantic States[8] to reduce CO_2 emissions from power plants. Under RGGI, the participating states have designed cap-and-trade programs that cap CO_2 emissions from power plants through 2015 and then lower the cap by 10 percent by 2018.

Each state is implementing this initiative through individual CO_2 Budget Trading Programs that are linked through the regional cap-and-trade program. Additional background on the initiative can be found at http://www.rggi.org.

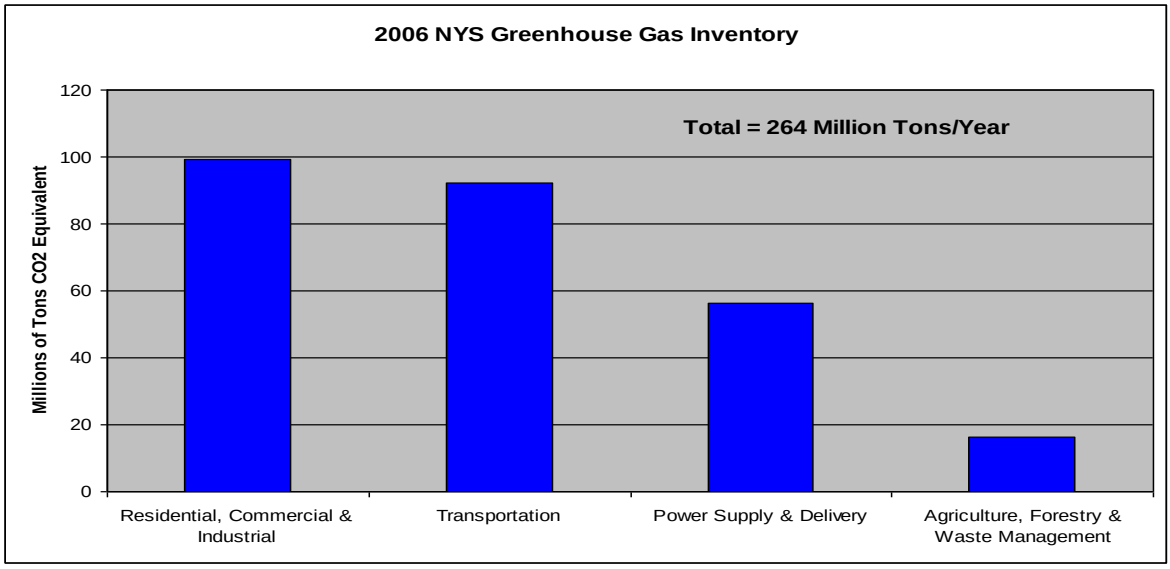
In New York, the RGGI Program has been implemented through two complementary programs: The New York State Department of Environmental Conservation (DEC) has established New York's CO_2 Budget Trading Program (6 NYCRR Part 242, 6 NYCRR Part 200, General Provisions) and the New York State Energy Research and Development Authority (NYSERDA) has established the CO_2 Allowance Auction Program (21 NYCRR Part 507).

The CO_2 Allowance Auction Program has established the rules through which New York will sell most of its CO_2 allowances. The CO_2 Allowance Auction Program (at 21 NYCRR Part 507.4(d)) also creates the parameters for use of the proceeds from the sale of allowances, and which will be used to:

> ". . . promote and implement programs for energy efficiency, renewable or non-carbon emitting technologies, and innovative carbon emissions abatement technologies with significant carbon reduction potential."

The Operating Plan was created to be consistent with the above regulatory requirements.

Figure 1. 2006 New York Greenhouse Gas Inventory—Breakdown by Sector



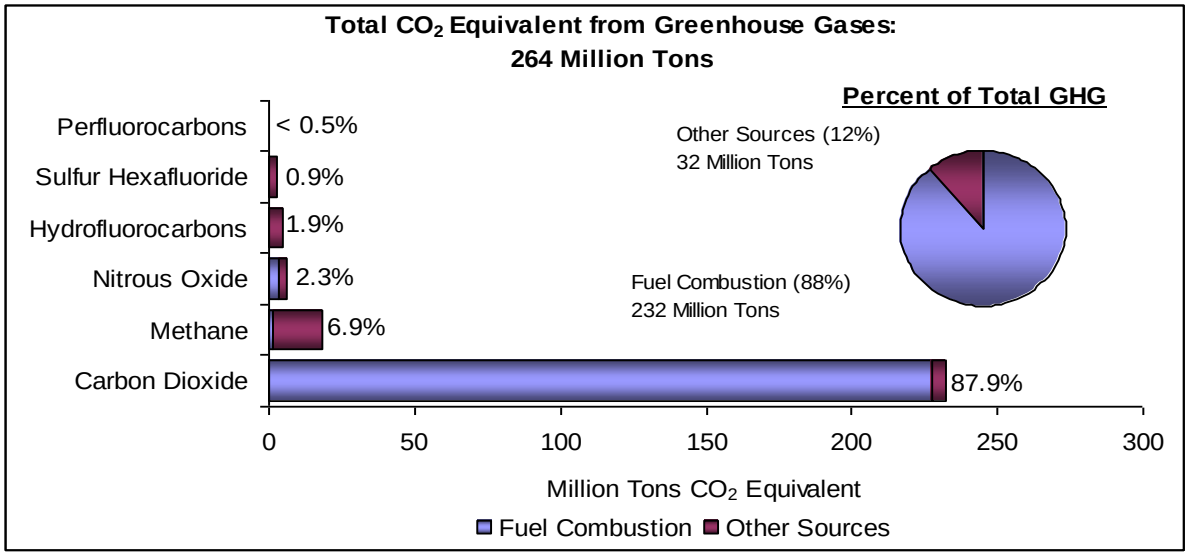
[8] Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont

1.A. New York Greenhouse Gas Inventory

To best inform New York agencies on greenhouse gas (GHG) emissions sources and levels and reduction opportunities, a Greenhouse Gas Inventory was completed. The Inventory quantified the total annual GHG emissions in New York in 2006 as 264 million tons of CO_2 and identified the sources of the emissions by sector. The emissions-by-sector breakdown is presented in Figure 1.

The Inventory also identified the contribution in CO_2 equivalent (CO_2e) tons of six primary greenhouse gases. The contribution of each gas is presented in Figure 2.

Figure 2. Breakdown of Primary Greenhouse Gas Emissions in New York for 2006



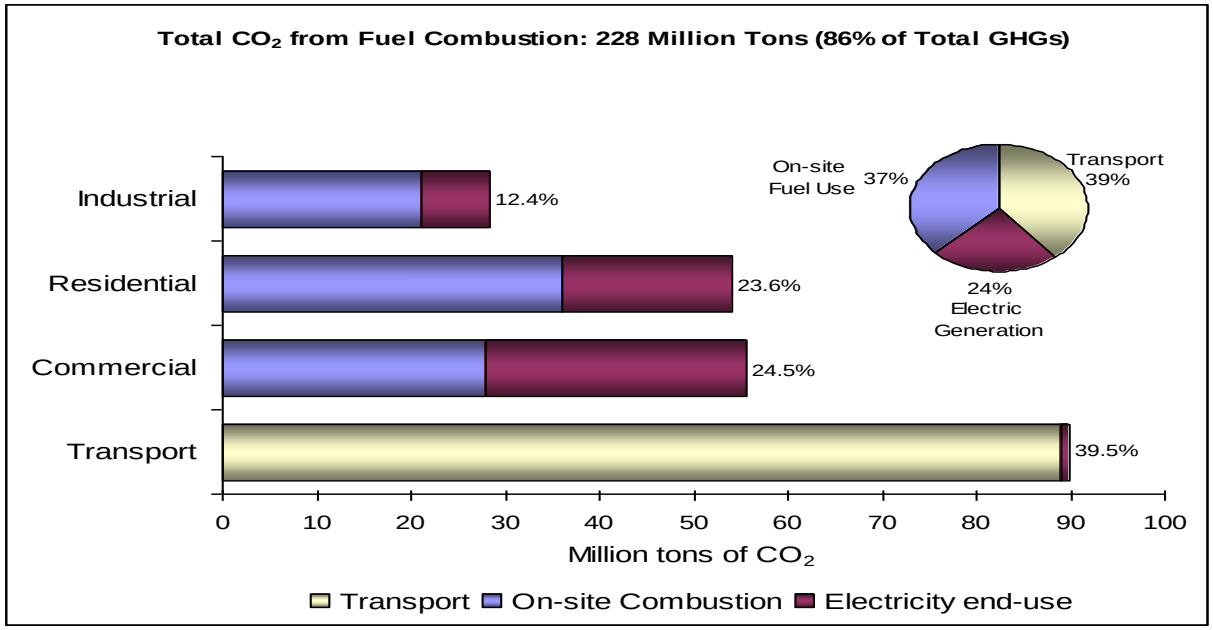
As illustrated in Figure 2, the primary GHG emitted in New York is CO_2 and CO_2 equivalents.

The Inventory examined a list of fifteen economic activities that produce GHG emissions.[9] Figure 3, in general terms, demonstrates that the primary source of New York's CO_2 emissions is fuel combustion which accounts for nearly 90 percent of all GHG emissions in the state. Fuel combustion can be broadly translated into the energy used to power our businesses, heat our homes, and power our cars.

The Inventory further refined the sources of CO_2 emissions by sector as presented in Figure 3. This sector breakdown of CO_2 emissions identifies where the opportunities for overall carbon mitigation efforts are most effectively directed and dedicated.

[9] The non-fuel combustion sources of greenhouse gases include agricultural animals, agricultural soil management, crop waste combustion, manure management, municipal waste and wastewater, natural gas leakage, aluminum production, cement production, chemical manufacturing, carbon dioxide use, electricity distribution, iron and steel manufacturing, and limestone use.

Figure 3. New York CO_2 Emissions from Fuel Combustion (2006)



1.B. Policy Context

New York currently supports a broad range of policies and programs aimed at climate change issues and energy policy and program goals.

Governor David A. Paterson has declared as a central tenet of his administration the initiation of policies and programs to transition New York to a clean energy economy. This comprehensive effort will require tapping into all elements of the state's resources — government, industry, the university system — to work together to craft creative, effective strategies that will essentially transform how New York approaches energy use and how New Yorkers can access new energy products and services to meet their energy requirements. To provide guidance in achieving this significant goal, Governor Paterson reinstituted the planning process for a State Energy Plan. Governor Paterson's Executive Order No. 2 instructed the State Energy Planning Board to include the GHG inventory and GHG mitigation strategies in the new State Energy Plan (SEP). Climate change in New York will be highlighted in the State Energy Plan and will feature prominently in the near- and long-term policy and program recommendations presented therein.

A key component of the clean energy economy is advancement of a clean energy goal — a challenge to New York to meet 45 percent of its electricity needs through improved energy efficiency and renewable energy by 2015. This "45 by 15" goal encompasses achievement of both a 15 percent reduction in electricity use, mostly through the expansion of energy efficiency activities, and development of renewable energy resources adequate to meet 30 percent of New York's electricity supply needs. In crafting the 45 by 15 goal, which will achieve the complementary goal of reducing greenhouse gases from New York sources, Governor Paterson has fashioned one of the most aggressive energy policy goals in the country.

Governor Paterson's Renewable Energy Task Force similarly has made broad recommendations on expanding the use of renewable resources in New York beyond the electricity sector. Among other recommendations, the Task Force put forward challenges with respect to jumpstarting the replacement, in part, of fossil-fuel-fired heating and hot water systems with solar thermal system technologies and helped to initiate a New York Biofuels Roadmap and Feedstock Inventory that will identify appropriate opportunities for sustainable development and sustainable use of biofuels.

To help achieve these and other energy policy goals, numerous New York institutions are implementing programs to advance clean energy economy goals. The New York State Public Service Commission (PSC) has progressively initiated programs for the advancement of energy efficiency and renewable energy over a span of decades, including the System Benefits Charge, designed to promote market transformation efforts in energy efficiency markets, the Renewable Portfolio Standard, designed to achieve goals for renewable energy use for both distributed-scale and grid-connected technologies, and most recently, the Energy Efficiency Portfolio Standard, which is designed to achieve a large portion of the energy savings targets for the 45 by 15 goal. In addition to electric sector programs, the PSC instituted energy efficiency programs for natural gas. The New York Department of Environmental Conservation (DEC), in conjunction with the Environmental Facilities Corporation, implements programs to achieve improved environmental performance for municipal and State facilities, which often result in energy efficiency improvements. The New York State Department of Transportation and New York State Department of Agriculture and Markets leverage federal and state monies for system improvements, energy efficiency, and other energy needs in their respective sectors. The federally funded Weatherization Assistance Program, which delivers energy efficiency services for low-income consumers, is implemented by the Division of Housing and Community Renewal. The New York Power Authority and the Long Island Power Authority have created and implemented electric energy efficiency, renewable, and clean energy programs to meet the needs of their customers. Numerous other State agency programs and municipal government initiatives also exist to achieve comprehensive energy policy goals.

These efforts, while successfully fostering interagency cooperation, have been implemented mostly on a program-by-program basis and are primarily designed to meet specific goals and requirements of individual agencies. RGGI provides an opportunity to identify activities which may fall outside the scope of existing individual program activities and goals and to develop more robust, complementary approach to energy efficiency and clean energy programs. By identifying market opportunities to be funded through RGGI, existing programs can be re-aligned to meet comprehensive climate mitigation strategies. Such realignment should foster a more systemic, synergistic approach to climate mitigation in the delivery of state programs and services.

As administrator of the RGGI program, as well as other, separately funded, programs with individual program goals and targets, NYSERDA is challenged with working within the frameworks established by the individual agencies, successfully leveraging multiple incentive opportunities, accurately attributing the measurable results of each of the program activities, and delivering to the market programs which provide seamless incentives. The efficiency and renewable programs that have been proposed in the Operating Plan build on existing program platforms that have successfully provided measurable results for programs focusing on reducing the use of electricity and natural gas. New activities from the RGGI proceeds should permit development of an energy services market that takes a "whole-building" approach. In this approach, an individual contractor can provide a clime with information and services that examine an entire structure's energy opportunities including electric lighting, insulation, heating systems, and possible renewable energy applications. Prior to RGGI, contractors often have to leave efficiency opportunities unexamined because program incentives were limited to specific energy improvements by virtue of the source of program funding. By applying a similar rationale to all programs in all sectors, New York can develop an holistic approach to its energy policies, expand the state's economic opportunities through RGGI investments, and realize broader and measurable GHG emissions reductions.

NYSERDA has longstanding experience in tracking program spending from various funding streams and accurately attributing program results to the appropriate funding streams. In some instances, individual NYSERDA programs, such as the low-income efficiency EmPower New York^{SM} program, tracks incentive payments and attributes program results from as many as seven discrete active funding sources. To prepare for significant program expansion resulting from the Energy Efficiency Portfolio Standard (EEPS) decision, NYSERDA has already initiated new changes and upgrades to its database system to expand capacity and to track project activity funded by multiple funding streams. Also as a result of the EEPS program expansion,

NYSERDA's evaluation activities are also being designed to protect the integrity of program results, including co-benefits, and to appropriately align the measured benefits to the initiating funding source, enabling evaluators to most accurately align the progress of each program to the program's specific goals and targets. Coordination of the evaluation of efficiency activities funded from different funding streams, for example from programs utilizing the whole-building approach, will be essential. Such coordination becomes necessary to ensure that program results are reported accurately and to ensure that evaluation data are not compromised by using multiple survey instruments or repeatedly surveying individual participants.

1.C. New York Greenhouse Gas Cost Study

NYSERDA is currently pursuing a state-based cost-curve study, building on the national work of McKinsey & Company,[10] and using methodologies and information that will provide a more accurate assessment of the GHG reduction opportunities in New York. The study will help characterize emission reduction opportunities and potential costs. The results of the analysis are anticipated to be completed in June 2009. Information from the analysis will help to identify modifications to current programs and introduce new program opportunities in future Operating Plans.

1.D. Program Goals

The goals of the investments made with Auction proceeds are to reduce GHG emissions in New York and to reduce the cost of complying with the CO_2 Budget Trading Program. Investments will be focused on GHG reduction opportunities related to energy production and use for all fuels and in all energy using sectors. Investments will seek to advance the State's broad energy goal of moving toward a clean energy economy by providing reductions in GHGs in the near term and positioning New York to make additional reductions in GHGs over the longer term.

While the majority of funds will be directed at cost-effectively reducing CO_2 in the near term, at least 25 percent will address areas that may require longer investment horizons. The program can thus deliver near-term benefits to New York consumers while also positioning New York to progress toward a clean energy economy and pursue the aggressive carbon reduction framework that will be needed to ensure a stable climate.

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

1.E. Program Focus and Geographic Scope

The Operating Plan focuses on activities related to energy production and use and are designed to capture opportunities to reduce CO_2 emissions resulting from fuel combustion activities, as depicted in the New York Greenhouse Gas Inventory (see Figure 2 above) and in accordance with the CO_2 Allowance Auction Program regulations. Initial RGGI Program activities that identify non-energy-related GHG emissions strategies will include analysis and characterization of opportunities for potential future funding.

As noted above, programs have been identified for funding, in part, based on the individual program's ability to provide cost-effective emissions reductions in the short term, while also providing sufficient funding for long-term activities to ensure that the evolution of climate strategies and programs is based on the advancement of new technologies and capabilities. Where applicable, RGGI program funding will be used to complement current investments in the **New York Energy $mart^{SM}** program, which is part of New York's System Benefits Charge (SBC) programs, the RPS, and the EEPS and other agency programs that support the goals of the CO_2 Budget Trading Program.

[10] McKinsey & Company, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?,* December 2007.

Programs that develop and expand the infrastructure and capacity within New York necessary for a sustained clean energy economy, and which effectuate significant GHG emissions reductions, will be a focus of the RGGI program. Municipal and other local government initiatives for effecting climate change strategic planning and identifying projects will expand program opportunities and engage a broader public interest in voluntary GHG mitigation activities. Capacity building for industries in all sectors of the economy will be designed to foster widespread, faster adoption of new technologies and services that result in GHG emission reductions and also promote the self-sustaining advancement towards a clean energy economy.

Recommendations of the Governor's Task Force on Renewable Energy will be considered in developing the Operating Plan.

Programs generally will be statewide in scope, although certain programs may have a geographic focus, and RGGI funded activities will fill gaps not otherwise eligible for funding from other sources.

1.F. Program Criteria

The following initial funding criteria were developed for selecting and designing programs:

Criteria 1: Cost effectiveness measured by quantity of carbon equivalents reduced per dollar invested.

Criteria 2: Long-range potential for the technology or investment to reduce GHG emissions in New York.

Criteria 3: Potential to reduce the costs of achieving the emission reduction goals of the CO_2 Budget Trading Program.

Criteria 4: Other benefits to New York, *e.g.*, the potential to: create jobs, leverage capital investment in New York to promote economic development, provide health and environmental benefits, and enhance municipal capacity to further reduce GHG emissions.

Criteria 5: Opportunities to reduce the disproportionate cost burden and environmental impacts on low-income families and environmental justice communities.

Criteria 6: Need for funds based upon availability from other funding sources.

The diverse portfolio of initiatives presented in the Operating Plan will balance achieving near-term results with investing in long-term strategies that will provide sustained, ongoing reductions in greenhouse gases.

Consistent with Part 242-10.3(d)(3), projects that receive funds under a program covered in the Operating Plan are not eligible to pursue CO_2 Emissions Offset credits under the CO_2 Budget Trading Program. Agricultural methane projects that receive CO_2 Emissions Offset credits under the CO_2 Budget Trading Program may also receive public benefits funds under a program covered in the Operating Plan. All entities, including Compliance entities, may pursue projects under any of the proposed programs in the Operating Plan.

Section 2. Budget Overview

The first two regional RGGI CO_2 allowance auctions for 2009 vintage allowances cleared at $3.07 per allowance and $3.38 per allowance, respectively. Similar to other markets, the value of allowances in future auctions may vary from prior results and may produce volatility. The Operating Plan includes a base budget for planning purposes, which has been conservatively estimated based on a value of $3 per allowance. New York also anticipates selling a nominal number of allowances from future compliance periods at each auction. Because representative data on the value of these allowances are not yet available, these allowances are assumed for planning purposes to sell at a reserve price per allowance of $1.86.

Under the program, RGGI participating states agreed upon a CO_2 emissions cap, *i.e.*, a regional CO_2 emissions budget, amounting to approximately 188 million tons of CO_2 per year. New York's share of the total annual emissions budget is 64,310,805 allowances.

For the purpose of the base budget, New York is assumed to sell 60,410,805 allowances from the current compliance periods during fiscal years (FY)[11] 2010-11 and 2011-12. The number of allowances was derived by subtracting 700,000, 1,500,000, and 1,700,000[12] allowances associated, respectively, with the voluntary renewable energy market set-aside account, the long term contract set-aside account, and a limited exemption for units with electrical output to the electrical grid from the New York's annual base budget of 64,310,805 allowances.[13] Approximately 3,020,540 allowances from future compliance periods were assumed to be sold during fiscal years 2010-11 and 2011-12. The number of allowances represents five percent of the 60.4 million allowances that are available for sale after the voluntary renewable energy market set-aside, the long-term contract set-aside, and the "behind the fence" exemption.

The number of allowances during Fiscal Year 2009-10 is expected to be different from the numbers sold in FY 2010-11 and FY 2011-12, since the FY 2009-10 number includes auctions held in December 2008 and March 2009. The allowances being offered for sale during the three-year period covered by the Operating Plan are summarized in Table 1.

Table 1. Projected Sales of Allowances for Planning Purposes

Allowance Vintage*	Fiscal Year 2009-10**	Fiscal Year 2010-11	Fiscal Year 2011-12
Current 3-year Compliance Period	75,513,506	60,410,805	60,410,805
Future Compliance Period	3,775,675	3,020,540	3,020,540

* Compliance periods cover three-year periods beginning on January 1, 2009 but could be extended to four years under certain circumstances. For more details see New York Department of Environmental Conservation Part 242 CO_2 Budget Trading Program.
** Covers allowances sold in auctions from the fourth quarter of calendar year 2008 through the first quarter of calendar year 2010.

NYSERDA's Part 507.4 (d) regulation states that:

> "[T]he proceeds of the CO_2 Allowance Auctions will be used by the Authority to promote and implement programs for energy efficiency, renewable or non-carbon emitting technologies, and innovative carbon emissions abatement technologies with significant carbon reduction potential, and for reasonable administrative costs incurred by the Authority in undertaking the activities described in Part 507 and for administrative costs, auction design and support costs, and program design and support costs associated with the CO_2 Budget Trading Program, whenever incurred."

[11] NYSERDA's fiscal year begins on April 1and ends on March 31 of the following year.
[12] This is an approximation based on the Department's calculation of the reduction in CO_2 Budget Trading Program base budget for 2009 of 1,680,935.
[13] For more information, see New York Department of Environmental Conservation Part 242 CO_2 Budget Trading Program.

The following table translates the projected auction proceed values into anticipated levels of funding available for investment in the programs described in Sections 3 through 7 of the Operating Plan.

Table 2. Budget

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Total
Total Revenue Estimate	$233,563,275	$186,850,620	$186,850,620	$607,264,515
Repayment of SBC Funds (for RGGI Inc. Start-up Costs)	($3,000,000)	N/A	N/A	($3,000,000)
Estimated Ongoing New York Share of RGGI, Inc. Costs	($750,000)	($1,000,000)	($1,000,000)	($2,750,000)
Program Evaluation (5%)	($11,678,164)	($9,342,531)	($9,342,531)	($30,363,226)
Program Administration (7%)	($16,349,429)	($13,079,543)	($13,079,543)	($42,508,516)
State Cost Recovery Fee (0.6%)	($1,401,380)	($1,121,104)	($1,121,104)	($3,643,587)
Funds Available for Programs	**$200,384,302**	**$162,307,442**	**$162,307,442**	**$524,999,186**

2.A. Repayment of SBC Funds

The Commission issued an Order in Case 05-M-0090, dated August 27, 2007, authorizing that up to $3 million of System Benefits Charge (SBC) funds, funded from interest earnings on unexpended SBC funds, be used to finance certain start-up costs of RGGI, Inc. (See Section 2.B. The funds would be reimbursed with interest upon successful auction of allowances. The amount expended is anticipated to be less than the maximum $3 million authorized by the Public Service Commission (Commission). Reimbursement of the SBC funds will occur upon approval of the Operating Plan.

2.B. Ongoing New York Share of RGGI, Inc. Costs

The Regional Greenhouse Gas Initiative, Inc. (RGGI, Inc.) is a non-profit corporation created to support development and implementation of New York's (and other participating states') CO_2 Budget Trading Programs.

NYSERDA has entered into an agreement with RGGI, Inc. for RGGI, Inc. to provide technical and support services for key elements of New York's CO_2 Budget Trading programs, including:

- Developing and maintaining a system to report data from emissions sources subject to RGGI and to track allowances.
- Implementing a platform to auction CO_2 allowances.
- Monitoring the market related to the auction and trading of CO_2 allowances.
- Providing technical assistance to the participating states in reviewing applications for emissions offset projects.
- Creating and implementing a market monitoring program.
- Providing technical assistance to the participating states to evaluate proposed changes to the states' RGGI programs.

2.C. Program Evaluation and Administration

Program evaluation and administration costs have been budgeted at five and seven percent, respectively, of total revenues consistent with the maximum amounts authorized under NYSERDA's SBC-funded efficiency programs.

2.D. State Cost Recovery Fee

NYSERDA is assessed an annual State Cost Recovery Fee under Section 2975 of the Public Authorities Law for general governmental services. The fee is allocated proportionately by funding among all NYSERDA programs and funding sources. The budget includes an estimate based on the current annual assessment of the fee expected to be allocated to the RGGI funded programs.

Table 3. Summary of Anticipated Funding Commitments ($000s)

Sector	Program	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Residential, Commercial & Industrial	Commercial and Industrial Efficiency	$28,000	$28,000	$28,000	N/A	$84,000
	Residential Space and Water Heating Efficiency	$23,370	$28,730	$31,890	N/A	$83,990
	Municipal and Institutional Climate Change Program	$18,110	$17,710	$11,810	N/A	$47,630
	Advanced Building Systems and Industrial Process Improvements	$800	$2,250	$5,800	$6,150	$15,000
Transportation	Transportation Efficiency	$10,000	$11,000	$9,000	$4,000	$34,000
	Electrified Rail Efficiency	$12,000	$16,000	$16,000	N/A	$44,000
	Advanced Transportation Development Program	$4,000	$5,000	$6,000	N/A	$15,000
Electric Power Supply and Delivery	Statewide Photovoltaic Initiative	$10,800	$10,800	$10,800	N/A	$32,400
	Advanced Power Technology	$4,250	$14,500	$32,250	$20,000	$71,000
Sustainable Agriculture and Bioenergy	Sustainable Agriculture and Bioenergy Program	$1,250	$4,500	$4,250	N/A	$10,000
Multi-Sector	Workforce Development	$2,955	$3,370	$2,675	N/A	$9,000
	Competitive Greenhouse Gas Reduction Bidding Program	N/A	$40,979	N/A	N/A	$40,979
	Clean Technology and Industrial Development	$3,250	$12,000	$13,750	N/A	$29,000
	Climate Research and Analysis	$3,000	$3,000	$3,000	N/A	$9,000
	Annual Total	**$121,785**	**$197,839**	**$175,225**	**$30,150**	**$524,999**

2.E. Summary Program Funding

Using the criteria described above and stakeholder feedback on information in the *Operating Plan Concept Paper*, NYSERDA identified a list of initiatives to be funded with Auction proceeds. These programs are grouped into target areas, or sectors, that are consistent with the categories used in the New York GHG abatement cost curve study that is underway: Residential, Commercial, and Industrial facilities; Transportation; Electric Power Supply and Delivery; Sustainable Agriculture and Bioenergy; and Multi-Sector. Descriptions of these programs and the rationale for their selection are provided in Sections 3 through

7 of the Plan. A summary of anticipated funding commitments is presented in Table 3 above. Table 4 shows a breakdown of program funding by target area:

Table 4. Program Funding by Target Area ($000s)

Target Area	3-Year Funding for Target Area	Percent of Funding	Percent of New York Annual CO_2e Emissions
Residential, Commercial, and Industrial	$230,620	43.9%	38%
Transportation	$93,000	17.7%	35%
Electric Power Supply and Delivery	$103,400	19.7%	21%
Sustainable Agriculture and Bioenergy	$10,000	1.9%	6%
Multi-Sector Programs	$87,979	16.8%	N/A
Total	**$524,999**	**100%**	**100%**

As noted in Table 4 above, programs in the Electric Power Supply and Delivery target area have a proposed three-year funding stream of $103.4 million. However, other programs[14] using RGGI funding will bring the proposed funding for electric generation improvements to $167.4 million or 32 percent of the three-year budget. A number of projects being submitted under the Competitive Greenhouse Gas Reduction Bidding Program are also expected to involve electricity related GHG reductions.

Because of the possible volatility discussed above in the ongoing allowance auction results, NYSERDA may make modest adjustments in the amounts allocated among the program areas but substantial changes will be presented as amendments to the Plan.

This budget assumes, for planning purposes, that allowances from the first compliance period are sold at $3 per allowance. If New York allowances are sold in the regional auction at values above $5 per ton, the incremental revenue would be used to support the achievement of a 30 percent Renewable Portfolio Standard goal.

[14] $20 million has been allocated to the Water and Wastewater Efficiency component of the Municipal and Institutional Climate Change Program, and $44 million has been budgeted for the Electrified Rail Efficiency program in the Transportation sector programs.

Section 3. Residential, Commercial, and Industrial Sectors

The residential, commercial, and industrial building sectors present the most significant opportunities to reduce GHG emissions. The purpose of the Residential, Commercial, and Industrial program is to reduce energy used by end users through energy efficiency improvements and improved maintenance practices. Because these sectors are served by established, operating energy efficiency and renewable resource programs and infrastructure, the program will be designed to fill critical gaps by targeting fuels not adequately addressed through the System Benefits Charge (SBC), Energy Efficiency Portfolio Standard (EEPS), and the Renewable Portfolio Standard (RPS) initiatives, by targeting environmental justice communities, by stimulating municipal commitments to greenhouse gas (GHG) reductions, and by promoting increased deployment of underutilized and emerging energy efficiency and clean energy technologies. To the extent possible, strategies and tactics for these sectors will be integrated with strategies and tactics featured in existing programs.

3.A. Near-Term Programs to Reduce Greenhouse Gases

The following programs have the potential to reduce GHG emissions in the near term with program implementation starting in the first few months after approval; installation horizons of up to a few years exist for large construction and renovation projects and are within months for many small, residential projects. Most of the near-term cost-effective initiatives are delivered through existing programs. Project cost will not exceed the lifetime of the individual measure.

3.A.1. Commercial and Industrial Efficiency

NYSERDA will offer a set of coordinated initiatives designed to achieve cost-effective CO_2 reductions by providing technical support and implementation assistance to existing facilities and new construction projects. The Commercial and Industrial Efficiency initiative extends several activities focused on fossil fuel efficiency that were initiated in the RGGI Early Action Plan. They include:

- *Technical Support*: FlexTech
- *Implementation Support*: Existing Facilities implementation support through Pre-Qualified Measures; Industrial and Process Efficiency; Energy Efficiency

In addition to these early action program initiatives, the Plan includes the following initiatives:

- *Technical Support*: CO_2 Lifecycle Management; Commercial Diagnostics
- *Implementation Support*: New Construction; Financing; and Solar Thermal Systems

Most of the planned initiatives described below integrate fossil fuel incentives into SBC and EEPS funded programs that currently focus on electricity savings. Fuel oil savings will be emphasized, but projects that address the use of purchased steam, coal, biomass, natural gas, and propane will be eligible. Technical support and implementation assistance will be provided for cost-effective CO_2 reductions through measures such as solar thermal systems and practices such as water conservation. Eligible participants include representatives of the commercial and industrial sectors, transportation, agriculture, municipal government, and institutional facilities including schools and hospitals.

Commercial and Industrial initiatives included in the Earl Action Plan and the additional initiatives included in the Operating Plan are organized under two primary program headings: Technical Support and Implementation Support.

3.A.1(a) Technical Support

Technical support includes customized analyses through FlexTech and new initiatives that provide CO_2 Lifecycle Management and Commercial Building Diagnostics.

- *FlexTech.* This initiative provides objective, customized, cost-shared technical analysis of energy efficiency improvements, energy and carbon planning, energy-related process improvements, waste minimization opportunities, and productivity improvements. Each participant receives a customized study from one of NYSERDA's pre-qualified FlexTech consultants or through a customer-selected service provider. Studies can investigate project feasibility of energy efficiency and carbon reduction projects, energy operations management, retro-commissioning, and energy procurement options. Program success is built on flexibility and freedom to focus on participants' individual sites and specific needs. Using RGGI funds will permit increased emphasis on energy master planning, carbon footprint assessments, and site-specific analyses of greenhouse gas mitigation strategies.
- *CO_2 Lifecycle Management.* This new initiative provides technical assistance to companies and institutions to evaluate and mitigate their carbon footprints. Services include cradle-to-grave product assessments and ongoing operational resource use. Identifying and mitigating activities that constitute a significant carbon footprint can result in cost savings and improved operational efficiencies. Low-carbon operations and products can also provide market advantages for organizations able to anticipate stakeholders desires for carbon neutrality and may allow organizations to adapt to expected federal carbon legislation. The following activities may be included in the initiative:
    - *Carbon Lifecycle Studies*: Studies will cover all aspects of applicants' carbon footprints by addressing facility infrastructure and operation, supply chain management, waste reduction, water consumption, and employee transportation.
    - *Water Conservation*: Incentives will be offered to support water conservation projects at commercial, industrial, and institutional facilities. The operation of water supply and treatment systems generates a carbon footprint. Reducing water consumption reduces the footprint and may generate process savings (*e.g.*, by reducing energy required for heating and pumping water).
- *Commercial Diagnostics Program.* This new initiative will reduce carbon emissions in commercial buildings by installing building diagnostics systems, optimizing energy using systems, and implementing low-cost and no-cost operations, maintenance, and operational improvements. Incentives will be provided to install equipment for web-based real-time monitoring of operations and to provide weather-normalized modeling of energy use. The equipment will track and energy performance and aggregate metrics and calculate carbon impacts. Billing analysis and diagnostics tools will be used to disaggregate energy loads and identify specific retro-commissioning and other cost-effective measures that represent the greatest opportunities to reduce carbon emissions associated with building operations. The initiative will be coordinated with energy benchmarking efforts already underway, including those developed by NYSERDA and the U.S. Environmental Protection Agency (U.S. EPA). The energy and carbon tracking tools may be used to facilitate U.S. Green Building Council LEED™ certifications and improve Energy Star ratings.

3.A.1(b) Implementation Support

NYSERDA will provide incentives for fossil fuel measures integrated with electricity savings in existing and new facilities and provide support for solar thermal projects. Implementation support will be offered through a coordinated framework that includes energy efficiency, pre-qualified measures, industrial and process efficiency, new construction, financing, and solar thermal.

- *Energy Efficiency.* Customers and energy service providers who are involved in energy efficiency projects will receive performance-based incentives for verifiable annual energy savings resulting from fossil fuel improvements. All projects are based on energy and CO_2 savings demonstrated in approved engineering studies. Partial performance payments are required after on-site verification that projects are installed consistent with approved engineering studies. Remaining performance

payments will be made following measurement and verification of achieved project performance.

- *Pre-Qualified Measures.* Customers who are involved in small energy efficiency and equipment replacement projects will receive incentives for pre-qualified conservation measures. Eligible fossil-fueled efficiency measures include boilers, furnaces, unit heaters, storage water heaters, insulation, and selected commercial kitchen equipment. The pre-qualified measures will be introduced gradually when efficiency levels are researched and established for fossil-fueled equipment.
- *Industrial and Process Efficiency.* Considerable opportunities exist for increasing fossil fuel and energy efficiency gains in various New York industries including manufacturing, data centers, and agriculture. Industrial and process improvements are complex projects with significant energy, economic development, and productivity benefits. Industrial and process efficiency activities will target key manufacturing sectors in New York including chemicals and pharmaceuticals, printing and publishing, automotive, food processing, and forest products. Industrial processes require customized approaches to achieve energy efficiency improvements. Production lines and manufacturing processes often have unique characteristics and functions. Site- and sector-specific approaches will be used to ensure that optimum energy efficiency opportunities are identified and addressed to maximize reliability, productivity, energy savings, and greenhouse gas reductions.
- *New Construction.* The commercial new construction program aims to increase the energy performance of new and substantially renovated buildings through services that include energy analysis, green building services, commissioning, and guidance on demand response load-management strategies. Through this new initiative, the New Construction Program will leverage services currently provided to SBC and EEPS customers by offering incentives for fossil fuel efficiency improvements such as boilers, furnaces, controls, building envelope improvements, and water heaters. The New Construction Program will integrate fossil fuel equipment and CO_2 reduction opportunities with electric efficiency measures analyzed through the program. Whole building design analysis is expected to yield the most fossil fuel savings because mmBtu savings opportunities are identified during the building modeling process. The New Construction Program also offers assistance for green building certification (*e.g.*, LEED®). This certification also encourages the use of recycled and locally manufactured materials and reduction of potable water. These sustainable building enhancements will generate additional reductions in CO_2 emissions.
- *Financing.* The New York Energy Smart Loan Fund, currently supported with SBC funds, works with a network of more than one hundred participating lenders to reduce the cost of financing energy efficiency measures for commercial businesses and institutions. The new initiative will use RGGI funds to provide interest-rate subsidies to commercial customers who need access to low cost capital for the installation of fossil-fuel efficiency and CO_2 reduction measures. Cost effective opportunities include efficient space and water heating measures and gas-fired commercial kitchen equipment, and new measures may be added. Lenders participating in the SBC-funded program will be advised of the availability of new funds to support low-interest financing for their customers and be provided with information about calculating cost savings and carbon reductions.
- *Solar Thermal Systems.* This new initiative will build on NYSERDA's research and development experience with projects that heat air before it enters a building. The technology, known as solar ventilation preheating and transpired solar collection, offers an efficient means to reduce energy costs and associated carbon impacts using a clean, renewable resource. Solar ventilation preheating systems are practical for many types of buildings including commercial and industrial buildings with large ventilation requirements, warehouses and storage facilities, laboratories, gymnasiums and high-rise apartment buildings requiring ventilation in corridors, and central-heating plants to preheat combustion air. The technology requires little maintenance and requires no liquids or moving parts other than ventilation system fans.

3.A.1(c) *Anticipated Multiyear Program Schedule*

The technical support and implementation assistance initiatives include new initiatives and outreach activities that are expected to require testing prior to full implementation. Most of the program activities are integrated into existing programs and are expected to experience few delays prior to implementation.

3.A.1(d) *Budget*

The program has a three-year budget of $84 million. Anticipated funding commitments are shown in Table 5 below.

Table 5. Commercial and Industrial Program Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Technical Assistance	$6,365	$6,365	$6,365	$0	$19,095
Implementation Support	$20,235	$20,235	$20,235	$0	$60,705
Outreach	$1,400	$1,400	$1,400	$0	$4,200
Total	**$28,000**	**$28,000**	**$28,000**	**$0**	**$84,000**

3.A.1(e) *Metrics and Benefits*

The program will address the following criteria and provide the benefits described below.

Criteria 1: CO_2 reductions will be provided based on societal and program dollars per ton of CO_2.

Criteria 4: Other benefits, specifically competitiveness and economic development benefits associated with lowering the operational costs of municipal, institutional, commercial, and industrial facilities in New York. Additional benefits include the enhanced capacity of these sectors to assess, track, and reduce CO_2 through energy reductions and introduction to decision makers in these sectors of a broad set of opportunities that include lifecycle CO_2 management and water management efficiencies.

Measurable results will include tons of carbon saved, reduced energy impacts, and gallons of water conserved. Many carbon reduction strategies have co-benefits for the applicant and society. Economic benefits to the applicant could include reduced costs of purchasing fewer materials and consumables, reduced water bills, reduced waste hauling bills, and increased revenue from green marketing. Societal benefits could include reduced demand for landfill space, reduced burden on the water supply and treatment systems, reduced demand on virgin resources, and increased awareness of climate change. The potential for changing weather patterns and reducing saltwater intrusions caused by rising sea levels into freshwater aquifers mean that water conservation may also prove valuable as a climate change adaptation strategy.

Table 6 shows anticipated fuel savings and CO_2 reductions for the program along with an indicator of the program cost per ton reduced over the lifetimes of installed measures.

Table 6. Commercial and Industrial Program Total Budget and Three-Year Savings

Program	Total Budget ($ Million)	Number of Participants	3-year Natural Gas Savings (mmBtu)	3-year Fuel Oil Savings (mmBtu)	3-year CO_2 Reduction (Tons)*	Program Cost per Ton (Lifetime)**
Commercial and Industrial Program	$84.0	1,760	4,730,315	2,785,582	709,850	$28

*These emission reductions are associated with both electric and fossil fuel saving measures. Under a cap-and-trade system, the total number of CO_2 allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, electric efficiency projects may not decrease the overall amount of CO_2 being emitted into the atmosphere by New York entities. However, electric efficiency projects will reduce end-users' carbon-footprints as they will be responsible for a smaller percent of the emissions associated with electricity production.

**Cost per ton is based on levelized program costs (including initial incentives, program administration, and performance-based incentives) divided by the estimated annual GHG emissions reductions. All initial costs are levelized over the measure or practice lifetime, and future program incentives are brought to a present value and then levelized where appropriate. Values are discounted using a five percent social discount rate.

3.A.1(f) *Program Outreach, Education and Technology Transfer*

The activities described above will integrate fossil fuel incentives with the promotion of **New York Energy $mart^{SM}** electricity incentives to leverage success. Activities will include working cooperatively with numerous key partners including Regional Planning and Development Boards, Empire State Development Corporation, the Association of Energy Engineers, the Manufacturers Association of Central New York, the New York City Economic Development Corporation, the New York Energy Consumers Council, Multiple Interveners, The Business Council of New York State, Consumer Power Advocates, New York State School Boards Association, New York State Association of Towns, and the New York State Conference of Mayors, to educate them on, and help them promote, programs, products, and services. NYSERDA's sector-based approach targets resources and addresses unique customer needs, and NYSERDA will use these efforts to identify and recruit selected customers that can benefit from fossil fuel efficiency measures. These outreach approaches will contribute to increased awareness of CO_2 reduction opportunities and benefits and lead to increased participation in CO_2 reduction programs.

Outreach to manufacturing facilities in environmental justice communities that may benefit from pollution prevention strategies will be referred to programs that can help the manufacturing facilities identify mitigation strategies.

3.A.2. Residential Space and Water Heating Efficiency

NYSERDA currently offers a suite of programs providing 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. One of the most important benefits of the program has been the discovery and mitigation of significant levels of carbon monoxide in numerous households at all income levels throughout the state. However, the SBC and EEPS funding for those programs is primarily focused on achieving electric savings, with many energy efficiency opportunities being left unimplemented because limits on the use of funding barred non-electric improvements and measures, such as heating equipment. Heating accounts for 30 to 40 percent of household energy costs, and improvements to heating and building shell systems can provide four times the energy cost savings of electric measures that consist primarily of lighting and appliance replacements.

NYSERDA has been able to use limited funds for gas efficiency measures, primarily for low-income consumers, in select gas utility service territories. NYSERDA will use RGGI funds for fossil-fuel based measures and renewable energy measures not eligible for SBC and EEPS incentives. Coordination of these funding sources will expand the number of households served and ensure that opportunities for carbon reduction measures are not lost.

RGGI funds will also be used to provide fossil-fuel efficiency programs in areas not currently served by NYSERDA's programs because of funding restrictions, such as on Long Island and in communities with electric service provided by municipal electric providers. In the event natural gas funding is not available, NYSERDA reserves the right to use RGGI funding to support natural gas efficiency measures. Nearly 50,000 households will be affected by the RGGI program over three years, and reductions in residential heating fuel use resulting from the programs will equal more than 110,000 barrels of oil each year.

The following programs are near-term, cost-effective programs that have significant technical potential for reducing greenhouse gases in the residential sector. The suite of programs allocates nearly 40 percent of funding to low-income programs, and the programs will seek to address environmental justice issues by directly targeting outreach to environmental justice communities and working with community-based organizations that address environmental justice issues by referring to them households and buildings.

Multifamily Performance Program. RGGI funding for oil and propane space and domestic water heating efficiency is proposed to supplement the SBC funding for the Multifamily Performance Program (MPP) which serves buildings with five or more units. Existing MPP consulting firms will use the program's benchmarking tools, Energy Reduction Plan templates, and various auditing software packages to determine what measures are cost effective, their expected energy savings, and the costs to install them. Energy Reduction Plans identify the measures needed to reduce energy use by at least 20 percent and develop financing plans for consumers to identify sources of funding to finance the measures.

RGGI funding will be used to reduce oil and propane energy use in multifamily buildings by providing incentives to repair and replace space and domestic water heating systems and install insulation, air sealing, and other building shell energy efficiency measures. Electric reduction measures, including ENERGY STAR® lighting and refrigerators, will be paid for with SBC and EEPS funding. In the event funding targeting electric measures is no longer available from SBC and EEPS, NYSERDA will utilize RGGI funds for all measures to preserve the integrated, whole building approach upon which MPP is based. Larger incentives are provided to buildings where the majority of tenants have incomes below 80 percent of the State Median Income. About one third of the multifamily buildings in New York are heated with fossil fuels. NYSERDA proposes to service 18,906 low-income units and 10,177 market rate units over the three year period assuming SBC funds are adequate to continue addressing the electric efficiency needs of those buildings.

EmPower New York℠. RGGI funding for oil and propane space and domestic water heating efficiency is proposed to supplement the SBC and EEPS Fast Track Funding for EmPower New York℠ (EmPower), which provides cost-effective energy reduction services to households with incomes below 60 percent of the State Median Income. In some regions of the state, NYSERDA currently administers gas funds to provide additional services to these households.

The RGGI funding will permit cost-effective oil and propane efficiency measures such as insulation, blower-door assisted air sealing, and heating systems repair and replacements. Additional funds will be available statewide for cleaning and tuning oil fired heating systems. Electric reduction measures, including ENERGY STAR® lighting and refrigerators, will be paid for with SBC and EEPS funding. The expanded services will provide home performance measures in an estimated 3,826 households and cleaning and tuning services in 3,600 households over the three year period. In the event gas funding is not available to supplement the EmPower program in all gas service territories of the state, NYSERDA reserves the right to expand use of the RGGI funds for gas-fired heating systems.

Home Performance with ENERGY STAR. RGGI funding will allow the Home Performance with ENERGY STAR program (HPwES) to target customers using oil and propane for space and domestic water heating purposes. This initiative will expand beyond the SBC territory into the Long Island Power Authority (LIPA) territory in an effort to reach a broader market. The funds will offset the cost for consumers to replace

inefficient oil and propane equipment and other measures that have a direct impact on reducing oil and propane consumption (*e.g.*, insulation, air sealing). Eligible electric measures will be covered by SBC funds within the SBC territory. Larger incentives are provided to households whose incomes are below 80 percent of the higher of the state or area median income. NYSERDA will coordinate with LIPA and municipal electric providers for customers outside of the SBC territory. In markets where HPwES is not fully developed, including Long Island, NYSERDA will offer direct consumer incentives for the installation of space and domestic water heating equipment to minimize the lost opportunity of encouraging high efficiency equipment installations while markets are being developed. An estimated 2,359 lower-income households and 3,836 market-rate households will receive services over the three year period.

NYSERDA currently administers gas funds for the HPwES program in some gas service territories. In the event gas funds are not available, NYSERDA reserves the right to expand use of RGGI funds to gas-fired heating equipment.

Residential Green Homes Incentive Program. Public Authorities Law (PAL) 1872 directs NYSERDA to create and administer a green residential building program in New York. The Residential Green Homes Incentives Program (Green Homes) is a market transformation initiative designed to change the building practices of the residential building industry for single-family and multifamily homes up to 12 units. Financial incentives will be provided for new green homes and extensively renovated existing homes. Green Homes will reduce energy and greenhouse gas production and preserve natural resources. Other benefits are lower material costs, reduced waste, improved indoor air quality, and reduced indoor and outdoor pollution. The program will capitalize on the work of the American National Standards Institute, the National Association of Home Builders, and the U.S. Green Building Council in the Leadership in Energy and Environmental Design (LEED-H) program to set the definition of "green" for new home construction. Program design, including incentive levels, is currently in development through a public rulemaking process. An estimated 2,912 buildings will be designated "green" over the three year period.

Solar Thermal Incentive Program. RGGI funds will support incentives for the installation of solar thermal systems to replace fossil-fuel and electric domestic hot water systems. Incentives will be available for new and existing multifamily and single-family buildings. Incentives will be fully coordinated with the Multifamily Performance Program, Home Performance with Energy Star, and the New York Energy Star Homes Program, which is a SBC funded program for one-to-four family new construction. The Solar Thermal Incentive Program will support the recommendation published in the February 2008 *First Report of the Renewable Energy Task Force*, which called for "the State to support the installation of 1,100 solar thermal systems across New York by 2011." An estimated 1,833 installations will occur over the three year period.

3.A.2(a) *Anticipated Multiyear Program Schedule*

The Multifamily Performance Program, EmPower, and Home Performance with Energy Star programs are existing programs that will begin producing results attributable to RGGI funding within the first quarter after funding approval. As the Solar Thermal Incentive Program will be fully coordinated with existing programs, enhanced incentives will be available immediately upon funding approval. Each program will take immediate steps to inform contractors and participants of the availability of the incentives, with the first payments expected to occur within six months. The preparation phase for Green Homes is expected to last through 2009 and will include the development of distinct rules and regulations for program qualification, incentive levels, standards specifications, and verification criteria. The first incentives in Green Homes are expected to be paid in the first quarter of 2010.

3.A.2(b) *Budget*

This program has a three-year budget of approximately $84 million. The anticipated funding commitments are shown in Table 7 below.

Table 7. Residential Space and Water Heating Efficiency Program Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Multifamily Performance Program	$8,400	$7,480	$6,640	N/A	$22,520
MPP Market Rate	$1,250	$1,110	$990	N/A	$3,350
MPP Low Income	$7,150	$6,370	$5,650	N/A	$19,170
EmPower New York	$3,956	$4,471	$5,016	N/A	$13,443
Home Performance with Energy Star	$4,498	$5,698	$5,998	N/A	$16,194
HP Market Rate	$898	$1,138	$1,198	N/A	$3,234
HP Low Income	$3,600	$4,560	$4,800	N/A	$12,960
Green Homes Incentive Program	$2,200	$6,239	$9,205	N/A	$17,644
Solar Thermal Incentive Program	$1,900	$2,600	$3,000	N/A	$7,500
Outreach	$2,416	$2,242	$2,031	N/A	$6,689
Total	**$23,370**	**$28,730**	**$31,890**	N/A	**$83,990**

3.A.2(c) *Metrics and Benefits*

Table 8 below presents anticipated fuel savings and CO_2 reductions with a metric related to the program cost per ton reduced over the lifetime of the installed measure. Financial savings attributable to the Solar Thermal Incentive Program are included in savings estimates for the programs through which solar thermal systems will be funded.

Table 8. Residential Space and Water Heating Efficiency Program Total Budget and Three-Year Savings

	Total Budget ($ Million)	Number of Participants	3-Year Electricity Savings (MWh)	3-Year Fuel Oil Savings (mmBtu)	3-Year Propane Savings (mmBtu)	3-Year Natural Gas Savings (mmBtu)	3-Year CO_2 Reduction (Tons)*	Program Cost Per Ton (Lifetime)**
Multifamily Performance Program	24.0	29,083	N/A	1,102,809	N/A	N/A	89,406	48
MPP Market Rate	4.8	10,177	N/A	394,226	N/A	N/A	31,960	24
MPP Low Income	19.2	18,906	N/A	708,583	N/A	N/A	57,446	54
EmPower New York	13.8	7,426	N/A	246,277	88,746	N/A	26,171	80
Home Performance with Energy Star	19.4	6,195	N/A	432,248	91,027	N/A	41,118	95
HP Market Rate†	4.9	3,836	N/A	250,050	30,900	N/A	22,143	34
HP Low Income	14.6	2,359	N/A	182,198	60,127	N/A	18,975	115
Green Homes Incentive Program	19.3	2,912	5,671	35,025	5,004	210,150	18,606	133
Solar Thermal Incentive Program††	7.5	1,833	23,589	5,831	2,399	N/A	13,520	81
Total	**84.0**	**47,449**	**29,260**	**1,822,190**	**187,176**	**210,150**	**188,821**	**87**

*These emission reductions are associated with both electric and fossil fuel saving measures. Under a cap-and-trade system, the total number of CO_2 allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, electric efficiency projects may not decrease the overall amount of CO_2 being emitted into the atmosphere by New York entities. However, electric efficiency projects will reduce end-users' carbon-footprints as they will be responsible for a smaller percent of the emissions associated with electricity production.

**Cost per ton is based on levelized program costs (including initial incentives, program administration, and performance-based incentives) divided by the estimated annual GHG emissions reductions. All initial costs are levelized over the measure or practice lifetime, and future program incentives are brought to a present value and then levelized where appropriate. Values are discounted using a five percent social discount rate.

†New emissions are currently not accounted for in this program; these emissions are not expected to significantly change the values in this table.

††For the Solar Thermal Program, the lifetime cost per ton includes only incentives for the measure; all other costs are borne by the programs with which the incentives will be coordinated, *i.e.*, the Multifamily Performance Program and the Home Performance Program.

The Residential Space and Water Heating Efficiency programs are designed to achieve the following criteria and benefits.

Criteria 1: Cost effectiveness as measured by quantity of carbon equivalents reduced per dollar. As shown in, the suite of programs provides cost effective carbon reduction in the residential sector.

Criteria 4: Other benefits to New York. The residential programs are based on a market transformation model that inherently supports job creation and skills development. The model ensures that contractors participating in the programs will sell the benefits of energy efficiency programs long after public subsidies are removed from the marketplace.

By leveraging RGGI funds with existing electric reduction programs funded through the SBC, participants will realize up to seven times more annual energy bill savings than when only electric measures are installed. Expected annual financial savings per participant attributable to RGGI funds are:

- Home Performance with Energy Star — $529 to $1,005
- EmPower program — $603
- Green Homes Incentive Program — $1,124
- Multifamily Performance Program — $200 to $280 per unit

Criteria 5: Opportunity to reduce the disproportionate cost burden and environmental impacts on low-income families and environmental justice communities. Approximately 43 percent of the proposed funding will be used to support energy efficiency work in low-income homes and multifamily buildings. The work improves energy affordability for households and addresses potential health and safety issues while increasing the comfort and quality of the housing stock. Targeted outreach will increase awareness of the programs among environmental justice communities.

Criteria 6: Need for these funds based upon availability of other funding sources. As stated above, NYSERDA currently administers SBC and EEPS funds primarily focused on electric efficiency. NYSERDA also integrates limited gas efficiency dollars in some gas utility service areas to target high efficiency gas measures. RGGI funds will permit selected efficiency improvements in oil-heated households and buildings that are not being addressed adequately by other funding sources.

3.A.2(d) *Program Outreach, Education, and Technology Transfer*

The proposed programs are designed to achieve significant, deep energy savings, to permanently transform the market for delivering such savings, and to ensure home renovations, as well as product purchasing patterns and consumer behaviors, continue to provide energy savings long after the programs have delivered their services. Integral to the market transformation approach is the need to increase the awareness of and demand for comprehensive building performance services while simultaneously building an infrastructure of trained, certified technicians and accredited contractors.

Consumer demand and contractor recruitment will be achieved through a comprehensive marketing campaign which will include the development of promotional and educational materials, co-operative advertising, television, print ads, and radio spots. Regional outreach will be conducted through community-based organizations and attendance at local events such as home shows and trade fairs.

Marketing is a critical component in delivering services to market-rate customers since this, rather than financial incentives, is the most effective means of building consumer demand. Marketing costs typically represent less than ten percent of NYSERDA's program budgets and will be used to target households not served by previous marketing campaigns, such as those on Long Island, and other areas that have significant concentrations of oil heat. Marketing funded through RGGI will build on existing materials, and most of the funding will be used for print, radio, and on-line media purchases and attendance at events. The target

number of households to be served is aggressive and will require aggressive marketing and public relations strategies. Programs will continually monitor participation rates and spend only the funds necessary to meet the program's goals.

3.A.3. Municipal and Institutional Climate Change Program

This set of initiatives is designed to reduce barriers to the development and adoption of energy efficient and carbon mitigation technologies and policies through a coordinated effort of technical support, financial assistance, education, and outreach. The program will provide valuable contributions including engaging important stakeholders, increasing participation in existing programs, improving the efficiency of critical local water and wastewater treatment infrastructures, expanding public awareness of climate change, and conducting research needed to initiate a revolving loan fund.

Revolving Loan Fund. Up-front capital costs are a substantial impediment to energy efficiency improvements. NYSERDA will conduct research to support establishing a low- or no-interest revolving loan fund to reduce this barrier to entry. The initial phase of this initiative includes research into alternative models for revolving loan programs, assembling an advisory group, and designing a program. Pending results from the research and input from the advisory group, the second phase would include issuing solicitations and program implementation.

Municipal and Institutional Climate Change Program. Local city, town, village, and county governments and institutions, State and local entities, and schools, colleges, and universities can be important partners in pursuing climate change mitigation. Each group has substantial economic concerns and carbon footprints, affect people and environments far beyond their own borders, and have expressed interest in addressing climate change. Individual government and institutional entities are subject to individual policies and policy makers. Many local governments and institutions are motivated to reduce their environmental footprints for economic and social reasons but lack technical expertise and financial wherewithal to initiate and pursue the necessary processes.

This initiative would offer a variety of resources and tools, for example, analytical and technical support for data gathering and tracking, planning assistance, personnel training, and implementation of carbon reduction plans. Assistance would include referrals to existing programs for reducing carbon from and operations and management perspective, e.*g.*, water and wastewater treatment, solid waste management, recycling and reuse programs, procurement, and planning including land use planning, codes, and permitting.

A recognition program would be offered for municipalities and institutions achieving specified carbon reductions. Recognition may include installation of "marquee," premium efficiency, and renewable projects (*e.g.*, high profile photovoltaic systems, hybrid vehicles). The recognition initiatives are intended to publicly acknowledge meaningful achievements that increase energy efficiency and reduce CO_2 emissions. Individual projects receiving recognition are expected to contribute ongoing reductions in energy use and CO_2 emissions.

College and University Competition. Several successful national and international competitions are held each year with the goal of spurring innovations in science and engineering. The competitions are designed for teams of college students working on their own or with industry partners and serve to educate students in a hands-on environment, provide publicity for participating schools, and develop exciting new perspectives in areas of science and engineering that are deemed by the scientific community as deserving attention. Pertinent examples include the U.S. DOE Solar Decathlon and the American Solar Car Challenge. This program will research and develop a new challenge specifically for colleges and universities in New York and will focus on technologies that contain promise for mitigating climate change and effecting global climate change. Possible challenge areas include smart-grid software and innovative energy storage.

A successful recurring challenge could position New York as a leader in energy research, and ideas developed during competitions are likely to engender startup businesses in the state. Previous competitions have received significant sponsorship support by technology corporations and uptake of winning ideas. Qualifying teams would receive funding support for the competition, and the winning team would receive a significant prize, possibly in the form of a financial support to commercialize their idea.

Grade School Education. As awareness of climate change gains traction in business and daily life, education become essential for the K-12 age group regarding the effects of climate change on their lives and how they can participate in mitigation activities. The objective of this program is to integrate climate change into K-12 curricula in New York schools to develop an understanding and interest in the area at a young age. This program will build on existing K-12 curriculum development and teacher training programs provided through NYSERDA and would expand the available course materials relevant to climate change and carbon mitigation. Additional funding may be provided via a competitive bid process to allow teachers, schools, school districts, and other interested parties to apply for funding to develop and implement climate-change-related courses, programs, and materials geared for K-12 students. NYSERDA's activities will include communication and coordination with representatives of the New York State Education Department and the New York State Department of Environmental Conservation (NYS DEC).

Water and Wastewater Efficiency. A unique opportunity exists to coordinate RGGI climate change goals and funding with federal economic stimulus goals and funding while installing infrastructure that will improve the environment and keep New York waters clean and healthy. Under the leadership of Governor David A. Paterson, New York State has been working to secure federal economic stimulus funds that will bolster efforts to finance a new generation of water and wastewater infrastructure via the Clean Water and Drinking Water State Revolving Fund Programs. Plants financed with State Revolving Fund monies should be constructed to the highest, most energy efficient, standards, thus minimizing carbon emissions and improving their economic and environmental performance. A pilot program co-managed by the Environmental Facilities Corporation (EFC) and NYSERDA will analyze and finance projects in participating communities under the Early Action Plan. The Municipal Water and Wastewater Efficiency Program will continue into the second year of the Operating Plan period.

EFC and NYSERDA will review projects on the State Revolving Fund Intended Use Plan (SRF IUP), including likely recipients of federal economic stimulus funds, and identify candidates for likely energy efficiency and carbon abatement opportunities. Selected projects will receive technical analysis that will identify costs and savings associated with energy efficiency, process improvements, and carbon abatement opportunities. NYSERDA will secure one or more experienced New York water and wastewater consultants to perform the analysis and assist participant communities by providing information and assistance with project application procedures and processes. EFC and NYSERDA will work together to develop project proposals for presentation to participant communities. Project installations will be cost-shared through New York RGGI auction proceeds and the State Revolving Fund program administered by EFC. The result will be lower operating cost for the site communities and reduced climate impacts over the, potentially decades-long, lifetime of the new infrastructure.

Table 9. Municipal and Institutional Climate Change Program Anticipated Multiyear Program Schedule

	2009				2010				2011			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Revolving Loan Fund	Program Research, Form Advisory Group, Design Program					Proceed based on findings of research and advisory group						
Municipal and Institutional Climate Change Program	Program Design and outreach		Program implementation with competitive solicitations in Q3 and Q4 if necessary									
Education: k-12	Program Design, Competitive Contractor Selection		Program Implementation									
Municipal Water and Wastewater	Program Design and Implementation beginning with Early Action Plan											

3.A.3(a) *Budget*

This program has a three-year budget of $47.6 million. Anticipated funding commitments are shown in Table 10 below.

Table 10. Municipal and Institutional Climate Change Program Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Municipal and Institutional Programs	$3,500	$3,500	$3,500	N/A	$10,500
Revolving Loan Fund	$50	$7,849	$7,849	N/A	$15,748
Outreach	$461	$461	$461	N/A	$1382
Water and Wastewater Efficiency	$14,100	$5,900	N/A	N/A	$20,000
Total	**$18,111**	**$17,710**	**$11,810**	**N/A**	**$47,630**

The budget for base program activities will be $3.5 million per year over three years. Spending is expected to be lower in the first year during program design and the competitive contractor selection period and will increase over the subsequent two years as the programs are implemented. Pending the results of research and the input of the Revolving Loan Fund Advisory Group, approximately $15.75 million would be recommended to support to the launch of this fund starting in 2010.

3.A.3(b) *Metrics and Benefits*

Other than the Water and Wastewater Efficiency program component (see Table 11 below), the Municipal and Institution Climate Change Programs are not anticipated to directly contribute to carbon reductions, however they each have meaningful measures of success and substantial societal benefits. The programs will be designed to balance the following criteria:

Criteria 1: Program cost effectiveness based on the societal and program dollars per ton of CO_2 equivalent.

Criteria 3: Program potential to reduce CO_2 emissions through reduced electric consumption. This, in turn, decreases the cost of achieving the CO_2 reduction goals associated with this program.

Criteria 4: Program potential to propagate climate change awareness and inspire energy-conscious behaviors. Program activities will be favored that can access and influence targeted groups and reach large audiences.

Revolving Loan Fund. The revolving loan fund research and advisory group will produce valuable information and feedback related to the challenges involved in developing this type of program and will potentially lead to the implementation of a program that will reduce capital cost barriers. Based on a preliminary assessment, implementation of the revolving loan fund program is estimated to result in between

$20 and $40 of program cost per ton of CO_2 equivalent. The estimate will be revised accordingly throughout the investigation period to account for other cost-to-benefit issues that may arise. (See Table 9 above.)

Municipal and Institutional Programs. The municipal and institutional climate change program will be evaluated based on the number of entities reached through the program and the achieved carbon reductions. The program will provide a valuable outreach vehicle that will guide municipalities and institutions in their efforts to understand their energy and CO_2 mitigation needs. The program is expected to serve as a point-of-entry to NYSERDA programs, and in addition to energy and CO_2 reduction benefits, increase program participation. The benefits to society will include reduced operating costs and positive publicity for participating local municipalities and institutions. Job and internship opportunities are expected to be offered in areas including carbon inventories, equipment retrofits, and alternative fuel and hybrid car maintenance. Public awareness of climate change, its impacts, and mitigation and adaptation options is also a key benefit.

Educational Programs. For the educational program, success will be measured by the number of teachers and students reached and reusable course materials developed through the program. The benefits of these programs are increased awareness among students and their families of climate change science, policy, and mitigation strategies. This awareness will result in more public support for climate-related policy immediately and in the long term. Students will be encouraged to pursue careers related to climate change and will receive the technical skills and understanding required to excel in those careers. Well-developed programs in climate related fields in New York's schools will also position the state for success in emerging green economies.

Water and Wastewater Efficiency. The water and wastewater treatment efficiency initiative will provide the savings presented in Table 11 below and address the following criteria and provide the indicated benefits.

Criteria 1: Provide cost-effective CO_2 reductions through energy efficiency improvement to water and wastewater treatment plants. The improvements are anticipated to be primarily electric efficiency.

Criteria 3: Through investments in electric reduction, the program will help reduce the overall compliance costs of the CO_2 budget trading program.

Criteria 4: In addition to the identified energy savings and the associated carbon reductions, this program will provide numerous other benefits. These benefits include improved water quality for the residents of New York, leveraging of federal economic stimulus funds, and increased employment opportunities that result from these infrastructure projects.

Table 11. Water and Wastewater Efficiency Program Total Budget and Three-Year Savings

Program	Total Budget (Millions)	Number of Participants	3-Year Electricity Savings (mWh)	3-Year Natural Gas Savings (mmBtu)	3-Year Fuel Oil Savings (mmBtu)	3-Year CO_2 Reduction (Tons)*	Program Cost per Ton** (Lifetime)
Water and Wastewater Efficiency	$20	85	97,833	62,703	46,987	60,902	$70

*These emission reductions are associated with both electric and fossil fuel saving measures. Under a cap-and-trade system, the total number of CO_2 allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, electric efficiency projects may not decrease the overall amount of CO_2 being emitted into the atmosphere by New York entities. However, electric efficiency projects will reduce end-users' carbon-footprints as they will be responsible for a smaller percent of the emissions associated with electricity production.

**Cost per ton is based on levelized program costs (including initial incentives, program administration, and performance-based incentives) divided by the estimated annual GHG emissions reductions. All initial costs are levelized over the measure or practice lifetime, and future program incentives are brought to a present value and then levelized where appropriate. Values are discounted using a five percent social discount rate.

3.A.3(c) *Program Outreach, Education and Technology Transfer*

The design of specific programs will take into account the expertise of existing advisory groups and programs currently being implemented and designed within NYSERDA, DEC, and other government and non-governmental organizations (NGOs). Successful implementation of these programs will require close coordination with diverse public and private stakeholders including the colleges and university of the State University of New York (SUNY) system, private colleges and universities, the American College and University Presidents Climate Commitment, New York State School Boards Association, New York State Conference of Mayors, Regional Planning and Development Boards, New York State Association of Towns, New York State Metropolitan Planning Organizations, environmental justice organizations, and NYS DEC.

NYSERDA's existing contacts in the community, including Energy $mart Community Coordinators, the Focus on Schools and Focus on Colleges programs, and University programs, will be used to reach the target audience. NYSERDA will also work through its Energy $mart Communities program to identify Energy Target Zones, including those located in environmental justice communities, that will benefit from the focusing of diverse energy efficiency and other energy services. Results of efforts in Energy Target Zones will be highlighted and communicated in case studies.

With respect to the water and wastewater treatment program, targeted and active outreach is necessary to reach and inform municipalities about this unique opportunity to reduce the long term operating expense at their water and wastewater facilities. NYSERDA will partner with EFC, and EFC, using the State Revolving Fund Intended Use Plan, will take a leadership position in identifying and obtaining participation in the Program. NYSERDA and its Focus on Water and Wastewater effort will assist, inform, and educate customers to expedite participation. In partnership with EFC, NYSERDA will focus additional outreach effort on municipalities in areas not currently exposed to NYSERDA programs such as Long Island, New York City, and Westchester County.

A recognition program for participants in the program will be created including awards, press events, and possibly bonuses for outstanding energy reductions.

3.B. Longer-Term Investments to Address High Potential GHG Reductions

The longer-term programs will support development and demonstration of technologies with substantial GHG reduction potential and that are relevant to New York manufacturing industries and building systems. Funded projects will focus mainly on innovations which reduce the use of fossil fuels; have high replication potential for New York's manufacturing base; are likely to be cost effective; and are not at present supported under SBC programs.

3.B.1. Advanced Building Systems and Industrial Process Improvements

Advanced Building Systems. This initiative will support the development and demonstration of next generation technologies having significant GHG reduction potential and that are relevant to building systems. The projects will focus on technical innovations which collectively enable net-zero-energy buildings. The strategy will focus on absolute reduction of building energy loads and increases in systems efficiency prior to introduction of renewable energy sources such as photovoltaic and solar thermal systems. Specific activities include improvements in the thermal performance of building envelopes and windows; increased efficiency of heating and cooling systems; clean, biofuel technologies that displace the use of fossil fuels; cost-effective, efficient micro-combined-heat-and-power (Micro-CHP) systems for residential applications; and advanced solar thermal systems for residential and commercial buildings. Supported projects will have significant replication potential; are likely to be cost-effective; and are not adequately supported under SBC programs.

While buildings improvements present significant potential for GHG reductions, the extreme fragmentation in the industry impedes participants from focusing on developing new technologies and products. The

technology areas having the more significant potential for GHG reductions would be the focus of this initiative. Improvements in heating system efficiencies will be emphasized for residential and small scale construction, and advances in cooling system efficiencies will be emphasized for larger commercial buildings. Improvement will be sought in materials and construction processes to reduce thermal and infiltration losses through improved building envelope and window systems. Heating, ventilation, and air conditioning equipment will be developed that is capable of more refined modulations in operating cycles, *e.g.*, variable output burners, circulation systems. Micro-CHP and self-powered heating systems for residential and small-scale buildings will be developed to provide power during outages and improve efficient on-site use of primary fuels. Development of advanced controls to support automation and optimization of building environmental systems will be pursued. Development, demonstration, and testing will be supported of clean burning, efficient biofuels technologies.

The program will be administered through existing Advanced Buildings Program solicitations. Eligible projects must meet overarching GHG reduction requirements and not be receiving support from existing SBC funding sources.

Industrial Process Improvements. This initiative will support the development and demonstration of next generation technologies having significant GHG reduction potential and that are relevant to New York manufacturers. The projects will focus on technical innovations that reduce and displace the use of fossil fuels; have high replication potential by New York manufacturers, are likely to be cost effective, and are not receiving adequate support from SBC programs.

Many New York industries are in a steady decline because of competition and the increasing costs of primary inputs including labor and energy. In many industries using thermal processes, the most immediate opportunity for reducing GHG emissions is in reduction of waste heat generated throughout production. On average, industrial processes result in losses of approximately 35 percent of initial thermal energy inputs. Improvements can be achieved through either increasing thermal efficiencies or replacing existing thermal processes with alternatives that are less energy intensive. However, development and adoption of these technologies is impeded by limited capital, uncertain expectation of success, and risk aversion. Existing SBC programs have not been able to fully address this sector's needs.

Projects under this initiative will include 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 may also include changes in material inputs and development of advanced controls provided they directly bring about GHG reductions.

This program will be administered through existing Industrial Process and Productivity Improvements (IPPI) solicitations. Eligible projects must meet overarching GHG reduction requirements and not be receiving support through SBC funding.

3.B.1(a) *Anticipated Multiyear Program Schedule*

During the first year, road maps will be developed that prioritize technology development and demonstration activities that can achieve the largest absolute GHG reductions given New York's demographics and the technical feasibility and likelihood of commercialization of the technologies. Similar activities include the biofuels and feedstock road map, the New York GHG supply curve, and the planned New York Academy of Sciences inventory of programs relevant to clean energy offered by New York's technical universities.

3.B.1(b) *Budget*

This program has a three-year budget of $15 million. Anticipated funding commitments are shown in Table 12 below.

Table 12. Advanced Building Systems and Industrial Process Improvements Anticipated Funding Commitments ($000)

	Fiscal Year 09-10	Fiscal Year 10-11	Fiscal Year 11-12	Out Years	Total
Advanced Building Systems	$300	$750	$2,000	$1,950	$5,000
Industrial Process Improvements	$500	$1,500	$3,800	4,200	$10,000
Total	**$800**	**$2,250**	**$5,800**	**$6,150**	**$15,000**

3.B.1(c) *Metrics and Benefits*

This initiative will address the criteria and provide the benefits described below.

Criteria 2: Invest in technology that has significant potential to reduce GHG emissions in New York.

Criteria 4: Other benefits, specifically economic development benefits associated with technology application at existing commercial, residential, and industrial facilities and product development in New York industries.

We anticipate that approximately 50 percent of the funds will be invested in product development with New York companies. Results of previous NYSERDA investments in buildings and industrial product development demonstrate that for every $1 invested by NYSERDA in such efforts, gross state product increases by $3. The program will support technology demonstrations at ten industrial facilities, which will result in replication at other sites in the same industry. In addition to normal commercialization efforts, product development activities will also be coordinated with NYSERDA's deployment programs as an additional strategy to accelerate introduction into the markets of emerging technologies.

3.B.1(d) *Program Marketing, Outreach, and Technology Transfer*

This initiative will be marketed and technology transfer achieved by working with existing trade associations, university industry centers, and collaborations with non-government organizations, including the American Council for an Energy Efficient Economy, Clarkson Center for Advanced Materials Processing, Syracuse Center for Indoor Environmental Quality, and Rad Tech, an industrial trade group that advocates ultraviolet and infrared alternatives to thermal processing.

Section 4. Transportation

The objectives of Transportation sector programs are to reduce greenhouse gas contributions from the transportation sector by reducing petroleum use and, where feasible, increasing the efficiency of electric mass transit. These objectives can be achieved by improving the efficiency of vehicles and transportation infrastructure, expanding the use of electricity and renewable fuels in the sector, and encouraging behavioral changes and smart growth policies that reduce vehicle miles traveled.

RGGI's transportation initiative consists of a portfolio of near- and long-term strategies that will cost effectively reduce GHG emissions. The initiative focuses on new and improved technologies and includes programs that seek behavioral changes by reducing vehicle miles traveled, developing and deploying high efficiency vehicles, and improving the performance and efficiency of transportation systems.

In 2006, New York's transportation sector was responsible for 39 percent of GHGs emitted through fuel combustion and accounted for 79 percent of the petroleum used in the state. The transportation sector is the only sector in New York in which 2006 GHG emissions from fuel combustion are higher than 1990 levels. In addition, most of the petroleum used in the transportation sector in 2006 was imported into New York and thus was responsible for exporting energy dollars out of the state. New development and deployment programs are needed to reverse the increasing use of fuel and cost effectively reduce transportation GHG emissions. Most initiatives in the transportation area require substantial expenditures, and auction proceeds would complement, rather than supplant, existing Federal and State funding.

The following programs seek to improve the energy efficiency of the transportation sector through system and vehicle efficiency improvements. These projects will also help educate New Yorkers about the connections between their transportation choices and climate change. Improving transportation system efficiencies by reducing congestion, lowering electricity needs, and shifting to more efficient transportation modes and improving vehicle efficiency through electrification, retrofits, and modernization are promising and complementary methods for reducing CO_2 emissions from the transportation sector.

4.A. Near Term Programs to Reduce Greenhouse Gases

4.A.1. Transportation Efficiency Program

The objective of the Transportation Efficiency Program is to improve vehicle and system efficiencies through measures that reduce total vehicle miles traveled (VMT) and improve the efficiency of New York's diesel fleet with retrofits, replacement, and electrification. Vehicle and system efficiencies require urgent attention. New York's transportation system carried New York's 19 million residents, plus millions of visitors and commercial vehicles, almost 400 million miles per day in 2007. Diesel vehicles in New York use 1.4 billion gallons of diesel fuel each year, emitting more than 15 million tons of CO_2 into the atmosphere.

Investment of RGGI funds in VMT-reduction programs is necessary because these activities are unlikely to be undertaken without public support. Private companies and individual drivers do not perceive the full costs of their transportation choices, which cause congestion, road deterioration, local air pollution, and climate change. Publicly financed programs to reduce VMT will help drivers choose transportation options that impose fewer costs on society. Diesel efficiency projects should receive RGGI funding because the current funding available for similar projects, through the Congestion Mitigation and Air Quality Improvement Program (CMAQ), is available only for certain areas of New York. RGGI funding would be the only statewide funding available for these important projects and would help overcome market barriers to adopting these technologies. Additionally, CMAQ funds are dedicated to reducing only criteria pollutant emissions. While the projects proposed for RGGI funding will also reduce criteria pollutant emissions, they prioritize reducing CO_2 emissions. Initial projects will include:

Transportation Demand Management. New York has the most energy efficient transportation system in the country, but VMT is growing, leading to increasing transportation energy use. To combat this, Governor Paterson has called for a ten percent reduction in VMT from projected levels over the next ten years. Enacting transportation demand management (TDM) strategies, such as ridesharing, expanding public transportation use and services, commuter choice programs, and promoting bicycle and pedestrian options, would help reduce VMT and reduce transportation energy use. This project would provide incentives for employers, municipalities, and private contractors to offer individuals benefits for shifting transportation modes and to install infrastructure to facilitate transportation demand management strategies.

Electric Trailer Refrigeration Units. Most refrigerated trailers used for trucking food are powered by separate diesel motors, but new hybrid-electric trailers can run on diesel while driving and use electricity from the electric grid while parked. This project would provide incentives to fleets and major depots to purchase hybrid trailers and install supporting infrastructure.

School Bus Coolant Heaters. Diesel-fuel-fired coolant heaters avoid the need for the main diesel engine to idle on cold mornings to warm a school bus. Instead, they use small amounts of diesel to heat the bus's coolant, quickly warming the engine and cabin. This project would provide financial incentives for school bus operators to purchase and install coolant heaters.

Heavy Duty Hybrid-Electric and Battery-Electric Vehicles. Heavy duty hybrid-electric and battery-electric vehicles, such as buses and delivery trucks, are typically high mileage vehicles that make frequent starts and stops, ideal conditions for hybrid-electric and battery-electric drivetrains. These cost of these vehicles is typically double that of equivalent standard diesel vehicles. This project would provide financial incentives for public and private fleets to purchase hybrid-electric and battery-electric vehicles.

4.A.1(a) *Anticipated Multiyear Program Schedule*

Transportation demand management projects may consist of annual solicitations for applicants wishing to implement a variety of transportation demand management strategies, an open-enrollment program for employers who want to offer commuting benefits to their employees, and other similar approaches. Multiyear applications will be considered, because past experience indicates that long-term transportation demand management programs have better success rates. NYSERDA would commit significant resources to education and outreach about transportation demand management programs for employers and communities across New York.

For hybrid refrigeration trailers, which require supporting infrastructure in addition to vehicle upgrades, the early stages of the programs would primarily involve soliciting program partners and coordinating infrastructure development. Funding commitments would increase in later years as partners build infrastructure improvements and purchase trailers.

For other diesel projects, which involve only vehicle purchases and retrofits using existing technologies, projects would likely consist of open-enrollment solicitations for eligible applicants based on pre-specified criteria. NYSERDA has successfully run similar programs in the past and would disseminate these solicitations to fleets across New York through existing networks and broader outreach.

4.A.1(b) *Budget*

This program has a three-year budget of $34 million; anticipated funding commitments are shown in Table 13.

Table 13. Transportation Efficiency Systems Program Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Transportation Efficiency Programs	$9,500	$10,450	$8,550	$3,800	$32,300
Outreach	$500	$550	$450	$200	$1,700
Total	**$10,000**	**$11,000**	**$9,000**	**$4,000**	**$34,000**

4.A.1(c) *Metrics and Benefits*

Calculations based on current research into consumer responses to transportation demand management programs suggest that while drivers often require significant incentives to switch their modes of transportation, the programs are cost effective because they save more in reduced fuel costs than they cost to administer. Currently, NYSERDA has little funding for these innovative projects, so support of this project would introduce a novel set of deployment projects.

Calculations based on NYSERDA's experience with diesel emission reduction programs and studies conducted for NYSERDA suggest that these programs are among the most cost effective methods currently available for reducing diesel use. While NYSERDA has operated programs in the past promoting these technologies, the previous sources of funding have been exhausted, and no funding is currently available for statewide programs.

NYSERDA estimates that these programs would cost approximately $156 per ton of CO_2 reduced. Over the first three years of the program, these projects are projected to save approximately 3.5 million gallons of diesel fuel and 2.5 million gallons of gasoline. Co-benefits of transportation demand management projects include reduced traffic congestion and accidents. Diesel vehicles emit a number of pollutants other than CO_2 including nitrogen oxides, carbon monoxide, and particulates, and the diesel efficiency measures will yield significant health improvements and better local air quality, especially in environmental justice areas. These measures also will serve to reduce fuel bills for public sector organizations such as schools and public transit agencies.

Table 14. Transportation Efficiency Systems Program Three-Year Budget and Savings

Program	Budget ($ Millions)	3-Year Diesel Savings (mmBtu	3-Year Gasoline Savings (mmBtu)	3-Year Electricity Increase (MWh)	3-Year CO2 Reduction (Tons)*	Program Cost per Ton (Lifetime)**
Transportation Efficiency Program	$34	481,791	316,200	7,651	61,142	$156

*These emission reductions are associated with both electric and fossil fuel saving measures. Under a cap-and-trade system, the total number of CO_2 allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, electric efficiency projects may not decrease the overall amount of CO_2 being emitted into the atmosphere by New York entities. However, electric efficiency projects will reduce end-users' carbon-footprints as they will be responsible for a smaller percent of the emissions associated with electricity production.

**Cost per ton is based on levelized program costs (including initial incentives, program administration, and performance-based incentives) divided by the estimated annual GHG emissions reductions. All initial costs are levelized over the measure or practice lifetime, and future program incentives are brought to a present value and then levelized where appropriate. Values are discounted using a five percent social discount rate.

4.A.1(d) *Program Outreach, Education, and Technology Transfer*

Concerted outreach and education efforts will precede introduction of the transportation demand management project because lack of information is a critical factor in their current underutilization. Project effectiveness will be determined by the reduction of vehicle miles traveled among people participating in transportation demand management programs. NYSERDA will collaborate with New York metropolitan planning organizations, U.S. Department of Transportation and U.S. Environmental Protection Agency, New York State Department of Transportation, New York State Department of Environmental Conservation, and regional Clean Cities Coordinators. Through contacts with organizations including the American Public

Transportation Association (APTA) and Smart Growth America, NYSERDA will share its experiences with innovative transportation systems programs and learn best practices from elsewhere in the country.

For diesel programs, NYSERDA has extensive experience working with private fleets, transit agencies, and school districts and will rely on this experience to reach a broad group of potential applicants. Project effectiveness will be determined by the number of new vehicles and retrofits purchased, reductions in diesel fuel used by participating fleets, the utilization factors at electrified docks for hybrid refrigeration trailers, and the extent to which these activities translate into broader statewide participation. NYSERDA will collaborate with the U.S. EPA, NYS DEC, NYS DOT, metropolitan planning organizations, and Clean Cities Coalitions that are also working to reduce diesel emissions. Private fleet participants will be important partners in these exercises, and their successes will generate positive exposure and generate case studies that can be shared with other fleets. NYSERDA will share results through organizations such as the American Trucking Association, the New York Association for Pupil Transportation (NYAPT), and the Electric Drive Transportation Association (EDTA). All project results will be disseminated and shared with all key stakeholders in New York.

4.A.2. Electrified Rail Efficiency

Electrified rail is a key mode of mass transit used in New York's largest metropolitan areas. The New York City Metropolitan Transit Authority (MTA), for instance, uses more than 3.4 billion kilowatt-hours per year of electrical power, with more than 2.6 billion kilowatt-hours used per year for electrified rail propulsion. Substantial opportunities exist in the near- and long term to increase the efficient use of electricity via deployable technologies thus reducing the greenhouse gas footprint of these operations.

The Electrified Rail Efficiency Improvement Program will continue a close working relationship with New York utility companies, primarily New York Power Authority (NYPA) and Consolidated Edison of New York, Inc. (Con Edison), and transit authority units including the Metropolitan Transit Authority, the New York City Transit Authority, Metro North Railroad, and the Long Island Railroad.

Typical projects that may be pursued under this program include:

- *Heater Controls:* A significant near-term opportunity focuses on the deployment of newly-developed systems for monitoring and controlling electrical resistance heaters for ice control, third rails, and rail switches. This technology allows operators to use heaters only when warranted by ice conditions rather than relying on the current operating procedures which call for turning all heaters on and off on a seasonal basis.
- *Insulator Cleaning:* One possible mid- to long-term initiative calls for development and deployment of semi-automated cleaning equipment for the thousands of electrical insulators supporting electrified third rails. The insulators, when dirty and corroded, enable substantial amounts of stray electrical current to be lost.
- *Traction Power Regeneration Improvement:* Another mid-to-long term project involves modifying train propulsion systems and installing energy storage systems, either at trackside or directly on rail cars, to improve substantially the ability of railcars to capture and use regenerative braking energy.
- *High Conductivity Third Rails:* Aluminum third rails reduce overall energy use by subway cars and have had limited use within the New York City Metropolitan Transit Authority system. Increased use of this relatively new technology can be promoted by disseminating the results of additional testing and demonstrations.

4.A.2(a) *Anticipated Multiyear Program Schedule*

Currently, project opportunities fall into two categories: readily deployable technologies (*e.g.*, heater controls) and mid- to near-term technologies (*i.e.*, initiatives requiring additional demonstration and development before deployment). The currently anticipated program schedule for each is shown below.

Table 15. Electrified Rail Efficiency Anticipated Schedule of Near-Term Projects Poised for Deployment

Milestone	Start Date	Completion Date
Program Planning	4/1/2009	10/1/2009
Technology Development and Demonstration	Done	Done
Deployment Specification Development	4/1/2009	6/1/2009
Procurement	6/1/2009	8/1/2009
Installation and Commissioning	9/1/2009	11/1/2009
Operation	12/1/2009	12/1/2009 and forward

Table 16. Electrified Rail Efficiency Anticipated Schedule for Mid-Term Projects Moving to Deployment-Readiness

Milestone	Start Date	Completion Date
Program Planning	4/1/2009	10/1/2009
Technology Development and Demonstration	6/1/2009	6/1/2011
Deployment Specification Development	4/1/2010	6/1/2010
Procurement	7/1/2010	9/1/2010
Installation and Commissioning	10/1/2010	12/1/2010
Operations	1/1/2011	1/1/2011 and forward

4.A.2(b) *Budget*

Annual funding is approximately $12 to $16 million. In the first year, most of the funding will be applied to previously developed and verified near-term deployable technologies (*i.e.*, switch heaters and third rail heater controls). In years two and three, technologies developed, qualified, and verified during the long-term technology development portion of the RGGI transportation program are expected to become an increasing focus of the near-term program and provide continuing improvements in program metrics.

Table 17. Electrified Rail Efficiency Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Near-Term, Deployment-Ready (initially, Heater Controls)	$10,000	$12,000	$12,000	N/A	$34,000
Future Products (Moving to Deployment-Readiness)	$2,000	$4,000	$4,000	N/A	$10,000
Total	**$12,000**	**$16,000**	**$16,000**	N/A	**$44,000**

4.A.2(c) *Metrics and Benefits*

This initiative will address the criteria and provide the benefits described below.

Criteria 1: Provide Cost effective GHG reduction measured by quantity of carbon equivalents reduced per dollar.

Criteria 4: Other benefits: Specifically economic development benefits associated with the New York manufacturing jobs that will be created from producing products funded under this program such as the heater controls for transit switches and third rail deicing.

Criteria 6: The need for funds: Historical underinvestment in energy efficiency in the transportation sector continues because of budget shortfalls and prioritizing safety and service improvements. Other

public benefit efficiency program are not providing needed support, and without this program, these cost-effective measures are unlikely to be implemented.

The specific projects outlined above, if fully implemented, can potentially save up to ten percent of the 2.6 billion kilowatt-hours per year of electrical energy used by the Metropolitan Transit Authority in operating electrified subway and commuter railcars. Similar new project opportunities developed and deployed in the course of this program are expected to achieve an additional ten percent energy reduction. These savings would accordingly result in decreased greenhouse gas and criteria pollutant emissions.

Table 18. Electrified Rail Efficiency Improvement Program Three-Year Budget and Projected Savings

Program	Total Budget ($ Millions)	3-Year Electricity Savings (MWh)	3-Year CO_2 Reduction (Tons)*	Program Cost per Ton (Lifetime)**
Electrified Rail Efficiency Improvement Program	$44	169,330	92,454	$86

*These emission reductions are associated with both electric and fossil fuel saving measures. Under a cap-and-trade system, the total number of CO_2 allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, electric efficiency projects may not decrease the overall amount of CO_2 being emitted into the atmosphere by New York entities. However, electric efficiency projects will reduce end-users' carbon-footprints as they will be responsible for a smaller percent of the emissions associated with electricity production.

**Cost per ton is based on levelized program costs (including initial incentives, program administration, and performance-based incentives) divided by the estimated annual GHG emissions reductions. All initial costs are levelized over the measure or practice lifetime, and future program incentives are brought to a present value and then levelized where appropriate. Values are discounted using a five percent social discount rate.

4.A.2(d) *Program Outreach, Education, and Technology Transfer*

Program outreach and technology transfer will build upon ongoing activities flowing from proactive outreach to and participation by all participants in the stakeholder community, including consultants, manufacturers, transit system operators, and organizations such as the American Public Transportation Association (APTA) and the Electric Power Research Institute (EPRI). Key results from funded projects will continue to be presented by contractors and transit organizations at public forums such as annual meetings of APTA and the Transportation Research Board (TRB) and be published in such trade journals as *Mass Transit* and *Metro* magazine.

4.B. Longer-Term Programs with Technical Potential for GHG Reductions

The Advanced Transportation Development program invests in next generation technologies that have significant technical potential for reducing greenhouse gases in the transportation sector. Current options are not capable of achieving long-term goals for greenhouse gas reductions, and the proposed long-term programs are designed to develop options and provide continual improvements in the performance and cost effectiveness of a variety of greenhouse gas reduction measures.

4.B.1. Advanced Transportation Development Program

The goal of the long-term Advanced Transportation Development Program is to commercialize improved technologies, products, systems, and services that provide superior GHG reduction performance and cost-per-ton values. Activities include product development, field testing, performance validation, policy development, and business assistance associated with emerging products that provide verified GHG benefits. The program has the following elements:

Plug–in Hybrid Vehicles (PHEVs) and Infrastructure. Plug-in hybrid vehicles have been evaluated by United States National Laboratories as having the potential to reduce greenhouse gases emitted by the mobile sector by 40 percent. When introduced in 2010 by major auto companies, plug-in hybrids may either result in a positive impact on the electric power grid or may add load that has negative effects. The future viability of plug-in hybrids will depend on their penetration rate, on their charging profiles, and on their compatibility with the electric grid. The development of advanced on-board chargers and the success of their interface with

power infrastructure are critical for electrifying the transportation sector and present opportunities for long-term program activities.

Electric Rail Efficiency. New York's electrified commuter rail and subway systems use more than two billion kilowatt-hours each year, equaling more than one million tons of CO_2. Analysis has shown that development, testing, and deployment of advanced technologies for electrified rail systems could reduce peak loads by as much as 20 percent. Over the past several years, NYSERDA's research and development program has developed several products that are being deployed, and other promising products are in the developmental stages. The program will continue to support development and demonstration of emerging technologies that can improve the energy efficiency of electric transportation by providing assistance from inception to full scale deployment. The program will continue to be administered in collaboration with the Metropolitan Transit Authority through solicitations such as PON 1217 *Advanced Energy Systems for New York City Passenger Mass Transit*.

Vehicle Efficiency. The New York metro area is unique in terms of the extent and severity of duty cycles imposed on vehicles. Vehicles developed for a national market are not designed for the type of driving typical of New York City. Technological improvements, including hybrid-electric and hydraulic launch assist drivetrains, efficient alternators, and idle-stop systems. can reduce the use of fuel by vehicles during urban driving. Working with representatives of businesses in the New York metro area, NYSERDA has supported the development of several products for urban commercial vehicles such as taxis, delivery trucks, buses and the hybrid-electric busses now used by the Metropolitan Transit Authority. The program would expand efforts to accelerate commercialization of New-York-made products and other products that address the operation of vehicles in urban settings.

Vehicle Miles Traveled Reduction. The program will have commercial vehicle and light duty, non-commercial components and will be administered through collaborative solicitations such as PON 1239 *Sustainable Transportation Systems* with the New York State Department of Transportation.

The commercial component of the program will focus on opportunities to promote intermodal strategies for reducing vehicle miles traveled (VMT), petroleum use, and GHG emissions in the commercial rail, highway, and marine sectors. Rail transport is more efficient, by a factor of ten to one, in moving certain types of freight. Shifting freight transport from trucks to rail will reduce truck VMT.

The light-duty-vehicle component of the program will focus on changing land-use and behavior patterns that are fundamental to reducing VMT. While the desired changes will require years of effort, the long term greenhouse gas reductions will be enormous and the benefits merit a strong, sustained commitment to "smart growth." The light-duty component would provide funding and coordination for analyses, studies, and demonstration projects that could catalyze changes in policy and land use. Key elements to be addressed by the program include promoting transit oriented development, bus rapid transit, ridesharing, vanpooling, and commuter reduction programs, *e.g.*, compressed work weeks, telecommuting.

4.B.1(a) *Anticipated Multiyear Program Schedule*

To the extent possible, program elements will be executed in parallel. Hardware demonstration and performance verification projects are expected to include design, procurement, installation, and operational milestones and will usually require two years for implementation following contracting. Most of the software and behavioral modification projects will require two-year periods. Product development projects will require one to three more years to complete product development and prepare commercial prototypes for field testing.

4.B.1(b) *Budget*

The three-year budget for this program is $15 million. RGGI activity could be integrated into current programs using a mix of focused and broad-based annual competitive solicitations in each of the program's focus areas.

Table 19. Advanced Transportation Development Program Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Plug-In Hybrid Electric Vehicles	$1,000	$1,000	$1,000	N/A	$3,000
Electrified Rail	$1,000	$1,500	$2,000	N/A	$4,500
Vehicle Efficiency	$1,000	$1,000	$1,500	N/A	$3,500
Vehicle Miles Traveled (VMT)	$1,000	$1,500	$1,500	N/A	$4,000
Total	**$4,000**	**$5,000**	**$6,000**	N/A	**$15,000**

4.B.1(c) *Metrics and Benefits*

This initiative will address the criteria and provide the benefits described below.

Criteria 2: Invest in technologies and systems with significant potential for reducing GHGs in New York. The transportation sector is responsible for more GHG emissions that any other sector, yet the products and technologies currently dominating the market in that sector have not shown significant improvement in energy efficiency in more than 20 years. The transportation sector also enjoys substantial potential for long-term improvements. Assessments of one technology, *e.g.*, plug-in-hybrid electric vehicles, have shown that existing excess current electric grid capacity is more than adequate to handle the conversion of 75 percent of all the vehicles in the northeastern United States. Using the current generation mix, conversions would result in a 45 percent reduction in GHGs from the transportation sector. The long-term transportation programs include activities that will enable and accelerate the market penetration of plug-in-hybrid electric vehicles in New York.

Criteria 4: Other benefits, specifically air quality and environmental justice. Vehicle tailpipe emissions are the largest single contributor to urban air pollution. Reduced urban transportation fuel use positively affects environmental justice issues and lowers operating costs for public entities such as schools, municipalities, and public transit agencies. Construction of cutting-edge infrastructure can encourage innovations and progress in the electrification of transportation.

Criteria 6: The need for funds based on the availability of other funding sources. Historically, energy efficiency in the transportation sector has been largely ignored because of budget shortfalls and the use of capital for priority safety and service improvements rather than to reduce operating costs. No other funding sources are currently available to pay for cost-effective CO_2 reductions from the transportation sector, despite the fact that the transportation sector is the largest emitter of greenhouse gases in New York.

Additional benefits include improved transportation system performance that will save time, save energy, and reduce costs. New products manufactured in New York create jobs and improve the economy. Approximately 75 percent of the funds are expected to be invested in product development with New York companies. Results of studies of previous NYSERDA investments demonstrate that for every $1 invested by NYSERDA in such efforts, $3 of economic benefits are produced in New York.

In year two, new products and innovations are expected to emerge that will have verified benefits and will be eligible for incentive funding under short-term implementation of the RGGI program. The long-term goal for the Advanced Transportation Program is to accelerate the development of innovations and products that provide superior GHG reductions compared to current practice. Because of the long-range nature of the

program, interim progress indicators will be used to illustrate success (*e.g.*, patents issued) and metrics used that capture the magnitude of commercial success upon ultimate deployment of technologies.

The long-term RGGI Transportation program will supplement, not supplant, transportation funding from NYSERDA's statutory funding source. As such, development and commercialization of activities currently underway will be accelerated and the program will be able to focus on new activities. Experience has shown that it requires, on average, $2 million of NYSERDA funding, when matched $3 to $1 by other sources, to completely develop, build manufacturing capacity, and successfully launch a new hardware product. Based on this historical experience, over three years, utilizing $17 million, the Advanced Transportation Program will launch and achieve significant market penetration of eight or more new, cost-effective technologies that would not otherwise have emerged from development.

4.B.1(d) *Program Marketing, Outreach, and Technology Transfer*

The target audience for this program includes State and local government agencies and businesses which supply products and services to public entities. NYSERDA routinely collaborates with State and local agencies to bridge the gap between the needs of the public sector and the capabilities of the private sector. An important mechanism is to provide and manage competitive solicitations seeking solutions and improvements in the efficient operation of the state's transportation systems on behalf of State and local entities. NYSERDA will manage product development projects, fund testing of new products, and pursue program activities and case studies for pilot demonstrations that can be documented and showcased locally and regionally.

Section 5. Electric Power Supply and Delivery

The objective of the Electric Power Supply and Delivery programs is to help reduce GHG emissions from the electric power sector in New York. The initiative will support a portfolio of diverse projects relating to electric power generation and transmission and distribution systems that reduce greenhouse gas emissions throughout the sector. Implementation of an integrated strategy enabling smart-grid functionality will increase penetration of renewable resources and demand management technologies into the electric system. Maintaining a diverse portfolio of efficient generation resources provides a hedge against the rising cost and volatility of any single fuel. A strategic benefit is also realized by not being overly dependent on a single resource for keeping the lights on.

Two programs, one short term and one long term, have been identified to reduce greenhouse gas emissions in the electric power sector.

A comprehensive effort will be undertaken to optimize the carbon reduction effectiveness of both programs. A multidisciplinary working group, to be known as the Electric Power Supply and Delivery Task Force (EPSD Task Force) will be formed with representatives of key stakeholders, including representatives from the electric utilities, the New York Independent System Operator, generation companies, and appropriate regulatory agencies. The EPSD Task Force will assist in developing a comprehensive, coordinated program to reduce greenhouse gas emissions from the electric power sector by promoting advanced power generation systems and technologies, renewable resources including a targeted solar photovoltaic initiative, efficient distributed generation, smart-grid networks, advanced meters, carbon capture and sequestration technologies, and power plant flue gas recycling and chemical co-production methods. The program will be designed to simultaneously ensure a significant level of system reliability, safety, and security.

5.A. Near-Term Programs to Reduce Greenhouse Gases

The Statewide Photovoltaic Program will focus on reducing greenhouse gas emissions in the short term by helping establish a sustainable market for solar energy throughout New York with targeted financial incentives. The program will support end-use solar installations for commercial, industrial, and residential customers and electric utility applications to improve the performance of distribution circuits and effect peak load reductions in critical load pockets.

5.A.1. Statewide Photovoltaic Program

Building an energy market based on clean, renewable resources requires coordinated and sustained State policies and investments. Through the efforts of the Systems Benefits Charge (SBC) programs and the Renewable Portfolio Standard (RPS), New York is investing in a comprehensive program to establish sustainable markets for solar energy. A critical barrier to widespread adoption of photovoltaic (PV) systems is high first costs that are out of reach for most residential and commercial customers. While prices are forecasted to decrease over the next decade, incentive programs are necessary in the near term to share initial capital investments. Photovoltaic systems can also help manage buildings' peak power demands. One of the goals of the program is to demonstrate the near-term commercial application of PV technologies that can provide substantive improvements to the distribution system.

NYSERDA currently administers a photovoltaic incentive program with funds provided through the RPS. The program involves over 100 system installers who, in many cases, work for small companies that have been in operation for only a few years. Using RGGI funds, NYSERDA will expand this program statewide to include customers who do not pay into the RPS program, including customers on Long Island. The initiative will focus on communities with high peak electric demands, customers of non-regulated utilities, and off-grid applications. The funding will be provided using programs that are already underway in the state. For example, the funds could be used to expand the reach of the Long Island Power Authority's PV programs, and NYSERDA would expand eligibility in the current PV incentive program to any resident, business, or

institution in New York. Given current pricing, the program is expected to share the cost of installing approximately 10 megawatts of PV power over the three-year period which will help achieve the State's goal of installing 50 megawatts of PV power on Long Island.

Photovoltaic Distribution System Integration. The RGGI Advanced Power Delivery Program will focus, in part, on applied demonstrations of advanced technologies that promote statewide interconnection of PV resources, smart-grid capability, and innovative demandside management strategies. As a companion to that effort, the Statewide Photovoltaic Program will partner with regulated and non-regulated utilities to use photovoltaic systems to improve the performance, power quality, and reliability of distribution circuits. All program activities will be closely coordinated with other renewable and transportation initiatives supported with RGGI funds to avoid overlaps.

Statewide School Power Naturally Program. NYSERDA will implement a program to install 100 photovoltaic installations at public and private schools over three years. NYSERDA has already installed 50 educational systems that upload each school's PV data to a public web site. In the new program, schools would apply for NYSERDA funding to install small PV systems designed as teaching tools. Although larger systems would be allowed, a funding cap would limit coverage of costs to two kilowatt demonstration systems. The program will require that schools install Data Acquisition Systems that monitor the performance of PV systems and provide educational opportunities for students. The program will coordinate with NYSERDA efforts in providing energy education to k-12 students and with the RGGI Municipal and Institutional Climate Change Program as part of a recognition program for municipalities and institutions that achieve specified carbon reductions.

5.A.1(a) *Anticipated Multiyear Program Schedule*

As an expansion of existing programs, the incentive program would begin by modifying program eligibility requirements. The system integration effort will increase of the three-year period.

5.A.1(b) *Budget*

Table 20. Statewide Photovoltaic Program Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Photovoltaic Incentive Program	$9,000	$8,000	$7,000	N/A	$24,000
Photovoltaic Distribution System Integration	1,000	2,000	3,000	N/A	6,000
Statewide Solar Power Naturally	800	800	800	N/A	2,400
Total	**$10,800**	**$10,800**	**$10,800**	N/A	**$32,400**

5.A.1(c) *Metrics and Benefits*

This program will address the criteria and provide the benefits described below.

Criteria 2: The programs will invest in technology that has significant long-term potential to reduce greenhouse gas emissions in New York.

Criteria 3: Through investments in distributed electricity generation, the programs will help reduce the overall compliance costs of the CO_2 budget trading program.

Criteria 4: The programs will provide other benefits, including job creation and increased geographic equity, since PV systems will be installed and funded statewide.

Criteria 5: The programs will provide emission-free, on-peak power that reduces generation by power plants that are often located in environmental justice communities.

Table 21. Statewide Photovoltaic Program Total Budget and Three-Year Savings

Program	Total Budget ($ Millions)	3-Year Electricity Savings (mmBtu)	3-Year CO_2 Reduction (Tons)*	Program Cost per ton (Lifetime)**
Statewide Photovoltaic Incentive Program	$24	21,900	11,957	284

*These emission reductions are associated with both electric and fossil fuel saving measures. Under a cap-and-trade system, the total number of CO_2 allowances is determined by regulation. Regulated entities can purchase allowances and collectively emit up to the cap that is currently in place. Therefore, electric efficiency projects may not decrease the overall amount of CO_2 being emitted into the atmosphere by New York entities. However, electric efficiency projects will reduce end-users' carbon-footprints as they will be responsible for a smaller percent of the emissions associated with electricity production.
**Cost per ton is based on levelized program costs (including initial incentives, program administration, and performance-based incentives) divided by the estimated annual GHG emissions reductions. All initial costs are levelized over the measure or practice lifetime, and future program incentives are brought to a present value and then levelized where appropriate. Values are discounted using a five percent social discount rate.

5.A.1(d) *Program Marketing, Outreach, and Technology Transfer*

The Statewide Photovoltaic Program will be integrated into existing delivery mechanisms for Long Island and the rest of New York. While PV system installers will have primary responsibility for marketing, software tools, educational brochures are available to help consumers evaluate the appropriateness of photovoltaic systems for their needs. Implementation and technology transfer for the program will involve developing partnerships with utilities for planning and implementation.

5.B. Longer-Term Investments to Address High Potential GHG Reductions

The Advanced Power Technology Program is designed to reduce greenhouse gas emissions in the long term. The program will focus on three primary areas — advanced renewable energy, advanced power delivery, and carbon capture, recycling, and sequestration — and will provide support activities to yield substantial greenhouse gas reductions. Other advanced power generation systems and technologies may be explored in the future based on input from the EPSD Task Force.

5.B.1. Advanced Power Technology Program

Advanced Renewable Energy. To achieve the State's 15 by 30 goal, New York must commit substantial resources to the development and commercialization of various renewable resource options. The objective of this component of the program is to support site-specific pre-development activities that will foster the introduction of diverse promising renewable energy technologies in New York markets, including advanced biomass, tidal, and off-shore wind technologies. Success will be measured by increased energy production from various renewable generating projects and technologies. Activities to be undertaken include the following:

- Pre-developing specific sites for renewable energy generation (*i.e.*, off-wind, solar, hydro, landfill gas, biomass) and pre-developing specific sites for the growth, extraction, harvesting, and management of renewable fuels and feed stocks that will be used to produce electricity.
- Demonstrating new and emerging power conversion and production technologies involving the use of renewable fuels.
- Funding engineering and evaluation services to ensure project performance.
- Funding early-stage technology developments will depend on the revenues obtained through the RGGI auctions.

Advanced Power Delivery. The objective of this component of the Advanced Power Technology Program is to support the demonstration of advanced technologies that promote widespread adoption of renewable resources and demand management strategies by focusing on applied demonstrations of advanced technologies that promote statewide interconnection of renewable resources, smart-grid capability, advanced meters, energy storage systems, and innovative demandside management strategies. Activities include targeted demonstration projects that ensure grid reliability, safety, and security as the delivery network

strives to accommodate low-carbon technologies such as renewable power generation, plug-in hybrid electric vehicles, and efficient combined heat and power distributed generation systems. Activities will be closely coordinated with other renewable and transportation initiatives supported with RGGI funds to avoid overlaps.

Specific projects may include the following:

- *Smart-Grid and Advanced Metering*. Integration of distribution network smart-grid technologies and advanced meters have the potential to provide benefits for utilities and end-use customers. Greenhouse gas reductions and energy cost savings are realized through changes in consumer behavior that result from exposure to real-time price signals via advanced meters. Improved system reliability is achieved with the use of improved sensors and controls on the utility distribution network.
- *Micro-Grid Combined Heat and Power*. Strategically deployed micro-grids can improve system reliability by providing power to critical isolated networks throughout the state. Micro-grids can be outfitted with efficient distributed generation systems that satisfy the electric and thermal needs of end-use customers within isolated networks.
- *Large-Scale Central Energy Storage Wind Farms*. Large-scale energy storage systems with nominal electric power output of 100 to 300 megawatts can be integrated with commercial wind farms to stabilize the intermittency characteristic of these renewable resources. Solution-mined salt caverns may provide the necessary underground storage to support multiple compressed air energy storage systems throughout New York. Energy storage is critical for increasing market penetration of renewable power systems including solar, run-of-river hydro, and wind.
- *Superconducting Cable*. Approximately ten percent of the electric energy produced in New York is lost throughout the transmission and distribution systems. Superconducting cables and components have the potential to significantly reduce overall system losses while simultaneously increasing asset utilization in networked distribution circuits.

Carbon Capture, Recycling, and Sequestration. Given the level of sophistication of current and emerging power generation technologies, carbon capture and sequestration are the only means now available to permit continuing use of fossil fuels without releasing climate-changing greenhouse gases into the atmosphere. Current U.S. DOE estimates put New York's onshore sequestration potential at more than three billion tons of CO_2, enough capacity to eliminate all of the state's power plant-generated emissions for nearly 50 years. By capturing and sequestering the lifetime emissions from one 600-megawatt integrated gasification combined-cycle power plant, the release into the atmosphere of more than 150 million tons of CO_2 could be avoided. Before these benefits can be realized, however, capture technologies need to advance and site-specific geological research needs to be conducted to determine the best methods and locations to sequester CO_2. Projects funded through this program will focus on assessing and demonstrating carbon capture, reuse, compression, and transport technologies, characterizing and testing the state's geological sequestration potential, and supporting development of carbon capture and sequestration demonstration projects in New York.

Some specific elements necessary to capture CO_2 will be pursued. Key technologies, *e.g.*, membranes, are necessary to improve the efficiency of air separation systems and technologies to remove CO_2 from the flue gas exhaust of fossil-fueled power plants. The feasibility of reusing CO_2 will be evaluated since significant carbon reductions can be realized from enhancing oil recovery and from the production of chemicals and aggregates (*e.g.*, biodiesel from algae, CO_2 recovered from cement production, aggregate material produced from CO_2 for use in road construction). Improved compression and transportation methods can reduce the cost of carbon capture and sequestration projects.

Elements in CO_2 sequestration research will focus on assessing the technical potential of on-shore and off-shore geological sequestration in New York, assessing the deliverability of CO_2 through injection testing, and assessing potential economic and environmental impacts. Because geology varies widely throughout the state, detailed characterizations of potential high-value sites, including collection and analysis of geological samples, field injection testing, and techniques for estimating storage capacities will be developed.

New York policy makers view carbon capture with geological sequestration as a critical solution to the problem of millions of tons of CO_2 entering the atmosphere. Given this huge potential, a major thrust of this program will be to identify and support one or more large-scale demonstrations in New York. Large-scale demonstration of these technologies will require significant leveraging of funds from the Federal government and the power sector.

Developing technology for capturing CO_2 will be pursued throughout the multiyear period. Initial work will provide support for the necessary technical and geological research that will lead to one or more large-scale demonstration projects.

- *Short Term 2009-2010.* The following activities will be completed in the 2009-2010 time frame: identify strategic capability for capture and reuse technologies, complete the statewide onshore geological and environmental characterization to assess the ultimate estimated storage capacity for New York following the guidelines of the U.S. DOE carbon sequestration partnerships; develop a geologic and economic model specific to New York to identify attractive sequestration locations; solicit site-specific geological characterization projects and seek opportunities to fund work on other sequestration modalities (*e.g.*, mineralization, shale adsorption); integrate site-specific data into the statewide model; and identify strategic partners for demonstration projects.
- *Medium Term 2010-2012.* Medium term activities will include: develop goal-oriented solicitations for carbon sequestration characterization, environmental interface issues, and technology research and demonstration; secure a number of small-scale injection tests in New York; update the state model to identify geological sequestration potential in New York; identify resources to support demonstration projects, and begin investigating long-term potential for offshore geological sequestration.
- *Long Term 2012.* The expected funding of $5 million per year is not sufficient to finance long-term, multiyear demonstrations; significant public and private funding will be needed to support a large-scale demonstration. To complete one or more large-scale demonstration projects in New York of 300,000 or more tons per year, this program will need to formalize relationships with partners, including carbon-source generators, oil and gas companies, and federal funding sources.

5.B.1(a) *Anticipated Multiyear Program Schedule*

The EPSD Task Force will develop a multiyear strategic plan for projects funded under the Advanced Power Technology Program. Funding in the first year will be focused on developing a strategic program plan and quantifying and prioritizing activities to pursue within the electric power generation sector.

Projects will only be pursued if one or more key New York stakeholders commits to actively supporting all phases of the initiative. Projects must demonstrate or enable significant greenhouse gas emissions reductions and demonstrate potential for widespread replication across New York. The program will focus on the implementation of demonstration projects that can be replicated throughout the state and have the potential to yield significant greenhouse gas reductions.

5.B.1(b) *Budget*

The Advanced Power Technology Program includes a three-year budget of $71 million. The estimated funding commitments are itemized in Table 22 below. Adherence to the schedule will depend upon how

quickly key stakeholders can mobilize support for the demonstration projects. Most of the funds are expected to support milestone activities in the second and third years.

Table 22. Advanced Power Technology Program Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Advanced Renewable Energy	$1,250	$6,500	$11,750	$9,500	$29,000
Advanced Power Delivery	$2,500	$4,000	$15,000	$6,500	$27,000
Carbon Capture, Recycling, and Sequestration	$1,500	$4,000	$5,500	$4,000	$15,000
Total	**$4,250**	**$14,500**	**$32,250**	**$20,000**	**$71,000**

*Funding for early-stage technology development will be dependent on an increase in the scale of revenues obtained through RGGI auctions.

The estimated three-year budget assumes a standardized schedule for all projects. For instance, all demonstration projects are expected to include design, procurement, installation, testing, and analysis milestones. The EPSD Task Force will work with utilities and other State and Federal entities to maximize potential leveraging and partnering opportunities.

The Advanced Power Technology program will be coordinated closely with generators, renewable resource developers, and electric utility companies to ensure that projects provide significant potential to reduce long-term greenhouse gas emissions.

5.B.1(c) *Metrics and Benefits*

Advanced Renewable Energy. This program component will address the criteria and provide the benefits described below.

Criteria 2: Invest in technology that has significant potential to reduce greenhouse gas emissions in New York.

Criteria 3: Help to reduce the cost of achieving the emissions reduction goals of the CO_2 budget trading program by decreasing reliance on greenhouse gas emitting resources.

Criteria 4: Increase long-term potential for new renewable developments that will increase prospects for economic development and add environmental benefits.

Criteria 6: Provide financial support for renewable energy generation technologies that cannot compete with other mainstream renewable resources but will likely become necessary over the long term to achieve renewable energy goals.

Based on historical experience with similarly designed activities with similar funding levels, the program can reasonably be expected to support the demonstration of up to ten renewable generation pilot projects, several energy conversion and repowering projects, and characterization and evaluation of up to twenty sites for potential development of renewable generating technologies. If successful, these activities could stimulate development of new and improved technologies and renewable fuel harvesting and management practices and support the deployment of multiple energy production facilities that can compete favorably with other mainstream renewable technologies. Experience with the RPS program indicates that the development of new power generation projects results in material economic benefits to New York. In the case of the RPS program, for every dollar invested to date in incentives for energy production from new renewable resources, New York expects to reap nearly $4 in direct benefits. While the level of return cannot be estimated with accuracy for projects to be supported through the new program component, the expectations for long-term economic benefits are high.

The resources to be supported through this program component are not market ready and therefore cannot compete today with the current generation of renewable resources. However, for New York to achieve it ambitious long-term RPS and climate change goals, building an inventory of new technologies and projects

capable of producing electric energy using the full complement of natural and renewable fuels found in the state will be necessary.

Advanced Power Delivery. The Advanced Power Delivery component of the Advanced Power Technology Program will address the criteria and provide the benefits described below.

- Investing in smart-grid technology that facilitates renewable resource market penetration and thereby provides potential in the long term for significantly reducing greenhouse gas emissions.
- Helping to reduce the cost of achieving the emission reduction goals of the CO_2 Budget Trading Program by improving the efficiency and reliability of the electric grid.
- Leveraging capital investment from public and private entities outside New York to support innovative transmission and distribution infrastructure projects.

The primary objective of the activities undertaken for this program component is to support effective transmission and distribution demonstration projects that enable significant market penetration of renewable resources, efficient combined heat and power systems, and demandside management applications while concurrently maintaining high levels of grid security, safety, and reliability. Success indicators for this program component include:

- Determine energy storage design requirements to satisfy a renewable portfolio standard exceeding 30 percent.
- Coordinate with New York companies to design and manufacture components for smart-grid applications.
- Demonstrate how effective integration of smart-grid technology and advanced meters can provide co-benefits for utilities and consumers.
- Establish micro-grids that facilitate interconnection of efficient combined heat and power systems and enable effective islanding of mission critical circuits.
- Evaluate innovative grid monitoring tools to prevent cascading outages and subsequent damage to low carbon generation and storage systems.
- Demonstrate technologies that reduce congestion and energy losses associated with the electric power delivery system.
- Leverage funding from external entities to support in-state technology demonstrations.

Four to five demonstration projects will be pursued over the three-year period at a total cost of $27 million. These projects must be highly leveraged with external cost shares since a critical mass of funding is necessary to support commercially viable large-scale demonstrations.

Carbon Capture, Recycling, and Sequestration. This program component will address the criteria and provide the benefits described below.

Criteria 2: Invest in technology with significant potential to reduce greenhouse gas emissions in New York.

Criteria 4: Provide other benefits to New York in the form of increased employment by technology providers and leveraged capital investment to promote economic development.

The activities proposed here will enable deployment of innovative capture technologies in New York and elsewhere, identify ultimate storage capabilities in specific locations and statewide, and identify potential reuse opportunities. Demonstration projects will be designed to confirm the efficacy of the subject technologies and identify areas for improvement while directly sequestering millions of tons of CO_2. All

these program elements are critical to reducing the geological and technical risk of large-scale carbon capture and sequestration deployment in New York.

Power plant operators, technology providers, and universities are now pursuing development of carbon capture and sequestration technologies in New York. Many are well positioned to take advantage of a growing carbon-capture-and-sequestration industry. Ultimately, a modest investment in these efforts will yield new jobs and investments in the state as these new technologies are deployed here and around the world.

A major benefit of the planned geological research is that such data are equally valuable for other subsurface resource needs including geothermal energy generation, compressed air energy storage, and natural gas exploration. Linking these programs are a basic understanding of the state's geology and the ability to demonstrate technological solutions in these areas. Success indicators for this program component include:

- Creating quantitative databases relating to geologic reservoir quality, injectivity, and site potential for on- and offshore areas of New York.
- Completing one or two CO_2 injection tests to sequester 5,000 to 10,000 tons of CO_2.
- Obtaining support for one or more carbon capture and sequestration demonstration projects that have the potential to sequester 300,000 tons of CO_2 or more per year and up to 50 million tons over the life of each project.
- Measuring reduction of risk from deploying carbon capture and sequestration technology in New York through proper geological characterization and identification of environmental interface issues.
- Increasing the number of companies working to expand carbon capture and sequestration technology development and manufacturing in New York.
- Increasing employment in companies producing carbon capture and sequestration technologies.
- Developing retrofits for existing combustion plants to reduce CO_2 emissions.
- Reducing significantly the CO_2 emissions from combustion plants as a result of widespread deployment of carbon capture and sequestration technologies in New York.
- Increasing investments in the power generation sector and manufacturing.

5.B.1(d) *Program Outreach, Education, and Technology Transfer*

Project results will be disseminated and shared with all key stakeholders in New York. Project effectiveness will be determined by the economic and technical performance of the technology demonstrations and the extent to which these activities are deployed statewide.

The target audience for this program is regional and national trade associations, power project developers, engineering firms, government authorities, utility companies, and universities. Program activities and case studies for pilot-scale demonstrations will be documented and shared publicly to showcase the potential for broad in-state and regional applications. NYSERDA has managed several competitive solicitations dealing specifically with advanced technology characterization efforts and field demonstrations. These existing efforts can be utilized to execute numerous aspects of this program, including marketing opportunities to prospective participants.

Section 6. Sustainable Agriculture and Bioenergy

The Sustainable Agriculture and Bioenergy program is designed to reduce emissions from activities associated with agriculture and characterize the potential for carbon sequestration in New York's terrestrial ecosystem. Priorities will be guided by findings and recommendations from the ongoing *Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply Study for New York* (*Renewable Fuels Roadmap*). Bioenergy is energy in the form of heat, electricity, fuel, and other products derived from biomass. End products are referred to as bioheat, biopower, biofuel, and bioproducts which include biomass-based enzymes for fermentation and biomass-based plastics for use in manufacturing. Bioenergy is applicable to a variety of technologies and sectors and supporting efforts will be coordinated with RGGI programs in the areas of transportation, buildings, power, multi-sector programs, and clean energy businesses. The Sustainable Agriculture and Bioenergy program will focus on biofuels and bioheat.

Because many aspects of the bioenergy industry are in their infancy, the focus of this program is on long-term programs, although selected programs with near- and mid-term benefits, such as climate-friendly farming, will be prioritized.

Activities undertaken in this program may include:

Technology and Process Development. Research innovative biomass feedstock supplies, processing technologies, conversion processes. and end-uses for near-term and advanced liquid, solid, and gaseous bioproducts.

Market, Policy, and Institutional Issues. Explore new business strategies to address the unique challenges presented by commercialization of bioenergy products, including overcoming financial barriers associated with long-term supply contracts for biomass and providing incentives to growers and foresters.

Develop Performance Standards. Develop methods to accurately estimate costs and benefits for different types of bioenergy systems implemented over specific timeframes and with respect to various scales of production, and develop performance-based standards for the bioenergy industry to measure CO_2 reduction.

Non-Food Feedstock Supplies. Develop methods to sustainably expand non-food feedstock resources, promote sustainable resource management techniques, and identify sustainable biomass supplies throughout New York (*e.g.*, new crop breeding and development, integrated cropping systems, resource mapping).

Outreach. Support education, outreach, and technology transfer activities for stakeholders and, in coordination with NYSERDA's multi-sector workforce development initiatives, provide workforce development and training aimed at strengthening the sustainable biomass supply and technology infrastructures.

Analysis and Demonstrations. Develop methodologies for determining baseline inventories and identify and measure opportunities for greenhouse gas reduction and mitigation on New York farms and in its forests.

Develop Tools and Models. Develop the necessary tools and models for the agricultural sector to participate in a market-based program for greenhouse gas reductions.

6.A. Anticipated Multiyear Program Schedule

The first year will focus on demonstrations of climate-friendly farming while the *Renewable Fuels Roadmap* is being completed. The second year will focus on feedstock supply development, and the third year will focus on technology and process development and on market, policy, and institutional issues identified in the *Roadmap*.

6.B. Budget

The three-year budget for this initiative is $10 million. The anticipated funding commitments are shown in Table 23 below.

Table 23. Sustainable Agriculture and Bioenergy Programs Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Technology and Process Development	N/A	$2,000	$3,000	N/A	$5,000
Market, Policy and Institutional Issues	N/A	$500	$1,000	N/A	$1,500
Non-Food Feedstock Supplies	N/A	$2,000	$250	N/A	$2,250
Outreach	$500	N/A	N/A	N/A	$500
Analysis and Demonstrations	$750	N/A	N/A	N/A	$750
Total	**$1,250**	**$4,500**	**$4,250**	**N/A**	**$10,000**

6.C. Metrics and Benefits

This initiative will address the criteria and provide the benefits described below.

Criteria 2: Invest in technology that has significant technical potential.

Criteria 4: Other benefits, specifically addressing economic opportunities in rural areas.

This initiative will substantially expand the bioenergy industry that includes new large and small businesses along the biomass supply chain. Participants in program activities may include forest landowners, farmers, equipment suppliers, biomass brokers, product manufacturers, and end-users. Job creation will occur in a variety of supporting industries and at diverse locations including rural upstate regions that formerly supported and relied upon the paper industry. In-state production of biofuels will encourage construction of efficient distribution channels and efficient infrastructure for fuel supplies while reducing the use of fossil fuels and reducing carbon emissions. Various activities supporting sustainable agriculture will be pursued, *e.g.*, revised tilling practices and use of co-products, to reduce greenhouse gases, result in cleaner water, air, and soil, and enhance wildlife habitats. Use of clean biofuels and bioheat will improve air quality in communities affected by environmental justice issues. Important biofuels and bioheat research that are capable of generating substantial benefits and are generally ineligible for SBC and other NYSERDA funding will be pursued.

Program success indicators may include acres of biocrops planted, numbers of new biocrops developed, gallons of biofuels made in New York, and numbers of new businesses and jobs created in the bioenergy industry. Increased employment opportunities, particularly in rural communities, are an expected outcome.

6.D. Program Marketing, Outreach, and Technology Transfer

Solicitations will target the biomass community in New York, including forest and agriculture researchers, feedstock generators, processors, and end users. The programs will be implemented with the close coordination and support of the New York State Department of Agriculture and Markets and the Department of Environmental Conservation. The *Renewable Fuels Roadmap* will provide a starting point for program marketing.

Section 7. Multi-Sector Programs

Some GHG reduction goals cannot be addressed within the confines of a single initiative and require a multidisciplinary approach that includes collaboration with government and private sector stakeholders. The following initiatives seek to leverage auction proceeds and build capacity in New York to develop and implement new climate change mitigation and risk management solutions and move toward a clean energy economy.

The following multi-sector programs are intended to produce meaningful results that will be measurable within the next one to three years. They include: targeted educational opportunities related to climate change at all levels; technical training and workforce development for fossil fuel efficiency; development of carbon tracking tools; support for local and regional carbon reduction efforts; and a program to facilitate development and implementation of low-cost greenhouse gas reduction strategies. The programs will support the efforts of local governments and other communities to reduce their carbon footprints, supply the trained workers and tools necessary to achieve and measure reductions, and ensure that New York builds on its leadership position in energy efficiency and greenhouse gas reduction.

7.A. Near-Term Programs to Reduce Greenhouse Gas Emissions

7.A.1. Workforce Development

Training programs are needed to ensure that a pool of qualified workers is available for jobs in product development, manufacturing, distribution and sales, installation, operations and maintenance, planning, and performance monitoring of energy efficiency and renewable energy products and systems. NYSERDA has established partnerships with many organizations throughout the state to train technicians, students, and professionals in these areas. The partnerships will be expanded through use of RGGI funds and focus on heating efficiency, solar thermal systems, and carbon benchmarking and tracking. These areas have received limited attention to date since the funds available to support workforce development are primarily geared to non-fossil fuel applications and emphasize opportunities to reduce electric use. The new activities will build upon the efforts currently being undertaken by NYSERDA and those proposed by NYSERDA under Public Service Commission Case 07-M-0548 Energy Efficiency Portfolio Standard (EEPS). New training initiatives will provide critical support in developing a workforce capable of addressing efficiency opportunities in all energy using systems. Activities will support the growing attention being paid to solar thermal applications that replace and supplement the use of electricity and fossil fuels and respond to widespread interest in reducing the impacts of carbon. The workforce development activities described in the Sustainable Agriculture and Bioenergy program will be coordinated with this program. (See Section 6.) The initiatives will build a skilled workforce including people transitioning to new careers in the green economy, underserved and unemployed workers, and workers currently involved with building trades who need to acquire new skills.

Workforce training and development activities targeting heating system efficiency will focus on proper specification, quality installation, and maintenance of fossil fuel based systems in the residential and commercial sectors. NYSERDA will work with state and local chapters of the industry, such as the Empire State Petroleum Association (ESPA), New York Oil Heat Association (NYOHA), and the Oil Heat Institute of Long Island (OHILI), to develop comprehensive training initiatives across the state. Training will be deployed through NYSERDA partnerships with the New York State Department of Labor, community based organizations, colleges, trade unions, and professional associations. To build immediate capacity, NYSERDA will work with product manufacturers to develop and deploy customized heating system efficiency training as the primary means to train technicians. Training initiatives will include on-line courses and expansion of existing curricula available from professional associations such as the Boiler Efficiency Institute, American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE), and the Air-conditioning Contractors of America (ACCA). Funding will help offset training and the costs for

certification exams and, to some extent, equipment costs for participants. Funds will be used for train-the-trainer activities to deploy additional instructors to support the overall training efforts.

NYSERDA is currently working with training organizations across the state to implement energy efficiency workforce training initiatives, and NYSERDA is working with several training institutions to develop a limited number of solar thermal training programs aimed specifically at certifying installers. RGGI funds will be used to expand these efforts and develop new initiatives to provide fundamental skills training for people that are transitioning to new careers in green technologies. Training will engage technicians, home contractors, heating and plumbing contractors, engineers, and architects in an effort to broaden the number of people capable of determining the viability of energy efficiency and solar thermal applications for residential and commercial buildings and to ensure quality installation and appropriate ongoing maintenance.

RGGI funds will be used to add one training center on Long Island and to fully equip all existing training centers throughout the state with the necessary equipment and diagnostic tools to provide quality training. In addition, organizations and companies that hire recently trained workers will receive stipends as inducements to provide new staff with important on-the-job skills.

A number of industry-recognized organizations have developed quality training materials and technical certifications. NYSERDA will license curriculum and training materials and, where possible, NYSERDA's workforce development activities will involve multiple providers whose materials meet certain criteria. NYSERDA anticipates working with the National Oil Research Association (NORA), North American Technical Excellence (NATE), the National Center for Construction Education and Research (NCCER), and the Northeast Gas Association (NGA).

RGGI funds will be used to train building operators, managers, university students, contractors, planners, engineering firms, and other professionals to use the existing and emerging carbon tracking and benchmarking tools that will help decision makers determine their current carbon footprint and identify strategies to reduce their carbon emissions. The demand for individuals conversant with these tools is expected to grow as local governments, institutions, universities, and individual businesses become increasingly interested in analyzing their carbon impact and developing action plans that encompass multiple pathways to reducing carbon emissions. Training curricula that exist in the market, including software programs for CO_2 tracking in commercial buildings, communities, and governments, will be evaluated and additional curricula will be developed, where needed, to help users apply carbon tracking concepts. Increasing the knowledge base in these areas will support corporate and government leadership initiatives and engage entire organizations and local governments in realizing energy efficiency improvements and GHG reductions through CO_2 lifecycle management and carbon master planning.

The proposed workforce development and training efforts are aligned with Governor David A. Paterson's "pathway out of poverty" priority articulated in the recommendations of the Governor's Renewable Energy and Environmental Justice Interagency Task Forces. NYSERDA will partner with other State agencies, including the New York State Department of Public Service, the New York State Department of Labor, the Office of Temporary and Disability Assistance, and the New York State Division of Housing and Community Renewal, and with the Workforce Development Institute and numerous local and regional environmental advocacy and community-based organizations. NYSERDA will leverage the support of these State and local agencies to identify and engage the labor supply in minority and low-income communities. Program activities will be coordinated with workforce development and training initiatives and partnerships being developed under EEPS. NYSERDA will use its existing network of Energy $mart Community Coordinators to identify potential workers in Energy $mart communities statewide and seek the help of the Energy $mart Community Coordinators in marketing workforce development and training opportunities to minority and low-income individuals and community-based organizations.

Partnering with State and local organizations will allow NYSERDA to quickly and economically provide funding to communities and individuals that represent emerging and existing workers who will be necessary to achieve RGGI goals. Basic skills and on-the-job training initiatives will be developed to assist individuals with obtaining entry level positions that initiate career pathways to highly skilled positions. Training will be provided to existing workers who are unemployed and underemployed. Qualified candidates will be offered advanced technical training in solar thermal systems and fossil fuel efficiency.

7.A.1(a) *Anticipated Multiyear Program Schedule*

Development and delivery of workforce training will likely involve two phases: a curriculum development phase in which NYSERDA will evaluate and solicit expertise in specific technology areas and begin train-the-trainer programs to fully develop a large instructor base and an implementation phase where newly developed training modules and instructors are fully deployed. NYSERDA will likely leverage technical training already offered in the marketplace and will offer this training during the first year of the program. The technical infrastructure to support the expanded training effort will be developed during this first year. Newly created and discovered curricula and innovative offerings will be offered as soon as they become available during the multiyear program period.

Workforce development projects may consist of annual solicitations for applicants with specific curriculum development expertise in solar thermal and heating fuel system efficiencies. An open-enrollment program will be offered for employers, trade unions, and professional associations wanting to offer training for their employees and members, and a cost-shared tuition reimbursement will be made available for certification training and examination.

7.A.1(b) *Budget*

This program has a three-year budget of $9 million. The anticipated funding commitments are shown in Table 24 below.

Table 24. Multi-Sector Programs Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year2010-11	Fiscal Year 2011 – 12	Out Years	Total
Curriculum Development	$882	$550	$450	N/A	$1,882
Training Equipment	$285	$365	$395	N/A	$1,045
Incentives	$1,788	$2,455	$1,830	N/A	$6,073
Total	**$2,955**	**$3,370**	**$2,675**	**N/A**	**$9,000**

7.A.1(c) *Metrics and Benefits*

The first year budget of $3 million will be used to train approximately 3,500 heating technicians, 700 solar thermal technicians, and 200 professionals in the heating system, retro-commissioning, and maintenance arenas. The budget reflects an additional $900,000 over the early action plan that will incrementally fund the development and delivery of training on benchmarking and the use of carbon tracking tools to help decision makers identify strategies to reduce their carbon emissions and will support companies and organizations during the first year of employment of newly trained workers.

Economic development and job creation are significant co-benefits of this new investment in workforce development. Companies and organizations seeking to employ newly trained technicians and other practitioners will realize their respective business objectives and energy savings because these individuals have completed proper training to design, install, operate, and maintain energy efficiency measures for all fuel-types. An opportunity exists through these efforts to address the goals of the Governor’s Environmental Justice Task Force. Some of the funds will target recruiting and training of underserved and underemployed workers in the state. NYSERDA will work with the New York State Department of Labor and community-based organizations to identify these candidates.

7.A.1(d) *Program Outreach, Education, and Technology Transfer*

Outreach will continue through existing NYSERDA programs and training channels. New training opportunities will be integrated with promotion of **New York Energy $mart[SM]** electricity incentives. Activities will include working cooperatively with key partners, including the New York State Department of Labor, New York City Economic Development Corporation, colleges and universities, trade unions, and other professional organizations, to inform and educate their staff and help them promote training and workforce development services. NYSERDA business partner programs will help deploy fossil fuel efficiency resources and training to upstream market actors including contractors, distributors, and manufacturers of fossil fuel efficiency technologies. Business partners staff will identify and recruit technicians to participate in entry-level and retraining opportunities involving fossil fuel efficiency measures. Training efforts will be coordinated with NYSERDA's existing comprehensive training activities and will be offered through NYSERDA's comprehensive workforce training and education web portal.

7.A.2. Competitive Greenhouse Gas Reduction Bidding Program

NYSERDA will design and administer a bidding program for direct and indirect energy and abatement projects that reduce greenhouse gas (GHG) emissions. Projects will be selected based on a combination of technical merit and cost.

The Bidding Program will balance the following goals:

- Procure greenhouse gas reductions for the lowest cost.
- Determine the market price point for delivering greenhouse gas emission reductions.
- Solicit greenhouse gas reduction projects including and beyond those targeted by the specific initiatives described elsewhere in the Operating Plan.
- Measure and verify procured greenhouse gas reductions.

The Bidding Program will be designed based on:

- Prior bidding programs administered by NYSERDA, such as the Aggregated Load Reduction Program, the Regional Greenhouse Gas Initiative auction for CO_2 allowances, and the Renewable Portfolio Standard.
- Past New York demandside management bidding experience.
- Other bidding programs such as Con Edison's Targeted Program, Xcel Energy's Custom Efficiency Program, and Connecticut Light and Power's Request for Proposal Program.

Potential greenhouse gas reduction strategies include:

- Energy efficient use of electricity, fuel oil, natural gas, biomass, propane, steam, and coal.
- Improving wholesale electricity generation and transmission and distribution system efficiencies.
- Abatement (*e.g.*, reducing fugitive emissions from fuel storage tanks, gas pipelines, industrial processes, wastewater treatment plants, and landfills).
- Transportation efficiencies.
- Fuel Switching.

Comprehensive projects that incorporate multiple greenhouse gas reduction strategies will be encouraged.

Respondents will be required to specify the amount of funding needed to implement projects within program guidelines. Projects will be selected using clear and transparent selection criteria and receive incentives for

delivering greenhouse gas reductions. Measurement and verification will be an important program component and project selection criterion. Incentive payments will be performance-based and may be paid over defined performance periods and at multiple stages within projects.

Final program design and release of the first solicitation are planned for the fourth quarter of 2009 after further design, research, and input from stakeholders, including RGGI Advisory Group organizations and other bidding program stakeholders.

Table 25. Competitive Greenhouse Gas Reduction Bidding Programs Anticipated Multiyear Program Schedule

Milestone	Anticipated time after Plan approval
Develop conceptual program design	3 months
Review conceptual design with stakeholders	6 months
Issue first solicitation	9 months
Bids due	15 months
Execute contracts	18 months
Meet with stakeholders to review bidding process and results	21 months
Issue subsequent solicitations, if warranted	24 months

7.A.2(a) *Budget*

The three-year budget for the bidding program is approximately $41 million. NYSERDA intends to issue at least one solicitation representing three years of funding early in the planning period to maximize the potential for success in meeting the goals stated above. Any unencumbered funds will be rolled into subsequent solicitations. The anticipated funding commitments are shown in Table 26 below.

Table 26. Competitive Greenhouse Gas Reduction Bidding Programs Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-2011	Fiscal Year 2011-12	Out Years	Total
Bidding Programs		$40,979			$40,979
Total		**$40,979**			**$40,979**

7.A.2(b) *Metrics and Benefits*

This initiative will address the criteria and provide the benefits described below.

Criteria 1: The bidding program will provide a framework for marketplace participants to compete for funding to support large greenhouse gas reduction projects primarily on a cost-per-ton of CO_2 equivalent basis.

Criteria 3: To the extent that bids include reductions in CO_2 through reduced electricity use, the costs of achieving the reduction goals of the CO_2 budget trading program should be reduced.

Criteria 4: The bidding program will likely result in additional benefits including job creation; leveraged capital investment to promote economic development; increased capacity of the electricity generation, transmission, and distribution systems; and increased capacity of the fuel distribution system.

The bidding program will be designed to achieve least-cost greenhouse gas reductions and assess the market-readiness of multiple sectors for greenhouse gas mitigation. The solicitation is expected to attract a mix of bids from a variety of sectors for varied technologies and incorporating innovative strategies, including those discussed elsewhere in the Operating Plan. NYSERDA expects the bidding program to fund projects with a program cost-per-lifetime-ton between $10 and $50. Program metrics and program cost-per-ton will depend on the mix and relative proportion of project types defined in bidding Requests for Proposals and the responding bids. The Competitive Greenhouse Gas Bidding Program will likely procure between 1.4 and 2.0

million tons of lifetime CO_2 reductions, assuming that emissions reductions cost between $20 and $30 per ton of CO_2

7.A.2(c) *Program Outreach, Education, and Technology Transfer*

Outreach. Potential bidders and representative groups include:

- Energy services companies
- Electric and natural gas distribution utilities
- Wholesale electricity generators
- Manufacturers and data centers
- College and university campuses
- Aggregators
- Engineering consultants
- Large municipalities

Representative groups include:

- National Association of Energy Services Companies
- Clinton Climate Initiative
- Independent Power Producers of New York
- New York Energy Association
- Multiple Intervenors
- Business Council of New York State
- New York Energy Consumers Council
- Uptime Institute
- Green Grid
- Association for the Advancement of Sustainability in Higher Education
- American Colleges and University Presidents Climate Change Commitment
- American Council of Engineering Consultants

In addition, the solicitation will be shared with stakeholder groups assembled as part of RGGI initiatives described elsewhere in the Plan (*e.g.*, the Electric System Power and Delivery Task Force).

Technology Transfer. Results of the bidding program will be used to optimize program design in the target sector. Information and data will be shared with stakeholders including RGGI advisory group organizations to demonstrate the market capacity and cost of reducing greenhouse gas emissions. Outcome information will also be used to develop case studies of successful projects that demonstrate mature approaches to low-cost greenhouse gas reductions.

7.B. Long-Term Programs with Significant Technical Potential for GHG Reductions

The following programs require long-term investments and have significant potential to reduce greenhouse gases and lay the foundation in New York for new economic activity and growth in emerging clean energy markets.

7.B.1. Clean Technology Industrial Development

The Clean Technology Industrial Development program seeks to create, attract, and grow industries in New York that can exploit emerging business opportunities in clean energy and environmental technologies while supporting the goal of carbon mitigation. Key elements of the program include advanced industrial research and development for development of innovative technologies development, providing risk capital and business assistance, and development of advanced research centers.

Advanced Industrial Research and Development. According to a recent Council on Competiveness report[15], 50 percent of growth in the United States annual Gross Domestic Product is attributable to increased innovation. As part of the *100-Day Energy Action Plan*, the Council prioritized the need to drastically increase investments in research and development and market commercialization to deliver secure, sustainable, affordable clean energy while generating well-paying domestic jobs. The Clean Technology Industrial Development program seeks to take advantage of the state's leading academic resources by establishing one or two Clean Energy Advanced Research Centers (CLEAR Centers) at universities in New York to advance and commercialize technologies relevant to carbon mitigation. CLEAR Centers are expected to conduct world-class industrial, applied, and translational research to develop and support industrial activity in New York through the commercialization of technologies. Technology transfer and commercialization activities aimed at increasing the probability of capturing economic benefits within New York will be important components of the program. The proposed funding will permit establishment of one CLEAR Center. (See Table 27.)

Each CLEAR Center will focus on a well-defined technology area. Areas will be selected based on the relevance of the technology to the reduction or mitigation of CO_2 emissions, the potential for New York leadership in developing the technology, and the potential for involvement by New York businesses and manufacturers. Examples of potential technology areas include:

- Carbon mitigating, clean energy technologies, *e.g.*, advanced photovoltaics
- Energy efficient technologies, *e.g.*, solid-state lighting
- Enabling technologies for renewable energy and efficiency, *e.g.*, energy storage, smart grids
- Environmental technologies for greenhouse gas mitigation, *e.g.*, measurement and validation technologies

Risk Capital for Clean Technology Market Development. Financial incentive programs will be launched to reduce project risk and enable private capital investments at key points in the growth of clean technology businesses. Project examples may include pilot plants employing new carbon-reducing and energy saving process technologies, advanced biofuels pilot production facilities, and manufacturing facilities for new clean technology products developed within the RGGI program. Possible financing models may include the existing SBC-funded Manufacturing Incentive Program (PON 1176), loan programs, and loan guarantees. Based on NYSERDA's experience with the Manufacturing Incentive Program, RGGI funds for this initiative

[15] Council on Competitiveness, *A 100-Day Energy Action Plan: For the 44th President of the United States*,2008. This report is part of the Council's Energy Security, Innovation & Sustainability Initiative.

are expected to represent between 5 and 15 percent of the capital investment required to build a commercial-scale facility.

Clean Technology Business Assistance Resources. Clean energy business incubators and other business assistance projects have been recently established through SBC funding (PON 1216). The RGGI-funded Clean Technology Industrial Development Program can be used to enhance the existing program model by extending the reach of SBC-funded programs to areas outside the SBC mandate, (*e.g.*, transportation) and establishing Clean Technology Resource Programs to support existing business assistance networks. These programs will provide specialized information on clean technology markets, legal and regulatory information, financial models, and rosters of companies and executives in New York. The programs would be responsible for providing networking opportunities within the clean technology sector in New York and for information maintenance and dissemination and support for existing general business assistance providers such as Small Business Development Centers, Technology Development Organizations, and business incubators. Based on the funding presented in Table 27 for this initiative, two to three new programs will be established, and each business assistance program is expected to support approximately fifty to sixty early stage companies and entrepreneurs per year.

Cluster Development. Clean Technology Industrial Development resources will focus on local development efforts centered on clean technology established by NYSERDA-funded CLEAR Centers. Local partnerships among stakeholders in CLEAR Center communities will be formed to support commercialization of technologies through startup companies and to attract industries. Participants may include representatives of local industries, community colleges, chambers of commerce, business service providers, workforce investment boards, and economic development entities. Activities may include: providing access to capital, branding, and promoting local clusters; fostering networks among individuals and firms; performing market research and competitive assessments; supporting development planning; providing business assistance; and other projects identified by local partners. The program will maximize the investment and capability of companies and entrepreneurs participating in the CLEAR Centers.

7.B.1(a) *Anticipated Multiyear Program Schedule*

The CLEAR Centers program will be designed and launched as soon as possible, beginning the first of two phases in the first year. In the first phase, NYSERDA will competitively award planning and program development grants for the development of center operating plans. CLEAR Centers will be selected based on the center operating plans following a merit review process in the second year.

The Risk Capital programs will be designed and launched as soon as possible. The Business Assistance Resource programs seek to build on SBC-funded projects that are currently in early implementation stages, and those programs will be developed gradually to complement and enhance existing SBC projects. The Cluster Development programs are intended to build on and complement the programs of CLEAR Centers and will not be launched until the Centers are established.

Business Assistance Resource and Cluster Development programs are expected to produce self-sustaining models that will reduce the need for future RGGI support.

7.B.1(b) *Budget*

This program has a 3-year budget of $29 million. The anticipated funding commitments are shown in Table 27 below.

Table 27. Clean Technology Industrial Development Programs Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	3-Year Total
CLEAR Centers*	$750	$5,000	$5,000	$6,250	$17,000
Risk Capital	$2,000	$3,000	$3,000	N/A	$11,000
Business Assistance	$500	$750	$750	N/A	$2,000
Cluster Development	N/A	N/A	$2,000	N/A	$2,000
Total	**$3,250**	**$12,000**	**$13,750**	**N/A**	**$29,000**

*The budget for the Clean Energy Advanced Research Centers will be supplemented by research and development funds from the targeted focus areas, *e.g.*, advanced renewable energy, advanced power delivery. The above budget reflects support for a single center, and a supplement would be required for the establishment of a second center.

7.B.1(c) *Metrics and Benefits*

Advanced Industrial Research and Development. The program will address the criteria and provide the benefits described below.

Criteria 2: Long-range potential for the technology and investments to reduce greenhouse gas emissions in New York.

- In the mid- to long-term, new technologies have potential to reduce and mitigate CO_2 production.
- In the long-term, Long-term. state-of-the-art commercially available products will significantly reduce CO_2 production.

Criteria 4: Other benefits to New York, *e.g.*, the potential to create jobs, leverage capital investment in New York to promote economic development.

- In the short- to medium term: obtain leveraged industrial funding and leveraged peer-reviewed federal funding, establish spinoff companies.
- In the mid- to long-term: business partnerships help establish and support New York businesses in relevant technology areas and a qualified workforce supports growing New York businesses.
- In the long-term: state-of-the-art commercially available products significantly reduce CO_2 production and significant New York business activities occur in target areas.

Risk Capital for Clean Technology Market Development: This program will address the criteria and provide the benefits described below.

Criteria 2: Long-range potential for the technology and investments to reduce greenhouse gas emissions in New York.

- Customers increase for new energy efficient and low-carbon-emission process technologies.

Criteria 4: Other benefits to New York, *e.g.*, the potential to: create jobs, leverage capital investment in New York to promote economic development.

- Return on investment is enhanced for projects and facilities.
- Revenue is generated from new projects and facilities.

Clean Technology Business Assistance Resources. The program will address the criteria and provide the benefits described below.

Criteria 4: Other benefits to New York, *e.g.*, the potential to create jobs and leverage capital investment in New York to promote economic development.

- Companies that access resources generate revenue, attract investments, and experienced growth in employment.

Cluster Development. The program will address the criteria and provide the benefits described below.

Criteria 4: Other benefits to New York, *e.g.,* the potential to: create jobs, leverage capital investment in New York to promote economic development.

- Spinoff companies from CLEAR Centers
- Revenue growth at spinoff companies
- Patent licenses issued to local companies and companies attracted to the local area
- New jobs created from industry attraction
- Leveraged external financial support for cluster activities, including funding from local sources

7.B.1(d) *Marketing, Outreach, and Technology Transfer*

Each CLEAR Center will have as a strong technology transfer goal to commercialize products using the technology in New York. Risk Capital programs will be marketed to global clean energy companies seeking to demonstrate technologies and develop production facilities in New York. Business Assistance programs will be marketed to clean technology companies in New York and to service providers that serve the industry. Cluster Development programs will focus on CLEAR Centers and their surrounding communities.

7.B.2. Climate Research and Analysis

This RGGI program builds on the NYSERDA 2007 multiyear climate change research plan developed with the New York Academy of Sciences and based on input from more than thirty stakeholders. It is designed to increase the understanding and awareness of the environmental impacts of energy choices and emerging energy options and provide a scientific, technical foundation for formulating effective, equitable, energy-related environmental policies and resources management practices. The program will support environmental accountability, help build an environmental research capability in New York to address critical climate change-related problems facing the state and the region, including the needs of environmental justice communities, assist in developing life-cycle analysis methods for program development and evaluation, and create opportunities for innovation. The program will focus on answering the following questions:

- What are the potential ecological, public health, infrastructure, and economic impacts of climate change in New York, and how can risks associated with climate change be managed and minimized?
- What are the cost-effective climate change mitigation and adaptation strategies for New York to pursue?
- What are the key parameters that need to be monitored to establish baselines and assess climate change impacts in New York?

The Climate Research and Analysis program will include, as a priority, the assessment of potential carbon-offset areas and policy initiatives and will address other critical areas and issues related to climate change.

This program will use RGGI funding to support the research studies, demonstrations, policy research and analyses, and outreach and education efforts described below.

Research Studies will build on the two current statewide assessments related to greenhouse gas abatement options and impact and adaptation strategies. The studies will be concentrated in the following areas:

- Evaluating the impacts of climate change on infrastructure and land use to provide guidance for

planners.

- Characterizing potential changes to the agricultural sector due to climate change and identifying adaptation strategies and opportunities.
- Improving understanding of the direct and indirect effects of climate change on air quality and human health in New York and identifying ameliorative strategies.
- Evaluating climate-related changes that can threaten the viability of natural resources in New York, including shorelines, tidal wetlands, wildlife species, forests, and hydrological resources.
- Defining the effect of climate-related changes on the ecological cycling of carbon and nutrients.
- Improving and refining greenhouse gas reduction curves for New York.

Demonstrations will be conducted to identify and assess the benefits and co-benefits of strategies that would be of significance to New York metropolitan and environmental justice areas, such as heat island mitigation strategies.

Policy Research and Analysis. The program will consider all sectors, not only those involving cap-and-trade strategies, and include integrated policy analyses. Guidelines and protocols could be developed to assist RGGI when considering new carbon-offset areas and policy initiatives.

Outreach and Education. Initiatives will be used to inform scientists, resource managers, educators, students, outreach professionals, and planners about likely climate change impacts, adaptation measures, emergency response plans, and other related measures. Efforts will be fully integrated with other NYSERDA education and climate-related outreach activities.

7.B.2(a) *Anticipated Multiyear Schedule*

The first annual solicitation will be issued in 2009.

7.B.2(b) *Budget*

Table 28. Climate Research and Analysis Anticipated Funding Commitments ($000)

	Fiscal Year 2009-10	Fiscal Year 2010-11	Fiscal Year 2011-12	Out Years	Total
Research and Analysis	$3,000	$3,000	$3,000	N/A	$9,000

7.B.2(c) *Metrics and Benefits*

Program success will be measured using a uniform set of metrics previously developed for NYSERDA's Environmental Monitoring, Evaluation. and Protection (EMEP) program with input from NYSERDA's Energy Analysis group. Success indicators include: acceptance and use of research results by the scientific and policy communities; briefings to federal, state and local policy makers on project findings; project-related publications in peer-reviewed journals; citations of funded research in scientific journals and policy documents; project-related presentations at conferences and scientific meetings; and related projects leveraged with NYSERDA resources.

In addition, these research initiatives will inform decisions related to reducing the cost of achieving the emission reduction goals of the CO_2 Budget Trading Program, evaluate and document health and environmental benefits, and guide initiatives designed to reduce the disproportionate cost burden and environmental impacts on low-income families and environmental justice communities.

7.B.2(d) *Marketing, Outreach, and Technology Transfer*

Solicitations will be aimed at State and Federal institutions, policy makers and regulators; scientific and public interest groups; universities; and energy and environmental analysts. Technology transfer efforts will include: close coordination with New York State Department of Environmental Conservation Office of Climate Change; presentations to the Governor's Office and Legislature, including the Governor's Environmental Justice Task Force; presenting findings at NYSERDA conferences; project updates and data on NYSERDA and principal investigator web sites; publishing technical articles in peer-reviewed journals; publishing NYSERDA final reports; and publishing short summary papers which translate research results into a form useful for policy makers and others.

Section 8. Program Evaluation and Reporting

The overarching goals of the RGGI program evaluation are to: provide a credible evaluation of the RGGI program portfolio and individual programs and provide timely information to all stakeholders, to include progress toward program and public policy goals, progress in moving markets toward behavior that results in emissions reductions and increased energy efficiency and use of renewable energy, and measuring efficiency and effectiveness of program implementation and administration. Program evaluation will ensure accountability in the use of RGGI funds to meet overall program goals.

8.A. Evaluation Budget

The budget for RGGI program evaluation is based on the program evaluation budget established for NYSERDA's current system-benefits-charge-funded (SBC) energy efficiency programs, which is limited to not more than five percent of total program funding. The five percent evaluation budget will support: overall design and planning, implementation of plans by third-party contractors, reporting, and NYSERDA's management of the evaluation activities. Implementation of the evaluation plans, which is likely to be the most resource intensive area, will involve collection and analysis of primary and secondary data by independent contractors. Primary data collection activities that may be undertaken by evaluation contractors include: on-site verification; metering and monitoring of installed measures; and fielding in-person, telephone, e-mail, and other types of surveys and interviews.

Many RGGI-funded program activities are substantially different than the programs currently administered through the SBC. However, NYSERDA will use its best efforts to leverage existing evaluation experience and staffing to maximize economies of scale.

8.B. Evaluation Approach

NYSERDA intends to tailor its evaluation to the specific types of RGGI programs and their approach to achieving CO_2 reductions. The focus of the evaluation work will be on assessing program impacts, namely CO_2 reductions. However, process and market evaluations are also planned, especially for programs that are not already receiving process or market studies under another funding source such as the SBC. Each of these three main areas of program evaluation is described briefly below:

- Impact Evaluation measures the outcomes and co-benefits attributable to programs, calculates the cost-effectiveness of programs, and compares the outcomes to the goals set forth for the programs.
- Market Characterization and Assessment develops an understanding of markets and market actors and provides information for program design and delivery and tracks changes in markets over time.
- Process Evaluation reviews program oversight and operations, gauges customer satisfaction with programs, and recommends program, process, and efficiency improvements.

The types of programs presented in the Operating Plan are expansive in terms of the sectors and fuels covered and the ways in which they reduce CO_2. NYSERDA has the most experience evaluating impacts from programs that provide direct emission reductions through on-site electric and fossil fuel efficiency projects. For programs that fall into this category, NYSERDA will first measure and verify the electric and fossil fuel savings attributable to the programs, and will then apply emission factors to determine CO_2 reductions. Measurement and verification and attribution (net-to-gross) analysis will be conducted on a sample of completed projects according to industry best practices and will build on NYSERDA's experience with SBC Program evaluation. Similar approaches may be appropriate as well for on-site generation projects that are displacing electricity otherwise purchased from the grid. Once the evaluation of electric and fossil fuel savings is complete, NYSERDA plans to apply default emission factors available from secondary sources. Default factors are commonly used in lieu of source testing due to the time and cost of such

testing.[16] Evaluations will ensure that appropriate emission factors, taking into consideration the technology, timing, and location of projects, are applied to fossil fuel savings.

Evaluation strategies for programs other than those that provide emission reductions through on-site energy efficiency and generation projects may be explored in detail by NYSERDA and a potential RGGI evaluation assistance contractor. The potential contractor's role is discussed below. Generally, these programs will receive appropriate impact, market, and process evaluations. Specific evaluation plans will take into consideration the level of rigor necessary for the program-reported emission-reduction estimates to apply an appropriate level of rigor in the evaluations. For example, programs involving detailed and project specific technical studies of expected emission reductions may require less emphasis in evaluations than other programs.

8.C. Evaluation Implementation

Evaluation of New York's RGGI programs will be managed by NYSERDA's Energy Analysis group. Energy Analysis is organizationally separate from NYSERDA groups that administer programs and has been responsible for managing evaluation of NYSERDA's major energy efficiency, electric demand reduction, renewable energy and research and development programs for more than a decade. The staff and knowledge base within Energy Analysis will be leveraged to provide effective, efficient evaluation management of the RGGI programs. Stakeholder input on evaluation of the RGGI programs will be sought.

As an initial step, NYSERDA is considering procuring the services of a consultant to assist with design and development of the RGGI program evaluation approach. Up to $200,000 of the total five percent evaluation budget would be allocated to the consultant for evaluation design and development activities for a one-year term. The consultant would assist NYSERDA in the following general areas:

- Research and recommend protocols for evaluating greenhouse gas emission reduction programs across sectors.
- Recommend specific greenhouse gas emissions factors and alternatives.
- Explore methods for valuing greenhouse gas emissions reductions.
- Develop evaluation strategies specific to New York's RGGI Programs.

Final design and implementation of program-specific evaluation efforts will be undertaken by one or more separate third-party evaluation contractors competitively selected and managed by NYSERDA. Most of the five percent evaluation budget will be allocated to the independent, third-party contractors for design and implementation of the evaluation effort. Relying largely on independent contractors to perform evaluations bolsters program accountability.

The RGGI evaluation will be closely coordinated with NYSERDA's existing evaluation efforts for SBC and other programs. This coordination will be especially important on programs that receive SBC and RGGI funding to ensure that the evaluation does not become overly burdensome for program participants and help to minimize issues associated with survey respondent fatigue. Equally important, the evaluation efforts will ensure proper accounting of benefits from separate funding sources.

8.D. Evaluation Reporting

NYSERDA will prepare an annual RGGI program report based on findings and inputs from the independent evaluation contractors. The report will include for each prior year: an accounting of all sales of CO_2 allowances and the funds generated by such sales, a summary description of program activities, an evaluation

[16] National Action Plan for Energy Efficiency (2007). *Model Energy Efficiency Program Impact Evaluation Guide*. Prepared by Steven R. Schiller, Schiller Consulting, Inc. www.epa.gov and eeactionplan, Chapter 6.

of the results and impacts of such program activities and program accomplishments, and an accounting of program administration costs and expenditures.

Metrics and targets presented in this document (*e.g.*, dollars per ton) were established for early comparison purposes to facilitate program selection and are subject to modification in the event that changes are made to the discounting rate, discounting approach, evaluation methods, and emissions factors.

Section 9. Administration

9.A. Guiding Principles

The members of NYSERDA's Board of Directors and NYSERDA management and staff are committed to carrying out their responsibilities with accountability and transparency, through efficient and effective operations. The following excerpts from NYSERDA's Mission Statement underscore certain guiding principles and values which influence its operations.

> "We place a premium on objective analysis, as well as collaboration, reaching out to solicit multiple perspectives and share information. We are committed to public service, striving to be a model of what taxpayers want their government to be: effective, flexible, responsive, and efficient."

NYSERDA uses an open, stakeholder-based planning process in developing, operating, and evaluating its programs. The involvement between NYSERDA's technically diverse and knowledgeable staff and external stakeholders in program planning, project selection, and program evaluation results in more effective program administration and provides for increased transparency and effectiveness. NYSERDA places emphasis on independent and objective analysis, and the free exchange of ideas and information in an effort to produce the best programs and policies. Management also promotes and encourages values of honest and ethical behavior within the work place to fulfill its responsibility of ensuring proper stewardship of public resources. Lastly, NYSERDA strives to achieve efficient and effective operations, using relatively modest staffing levels. Programs are adapted to changing needs and carried out in a responsive manner, while maintaining sound fiscal and managerial controls.

9.B. Procurement Policies and Procedures

In administering all of its programs, including those proposed in the Operating Plan, contracts are procured in accordance with NYSERDA's *Procurement Contract Guidelines* (*Guidelines*), approved annually by NYSERDA's Board of Directors pursuant to Public Authorities Law Section 2879. The *Guidelines* generally require NYSERDA to use its best efforts to secure offers from potential contractors on a competitive basis and requires advance notice of pending solicitations to be published in the *State Contract Reporter*. Historically, more than 97 percent of NYSERDA's contracts are awarded on a competitive basis. For the remaining 3 percent, the Guidelines permit waiver of the competitive solicitation requirements for: work that is expected to cost $25,000 or less; unsolicited proposals, single source and sole source vendors; and other designated reasons.

Programs and contract awards also receive extensive internal review. NYSERDA's Program Planning Committee annually reviews and NYSERDA's Board approves a multiyear strategic program plan setting forth NYSERDA's programmatic goals and strategies. Internal oversight of program planning activities is also carried out by a multi-disciplinary Program Development Management Committee (PDMC), consisting of senior management from all NYSERDA units, who review and approve requests for issuance of solicitations and procurement. Solicitations and program contracts are also reviewed and approved by a project team, including program staff and representatives of Contracts Management, Energy Analysis, Communications, and Counsel's Office.

Selection of contracts is accomplished in an extremely transparent manner. Proposals submitted in response to solicitations are reviewed and evaluated in accordance with the criteria noted in the solicitation by a Technical Evaluation Panel (TEP), comprised of NYSERDA staff and outside reviewers with relevant expertise. The TEP makes recommendations to program staff, who present the results for review and approval to the Management Review Team (comprised of the Vice President for Programs, General Counsel, and Director of Contract Manager) or, at the Vice President for Programs' discretion, to the PDMC. A

number of NYSERDA programs also provide incentives to any qualified program participant who meets pre-defined program terms and conditions.

9.C. Financial Tracking Systems

NYSERDA will provide for an efficient and accurate accounting of all program expenditures and administrative costs using its well-established system of internal controls and a variety of systems and procedures. The programs are subjected to annual audit by independent auditors appointed by the NYSERDA Board. In addition:

- NYSERDA's accounts are under the control of the Commissioner of the Department of Taxation and Finance, NYSERDA's statutory fiscal agent. Funds for the RGGI-funded activities are segregated from other funding sources to facilitate an accurate accounting of all receipts, interest earnings, and disbursements.
- Pursuant to NYSERDA's By-laws, contracts and agreements may only be signed by one of NYSERDA's Officers. This centralized authorization function provides for effective segregation of financial and contracting duties and facilitates effective accountability.
- All payment requests receive a multi-disciplinary review prior to payment. Finance department staff checks the mathematical accuracy of the invoice and compliance with contract budget terms. Project management staff ensures that costs are appropriate and that the contractor's activities are consistent with the statement of work. Contract Management department staff ensure that terms and conditions of the contract such as insurance requirements are followed.

NYSERDA uses an automated accounting system which facilitates an accurate and timely accounting of all program expenditures. Staff salary costs charged to the RGGI-funded programs are based upon staff time allocations and the allocation of staff salary costs to various activity and funding codes are reviewed and approved by management quarterly. Contractual arrangements and program incentives are entered, maintained and monitored in the automated accounting system, which tracks each individual contract or agreement, recording the amount of the contract agreement and expenditures incurred to date.

The automated accounting system and described above allow NYSERDA to produce various monthly financial reports which are distributed to NYSERDA management and program staff for review. In addition, this information is used to prepare evaluation and financial status reports as required by the evaluation plan.

9.D. Administration Budget

The budget for program administration costs has been based on the program administration budget established for NYSERDA's current SBC-funded energy efficiency programs, which is limited to not more than seven percent of total funding. Many of the RGGI-funded program activities may be substantially different than the programs currently administered through the SBC, and therefore the staff resources necessary to properly administer the programs may be higher. However, NYSERDA management will use its best efforts to leverage off existing staff resources to achieve the maximum level of economies of scale possible. Ultimately, if the staff resources needed to administer the programs is determined to be higher than the amount proposed in the budget in the Operating Plan, NYSERDA will present a request to amend the Operating Plan and program administration budget.

Based on the projected budget and program scope, NYSERDA has estimated that approximately 59 program staff will be required across all programs – residential, commercial and industrial, research and development, demonstrations, clean energy and market development. The direct salaries and related benefits for program staff account for approximately 54 percent of the administrative budget. The balance of the administrative budget is for support staff (*e.g.*, contracts, finance, information technology, legal, and marketing and outreach), facilities, travel, supplies, etc. Fixed costs are applied proportionally across all funding sources

and therefore reflect economies of scale. As stated above, these estimates are based on historical experience with the SBC-funded programs and consider administrative efficiencies.

The staffing plan also acknowledges that while most staff will be needed to support programs during the years that the RGGI funds are auctioned, some staff will be required for several years after auctions are complete to continue oversight of multi-year programs. The "effective" administrative rate during early years of the RGGI program is approximately five percent to accommodate those expenditures in the later years so that overall the costs would not exceed seven percent.

Program staff undertake a variety of tasks depending on the nature and design of the programs. As approximately 97 percent of NYSERDA contracts are awarded through competitive processes, program staffs write solicitations, manage proposal review processes, develop contracts, and then oversee the performance of the contracts through their duration, including reviewing and verifying invoices and ensuring programs are charged appropriately to the related funding sources.

In the energy efficiency program areas, contracts may include those for program implementation, quality assurance, marketing and outreach, application and incentive processing, technical assistance, workforce training, and other technical support. In the research and development and demonstration areas, contracts may be for technology or product development, pilot demonstrations, data collection and analysis, technical assistance, and business development assistance

Program staff review applications of contractors in the field who desire to become program partners and deliver services, provide oversight of the performance of those partners, and work to resolve any issues that may arise between customers and program partners. Program staff review individual incentive applications from program partners and from buildings, and process them for payment. Program staff also collect, review and analyze data, and develop reports. Program staff coordinate activities with other state agencies, utilities and other organizations that may have related programs, or may be one of several funding sources for programs, and update program plans as needed to reflect changing market conditions. Finally, program staff review individual projects, perform on-site inspections, and follow up on quality installation issues and corrective actions. It is anticipated that over the three-year scope of this program, more than 50,000 customers will be served by energy efficiency programs, and hundreds more businesses and organizations will be served through other RGGI-funded programs.