Linking Market-Based Energy Efficiency Programs to Economic Growth, Sustainable Development and Climate Change Objectives

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ABSTRACT

Market-based energy efficiency programs provide a means to simultaneously meet energy and environmental objectives, while also stimulating economic growth. Cost-effective energy efficiency programs provide a "no regrets" strategy for reducing air emissions.

The case study presented in this paper applies economic and energy modeling techniques to examine the aggregate economic and environmental benefits of building sector energy efficiency programs initiated by the New York State Energy Research and Development Authority (NYSERDA). While research by energy efficiency and environmental advocates has emphasized the long-term economic benefits of pursuing energy efficiency measures, such research is typically based on engineering estimates of "technical potential" of various technologies. In contrast, the data presented in this paper are derived, to the extent possible, from on-site evaluations at specific customer locations in New York. More importantly, this paper focuses on proven program mechanisms, developed and successfully applied by NYSERDA, for overcoming market barriers and delivering the energy efficiency measures.

The analysis provides compelling evidence that investments in energy efficiency are "good business," not only for program participants, but for society in general. As New York enters the next century, market-based energy efficiency programs can provide customers and government decision-makers with the tools necessary to move toward a more sustainable economy that is growing, clean, and efficient. Furthermore, NYSERDA's energy efficiency programs and open planning process provide a model of implementation that can be replicated in other states to provide benefits similar to those identified in this study.

Introduction

As federal and state governments debate policy options to meet future energy requirements cleanly and cost-effectively, market-based energy efficiency programs[1] are emerging as a means to simultaneously meet these objectives while stimulating increased economic growth. Pursuing cost-effective energy efficiency strategies lowers energy consumption and expenditures for energy services, stimulates economic development and provides a "no regrets" strategy for reducing air emissions.[2]

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[1] Market-based energy efficiency programs are initiatives that facilitate implementation of cost-effective measures in a competitive energy market place by alleviating market barriers and associated uncertainties faced by market participants, without extensive or intrusive government intervention.

[2] "No regrets" refers to those energy efficiency actions taken as a result of economic savings which also produce reductions in air emissions. In other words, there are economic incentives which could cause these measures to be pursued in their own right irrespective of whether there are any associated emission reductions. In a "no regrets"

The New York State Energy Research and Development Authority (NYSERDA)[3] serves as a catalyst in helping businesses, institutions, industries, and households improve their energy efficiency through market-based initiatives. NYSERDA's programs are designed to target new building construction; improve the efficiency of existing buildings, particularly in small businesses and institutions; increase the efficiency, productivity and product quality in small industrial facilities; and pursue various market transformation activities for procuring high-efficiency equipment.

The case study presented in this paper examines the aggregate economic and environmental benefits of selected NYSERDA programs, primarily in the buildings sector, by applying economic and energy modeling techniques to estimate the total energy savings, jobs created, and amount of air emissions reduced, as part of a broader strategy to meet the energy needs of a growing economy in an environmentally sound manner. The objective of this case study approach is to provide policy-makers with credible and objective analysis and information on the applicability, design, and implementation of energy efficiency programs to meet multiple public policy objectives. The paper identifies the diverse market segments targeted and the critical components of the program delivery mechanisms that have been developed and successfully applied by NYSERDA.

While research by energy efficiency and environmental advocates has emphasized the long-term economic benefits of pursuing energy efficiency measures,[4] such research is typically based on engineering estimates of "technical potential" of various technologies. In contrast, the data presented in this paper are derived, to the extent possible, from on-site evaluations at specific customer locations in New York. More importantly, this paper focuses on proven program mechanisms for overcoming market barriers and delivering the energy efficiency measures.

New York's Energy Situation and the Need to Improve the Energy Efficiency of the State's Economy

New York is the fourth largest energy consumer among all states, and 90% of its primary energy supplies are imported from other states and countries. As a result of New York's need to import energy, a large portion of its $33 billion annual energy expenditure flows out of the State, resulting in a substantial

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strategy, the value of energy savings over the life of the measures exceeds the measures' implementation cost, resulting in net monetary savings to the participant and collateral air emission reductions which have no incremental cost to society in general.

[3] NYSERDA is a public benefit corporation, responsible for energy research and development, energy efficiency services, energy analysis, nuclear coordination, and bond financing. In addition, NYSERDA manages, on behalf of New York State, the Western New York Nuclear Service Center(West Valley), the site of a former plant for reprocessing spent nuclear fuel. NYSERDA has also been designated by New York's Public Service Commission as the third party administrator for System Benefits Charge funding for public benefit R&D, energy efficiency, low income and environmental programs during the transition to competition in the electricity industry. NYSERDA's base funding is derived from an assessment on the intrastate gas and electricity sales of the State's investor-owned utilities and from other sources, including an annual voluntary contribution from the New York Power Authority.

[4] For example: Nadel, S., S. Laitner, M. Goldberg, N. Elliot, J. DeCicco, H. Geller, and R. Morris, Feb. 1997, *Energy Efficiency and Economic Development in New York, New Jersey, and Pennsylvania*, American Council for an Energy-Efficient Economy (ACEEE). The methodology and results of the ACEEE study are compared to NYSERDA's results in footnote 14.

drain on its economy. Improving energy efficiency reduces economic leakage from the State, enabling more dollars to be retained in New York's economy.

New York's retail energy prices are substantially higher than the national averages for comparable fuels and customer sectors. For example, in 1995, New York's commercial electricity and natural gas prices were 45% and 15% higher, respectively, than the national averages. Similarly, New York's home heating oil price was 14% higher than the national average. Higher retail energy prices, resulting from a wide variety of factors, underscore the need to improve the efficiency of energy use.[5]

Energy markets in New York and throughout the nation are changing dramatically, as greater competition and customer choice are introduced into what were once highly regulated markets. Increased competition will give customers greater opportunities to choose their energy suppliers and the energy products and services they desire. While the current restructuring of the electricity industry is expected to lower electricity prices for all customers in New York, electricity prices are likely to remain higher than in other states with which New York competes for attracting businesses.

Beyond its economic effects, the production and use of energy is the predominant source of air pollutant emissions, such as sulfur dioxide (SO_2) and nitrogen oxides (NO_x), as well as carbon dioxide (CO_2), which is unregulated currently. SO_2 and NO_x are primary precursors of acid rain, and when NO_x combines with volatile organic compounds (VOCs) in the presence of sunlight, ground-level ozone is formed. Furthermore, CO_2 is considered the primary greenhouse gas associated with global climate change.

Under the federal Clean Air Act (CAA) amendments of 1990, New York is required to reduce its emissions of SO_2 from electric generation sources by 50% from 1980 levels by the year 2000, to a level of just under 270,000 tons per year. New York is also required to meet stringent federal air quality standards for ground-level ozone in the New York City metropolitan area by 2007.

Following negotiations in Kyoto, Japan, in December 1997, more than 150 nations, including the United States and 37 other industrialized nations, agreed to reduce emissions of greenhouse gases (GHGs). The U.S. agreed to achieve a 7% reduction in GHG emissions from 1990 levels by 2012. Although it is uncertain whether the U.S. Senate will ratify the Kyoto agreement, the agreement provides an indicator that future U.S. environmental policy, and that of New York, could be increasingly influenced by the need to reduce emissions of CO_2 and other GHGs.

This paper estimates the potential air emission reductions and economic benefits that could be achieved by the pursuit of selected energy efficiency measures in New York.

NYSERDA's Role in Delivering Energy Efficiency

NYSERDA is a unique organization because it both conducts energy research and development and serves as the focal point to deliver energy efficiency services to New Yorks's citizens, businesses, institutions, industries, and municipalities. In this latter role, NYSERDA plans and deploys innovative market-based programs and technologies directly to public and private buildings and industrial facilities, as well as to the transportation sector. Additionally, NYSERDA was recently designated by New York's Public Service Commission as the independent third party administrator of system benefits charge (SBC)

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[5] As documented in the *1998 Draft New York State Energy Plan*, "Factors That Affect Energy Prices," New York's relatively high electricity prices are driven by a combination of higher taxes, higher capital and operating costs, and higher fuel and purchased power costs. New York's higher end-use fuel prices are also driven by higher distribution costs in urbanized areas and the higher cost of doing business in the New York City metropolitan area.

funds, which provide for the coordinated administration of public benefit energy efficiency, R&D, low-income and environmental protection programs during the transition to greater competition in the electricity industry.

NYSERDA recognizes that the key to delivering energy-efficiency programs in a competitive energy marketplace is to help alleviate market barriers and associated uncertainties that market participants face, so that an active and robust efficiency market develops and flourishes.

NYSERDA's experience in designing and implementing energy efficiency programs has led to the development of an open and collaborative program planning process that relies on market participants[6] to help determine its priorities, allocate resources, and design delivery mechanisms. Through this approach, input from both stakeholders and customer representatives is used to identify those market segments where there are significant informational, institutional or financial barriers to cost-effective energy efficiency opportunities. This process enables NYSERDA to better understand the marketplace and provides real-world feedback to ensure that limited public funds are directed only to programs which address unmet needs or market failures.

As a result of input from market participants, NYSERDA's energy efficiency programs are directed toward:

- Commercial and industrial customers, with emphasis on small- to medium-sized facilities;
- Institutional, not-for-profit, and multifamily residential customers; and
- State and local government customers.

One of NYSERDA's primary market-based delivery mechanisms for energy efficiency measures is the use of energy performance contracting through energy service companies.[7] Using a performance contract, private sector capital can be leveraged to make long-lasting guaranteed energy improvements at a customer's facility, with little or no up-front capital required from the customer. Even with the financial advantages offered by a performance contract, many customers still view performance contracting with some apprehension, which presents a barrier to the use of this mechanism in delivering cost-effective efficiency improvements.

Recognizing the need for objective information and analytical services to assist customers in using performance contracting, NYSERDA:

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[6] For example, the Energy Efficiency Services Technical Review Group members include representatives from the Energy Association of New York; Western New York Technology Development Center, Inc.; Commission on Independent Colleges and Universities; Revere Copper Products, Inc.; Health Care Association of New York; Business Council of New York State, Inc; Alliance to Save Energy; NYS Governor's Office; and NYS Senate and Assembly Energy and Finance Committees.

[7] Energy performance contracting is a mechanism by which an energy services company (ESCO) provides a package of energy efficiency improvements to a facility, with the ESCO taking on the project performance risk by contractually guaranteeing to the owner that energy usage or cost reduction will be sufficient to pay all or a specified portion of the project costs. ESCOs design, finance, implement, and manage energy efficiency and energy cost reduction programs for large customers or groups of smaller customers. The distinguishing feature of an ESCO, relative to other types of firms in the energy efficiency industry is their ability to take advantage of economies of scale, bundle services, and provide a turnkey service for energy consumers.

- Provides independent and unbiased engineering and technical support to potential customers from pre-qualified contractors;
- Develops standard performance contract terms, conditions and documents;
- Expedites procurement and implementation of energy efficiency measures;
- Assists in contract negotiations and commissioning of installed measures; and
- Makes available up-front financing or "risk reduction" capital.

As a result of NYSERDA's use of open, collaborative planning and its Technical Review Group, Table 1 outlines the types of programs that are targeted to the building sector to deliver energy efficiency services. NYSERDA recognized that for customers to participate and use market-based approaches, it had to provide technical assistance, objective information, and in some cases "seed capital" to provide the necessary impetus to encourage customers to pursue energy efficiency improvements. Additionally, since New York's building construction energy code has not been updated in over a decade, it was recognized by building code officials, home builders, and State government agencies responsible for code administration, that improving the code will ensure that a higher level of energy efficiency is delivered in new and renovated buildings as New York enters the next century.

Table 1

NYSERDA Energy Efficiency Programs		
Program	***Description***	***Targeted Customer Sector***
1. Flexible Technical Assistance Program (FlexTech)	Provide on-site energy evaluations to facilitate implementation of energy efficiency improvements.	Business, institutional, local government, not-for-profit and multifamily buildings.
2. State Energy Investment Program (State EnVest)	Facilitate energy performance contracts to implement energy efficiency measures.	New York State government-owned and operated facilities.
3. Energy Conservation for Health Care Organizations (ECHO)	Facilitate energy performance contracts to implement energy efficiency measures.	Hospitals and health care institutions.
4. Financial Packaging Services (FinPak)	Facilitate energy performance contracts to implement energy efficiency measures.	Public and private school districts.
5. NYS Building Energy Code	Update, implement, and enforce an improved building construction energy code.	Residential and commercial new construction and substantial renovation.

Energy, Jobs, and Environmental Benefits of Pursuing Energy Efficiency Programs

This case study focuses on the five NYSERDA energy efficiency programs described in Table 1, which are targeted primarily to the buildings sector.[8] Some of these programs are currently operating and have already achieved significant results, while others are being developed or are just being implemented.

A stream of projected annual energy efficiency investments and expected program costs were developed for the State Energy Investment Program (State EnVest), Flexible Technical Assistance Program (FlexTech), Financial Packaging Services (FinPak), Energy Conservation for Health Care Organizations (ECHO), and Building Energy Code improvements over the 1998 through 2003 time period.[9] The energy savings, employment impacts, and CO_2 reductions from these programs were estimated for the year 2003, building on the estimated benefits that specific projects are achieving currently or are projected to achieve in the future. The analyses are based on current program results (to the extent that performance evaluations have been completed)[10] or technical and engineering estimates of anticipated energy efficiency improvements, most of which are based on on-site evaluations at specific customer locations. Benefits are estimated for 2003 to allow for the program impacts to accumulate over the 1998-2003 time period. Energy, environmental, and economic development benefits will continue to accumulate well after 2003 as additional program participants are added. However, these future benefits are not accounted for in this analysis.

The estimated energy reductions in 2003 from the selected NYSERDA energy efficiency programs are summarized in Table 2. In 2003, these programs are anticipated to save over 900 gWh of electricity, nearly 7 million Mcf of natural gas, and nearly 57 million gallons of oil. These fuel savings represent about 0.6% of New York's projected electricity and natural gas requirements, and about 0.5% of its petroleum requirements.

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[8] In 1996, New York's energy expenditure for lighting, heating and cooling buildings was $20.8 billion, representing 62% of the State's total energy bill. The energy used by buildings resulted in emissions of over 113 million tons of CO_2, or about 50% of the State's total CO_2 emissions.

[9] NYSERDA's program implementation costs in 1998 total approximately $3.8 million and are expected to leverage more than $132 million in energy efficiency investments. Over the 6-year period (1998-2003), cumulative NYSERDA program costs are estimated at $29 million, which are expected to result in cumulative energy efficiency investments of over $1.3 billion.

[10] For example, an evaluation of the FlexTech program completed in 1995 found that 64% of the recommended measures were installed and that customers planned to install an additional 19% of the identified measures in the future. Based on this evaluation, it is estimated that the 96 customers assisted in 1996 with $900,000 of NYSERDA funding made capital investments of over $15 million, resulting in annual energy savings of $4.5 million. These results imply that each dollar spent by FlexTech leverages $17 in private capital improvements and $5 in annual energy savings.

The analysis of the economic development potential of reducing energy costs and improving building efficiency was performed using the REMI Economic-Demographic Forecasting and Simulation (EDFS) model for New York State, developed by Regional Economic Models, Inc. of Amherst, Massachusetts.[11] The analysis includes the direct, indirect, and induced in-State economic impacts of the energy cost savings and the incremental investment in energy efficiency equipment, as well as the offsetting impacts of the opportunity cost of the incremental expenditures and the reduced sales of electricity, natural gas, and oil by the State's energy-providers. The analysis demonstrates the critical role improving energy efficiency plays in stimulating increased economic growth.

Table 2

Energy Reductions from Selected NYSERDA Energy Efficiency Programs in 2003*

	Nat. Gas (1000 Mcf)	Oil (1000 Gal.)	Electricity (Gwh)
State EnVest	3,115	27,487	174
FlexTech	699	5,490	167
ECHO	75	524	6
FinPak	46	10,655	126
Energy Code	2,960	12,800	444
Total	6,894	56,956	917

*Total energy reductions from efficiency measures on-line in 2003, reflecting the continuing benefits of investments made in 1998-2003.

The economic impacts of the energy efficiency programs are driven primarily by reducing energy expenditures. Since New York imports most of its primary energy supplies from other states and countries, investments in cost-effective energy efficiency reduce economic leakage, as more dollars are retained in New York's economy, thereby increasing discretionary income within the State. Savings that result from initiating cost-effective energy efficiency improvements can be used to foster additional business and consumer investments, as well as increase consumer spending for non-energy related products and services, some of which create additional new jobs within the State.

Notwithstanding the jobs created by in-State spending of energy savings, additional jobs are created by the purchase and installation of new equipment to the extent that the equipment or its components are manufactured within the State, purchased from in-State suppliers and installed by in-State labor. The economic impacts of the energy efficiency programs examined in the case study, when fully implemented in 2003, are shown in Table 3. In the year 2003, these programs are estimated to result in nearly 2,300 jobs in the State that would not exist in the absence of the programs. Similarly, the State's total economic

[11] The REMI Economic and Demographic Forecasting Model is a 53-sector dynamic structural model of New York that is linked to a U.S. economic model. The model simulates inter-industry interactions between sectors and trading flows into and out of New York, based on the relative costs of doing business. The relative cost of doing business is developed for each industry based on wages, costs of intermediate inputs, fuel costs, and taxes. Model outputs include annual net effects on employment by sector, aggregate income, and gross state product.

output in 2003 is estimated to increase by approximately $419 million, gross state product (GSP) by $139 million, and income by $217 million (1997 dollars).[12]

Viewed from another perspective, the estimated number of job-years[13] per $1 million invested by customers in energy efficiency that results from the NYSERDA efficiency programs over the expected life of the measures implemented provides somewhat of a different picture, as shown in Table 4.[14] Job creation estimates range from 21 to 45 job-years per $1 million invested by customers. Job-years per $1 million invested is largely a function of the payback period and the expected life of the

Table 3

Economic Impacts of Selected NYSERDA Energy Efficiency Programs in 2003 (97$)*

	Jobs	Total Output ($million)	GSP ($million)	Income ($million)
State EnVest	764	217	46	67
FlexTech	302	49	28	21
ECHO	44	5	3	2
FinPak	552	60	24	62
Energy Cod	633	88	38	65
Total	2,295	419	139	217

* Reflects impacts of total energy reductions on-line in 2003, including the continuing benefits of investments made in 1998-2003.

[12] These estimated impacts are a "snapshot" of New York's economy during one calendar year, reflecting the net effects within that year of the expenditures and savings associated with the selected energy efficiency programs. The expenditures within that year will continue to provide benefits for years to come. Similarly, the energy savings within that year reflect both the new participants added in that year and the participants that have accumulated from expenditures in previous years. The shortcoming of this type of "snapshot" analysis is that, because it considers only what is happening within one year, it does not weigh the total costs of energy efficiency measures against their total benefits over their expected life. However, the strength of this approach is that it clearly demonstrates the positive impacts of energy efficiency programs on the State's economy after a only few years of implementation and long before all of the long-term benefits are realized.

[13] One job-year is defined as one person working full-time for a year. Consequently, 10 job-years could represent one person working for ten years or, alternatively, ten people working for one year. The strength of this type of analysis, which measures total job-years, as opposed to number of jobs with in a specific calender year such as 2003, is that it accounts for all of the costs and all of the benefits over the life of the energy efficiency measures. However, this approach does not show the impacts which are expected to occur in any specific year. Net impacts would be negative in the early years before payback occurs and positive in the years following the end of the payback period.

[14] The estimates of job-years per $1 million investment shown in Table 4 are consistent, in general terms, with the results of the 1997 ACEEE study referenced earlier, which also concluded that investments in energy efficiency would result in increased employment in New York. The study results are not directly comparable due to conceptual differences in methodology. However, the aggressive "High-Efficiency Scenario" approach modeled by ACEEE based on "technical potential" implies the creation of 19 jobs per $1 million invested over the 14-year period (1997-2010), based on the stream of annual investments and employment benefits reported. While this value is lower than the range of 21 to 45 jobs per $1 million invested estimated by this study, the cumulative number of job-years used in this calculation does not include employment impacts that would continue to accrue after 2010 as a result of the investments made during the 14-year scenario period.

measures, which is generally assumed to be 15 years in this analysis. Lighting measures have a shorter life span, while many building shell improvements are longer-lived. Energy Code and ECHO measures are expected to have payback periods of five to seven years, while State EnVest and FlexTech measures typically have payback periods of three to five years; FinPak measures frequently have payback periods of over 15 years.

Table 4

Jobs and CO2 per $1 Million Investment*

	Jobs	CO2 (tons)
State EnVest	37	29,000
FlexTech	45	34,000
ECHO	35	14,000
FinPak	21	8,000
Energy Code	31	22,000
Average	34	21,000

* Cumulative job-years of employment created and CO2 emissions reduced over the expected life of the measures.

The analysis also estimated the CO_2 reductions that could be achieved as a result of a "no regrets" climate change strategy. Pursuing this set of efficiency measures is estimated to result in an average saving of about 21,000 tons of CO_2 over the life of the measures for every $1 million invested in efficiency. The variability in the amount of CO_2 reduced as a result of pursuing the case study efficiency programs is also driven by payback period and the expected life of the measures, as well as by the fuel mix that the efficiency measures displace. For example, the expected CO_2 impacts are lower for the Energy Code than State EnVest and FlexTech programs because natural gas space heating dominates New York's building sector, thereby resulting in lower CO_2 reductions than measures which reduce electricity use. CO_2 impacts are lower for FinPak and ECHO because these programs roll-in some capital investments that are not directly related to energy savings, such as roof replacements and indoor air quality improvements.

The CO_2 reductions that could be achieved in 2003 by pursuing these energy efficiency programs are shown in Table 5. From an all-fuels perspective, approximately 40% of the CO_2 reductions are achieved by reducing oil use, while electricity and natural gas reductions contribute 34% and 26% respectively. The identified energy efficiency programs are projected to reduce about 0.6% of New York's CO_2 emissions in 2003.

To gauge the effect of these programs on New York's electricity system and to estimate their effect on reducing SO_2, NO_x and CO_2 emissions from electricity generation, the projected electricity reduction was input into an electricity production costing simulation model. General Electric's Market Assessment and Portfolio Strategies (MAPS) model with Megawatt Flow[15] was used to simulate the effect of the

[15] The MAPS with Megawatt Flow model, formerly known as the Multi-Area Production Simulation model, is proprietary software of the General Electric Company of Schenectady, New York. MAPS is used to create an hour-by-hour simulation of New York's electricity system. The MAPS with Megawatt Flow model has full transmission representation and provides information on projected powerplants' energy output, fuel consumption, production costs, air emissions, and transmission flows and constraints between regions of the State. The model's estimates are based on simulations of the New York Power Pool, including its operating agreements, unit commitments, and dispatch and security constraints. The MAPS model also simulates the import and export of electricity in New York, thereby allowing energy transfers between regions to be modeled. For this analysis, it was assumed that New York's

energy efficiency programs on New York's integrated electricity system for 2003. From an electricity system perspective, the energy efficiency programs are projected to reduce over 900 gWh of electricity, which equates to a coincident peak demand reduction of about 290 megawatts of generating capacity. The analysis simulated the effect of the programs by running a base case without the reductions and then running a second simulation accounting for the energy reductions to determine the difference in fuel use and emissions. Results were observed from an annual system-wide perspective, as well as from a five-month ozone season perspective, in which New York's emissions from electricity generation were disaggregated by Ozone Transport Region (OTR) emission control zones.[16]

Table 5

CO2 Reductions from All Fuels for Selected NYSERDA Energy Efficiency Programs in 2003 (tons)

	CO2 Reductions from New Participants Added in 2003	Total CO2 Reductions On-Line in 2003*
State Envest	120,000	607,000
FlexTech	34,000	203,000
ECHO	0	14,000
FinPak	33,000	196,000
Energy Code	195,000	584,000
Total	382,000	1,604,000

* Reflects CO2 reductions projected to occur in 2003 as a result of new participants added from 1998 through 2003.

In 2003, the energy efficiency programs are projected to result in reductions of about 1,230 tons of SO_2, 790 tons of NO_x, and 543,000 tons of CO_2 from electricity generation sources. These reductions represent about 0.5%, 0.9%, and 0.8%, respectively, of projected electricity generation emissions in 2003. Reductions of NO_x emissions during the five-month ozone season are also projected to be significant, particularly in the New York City Metropolitan ozone non-attainment area. This area is part of the OTR Inner Zone, where the most aggressive steps are required to reduce ozone formation. The efficiency programs are projected to reduce Inner Zone NO_x emissions from electricity generation sources by about 300 tons during the summer ozone season.[17]

Independent System Operator would operate the electricity system in a similar manner as the historical practices of the New York Power Pool.

[16] The Ozone Transport Region, established by the Clean Air Act amendments of 1990, is based on the recognition that the interstate transport of ozone pollution contributes significantly to violations of national ozone standards in the northeast The 12 member states from Maine to Northern Virginia and the District of Columbia comprise the OTR. Memorandum of Understanding among the OTR members specifies three emission control zones, Inner, Outer and Northern, which have different levels of required emission reductions to be implemented in 1999 and 2003. The most stringent controls are required in the Inner zone and the least stringent in the Northern Zone.

[17] About 90% of the ozone season NO_x reductions are projected to occur in the Inner Zone. NO_x reductions that occur during the ozone season will reduce the cost of Clean Air Act Title I compliance for electric generation facilities by an estimated $748,000 per year, based on the Cantor Fitzgerald market price index of $2,204 per ton as of June 1998. Similarly, the SO_2 reductions would reduce CAA Title IV compliance costs by an estimated $183,000 per year, based on a market value of $148 per ton.

In total, the efficiency programs are expected to reduce emissions of SO_2, NO_x, and CO_2 by about 2,140 tons, 1,620 tons, and 1,604,000 tons, respectively, in 2003.

Lessons Learned

NYSERDA's approach to program development and service offerings is geared to helping diverse customer segments and service providers to better understand the changes occurring in the energy marketplace as a means to help market participants improve their energy efficiency. Through greater customer outreach, a participative planning and program development process, collaboration, and leveraging of technical and financial resources, NYSERDA develops and delivers energy efficiency products and services tailored to meet identified and specific customer needs.

NYSERDA has found that for energy efficiency programs to succeed in meeting customer needs, overcoming market barriers, and ensuring economic and environmental benefits, they should:

- Represent multiple parties and interests, be collaboratively developed, and respond to real customer needs;
- Assist customers in obtaining needed technical assistance and capital to install efficiency measures;
- Provide cost-sharing or leveraging of limited financial resources;
- Provide productivity, product quality, indoor air quality, and other environmental benefits, in addition to energy efficiency;
- Provide monitored and measured results; and
- Be simple in design and implementation for easy replication.

Conclusion

The analysis presented in this paper provides compelling evidence that investments in energy efficiency are "good business," not only for program participants, but for society in general. These investments provide real and sustainable benefits in terms of more efficient use of limited energy resources, increased economic growth, and improved environmental quality. As New York enters the next century, market-based energy efficiency programs can provide customers and government decision-makers with the tools necessary to move toward a more sustainable economy that is growing, clean, and efficient. Furthermore, NYSERDA's energy efficiency programs and open planning process provide a model of implementation that can be replicated in other states to provide benefits similar to those identified in this study.