RECOMMENDATIONS TO GOVERNOR PATAKI FOR REDUCING NEW YORK STATE GREENHOUSE GAS EMISSIONS

By:
The Center For Clean Air Policy

In Collaboration with the New York Greenhouse Gas Task Force

April 2003

CENTER FOR CLEAN AIR POLICY

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April 4, 2003

Mr. John P. Cahill
Secretary to the Governor
Chairman of the Governor's Greenhouse Gas Task Force
Room 207
Executive Chamber
State Capital
Albany, NY 12224

Dear Mr. Cahill:

The Center For Clean Air Policy is pleased to transmit our final report "Recommendations To Governor Pataki For Reducing New York State Greenhouse Gas Emissions" developed in collaboration with the New York Greenhouse Gas Task Force. These recommendations were based on exhaustive stakeholder and technical work group discussions and analysis beginning in June 2001 that spanned all major sectors of the New York economy. The Task Force considered a wide array of potential actions and policy mechanisms, and relied on expert assessments of economic, environmental and social implications involved in each.

Many of these recommendations were predicated not only upon their merit toward achieving meaningful long-term reductions in greenhouse gases, but also their contributions to energy savings and security, air quality, fiscal prudence, and quality of life. The deliberations of the Task Force were not premised on reaching consensus, but were designed to provide options for the Governor to consider that would significantly advance New York's leadership in the fight against global climate change. The group was guided by the belief that a strong federal approach is needed in the future, and that leadership actions by regions and states will constructively influence and complement this process.

We are indeed proud to have been associated with this effort, and believe the recommendations from this process will enable Governor Pataki to make substantial new commitments to climate change policy in New York and beyond. We are encouraged by the steps to reduce carbon emissions that the Governor has already endorsed and look forward to his favorable consideration of the full suite of recommendations contained in this report.

Sincerely,

Edward A. Helme

Edward A. Helme
Executive Director

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EXECUTIVE SUMMARY

THE PROBLEM OF GLOBAL CLIMATE CHANGE

Since the Industrial Revolution in the mid-19th century, human activities—particularly fossil fuel combustion and changes in land use patterns—have caused an unprecedented increase in emissions of greenhouse gases (GHGs), the underlying cause of global climate change. The United Nations Intergovernmental Panel on Climate Change (IPCC) recently published an updated five-year assessment of the links between human-induced GHG emissions and climate change, the potential effects of climate change, and the potential pathways for reducing emissions and stabilizing atmospheric GHG concentrations.

The IPCC's findings are sobering: Without strong mitigation action, anticipated levels and rates of temperature change in the next century are likely to exceed those experienced during the past 10,000 years. Temperature changes will significantly alter precipitation cycles, and both types of fluctuation are likely to occur unevenly across the globe and over time. Global sea levels will rise. Swift, severe changes are possible. Such changes pose a serious challenge to human and ecosystem adaptation.

The global community must reduce its GHG emissions below 1990 levels within a few decades if we are to stabilize atmospheric concentrations of carbon dioxide (CO_2). Failure to significantly reduce global GHG emissions by as early as 2020 could eliminate the ability to achieve stabilization levels of 450 parts per million (ppm) CO_2 or lower, compared with today's concentration of 360 ppm CO_2. The stabilization of CO_2 at 450 ppm could lead to average increases in temperature of between 2.0 and 7.2°F by 2100.[1] Stabilizing concentrations of CO_2 at 650 ppm, on the other hand, could lead to increases in average temperature of between 3.4 and 10.6°F. The larger the temperature changes, the greater are the risks to ecosystems. Higher temperatures also increase the likelihood of extreme climate events and the distribution of adverse impacts.

NEW YORK LEADERSHIP ON CLIMATE CHANGE

The Greenhouse Gas Task Force was formed to help New York build on its history of successes in promoting energy efficiency, renewable energy technologies and transportation strategies that have helped it lead the nation in the efficient use of energy. New York is currently the most energy-efficient state in the continental United States on a per capita basis, accounting for less than five percent of the nation's primary energy use, although it is home to seven percent of the nation's population. In terms of energy intensity (Btu per dollar of Gross State Product), New York ranks second lowest in the continental United States, despite being the fourth largest energy user of all states. In 2000, the State's energy intensity was 44 percent below the national

[1] United Nations Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2001: The Scientific Basis.* Report of Working Group I: Summary for Policymakers.

average. New York's energy efficiency translates directly into GHG efficiency, relative to other states. In 1999, New York's fuel combustion-related CO_2 emissions per capita was 3.1 metric tons of carbon equivalent, compared with the national average of 5.4.

New York's prominence in energy efficiency is largely because it has the most energy-efficient transportation sector in the nation, as a result of the high use of transit alternatives that include buses, commuter rail, and ferries. New York is also a significant developer of renewable energy, which already accounts for between 15 and 18 percent of the State's electricity generation and ten percent of primary energy use. To continue this trend of leadership on transportation efficiency, renewable energy use, and energy efficiency, New York has established and will continue to support the following programs: System Benefits Charge Program; Governor's Executive Order 111; New York State Energy Conservation Construction Code; Clean Water/Clean Air Bond Act; New York State Alternative Fuel (Clean Fuel) Vehicle Tax Incentive; New York State Green Building Tax Credit; NYSERDA Statutory Energy Efficiency Research and Development; Governor's Acid Deposition Reduction Program**;** NO_x Set-Aside Program; Wind Generation support; Solar Electric and Wind Product Development; Fuel Cells Development and Demonstration; Biomass Combustion; Anaerobic Digestion; Biodiesel/Biofuel Development and Deployment; Long Island Power Authority renewable and clean energy programs; New York Power Authority energy efficiency and renewable energy projects; Solar Net Metering Law; Environmental Disclosure Program on electricity bills; and Open Space protection.

NEW YORK GREENHOUSE GAS TASK FORCE

On June 10, 2001, Governor George E. Pataki announced the formation of a New York State Greenhouse Gas Task Force (the Task Force) to develop policy recommendations for reducing the State's GHG emissions.[2] The Center for Clean Air Policy (CCAP) was asked to perform the following duties:

1. Facilitate the deliberations of the Task Force of stakeholders (chosen by Governor Pataki);
2. Develop and analyze GHG reduction policy options;
3. Deliver a final report with recommended GHG policy actions in collaboration with the Task Force; and
4. Recommend strategies and actions to reduce New York GHGs to the New York State Energy Planning Board to assist in the development of the State Energy Plan.

The tragic events of September 11, 2001 understandably delayed the development of this report and had an adverse effect on the State's budget. The State went from a significant projected budget surplus in June 2001 to a projected shortfall. Nevertheless, administration officials conveyed the Governor's continuing concern with the problem of global climate change and indicated that the work of the Task Force would proceed, albeit under more challenging circumstances.

[2] See Appendix 2 of this report for a full list of Task Force members.

In developing the broad range of policy recommendations, the Center relied extensively on the advice, analysis, and expertise of Task Force members, its own extensive quantitative analyses, and the modeling of the electricity-sector options by ICF Consulting. This report constitutes the Center's recommendations as advised by the Task Force. The Task Force effort was not designed as a consensus process although, in many cases, the recommendations reflect the support of a majority of the Task Force members. The report indicates where there were significant differences of opinion on specific recommendations or issues. In isolated instances specific recommendations faced widespread opposition from Task Force members and were not recommended.

The Task Force process produced broad support for an aggressive statewide carbon emissions reduction target of five percent below 1990 levels in 2010 and ten percent below 1990 levels in 2020. These target levels were arrived at through a combination of a "bottom-up" analysis based on emissions reduction potential and cost-effectiveness of specific measures identified in the report, and a "top-down" approach used by most other jurisdictions in the United States where a target has been set. A bottom-up analysis relies on quantifying individual policy measures and aggregating these to establish a cumulative reduction target. A top-down analysis sets a target based on a level of desired emissions, taking into account various policy criteria.

A fundamental finding of the Task Force was that even the most aggressive GHG reduction measures considered in this report would be insufficient to stabilize global CO_2 concentrations at the 450 ppm level and prevent serious climate change. The Task Force came to understand that the critical element in tackling the climate change problem is a focus on stabilizing atmospheric concentrations of CO_2 rather than attempting incremental reductions below 1990 levels. As the IPCC stated in its recent report, "eventually CO_2 emissions would need to decline to a very small fraction of current emissions."[3] The level of reductions envisioned in this report and in existing international agreements such as the Kyoto Protocol constitute a small but important first step toward levels ultimately required to avoid the adverse effects of global climate change: significant net reductions in global emissions on the order of 60 percent.[4] The Task Force agreed that a comprehensive solution would require a major shift in technology and energy use patterns during this century, as well as a national and global commitment to take action to reduce atmospheric concentrations of CO_2 to levels that will stabilize climate change in the future.

The Center is grateful to the Rockefeller Brothers Fund, the New York Community Trust, the New York State Energy Research and Development Authority (NYSERDA), Swiss Reinsurance, the Rockefeller family, the Energy Foundation, and the John Merck Fund for their financial support of our work on this project.

[3] IPCC. *Climate Change 2001: The Scientific Basis.* Report of Working Group I: Summary for Policymakers.
[4] Stabilization at 450 ppm would require reductions of 40-75% below 1990 levels in 2050, see: Berk, M., et al.,.*Climate OptiOns for the Long-term (COOL) Global Dialogue.* RIVM. 2002.

RECOMMENDED NEW YORK STATE GREENHOUSE GAS EMISSIONS TARGET AND POLICY ACTIONS

Although New York is home to only 0.3 percent of the world's population, the State of New York emits 0.9 percent of the world's carbon emissions and 4.2 percent of US carbon emissions. In this regard, New York State's population and emissions are comparable to those of entire countries: emissions for the State exceed those of Sweden and the Netherlands, countries that have committed to cutting their emissions to eight percent below 1990 levels by 2012.

As Table ES-1 demonstrates, most of New York's direct GHG emissions come from three sectors: transportation, buildings, and electricity. In 1990, transportation's share was the largest at 33 percent, with electricity second at 28 percent and buildings third at 24 percent.

Table ES-1: New York State Greenhouse Gas Emissions, by Direct Sources (MMTCE)

	1990	2000	2005	2010	2020
Transportation	20.79	22.98	24.82	26.94	29.62
Buildings	15.26	18.23	18.88	19.57	20.02
Electricity	17.46	15.33	11.67	14.52	15.47
Industry	5.37	5.47	5.49	5.51	5.75
Ag/For	0.65	0.57	0.55	0.53	0.50
Other	3.77	4.35	4.41	4.48	4.49
Total	***63.30***	***66.93***	***65.81***	***71.54***	***75.86***

Note: Electricity sector emissions are based upon modeling performed by ICF as a part of this project. Transportation emissions are based upon revisions to state estimates using the methodology described in Chapter VII. All other data are from NYSERDA. Totals may not sum due to rounding.

Emission Reduction Target

In light of New York's desire to continue its leadership in addressing the serious potential effects of climate change on New York and the globe, **the Center and the Task Force recommend that New York establish a statewide target to reduce GHG emissions to five percent below 1990 levels by 2010 and ten percent below 1990 levels by 2020.** This recommendation was adopted on June 11, 2002 by the New York State Energy Planning Board in the *New York State Energy Plan* as a statewide goal. This target translates to an emissions ceiling of 60.14 million metric tons of carbon equivalent (MMTCE) in 2010 and 56.97 MMTCE in 2020. On the basis of a bottom-up analysis of recommended actions, the Center initially recommended a target of stabilization at 1990 levels in 2010 and 2020. The Task Force believes that New York State should establish more aggressive targets.

In addition to a statewide GHG target, it is recommended that New York:

- Advocate for federal action on climate change. The Task Force agreed that national action to establish a comprehensive policy to cap GHG emissions was the optimal approach. At the same time, the task force recognized that such national action is unlikely in the near future, and that states would play a key role under any future national strategy. In the absence of national action, unilateral state action and regionally coordinated policies offer an attractive path for progress on this critical issue.
- Implement the specific policies recommended in this report, as well as such other policies that may be needed to achieve the statewide target.
- Work aggressively to encourage New England, other northeastern and mid-Atlantic states, and neighboring Canadian provinces to pursue a coordinated strategy to reduce GHG emissions with a similar effort on a regional basis.

A strong precedent exists for this approach. During the past 30 years, New York and other environmentally progressive states have served as powerful laboratories of democracy. Reducing GHG emissions is the latest opportunity for environmental policy leadership by states. To date, only New Jersey has set a statewide GHG emissions reduction target and is actively working toward that target. In addition, the New England governors and Eastern Canadian premiers have committed their states to regionally coordinated state and provincial GHG emissions reduction targets. Two states (Massachusetts and New Hampshire) have enacted mandatory caps on CO_2 emissions from their electric generators, and last year California enacted legislation to establish light-duty vehicle GHG tailpipe standards and a 20 percent renewable portfolio standard.

Recommended Policy Actions

Global climate change is primarily caused by fossil fuel combustion. The range of policy options to solve this problem extends to virtually every area of society. The Center has assessed the range of options for reducing GHG emissions against an extensive set of policy evaluation criteria. We have placed the greatest weight on six: (1) potential GHG reductions, (2) cost-effectiveness, (3) administrative/political feasibility, (4) impact on State economic competitiveness, (5) security of energy supply, and (6) ancillary societal benefits. After reviewing a wide range of choices in light of these criteria, CCAP recommends a policy package that centers on the following major initiatives:

1. A package of measures to reduce transportation GHG emissions, which are growing faster than emissions from any other sector. Key measures include shifting funding to more GHG-efficient alternatives such as transit and smart growth, and adoption of light-duty vehicle GHG standards, upon implementation in California. One approach to implementing these initiatives would be the creation of a new state transportation emissions reduction entity with a goal of reducing transportation GHG emissions to 20 percent above 1990 levels by 2010, ten percent above 1990 levels by 2020, and to 1990 levels by 2030, and a dedicated funding mechanism and authority sufficient to implement the proposed actions in this report. (NOTE: On January 8, 2003, Governor Pataki, in his State of the State Address, stated: “let's work to reduce greenhouse gases by adopting the

carbon dioxide emission standards for motor vehicles which were recently proposed by the State of California.")

2. The creation of an indigenous biofuels industry, coupled with incentives for expanded use of biofuels and a renewable fuel standard for biodiesel. The availability of alternative fuels will reduce GHG emissions related to transportation fuel use and reduce New York's dependence on oil imports.
3. A package of measures to reduce further GHG emissions from the electric generation sector, which are projected to fall to 17 percent below 1990 levels by 2010 without any additional action by the state according to IPM modeling results. This package should include:
    a. An extension of the State's strong energy efficiency programs and the establishment of new measures to reduce growth in electricity demand to no more than 0.58 percent per year on average through 2010 and beyond. Extension of the state's energy efficiency program will require approximately $277 million of State spending and $364 million of private spending per year for five years. This and other efficiency measures are estimated to achieve a net cost savings.
    b. A renewable portfolio standard (RPS) that will require electric service providers in the New York market to ensure that six percent of the electricity offered for sale in 2010 is from renewable energy sources, including wind, landfill gas, biomass, and solar power, increasing to eight percent in 2020. Implementation of the RPS alone is projected to reduce CO_2 emissions from electric generation by 20 percent below 1990 levels by 2010. (NOTE: On January 8, 2003, Governor Pataki, in his State of the State Address, effectively endorsed this recommendation by announcing that he would be "directing the Public Service Commission to implement a Renewable Portfolio Standard – a program which will guarantee that within the next ten years at least 25 percent of the electricity bought in New York will come from renewable energy resources like solar power, wind power, or fuel cells."[5])
    c. A mandatory cap on carbon emissions from New York electricity generation equal to at least 25 percent below 1990 levels by 2010. In addition, the State should seek to reach agreement with the New England States on regional coordination of state caps on this sector that permit interstate emissions trading. Caps adopted individually by each of the New England states stabilizing emissions at 1990 levels are projected to produce further reductions by New York electric generators sufficient to achieve a 31 percent reduction below 1990 levels from this sector in New York.
4. A package of efficiency measures for buildings and industry that includes support for combined heat and power (CHP), oil and gas end-use efficiency, and negotiated agreements with industry, in addition to the reductions in electricity use that the efficiency initiative will produce.

[5] The level of the RPS announced by the Governor appears to be roughly consistent with CCAP's recommendation for an RPS if hydroelectric power generation is included. The IPM base case projects that electricity generation from hydropower will account for approximately 18.3 percent of total generation in 2010 and 16.5 percent of generation in 2020.

Table ES-2 lists each of these options along with others that are recommended, and reflects the Center's best estimate of the potential carbon reductions that can be achieved in 2010 and 2020 for each option. As the table demonstrates, this bottom-up analysis indicates that adopting these measures would reduce New York's carbon emissions to 5.9 percent above 1990 levels in 2010 and 4.1 percent above 1990 levels in 2020. The Center also identified a number of additional options that were not recommended formally, but could be implemented to assist the State in reducing its emissions to five percent below 1990 levels. These include tightening the electricity generation cap to 40 percent below 1990 levels, expanding the green buildings tax credit, creating incentives for biodiesel use in industrial boilers, and a variety of other measures listed in Table 2.4 of the main report. New Jersey's experience in meeting its target of 3.5 percent below 1990 by 2005 has demonstrated that sources and actors that are too small to be covered by regulatory measures can also produce meaningful reductions. Nevertheless, achieving the task force's recommended target of five percent below 1990 levels by 2010 is clearly an ambitious goal, one that will require technological innovation as well as additional policy initiatives.

Two items stand out in Table ES-2: the proposed carbon emissions cap on New York's electricity-generation sector and the set of transportation measures, including VMT reduction and light-duty vehicle GHG standards. These measures are projected to produce more than half of the carbon emissions reductions and, along with the moderate energy efficiency measures, are among the most cost-effective proposals. In the 2010 timeframe, it appears impossible for New York to meet its goal for carbon emissions reduction without adopting these key measures.

Most of the options in the table are traditionally carried out at the state and local level. Two of these options, the cap on emissions from electricity generation and the light-duty vehicle GHG tailpipe standard (or GHG-based feebate incentive package), can also be effective on a national or regional level. The Task Force was virtually unanimous in favoring a national cap on GHG emissions from electric generation as well as extension of a New York electricity cap to a regionally coordinated policy. It should be noted that regional approaches basically require each of the states involved to enact its own state cap and to grant authority to sources to trade on an intra as well as interstate basis.

In contrast to the electricity cap, which could be effective on a one-state only basis, the light-duty vehicle GHG tailpipe standards and/or GHG-based feebate incentive mechanism would be more effective if adopted on a national or multi-state basis. For example, when California finalizes and implements light-duty vehicle GHG standards, New York and other states can adopt the same standards under the existing provisions of the Clean Air Act of 1990. Also, although GHG feebates adopted by a single state can affect car-buying decisions by individual consumers, a regional approach (particularly if coupled with a Canadian program) could affect vehicle manufacturer's decisions about the vehicles they sell.[6]

[6] The Canadian government recently proposed the enactment of a feebate system as part of each of the alternative compliance strategies it is considering to meet its Kyoto Protocol commitment.

Table ES-2: Key Actions in Each Sector Under Recommended Package		
Key Action	**GHG Reductions in 2010 (MMTCE)[1]**	**GHG Reductions in 2020 (MMTCE)[1]**
NY GHG Emissions in 1990: 63.30 MMTCE **Reference Case Emissions in 2010: 71.54 MMTCE** **Emissions with Recent NY Actions in 2010: 70.78 MMTCE[1]**		
Transportation		
Smart growth, transit, and VMT reduction measures	0.69	1.13
Commuter Choice / Transit Benefits	0.13	0.26
Light-duty vehicle GHG standards (or GHG-based Feebates)	0.20	2.59
Advanced Technology Vehicle RD&D	0.27	0.31
Best Practices (speed limits, driver training, maintenance, oil, tires)	0.10	0.16
Biofuels	0.12	0.55
Freight and Aviation Measures	0.11	0.18
Other Transportation Measures	0.01	0.05
Total	**1.64**	**5.23**
Electricity		
Carbon cap of 25 percent below 1990 by 2010; RPS of six percent by 2010, eight percent by 2020 coupled with policy and economic incentives for renewable energy; moderate economic incentives and policy changes to encourage energy efficiency	1.42	2.37
Total	**1.42**	**2.37**
Coordination of state caps with New England that permits interstate emissions trading	*0.98*	*1.01*
Total (w/ New England coordination) [2]	*2.40*	*3.38*
Buildings (additional to power sector modeling)		
CHP additional to power sector modeling (moderate and high impact)	0.26	0.66
Oil and gas end-use	0.26	0.26
Appliance Standards	0.05	0.14
Other Buildings Measures (e.g., aluminum recycling)	0.02	0.02
Total	**0.58**	**1.07**
Industry (additional to power sector modeling)		
Negotiate agreements with industry to reduce GHGs	0.10	0.25
Total	**0.10**	**0.25**
Agriculture/Forestry		
Expansion of Agricultural Environmental Management	0.01	0.01
Urban Forestry	-	0.25
Total	**0.01**	**0.26**
TOTAL RECOMMENDED ACTIONS	**3.76**	**9.18**
(w/ New England coordination) [2]	*4.73*	*10.19*
Total Emissions w/ All Actions	**67.03**	**65.92**
(w/ New England coordination)	*66.05*	*64.91*
Emissions compared to 1990 Levels	**5.9%**	**4.1%**
(w/ New England coordination)	*4.3%*	*2.5%*

1) Does not include emissions reductions from recent actions (i.e., EO 111, new State energy code, and CHP funded by the SBC) that will displace electricity since these would be covered by the electricity sector cap.

2) Includes emissions reductions occurring in NY as a result of coordination of electricity sector caps with New England. It must be noted that while these additional reductions financed by New England generators would reduce actual carbon emissions in New York, they would be recorded as reductions achieved by the New England generators under any eventual national emissions trading regime. Moreover, to be completely consistent, if these reductions were credited to New York, then increases in emissions due to expanded power imports from natural gas facilities in neighboring states that are motivated by the New York carbon cap should also be scored in New York.

ECONOMIC IMPACT OF THE PROPOSED GHG REDUCTION PACKAGE

New York can achieve most of the carbon reductions recommended in this report at a relatively low cost to energy consumers in the State. The process did not include an analysis of economic development and employment benefits of proposed programs in renewable energy, biofuels, community development, and energy efficiency, this program emerges as the proverbial "win-win" package for the State. This would achieve important environmental and public health benefits in the form of reduced air pollution and carbon emissions, and important economic benefits in the form of increased interstate and international competitiveness of New York industries and businesses. Six key factors lead the Center to this conclusion:

1. An aggressive package of transportation policy actions and funding will catalyze innovation in community development, open space protection, transit, and land use and complement New York's Quality Communities Program to promote smart growth. Communities will avoid potentially costly and inefficient infrastructure expenditures by targeting growth. In the process, these communities will relieve pressure to increase property taxes.
2. Two new innovative industries will be grown with important roots in Upstate New York: wind and biomass electricity generation, and biofuels production. New York will enjoy a "first mover" advantage in these areas and, with its path-breaking electricity carbon cap, will create an opportunity for Wall Street brokerages to participate in the emerging carbon trading market that so far is dominated by European competition in London and Paris.
3. Consumer spending on petroleum and electricity imports will be reduced below current projected levels if the vehicle miles traveled (VMT) reduction and RPS programs are implemented. Less reliance on imports can translate into more money spent within the New York economy. In addition, the GHG tailpipe standards would encourage significant net savings in gasoline use, which translates into economic savings for consumers.
4. Under a New York-only cap of 25 percent below 1990 levels, State average wholesale electricity prices are projected to decrease by 0.3 percent in 2010 and to rise by 0.3 percent in 2020. A New York carbon emissions cap on electric generators equal to 25 percent below 1990 emission levels by 2010 coupled with a New England states stabilization target is projected to raise State average wholesale electricity prices by almost three percent in 2010 and 6.2 percent in 2020, according to ICF modeling. Changes in retail prices would be even smaller.
5. The expanded energy efficiency and renewable energy sources program is likely to spur technological innovation and put New York on the cutting edge of technology research and development, while saving participating consumers money and improving commercial and industrial competitiveness. New York State electricity consumers participating in the EE program are projected to receive a *net reduction in energy costs of $511 million annually*.
6. Policies that reduce carbon emissions will also reduce conventional pollutants that threaten public health and ecosystems in New York State.

INVENTORY, REPORTING, AND REGISTRY

New York State should create an effective inventory and reporting system, and a registry of State emissions that supports its target, action plan, and regional leadership role. The State will need to do the following to put such systems in place:

- Expand and improve the annual statewide GHG emissions inventory, and related State inventories such as DOT's VMT survey, to include all GHG emissions from entities and sectors at the statewide and substate levels. These improvements will enable the State to effectively track progress toward its GHG reduction target as well as individual sector targets. In addition to GHG data, the inventory should include indicators or proxies of GHG emissions, such as VMT, as needed to ensure comprehensive tracking of emissions.
- Require mandatory reporting of GHG emissions by "major" stationary sources, large State facilities, major new private developments, large public and private fleets, oil and gas distributors, and municipal solid waste landfills.
- Establish a voluntary registry for emitters in the State that requires separate reports by participating entities on direct and indirect emissions from facility and entity-wide activities using a defined base year(s). The registry should be transparent and available to the public, provide public recognition, baseline protection, and support future emissions trading regimes to the extent possible.
- Collaborate with other states and regions on consistent and mutually recognized approaches for inventory and reporting.

SECTOR SUMMARIES

Electricity Generation

On the basis of electricity modeling by ICF Consulting (ICF), analysis by CCAP, and input from the Electricity working group, we recommend that carbon emissions from the electric generation sector be reduced to at least 25 percent below 1990 levels by 2010. Based on the ICF modeling, New York carbon emissions from electricity generation are projected to be 17 percent below 1990 levels in 2010 in the absence of any carbon-related policy changes. The following specific actions are recommended:

- Extend the State's strong energy efficiency (EE) programs, including extension of the SBC and NYPA/LIPA programs for another five years, and establish new measures to reduce electricity demand growth to no more than 0.58 percent per year on average through 2010 and beyond. The SBC and NYPA/LYPA will be funded through a combination of annual State spending of $277 million per year and private spending of $365 million per year over the 2006-2010 period. Private spending for other EE measures averages $125 million per year over the 2005–2020 period. Spending for all EE measures is equivalent to $1.04 billion in net present value for the public sector and $2.53 billion in net present value for the private sector. According to the modeling analysis, these programs alone will reduce electric generation sector carbon emissions to 21 percent below 1990 levels by 2010.
- Adopt a renewable portfolio standard (RPS) that will require electric service providers in the New York market to ensure that six percent of the electricity offered for sale in 2010 is from

renewable energy sources including wind, landfill gas, biomass, and solar sources, increasing to eight percent in 2020. The RPS will lower natural gas prices, which will reduce electricity imports into New York and, in turn, limit leakage of carbon emissions to surrounding regions. The ICF modeling analysis indicates that an RPS alone would reduce electric generation sector carbon emissions to 20 percent below 1990 levels by 2010.

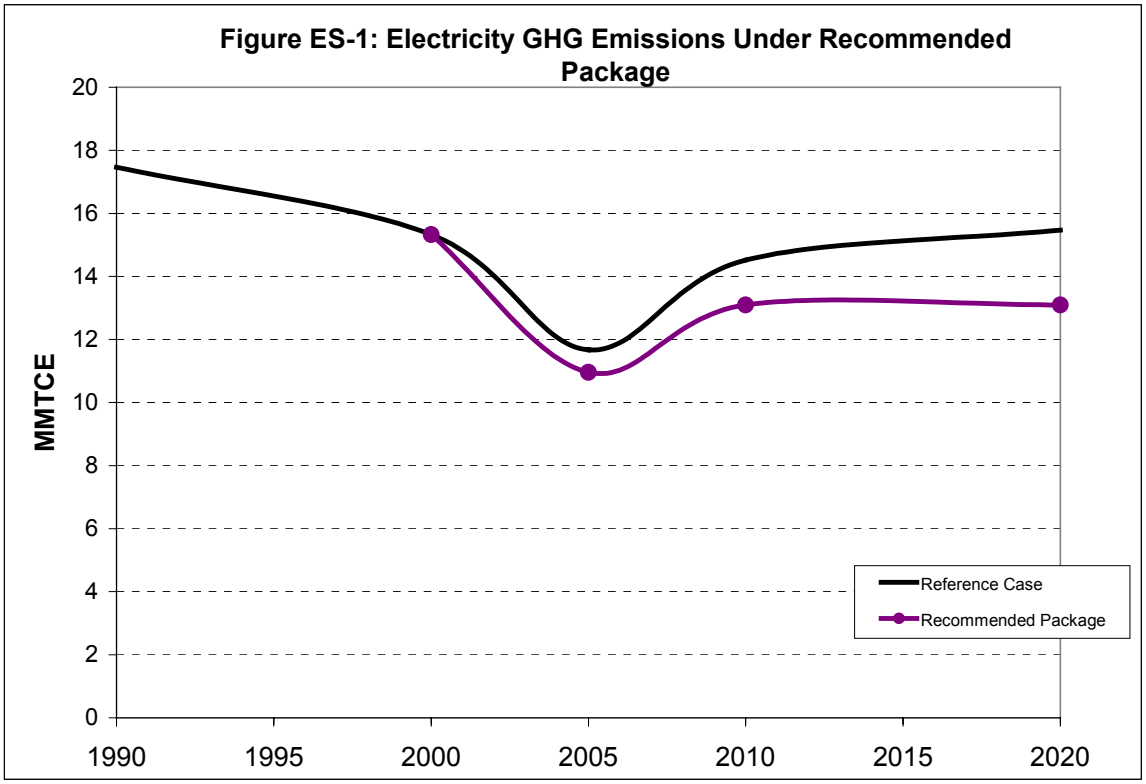
- Adopt a mandatory New York electricity-sector carbon cap of at least 25 percent below 1990 levels by 2010 and implement this measure through a cap-and-trade system. When added to the energy efficiency and RPS programs, this cap is projected to require no more than a four percent additional reduction in carbon emissions from the electric generation sector in New York in 2010 and will not increase state average wholesale electric prices. An additional six percent reduction below 1990 levels (to an aggregate 31 percent below 1990 levels) could be achieved through regionally coordinated actions with New England states to cap emissions from electric generation. ICF's analysis projects that New York emissions from electric generation will fall to 31 percent below 1990 levels if New England states enact laws to stabilize power sector emissions at 1990 levels by 2010.
- Promote the development of indigenous renewable energy through net metering for distributed renewable sources, voluntary programs, and public education.
- Support regulatory changes (e.g., standardized interconnection rules and stand-by rates and streamlined permitting process), economic incentives, and technical assistance to promote clean, efficient distributed energy resources such as combined heat and power (CHP) facilities.
- Provide regulatory incentives to encourage repowering of old, inefficient fossil plants to cleaner, more efficient plants.
- Assess the technical, environmental, and economic feasibility for carbon capture and sequestration within New York State as a long-term carbon reduction option.

Impact On And Benefits For New York. Adoption of the recommended package of electric generation options is projected to:

- Reduce carbon emissions by 1.42 million metric tons of carbon equivalent (MMTCE) in 2010 and 2.11 MMTCE in 2020 (see Figure ES-1); [7]
- Improve the competitiveness of New York industries and businesses as a result of the expanded EE program;
- Promote an indigenous new renewable energy sources industry; and
- Put the State on the cutting edge of the development of new energy efficient and renewable technologies and a carbon trading market.

Based on the CCAP and ICF modeling analysis, carbon emissions reductions achieved through a combination of the cap, the recommended EE program, and the RPS are the most cost-effective reductions available to the State from any sector of the economy. These options are critical to

[7] While the results of the modeling show emissions of 1.32 in 2010, the cap of 25 percent below 1990 levels (i.e., 1.42 MMTCE reduction) is met as a result of early actions taken by the electricity sector which are banked towards use in meeting the cap.



MMTCE = million metric tons of carbon equivalent

putting the state on a path to achieve the Task Force's recommended statewide GHG reduction target of five percent below 1990 levels by 2010. The ICF analysis projects that adoption of a New York power sector carbon cap at 25 percent below 1990 levels coupled with the recommended EE program and an RPS on a New York-only basis will reduce State average wholesale electric prices by 0.3 percent in 2010 and increase prices by 0.3 percent in 2020. The impact on retail electricity rates will differ because, among other things, the cost of building renewable facilities in meeting the RPS will be spread out among all retail electricity customers. This RPS adder to the retail rate is estimated to result in retail price increases of 1.8 percent in 2010 and 4.1 percent in 2020.

In addition, the ICF modeling analysis shows that with the adoption of the 25 percent carbon cap, EE measures, and RPS:

- Electricity generation system costs are expected to decrease by $60 million in 2010 and $216 million in 2020. These cost changes are in addition to wholesale cost changes associated with the state's Acid Deposition Reduction (ADR) Program and do not include the incremental costs of the EE and RPS programs.
- New York State electricity consumers participating in the EE program are projected to receive a *net reduction in energy costs of $511 million annually* because the savings to participating customers on their electricity bills over time exceeds the costs of implementing the efficiency programs. Participating customers are projected to have more disposable

income than they did before the program's implementation. Customers not participating in efficiency programs would experience a modest increase in wholesale prices.

- The impact on the New York economy is expected to be positive because of the net investment in new technologies and innovation. New York industries and businesses are projected to be more competitive in interstate and international markets as a result of the recommended new investments in EE. A full macroeconomic analysis of the impact was beyond the scope of this effort.
- The RPS will increase fuel diversity in the State, reduce real wholesale electricity prices and put downward pressure on natural gas prices. In particular, Upstate New York is likely to benefit from the development of new indigenous renewable energy sources and biofuels industries. The RPS will also ease compliance with a carbon cap, potentially enhancing New York's competitiveness under a regional or national carbon trading program.
- The State will likely enjoy a "first mover" advantage in terms of experience with carbon trading. With Canadian and European pilot trading programs expected to be in place by 2005, the opportunity for Wall Street brokerages to get involved in linking the New York carbon trading program with neighboring state and international programs will be substantial.
- Natural gas consumption for electricity generation is projected to be $329 million *less* in 2010 and $599 million *less* in 2020, compared to without the policy.
- Power imports from the PJM region and Ontario into New York are projected to increase by 3.3 percent in 2010, by five percent in 2015 and increase significantly by 25 percent in 2020. Accounting for the net emissions in PJM, Ontario and New England of a New York-only carbon cap of 25 percent below 1990 levels is not expected to lead to any net leakage in carbon emissions from power imports in 2010 and only a small amount in 2020.
- Overall, the asset value of existing generating units is expected to decrease by $648 million (-2.8 percent), with non- and low-carbon emitting units increasing in value and coal and oil units decreasing in 2010.

Adding a New England Cap to the Recommended Actions. The policy context is important. In the reference case developed in collaboration with NYSERDA and the Electricity working group, ICF found that carbon emissions in New York from electricity generation would be 17 percent below 1990 levels in 2010, given the assumptions agreed to for the modeling analysis. This means that New York would need to reduce emissions by an additional eight percent below 1990 levels to reach the 25 percent target.

The projected pattern of declining power sector emissions in New York is a somewhat unique phenomenon among US states—most project carbon emissions to rise in the future if no additional emissions reductions are enacted. New York's emissions are projected to fall as a result of the construction of a number of proposed combined-cycle natural gas generating facilities in the State, the aggressive energy efficiency program financed by the State's public benefit fund, and the implementation of the Governor's Acid Deposition Reduction Program, as well as other programs. In addition, New York's electricity-related emissions in 1990 were higher than normal because several nuclear units were not operating at normal levels that year.

In contrast to New York's emissions projections, New England electricity-related emissions were projected to be nine percent above 1990 levels in 2010 and those of the neighboring

Pennsylvania, New Jersey, Maryland (PJM) region are projected to be 19 percent above 1990 levels.

New York's generators, in aggregate, would need to reduce emissions by eight percent annually to achieve a cap of 25 percent below 1990 in 2010. New England generators in aggregate would need to make a nine percent reduction in 2010 to achieve stabilization at 1990 levels in 2010. These levels of effort appear comparable, and ICF's modeling results bear that out: New York and New England wholesale electric prices are projected to rise by comparable amounts under such a regional strategy – a little less than three percent in 2010. ICF's analysis of a New York cap of 25 percent, moderate EE measures, and an RPS in combination with a New England 1990 stabilization cap and moderate EE measures shows that New York would over comply, achieving a 31 percent reduction from 1990 levels while still experiencing no more than a 2.8 percent increase in wholesale electricity prices in 2010 and a 6.2 percent increase in 2020.

While New York consumers, on average, are expected to pay 1.3 percent more if New England states enact carbon stabilization legislation, generation owners in New York are better off with a cap in New York *and* New England. The net present value of New York power plants will increase by $829 million in the next 20 years under the regional cap approach relative to a New York-only approach, providing emission allowances are given to the power industry for free. The asset value of New York power plants under a regional approach would increase by $182 million relative to the reference case.

The implementation of the New York 25 percent cap in concert with a New England stabilization target is projected to lead to higher power imports, resulting in some leakage of carbon emissions in the surrounding areas. Specifically, emissions in PJM and Ontario increase by 0.7 MMTCE in 2010 and 1.1 MMTCE in 2020 under the regional cap approach. The combined New York and New England state caps are projected to achieve 2.0 MMTCE of reductions and 3.4 MMTCE in 2020. When leakage is accounted for, the net reduction is 1.3 MMTCE in 2010 and 2.3 MMTCE in 2020. A policy mechanism could be considered to address emissions leakage, such as setting a Generation Portfolio Standard (GPS) to govern carbon emission rates associated with power sales to New York consumers. Enactment of a national cap program for CO_2 would eliminate this leakage and the need for a GPS approach.

The relatively modest impacts on consumer and producer costs under New York and New England caps suggest a more stringent cap in New York could be considered in the future, either alone or in conjunction with additional energy efficiency and renewable energy measures or in concert with a broader regional or national effort.

In the event that federal legislation is passed to limit sulfur dioxide (SO_2), nitrous oxides (NO_x) and mercury emissions from electricity generation, this could further bolster the case for a stronger carbon cap in New York. Preliminary IPM modeling results suggest that a federal three-pollutant bill would lead New York utilities to significantly cut their carbon emissions at *no additional cost* for carbon beyond what they would already pay to cover the costs of a new Federal air pollution control requirement. Implementation of a federal three-pollutant bill would therefore make it possible for the state to ramp down the power sector carbon cap.

Views of the Task Force. Task Force members supported achieving reductions from the electric-generation sector, and they strongly favored a national cap, or a regional cap over a New York-only cap. Although the Task Force did not reach consensus on a specific cap level, many members expressed support for beginning with a New York-only cap by 2010 and ramping down cap levels in the future, contingent on persuading other northeastern states to implement similar caps.[8] One electricity industry representative was opposed to any cap on electricity, arguing that the electricity industry had already done its share in reducing GHG emissions. One State agency indicated serious reservations about the more stringent cap proposal, and a second raised questions about its projected economic impact. The incentive program for repowering older fossil units and the expanded EE program enjoyed broad support, with some State agencies indicating that flexibility on how New York would contribute its $277 million share per year over the 2006-2010 period was important. Two State agencies indicated reservations concerning the RPS, arguing that having both a system benefit charge program financing renewable energy, and a new RPS, would create duplicative incentives for renewable energy. It was suggested, in the event that an RPS was mandated, that public benefit funding for renewable generation should be redirected to smaller "distributed" (on-site) renewable sources.

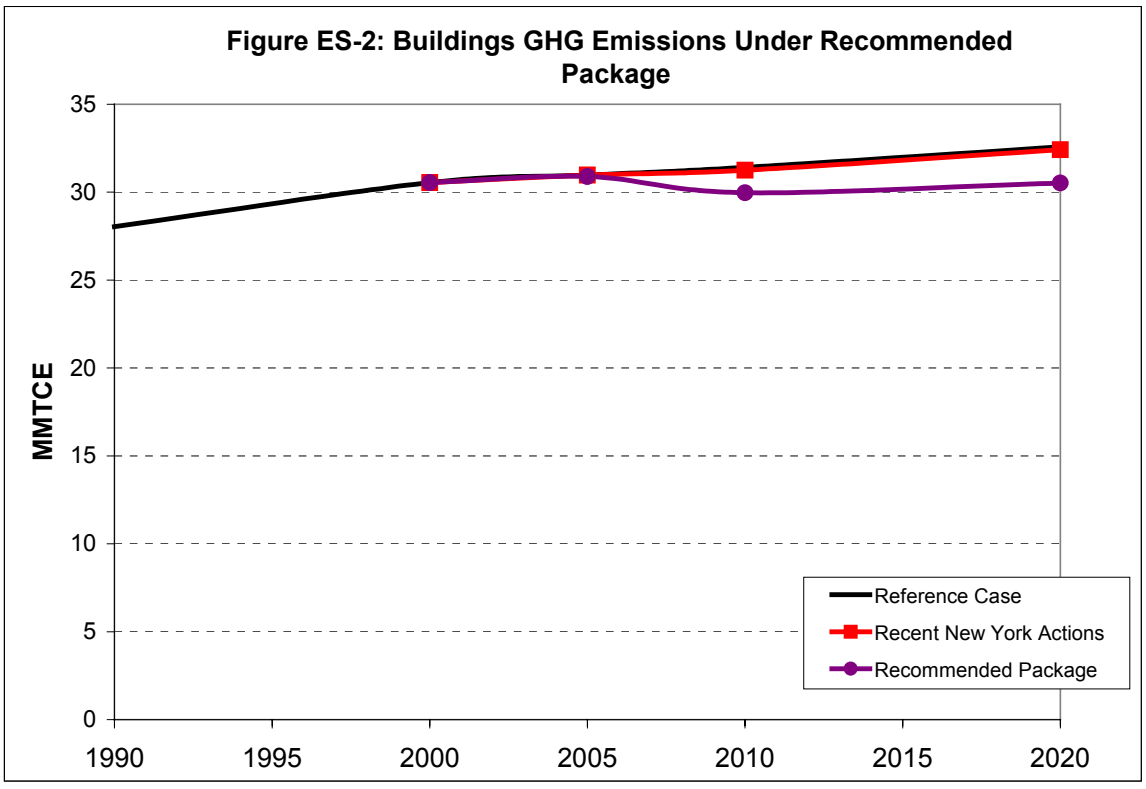
Buildings

Analysis by the Buildings and Industry working group found that the buildings sector could reduce emissions from the baseline by 0.58 MMTCE in 2010 and 1.07 MMTCE in 2020. These projected reductions are in addition to those achieved in the electricity sector and achieve a net cost savings for every ton of carbon reduced. Total reductions from the buildings sector, including efficiency measures displacing power sector emissions, would come to 1.28 MMTCE in 2010 and 1.89 MMTCE in 2020, resulting in a four to six percent reduction from the adjusted emissions baseline and a seven to nine percent increase from 1990 levels in 2010 and 2020 (see Figure ES-2).[9] These reductions are smaller than we previously calculated in our bottom-up assessment because the power sector reacts to lower demand levels by purchasing less new natural gas combined cycle generation. In addition, we assume currently planned actions and others that displace electricity in excess of the "moderate efficiency" scenario modeled by ICF would help to meet a power sector cap but would not achieve incremental emissions reductions unless a tougher cap were adopted. The recommended actions are cost-effective but require high-level political support to extend existing efficiency measures and foster new initiatives. Additional cost-effective actions in this sector may also be available. The following actions are recommended for implementation:

[8] Specific cap levels suggested by Task Force members – 30% below 1990 levels if the State acts alone and 40% below 1990 levels if New England states also take power sector caps – were based on results of preliminary ICF modeling and would no longer be supported by the final runs discussed later in this chapter. The Task Force did not have the newest modeling results when making their recommendations, so their views on specific cap levels were not based on the most current data. The key issue is that the recommended New York-only cap level went beyond business as usual reduction levels by about 1.42 MMTCE in 2010 (when accounting for banked emissions reductions). Similarly, recommended New York power sector cap levels under a system that involved simultaneous cap and trade programs in New York and New England states went beyond business as usual reduction levels in New York by more than 2.4 MMTCE.

[9] Baseline is adjusted for recent actions taken by the state displacing oil and gas but not for recent actions displacing electricity generation, as these latter actions were not included in electricity sector modeling and therefore would not be additional.

- Extend existing end-use efficiency programs that target power-sector emissions, with special emphasis on incentives to make rebuilding of the World Trade Center and surrounding areas models of energy efficient design.
- Establish a new efficiency program to target emissions from oil and gas end use, and evaluate the possibility of new incentives or requirements for use of biofuels in stationary boilers.
- Implement high-efficiency appliance standards for an array of residential, commercial, and institutional appliances, and review these standards every five years.
- Remove barriers to combined heat and power (CHP) and other clean distributed generation through policy changes and economic incentives.
- Educate commercial and residential owners and operators about energy- and cost-saving opportunities through enhanced training for building operators and by producing targeted public service announcements on energy efficient mortgages and recycling.
- Establish an emissions reduction goal for the buildings sector and track progress toward the goal.



MMTCE = million metric tons carbon equivalent

Impact On And Benefits For New York. New York has much to gain from investments today in a more energy efficient future. New York's experience in implementing energy efficiency programs bears this out. While consumers will likely face higher first costs for new appliances and may continue to pay a system benefit charge on their power rates from 2006 through 2010 as well as a new charge on oil and gas purchases, New York's benefits will greatly exceed the costs in the medium and long terms. Key advantages of efficiency investments include cost savings to energy consumers, lower reliance on imported oil, lower susceptibility to fluctuations in energy

costs, significant reductions in greenhouse gas (GHG) and other emissions, and lower costs for the power sector to meet an electricity-sector carbon cap.

On the cost side, assuming use of a financing mechanism that adds a surcharge on energy costs, costs to residential and commercial electricity consumers could average from 1.6 to 1.65 mills/kWh from 2006 to 2010, about a 1.4 percent increase in average statewide retail prices. This surcharge is higher than the current average SBC surcharge due to the decline in electricity purchases from implementation of efficiency measures (the surcharge is spread out over a smaller number of kWhs) and because SBC, NYPA and LIPA charges are assumed to be distributed equally across the state. Costs to residential and commercial consumers of oil and gas are projected to be 0.4 percent of residential oil costs and 0.2 percent of residential gas costs, assuming that half the value of the program is applied to oil distribution and half to gas distribution.

Residential and commercial end users taking advantage of new incentive programs and technical assistance will have their upfront costs subsidized through government incentives, and will reap cost savings associated with lower energy spending. New York receives an annualized net benefit of over $850 million from implementation of energy efficient measures. These cost savings will ultimately boost the competitiveness of businesses in New York and could lead to more consumer spending, benefiting the State economy.

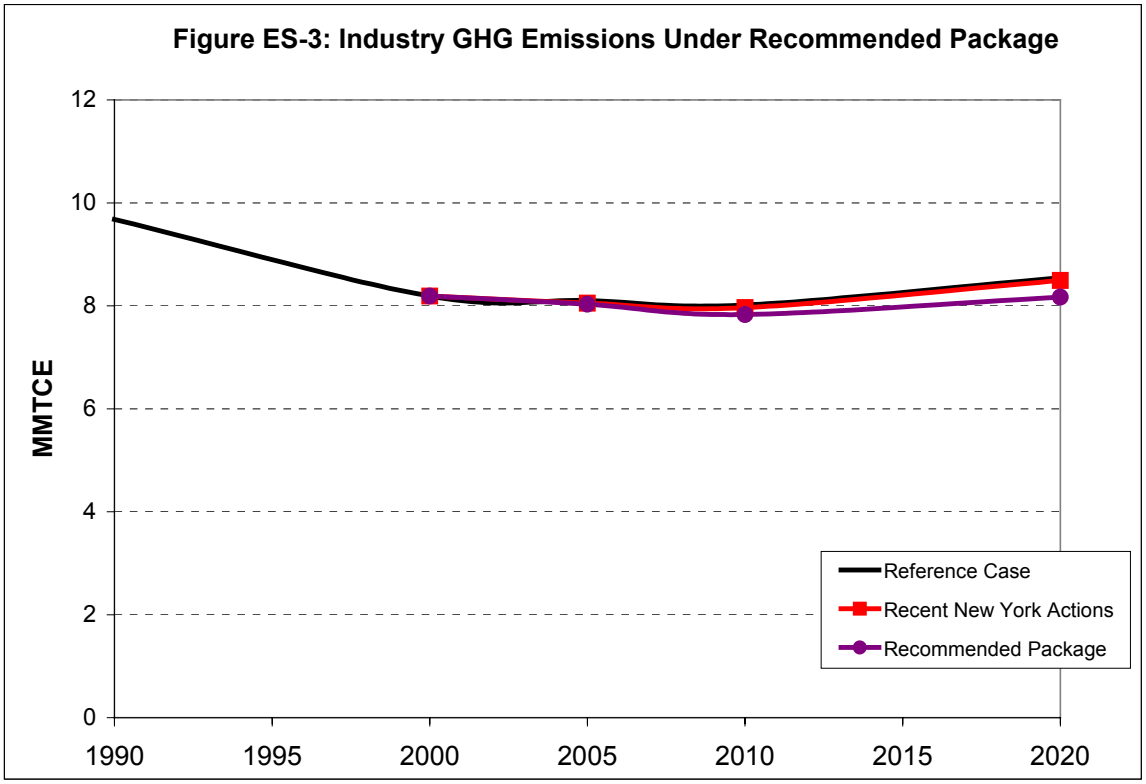
Views of the Task Force. The Task Force agreed with the thrust of recommendations in this sector. Although the recommended actions are cost-effective, there is a need to pull together financial resources to support implementation. Some of the government representatives on the Task Force expressed interest in considering direct appropriations to fund future energy efficiency measures that displace electricity, in lieu of extending the existing public benefit fund (SBC) program. In response to this concern, the recommendation focuses on the level of public funding needed rather than recommending a single mechanism to produce that funding level.

Industry

Analysis by the Buildings and Industry working group found that the industry sector could reduce emissions from the baseline by 0.10 MMTCE in 2010 and 0.25 MMTCE in 2020. These projected reductions are in addition to those achieved in the electricity sector and achieve a net cost savings for every ton of carbon reduced. Total reductions from the industry sector, including efficiency measures displacing power sector emissions, come to 0.13 MMTCE in 2010 and 0.32 MMTCE in 2020. Because the industry reference case shows a decline in the absence of new policy measures, these industry sector actions help achieve emissions reductions of 19 percent below 1990 levels in 2010 and 16 percent below 1990 levels in 2020 (see Figure ES-3). Although cost-effective, the recommended measure (negotiated agreements) will require up-front time to implement. Actual reductions will depend on total participation levels and the greenhouse gas (GHG) reduction commitments made by industry. Additional cost-effective actions within this sector may also be available, but were not thoroughly investigated. The following actions are recommended for implementation:

- Negotiate GHG-reduction agreements with industry to address 50 percent of total GHG emissions from this sector by 2010.
- Implement energy efficiency incentive programs and other technical assistance targeted to industrial appliances and processes.
- Establish mandatory reporting requirements covering most industry emissions.

Figure ES-3: Industry GHG Emissions Under Recommended Package



MMTCE = million metric tons of carbon equivalent

Impact on and Benefits for New York. New York industry has much to gain from investments today in a more energy efficient future. Although energy prices may increase from 2006 to 2010 to cover the costs of new and extended energy efficiency programs and new appliances will have higher first costs, the benefits to New York industry of new and extended efficiency measures will greatly exceed the costs in the medium and long terms. Key advantages of efficiency investments include cost savings to industrial energy consumers that take advantage of incentive programs, lower reliance on imported oil, lower susceptibility to fluctuations in energy costs, and significant reductions in GHGs and other emissions.

On the cost side, the decision on whether to participate in the negotiated agreement program is purely voluntary and would only be taken where industry believes benefits will outweigh costs. Industrial end users that choose to participate in the negotiated agreement program and take advantage of new incentives and technical assistance will have their up-front costs subsidized through government incentives, and will reap cost savings through lower energy spending. Applying the results of the Department of Energy commissioned *Scenarios for a Clean Energy Future* study on a prorated basis to New York, implementation of negotiated agreements and

associated measures for energy efficiency is expected to result in a net benefit to New York of $81 million per year. These cost savings will ultimately boost the competitiveness of industry in New York.

In addition to costs associated with participation in negotiated agreements, industry could experience higher energy costs on a temporary basis in association with implementation of the broad-based energy efficiency programs discussed in the buildings chapter, depending on the chosen financing mechanisms. Assuming use of a financing mechanism for new energy efficiency programs that adds a surcharge to energy costs, costs to industry electricity consumers could range from 1.6 to 1.65 mills/kWh, just over a three percent increase in power prices above BAU levels[10]. Costs to industrial consumers of oil and gas are also expected to be increase. For example, the increase in industry natural gas utility bills is estimated at 0.2 percent.

Implementation of negotiated agreements would reduce emissions by 0.13 MMTCE in 2010 and 0.32 MMTCE in 2020. A small portion of these reductions is used to help meet the power-sector cap, reducing power-sector compliance costs. The remaining 0.10 MMTCE in 2010 and 0.25 MMTCE in 2020 are additional to the modeled power-sector cap. In addition to achieving reductions in carbon, co-benefits in the form of lower emissions of NO_X, SO_2, and mercury are also expected. Measures that target oil, gas, and electricity consumption in industry would also lower energy consumption statewide, reducing the State's reliance on foreign oil and susceptibility to fluctuations in electricity and natural gas prices.S

Views of the Task Force. The Task Force expressed strong support for new efforts to negotiate agreements with industry to reduce GHG emissions. Members expressed strong sentiment that the agreements should be designed to preserve and enhance industry competitiveness and enable industry growth through use of energy efficiency benchmarking, adjustable baselines or other means. The Task Force also indicated support for new industry reporting and the possibility of receiving credit or other recognition for emissions reductions in excess of corporate commitments.

Transportation

Analysis by the Center with input from the Transportation and Land Use working group found that this sector can reduce emissions by 1.64 MMTCE in 2010, with total emissions 20.9 percent *above* 1990 levels, and reductions of 5.23 MMTCE in 2020, with total emissions 16.5 percent *above* 1990 levels, through implementation of the actions recommended in this chapter (see Figure ES-4).

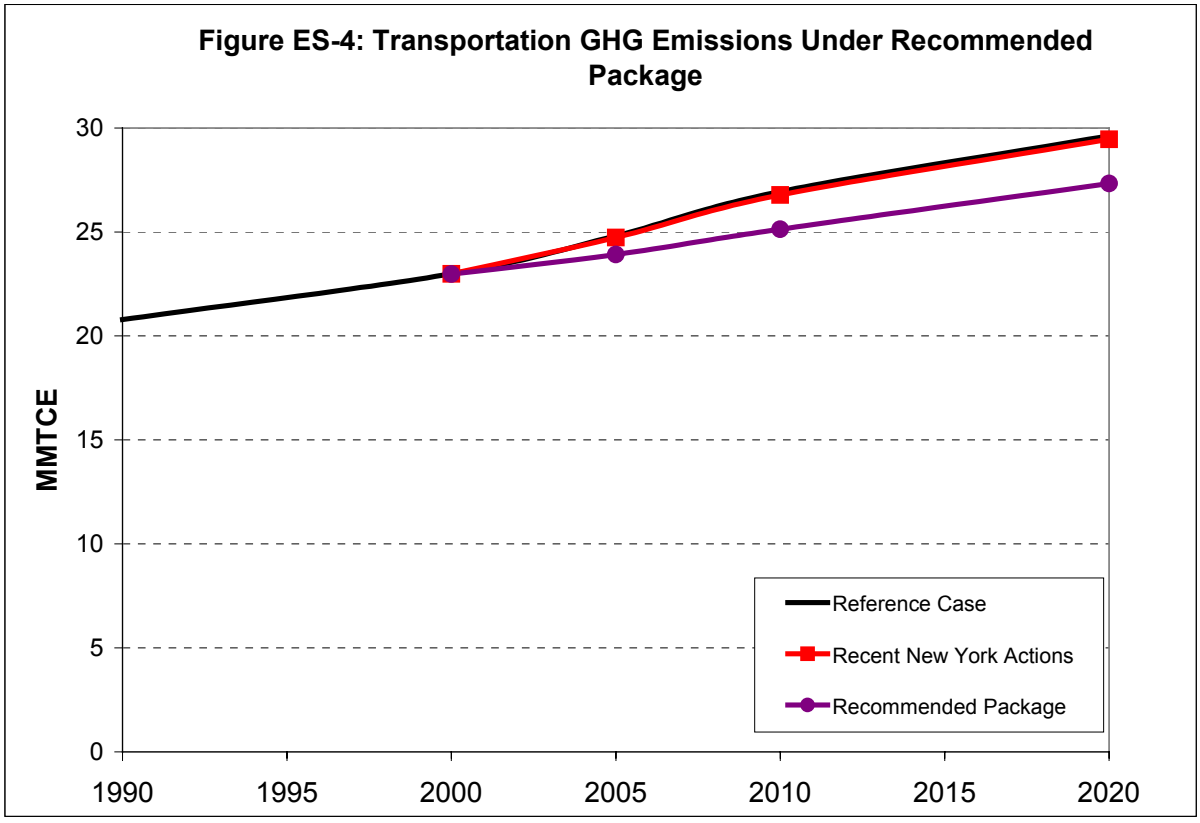
[10] These figures assume the cost of the efficiency programs are distributed equally to consumers across the state. Given historical pricing practices, industry would likely bear a smaller than average share of this cost. In addition, to the extent that industry shoulders the current SBC, NYPA and LIPA programs, the incremental cost of supporting new and extended efficiency measures would be much smaller.

We recommend that New York implement the following actions:

- Slow the growth of vehicle miles traveled (VMT). The State should shift funding to more GHG-efficient alternatives such as transit and smart growth, and should harmonize other State funding and incentives with GHG reduction and Quality Communities Goals. GHG reporting should be required in the State Environmental Quality Review Act (SEQRA), Transportation Improvement Programs (TIPs), and long-range transportation plans (LRPs). The State should assist municipalities and metropolitan planning organizations (MPOs) with integrated land use and transportation planning, and should initiate an annual competitive grant solicitation for local governments and private companies to propose GHG reduction ideas. The GHG and air-quality effects of major private developments should be tracked, and by 2007 the State should decide on implementing a GHG offsets requirement.
- Reduce vehicle GHG emission rates. New York should follow California's lead and set GHG emissions standards for new light-duty vehicles beginning with the 2009 model year. Section 209 of the federal Clean Air Act permits California to establish emissions standards for new light-duty vehicles that are more stringent than the federal standard and Section 177 allows other states to adopt the identical California standard. While New York cannot adopt GHG tailpipe standards before California finalizes their standards, the State should undertake the necessary background work to the adoption of the new California standards once they are finalized. If implementation of the California standards faces significant delays, New York should introduce a revenue-neutral, GHG-based "feebate" program for new cars and light trucks in which low-GHG vehicles receive a rebate and high-GHG vehicles pay a fee. The Center recommends that the State provide other incentives to enhance demand for GHG-efficient vehicles; foster deployment of advanced-technology, GHG-efficient vehicles; modify Clean Fleets goals to maximize GHG reductions; and encourage best practices in enforcing speed limits, conducting driver training, and encouraging vehicle maintenance, including low rolling resistance tires and oil.
- Expand use of low-GHG fuels. All diesel fuel sold in New York State should contain two percent biodiesel by 2010. As additional supply becomes available, the State should increase the percentage of biodiesel so that half of all diesel sold in New York consists of 20 percent biodiesel by 2020. The State should also maximize use of biodiesel in its own fleets and encourage biodiesel use in municipal and private fleets. New York State should also develop a biofuels program with incentives for producers.
- Improve multimodal freight efficiency. The State should invest in key freight rail infrastructure such as the Cross-Hudson tunnel, should raise bridges to accommodate double-stack containers, and should expand the Brooklyn port to facilitate intermodal transfers. New York should also continue to encourage the Legislature to pass rail taxation reform and should reduce truck emissions by promoting the deployment of truck-stop electrification technology, enforcing truck speed limits, and consider increasing truck tolls and/or highway user fees.
- Improve aviation efficiency and promote high-speed rail. We recommend that New York provide incentives for low-GHG airport ground and gate equipment and evaluate the potential for high-speed rail to displace short-haul flights.

- Establish a New York State Transportation Emissions Reduction Entity. The establishment of a New York State transportation emissions reduction entity would greatly facilitate the implementation of the recommended actions. Reducing GHG emissions from transportation will require the involvement of multiple State agencies,

Figure ES-4: Transportation GHG Emissions Under Recommended Package



MMTCE = million metric tons of carbon equivalent

including the New York State Department of Transportation (NYSDOT), the New York State Energy Research and Development Authority (NYSERDA), and the New York State Department of Environmental Conservation (DEC). One State entity focused on transportation emissions reductions could improve coordination of multi-agency efforts and focus or redirect State funding toward climate-friendly projects. Such an entity will require a dedicated funding mechanism and authority sufficient to implement the recommended policies and measures. Proposed goals for this entity would be to reduce transportation GHG emissions to 20 percent above 1990 levels by 2010, ten percent above 1990 levels by 2020, and 1990 levels by 2030.

Impacts on and Benefits for New York. The transportation measures recommended in this report would strengthen the New York economy and continue the State's exemplary record of environmental leadership in the transportation sector.

Economic Effects. Slowing VMT growth and reducing vehicle GHG emissions rates will lower consumer fuel expenditures and reduce New York's dependence on imported petroleum. Targeting State transportation expenditures to strengthen communities and maximize use of existing infrastructure will reduce long-term costs by avoiding inefficient infrastructure expenditures. The California legislation on tailpipe GHG emissions requires that the standards be cost effective and economical to vehicle owners taking into account full life-cycle costs. Since California has not yet defined the level of the new GHG tailpipe standards, it is not possible to ascertain actual program costs, but other analyses in California and Canada enable us to estimate the economic impacts of the GHG tailpipe standard to range from a benefit of $36 per MTCE to a cost of $143 per MTCE.[11] The alternative GHG-based "feebate" program would result in low short-term costs for a one-state approach, and net benefits for a long-term or multistate approach. Research, development, and deployment of advanced vehicles will bolster New York's technology sector in a competitive and lucrative market. The requirement for two percent biodiesel by 2010 could increase diesel prices by about one cent per gallon (depending on federal support and production improvements). Biofuel production and use incentives, however, will strengthen New York's agricultural sector and help preserve valuable farmland. These benefits would be achieved by reorienting existing financial resources and capitalizing on synergies with complementary initiatives such as federal and State tax credits for brownfield redevelopment, and open space protection efforts.

Quality of Life Improvements. Increasing the transportation choices available to all New Yorkers will reduce time in traffic, improve air quality, enhance public health and safety, and foster a more efficient and equitable transportation network. VMT reductions can also enhance equity and environmental justice by reducing mobile-source pollution in key exposure areas.

Demonstrating Continued Leadership. By creating a New York State transportation emissions reduction entity, New York would demonstrate continued leadership on the most important challenge facing transportation in the United States, and even the world. New York State currently has the most energy efficient transportation sector in the United States due in large part to transportation infrastructure investments and supportive land use planning in the New York City region that enable high levels of transit use, walking, and bicycling. New York State has also been a leader in adopting new technologies and clean fuels.

Views of the Task Force. The Task Force concluded that the transportation sector is the dominant source of GHG emissions in New York and poses the State's most significant challenge to reducing emissions. There was near-unanimous support for redirecting transportation spending toward more efficient modes and providing tools and incentives to encourage VMT reductions. There was significant discussion on the optimal policy approach to reducing transportation sector GHG emissions. The Task Force considered an Executive Order on VMT reduction, a transportation efficiency fund, and a transportation emissions reduction office at NYSDOT. At the final Task Force meeting, a member expressed the need for a NYSERDA-like entity to address transportation emissions, noting the key role that NYSERDA

[11] California has not yet defined the specific levels of the tailpipe GHG standards. Cost estimates based upon: California Energy Commission and California Air Resources Board. *Task 3 Petroleum Reduction Options.* Staff Draft Report, March 2002 and Canada Transportation and Climate Change Table, *Transportation and Climate Change: Options for Action*, November 1999.

and Energy $mart have played in reducing GHG emissions from electricity generation. Although there was insufficient time to develop the idea at that meeting, the Center continued to develop the transportation emissions reduction entity idea in conjunction with other Task Force and Transportation working group members.

The Transportation and Land Use working group initially proposed increasing motor fuel taxes by one cent per year (for ten years), with revenues devoted to reducing transportation-related GHG emissions. Although supported by a majority of the working group, this measure was strongly opposed by State officials and subsequently dropped. There was broad agreement that shifting revenues from the existing Petroleum Business Tax or Motor Fuel Excise Tax to fund such activities could be more feasible.

Task Force members indicated that New York could not set light-duty vehicle GHG emissions standards before California regulations go into effect. The alternative proposal of a GHG-based feebate program in New York received general support, with the intention of expanding to a regional program to include other northeastern states. The automotive industry representative on the Task Force was opposed to tailpipe standards and feebates, and other Task Force members saw them as a second-best approach necessary because of lack of federal action on motor-vehicle GHG emissions.

Members of the Task Force gave strong support to enhancing research and development and deployment (RD&D) efforts, as well as the development of an aggressive biofuels program in New York. Members expressed concern about requiring GHG offsets from major development projects (such as "big-box" retail stores), so the recommendation was modified to begin with reporting of projected GHG emissions by major private developments above a certain size and then allowing the State to decide whether the magnitude of emissions justifies a new approach to require offsets. Task Force members agreed on the priority of reducing emissions from freight, although there was little discussion of specific policy proposals.

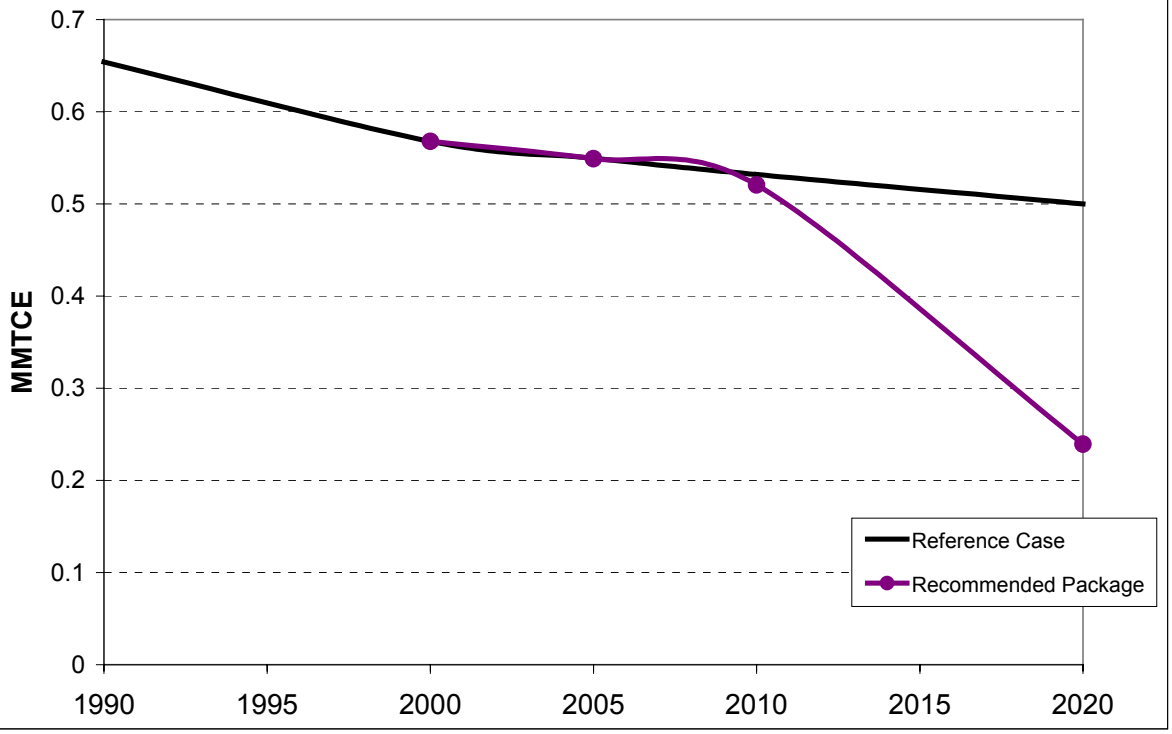
Agriculture/Forestry

Analysis by the Center with input from the Agriculture and Forestry working group found that this sector could achieve a total reduction of 0.011 MMTCE in 2010, 20 percent below 1990 levels, and 0.26 MMTCE in 2020, 58 percent below 1990 levels, through implementation of the following recommended actions:

- Expand the New York Agricultural Environmental Management program by improving nutrient management plans on all Confined Animal Feeding Operations (CAFO)-sized farms (563) and over 22 percent of non-CAFO-sized farms (1,696) by 2010; and 50 percent of non-CAFO-sized farms (3,819) by 2020; installing digesters on 15 percent of CAFO-sized farms (85) by 2010 and 35 percent (197) by 2020; and developing a pilot conservation tillage program.
- Plant a sufficient quantity of trees per year so that by 2020 more than three million properly planted trees will have survived to a sufficient size to decrease energy demand in the surrounding area, and consider actions to increase the State's carbon sink.

- Improve the State's land-use inventory to allow for better tracking of actions at the entity level and to support future land conservation actions.

Figure ES-5: Ag/For GHG Emissions Under Recommended Package



MMTCE = million metric tons of carbon equivalent

I. INTRODUCTION

A. OVERVIEW

On June 10, 2001, Governor George E. Pataki announced the formation of a New York State Greenhouse Gas Task Force (the Task Force) to develop policy recommendations for reducing the State's greenhouse gas (GHG) emissions. The Center for Clean Air Policy (CCAP or the Center) was asked to facilitate the deliberations of the Task Force, develop and analyze policy options for reducing GHG emissions, deliver a final report recommending GHG policy actions in collaboration with the Task Force, and recommend GHG-reduction strategies and actions to the New York State Energy Planning Board to assist in the development of the New York State Energy Plan.

The tragic events of September 11, 2001, understandably delayed the development of this report and depleted New York State's budget. The State went from a significant projected budget surplus in June 2001 to a projected shortfall. Nevertheless, administration officials conveyed the Governor's continuing concern with the problem of global climate change and indicated that the work of the Task Force would proceed, albeit under more challenging circumstances.

In developing the broad range of policy recommendations, the Center relied extensively on the advice, analysis, and expertise of Task Force members; its own extensive quantitative analyses; and the modeling of the electricity-sector options by ICF Consulting, a nationally recognized firm. This report constitutes the Center's recommendations as advised by the Task Force. Although the Task Force effort was not designed to bring about total consensus, in many cases the recommendations received the support of a majority of Task Force members. Most important, the Task Force process produced broad support for an aggressive statewide carbon emissions reduction target of five percent below 1990 levels in 2010 and ten percent below 1990 levels in 2020. The report indicates differences in opinion on specific recommendations. In isolated cases, when a particular policy measure faced widespread opposition from Task Force members, it was not recommended on feasibility grounds.

Task Force members recognized that even the most aggressive GHG reduction measures considered in this report would be insufficient to achieve the level of emissions required globally to stabilize carbon dioxide (CO_2) concentrations at the 450 parts per million (ppm) or 550 ppm levels and prevent serious climate change. According to the IPCC, under stabilization scenarios, "Eventually CO_2 emissions would need to decline to a very small fraction of current emissions."[12] The Intergovernmental Panel on Climate Change (IPCC) estimates that atmospheric concentrations of GHGs will surpass 450 ppm by 2025 without serious mitigation efforts, and that a doubling of atmospheric concentrations to 550 ppm will occur by 2050. The level of reductions envisioned in this report and in existing international treaties constitutes a small but important first step toward the goal of atmospheric stabilization of GHGs. The Task Force agreed that a comprehensive solution will require a major shift in technology and energy use patterns over this century, as well as a national and global commitment to take action to reduce atmospheric concentrations of CO_2 to safe levels. As a first and important step, this report

[12] United Nations Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2001: The Scientific Basis*. Report of Working Group I: Summary for Policymakers. Cambridge: IPCC, 2001. p. 12.

recommends a GHG reduction target for New York State, comprehensive actions in each sector, specific policy mechanisms for implementation, and an inventory, reporting, and registry system**.**

The Center is grateful to the Rockefeller Brothers Fund, New York Community Trust, the New York State Energy Research and Development Authority (NYSERDA), Swiss Reinsurance, the Rockefeller family, the Energy Foundation, and the John Merck Fund for their financial support of our work on this project.

Task Force Members

The State of New York created the Task Force with advice from the Center. The following representatives of the business community, environmental organizations, State agencies, and universities served:

- John P. Cahill, New York Executive Chamber
- Kelly Brown, Ford Motor Company
- Erin Crotty, New York State Department of Environmental Conservation (NYDEC)
- Paul J. Elston, New York League of Conservation Voters
- William Flynn, New York State Energy Research and Development Authority (NYSERDA)
- Ashok Gupta, Natural Resources Defense Council (NRDC)
- Kevin Healy, Robinson, Silverman, Pearce, Aronsohn & Berman LLP (RSPAB)
- Maureen Helmer, New York State Public Service Commission (NYSPSC)
- Darlene Kerr, Niagara Mohawk
- Joe Boardman, New York State Department of Transportation (NYSDOT)
- David Lyons, Corning, Inc.
- John Mutter, Lamont-Doherty Earth Observatory
- Brenda Pulley, Alcan Aluminum
- John Reese, Reliant Energy
- Nathan Rudgers, New York State Department of Agriculture and Markets (NYDAM)
- Jim Tripp, Environmental Defense
- David Wooley, Pace Energy Project and American Wind Energy Association
- Val Washington, Environmental Advocates of New York (EANY)

Working Groups

For in-depth discussion and evaluation of the policy options for reducing GHG emissions, the Task Force formed four sector-based working groups, and a Registry and Trading working group (see Appendix 2). Task Force members participated in these groups directly or through a staff designee. Working groups and chairs were as follows:

- **Electricity Generation:** Paul Powers (NYSPSC)
- **Buildings and Industry:** Peter Smith (NYSERDA)
- **Transportation and Land Use:** Steve Winkelman (CCAP)
- **Agriculture and Forestry:** Dave Fellows (NYDAM)
- **Registry and Trading:** Kevin Healy (RSPAB)

Schedule

The Task Force met five times from July 2001 through May 2002. Working groups conferred several times during this period to propose, discuss, and analyze policy options and implementation issues. Working groups identified a first round of GHG reduction actions for analysis and further iteration (see Appendix 3). On November 30, 2001, the Center provided interim recommendations to the New York State Energy Plan (SEP) for public comment through April 2002 (see Appendix 4). Working groups continued to refine specific recommendations in keeping with the broad initial recommendations to the SEP. The working groups also performed supportive analyses on the effectiveness, cost, and implementation of their recommendations. The Center formulated final recommendations for Task Force review and discussion on May 23, 2002. Input from that meeting and additional input from Task Force members shaped final recommendations, presented on June 20, 2002, with the exception of the electricity sector. CCAP worked with NYSERDA and members of the electricity working group on several additional modeling analyses for this sector through early January 2003, and formulated final recommendations to the Governor based on these results and discussions.

Report Structure

The Center's final recommendations and other background material are discussed in detail in the following chapters of the report:

- Chapter I provides an overview of the Task Force process, the problem of global climate change, and significance of New York's GHG emissions actions.
- Chapter II discusses the recommended New York State GHG target and the process for developing the target.
- Chapter III discusses the key components of a State GHG emissions inventory and registry.
- Chapters IV through VIII discuss the actions recommended for each sector (electricity, buildings, industry, transportation, and agriculture/forestry) and the implementation strategy for these recommendations.

B. THE PROBLEM OF GLOBAL CLIMATE CHANGE

Fossil fuel combustion and changing land use patterns are the underlying cause of global climate change. Human activities since the Industrial Revolution have accelerated the use of fossil fuels and increased emissions of GHGs into the atmosphere at an unprecedented rate. The atmospheric concentration of carbon dioxide (CO_2) has increased from a pre-industrial level of 280 parts per million (ppm) to the current level of 360 ppm—31 percent higher than pre-industrial levels. Without serious mitigation efforts, CO_2 levels are projected to increase to 450 ppm by 2025 and 550 ppm by 2050. The current rate of increase is faster than any observed for at least the past 20,000 years, and the projected rate of temperature fluctuations over the next century will equal those that occurred in the most recent Ice Age during a 10,000-year period. The current level of CO_2 in the atmosphere has not been exceeded in the past 420,000 years, and not likely in the past 20 million years.[13]

[13] Ibid.

The United Nations Intergovernmental Panel on Climate Change (IPCC) recently released its *Third Assessment Report* on the linkages between human-induced GHG emissions and climate change.[14] The IPCC reports that over the 20th century, the global average surface temperature increased by about one degree Fahrenheit. According to analyses of paleoclimatic data for the Northern Hemisphere, the warming during the 20th century is the greatest in any century during the past millennium, and the 1990s were likely to have been the warmest decade of the past millennium (See Figure 1.1).[15] The IPCC concludes, "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."[16] Unfortunately, atmospheric GHG concentrations are not reversible because these gases persist in the atmosphere. Carbon dioxide (CO_2) molecules persist more than a century once they enter the atmosphere. Climate change cannot be quickly halted or reversed. Scientists urge caution in considering policies that lock the earth into high atmospheric GHG concentrations without assurance that they will be safe and sustainable. Actions taken or not taken today have long-lasting consequences to the climate and the earth's systems.

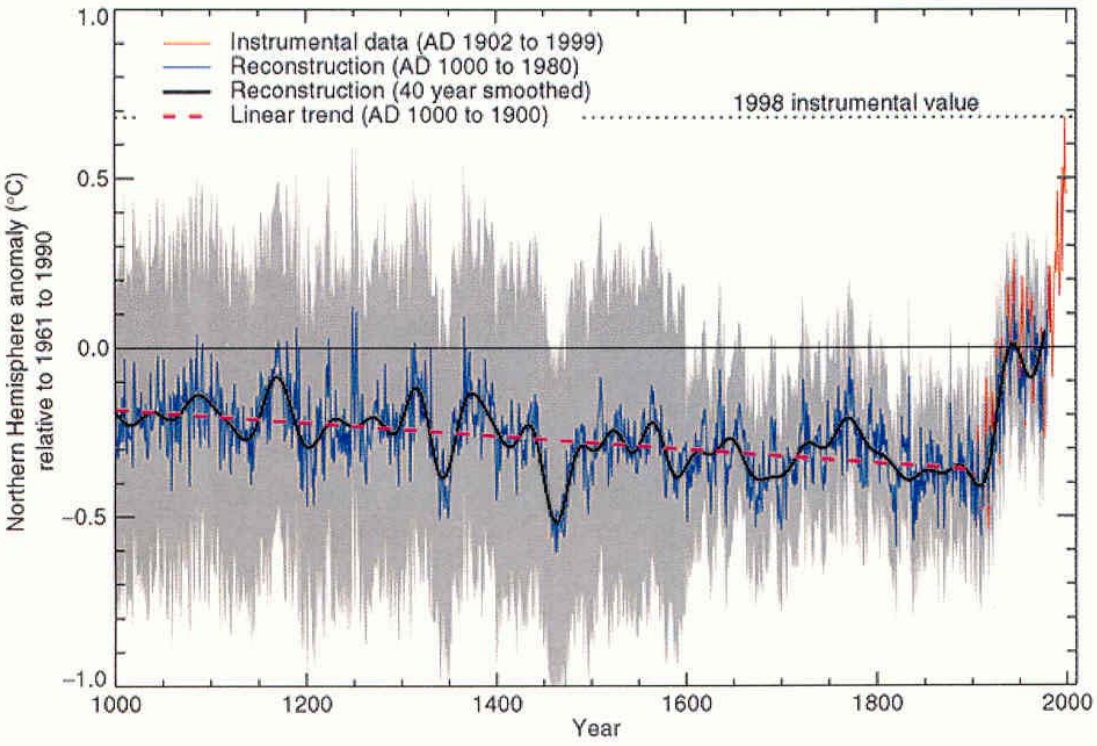
The effects of atmospheric changes on the earth's climate are difficult to predict with complete certainty because of the climate system's complexity. The IPCC's increasingly sophisticated modeling results suggest that by 2100, the effects of climate change could include increased global average surface temperature of 2.5 to 10.4° F; increased global average water vapor concentration and precipitation; decreased Northern Hemisphere snow and ice cover; and global mean sea level rise of 0.29 to 2.89 feet.[17] These changes are not likely to be evenly distributed over time or geography, and may include rapid and unexpected changes in temperature and water cycles as well as disproportionate effects on sensitive populations and ecosystems. Climate changes could have significant environmental and economic consequences, potentially affecting food and water security, heat-related mortality, the spread of tropical diseases, inundation of coastal areas, forest migration and dieback, loss of biodiversity, and the frequency and severity of storm events. Long-term projected levels of temperature increase (without GHG mitigation) are higher and faster than the earth has experienced during human history. The severity and rapid, uneven onset of these climate changes fundamentally challenge human and ecosystem adaptation capabilities.

Emissions and Stabilization Pathways

In 1992, the United States and the other parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed to adopt the long-term goal of stabilizing GHG concentrations in the atmosphere at a level that would prevent "dangerous anthropogenic interference" with the climate system. As a result of the long atmospheric lifetime of GHGs, the effects of current GHG emissions will continue to be felt for decades and centuries to come. Future stabilization of atmospheric GHG concentrations will require significant reductions in emissions. Scientists have modeled different scenarios to determine the magnitude and timing of the emissions reductions necessary to achieve stabilization of atmospheric GHG concentrations at various levels (e.g., 450, 550, and 650 ppm).

[14] Ibid.
[15] Ibid.
[16] Ibid, p. 10.
[17] Ibid; all values converted from Celsius to Fahrenheit and meters to feet.

Figure 1.1: Variations of the Earth's Surface Temperature for the Past 1,000 Years



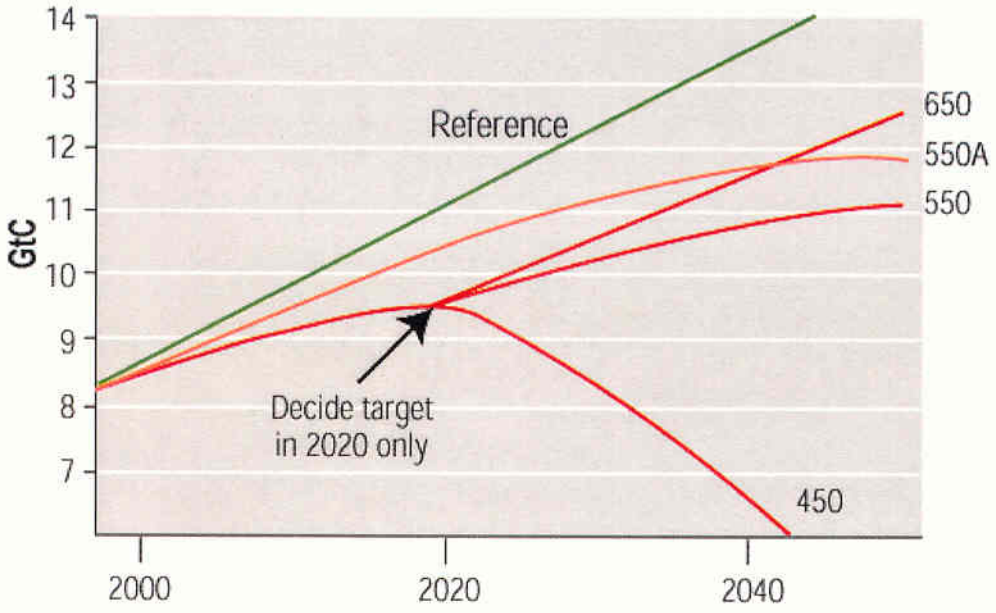
Note: This figure shows the changes in surface temperature in the Northern Hemisphere relative to the average from 1961 to 1990. The 95% confidence range in the annual data is represented by the gray region.

Source: *IPCC Third Assessment Report, Summary for Policymakers*

One of the IPCC's most striking findings concerns the lag time between emissions reductions and changes in atmospheric concentrations. This lag time makes early action crucial. Failure to take action early enough to reduce GHG emissions could rapidly eliminate the ability to achieve stabilization level of atmospheric GHG concentrations at lower levels. Figure 1.2 illustrates that in order to stabilize atmospheric concentrations at 450 ppm, the global community would need to commit to a significant emissions reduction pathway as early as 2020. Failure to do so would eliminate this global stabilization option for the foreseeable future. Preserving future stabilization options at levels as low as 450 ppm will require emissions to be below 1990 levels within a few decades and continue to decrease steadily thereafter. Regardless of which stabilization target is selected, global GHG emissions must be reduced to below 1990 levels in order to stabilize atmospheric concentrations.[18]

[18] Ibid, p. 12.

Figure 1.2: Stabilization Pathways to 450, 550, and 650 ppm



Source: IPCC, *Third Assessment Report*, 2001

To put the need for action in perspective, the recent UNFCCC agreement in Marrakech, Morocco, established a target of 5.2 percent reduction in GHGs below 1990 levels by 2012 for industrialized nations (excluding the United States). [19] This is equal to removing GHG emissions of 115 million metric tons of carbon equivalent (MMTCE) from a worldwide business-as-usual scenario—a 0.6 percent reduction. [20] These reductions are an extremely small fraction of the estimated 600 billion MMTCE of GHG emissions reductions needed worldwide in the next century to stabilize atmospheric GHG concentrations at 450 ppm.[21] Viewed in these terms, this agreement is a critical first step, albeit small, toward long-term stabilization.

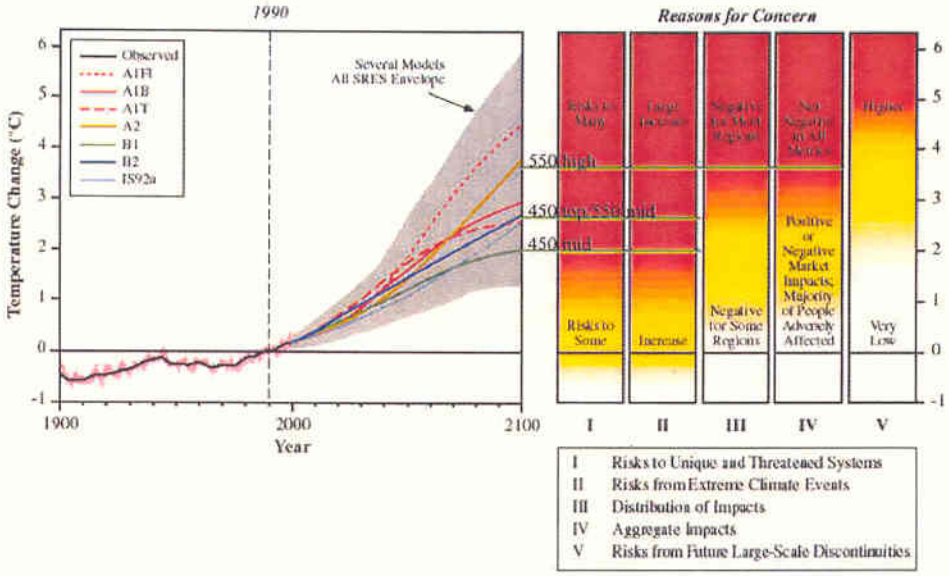
Increasingly aggressive reduction actions will be required worldwide throughout this century to stabilize GHG concentrations, and will necessitate major shifts in energy technology, alternatives, and conservation to be successful. Early actions are important because they reduce the cumulative burden of reductions that will be needed and begin the mitigation process, initiate the signal to develop mitigation technology and actions, preserve the option for relatively low stabilization levels (i.e., 450 or 550 ppm), capitalize on low-cost reduction options available today, and create a softer and more certain pathway to meet future stabilization scenarios.

[19] For information on the impact of the Marrakech Accords, see Rijksinstituut voor Volksgezondheid en Milieu (RIVM), *The Bonn Agreement and Marrakesh Accords: An Updated Evaluation*, Bilthoven, the Netherlands: 2001.
[20] This percentage is 4.3 percent below base-year levels when including the efforts to remove CO_2 through sinks to capture the total effect on atmospheric CO_2 build-up.
[21] IPCC, Third Assessment Report, 2001.

Scenarios that rely on sudden, dramatic changes in energy use later in the century are much less certain in terms of effectiveness and cost compared to near- and mid-term actions, and imply a higher risk of irreversible growth in atmospheric GHG concentrations.

Even with actions to reduce GHG emissions, effects on the global climate system are predicted due to the long atmospheric lifetimes of GHGs already in the atmosphere, although efforts to reduce global GHG emissions can mitigate predicted future effects. As Figure 1.3 illustrates, any particular global stabilization target implies a likely temperature change and concurrent damages to which we must adapt. The lower the concentration scenario achieved, the lower the predicted changes in temperature and water cycle.

Figure 1.3: Temperature Change and Impacts from Concentration Scenarios



Source: IPCC, *Third Assessment Report*, 2001

As seen in Figure 1.3, the stabilization of GHG concentrations at 450 ppm could lead to average increases in temperature by 2100 between 2.0 and 7.2°F. Stabilization at 650 ppm, on the other hand, could lead to increases in average temperature of between 3.4 and 10.6 degrees Fahrenheit. The larger the temperature changes, the greater the risks to ecosystems, risks from extreme climate events, and distribution of effects.

Climate Change in New York

The global effects of climate change must also be placed in a regional context, since climate and the potential changes to climate vary by region. The recent US National Assessment of Climate Change estimated the effects of climate change on each region in the United States.[22] For the Northeastern region, which includes New York State, climate effects are projected to include,

[22] The National Assessment Synthesis Team. *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change.* 2000. Available at <www.usgcrp.gov/usgcrp/Library/nationalassessment/overview.htm>. The assessment looked at effects in the 21st century using two models: (1) the Hadley model, which estimates a global temperature increase of 5°F; and (2) the Canadian model, which estimates a 9°F increase in global temperatures.

but not be limited to, increases in average winter minimum temperatures from 4°F to as much as 9°F by 2100, with the largest increases in coastal regions; precipitation changes from very little to an average increase of roughly 25 percent by 2100, with potentially significant changes in decadal drought patterns; and increased variability in precipitation in coastal areas. The predicted effects on the region of these changes include, but are not limited to, the following:[23]

- New York's mixed forests are projected to change to a more temperate deciduous forest.[24] For southern New York, this is predicted to result in the virtual elimination of maple, beech and birch forests and their replacement by oak and hickory forests.
- The 100-year flood event (the flood height that occurs on average once every 100 years) in New York City is likely to occur much more frequently (e.g., every 19 years in one model) because of the sea-level increase.
- The Great Lakes are very likely to experience decreased ice cover, a shorter season of ice cover, or both with climate change, yet a transient increase in the frequency and intensity of lake effect snows is possible.
- Globally predicted sea-level rise by 2100 is likely to increase the occurrence of flooding as a result of coastal storm surges, which could affect many of the region's vital transportation systems (including airports, subways, highways, and major road and railroad tunnels).
- A number of ski areas and other winter recreation locations could be eliminated by the decline in winter snows, causing a significant adverse economic impact.
- Long Island may lose beachfront property and suffer destruction of barrier islands as a result of higher sea-level rise coupled with increased winter storms. However, summer recreational activities are likely to experience extended seasons.
- Fall foliage may be affected as a result of increased autumn warmth and droughts and the loss of maple species.[25]
- New York's agricultural resource base is likely to survive a changing climate, and may even benefit relative to other regions of the United States; however, the potential high costs of adaptation could have a significant impact on small farms and certain industry segments, such as dairy and apples.[26]

C. SIGNIFICANCE OF NEW YORK STATE GREENHOUSE GAS ACTIONS

Table 1.1 illustrates the global and national significance of New York GHG emissions compared to some key countries and other states. With New York accounting for almost one percent of global emissions (while accounting for 0.3 percent of the world's population), more than four percent of US emissions (while accounting for seven percent of the US population), a greater world share than many industrialized nations, and a larger share than the Alliance of Small

[23] For more information on the New York City Metropolitan region, see also The National Assessment Synthesis Team. *Climate Change and a Global City: An Assessment of the Metropolitan East Coast Region*. 2000. Available at <http://metroeast_climate.ciesin.columbia.edu/reports/assessmentsynth.pdf>.
[24] One model estimated that most of New York's forest would become temperate deciduous types, whereas the other model estimated only a slight change in the composition of the forest species.
[25] The impact on fall foliage varied for each of the models used.
[26] Milk production by dairy cows is optimal at cool temperatures, so an increase in temperatures will require substantial increases in air conditioning costs.

Island States (AOSIS) combined—actions taken by New York can have an important impact on global GHG emissions.

Table 1.1: CO_2 Emissions for Various Countries, Regions, and New York in 1998

Country / Region / State	CO_2 Emissions (MMTCE)	Share of World Total
World	**6,604**	**100.0%**
United States	**1,486**	**22.5%**
China	848	12.8%
Russian Federation	392	5.9%
Japan	309	4.7%
India	290	4.4%
Germany	225	3.4%
Texas	167	2.5%
United Kingdom	148	2.2%
Canada	127	1.9%
Italy	113	1.7%
Mexico	102	1.5%
France	101	1.5%
California	93	1.4%
Australia	90	1.4%
Pennsylvania	68	1.0%
New York	**62**	**0.9%**
Florida	61	0.9%
New England*	46	0.7%
Netherlands	45	0.7%
AOSIS**	38	0.6%
New Jersey	31	0.5%
Belgium	28	0.4%
Maryland	20	0.3%
Austria	17	0.3%
Chile	16	0.2%
Denmark	15	0.2%
Sweden	13	0.2%
Ireland	10	0.2%
Norway	9	0.1%

* New England is the group of New England Governors that are part of the NEG / ECP GHG target; consisting of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

** AOSIS is the Alliance of Small Island States; see http://www.sidsnet.org/aosis/ for a complete listing of the 40+ member countries. Generally, this alliance represents the small island nations of the world, many of whom are at greatest risk from sea level rise.

Sources: World, region, and country CO2 emissions: Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory, *Global, Regional, and National CO2 Emission Estimates from Fossil Fuel Burning, Cement Production, and Gas Flaring: 1751-1998,* 2001. New York CO_2 emissions: NYSERDA, *Patterns and Trends – New York State Energy Profile: 1986-2000,* December 2001. Other US State data: US EPA, *Energy CO2 Inventories*, available at <http://yosemite.epa.gov/globalwarming/ghg.nsf/emissions/CO2EmissionsBasedOnStateEnergyData>.

The Greenhouse Gas Task Force was formed to help New York to build on its history of success in promoting energy efficiency and renewable energy technologies and transportation strategies that have helped it lead the United States in the efficient use of energy. New York is already the most energy efficient state in the continental United States on a per capita basis, accounting for less than five percent of the nation's primary energy use even though it is home to seven percent of the nation's population. New York is also a significant developer of renewable energy, which already accounts for 15 to 18 percent of the State's electricity generation, and ten percent of primary energy use. In addition, New York has long been a leader in open space conservation by protecting 15 percent of the State's land area.

New York's prominence in per capita energy efficiency is largely due to the fact that it has the most energy efficient transportation sector in the nation, which relies on transit alternatives to driving, including buses, commuter rail, and ferries. Transit ridership in New York not only accounts for more than one-third of the nation's ridership, but in 2000, more than 50 percent of the increase in national transit ridership occurred in New York. Much of the recent growth of public transit within the State can be attributed to the State's fiscal and fare policies, including MetroCard Fare program, Commuter Choice, and E-Z Pass. Also contributing to low per capita fuel use is the number of New York residents working at home, which increased from 2.6 percent in 1990 to 5.1 percent in 1995. New York's leadership in open space conservation is largely a result of its continued investment through bond acts, special appropriations for land acquisition, and a dedicated Environmental Protection Fund.

In terms of energy intensity (or energy productivity), which measures energy use in Btus per dollar of gross state product, New York ranks second lowest in the continental United States, despite being the fourth largest energy user of all states. In 2000, the State's energy intensity was 44 percent below the national average. New York's energy intensity has improved significantly over the past two decades. This improvement is partially due to a general shift from a manufacturing economy to a service-based economy, but also reflects substantial increases in energy efficiency from more stringent energy building codes and appliance standards, government- and utility-sponsored energy efficiency programs, and naturally occurring price-induced energy efficiency practices.

This lower energy intensity has resulted in a concurrent decline in GHG intensity. In 1999, New York's fuel-combustion-related CO_2 emissions per capita were 2.9 metric tons of carbon equivalent—the fourth lowest among all states and the District of Columbia—compared with the national average of 5.4 tons of carbon equivalent. However, due to the large share of the US population residing in New York (seven percent), New York's total CO_2 emissions are the ninth largest among all states and the District of Columbia. Table 1.2 compares the per capita and aggregate GHG emissions from all 50 states and the District of Columbia.

Recent Policy Actions Taken by the State of New York

By establishing the GHG Task Force, New York has committed to continuing to lead the nation in actions that reduce GHG emissions. This commitment involves aggressive implementation of existing programs, and development of new technologies and strategies to significantly reduce emissions. These efforts also must meet energy planning objectives related to reliability, diversity, safety, prices, air quality, economic development, fairness, and equity in promotion of competitive markets.

Table 1.2: Total and Per Capita CO2 Emissions by State in 1999				
State	Per Capita CO_2 Emissions		Total CO_2 Emissions	
	MTCE per person	State Rank	MMTCE	State Rank
District of Columbia	2.18	51	1.13	51
Massachusetts	2.78	50	17.16	30
California	2.86	49	94.83	2
New York	**2.87**	**48**	**52.31**	**9**
Vermont	2.98	47	1.77	50
Connecticut	3.07	46	10.09	41
Rhode Island	3.11	45	3.08	49
Idaho	3.28	44	4.11	47
Oregon	3.39	43	11.24	37
Hawaii	3.58	42	4.25	46
New Hampshire	3.79	41	4.55	44
Maine	3.88	40	4.86	43
New Jersey	3.94	39	32.10	17
Washington	4.01	38	23.11	23
Florida	4.03	37	60.83	5
Maryland	4.09	36	21.16	26
Virginia	4.31	35	29.62	19
Arizona	4.49	34	21.47	24
Illinois	4.83	33	58.58	7
North Carolina	4.86	32	37.19	12
South Dakota	4.95	31	3.63	48
Minnesota	5.24	30	25.02	22
Colorado	5.26	29	21.32	25
Wisconsin	5.33	28	27.97	20
Pennsylvania	5.34	27	64.05	4
Michigan	5.37	26	52.96	8
South Carolina	5.39	25	20.93	27
Georgia	5.54	24	43.11	11
Delaware	5.71	23	4.30	45
Tennessee	5.90	22	32.36	16
Nevada	6.03	21	10.91	40
Mississippi	6.16	20	17.05	32
Ohio	6.20	19	69.75	3
Missouri	6.43	18	35.17	15
Nebraska	6.67	17	11.11	38
Arkansas	6.70	16	17.09	31
Iowa	7.20	15	20.65	28
Kansas	7.32	14	19.43	29
Oklahoma	7.46	13	25.04	21
Utah	7.79	12	16.60	34
Alabama	8.22	11	35.90	14
Texas	8.31	10	166.56	1
New Mexico	8.68	9	15.10	35
Kentucky	9.20	8	36.43	13
Montana	9.48	7	8.37	42
Indiana	10.07	6	59.85	6

Table 1.2: Total and Per Capita CO2 Emissions by State in 1999				
State	Per Capita CO_2 Emissions		Total CO_2 Emissions	
	MTCE per person	State Rank	MMTCE	State Rank
Louisiana	11.70	5	51.16	10
West Virginia	16.96	4	30.65	18
Alaska	17.80	3	11.03	39
North Dakota	21.81	2	13.82	36
Wyoming	35.01	1	16.79	33
US Total	**5.42**		**1477.32**	
NOTE: Emissions levels may be different than state developed inventories due to differences in scope of coverage, underlying data, emission factors, or assumptions.				

Sources: State CO2 emissions: US EPA, Energy CO2 Inventories, available at <http://yosemite.epa.gov/globalwarming/ghg.nsf/emissions/CO2EmissionsBasedOnStateEnergyData>. Per capita data based upon population estimates from the US Census Bureau.

The programs described below have established, and will continue to enhance, New York's leadership position in reducing GHG emissions:

System Benefits Charge Program. New York Energy $mart Programs, funded for $750 million over five years (2001–2006), include energy efficiency, low-income assistance, and research and development initiatives to (1) improve system wide reliability through actions aimed at more efficient energy use; (2) reduce environmental effects of energy production and use; (3) facilitate competition to benefit end users (both individual consumers and industries); and (4) improve energy efficiency and access to energy options for underserved customers. Through the 2006 period the **New York Energy $mart** Program anticipates achieving 3,500 GWh in electricity savings and more than 1,000 MW in peak demand savings. The **New York Energy $mart** public benefits program, administered by NYSERDA, combines infrastructure development, awareness activities, and targeted incentive offerings to transform markets. The program establishes long-term relationships with participants and networks of trade allies to support and sustain changes in markets and consumer behavior.

Governor's Executive Order 111. In June 2001, Governor Pataki issued Executive Order 111 requiring all State agencies, departments, and authorities to seek a 35 percent reduction in energy use by 2010, relative to their energy use in 1990. In addition, each agency, department, and authority is directed to purchase ten percent of its energy from renewable energy sources by 2005, increasing to 20 percent by 2010. Local governments and school districts are also being actively encouraged to comply with the Order. When procuring new vehicles, State agencies must obtain increasing percentages of alternative-fuel vehicles. By 2005, at least 50 percent of new light-duty vehicles acquired by each agency shall be alternatively fueled. By 2010, 100 percent must be alternatively fueled. For medium and heavy-duty vehicles, State agencies must implement strategies to reduce petroleum use and emissions, using alternative fuel vehicles wherever possible. By seeking to reduce its own energy use, improve its energy efficiency, and improve its environment, New York is striving to eliminate barriers to energy efficiency and become a national leader in energy efficiency and environmental policy.

Clean Energy Initiative. In May 1999, the LIPA's Board of Trustees approved a five year, $170 million Clean Energy Initiative. This initiative sponsors programs, research, and development

efforts to improve energy efficiency for electricity customers on Long Island. The CEI Program concludes in 2004. During its five-year operational period, the program is expected to save more than 300 GWh of electricity and reduce peak demand by more than 170 MW.

Energy Services Program. The New York Power Authority (NYPA) sponsors an Energy Services Program (ESP) that provides financing, technical services, and direct installation of energy efficient electric technologies. The ESP targets residential, commercial, industrial, municipal, and institutional energy customers. Between 2002 and 2004 the ESP is expected to expend $300 million on efficiency and demand programs that will save approximately 120 GWh of electricity and reduce peak demand by 26 MW.

New York State Energy Conservation Construction Code. New York's amended Energy Code, which becomes effective in summer 2002, is among the most progressive building energy codes in the country. Enhancements include the adoption of standards for National Electrical Manufacturers Association (NEMA) Standard ENERGY STAR®/TP-1 transformers, the adoption of recommendations on building, and higher building-envelope requirements for electrically heated homes.

Clean Water/Clean Air Bond Act. The 1996 Clean Water/Clean Air Bond Act included $55 million for clean-fueled vehicles and clean-fueled buses. The Clean-Fueled Bus Program, administered by NYSERDA, provides funds to state and local transit agencies, municipalities, and schools for up to 100 percent of the incremental cost of new alternative fuel buses and supporting infrastructure. A total of $25 million has been awarded in five rounds of the program. This funding will support the purchase of 529 alternative fuel buses using compressed natural gas (428), battery electric (8), and diesel hybrid-electric technology (93). More than $8.6 million (about one-third) of the Clean-Fueled Bus Program funds awarded to date are for hybrid-electric buses. This funding will support the purchase of 93 buses, all of which are expected to be on routes by about 2006.

New York State Alternative Fuel (Clean Fuel) Vehicle Tax Incentive. New York recently enacted tax-incentive legislation for electric vehicles, clean-fuel vehicles, and clean-fuel vehicle refueling properties. Federal tax credits also exist for these technologies. Eligible clean fuels include natural gas, liquefied petroleum gas, hydrogen, and electricity. The New York State tax credit for electric vehicles is equal to 50 percent of the incremental cost (up to a maximum of $5,000 per vehicle) of a comparably sized and styled gasoline vehicle.

New York State Green Building Tax Credit. In an effort to promote green buildings in New York, the State approved a $25 million tax credit as part of the fiscal year 2000–2001 budget. The credit is intended to encourage building owners and developers to use advanced materials and technologies in building construction and renovation projects.

Energy Efficiency Standards for State Purchasing. Legislation enacted in 2000 requires the State of New York to establish minimum energy efficiency standards for appliances and other products purchased for government use.

NYSERDA Statutory Energy Efficiency Research and Development. New York leads the nation in energy research and development. The Empire State is poised to take advantage of technological developments that enable the most advanced uses of energy in the world, and to

attract energy technology and component manufacturing industries. Buildings programs work with developers, designers, contractors, and building equipment manufacturers to develop and demonstrate innovative, energy efficient products in the areas of lighting, heating, ventilation, air conditioning, and building controls. Industry programs assist businesses in developing, demonstrating, and commercializing energy efficient technologies and long-term solutions to reducing energy costs. Examples of technologies targeted under this program include super conducting transformers, advanced cooling equipment, furnaces, and boilers. Transportation programs provide support to New York State firms for developing and commercializing advanced technologies. Examples include developing an electric postal van for the US Postal Service, electric light-duty carrier route vehicles, and hybrid-electric city buses.

Governor's Acid Deposition Reduction Program. New York also leads the nation in adopting flexible, yet stringent, environmental policies that balance energy needs with the need for improved public health and safety. The Governor's Acid Deposition Reduction (ADR) Program will result in regulations that will require New York's electricity generation plants to reduce sulfur dioxide (SO_2) emissions by 50 percent below the levels required by the federal CAA Amendments of 1990. The ADR Program will also require such plants to implement year-round controls for nitrous oxides (NO_X), a substantial extension of the five-month summer ozone season controls required under current federal and State regulations. The first full year of fully implemented NO_X controls is 2005, and SO_2 controls will be fully phased in by January 2008. NO_X compliance actions may include a mix of end-of-pipe emissions control technologies, such as selective catalytic reduction and selective non-catalytic reduction. SO_2 compliance actions may include switching to lower sulfur coal, retiring certain coal plants, and installation of flue-gas desulfurization equipment, or scrubbers, on a substantial proportion of existing coal plants. Although the ADR Program's primary objective is to reduce emissions of precursors of acid rain, modeling analysis indicates that emissions of CO_2, the principal greenhouse gas associated with global warming, could be reduced by up to ten percent. This indirect benefit would likely result in shifts from coal- and oil-fired generation to natural gas.

NO_x Set-Aside Program. The energy efficiency and renewable set-aside component of the NO_x budget trading program provides incentives to implement electric end-use energy efficiency and renewable generation projects by allocating three percent, or about 1,200 tons, of New York's ozone-season NO_x allowance budget to eligible projects, beginning in 2003. A pilot program under which 115 tons of NO_x allowances are available for end-use efficiency projects has been in place since 1999. Projects that can be bought and sold on the open market are certified as tradable emissions allowances. This program provides a viable model for the planned development of a carbon registry for early reduction credits and trading.

Wind Generation. By the end of 2001, NYSERDA had supported the construction and operation of 41.5 MW of in-State wind energy generation, with over 210 MW of installed wind capacity expected by 2006. NYSERDA also supports small wind installations under 100 kW for the agriculture, municipal, and commercial sectors, as well as building-integrated PV systems for commercial, industrial, and institutional buildings, and grid-connected residential PV systems.

Solar Electric and Wind Product Development. This program aims to develop in-State manufacturing capabilities for solar-electric and wind products to meet the growing State and worldwide demand for renewable energy. The program solicits proposals for solar electric and wind devices, components, products, and improved manufacturing methods for equipment that

will be manufactured in New York, targeting technologies that will be commercialized within five years.

Fuel Cells. Between 1992 and 1997, NYSERDA invested over three million dollars in fuel cell development and demonstrations, including projects that developed a 50 kW proton-exchange membrane (PEM) fuel cell for passenger cars. Cooperating with the NYPA, NYSERDA also helped demonstrate a 200 kW phosphoric acid fuel cell operating on bio-gas from a wastewater treatment plant in Yonkers, Westchester County. Currently, NYSERDA is administering a six million dollar project, funded by the Clean Air/Clean Water Bond Act to demonstrate fifty 7-kW PEM fuel cells at ten sites owned by New York. The fuel cells are manufactured by Plug Power, LLC in Latham, New York. Other anticipated NYSERDA fuel cell projects include installation and demonstration of a 250-kW fuel cell at Brookhaven National Laboratory on Long Island and a project to develop a process for low-cost, integrated manufacture of fuel cells.

Biomass Combustion. Since 1996, NYSERDA has been partnering with the Salix Consortium to spur the commercial harvesting of willows to be used as a sustainably managed fuel source. NYSERDA has invested $1.4 million in this project. Approximately 500 acres of willow have been planted to date, with enough biomass to generate about 0.75 MW of electricity. Co-firing of the first commercially harvested willow is planned for summer 2002 at the Dunkirk power plant in Western New York.

Anaerobic Digestion. NYSERDA has current commitments for over $3.1 million to fund 18 projects that will use anaerobic-digestion gas from farm wastes for co-generated electricity and heat. The total installed capacity from these projects will be approximately 1.6 MW.

Biodiesel/Biofuel. In March 2002, NYSERDA awarded $212,000 under its New York State Clean City Challenge program to NOCO Energy Corporation and Niagara Frontier Transportation Authority to produce and demonstrate B20 fuel in transit buses and other vehicles operated by NOCO and the Town of Tonawanda. The projects will provide data on distribution and end-use operational requirements and benefits. NYSERDA is also providing $170,000 to NOCO through its research and development program to evaluate the use of bio-heating fuels in boilers and furnaces. The goal is to identify affordable domestic fuels that can be derived from cooking oils, soaps, or other consumer items that can be blended with Number 2 and Number 6 oils, which are used in home and commercial heating systems, respectively. NYSERDA is managing a project to conduct a large-scale demonstration of using biodiesel-blended home heating oil. The residential sector currently accounts for 12 percent of the petroleum usage in the State, primarily for home heating. This ongoing project involves monitoring the performance of a blended biodiesel fuel in 100 homes in the Newburgh area, and will identify its effects on efficiency, fuel filter and pump seal performance, soot formation, and maintenance costs. NYSERDA is considering a project to investigate blending biodiesel with #6 fuel oil for use in industrial boilers to reduce pollutant emissions. NYSERDA is initiating an effort to test the use of biodiesel in stationary back-up diesel generator sets, with the goal of demonstrating an environmentally acceptable alternative to petroleum-based diesel and improving reliability. Since 1999, NYSERDA has invested $850,000 in projects that seek to reduce dependence on petroleum by substituting bioresources for petroleum-based products, components, or processes. Examples of projects include improved enzyme production technology, bio-pesticides, polymers, and gasification of willow feedstock.

End-Use Renewable Programs. The SBC Commercial/Industrial New Construction Program provides incentives of up to $300,000 per project for design and installation of building-integrated PV and advanced solar and daylighting technologies. Advanced solar technologies include thermal storage systems, solar preheating systems, and flat plate solar collectors. The SBC Loan Fund Program provides loans for renewable energy systems.

Long Island Power Authority Programs. LIPA is providing support for various renewable technologies through its Clean Energy Initiative. Through the Solar Pioneer Program, LIPA is offering residential homeowners and small commercial customers a rebate for grid-connected systems. LIPA is participating in the Million Solar Roofs Initiative and has committed to install 10,000 solar roofs on Long Island by the year 2010. LIPA has installed a wide range of PV systems and a geothermal heat pump system, and has announced that it will build a 100 MW windmill farm in the waters off Jones Beach. This installation will be the first offshore project in the United States.

New York Power Authority. NYPA is actively engaged in efforts to preserve and protect the renewable power generated by New York's two largest hydroelectric projects, St. Lawrence-FDR and the Robert Moses Niagara Power Plant. NYPA is also engaged in five small hydropower projects across the State, and supports a wide range of renewable energy technologies, including PV, fuel cells, landfill gas, and wind.

Net Metering Law. New York's net metering law (The Solar Choice Act of 1997, L. 1997, Ch. 339), allows residential electricity customers to offset their electricity use with power they send into the grid using PV equipment owned by the customer. New York's net metering legislation includes a 25 percent tax credit for the purchase and installation cost of a qualifying PV system, not to exceed $3,750. The PSC has developed uniform interconnection rules for net-metered systems. As of June 2002, 23 systems have been interconnected, representing total installed capacity of 48 kW. Another 16 systems are in progress, representing 43 kW of installed capacity. Eight systems, representing 23 kW of installed capacity, are in the application phase.

Environmental Disclosure Program. The PSC now requires electricity providers throughout the state to include "environmental disclosure labeling" information in electricity bills at least twice a year. The label to be included in each customer's bill provides information on the mix of fuels used to generate the electricity sold by their supplier over a 12-month period. Customers will see the percentage of their power that is coming from each fuel source, as well as the air emissions relative to the State average. This information will help empower consumers to make informed choices about their energy sources. Environmental disclosure should also encourage generators to consider providing more green power among their supply offerings.

Open-Space Conservation. Governor Pataki, in his 2002 State of the State message, outlined a vision of protecting an additional million acres of land, or about three percent of New York's land area, during the next decade. Using the State Environmental Protection Fund, which now provides about $38 million annually for land purchases in New York State, as well as other funding sources, New York is meeting the Governor's initiative.

New York State estimates that a number of these recently implemented actions will achieve emissions reductions in the near future. These recent actions (termed *Recent New York Actions* for the remainder of the report) quantify the expected emissions reductions from programs that

are underway but are not yet fully implemented. Two of these actions also are included in the reference case: the Governor's Acid Deposition Reduction (ADR) program, and the projects funded through New York's System Benefits Charge (SBC). Recent actions not included in the reference case include: energy efficiency improvement in State buildings, renewable energy purchase requirements for government buildings, new State energy building conservation code, combined heat and power from the SBC, SBC programs that affect oil and natural gas use, methane flaring at landfills, and Transportation Improvement Programs (TIPs). Table 1.3 summarizes these Recent New York Actions and their expected emissions reductions from all sectors, in 2010 and beyond.

Table 1.3: Emission Reductions from Recent New York Actions

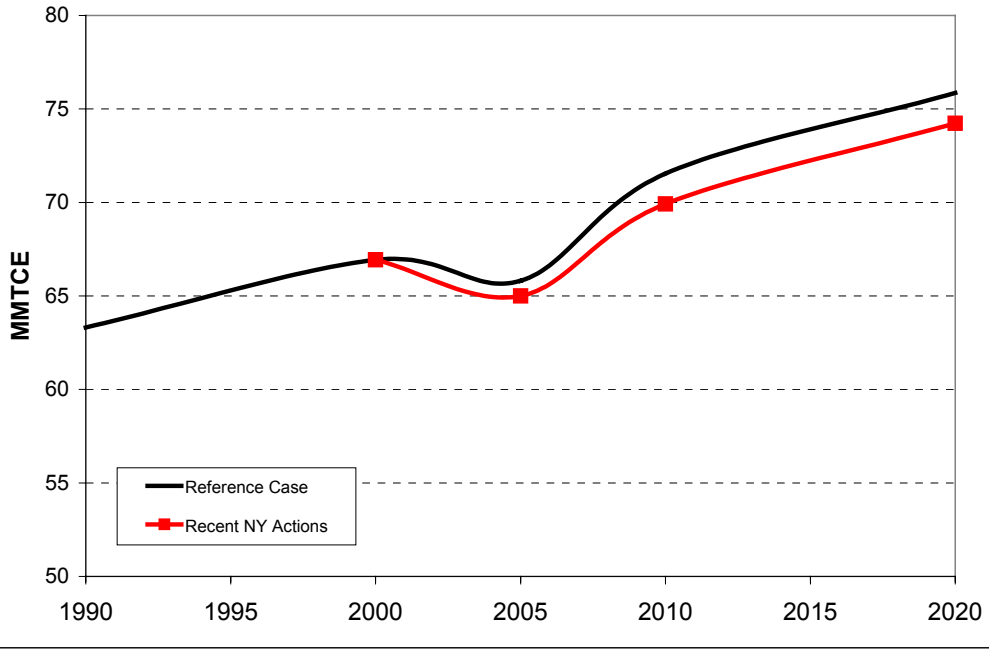
Program	Emissions Reductions in 2010 (MMTCE)
Executive Order 111 (35 percent EE improvements in state buildings)[1]	*0.34*
Executive Order 111 (20 percent RPS in state buildings)[1]	*0.04*
New State Energy Code[1]	*0.45*
Combined heat and power funded by SBC[1]	*0.05*
SBC residential (oil & gas)	0.01
SBC commercial (oil & gas)	0.14
SBC industrial (oil & gas)	0.05
Methane Flaring	0.38
Transportation Improvement Programs	0.17
Total	***0.76***

1) Note: emissions reductions from these programs are not included as additional reductions from the reference case when considering the impact of recommended actions since these reductions will be covered by the electricity sector cap.
SBC = Systems Benefit Charge; MMTCE = million metric tons carbon equivalent; RPS = Renewable portfolio standard.

Source: NYSERDA

As shown in Figure 1.4, these Recent New York actions are projected to lead to significant reductions in GHG emissions from the reference case. GHG emissions for the scenario that includes Recent New York Actions are expected to be 2.3 percent and 2.1 percent below reference case emissions in 2010 and 2020, respectively. The State's GHG emissions are still predicted to rise in the future with economic growth, population growth, and increasing demand for energy. GHG emissions after recent actions are estimated to be 10.5 percent and 17.3 percent above 1990 levels in 2010 and 2020, respectively. The remainder of this report discusses actions that New York State can take to reduce GHG emissions even further.

Figure 1.4: NY GHG Emissions Under New York Recent Actions



MMTCE = million metric tons of carbon equivalent

The Need for Actions at both the National and State Levels

As global trends for GHG emissions and concentrations demonstrate, more must be done in the near term to stabilize GHG concentrations. To reach a long-term concentration of GHGs between 450 and 550 ppm, significant worldwide reductions in atmospheric loading of GHGs must occur in the next two decades. US action is crucial to this goal. The United States is the largest worldwide emitter of GHGs at 1,909 MMTCE in 2000 and the highest per capita emitter.[27] By 2030, key developing nations will also become leading emitters, exacerbating the problem.[28] As a consequence, US leadership in the near term is essential to preserving GHG stabilization options, and meaningful reductions by developing nations and industrialized nations together will be essential in the long term. A clear national commitment by the United States, including substantial near- and mid-term action, would facilitate reductions from major domestic

[27] Value does not account for removals from carbon sinks. See U.S. Environmental Protection Agency (U.S. EPA). *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2000*. Washington, DC: U.S. EPA, 2002.
[28] U.S. Energy Information Administration (U.S. EIA). *International Energy Outlook 2002*. Washington, DC: U.S. EIA, 2002.

and international sources. Even with a national commitment in the future, states will need to implement major reduction efforts where federal commitments are not practical (such as in the transport and construction sectors). A combined state/federal approach will be needed. New York plays an important role in this process by virtue of its leadership potential, high emissions levels, and major opportunities for near-term GHG reductions.

Fossil fuel use is of particular concern because the vast majority of GHG emissions result from fossil fuel production and use. The IPCC estimates that about three-quarters of global GHG emissions in the past 20 years were from fossil fuels. Fossil fuels provide 81 percent of New York's direct energy and electricity production, resulting in 56 MMTCE in 1999.[29] Although the energy and carbon intensity of the State's gross output has been declining, total energy consumption and GHG emissions are expected to increase at an accelerating pace unless aggressive steps are taken.[30]

New York GHG reduction actions can remove a significant amount of GHGs from the atmosphere. These actions can also provide an impetus for action by other states and regions, and for much-needed national actions. To date, one state (New Jersey) is actively working toward a statewide GHG emissions reduction target. In addition, the New England Governors and Eastern Canadian Premiers have committed to regionally coordinated state and provincial GHG emissions reduction targets. Two New England states—Massachusetts and New Hampshire—have enacted mandatory caps on CO_2 emissions from their electric generators. Specific action by New York at or beyond this target level could open the door to regional mechanisms and actions to accelerate and expand this agreement, and broaden participation by new states and regions. In addition, New York actions could begin to encourage the development of new technologies that can assist in achieving long-term stabilization of GHGs.

In the absence of national action, unilateral State action and regionally coordinated policies offer an attractive path for progress on this critical issue. There is strong precedent for this approach. During the past 30 years, New York and other environmentally progressive states have served as powerful laboratories of democracy by enacting environmental laws that charted the course for the later passage of major national environmental laws. Reducing GHG emissions is the latest opportunity for environmental policy leadership by states.

New York State Emissions Inventory

Prior to the formation of the Task Force, NYSERDA developed a State emissions inventory that included historic and projected greenhouse gas emissions in New York by emissions activity and sector.[31] In the process of the Task Force discussions, two modifications were made to the NYSERDA greenhouse gas inventory. First, the transportation reference case was adjusted to correct for differences between transportation fuel sales and fuel consumption in New York. This difference arises because an estimated 18 percent of gasoline and diesel consumed in New York is purchased out of state by commuters, delivery vehicles, and through-traffic. Failure to adjust

[29] U.S. Department of Energy (DOE). *State Energy Data Report*. Washington, DC: DOE, 1999. *New York State Energy Plan*, pp. 3–44. New York State Energy Research and Development Authority (NYSERDA), *NY Draft Climate Change Action Plan*, Appendix, Figure 3.
[30] New York State Energy Planning Board. *New York State Energy Plan and Final Environmental Impact Statement*, pp.3–5. Albany: 2002.
[31] NYSERDA, *New York State Greenhouse Gas Inventory,* 2001.

for this difference would result in a 15 percent underestimation of the transportation sector's fuel consumption and GHG emissions, totaling 3.5 MMTCE in 2010, and 3.8 MMTCE in 2020.[32] (See chapter VII for greater discussion). Correct information is particularly important because the transportation sector is responsible for most of the state's GHGs today and in future projections.

Second, emissions for the electricity-sector reference case were forecasted using the ICF Integrated Planning Model (IPM). The estimate of future GHG emissions developed using the IPM modeling was extremely close to the results of modeling done for the New York SEP (see chapter IV for greater discussion). Table 1.4 shows New York GHG emissions from 1990 and 2000, with future projections for 2005, 2010, and 2020.[33] (See Appendix 5 for a more detailed inventory of greenhouse gas emissions).[34]

New York's aggregate GHG emissions grew from 63.30 MMTCE in 1990 to an estimated 66.93 MMTCE in 2000—an increase of 3.63 MMTCE or about six percent over the period if out-of-state purchases of transportation fuels are included. In the future, reference-case GHG emissions in the State are predicted to grow to 71.54 in 2010 and 75.86 MMTCE in 2020—a growth of about seven and six percent between 2000–2010 and 2010–2020, respectively. Reference case emissions are expected to exceed 1990 emissions by 8.24 MMTCE in 2010, and 12.56 MMTCE in 2020. For discussion within the Task Force, the State's activity data were aggregated into sector categories: electricity, transportation, buildings, industry, agriculture/forestry, and other.[35] The grouping of GHG emissions by source (direct emissions) is shown in Table 1.4.

Table 1.4: New York State Greenhouse Gas Emissions, by Direct Sources (MMTCE)

	1990	2000	2005	2010	2020
Transportation	20.79	22.98	24.82	26.94	29.62
Buildings	15.26	18.23	18.88	19.57	20.02
Electricity	17.46	15.33	11.67	14.52	15.47
Industry	5.37	5.47	5.49	5.51	5.75
Ag/For	0.65	0.57	0.55	0.53	0.50
Other	3.77	4.35	4.41	4.48	4.49
Total	***63.30***	***66.93***	***65.81***	***71.54***	***75.86***

Note: Electricity sector emissions based upon modeling performed by ICF as a part of this project. Transportation emissions based upon revisions to state estimates using methodology described in Chapter VII. All other data from NYSERDA. Totals may not sum due to rounding.

[32] There was also a 0.01 MMTCE discrepancy in the 1990 data.
[33] Included in this baseline is the predicted emissions reductions resulting from the Governor's Acid Deposition Reduction Program and the projects funded from the Systems Benefit Charge.
[34] Note: To convert from CO_2 to C, divide by 44/12 or 3.66. Methane (CH_4), nitrous oxide (N_2O), and other gases are converted to MMTCE based on the comparable global warming potential of these gases compared with atmospheric carbon.
[35] Emissions from the building sector include residential and commercial fuel use and emissions from CO_2 manufacture. Emissions from this sector include emissions from cement production, limestone use, soda ash use, aluminum production, and refrigerant substitutes. "Other" emissions in this report are attributed to electric transmission and distribution, natural gas systems, municipal waste management, and municipal wastewater.

As shown in Figure 1.5, most historic GHG emissions come from three sectors: transportation, buildings, and electricity generation. Industry emissions account for the next-largest percentage, followed by "other" and agriculture/forestry.

Emissions from electricity generation can be further disaggregated according to where the energy is used (termed *end use* in this report). Table 1.5 shows the emissions by sector when electricity emissions are attributed to the end user.

When electricity emissions are attributed according to end-user, buildings become the dominant sector through 2020, followed by transportation and industry. Figure 1.6 shows the share of greenhouse gas emissions by end use for 1990 and 2000.

The share of emissions by sector provides important insight into the sectors where greater attention is needed in both the near- and long-term. The Task Force considered the relative shares of each sector. For example, agriculture and forestry emissions in New York were a relatively small share of total State emissions; therefore, a smaller number of options were considered in this sector. Those sectors that constituted the largest share of total state emissions—transportation, buildings, electricity, and industry—were given greater attention.

Figure 1.5: Historic Direct Emissions by Sector

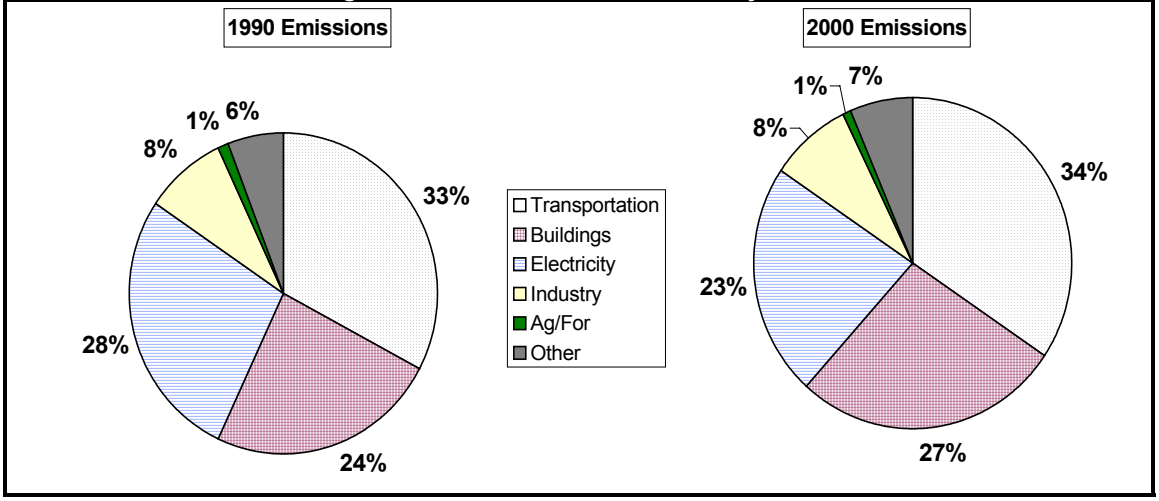
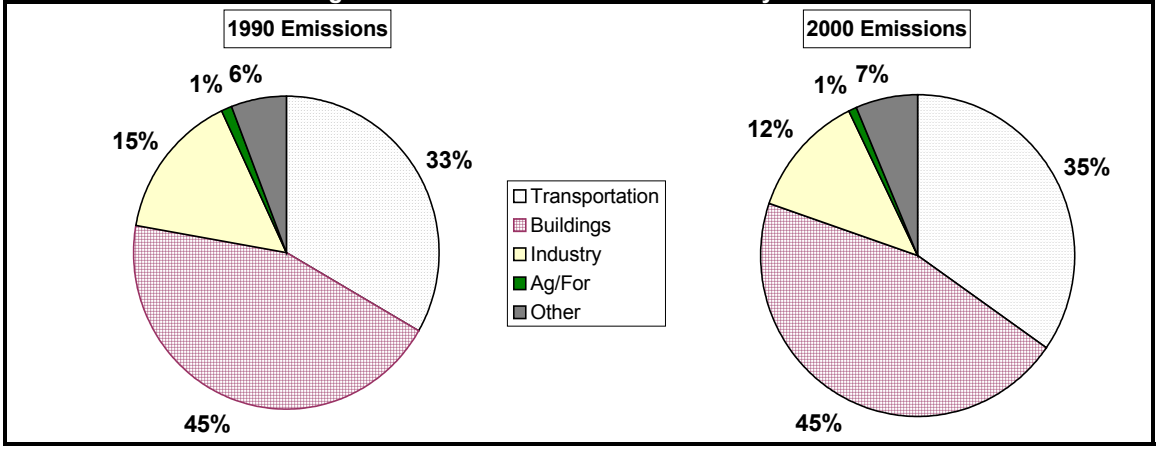


Table 1.5: NY State GHG Emissions, by End-User (in MMTCE)

	1990	2000	2005	2010	2020
Transportation	**21.17**	**23.28**	***24.99***	**27.09**	**29.78**
Buildings	**28.04**	**30.55**	**28.33**	**31.42**	**32.55**
Industry	**9.68**	**8.19**	**7.53**	**8.02**	**8.54**
Ag/For	**0.65**	**0.57**	**0.55**	**0.53**	**0.50**
Other	**3.77**	**4.35**	**4.41**	**4.48**	**4.49**
Total	***63.30***	***66.93***	***65.81***	***71.54***	***75.86***

Note: Electricity sector emissions are attributed to the end-user of the electricity.

Figure 1.6: Historic End-Use Emissions by Sector



II. EMISSIONS TARGETS

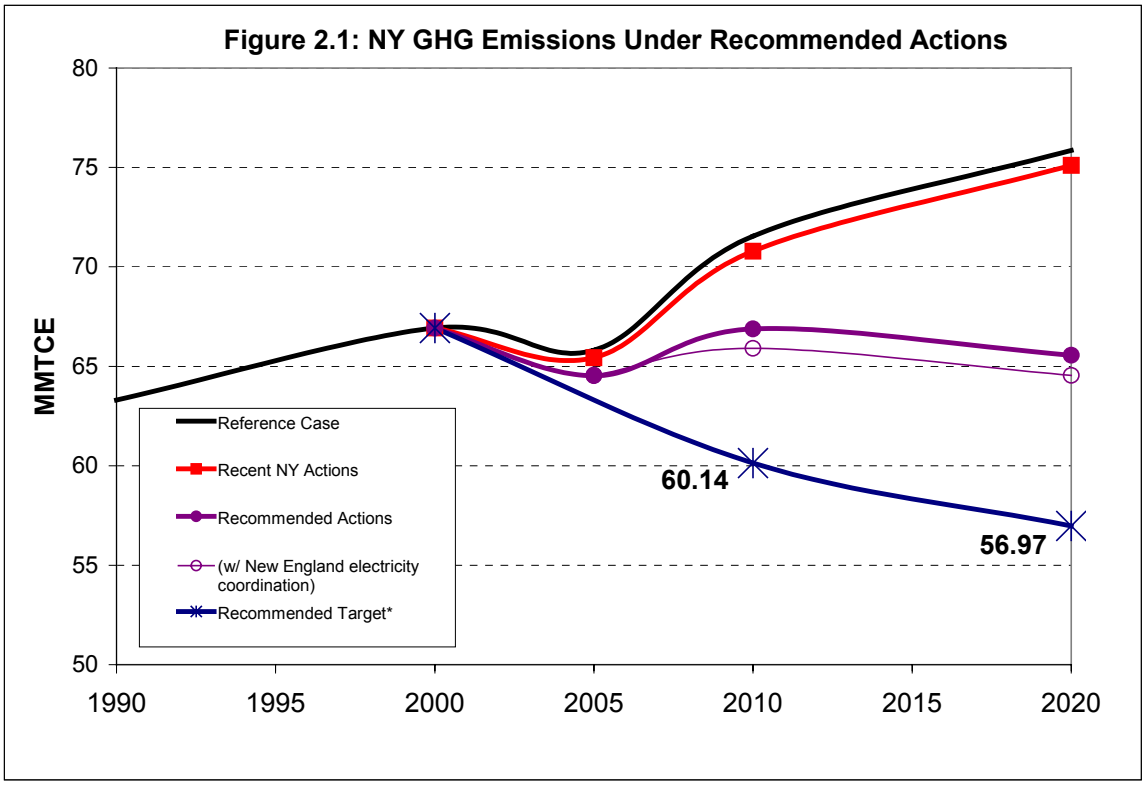
A. SUMMARY

By taking all of the actions recommended in this report, New York could reduce total GHG emissions to 5.9 percent above 1990 levels in 2010—a reduction of 3.76 million metric tons of carbon equivalent (MMTCE) in 2010 from the reference case with recent New York actions. Adoption of the recommended actions would bring GHG emissions to 4.1 percent above 1990 levels in 2020, equivalent to emissions reductions of 9.18 MMTCE in 2020. In addition, by reaching agreement with the New England States on regional coordination of state caps on the electricity sector that permits interstate emissions trading, an additional 0.98 MMTCE of reductions would occur in 2010 from New York sources, resulting in total emissions levels 4.3 percent above 1990 levels. These emissions reductions are lower than had previously been estimated due to changes in power sector assumptions, correction of a modeling error, and more consistent treatment of energy efficiency measures that are not included in power sector modeling.

On the basis of the earlier data, the Task Force recommended setting the statewide target to five percent below 1990 levels in 2010, and ten percent below 1990 in 2020, which translates to a ceiling of 60.14 MMTCE in 2010 and 56.97 MMTCE in 2020 (see Figure 2.1). The newer assumptions make these targets more challenging. The gap between the recommended actions and five percent below 1990 levels could be closed through a combination of regionally coordinated actions, particularly for the electricity and transport sectors, new measures and advanced technologies stimulated by an aggressive long-term target, and more aggressive implementation of recommended actions (see Table 2.4 later in this chapter).

In addition to adopting statewide GHG targets for 2010 and 2020, the Center recommends that New York undertake the following key actions:

- Explore opportunities for regional and interstate linkage of targets and measures to expand the scope of potential mitigation actions and enable interstate trading and crediting. Near-term options in this regard include: 1) linking New York and New Jersey efforts with an expanded New England/Eastern Canada agreement; 2) linking New York with other Northeast and Mid Atlantic states' efforts to reduce GHG emissions from the electricity sector; 3) encouraging adoption of California GHG tailpipe standards and other transport measures affecting the penetration of advanced technology and alternative fuels in the regional market by other regional states; and 4) creating opportunities for joint actions and purchase of credits from states and nations under climate control agreements, particularly the European Union during the 2005-2008 period.
- Advocate increased action at the national level in key areas to support expanded opportunities for New York to take action, particularly in the transportation and power-generation sectors.



MMTCE = million metric tons of carbon equivalent

- Implement all sectoral actions and mechanisms identified in this report, and examine additional measures as the basis for potential new reductions as a part of an ongoing effort towards continuous improvements in energy efficiency and GHG control in the State.
- Aggressively implement all measures by providing full funding, technical support, education, incentives, and other forms of support envisioned in this report.
- Track implementation of statewide targets and sectoral measures carefully to determine progress and provide feedback for targeting and developing new measures.

B. Recommended New York Greenhouse Gas Target

Overview

This chapter discusses the bottom-up analysis developed by the Center in collaboration with the Task Force, and discusses the recommended package of actions and the resulting emissions reductions. The range of views of Task Force members is also discussed.

The final recommendation for a New York GHG target combines detailed analyses of specific actions (a "bottom-up" analysis) with "top-down" assessments of targets established in other jurisdictions, such as New Jersey and New England. On the basis of the bottom-up assessment, consistency with other regional and national commitments, and a desire to place the state clearly on the path toward long-term climate stabilization, the Center recommended to the Task Force that New York State establish a target to stabilize emissions at 1990 levels by 2010 and maintain those levels through 2020. The New York Greenhouse Gas Task Force recommended going

further to establish a statewide target of five percent below 1990 levels by 2010 and ten percent below 1990 levels by 2020.

The Task Force anticipates the emergence of promising new options for GHG emissions reductions during the next several years. Mitigation options are likely to materialize in unexpected locations because GHG emissions occur in a vast number of places. New Jersey's experience in striving toward a 2005 target of 3.5 percent below 1990 levels has demonstrated that meaningful reductions can come from sources and actors too small to be covered by regulatory measures and analyses such as this one. In light of New York's desire to continue its leadership in addressing the serious potential effects of climate change on New York and the globe, **the Center and The Task Force recommend that New York State establish a statewide target to reduce its GHG emissions to five percent below 1990 levels by 2010 and ten percent below 1990 levels by 2020.** This recommendation was adopted on June 11, 2002 by the New York State Energy Planning Board in the latest *New York State Energy Plan* as a statewide goal. This translates to a GHG emissions ceiling of 60.14 MMTCE in 2010 and 56.97 MMTCE in 2020. Recommended measures detailed in this report will go about halfway towards achieving the statewide target. To meet the statewide goal, additional measures will be needed to foster innovative technologies and to otherwise pursue greenhouse gas emission reduction opportunities in all sectors of the economy.

Recommended Actions

With substantial guidance and input from the New York GHG Task Force, the Center assessed the range of options against an extensive set of policy evaluation criteria and placed the greatest weight on five of these: potential GHG reductions, cost-effectiveness, administrative/political feasibility, impact on State economic competitiveness and security of energy supply, and ancillary societal benefits. Table 2.1 identifies the recommended actions in each sector and the estimated emissions reductions in 2010.[36]

The Center recommends a policy package focused on six major initiatives:

- An aggressive package of transportation initiatives that send price signals, reduce vehicle GHG emission rates, and slow travel demand growth to reduce transportation-related GHG emissions, which are growing faster than emissions from any other sector. One method of implementing these initiatives is the creation of a new state transportation emissions reduction entity with a set of specific emissions targets and goals for GHG reduction, and a mandate for integrating transport emissions reductions across state programs. NOTE: On January 8, 2003, Governor Pataki, in his State of the State Address, stated: "let's work to reduce greenhouse gases by adopting the carbon dioxide emission standards for motor vehicles which were recently proposed by the State of California."

[36] The portion of buildings- and industry-sector energy efficiency measures that displace electricity are shown under the electricity sector. Measures that displace direct combustion of oil and gas, or otherwise additional power sector modeling, are listed under the buildings and industry headings. Fuller explanations can be found in chapters IV–VI.

Table 2.1: Key Actions in Each Sector Under Recommended Package		
Key Action	**GHG Reductions in 2010 (MMTCE)[1]**	**GHG Reductions in 2020 (MMTCE)[1]**
NY GHG Emissions in 1990: 63.30 MMTCE **Reference Case Emissions in 2010: 71.54 MMTCE** **Emissions with Recent NY Actions in 2010: 70.78 MMTCE[1]**		
Transportation		
Smart growth, transit, and VMT reduction measures	0.69	1.13
Commuter Choice / Transit Benefits	0.13	0.26
Light-duty vehicle GHG standards (or GHG-based Feebates)	0.20	2.59
Advanced Technology Vehicle RD&D	0.27	0.31
Best Practices (speed limits, driver training, maintenance, oil, tires)	0.10	0.16
Biofuels	0.12	0.55
Freight and Aviation Measures	0.11	0.18
Other Transportation Measures	0.01	0.05
Total	**1.64**	**5.23**
Electricity		
Carbon cap of 25 percent below 1990 by 2010; RPS of six percent by 2010, eight percent by 2020 coupled with policy and economic incentives for renewable energy; moderate economic incentives and policy changes to encourage energy efficiency	1.42	2.37
Total	**1.42**	**2.37**
Coordination of state caps with New England that permits interstate emissions trading	*0.98*	*1.01*
Total (w/ New England coordination) [2]	*2.40*	*3.38*
Buildings (additional to power sector modeling)		
CHP additional to power sector modeling (moderate and high impact)	0.26	0.66
Oil and gas end-use	0.26	0.26
Appliance Standards	0.05	0.14
Other Buildings Measures (e.g., aluminum recycling)	0.02	0.02
Total	**0.58**	**1.07**
Industry (additional to power sector modeling)		
Negotiate agreements with industry to reduce GHGs	0.10	0.25
Total	**0.10**	**0.25**
Agriculture/Forestry		
Expansion of Agricultural Environmental Management	0.01	0.01
Urban Forestry	-	0.25
Total	**0.01**	**0.26**
TOTAL RECOMMENDED ACTIONS	**3.76**	**9.18**
(w/ New England coordination) [2]	*4.73*	*10.19*
Total Emissions w/ All Actions	**67.03**	**65.92**
(w/ New England coordination)	*66.05*	*64.91*
Emissions compared to 1990 Levels	**5.9%**	**4.1%**
(w/ New England coordination)	*4.3%*	*2.5%*

1) Does not include emissions reductions from recent actions (i.e., EO 111, new State energy code, and CHP funded by the SBC) that will displace electricity since these would be covered by the electricity sector cap.

2) Includes emissions reductions occurring in NY as a result of coordination of electricity sector caps with New England. It must be noted that while these additional reductions financed by New England generators would reduce actual carbon emissions in New York, they would be recorded as reductions achieved by the New England generators under any eventual national emissions trading regime. Moreover, to be completely consistent, if these reductions were credited to New York, then increases in emissions due to expanded power imports from natural gas facilities in neighboring states that are motivated by the New York carbon cap should also be scored in New York.

- The creation of an indigenous biofuels industry, coupled with incentives for expanded use of biofuels and a renewable fuel standard for biodiesel. The availability of alternative fuels will reduce GHG emissions related to transportation fuel use and reduce New York's dependence on oil imports.
- A mandatory cap on carbon emissions related to New York electricity generation equal to at least 25 percent below 1990 levels by 2010. In addition, the State should seek to reach agreement with the New England States on regional coordination of state caps on this sector that permit interstate emissions trading. Caps adopted individually by each of the New England states stabilizing emissions at 1990 levels are projected to produce further reductions by New York electric generators sufficient to achieve a 31 percent reduction below 1990 levels from this sector in New York. Without any action by the State, carbon emissions are projected to fall to 17 percent below 1990 levels by 2010, based on modeling results.
- A renewable portfolio standard (RPS) that requires electric service providers in the New York market to ensure that six percent of the electricity offered for sale in 2010 is from renewable energy sources, including wind, landfill gas, biomass, and solar power, increasing to eight percent in 2020. (NOTE: On January 8, 2003, Governor Pataki, in his State of the State Address, announced that he would be "directing the Public Service Commission to implement a Renewable Portfolio Standard –a program which will guarantee that within the next ten years at least 25 percent of the electricity bought in New York will come from renewable energy resources like solar power, wind power, or fuel cells.")
- An extension of the State's strong energy efficiency program and the establishment of new measures to reduce growth in electricity demand to no more than 0.58 percent per year on average through 2010 and beyond. Extension of the state's energy efficiency program will require approximately $277 million of State spending and $364 million of private spending per year for five years. This and other efficiency measures are achieved at a net cost savings.
- A package of efficiency measures for buildings and industry. The package would include support for combined heat and power, oil and gas end-use efficiency, and negotiated agreements with industry, in addition to the reductions in electricity use that the efficiency initiative will produce.

These measures will result in significant emissions reductions from all sectors. Table 2.2 shows the estimated reductions to be achieved in each sector under the Center's recommended package of actions. The combination of the recommended packages in each sector results in a total State GHG emissions level of 5.9 percent above 1990 emissions levels in 2010 and 4.1 percent above in 2020. Regional coordination with New England on the electricity program results in emissions of 4.3 and 2.5 percent above 1990 levels in 2010 and 2020, respectively. The emissions levels resulting from this package are listed in Table 2.3.

Table 2.2: Summary of Recommended Actions					
	Estimated Emissions Reductions (MMTCE)				
	1990	2000	2005	2010	2020
Reference Case	**63.30**	**66.93**	**65.81**	**71.54**	**75.86**
Recent NY Actions[1]			65.44	70.78	75.10
Recommended Actions					
Electricity			0.02	1.42	2.37
(Additional w/ New England coordination)[2]			*(0.03)*	*0.98*	*1.01*
Transportation			0.82	1.64	5.23
Buildings[3]			0.08	0.58	1.07
Industry[3]			0.02	0.10	0.25
Agriculture/Forestry			0.00	0.01	0.26
Total			**0.94**	**3.76**	**9.18**
(w/ regional electricity program)[2]			*0.91*	*4.73*	*10.19*

NOTE: Totals may not sum due to rounding; values in parentheses represent emissions increases.

1) Expected emissions reductions from programs that are underway but are not yet fully implemented. Does not include emissions reductions from recent actions (i.e., EO 111, new State energy code, and CHP funded by the SBC) that will displace electricity since these would be covered by the electricity sector cap.
2) Includes additional emissions reductions arising from a regional electricity sector program. It must be noted that while these additional reductions financed by New England generators would reduce actual carbon emissions in New York, they would be recorded as reductions achieved by the New England generators under any eventual national emissions trading regime. Moreover, to be completely consistent, if these reductions were credited to New York, then increases in emissions due to expanded power imports from natural gas facilities in neighboring states that are motivated by the New York carbon cap should also be scored in New York.
3) Buildings and industry sector reductions that displace electricity are included in the electricity sector heading. Only those actions additional to electricity sector modeling are listed under buildings and industry.

Two measures stand out as the linchpins of the package of recommended measures: the proposed carbon emissions cap on New York's electricity-generation sector and the program of measures related to transportation efficiency. Adoption of these two measures alone would produce more than half of the carbon emissions reductions and, along with the aggressive energy efficiency measures, are among the most cost-effective proposals made in this report. In the 2010 timeframe, New York would be virtually unable to meet its goal for carbon emissions reduction without adopting these two key measures. (Note that many of the bottom-up measures analyzed in the buildings and industry sectors were covered in the power-sector modeling because these measures reduce electricity demand, thereby reducing electricity-sector emissions.)

Table 2.3: NY State GHG Emissions Under Recommended Actions (MMTCE)					
	1990	**2000**	**2005**	**2010**	**2020**
Reference Case	63.30	66.93	65.81	71.54	75.86
Recent NY Actions			65.44	70.78	75.10
Recommended Actions			**64.50**	**67.03**	**65.92**
(w/ regional electricity program)			*64.53*	*66.05*	*64.91*
Recommended Target*				**60.14**	**56.97**
GHG Emissions Under Recommended Actions Compared to:					
1990 Levels			1.9%	5.9%	4.1%
(w/ New England electricity coordination)			*1.9%*	*4.3%*	*2.5%*
2000 Levels			-3.6%	0.2%	-1.5%
(w/ New England electricity coordination)			-3.6%	-1.3%	-3.0%
* Target recommended by CCAP and the New York GHG Task Force.					

GHG = greenhouse gases; MMTCE = million metric tons of carbon equivalent

Regional and National Issues

Members of the Task Force showed extensive interest in considering means to coordinate New York actions with those of surrounding states, or states with similar leadership interests. The Task Force discussed avenues for regional coordination, including emissions trading between jurisdictions and supporting regional action on a number of key measures. Additionally, the Task Force highlighted the importance of strong national leadership on several key issues.

Nearly all of the options in Table 2.1 are traditionally carried out at the state and local level. Two of these options, the cap on emissions from electricity generation and the light-duty vehicle GHG tailpipe standard to encourage the purchase of low-GHG vehicles, can also be quite effective on a national or regional level.

Electric Utility Cap. The Task Force was nearly unanimous in favoring a national cap on GHG emissions from electric generation over a unilateral state cap. The majority also favored extension of a New York electricity cap to a regionally coordinated policy. Accordingly, the Center suggests that New York implement a cap of 31 percent below 1990 levels by: 1) first adopting a cap at 25 percent below the 1990 levels on a unilateral basis before 2010; and 2) achieving the remainder of the 31 percent reduction below 1990 levels in 2010 through

regionally coordinated action to establish a similar electricity generation cap by neighboring states in New England.

Automobile Tailpipe Standards. The Task Force was similarly in favor of national action to improve vehicle fuel economy. Task Force members indicated that New York could not set light-duty vehicle GHG emissions standards before California regulations go into effect due to Clean Air Act restrictions. CCAP recommends that New York follow California on setting GHG emissions standards for new light-duty vehicles. While New York cannot adopt GHG tailpipe standards before California finalizes their standards, the State should undertake the necessary background work to enable New York to adopt the new California standards once they are finalized. If implementation of the California standards faces significant delays, New York should develop a comprehensive proposal for a revenue-neutral, GHG-based "feebate" program for new cars and light trucks in which low-GHG vehicles receive a rebate and high-GHG vehicles pay a fee.[37]

Additional Actions to Reduce Emissions

A number of actions that the Center analyzed (such as green buildings credits, gasoline GHG tax, and the Executive Order on vehicle miles traveled) were not recommended due to higher costs or implementation barriers. In addition, emissions reductions from a number of measures were not quantified either due to time constraints or difficulty in assessing emissions reductions potential (often from lack of reliable data). The Center has identified a number of additional options that have not been formally recommended but could be implemented to assist the State in reducing its emissions to five percent below 1990 levels as recommended by the Center and Task Force. These options include tightening the electricity-generation cap to 40 percent below 1990 levels; expanding the green buildings tax credit; creating incentives for biodiesel use in industrial boilers, participation in emissions trading with other jurisdictions, advanced technology introduction, and a variety of other measures listed in Table 2.4. As mentioned before, meaningful reductions are also likely to come from relatively small and unexpected sources.

The total expected emissions reductions from the quantified actions that were not recommended could be about 2.96 MMTCE by 2010. Of those quantified, the largest emissions reductions are expected from a power-sector cap of 40 percent below 1990 levels. Additional and more aggressive actions in the transportation sector could yield significant emissions reductions as well. An additional number of potentially promising options were not quantified as a part of the Task Force process. These actions could yield additional emissions reductions to help the State achieve its target. Further discussions will be required to fully assess the likelihood of the expected emissions reductions, the desirability of these additional actions, and the reductions from the actions that were not quantified.

[37] In contrast to the electricity cap, which can be effective on a one-state-only basis, the GHG-based feebate incentive mechanism would clearly be more effective if adopted on a national or regional basis. Although a one-state feebate program can affect car-buying decisions by individual consumers, a regional approach—particularly if coupled with a Canadian program—could begin to affect vehicle manufacturers' decisions about the relative efficiency of vehicles offered for sale in states and countries with feebates. The Canadian federal government recently proposed the enactment of a feebate system as part of each of the alternative compliance strategies it is considering to meet its Kyoto Protocol commitment. A detailed design strategy for a regionally coordinated GHG-based feebate system, including assessments of technical and legal issues, needs to be developed to make this option a reality.

Table 2.4: Potential Additional Policy Actions in New York	
Action	**Additional Emissions Reductions in 2010 (MMTCE)**
Electricity Sector Carbon Cap at 40 percent below 1990[1]	2.62
Green Building Tax Credit ($20-100 million)[2]	0.65
Commuter Choice (NYSDOT aggressive case)	0.13
Pay as You Drive Insurance	0.10
Biodiesel Blend for All Stationary Sources	0.08
Private and Municipal Fleet Initiatives	0.02
Vehicle Scrappage	0.005
Conservation Tillage (50 percent of NY cropland)[3]	(could be up to 0.55)
Sinks	not quantified
Mandatory Cap & Trade Industry	not quantified
Freight	
Rail system improvements	*not quantified*
Truck tolls	*not quantified*
Truck driver training/best practices	*not quantified*
Marine Freight	*not quantified*
Passenger Ferries	not quantified
High Speed Rail	not quantified
Emissions Trading (w/ other states/regions and countries)	not quantified
Advanced Technology Introduction	not quantified
Total Quantified Reductions	**2.96**

1) Emissions reductions additional to the 25 percent cap.

2) The emissions reduction from the Green Building Tax Credit is not included in the "Total Quantified Reductions" sum to account for possible double counting with the electricity sector carbon cap.

3) The noted emissions reductions from conservation tillage are not included in the total.

NOTE: The actions highlighted and the emissions reductions noted are not comprehensive and merely highlight some potential actions that could lead to additional emissions reductions.

C. GHG REDUCTION TARGETS FROM OTHER JURISDICTIONS

Summary of Related Targets

New York's target may be compared with a number of recently established GHG targets. Numerous companies, localities, states, regions, nations, and international bodies have established targets for emissions reduction, many within the past year. Table 2.5 shows a representative, but by no means comprehensive, set of reference point targets, grouped by initiating entity.

TABLE 2.5: GHG Reference Targets in Other Jurisdictions

	Target Level
National and International	
Rio Convention (UNFCCC–1992)	1990 levels by 2000
Marrakech Accords (UNFCCC–2001)	5.2% below 1990 by 2012
Companies	
British Petroleum	10% below 1990 by 2010
Dupont	65% below 1990 by 2010
Entergy	2000 levels through 2005
Regions	
New England Governors/Eastern Canadian Premieres	1990 levels by 2010; 10% below 1990 by 2020
States	
New Jersey	3.5% below 1990 by 2005
Localities	
Toronto, Ontario	20% below 1990 by 2005
Seattle, Washington	7% to 40% below 1990 by 2010
Salt Lake City, Utah	7% below 1990 by 2012
Portland City / Multnomah County, Oregon	10% below 1990 by 2010

UNFCCC = United Nations Framework Convention on Climate Change.

Throughout the Task Force discussion, the targets set by the New England Governors/Eastern Canadian Premieres (NEG/ECP) and New Jersey received considerable attention. A brief discussion of each is provided to highlight the specifics of these targets.

New England Governors/Eastern Canadian Premiers

In August 2001, the New England governors and Eastern Canadian premieres (NEG/ECP) agreed to a Climate Change Action Plan that consists of a comprehensive and coordinated regional plan, regional GHG emissions targets, and a commitment from each state and province to develop plans for GHG reductions. This group—consisting of the governments of

Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Newfoundland, New Brunswick, Nova Scotia, Prince Edward Island, and Quebec—agreed to a regional target that entailed:

- Stabilization at 1990 levels by 2010.
- Reductions to at least ten percent below 1990 levels by 2020 (and development of a process for adjusting the goals every five years as necessary).
- A long-term commitment to reduce regional emissions to sufficiently eliminate any dangerous threat to the climate system (current science estimates a reduction of 75 to 85 percent below current levels is needed).

To begin the process of meeting the regional target, the NEG/ECP established a set of nine action items:

1. Establish a regional standardized GHG emissions inventory
2. Establish a plan for reducing emissions and conserving energy
3. Promote public awareness
4. Reduce state and provincial government emissions
5. Reduce electricity-sector emissions
6. Reduce total energy demand through conservation
7. Decrease transportation-sector emissions
8. Create a regional emissions registry and explore a trading mechanism
9. Reduce or adapt to the negative social, economic, and environmental effects of climate change

Each action item specifies a goal, either quantitative or qualitative, and recommendations for meeting the objective. The NEG/ECP formed a steering committee to oversee the implementation of these action items and individual working groups to discuss the tasks within each action item. The actions taken by NEG/ECP will include individual state actions and regional coordination, where possible.

New Jersey Greenhouse Gas Reduction Program

In March 1998, the Commissioner of the New Jersey Department of Environmental Protection issued an Administrative Order establishing a state GHG emissions target of 3.5 percent below 1990 levels by 2005. This goal was supported by then-Governor Whitman when she expressed the state's firm commitment to the target. The target grew out of the development of a Greenhouse Gas Action Plan created by the New Jersey Greenhouse Gas Working Group, consisting of representatives from state government agencies. A group of external stakeholders—including representatives from academia, industry, public interest groups, state agencies, and the federal government—assisted in developing the Action Plan. The Action Plan contains a set of specific policy actions and a set of general principles for additional actions. To date, the State has introduced a variety of measures to meet the target, including negotiated agreements with energy-intensive industries, reduction commitments from colleges and universities, a consent decree with a major utility to reduce the intensity of its electricity generation, energy efficiency and renewable energy incentives, and a sustainable school initiative.

D. ANALYZING "BOTTOM-UP" POLICY ACTIONS AND TARGETS FOR NEW YORK

At the initial meeting of the Task Force, the Center presented potential GHG-reducing actions for all sectors. Task Force and working group participants were asked to provide suggestions for additional policies and measures to add to the list of potential actions. The full list of potential actions was discussed within the working groups and further refined to a set of key actions for analysis. For these actions, the Center analyzed the emissions reduction potential in 2005, 2010, and 2020 and the cost-effectiveness (year 2000 dollars per metric ton of carbon equivalent). Additionally, the Center analyzed the various options using the other criteria listed in chapter I for guidance and used additional criteria as needed. In collaboration with the Task Force, the Center grouped these actions into three categories: low (green), medium (blue), and high (gold). In general, measures that were comparatively inexpensive (on a per-ton basis) and had limited implementation barriers were classified as low. Measures classified as high were either relatively expensive or had significant implementation barriers. Measures for which significant co-benefits were expected, such as improving other environmental performance and creating jobs, were classified as either low, medium, or high depending on the cost and ease of implementation. (For details on the criteria and justifications for the classifications in individual sectors, see the sector-specific chapters in the remainder of this report). In addition to the bottom-up analysis conducted by the Center, the Task Force suggested that modeling analysis was needed on three of the options in the electricity sector. To this end, electricity-sector modeling runs were conducted by ICF Consulting, a nationally recognized economic analysis firm, looking at the carbon cap, energy efficiency programs, and renewable portfolio standard. (See chapter IV for greater discussion of this analysis.)

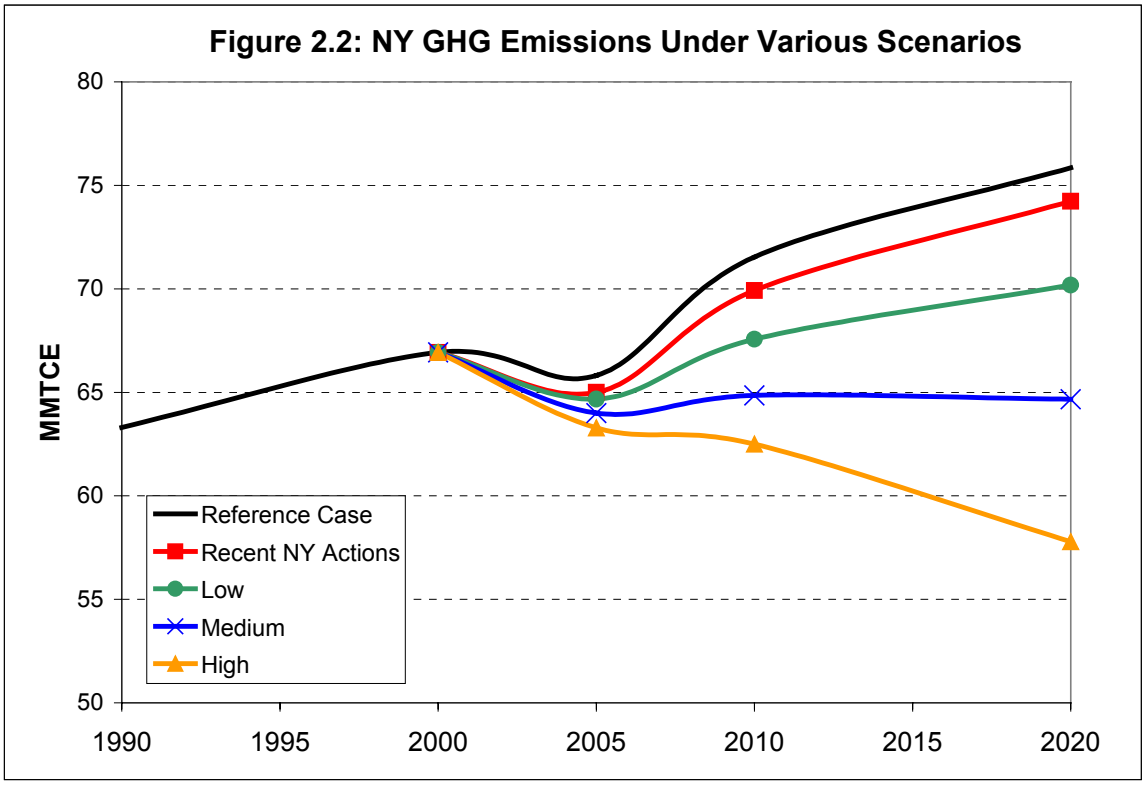
New York Greenhouse Gas Emissions Levels Under Scenarios Analyzed by CCAP

Before selecting actions for recommendation, the Center analyzed a wide range of potential actions at varying levels of stringency and aggregated them into low, medium, and high policy scenarios for discussion. The following section provides a summary of the results of the individual analyses performed for each sector and highlights some of the key actions analyzed. Details of the actions analyzed in each sector are discussed in the chapters on specific sectors in the remainder of this report. The effects on GHG emissions reductions of low-, medium-, and high-action scenarios were added together within their respective categories to develop a bottom-up assessment of their cumulative effect. Although this calculation was a useful first step toward estimating potential GHG reductions, this assessment overestimates emissions reductions because a recommended power-sector cap would subsume many of the end-use efficiency measures displacing electricity. The key measures for each sector by scenario are listed in Table 2.6.

Table 2.6: Key Measures in Each Sector Under Various Scenarios		
Scenario		
Low	**Medium**	**High**
Electricity		
	RPS Moderate	Renewable Stretch
	Repowering Coal Plants-ten percent NGCC	Repowering Coal Plants- ten percent -PFBC
	Extension of SBC	Carbon Scrubbing & Disposal (replacing ten percent new capacity)
Transportation		
Smart Growth/Transit-Low	Smart Growth/Transit-Medium	Smart Growth/Transit-High
Advanced Technology Vehicle RD&D-Low	Commuter Choice / Transit Benefits-Medium	Commuter Choice / Transit Benefits-High
Truck Stop Electrification	Advanced Technology Vehicle RD&D-Medium	Gasoline Tax ($0.10)
	Biodiesel	Pay as you Drive Insurance
		Advanced Technology Vehicle RD&D-High
		Car & Lt Truck GHG Stds (California)
		Enforce Current Speed Limits – Cars
		Biodiesel
Buildings		
Appliance Standards w/ State Authority	SBC, NYPA, & LIPA expansion	Green Building Tax Credit
CHP Moderate	CHP High Impact	
SBC, NYPA, LIPA extensions	Appliance Standards Requiring Federal Waiver	
Oil & Gas End Use		
Industry		
Negotiated Agreements		
Ag/For		
Nutrient Management-Low	Nutrient Management-Medium	Nutrient Management-High
Urban Forestry— One million trees	Urban Forestry – two million trees	Urban Forestry – three million trees

CHP = combined heat and power; GHG=greenhouse gas; MMTCE = million metric tons of carbon equivalent; NGCC = Natural Gas Combined Cycle; NYPA = New York Power Authority; LIPA = Long Island Power Authority; RD&D = Research, Development, and Deployment; PFBC = Pulverized Fluidized Bed Combustion ; SBC = Systems Benefit Charge.

As shown in Figure 2.2, the key sector actions in Table 2.6, combined with additional measures, were estimated to result in significant reductions below the reference case. The total expected emissions reductions from the quantified actions that were not recommended could be about 2.96 MMTCE by 2010. Of those quantified, the largest emissions reductions are expected from a power-sector cap of 40 percent below 1990 levels. Additional and more aggressive actions in the transportation sector could yield significant emissions reductions as well. An additional number of potentially promising options were not quantified as a part of the Task Force process. These actions could yield additional emissions reductions to help the State achieve its target. Further discussions will be required to fully assess the likelihood of the expected emissions reductions, the desirability of these additional actions, and the reductions from the actions that were not quantified.



MMTCE = million metric tons carbon equivalent

Table 2.7: NY State GHG Emissions Under Various Scenarios (MMTCE)					
	1990	2000	2005	2010	2020
Reference Case	63.30	66.93	65.81	71.54	75.86
Recent NY Actions[1]			**65.00**	**69.92**	**74.23**
Action Scenarios:[2]					
Low			**64.67**	**67.57**	**70.18**
Medium			**64.00**	**64.85**	**64.66**
High			**63.28**	**62.50**	**57.79**
GHG Emissions Compared to 1990 Levels:					
Low			**2%**	**7%**	**11%**
Medium			**1%**	**2%**	**2%**
High			**-1%**	**-4%**	**-11%**
GHG Emissions Compared to 2000 Levels:					
Low			**-3%**	**1%**	**5%**
Medium			**-4%**	**-3%**	**-3%**
High			**-5%**	**-7%**	**-14%**

1) Recent NY Actions are calculated as emissions reductions from the reference case.

2) These are the analysis of various scenarios under the bottom-up analysis. Therefore, these values overestimate emissions reductions because a recommended power sector cap would subsume many of the end-use efficiency measures displacing electricity.

GHG = greenhouse gases; MMTCE = million metric tons of carbon equivalent

Implementation of Policy Actions

In addition to an analysis of the technical potential from the various actions, the Task Force and the working groups discussed key implementation issues for each action. The actions were discussed in the context of the type of implementing mechanism—emissions trading, negotiated agreements, regulatory programs, financial mechanisms, and voluntary programs. These mechanisms are not mutually exclusive. In fact, several recommendations in this report presume that a combination of mechanisms will be used. In this report, these mechanisms are defined as follows:

- **Emissions Trading.** Participants meet a specified target that can be achieved onsite, or through the purchase or sale of emissions credits.

- **Negotiated Agreements.** Companies voluntarily commit to reduce their emissions at some negotiated level, typically expressed as an efficiency rate, established by benchmarking within the sector or subsector and graduating emissions reductions over time. The target(s) becomes binding when the company enters into the agreement. In exchange for this commitment, companies are often given a package of incentives, including regulatory flexibility and recognition.
- **Regulatory.** Existing regulations are adjusted to include GHG's, or new regulations are adopted to make compliance mandatory. In many cases GHGs are added to existing regulations for air quality, energy, or land-use standards as an expanded objective or criteria.
- **Financial.** Emitters and energy users are given financial incentives to reduce their emissions or are required to meet GHG performance standards to receive continued or expanded funding. The incentive can be in the form of direct spending assistance, tax incentives, fees, penalties, or financial awards.
- **Voluntary.** Actions such as education encourage, but do not require, participation. Penalties are not imposed for failure to meet program goals. An action or set of actions may initially begin as a voluntary program and be modified to a more binding mechanism at a later stage.

The path and mechanisms for implementing the key measures were important points of discussion during the Task Force process. Discussions went beyond mere potential and focused on the key tools for making the reductions a reality. Table 2.8 provides a summary of the key actions from each sector according to the policy mechanisms mentioned above.

Table 2.8: Implementation Mechanisms for Key Analyzed Measures						
	Inventory and Registry	**Emissions Trading**	**Negotiated Agreements**	**Regulatory Programs**	**Financing Mechanisms**	**Voluntary Programs**
POWER	Mandatory reporting for major power-generating plants	Electricity carbon cap and trade in concert with Acid Deposition Reduction Program		RPS Utility regulatory changes to encourage DG/CHP Net metering for distributed RE	Tax incentives for repowering old fossil plants to clean generating units	State green power purchase Green marketing
TRANSPORT	State inventory of vehicle miles traveled, Fuel sales, Mode split, Land use, Funding			Report GHGs in SEQRA, TIP, long-range plans Report GHGs from major development, consider requiring offsets Vehicle GHG standards OR Revenue-neutral GHG-based feebates two percent biodiesel by 2010, ten percent by 2020	State agency grants Invest more in efficient modes Deployment of advanced technology vehicles Rail infrastructure Rail tax reform Incentives for airport ground and gate equipment	Land-use and transportation planning Employer commute programs
BUILDINGS	Require fuel and electricity suppliers to report sales			Implement high efficiency appliance standards Continuously review	Expand and extend end-use efficiency programs Establish new	Educate consumers on energy efficient mortgages Provide for enhanced

Table 2.8: Implementation Mechanisms for Key Analyzed Measures						
	Inventory and Registry	**Emissions Trading**	**Negotiated Agreements**	**Regulatory Programs**	**Financing Mechanisms**	**Voluntary Programs**
				building energy codes Remove high backup power charge barrier to CHP	efficiency program targeting oil & gas end uses Establish new incentives for CHP and efficient sizing of conductors Establish new incentives targeted to making World Trade Center a model of efficient construction	building operator training Educate consumers on energy/climate benefits of recycling
INDUSTRY	Mandatory greenhouse gas reporting of major facilities		Negotiated agreements with New York industries			
AGRICULTURE/ FORESTRY	Improved land use/change inventory				Nutrient management Manure digesters Urban tree planting	

III. EMISSIONS INVENTORY AND REGISTRY

CCAP and the Task Force recommend that New York State create appropriate tools for an effective inventory, reporting system, and registry of State emissions that supports the State's target, action plan, and regional leadership role—including mutual recognition by other jurisdictions. A tracking system of this sort will promote the credibility of New York's program by providing greater assurance that New York's actions will be recognized. Development of such a system involves the following actions:

- Expanding and improving the annual statewide greenhouse gas (GHG) emissions inventory, and related State inventories such as the New York Department of Transportation's (DOT's) vehicle miles traveled (VMT) survey, to include all GHG emissions from entities and sectors at the statewide and substate levels. These improvements will enable the State to effectively track progress toward its GHG reduction target as well as individual sector targets. In addition to GHG data, the inventory should include indicators or proxies of GHG emissions, such as VMT, as necessary to ensure comprehensive tracking of emissions.
- Mandatory reporting of GHG emissions by "major" stationary sources, large State facilities, major new private developments, emissions from large public and private fleets, oil and gas distributors, and municipal solid waste landfills.
- Developing a voluntary GHG emissions registry that requires that participating entities separately report direct and indirect emissions from facility and entity-wide activities using a defined base year(s). The registry should be transparent and available to the public, provide public recognition, baseline protection, and support future emissions trading regimes to the extent possible.
- Working with other states and regions on consistent and mutually recognized approaches for inventory and reporting.

A. RECOMMENDED GREENHOUSE GAS EMISSIONS INVENTORY AND REGISTRY

The Center's recommended approach for a greenhouse gas inventory and registry is discussed in the context of three separate issues that assist in achieving a cohesive, comprehensive, and transparent mechanism for tracking the State's progress toward its emissions reduction goals and encourages voluntary emissions reductions.

Create an Annual Statewide GHG Emissions Inventory

To effectively track progress toward the State target(s) and sector goals and to provide feedback for policy targeting and development, we recommend that New York establish and maintain an annual, State-level GHG inventory that is comprehensive, appropriately detailed, and mandatory. If data cannot be collected annually, they should be collected in such a way that it can be disaggregated annually after collection. An accurate tracking system is an imperative step in developing a State program that is credible and provides greater assurance that New York State's actions will be recognized.

Such a program should include data collection for tracking State GHG emissions at the sector and subsector levels for all sectors, including: electricity, transportation, buildings, industry, agriculture, and forestry. Sector and subsector data should be combined with substate and activity-level data, to enable each sector's progress to be monitored against targets and goals for that sector. For instance, the daily timing of electricity demand may need to be tracked to determine dispatch and fuel type at certain times of day. Household and commercial fuel use (user-type data) should be differentiated and usage should be segregated by location and trip purpose to manage transport demand (activity-level data).

Sector inventories should provide accounting for emissions-generating activities, or emissions reduction activities that occur in the State through fuel use (or other actions), regardless of the geographical source of the emissions. Similarly, we recommend that the State track fuel exports that lead to emissions elsewhere or emissions from power consumed in New York but generated elsewhere. For instance, gasoline *consumption* should be tracked as a more reliable indicator of transport emissions than gasoline *sales* due to discrepancies in these data (see chapter VII). Electric power imports from Pennsylvania-New Jersey-Maryland (PJM) and other regional sources should be tracked to provide a full picture of emissions from electricity consumption in the State and to avoid undercounting State emissions (see chapter IV).

NYSERDA has currently developed GHG emissions inventories for 1990, 1999, and 2000 emissions levels. This inventory tracks emissions of carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF_6). Data used in developing the current GHG inventory is generated from top-down data collected as a part of NYSERDA's annual *Patterns and Trends* report and supplemented with additional data as needed. This report is developed primarily using US Energy Information Administration data on State fuel uses by type.

Data reported to the inventory should include actual emissions measurements, where practicable, or estimation by modeling GHG indicators or proxies, such as VMT, that can be translated into State and substate GHG emissions. Data should be supplied by transparent and reliable methods. In addition, data should be collected at the appropriate level to track progress of the individual policy actions undertaken by New York to achieve statewide and sector targets. (See chapters IV–VII for a discussion of policy actions.) New York State should ensure that its inventory program is consistent with the basic national reporting standards under the UN Framework Convention on Climate Change (UNFCCC). These standards are not adequately detailed for state-level tracking or policy development (they are designed for national reporting), but they provide a broad framework for jurisdictional reporting. Inventory systems should build on existing local, state, and national efforts where possible and integrate GHG emissions into current State systems for air pollutants, energy, VMTs, or other measures as appropriate.

As a requirement of this system, we recommend that New York establish historic sector and subsector baselines of GHG emissions and provide annually updated projections of the same. Specific details of sector and subsector tracking systems should be developed by GHG work groups and relevant New York agencies (e.g., NYSERDA, DEC, DOT, NY Ag and Markets, and

PSC). The sector chapters that follow provide greater detail on the inventory needs of each sector.

Mandatory Public and Private Reporting

To develop a robust inventory, provide a solid foundation for the GHG registry, and support tracking the progress of sector actions, we recommend that New York require major entities in the private and public sectors to report annual GHG emissions (or applicable indicators) using established protocols. The State should build upon data currently reported to the State, where applicable (in some cases public disclosure of emissions is already required by agencies and provides a basis for more direct GHG reporting in the future). Where the State collects additional data, it should ensure that confidentiality is reasonably maintained. We also recommend that New York allow and encourage the voluntary reporting of GHG emissions (either direct or indirect) by sources located in New York that are not subject to the mandatory reporting requirement.

In addition, we recommend that the State (i.e., NYSERDA or DEC) establish protocols for the measurement and reporting of GHG emissions, including direct and indirect emissions. In establishing protocols, the State should draw on the extensive work already accomplished by states and other entities in this area, including the California Climate Action Registry and the World Resources Institute's Greenhouse Gas Protocol.

The key entities that should be required to report are described in the following sections. (The chapters on individual sectors provide details on the methodology for implementing the reporting recommendations).

"Major" Stationary Sources. "Major" stationary sources are currently required to report air pollutants as a part of permitting under Title V of the National Clean Air Act.[38] Starting with these sources, New York should establish a reporting threshold that covers nearly all emissions from the electricity and industry sectors.[39] Currently, 535 entities are required to report their annual emissions of criteria air pollutants. In the current reporting format, those entities provide their direct[40] fuel-use data specified by fuel type.[41] The data can be easily converted to CO_2 emissions through standard conversion factors. Reporting of other GHG emissions from these sources should be included as soon as possible.[42] Additionally, this mandatory reporting should be expanded to include reporting of certain indirect emissions.[43] For example, large stationary

[38] Major sources are required to report. For information on minimum thresholds for reporting, see <www.dec.state.ny.us/website/dcs/air/air04.html>.
[39] This reporting is in addition to the reporting of air pollutants currently required by law.
[40] Direct emissions are GHG emissions from a source that is controlled or owned by an entity.
[41] The reporting does not currently require that large utilities (above 25 MW) report data from their continuous emissions monitors (CEMs). This requirement should be modified to require that these facilities report their CEM data, since these sources currently report CO_2 emissions from their CEMs to the U.S. Environmental Protection Agency.
[42] Early discussions may show that reporting of other GHG emissions, such as methane, may require little additional work.
[43] Reporting of emissions related to electricity use and vehicle fleets are strong candidates for inclusion.

sources could be required to report GHG emissions from the electricity used by the facility.[44] Direct and indirect emissions should be reported as separate items to ensure transparency and to avoid double counting. Similar mandatory reporting has been either required or proposed by other states.[45] (See chapter IV for discussion of reporting for the electric generating facilities; see chapter VI for discussion of reporting for industry facilities.)

Oil and Gas Distributors. Oil and gas distributors that sell fuel within the State should be required to report the carbon equivalent content of the fuel sold by end-user class (i.e., residential, transport, commercial, and industrial). Although many distributors are not currently required to report data that could be used in reporting the carbon content of the fuel sold, a number of current data reporting requirements for private entities could be built upon.[46] Common conversion factors should be developed to convert fuel volume into GHG emissions content. Reporting on this information will provide accurate data to be used in tracking progress toward State targets and sector goals. (See chapters V and VII for further information.)

Large State Facilities. State facilities above a threshold level should be required to report GHG emissions from their operations. These facilities should be required to report direct emissions from fuel used in their operation, if applicable, and indirect emissions from purchased electricity and vehicle fleets. Direct and indirect emissions should be reported separately for transparency and to avoid double counting.

Large Public and Private Fleets. New York State should develop protocols for requiring that public and private fleets, above a threshold level, report the GHG emissions from the operation of their fleets. For example, State vehicles, local garbage trucks, and local delivery trucks could be required to report under this provision. (See chapter VII for further details.)

Municipal Solid Waste Landfills. Entities responsible for municipal solid waste landfills should be required to report the necessary data to develop GHG inventories for each landfill above a minimum size.

Major New Private Developments. Large private developments above a de minimus level, such as shopping malls and office parks, can generate significant emissions by attracting motor vehicle traffic. New York should develop guidelines and protocols to induce these large private developments to report such emissions. (See Chapter VII for further details.)

[44] They could be required to report emissions using a common conversion factor for all State electricity or, more desirably, by more specific conversion factors based upon the seller of the electricity.

[45] Wisconsin requires that all sources above 100,000 tons of GHG emissions report their emissions in connection with the state's inventory development. New Jersey has recently proposed that current reporting requirements for large facilities be expanded to included CO_2 and methane emissions.

[46] Major petroleum product suppliers, pipeline companies, and barge companies are required to report the quantity of fuel sold into the State by type (i.e., distillate, residual, motor gasoline, kerosene, jet fuel, and liquefied petroleum gas). Gas supply and demand by customer served for the New York Gas Group is reported annually to the New York State Public Service Commission.

Voluntary Emissions Reporting Registry for Entities

We recommend that New York create a State emissions registry for entities that wish to register emissions reductions from GHG mitigation programs and projects. The registry could be operated by a public agency, public benefit corporation, or a newly created public or private entity. The following overview summarizes the key design issues related to creating a New York GHG registry.

Registry Purpose. The registry would have three purposes: 1) to create a publicly available database; 2) to provide baseline protection to the extent possible; and 3) to support future emissions trading regimes through superior environmental performance.

1. **Create a Publicly Available Database.** The registry should be designed to provide transparent emissions data from its participants. Although individual entities are reporting GHG emissions under certain circumstances, a consistent publicly available dataset does not exist.[47] As with the National Toxics Release Inventory, a publicly available data reporting system for GHG emissions reductions would provide an important opportunity to encourage reductions through consumer choice and industry competition. It would also provide the basis for consistent and credible public recognition, labeling and award programs.

2. **Provide Baseline Protection.** The registry should recognize early action by entities that make reductions in GHG emissions before the existence of any state, federal, or international requirement to do so.[48] There is a concern that when GHG emissions become subject to mandatory reduction requirements, regulatory agencies may overlook early actions, which would in effect penalize early actors by requiring additional reductions.

3. **Support Trading of Emissions Credits.** The registry should support a system of credits to recognize superior environmental performance (i.e., emissions reductions beyond those required by current or future targets or regulations). The registry program could include a program that enables participants to trade credits for emissions reduction, modeled on existing programs in other states and countries (e.g., the Canadian Greenhouse Gas Emission Reduction Trading Pilot), that could be used by participating entities to meet their GHG emissions reduction goals. Credit trading should be developed across sectors and jurisdictions to create maximum opportunity for, and value of, creditable actions. The credit system should rely on the same performance criteria the State uses to set and assess progress toward the State target. Otherwise crediting will erode the State target and dilute the market value of credits in trades across jurisdictions. The registry's managers should work with other entities to develop mechanisms to ensure that GHG reductions above the target level are considered permanent and creditable under the applicable registry protocols.

[47] Some companies report under the U.S. Department of Energy 1605(b) program, and other entities voluntarily report their emissions as a part of company GHG targets. Emissions reported under these programs vary significantly.

[48] New York State could agree to assist the participating entities in achieving recognition for their activities under a future regulatory regime, similar to the approach taken by California in its GHG registry.

The registry program should require participating entities to commit to GHG emissions reduction goals, which should be specified in an agreement between the registry and the participating entity. The target should be defined to enhance New York's ability to meet its GHG reduction target. Entities that fail to meet their emissions reduction goals should not be permitted to use the registry.

Facility and Entity-Wide Reporting. As a requirement of this voluntary system, all registering entities must report annual facility and entity-wide emissions. Therefore, each participating entity must, at a minimum, report GHG emissions from the facilities that it owns or operates in New York. In addition, each entity should report aggregate GHG emissions for all its company's emissions. This helps track leakage by ensuring that emissions from facilities in New York are not simply being shifted outside of the State. An entity may report a portion of its operations if it can demonstrate that no leakage or displacement of emissions is occurring outside of the reporting boundary. The entity operating the registry should provide clear definitions of "facility" and "company."[49] The report should provide transparent data by separately reporting emissions from each facility owned by the company; in-state facilities versus out-of-state facilities; and the sale or purchase of facilities. Separate reporting provides regulators with information that can be used to assess compliance with a future regulatory regime, avoid penalties for early action, and prevent double counting. As a first step, New York should develop a registry that allows the reporting of GHG emissions by "large" entities. A mechanism for capturing data from "small" entities is also recommended to encourage reductions from these sources.[50] Transportation and building emissions, for example, are largely the result of the actions of many individual emitters, each contributing a small share to total emissions. Collectively these actions account for most of the State's emissions. Mechanisms to encourage data collection from "small" emitters can significantly help New York State meet its emissions reduction goals.

Defining a Base Year. Participating entities should be required to establish an acceptable base year against which to judge future performance. The base year should be consistent for all reporting entities. The choice of base could be a single year (e.g., 1990 or 2000) or an average of a given period (e.g., a five-year period). Entities reporting could also be required to report reasonable projections of future GHG emissions to inform the development of statewide GHG projections. Although a set methodology could be established for the baseline development, the development of an accurate and defensible baseline is often difficult in practice. Future projections should not be used as a basis of determining reductions.

Emissions reported under an entity's base year should be adjusted for structural changes, such as acquisitions and divestures, when they have a significant impact on consistent reporting of an entity's emissions. Growth and decline in emissions due to increases and decreases in production should not be a basis for adjusting the base year.

[49] The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) through their *Greenhouse Gas Protocol Initiative* provide useful guidance on these issues. For more information, see <www.wri.org/pdf/ghg_protocol.pdf>.

[50] One method for reporting by small entities is to allow aggregation, where a group of smaller entities group their emissions and report as a single entity.

Direct and Indirect Emissions Reporting. Participating entities should be required to report both direct emissions[51] and a limited segment of indirect emissions,[52] such as electricity, heat, and steam purchases. The entity operating the registry will need to define the protocols for determining direct and indirect emissions.[53] Direct and indirect emissions should be reported separately to provide transparent data. All emissions should be reported as total quantities of gases in carbon equivalents using global warming potentials provided by the State. This separate reporting, combined with clear documentation of the sources and recipients of indirect emissions, will help to address any future issues related to double counting. As relevant, entities should report CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6. Reporting of indirect emissions provides adequate data for entities to assess reduction opportunities through actions under their control (e.g., reducing energy consumption in company facilities). Documentation of indirect emissions also helps avoid the potential perverse incentive for companies to outsource activities, thereby shifting emissions to another entity.

Verification of Emissions Reporting. Verification of emissions reporting should be performed in two phases. To provide a solid foundation for baseline protection and emissions trading, entities should be required to have reports verified by a third party using generally accepted accounting protocols.[54] A standardized audit program is critical in providing the necessary level of assurance of accuracy to provide baseline protection and emissions trading. In addition, the entity operating the registry should provide limited verification by ensuring that all relevant data are reported properly.

Interaction with Other Systems. CCAP and the Task Force recommend that New York create a registry with an accounting system that is credible and mutually recognizable by other states and jurisdictions with GHG registries. To that end, New York should seek opportunities to work with other states, such as those in the New England Governors/Eastern Canadian Premieres program, to develop consistent accounting systems. If the registry is created by legislation as a State entity, New York should commit to using its best efforts to ensure that participants in the registry receive appropriate consideration under any future international, federal, or State regulatory scheme relating to GHGs, as California has with respect to the California Climate Action Registry. New York should also ensure that its registry program is consistent with international standards under the UNFCCC to the applicable extent.

Registry of Voluntary Reductions. The registry should allow for the reporting of emissions reductions that result from the activities of entities participating in the voluntary reporting system. The reductions reported should include a robust amount of supporting data, so that reductions can be properly tracked and documented. At some later stage, New York could assess

[51] Direct emissions are GHG emissions from activities that are directly under the control of the participating entity. These are principally from the production of electricity, heat, or steam; physical or chemical processing; the use of vehicles, such as fleet vehicles; and fugitive emissions, such as methane and chemical refrigerants.

[52] Indirect emissions are GHG emissions that are a consequence of the activity of an entity but are emitted from sources owned or controlled by another entity.

[53] WRI/WBCSD's *Greenhouse Gas Protocol Initiative* provides some information on this topic. For more information, see <www.wri.org/pdf/ghg_protocol.pdf>.

[54] A generally agreed verification protocol has not currently been developed, but one is under development by several entities that develop protocols for other purposes.

the merits of the reported reductions and attribute credits toward future regulatory regimes. Emissions reductions through either purchased offsets or the entities' direct actions should be reported separately in the registry.

Registry Incentives. The registry should offer incentives for participants to reduce emissions, including the following:

- Resources and assistance. The registry could offer referrals to approved providers for technical assistance, advice on how to establish GHG baselines, and how to monitor, estimate, calculate, and report GHGs; help with establishing emissions reduction goals; and aid in designing and implementing organization-specific plans that improve energy efficiency.
- Public relations. The registry should promote and publicize the GHG emissions reduction activities of participating entities and allow for public access to registry records.
- Stakeholder participation. The entity operating the registry should be directed through a board of advisors. The makeup of the board should be developed by New York State and could consist of representatives from certain key participants.
- Removal of barriers. New York should seek to remove barriers that impede the ability of participating entities to reduce their GHG emissions. The State should enact appropriate State statutes and work for appropriate changes to federal law to implement this recommendation.
- Recognition and awards. The registry should include a program for granting leadership awards to participants based on their GHG reduction results.

Other Critical Issues. Critical issues that would need to be studied in establishing a registry include:

- Legislative authority required to establish the program;
- Identification of an appropriate entity to administer the program;
- Program costs;
- Data collection methods and use of existing data; and
- Protocols for measuring and verifying emissions reductions.

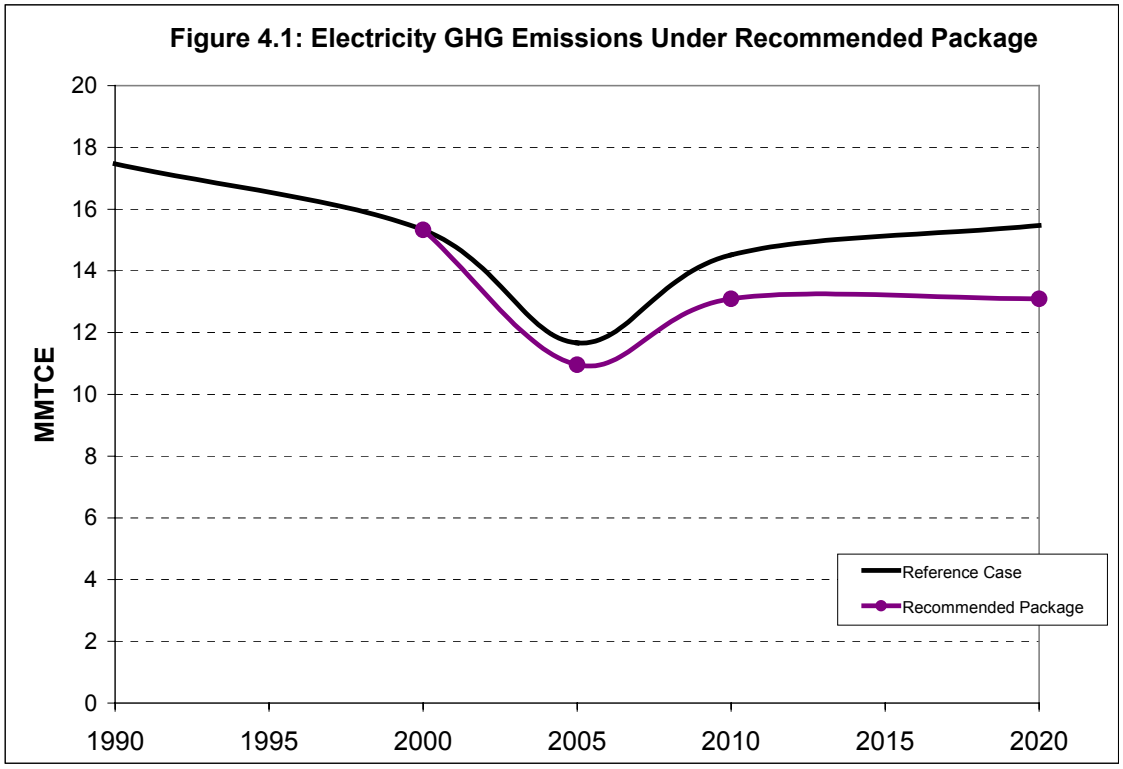
IV. ELECTRICITY GENERATION

A. SECTOR SUMMARY

On the basis of electricity modeling by ICF Consulting (ICF), analysis by CCAP, and input from the Electricity working group, we recommend that carbon emissions from the electric generation sector be reduced to at least 25 percent below 1990 levels by 2010. Based on the ICF modeling, New York carbon emissions from electricity generation are projected to be 17 percent below 1990 levels in 2010 in the absence of any carbon-related policy changes. The following specific actions are recommended:

- Extend the State's strong energy efficiency (EE) programs, including extension of the SBC and NYPA/LIPA programs for another five years, and establish new measures to reduce electricity demand growth to no more than 0.58 percent per year on average through 2010 and beyond. The SBC and NYPA/LYPA will be funded through a combination of annual State spending of $277 million per year and private spending of $365 million per year over the 2006-2010 period. Private spending for other EE measures averages $125 million per year over the 2005–2020 period. Spending for all EE measures is equivalent to $1.04 billion in net present value for the public sector and $2.53 billion in net present value for the private sector. According to the modeling analysis, these programs alone will reduce the electric generation sector's carbon emissions to 21 percent below 1990 levels by 2010.
- Adopt a renewable portfolio standard (RPS) that will require electric service providers in the New York market to ensure that six percent of the electricity offered for sale in 2010 is from renewable energy sources including wind, landfill gas, biomass, and solar sources, increasing to eight percent in 2020. The RPS will lower natural gas prices, which will reduce electricity imports into New York and, in turn, limit leakage of carbon emissions to surrounding regions. The ICF modeling analysis indicates that an RPS alone would reduce electric generation sector carbon emissions to 20 percent below 1990 levels by 2010.
- Adopt a mandatory New York electricity-sector carbon cap of at least 25 percent below 1990 levels by 2010 and implement this measure through a cap-and-trade system. When added to the energy efficiency and RPS programs, this cap is projected to require no more than a four percent additional reduction in carbon emissions from the electric generation sector in New York in 2010 and will not increase state average wholesale electricity prices. An additional six percent reduction below 1990 levels (to an aggregate 31 percent below 1990 levels) could be achieved through regionally coordinated actions with New England states to cap emissions from electric generation. ICF's analysis projects that New York emissions from electric generation will fall to 31 percent below 1990 levels if New England states enact laws to stabilize power sector emissions at 1990 levels by 2010.
- Promote the development of indigenous renewable energy through net metering for distributed renewable sources, voluntary programs, and public education.
- Support regulatory changes (e.g., standardized interconnection rules and stand-by rates and streamlined permitting process), economic incentives, and technical assistance to promote clean, efficient distributed energy resources such as combined heat and power (CHP) facilities.

- Provide regulatory incentives to encourage repowering of old, inefficient fossil plants to cleaner, more efficient plants.
- Assess the technical, environmental, and economic feasibility for carbon capture and sequestration within New York State as a long-term carbon reduction option.



MMTCE = million metric tons of carbon equivalent

Impact On And Benefits For New York

Adoption of the recommended package of electric generation options is projected to:

- Reduce carbon emissions by 1.42[55] million metric tons of carbon equivalent (MMTCE) in 2010 and 2.11 MMTCE in 2020 (see Figure 4.1);
- Improve the competitiveness of New York industries and businesses as a result of the expanded EE program;
- Promote an indigenous new renewable energy sources industry; and
- Put the State on the cutting edge of the development of new energy efficient and renewable technologies and a carbon trading market.

Based on the CCAP and ICF modeling analysis, carbon emissions reductions achieved through a combination of the cap, the recommended EE program, and the RPS are the most cost-effective

[55] While the results of the modeling show emissions of 1.32 in 2010, the cap of 25 percent below 1990 levels (i.e., 1.42 MMTCE reduction) is met as a result of early actions taken by the electricity sector which are banked towards use in meeting the cap.

reductions available to the State from any sector of the economy. These options are critical to putting the state on a path to achieve the Task Force's recommended statewide GHG reduction target of five percent below 1990 levels by 2010. The ICF analysis projects that adoption of a New York power sector carbon cap at 25 percent below 1990 levels coupled with the recommended EE program and an RPS on a New York-only basis will reduce State average wholesale electric prices by 0.3 percent in 2010 and increase prices by 0.3 percent in 2020. The impact on retail electricity rates will differ because, among other things, the cost of building renewable facilities in meeting the RPS will be spread out among all retail electricity customers. This RPS adder to the retail rate is estimated to result in retail price increases of 1.8 percent in 2010 and 4.1 percent in 2020.

In addition, the ICF modeling analysis shows that with the adoption of the 25 percent carbon cap, EE measures, and RPS:

- Electricity generation system costs are expected to decrease by $60 million in 2010 and $216 million in 2020. These cost changes are in addition to wholesale cost changes associated with the state's Acid Deposition Reduction (ADR) Program and do not include the incremental costs of the EE and RPS programs.
- New York State electricity consumers participating in the EE program are projected to receive a *net reduction in energy costs of $511 million annually* because the savings to participating customers on their electricity bills over time exceeds the costs of implementing the efficiency programs. Participating customers are projected to have more disposable income than they did before the program's implementation. Customers not participating in efficiency programs would experience a modest increase in wholesale prices.
- The impact on the New York economy is expected to be positive because of the net investment in new technologies and innovation. New York industries and businesses are projected to be more competitive in interstate and international markets as a result of the recommended new investments in EE. A full macroeconomic analysis of the impact was beyond the scope of this effort.
- The RPS will increase fuel diversity in the State, reduce real wholesale electricity prices and put downward pressure on natural gas prices. In particular, Upstate New York is likely to benefit from the development of new indigenous renewable energy sources and biofuels industries. The RPS will also ease compliance with a carbon cap, potentially enhancing New York's competitiveness under a regional or national carbon trading program.
- The State will likely enjoy a "first mover" advantage in terms of experience with carbon trading. With Canadian and European pilot trading programs expected to be in place by 2005, the opportunity for Wall Street brokerages to get involved in linking the New York carbon trading program with neighboring state and international programs will be substantial.
- The cost of natural gas consumption for electricity generation is projected to be $329 million *less* in 2010 and $599 million *less* in 2020, compared to the case without the policy.
- Power imports from the PJM region and Ontario into New York are projected to increase by 3.3 percent in 2010, by five percent in 2015 and increase significantly by 25 percent in 2020. Accounting for the net emissions in PJM, Ontario and New England of a New York-only carbon cap of 25 percent below 1990 levels is not expected to lead to any net leakage in carbon emissions from power imports in 2010 and only a small amount in 2020.

- Overall, the asset value of existing generating units is expected to decrease by $648 million (-2.8 percent), with non- and low-carbon emitting units increasing in value and coal and oil units decreasing in 2010.

Adding a New England Cap to the Recommended Actions.

The policy context is important. In the reference case developed in collaboration with NYSERDA and the Electricity working group, ICF found that carbon emissions in New York from electricity generation would be equal to 17 percent below 1990 levels in 2010, given the assumptions agreed to for the modeling analysis. This means that New York would need to reduce emissions an additional eight percent below 1990 levels to reach the 25 percent target.

The projected pattern of declining power sector emissions in New York is a somewhat unique phenomenon among US states—most project carbon emissions to rise in the future if no additional emissions reductions are enacted. New York's emissions are projected to fall as a result of the construction of a number of proposed combined-cycle natural gas generating facilities in the State, the aggressive energy efficiency program financed by the State's public benefit fund, and the implementation of the Governor's Acid Deposition Reduction Program, as well as other programs. In addition, New York's electricity-related emissions in 1990 were higher than normal because several nuclear units were not operating at normal levels in 1990.

In contrast to New York's emissions projections, New England electricity-related emissions were projected to be nine percent above 1990 levels in 2010 and those of the neighboring Pennsylvania, New Jersey, Maryland (PJM) region are projected to be 19 percent above 1990 levels.

New York's generators, in aggregate, would need to reduce emissions by eight percent annually to achieve a cap of 25 percent below 1990 in 2010. New England generators in aggregate would need to make a nine percent reduction in 2010 to achieve stabilization at 1990 levels in 2010. These levels of effort appear comparable, and ICF's modeling results bear that out: New York and New England wholesale electric prices are projected to rise by comparable amounts under such a regional strategy – a little less than three percent in 2010. ICF's analysis of a New York cap of 25 percent, moderate EE measures, and an RPS in combination with a New England 1990 stabilization cap and moderate EE measures shows that New York would over comply, achieving a 31 percent reduction from 1990 levels while still experiencing no more than a 2.8 percent increase in wholesale electricity prices in 2010 and a 6.2 percent increase in 2020.

ICF's analysis of a New York cap of 25 percent, moderate EE measures, and an RPS in combination with a New England 1990 stabilization cap and moderate EE measures shows that New York would over comply, achieving a 31 percent reduction from 1990 levels while still experiencing no more than a 2.8 percent increase in wholesale electricity prices in 2010 and a 6.2 percent increase in 2020. In effect, New York power generators are projected to sell the additional reductions beyond the 25 percent cap level to New England generators, as this is more cost effective for New England generators than making those reductions at New England plants.

While New York consumers, on average, are expected to pay 1.3 percent more if New England states enact carbon stabilization legislation, generation owners in New York are better off with a cap in New York *and* New England. The net present value of New York power plants will increase by $829 million in the next 20 years under the regional cap approach rather than a New York-only approach, providing emission allowances are given to the power industry for free. The asset value of New York power plants under a regional approach would increase by $182 million relative to the reference case.

The implementation of the New York 25 percent cap in concert with a New England stabilization target is projected to lead to higher power imports, resulting in some leakage of carbon emissions in the surrounding areas. Specifically, emission in PJM and Ontario increase by 0.7 MMTCE in 2010 and 1.1 MMTCE in 2020 under the regional cap approach. The combined New York and New England state caps are projected to achieve 2.0 MMTCE of reductions and 3.4 MMTCE in 2020. When leakage is accounted for, the net reduction is 1.3 MMTCE in 2010 and 2.3 MMTCE in 2020. A policy mechanism could be considered to address emissions leakage, such as setting a Generation Portfolio Standard (GPS) to govern carbon emissions rates associated with power sales to New York consumers. Enactment of a national cap program for CO2 would eliminate this leakage and the need for a GPS approach.

The relatively modest impacts on consumer and producer costs under New York and New England caps suggest a more stringent cap in New York could be considered in the future either alone, in conjunction with additional energy efficiency and renewable energy measures, in concert with a broader regional or national effort.

In the event that federal legislation is passed to limit sulfur dioxide (SO_2), nitrous oxides (NO_x) and mercury emissions from electricity generation, this could further bolster the case for a stronger carbon cap in New York. Preliminary IPM modeling results suggest that a federal three-pollutant bill would lead New York utilities to significantly cut their carbon emissions at *no additional cost* for carbon beyond what they would already pay to cover the costs of a new Federal air pollution control requirement. Implementation of a federal three-pollutant bill would therefore make it possible for the state to ramp down the power sector carbon cap.

Views of the Task Force

Task Force members supported achieving reductions from the electric-generation sector, and they strongly favored a national cap, or a regional cap over a New York-only cap. Although the Task Force did not reach consensus on a specific cap level, many members expressed support for beginning with a New York-only cap by 2010 and ramping down cap levels in the future, contingent on persuading other northeastern states to implement similar caps.[56] One electricity

[56] Specific cap levels suggested by Task Force members – 30% below 1990 levels if the State acts alone and 40% below 1990 levels if New England states also take power sector caps – were based on results of preliminary ICF modeling results and would no longer be supported by final run results discussed later in this chapter. The Task Force did not have the newest modeling results when making their recommendations, so their views on specific cap levels were not based on most current data. The key issue is that the recommended New York-only cap level went beyond business as usual reduction levels by about 1.42 (when accounting for banked emissions reductions) in 2010. Similarly, recommended New York power sector cap levels under a system that involved simultaneous cap

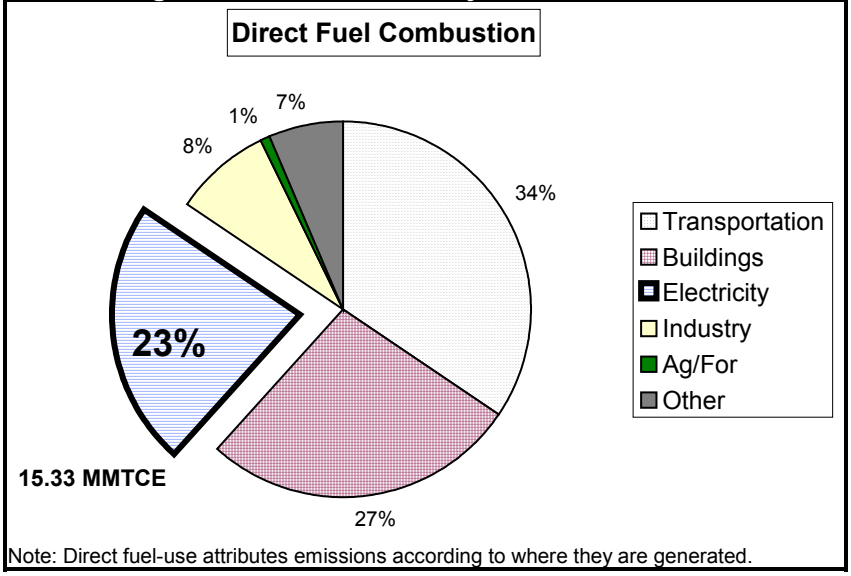
industry representative was opposed to any cap on electricity, arguing that the electricity industry had already done its share in reducing GHG emissions. One State agency indicated serious reservations about the more stringent cap proposal, and a second raised questions about its projected economic impact. The incentive program for repowering older fossil units and the expanded EE program enjoyed broad support, with some State agencies indicating that flexibility on how New York would contribute its $277 million share per year over the 2006-2010 period was important. Two State agencies indicated reservations concerning the RPS, arguing that having both a system benefit charge program financing renewable energy, and a new RPS, would create duplicative incentives for renewable energy. It was suggested, in the event that an RPS was mandated, that public benefit funding for renewable generation should be redirected to smaller "distributed" (on-site) renewable sources.

B. OVERVIEW

Electricity-Sector Emissions

The New York State GHG inventory shows that GHG emissions from electric power generation in New York totaled 17.46 MMTCE in 1990. The 2002 State Energy Plan indicates that in 2000 total GHG emissions from in-state generation were 15.33 MMTCE, a 12 percent reduction relative to 1990 emission levels. In 2000, the electricity sector contributed nearly one-fourth (23 percent) of total GHG emissions in New York State (see Figure 4.2). Based on consultations with state officials and CCAP, the final reference case used in this study projects that carbon dioxide (CO_2) emissions in New York would be 14.52 MMTCE in 2010 and 15.47 MMTCE in 2020, 17 percent and 11 percent below the 1990 levels, respectively. Electricity sector GHG emissions under the reference case are shown in Table 4.1.

Figure 4.2: 2000 Electricity Sector Emissions



Note: Direct fuel-use attributes emissions according to where they are generated.

and trade programs in New York and New England states went beyond business as usual reduction levels in New York by more than 2.4 MMTCE.

Table 4.1: Electricity-Sector Baseline Greenhouse Gas Emissions					
	1990	2000	2005	2010	2020
Reference (MMTCE)	17.46	15.33	11.67	14.52	15.47
percent relative to 1990		–12	–33	–17	–11

MMTCE = million metric tons of carbon equivalent

The critical number for policymakers in these data is the projected reduction in emissions in 2010 to 17 percent below 1990 levels under the business as usual scenario. This projection makes possible the consideration of a cap on the electricity sector at 25 percent below 1990 levels, which would require electric generators in New York to reduce emissions by eight percent in 2010.

The baseline GHG emissions projections for the power sector reflect forecasted future electricity demand and generation resources, existing State EE programs (e.g., the SBC program), and anticipated environmental regulation for the sector. The key environmental regulation included in the baseline projection is the Governor's ADR Program, which requires power plants in New York to reduce SO_2 emissions by an additional 50 percent beyond Phase II requirements of the Clean Air Act Title IV Acid Rain program, and NO_x emissions by another 40 percent year-round from Phase II requirements of Title IV, starting in 2003.

One currently planned action affecting emissions from the electricity sector, the Governor's Executive Order 111, is not included in the reference case. Executive Order 111 requires State buildings to purchase 20 percent of their electricity from renewable sources by 2010. It is estimated that this requirement will induce GHG emissions reduction benefits of 0.04 MMTCE by 2010. If, as we recommend, New York adopts a statewide RPS, the renewable power purchases by the State will contribute toward achieving the total six percent RPS target.

Factors Affecting Electricity-Sector Emissions

GHG emissions projections from New York's electricity generation show a decline in the near future followed by an increase in emissions from 2005 to 2020. Future GHG emissions will depend on factors such as New York's economic and population growth patterns, electric generation resource mix, new electric generating capacity additions, and levels of imported power. State climate change policy, combined with efforts to reduce other air pollutants that affect public health and the environment, can help ensure that new demand is met by clean, efficient electricity supplies.

C. Analysis of Mitigation Options

Bottom-up Analysis of Policy Options

In the initial stage of the effort, the Electricity working group of the New York GHG Task Force identified about 30 measures that could reduce total GHG emissions from the electricity sector. The working group had extensive discussions to screen the proposed options, separate out those

that were already underway, and group similar measures (e.g., policy incentives to encourage renewable energy sources). CCAP chose five priority policy measures for more in-depth investigation on the basis of an initial test for cost-effectiveness, GHG reduction potential, regulatory and administrative feasibility, and ancillary benefits:

- A carbon cap-and-trade program;
- Incentives for repowering older coal-fired plants to new, clean generating technologies (beyond the oil units that the carbon cap would encourage to repower);
- Renewable policy and measures, i.e., an RPS and net metering for distributed renewable sources;
- Policy measures to encourage self-generation of onsite CHP and clean, efficient distributed generation (DG); and
- Carbon capture and sequestration.

CCAP has coordinated and led the policy option analysis for the electricity sector with substantive inputs from the working group members. As the policy actions for promoting CHP and other clean DG will affect residential, commercial, and industrial electricity end users, discussions of these policy measures are included in Chapter V. However, the working group recognized that a static, bottom-up analysis of policy options could not capture dynamic changes in the electricity system in response to the recommended policies. The analysis also fails to acknowledge tradeoffs in the competitive electricity market when regions that do not face any carbon controls compete with the New York system. Accordingly, the Task Force agreed at the March 2002 meeting to finance an electric system modeling study to investigate the effects and interactions of the various policy options within the electricity sector in New York and neighboring regions. The results of the analysis are found in Appendix 6.

Electricity Modeling Analysis of Policy Options Using IPM

NYSERDA, in coordination with CCAP, commissioned a modeling analysis using ICF's Integrated Planning Model (IPM™). IPM is a detailed engineering-economic production costing model that estimates the marginal cost of emissions reductions for the electric generating sector and has been used by the US Environmental Protection Agency (EPA) and many private-sector clients to analyze alternative approaches for reducing multiple emissions from electricity generation. IPM determines the least-cost means of meeting carbon policy requirements and forecasts allowance prices, compliance costs, and unit dispatch and retrofit decisions for each boiler and generator in the North American Electric Reliability Council (NERC) regions. Carbon prices in the electric sector are determined, excluding technologies that remove carbon from the post-combustion process, by the increased system costs of building and operating lower carbon intensive generation as well as existing unit dispatch changes. (See Appendix 6 for more detailed information on IPM analysis and summary of the study results.)

IPM modeling runs were conducted in two phases. In the initial phase, NYSERDA, CCAP, and the Electricity working group worked together, in consultation with ICF, to develop modeling assumptions and scenarios. After intensive discussions, the group reached consensus. Many assumptions mirrored those in the State Energy Plan. In particular, the New York State Energy

Plan assumes that 6,000 MW of new combined-cycle natural gas capacity would be added in New York by 2005. NYSERDA, CCAP, and the working group members developed other assumptions in a consensus process, including assumptions on New York's power generation system, fuel market, new capacity additions, renewable resource potential, and demand growth under various EE scenarios. Energy efficiency assumptions (reference case efficiency) and "moderate" and "aggressive" new efficiency scenarios were developed from NYSERDA estimates of existing efficiency programs and bottom-up assessments of new efficiency options identified and quantified by the buildings and industry work group. The electricity sector group adjusted the electricity demand growth rate to reflect these efficiency measures. Specifically, energy efficiency programs are expected to reduce electricity demand growth from 1.3 to 1.0 percent per year in the base case, further reduce demand to 0.58 percent per year in the moderate efficiency case, and 0.40 percent per year in the aggressive efficiency scenario. Because the study also aimed to examine the implications of regional carbon reduction actions in New York and New England, the group agreed on electricity demand growth assumptions in New England under various EE scenarios, accounting for current and future State programs.

These assumptions were used in a set of ten initial modeling scenarios (two reference cases and eight policy runs) agreed to by the working group. These scenarios looked at different combinations of power sector emission reduction policies, including different cap levels (20, 30 and 40 percent), energy efficiency levels (aggressive and moderate) and a renewable portfolio standard. Most scenarios assumed New York would act alone, though two runs assumed a regional program that included New England states. The second reference case and a policy scenario looked at the effects of a federal multi-pollutant control program in combination with a state climate program.

While the initial modeling results were useful in understanding directional impacts of different policy measures, several state officials expressed concern that some of the modeling assumptions might be too optimistic under a changing economic climate. Specifically, there was concern that the assumed "aggressive" level of efficiency was more aggressive than is realistically likely to occur in the near-term due to the high first cost of efficiency programs in a time of state budget tightening. In addition, while significant new natural gas generation capacity in New York appeared realistic at the time the model assumptions were being developed, several applications for construction of natural gas combined cycle units have since been withdrawn in New York, raising the possibility that the assumed levels of new natural gas capacity additions may not occur under a "business as usual" scenario. Moreover, ICF found an error in their work regarding imports from Ontario. Correcting the error increases reference case carbon emissions in New York State on the order of eight percent in 2010 and five percent in 2020.

As a result of these concerns, a small group of state government officials and CCAP, with input from ICF and select working group members, worked to refine the assumptions and corrected the earlier error. The following is a comprehensive list of changes to the assumptions underlying the reference. In the new runs:

- The model is allowed to decide on an economic basis whether new natural gas combined cycle units in New York are to be constructed rather than assuming that 6,000 MW of new natural gas generation capacity would come on line by 2005.

- The amount of existing firm wind capacity in upstate New York was increased to 300 MW, consistent with new wind turbine capacity being developed through the state's SBC program.
- Transmission capacity between Connecticut and Long Island was increased by 300 MW to reflect a new transmission line.
- Transmission capacity from Ontario to New York was reduced by 1,075 MW (from 2,325 MW to 1,250 MW) while the transmission line capacity going from New York to Ontario was increased from 1,300 to 1,400 MW to reflect recent market developments.
- Assured generation capacity in Ontario was reduced in two ways. First, 1.6 GW of nuclear capacity (three Pickering units) were assumed not to come back on-line. Second, an 800 MW natural gas plant (Southdown Station) previously assumed to be a "firm build" was instead made available as an economic choice in the model, reflecting an "indefinite hold" placed on the project recently.
- ICF corrected an error in the treatment of imports from Ontario. They had double counted Ontario imports by mistakenly hard-wiring Ontario imports in addition to modeling them through economic optimization.

In addition to the revised reference case assumptions discussed above, a different energy efficiency scenario was used and the design of the renewable portfolio standard policy option was changed.

- The "moderate" level of efficiency is used in lieu of the "aggressive" efficiency level. The moderate efficiency scenario includes extension of existing SBC, NYPA and LIPA efficiency programs, establishment of appliance standards for a number of appliances, and negotiated agreements with industry. Expansion of efficiency programs and appliance standards requiring a federal waiver are not included in the new IPM runs.
- This RPS was assumed to be implemented more gradually, beginning at one percent of electricity sales in 2005 and increasing by one percent annually to reach six percent in 2010 and eight percent in 2012. This reflects a more realistic on-line schedule. This change has little effect on model results in 2010 and beyond.

On balance, the above changes in the modeling assumptions result in a more realistic characterization of the regional electricity market. As a result, the new reference case shows higher carbon emissions in New York (two MMTCE more in 2010 and 1.24 MMTCE more in 2020) than the earlier reference case. Consequently, cap levels in the policy scenarios were made less stringent to reflect cost-effective opportunities given the higher level of emissions now forecast for business as usual.

Policy Scenarios

Based on the new reference case, the small working group developed four new policy scenarios representing different combinations of policy variables to examine the effects of: (1) moderate energy efficiency penetration in New York, (2) an RPS in New York, (3) a carbon cap of 25 percent below 1990 levels in New York coupled with moderate EE (Scenario 1) and an RPS (Scenario 2), and (4) the package of policies as in scenario (3) in New York plus stabilization of carbon at 1990 levels and moderate energy efficiency measures in New England. Table 4.2

summarizes the reference and policy cases modeled in IPM and the key assumptions for each of the scenarios.

Table 4.2: Reference Case and Policy Scenarios in IPM Modeling

Scenario	Northeast State Policies	Energy Efficiency Penetration and Demand in New York (NY) and New England (NE)	Regional CO_2 Cap (New York and New England)	Regional RPS (New York and New England)
Reference Case	Yes	Existing Actions NY: 1.0 percent NE: 1.5 percent	None	None
Policy Scenario 1	Yes	Moderate NY: 0.58 percent NE: 1.0 percent	None	None
Policy Scenario 2	Yes	Existing Actions NY: 1.0 percent NE: 1.5 percent	None	NY-Only RPS 2005: 1 percent 2010: 6 percent 2012+: 8 percent
Policy Scenario 3	Yes	Moderate NY: 0.58 percent NE: 1.0 percent	NY-only: 25 percent below 1990 levels in 2010 NE: none	NY-Only RPS 2005: 1 percent 2010: 6 percent 2012+: 8 percent
Policy Scenario 4	Yes	Moderate NY: 0.58 percent NE: 0.7 percent	NY: 25 percent below 1990 levels in 2010 NE: 1990 levels in 2010	NY-Only RPS 2005: 1 percent 2010: 6 percent 2012+: 8 percent

Modeling Results. This section summarizes key findings of ICF's IPM analysis including final run results (scenarios 1-4) and directional impacts of earlier runs that illuminate key points of interest. Appendix 6 contains the summary of the four final scenarios prepared by ICF.

Policy Scenario 1: Moderate Energy Efficiency

ICF analyzed a moderate energy efficiency scenario that includes extension of existing SBC, NYPA/LIPA efficiency programs, new appliance standards and negotiated agreements with industry (no cap on carbon emissions or renewable portfolio standards was included in this scenario). Compared to the reference case, ICF projects that:

- New York carbon emissions will decline by 0.7 MMTCE in 2010 and by 0.9 MMTCE in 2020, resulting in carbon emissions at 21 percent and 17 percent below 1990 levels in 2010 and 2020, respectively (Figure 4.3).

- Average wholesale marginal electricity prices in New York will increase slightly by 0.2 percent (+0.18 mills/kWh) in 2010 and by 0.4 percent (+0.13 mills/kWh) in 2020.
- Average wholesale capacity costs decline by 1.3 percent in 2010 and by 6.6 percent in 2020.
- Average wholesale firm power prices (combined energy and capacity prices) would increase by 0.2 percent in 2010 and decrease by 0.6 percent in 2020. Firm power prices decline in 2020 because the decline in the cost of capacity outweighs the increase in wholesale electricity prices.
- The average difference between wholesale prices and retail prices in New York in 2002, according to the Energy Information Administration, is $61.7/MWh.[57] Because retail prices are higher than wholesale prices, Policy Scenario 1 would result in a smaller percent change in average retail prices than the percent change in wholesale prices – 0.1 percent in 2010 and a decrease of 0.2 percent in 2020 (Figure 4.4).
- The total electricity system costs would decline by $189 million (-5.8 percent) in 2010 and by $269 million (-9.5 percent) in 2020, as there is less need to buy new generation resources.
- By 2020, 1,722 MW of the 15,787 MW of coal, oil, gas steam capacity would be repowered to operate as natural gas combined cycle, resulting in cumulative repowered NGCC capacity of 5,166 MW, compared to 5,731 MW in the reference case;[58] 1,311 MW of wind capacity would be built, 136 MW less than the reference case; 1,317 fewer MW of combined cycle capacity would be added; and the total cumulative capacity added in Policy Scenario 1 is 8,331 MW, over 2,000 MW (or 19 percent) less than the reference case (Figure 4.5).
- Generation from biomass co-firing would be zero, and total coal generation would remain unchanged throughout the period; old oil and gas steam generation would increase slightly by 1.7 percent in 2010 and by 0.8 percent in 2020; NGCC would drop by 61 percent in 2010 and by 39 percent in 2020; generation from repowering would decline by 8.3 percent in 2010 and 1.8 percent in 2020; and cogeneration would increase slightly in 2010 by 0.9 percent and by nine percent in 2020. Wind power would increase dramatically in 2010 by 270 percent, but would decline in 2020 by 11 percent compared to the reference case (Figure 4.6).
- Net power imports from PJM (East and West regions) and Ontario[59] into New York will increase by seven percent in 2010 and by ten percent in 2020. The EE measures lead to less new capacity, about 2,000 MW, which creates the economic opportunity for more electricity imports into New York. Increased imports are expected to reduce the total net regional emission reductions, including New York, New England, PJM and Ontario, by 0.6 MMTCE in 2010 and by 0.8 MMTCE in 2020.

[57] The Energy Information Administration (EIA) reports that the average retail revenues per MWh in New York in 2002 were 11.4 cents/kWh. EIA also reports that the average wholesale price of electricity is 5.23 cents/kWh in 2002. The average increment over wholesale rates in New York is 6.71 cents/kWh, which includes transmission, distribution and other retail related charges. Different retail class customers would pay different increments over wholesale prices, with residential customers paying the most and industrial customers the least.

[58] The biomass co-firing option was allowed under policy option analysis and limited to 20 percent of total coal capacity in New York.

[59] Imports from Ontario increase in 2015, but decrease in 2020. Reported percentages reflect the net imports into New York from these regions.

Figure 4.3: New York Carbon Emissions
Policy Scenario 1

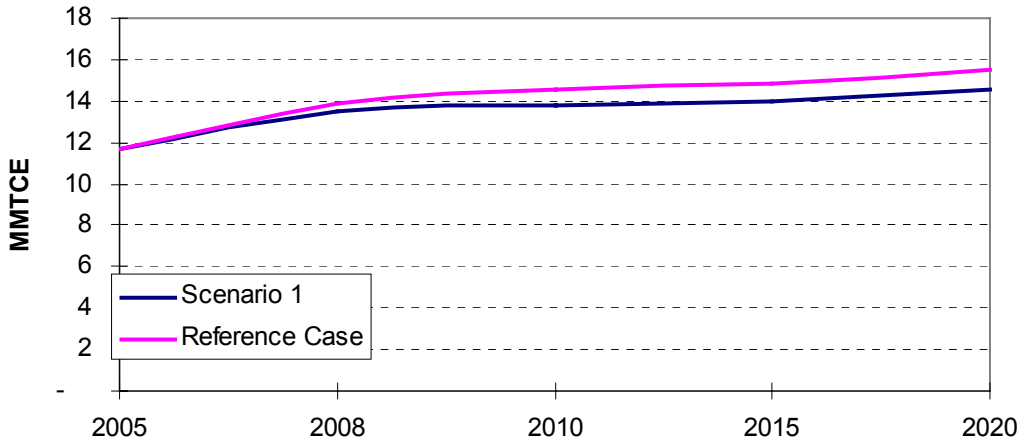
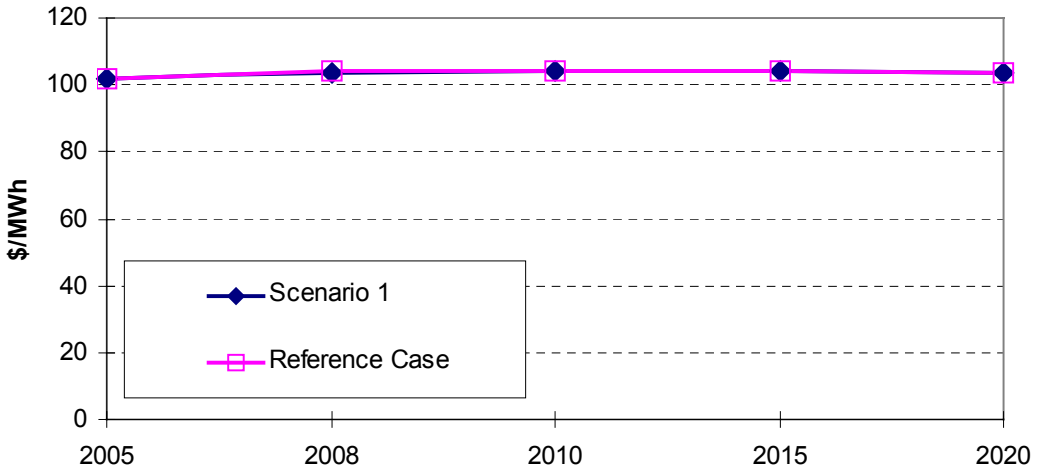


Figure 4.4: Average Retail Electricity Prices*
Policy Scenario 1



* Assumed Retail charges are $61.77/MWh in addition to firm wholesale prices. Source: EIA.

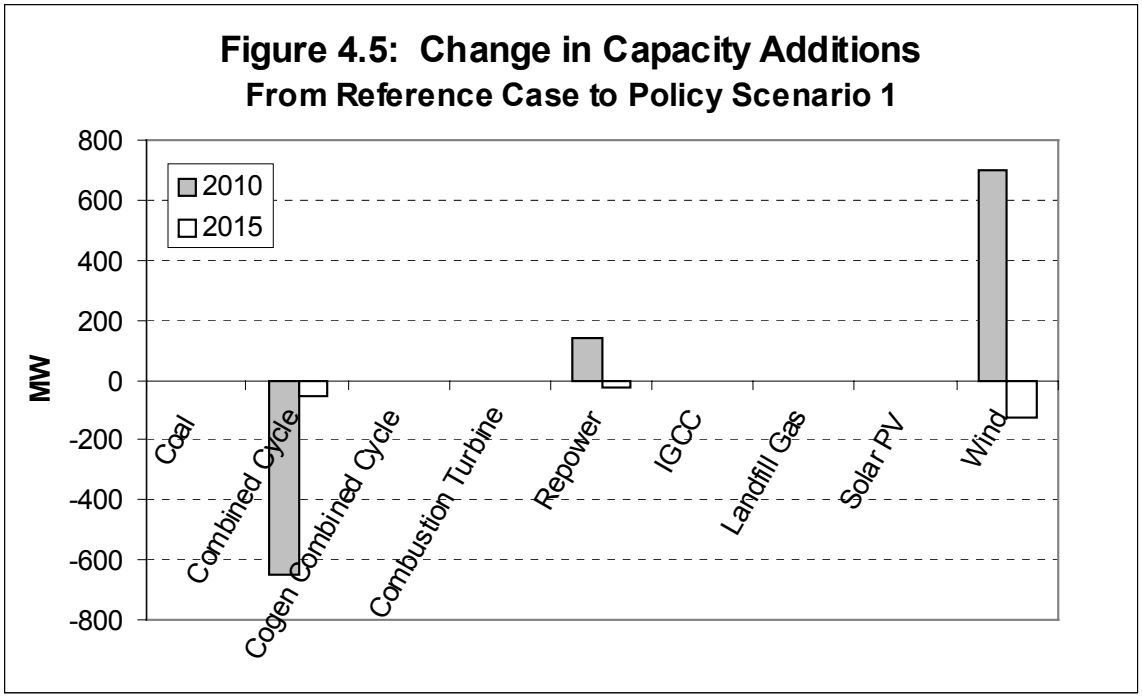


Figure 4.5: Change in Capacity Additions
From Reference Case to Policy Scenario 1
MW
800
600
400
200
0
-200
-400
-600
-800
2010
2015
Coal
Combined Cycle
Cogen Combined Cycle
Combustion Turbine
Repower
IGCC
Landfill Gas
Solar PV
Wind

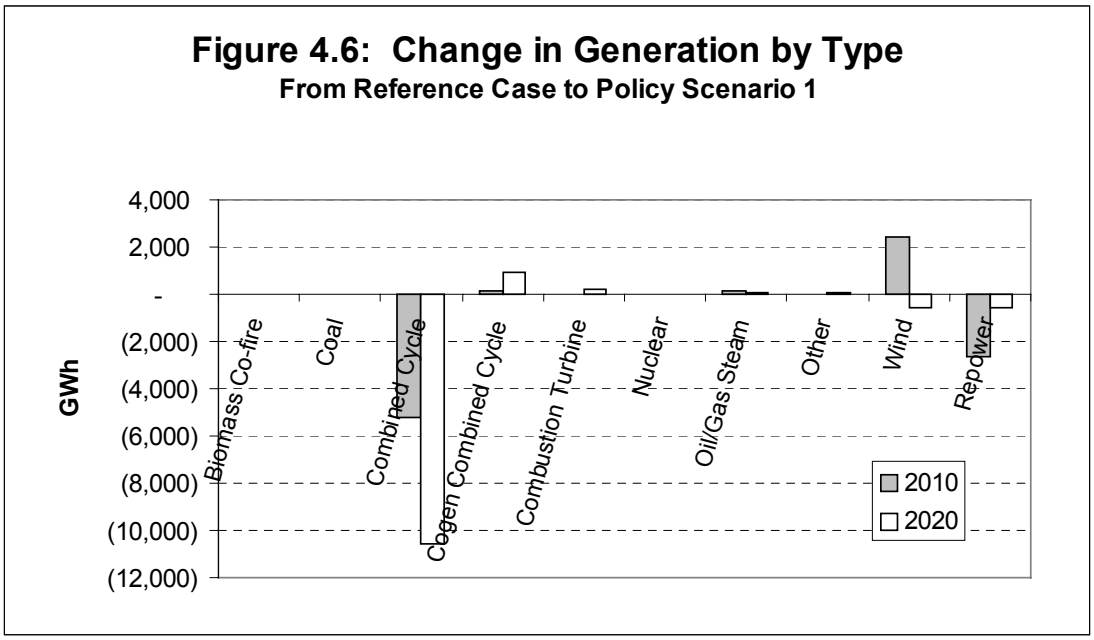


Figure 4.6: Change in Generation by Type
From Reference Case to Policy Scenario 1
GWh
4,000
2,000
-
(2,000)
(4,000)
(6,000)
(8,000)
(10,000)
(12,000)
Biomass Co-fire
Coal
Combined Cycle
Cogen Combined Cycle
Combustion Turbine
Nuclear
Oil/Gas Steam
Other
Wind
Repower
2010
2020

Because moderate energy efficiency policies result in lower electricity demand, the need for additional capacity would be lessened. In this case, over 2,000 MW of new capacity would be avoided through energy efficiency investments, resulting in lower capacity costs. At the same time, the lower demand for electricity would make repowering less profitable, so existing units would continue to run at a higher marginal cost, leading to higher marginal electricity rates. As noted above, the final impact on retail rates not including the system benefit charge is close to zero, slightly higher in 2010 and slightly lower in 2020.

In IPM, electricity demand growth in New York is assumed to be 0.58 percent per year under the moderate EE scenario based on most recommended options displacing electricity in the CCAP/NYSERDA bottom-up analysis, compared with annual average electricity demand growth of 1.04 percent per year under the reference case. The specific measures recommended in the moderate EE scenario are discussed in more detail in Chapters V and VI.

Other existing and new state actions could help justify a lower growth rate than 0.58 percent per year in the future. For example, several existing measures were not factored into the IPM modeling, including the State's Executive Order 111 calling for a 35 percent reduction in energy use per square foot plus renewable energy purchases in state buildings, the new state energy code, and CHP funded by the system benefit charge program. In addition, one recommended action (appliance standards requiring a federal waiver) achieves emissions reductions beyond those included in the moderate scenario. In total, these measures could achieve additional reductions totaling up to 0.84 MMTCE in 2010 and 1.07 MMTCE in 2020 if the power sector cap were lowered by these amounts. However, actual reductions are likely to be less than these "bottom up" estimates suggest because the power system will dynamically react to lower demand levels. Specifically, earlier modeling runs suggest that lower demand growth may lead to a delay in new cleaner generation, reducing by about half the expected benefits of demand-side efficiency measures.

In the future, we expect that many additional efficiency measures (beyond those that were recommended) will prove to be economical with advancements in efficient technology and improvements in state budget conditions. In particular, periodic improvements in appliance standards and building codes and expansion of current efficiency programs could enable the State to further lower the power sector cap and achieve additional progress towards the overall state target.

The IPM model does not factor in the added cost of efficiency measures, so CCAP conducted a separate calculation to examine the full costs and benefits of the EE scenario. Because the costs of these EE programs and the benefits in reduced electricity expenditures among participating consumers occur at different times[60], we conducted the analysis using the net present value and the levelized annual cost of the program to compare the costs and benefits over the period from 2003 through 2020. The results show that the benefits of the EE programs far exceed the costs:

- The net present value of the recommended moderate EE scenario totals $3.56 billion, of which $1.04 billion is public spending through SBC and NYPA/LIPA programs and $2.53

[60] Costs are incurred between 2006 and 2010 whereas benefits accrue through 2020.

billion comes from private investment, reflecting the ratio of private investment to public investment that has occurred so far under these State programs. The net present value of energy savings among consumers totals $8.7 billion during the same period.[61] The resulting net benefits among consumers participating in the EE programs are $5.14 billion. In addition, the net present value of electricity system costs will decline by $1.5 billion.

- The total levelized cost of the recommended moderate EE scenario is $354 million per year, of which levelized private funding is $251 million per year and public funding is $103 million per year. The levelized benefit in energy savings among participating consumers totals $865 million per year. The net savings among consumers participating in the EE program total $511 million each year. (See Table 4.3) Consumers not participating in the EE program will face slightly higher costs.
- The actual average annual cost of the recommended moderate EE program sponsored by state government is $277 million per year between 2006 and 2010. If financed through extension of the SBC and NYPA/LIPA EE programs, the aggregated surcharges for both programs on retail electricity bills are estimated to average 1.60-1.65 mills/kWh over the 2006–2010 period. Alternatively the EE program can be funded through additional State appropriations. The advantage of the SBC approach lies in the additional price signal that the surcharge sends to consumers to conserve, but it is likely to be harder to enact.

Table 4.3: Costs and Benefits of Energy Efficiency (EE) Scenarios (Levelized $ Millions, 2000)

	Moderate EE
EE Expenditures	–354
Public funding	–103
Private funding	–251
Energy Savings	865
Net Benefits to Participating Consumers	511

Consumers participating in the program will benefit from reduced expenditures on electricity consumption by avoiding some electricity purchases. Although upfront investments are necessary in both the public and the private sectors, consumers who participate in the EE program are projected to have a net benefit over the long run. This analysis did not quantify the additional benefits of the program that would accrue to consumers as a result of avoiding costs in building new generating capacity and expanding transmission and distribution infrastructure. The analysis also does not estimate the impact on non-participating customers who would continue to experience the SBC charges and a higher share of transmission and distribution costs without the associated cost savings. Further analysis is necessary to assess the exact impact on non-participants.

[61] The average retail electricity prices are derived by adding the firm energy prices projected by ICF's IPM modeling and a state average retail adder of $61.7/MWh added to wholesale cost, based on actual 2002 data from EIA. According to NYSERDA's estimate, the total electricity demand will be reduced by 8,759 GWh in 2010 and 13,920 GWh in 2020 (an average of 8,430 GWh per year) under the recommended EE scenario.

Policy Scenario 2: New York Renewable Portfolio Standard

The New York RPS scenario consists solely of a Renewable Portfolio Standard phased in over time. Starting in 2005, one percent of all electricity sales must come from renewable electricity generation within New York. The required percentage will increase one percent every year so that in 2010, the RPS will be six percent and in 2012, and thereafter, eight percent. In its analysis of this New York-only RPS, compared to the reference case, ICF finds that:

- New York carbon emissions will be reduced by 4.3 percent (-0.6 MMTCE) in 2010 and by 3.9 percent (-0.6 MMTCE) in 2020, resulting in carbon emissions at 20 percent and 15 percent below 1990 levels in 2010 and 2020, respectively (Figure 4.7).
- Average wholesale marginal electricity prices (energy only) are projected to decrease slightly in New York by 1.2 percent (-0.4 mils/kWh) in 2010 and by 1.1 percent (-0.39 mils/kWh) in 2020.
- Average wholesale capacity costs would increase by 3.8 percent in 2010 and by 0.8 percent in 2020.
- Average wholesale firm power prices (combined energy and capacity prices) decrease by 0.3 percent in 2010 and by 0.8 percent in 2020.
- Assuming that transmission, distribution and other retail charges average $61.7/MWh, based on EIA statistics, Policy Scenario 2 is projected to result in average retail rate increases of 1.8 percent in 2010 and 3.9 percent in 2020, with the RPS adder. Actual retail rate increases will depend on decisions by the NYPSC and will vary regionally and by customer class (Figure 4.8).
- Natural gas consumption in the electricity sector is projected to decline by eight percent in 2010 and by seven percent in 2020, with a slight decline in natural gas prices in 2010 and a slight increase in 2020. Total spending in natural gas will decrease by $165 million in 2010 and $175 million in 2020.
- The total electricity system costs would increase by 5.4 percent (+$231 million) in 2010 and by 9.8 percent (+$501 million) in 2020.
- By 2020, 1,750 MW out of 15,787 MW of coal, oil or gas steam capacity would be repowered to operate as natural gas combined cycle, resulting in cumulative repowered NGCC capacity of 5,250 MW, compared to 5,731 MW in the reference case; 248 fewer MW of combined cycle capacity would be added; an additional 2,846 MW of wind capacity would be added compared to the reference case; 111 MW of landfill gas would be built, while none was built in the reference case; and the total cumulative capacity added in this scenario is 12,577 MW, which is greater than the reference case by 2,228 MW, an increase of 22 percent (Figure 4.9).
- No biomass co-firing would be encouraged (biomass co-firing was allowed as an air compliance option, but not allowed to count toward the RPS requirement), and total coal generation would remain constant; old oil and gas steam generation would decline by 3.3 percent in 2010 and by 2.2 percent in 2020; NGCC would drop by 9.6 percent in 2010 and by 7.5 percent in 2020; generation from repowering would decline by 15.5 percent in 2010 and nine percent in 2020; and cogeneration would increase slightly in 2010 by 1.2 percent and

would decline by 6.5 percent in 2020. Wind power makes up most of the difference in generation, increasing by 924 percent in 2010 and by 177 percent in 2020 (Figure 4.10).

- Power imports from the PJM East region and Canada into New York are projected to increase by 2.3 percent in 2008, then to decrease by 9.2 percent in 2010 and to decrease by 17.2 percent in 2020; the RPS requirement that renewable generation come from in-state facilities naturally crowds out some imports into New York as the RPS level increases.
- Due to the declines in power imports, emissions from New England, PJM and Ontario decline by 0.2 MMTCE in 2010 and 0.3 MMTCE in 2020. Net emission reductions for all four regions total 0.9 MMTCE in 2010 and 2020.

The RPS results in more capacity additions than the reference case because renewable energy sources have a lower capacity factor due to the intermittent nature of renewable generation. For example, even though a five MW wind turbine has the potential to produce five MWh of electricity every hour, it can only do so when wind is at the optimum speed. At other times, it will produce less than five MWh of electricity or none at all if wind speed is low. On the other hand, a five MW fossil plant can operate at any time, apart from planned and forced outages, to produce five MWh of electricity. Therefore, more wind capacity is needed to supply a given demand for electricity than if that demand were supplied by fossil fuel plants. Because the RPS forces a percentage of generation to come from renewable energy sources, a disproportionate level of renewable capacity compared to fossil capacity must be built. Wind, which is one of the lowest cost renewable options, was projected to meet the bulk of the RPS requirement and, in the process, would add over 2,200 MW to total capacity additions in New York relative to the reference case.

Figure 4.7: New York Carbon Emissions
Policy Scenario 2

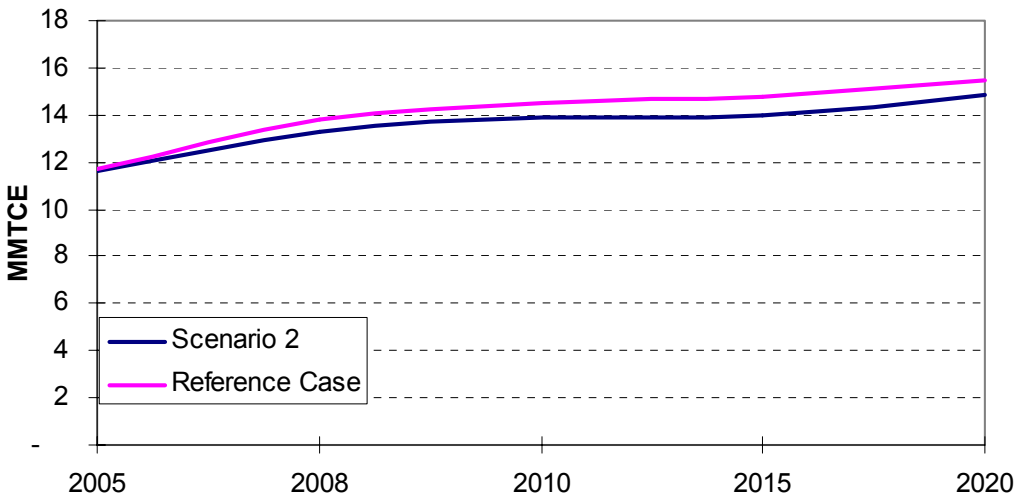
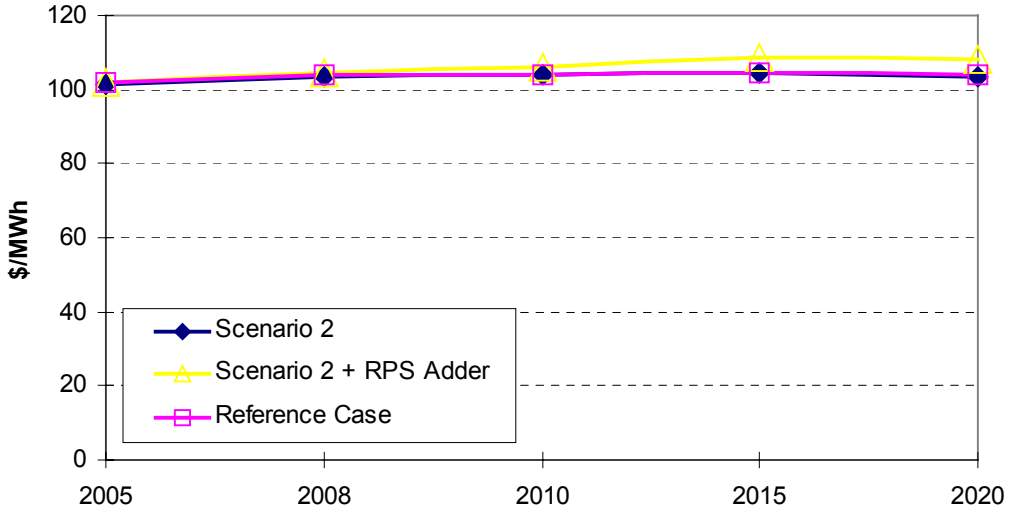


Figure 4.8: Average Retail Electricity Prices*
Policy Scenario 2



* Assumed Retail charges are $61.77/MWh in addition to firm wholesale prices. Source: EIA.

Figure 4.9: Change in Capacity Additions
From Reference Case to Policy Scenario 2

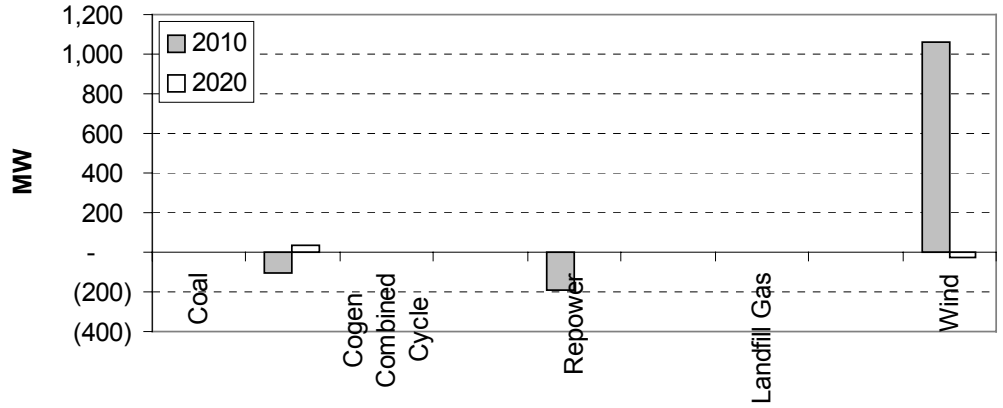
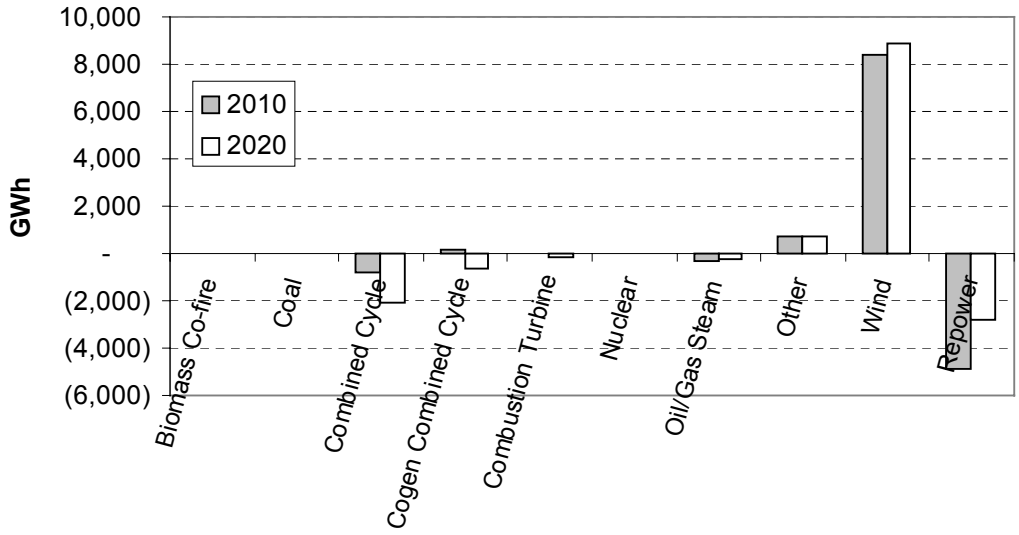


Figure 4.10: Change in Generation by Type
From Reference Case to Policy Scenario 2



Policy Scenario 3: New York-Only 25 percent Carbon Cap with an RPS and Moderate EE

In its analysis of a New York-only carbon cap on the electricity sector set at 25 percent below 1990 levels, coupled with moderate EE measures (Policy Scenario 1) and a Renewable Portfolio Standard (Policy Scenario 2), ICF projected the following outcomes compared to the reference case:

- As expected, the carbon cap reduces New York emissions to 25 percent below the 1990 levels in 2010 and 2020.
- New York carbon emissions decline by nine percent (-1.3 MMTCE) in 2010 and by 14 percent (2.1 MMTCE) in 2020 below the level they would have been in the absence of the cap (Figure 4.11).
- Average wholesale marginal electricity prices (energy only) are projected to decrease incrementally in New York by 0.3 percent (-0.11 mills/kWh) in 2010 and to increase by 0.33 percent (+0.12 mills/kWh) in 2020.
- Average wholesale capacity costs – the cost of obtaining required reserve capacity – decline by 7.1 percent in 2010 and by 6.7 percent in 2020.
- Average wholesale firm power prices (combined energy and capacity prices) are the same as in the reference case in 2010 and decline by 0.7 percent in 2020.
- Assuming that additional retail charges average $61.7/MWh as reported by EIA, Policy Scenario 3 would result in average retail rate increases, including the RPS adder, of 1.8 percent in 2010 and 4.1 percent in 2020 (Figure 4.12).
- Natural gas consumption in the electricity sector would decline by 16 percent in 2010 and by 23 percent in 2020, with a slight decline in natural gas prices in 2010 and no effect in 2020. Expenditures on natural gas are projected to be $329 million *less* in 2010 and $599 million *less* in 2020.
- The total electricity system costs would decline by 1.4 percent (- $60 million) in 2010 and by 4.2 percent (- $215 million) in 2020.
- By 2020, 4,605 cumulative MW of coal, oil or gas steam capacity would be repowered to operate as natural gas combined cycle, about 1,125 MW *less* than in the reference case;[62] an additional 2,600 MW of wind capacity would be added compared to the reference case; 1,500 fewer MW of combined cycle capacity would be added; and the total cumulative capacity added in Policy Scenario 1 is 10,391 MW, a mere 42 MW greater than in the reference case (Figure 4.13).
- 24 percent of generation from coal plants – over 6,000 GWh, which is roughly equivalent to 875 MW of coal capacity – would be fueled by biomass-co-firing, maintaining the total output from coal plants compared to the reference case but reducing coal consumption and emissions from coal plants by 24 percent; old oil and gas steam generation would decline by less than one percent in 2010 and 2020; NGCC would drop by 64 percent in 2010 and by 45 percent in 2020; generation from repowering would decline by 22 percent in 2010 and 26 percent in 2020; and cogeneration would remain nearly constant in 2010 and would decline by eight percent in 2020. Wind power and biomass co-firing makes up most of the

[62] The biomass co-firing option was limited to 20 percent of total coal capacity in New York.

difference in generation, with wind increasing by 895 percent in 2010 and by 161 percent in 2020 and co-firing increasing by over 6,000 GWh (Figure 4.14).[63]

- The loss in the total asset value for all generating units in New York State, as a result of Policy Scenario 3, is $648 million (-2.8 percent), with non and low carbon emitting units increasing and coal and oil units decreasing.
- The cost of CO_2 allowances is projected to range between $0.28 per ton to $0.42 per ton during the period 2010 to 2020.
- Power imports from the PJM region and Ontario into New York are projected to increase by varying degrees through 2020. Relative to the reference case, imports increase by nine percent in 2008, by 3.3 percent in 2010, by five percent in 2015, and significantly by 25 percent in 2020.

Despite increases in power imports from PJM East and Ontario into New York under a carbon cap of 25 percent below 1990 levels, emissions in these two regions do not show significant increases because the additional generation is primarily from natural gas-fired combined-cycle capacity. As shown in Table 4.4, carbon emissions in PJM East increase slightly, by 0.2 MMTCE in 2010 and 0.8 MMTCE in 2020, respectively. In Ontario, carbon emissions do not change until 2020, when they decrease slightly by 0.1 MMTCE. Emissions in New England are expected to decrease by 0.1 MMTCE in 2010 and increase by the same amount in 2020. Accounting for the net emissions in PJM, Ontario and New England, the net carbon reduction in the region as a whole is 1.4 MMTCE in 2010 and 1.8 MMTCE in 2020 (see Table 4.4). A New York-only carbon cap of 25 percent below 1990 levels is not expected to lead to any net additions in carbon emissions from power imports in 2010 and only a small amount in 2020.

Table 4.4: Net Carbon Emissions Reductions in New York, PJM East Region, New England and Ontario Under a 25 Percent Carbon Cap Case (MMTCE)

Region	2010	2015	2020
New York	–1.32	–1.76	–2.11
PJM	+0.06	+0.08	+0.37
New England	–0.10	0.00	+0.07
Ontario	–0.02	0.00	–0.08
Net reductions	–1.4*	–1.68	–1.76

MMTCE = million metric tons of carbon equivalent PJM = Pennsylvania, New Jersey, Maryland
*Numbers appear not to add correctly because of rounding.

Individually, moderate energy efficiency policies would result in 0.7 MMTCE of reductions in 2010 and 0.9 MMTCE in 2020, and the RPS would result in 0.6 MMTCE in 2010 and 2020. Although some of the emission reduction benefits of the policies as implemented separately are lost when implemented jointly, most of the reductions remain. Because the moderate EE and RPS policies achieve most of the reductions, the carbon cap imposes little constraint on the electricity system, explaining why the price of carbon allowances is so low – between $0.28 and $0.42 per ton.

[63] Since biomass co-firing is not in the reference case, it is impossible to report a percentage increase in the Scenario.

Figure 4.11: New York Carbon Emissions
Policy Scenario 3

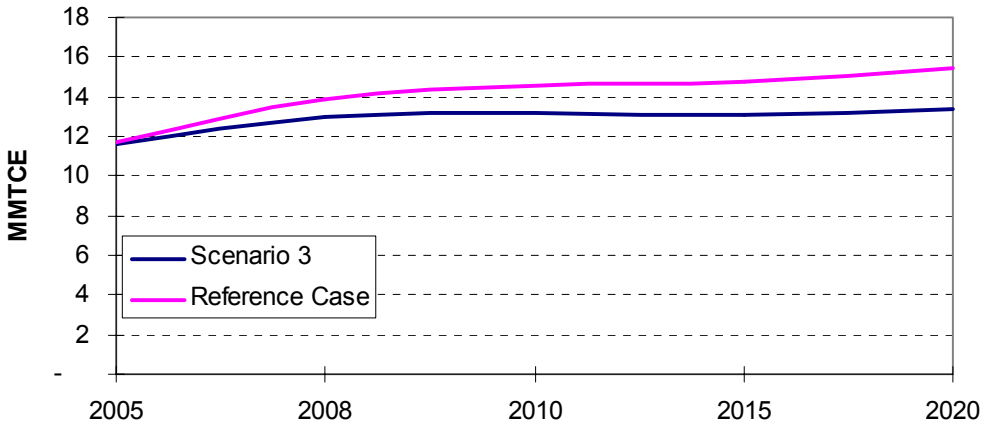
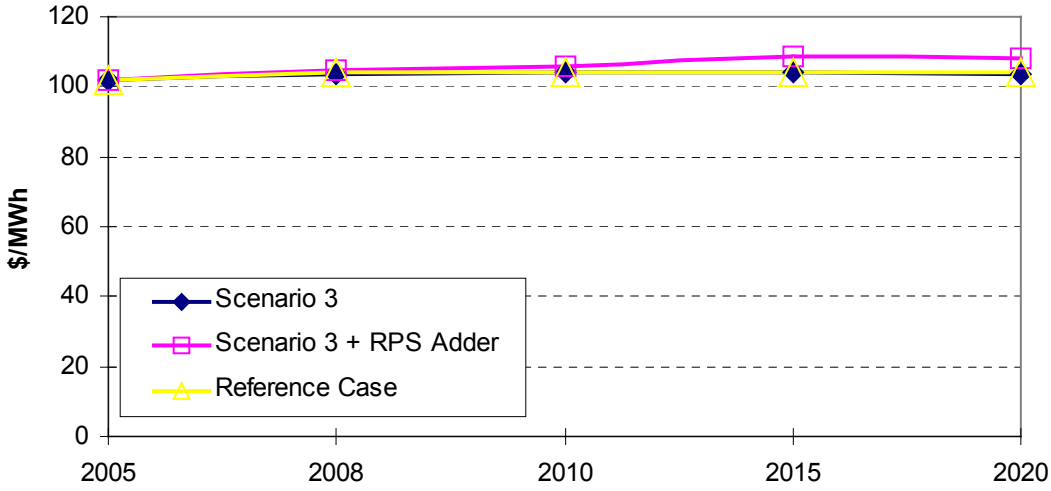


Figure 4.12: Average Retail Electricity Prices*
Policy Scenario 3



* Assumed Retail charges are $61.77/MWh in addition to firm wholesale prices. Source: EIA.

Figure 4.13: Change in Capacity Additions
From Reference Case to Policy Scenario 3

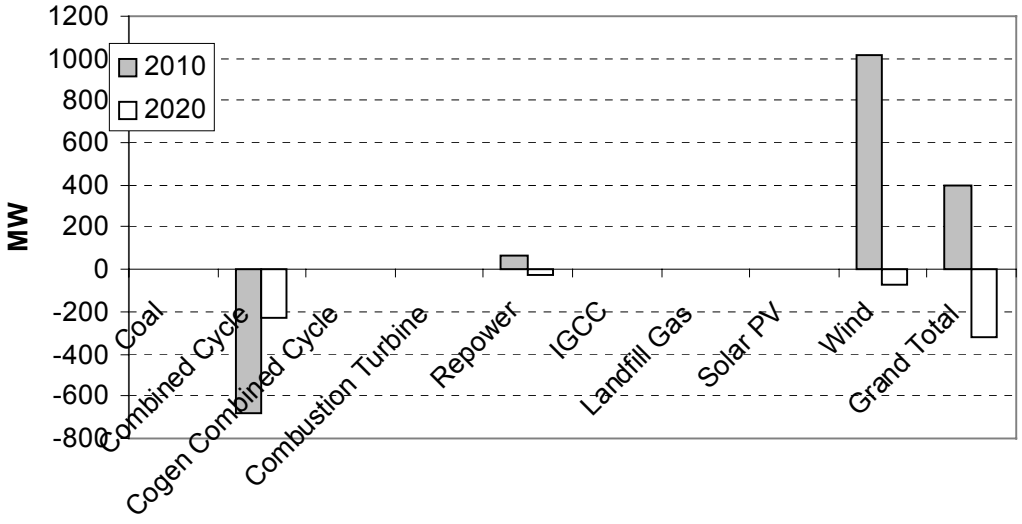
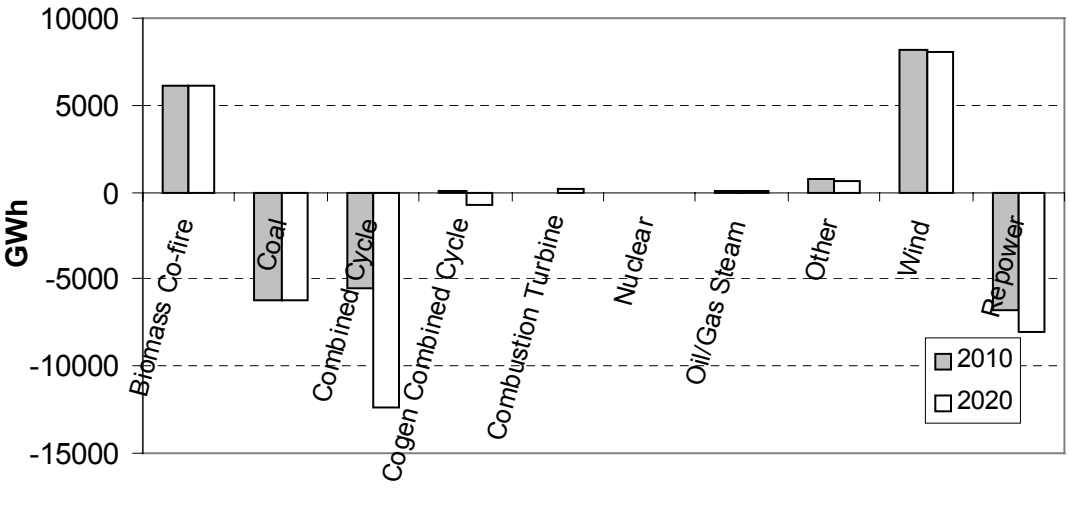


Figure 4.14: Change in Generation by Type
From Reference Case to Policy Scenario 3



Policy Scenario 4: 25 percent below 1990 Carbon Cap for New York (with RPS and Moderate EE), plus 1990 Carbon Cap for New England (with Moderate EE)

In this scenario, a regional carbon cap covering New York and New England is set equal to 25 percent below 1990 levels by 2010 for New York plus 1990 levels by 2010 for New England. As in Policy Scenario 3, New York is assumed to have a moderate energy efficiency policy and an RPS. New England is assumed to have a moderate energy efficiency policy. ICF projects that, relative to the reference case, when New York and New England both have carbon caps and policies as outlined directly above and are allowed to trade emissions to reach the caps:

- New York carbon emissions decline by 2.4 MMTCE (16.5 percent) in 2010 and 3.4 MMTCE (21.9 percent) in 2020 compared with the reference case, resulting in carbon emission levels in New York at 31 percent below 1990 levels in 2010 and after (Figure 4.15).
- Average wholesale marginal electricity prices are projected to increase in New York by 2.8 percent (+1.0 mills/kWh) in 2010 and by 6.2 percent (+2.3 mills/kWh) in 2020.
- Average wholesale capacity costs in New York increase by 4.9 percent in 2010, but decrease by 10.9 percent in 2020.
- Average wholesale firm power prices (combined energy and capacity prices) in New York would increase by 3.1 percent in 2010 and by 3.8 percent in 2020 (Figure 4.16).
- Assuming that average additional retail charges are $61.7/MWh, Policy Scenario 4 would result in an average retail rate increase, including the RPS adder, of 3.1 percent in 2010 and 6.1 percent in 2020 in New York.
- The total electricity system costs for New York would decline by 6.8 percent in 2010 and by 12.5 percent in 2020.
- By 2020, 1,218 fewer MW of coal, oil or gas steam capacity would be repowered to operate as natural gas combined cycle;[64] wind capacity would increase by 2,603 MW; 2,529 fewer MW of combined cycle capacity would be added; 111 MW of landfill gas capacity would be built, while none was built in the reference case; and the total cumulative capacity added in Policy Scenario 4 is 9,316 MW, which is over 1,000 MW less than the reference case, a decrease of ten percent (Figure 4.17).
- Over 6,000 GWh of electricity, roughly equivalent to 875 MW of capacity, would be generated from biomass co-firing – there was no generation from co-firing in the reference case – and total coal generation including biomass co-firing would decline by about 2.6 percent in 2010 and 2020 compared to total coal generation in the reference case; old oil and gas steam generation would increase slightly by 0.7 percent in 2010 and by 2.1 percent in 2020; NGCC would decline significantly by 64 percent in 2010 and by 76 percent in 2020; generation from repowering would decline by 37 percent in 2010 and 30 percent in 2020; and cogeneration would decline in 2010 by 15 percent and in 2020 by six percent. Wind power would increase substantially by 896 percent in 2010 and by 161 percent in 2020 (Figure 4.18).
- The cost of CO_2 allowances is projected to range between $3.15 per ton to $5.41 per ton during the period 2010 to 2020.

[64] The biomass co-firing option was limited to 20 percent of total coal capacity in New York.

- Policy Scenario 4 results in an increase in total asset value for all generating units in New York by $182 million compared to the reference case.
- Power imports from PJM, New England and Ontario into New York are projected to increase substantially by 52 percent in 2010 and by 137 percent in 2020.

Under New York and New England carbon caps as outlined in this scenario, carbon emissions in New York and New England both fall to meet the aggregate reductions dictated by the two caps. Scenario 4 results in a reduction of 3.4 MMTCE in 2010 and 5.5 MMTCE in 2020 for New York and New England combined. But there is some net increase in emissions to surrounding areas because of increased electricity imports, offsetting some of the additional carbon reductions (see Figure 4.19). Adjusted for leakage, the net reduction for New York, New England, PJM and Ontario combined is 2.6 MMTCE and 4.1 MMTCE in 2010 and 2020. Leakage of carbon emissions totals 0.7 MMTCE in 2010 and 1.4 MMTCE in 2020.

Policy Scenario 4 Compared to Policy Scenario 3

Comparing the results of the New York and New England cap case to the case with the New York-only cap, Policy Scenario 3, New York carbon emissions decline by an additional 1.1 MMTCE in 2010 and 1.3 MMTCE in 2020. Net regional emissions, including New York, New England, PJM and Ontario, decline by an additional 1.4 MMTCE in 2010 and 1.8 MMTCE in 2020 compared to Policy Scenario 3 (Figure 4.19). Average wholesale electricity prices increase by 3.1 percent in 2010 and by 5.9 percent in 2020. Average retail prices, including the RPS adder, increase by 1.3 percent and 1.8 percent compared to Policy Scenario 3. About 1,000 fewer megawatts of natural gas combined cycle plants are constructed. The cost of CO_2 allowances is projected to range between $3.15 and $5.41 per ton during the period 2010 to 2020 compared to $0.28 to $0.42 per ton in Policy Scenario 3. Power imports are expected to increase in Policy Scenario 4 compared to Policy Scenario 3 by 89 percent and 119 percent in 2010 and 2020, respectively.

Figure 4.15: New York Carbon Emissions
Policy Scenario 4

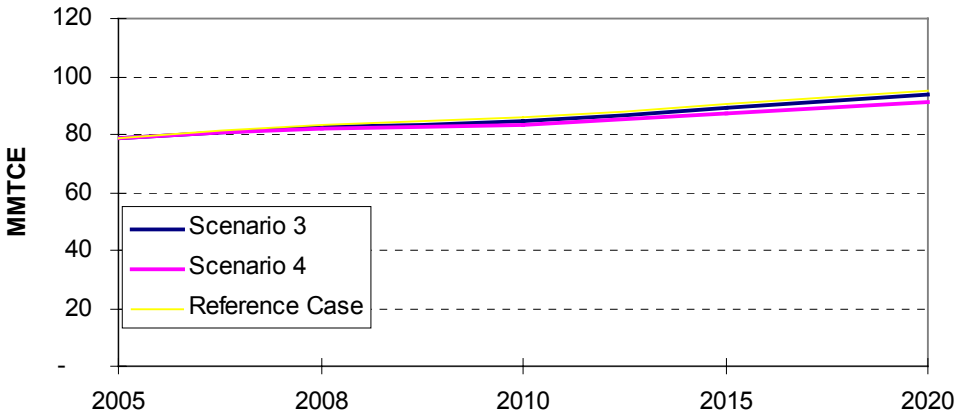
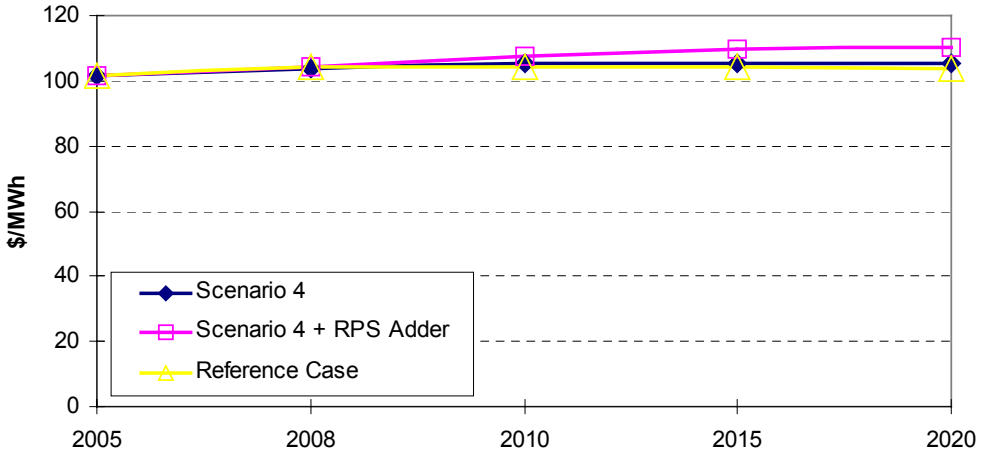


Figure 4.16: Average Retail Electricity Prices*
Policy Scenario 4



* Assumed Retail charges are $61.77/MWh in addition to firm wholesale prices. Source: EIA.

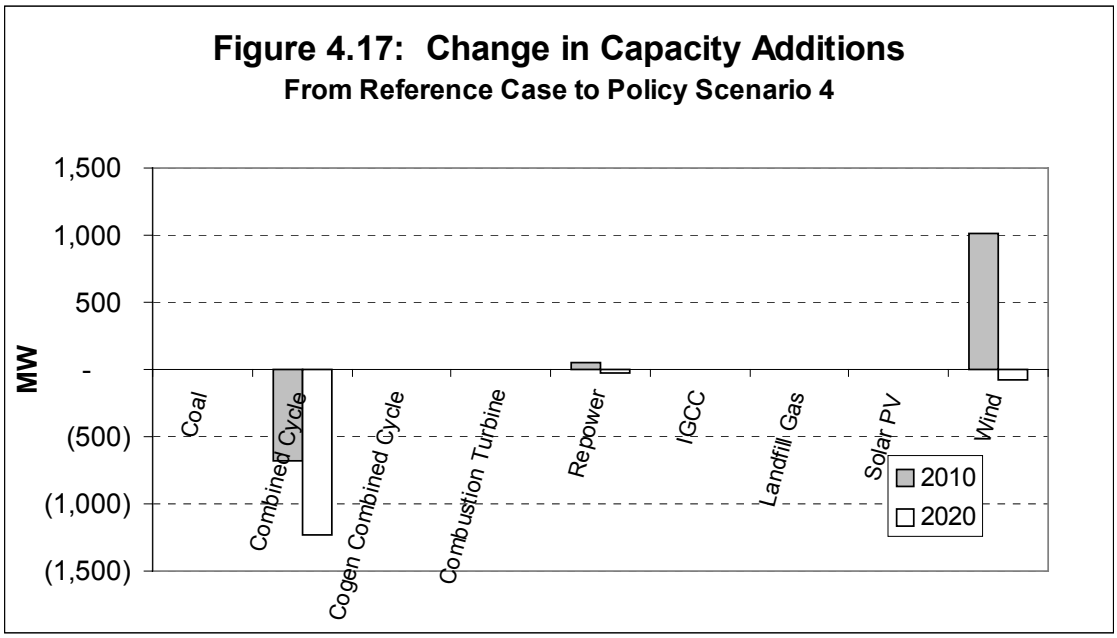


Figure 4.17: Change in Capacity Additions
From Reference Case to Policy Scenario 4
1,500
1,000
500
-
(500)
(1,000)
(1,500)
MW
Coal
Combined Cycle
Cogen Combined Cycle
Combustion Turbine
Repower
IGCC
Landfill Gas
Solar PV
Wind
2010
2020

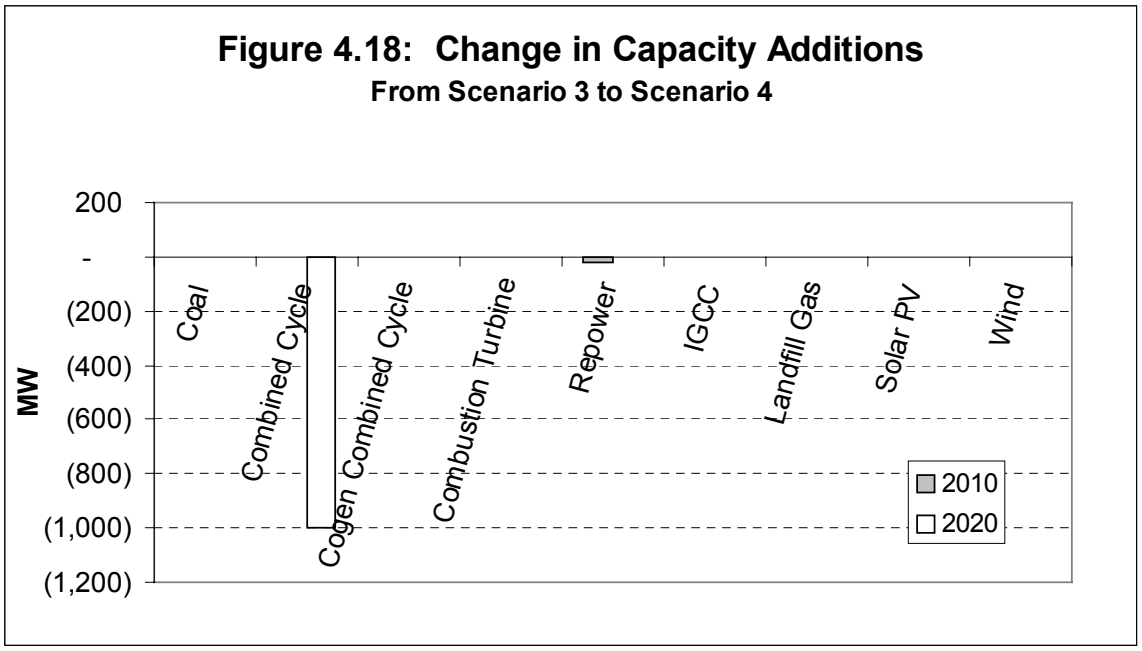


Figure 4.18: Change in Capacity Additions
From Scenario 3 to Scenario 4
200
-
(200)
(400)
(600)
(800)
(1,000)
(1,200)
MW
Coal
Combined Cycle
Cogen Combined Cycle
Combustion Turbine
Repower
IGCC
Landfill Gas
Solar PV
Wind
2010
2020

Figure 4.19: Change in Carbon Emissions
From Scenario 3 to Scenario 4

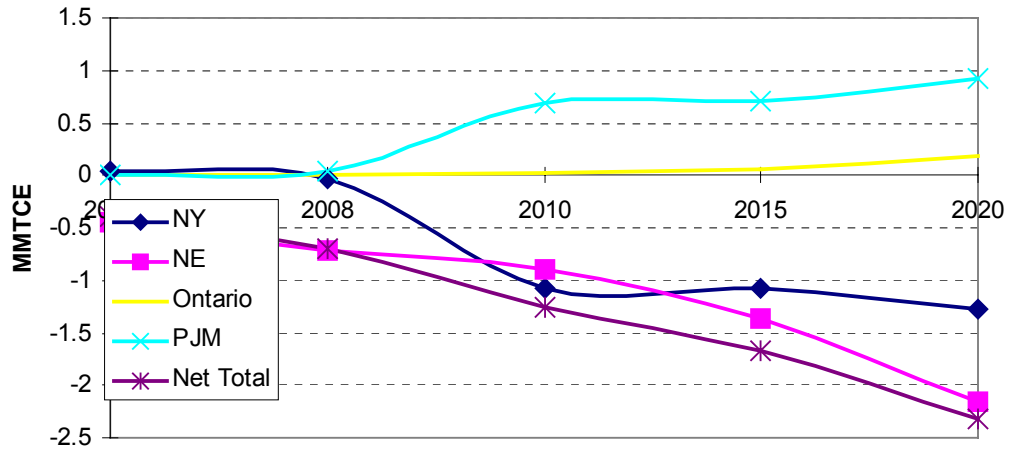
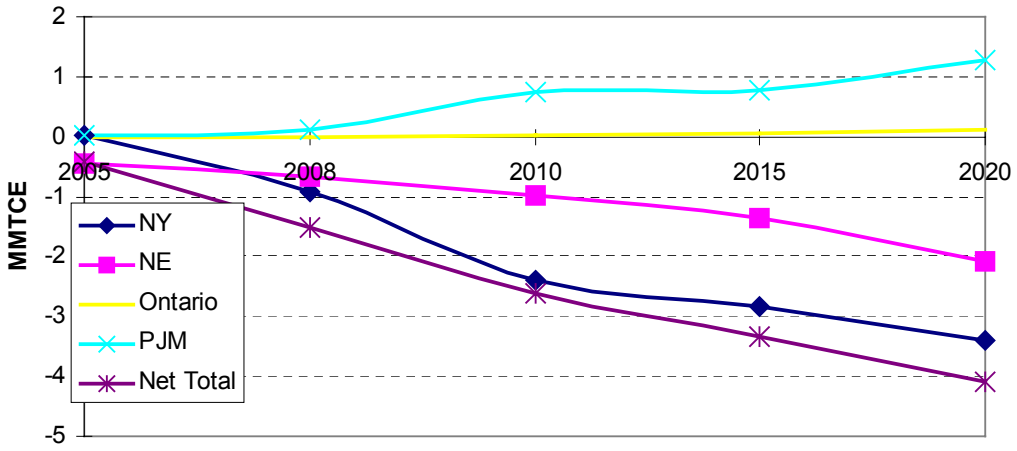


Figure 4.20: Change in Carbon Emissions
From Reference Case to Scenario 4



D. RECOMMENDED PACKAGE OF ACTIONS

Electricity-Sector Carbon Cap and Trade

As noted earlier, implementation of a 25 percent New York cap with a stabilization cap in New England will increase wholesale electricity prices in New York by 2.8 percent in 2010 and 6.2 percent in 2020. In concert with its ADR Program, a carbon cap-and-trade program will create a holistic regulatory framework for addressing emissions of carbon and multiple pollutants from New York's power plants in a cost-effective manner. A detailed implementation plan through legislation or administrative action should be developed.

Empirical evidence indicates that market-based cap-and-trade systems, such as the Title IV Acid Rain program under the Clean Air Act and regional NO_x reduction in the northeastern states, meet emissions targets effectively with lower compliance costs and greater flexibility for the industry as compared with a command-and-control approach. The carbon cap should be implemented through a cap-and-trade program, consistent with the Federal and State NO_x and SO_2 reduction programs in New York. However, a suite of implementation issues will need to be resolved, including the following:

1. When should the cap be phased in and how should reduction levels be set over time?
2. What sources should be covered under the program (>15MW)?
3. How should the allowance allocation scheme be designed?
4. How should allowance banking provisions be structured?
5. Should the cap be designed to allow eventual expansion to smaller electricity generating sources, industrial boilers and other sectors?
6. Should an offset program be designed?

Competitiveness Implications Of New York's Electricity-Sector Cap In Relation To Neighboring States

In the course of the Task Force's deliberations, State agencies expressed concern that a unilateral cap imposed on New York's electricity generators would economically disadvantage them, or some of their industrial and commercial customers, in competition with counterparts in other states where there was not a carbon cap on electricity generation. ICF's analysis provides some insight into this question by presenting projected wholesale electricity prices for New York State as well as each of the neighboring power pools under each of the proposed policy scenarios. The analysis also assesses the asset values of existing generating units in New York under the various policy scenarios.

The policy context is important. In the reference case developed in collaboration with NYSERDA and the Electricity working group, ICF found that carbon emissions in New York from electricity generation would be equal to 17 percent below 1990 levels in 2010, given the assumptions agreed to for the modeling analysis. This means that New York would need to reduce emissions an additional eight percent below 1990 levels to reach the 25 percent target.

Table 4.5: Policy Matrix for Recommended Actions in Electricity Sector					
Inventory and Registry	**Cap and Trade**	**Policies and Measures**	**Incentives Funds**	**Voluntary Programs**	**Research and Development**
√ Require power-generating plants to report	√ A mandatory carbon cap of at least 25 percent below 1990 levels to be implemented through trading	√ Renewable portfolio standard (six percent in 2010; eight percent in 2020) √ Utility regulatory changes to encourage distributed generation/ combined heat and power √ Net metering for distributed RE	√ Extended SBC and NYPA/LIPA energy efficiency program √ Regulatory incentives for repowering old fossil plants to clean generating units	√ State green power purchase √ Green marketing	√ Carbon capture and sequestration

The projected pattern of declining power sector emissions in New York is a somewhat unique phenomenon among US states—most project carbon emissions to rise in the future if no additional emissions reductions are enacted. New York's emissions are projected to fall as a result of the construction of a number of proposed combined-cycle natural gas generating facilities in the State, the aggressive energy efficiency program financed by the State's public benefit fund, and the implementation of the Governor's Acid Deposition Reduction Program, as well as other programs. In addition, New York's electricity-related emissions in 1990 were higher than normal because several nuclear units were not operating at normal levels in 1990.

In contrast to New York's emissions projections, New England electricity-related emissions were projected to be nine percent above 1990 levels in 2010 and those of the neighboring Pennsylvania, New Jersey, Maryland (PJM) region are projected to be 19 percent above 1990 levels.

New York's generators, in aggregate, would need to reduce emissions by eight percent annually to achieve a cap of 25 percent below 1990 in 2010. New England generators in aggregate would need to make a nine percent reduction in 2010 to achieve stabilization at 1990 levels in 2010. These levels of effort appear comparable, and ICF's modeling results bear that out: New York and New England wholesale electric prices are projected to rise by comparable amounts under such a regional strategy – a little less than three percent in 2010. However, if New York acts unilaterally and New England takes no action, New York wholesale electric prices are projected

to fall very slightly in 2010 and increase slightly in 2020 with a 25 percent New York only cap. New England prices are projected to be unchanged in 2010 and to rise slightly in 2020.

In short, unilateral action by New York is slightly more positive for its competitive position with neighboring states than a New York cap coupled with a comparable New England states cap.

Whether state-specific or regional, a New York power sector cap will put the state at a competitive disadvantage over uncapped states when compared with a business as usual scenario. New York electricity prices are projected to be more competitive with wholesale prices in the PJM East region, and in the Midwest East Central Area Reliability (ECAR) region, under - New York only caps than they would be under a broader regional effort with New England. [65] Further analysis is needed to understand the effects on New York electricity prices of new caps that encompass Pennsylvania, New Jersey and other neighboring states to the south.

The second indicator of competitiveness, the effect on the asset value of New York's electric generators, could lead to a different conclusion. Under a regional cap, the asset value of New York's existing generators may increase more than under a New York-only cap. ICF modeling analysis found that when the New York 25 percent carbon cap is implemented in conjunction with the New England stabilization cap, the total asset value for all generating units in New York will increase by $83 million compared to the 25 percent New York-only carbon cap. Relative to business-as-usual, the regionally coordinated carbon reduction effort increases the value of New York generating assets by $18 million. This increase results from the relatively higher prices for carbon and wholesale energy that are projected to occur in the proposed regional cap, as well as the sale of carbon reduction credits from New York generating units to New England due to the relatively lower cost for carbon reductions in New York. While no modeling was carried out on new caps in Pennsylvania, New Jersey and other neighboring states, it is reasonable to expect that action by those states to establish carbon caps would be advantageous to the competitive position of New York electricity industry.

A caveat: The ICF analysis is based on the assumption that existing generating plants receive allowances on the basis of their historic carbon emission levels. Under such a system, coal plants receive a large share of allowances. In New England, however allocation of allowances under the NO_x trading program has been based on emission rates per kWh, a generation performance standard. This system rewards "clean" generators such as combined-cycle gas, and generally penalizes coal units. If the regional allocation system for CO_2 were based on a similar system, New York generators as a group would be at a disadvantage because there more coal units are in the New York mix than in New England. Asset values for the New York generators may not prove to be higher under the regional cap scenario.

Assessing which options are better from a State competitiveness point of view depends on whether the concern is weighted more heavily toward protecting the competitive position of electricity generators or the competitive position of industrial, commercial, and residential

[65] This is because required carbon reductions are smaller in the New York only scenario and consequently carbon prices are projected to be lower in that scenario than in the regional scenario. It follows that New York electricity prices are also projected to rise less in the New York only scenario than in the regional scenario.

customers in terms of the level of electricity prices they face. Electric generators would be likely to be better off economically under a regional approach (25 percent below in New York, stabilization in New England, assuming allocation of allowances based on historic emission levels). Electricity consumers would likely be better off with a New York only cap of 25 percent. Further macroeconomic analysis would be helpful in determining the full range of effects on competitiveness, as such analysis was beyond the scope of this project.

Justification for the Cap-and-Trade Approach. To combat acid rain pollution in New York, the Governor launched the ADR Program that directed the New York State Department of Environmental Conservation (DEC) to further cut NO_x and SO_2 emissions from power plants in New York State. In the next ten years, the US electric power industry is likely to face requirements to reduce emissions of NO_x, SO_2, fine particulates, and mercury. At the Federal level, various "four-pollutant" (4P) bills have been introduced to address emissions of NO_x, SO_2, mercury, and CO_2 from US power plants.[66] Legislative and regulatory 4P initiatives are arising at the State level such as the new 4P legislation in Massachusetts and New Hampshire.[67] New York also joined the Northeast states to support Federal efforts to achieve integrated reductions of these pollutants from power plants.[68] The implementation of this strategy could have significant implications for the investment decisions and compliance strategy of New York's electricity industry.

A carbon cap-and-trade program has the benefit of guaranteeing emissions reductions at a given level while achieving cost-effective compliance. Applying a carbon cap along with caps on other pollutants will result in the following benefits:

- *Local air pollution reductions and improvements in human health and the environment*: A multi-pollutant cap that includes CO_2 will greatly reduce emissions of NO_x, SO_2, mercury, and air toxics from power plants. ICF's IPM analysis shows that reducing carbon emissions in New York to 31 percent below 1990 levels will further reduce emissions of NO_x, SO_2, and mercury from New York's power plants. The population in New York will benefit from reduced risks from hazardous pollution exposure and improved ecosystem health from reduced acid deposition. In order for the NO_x and SO_2 benefits to occur, however, national caps on the pollutants need to be reduced. Otherwise, reductions in New York will simply be banked and traded to companies in other states, thereby negating the benefits of New York reductions.
- *Enhancement in the market competitiveness of clean, efficient power-generation technologies and zero-emission renewable energy sources*: Carbon caps imposed on fossil-fueled power plants makes zero- or low-emitting generation technologies economically more attractive. Electricity prices would increase to reflect the increased costs of carbon.

[66] For example, Senator Jeffords' Clean Power Act (S.556) and H.R. 1256, the Clean Smokestacks Act of 2001, introduced by Congressman Waxman.

[67] See HB284, The New Hampshire Clean Power Act: An Integrated Strategy to Reduce Emissions of Multiple Pollutants from New Hampshire's Electric Power Plants, April 2002.

[68] *Northeast States' Perspective on National Legislation to Reduce Power Plant Emissions,* September 2001. Reduction targets are approximately 78 percent for SO_2 from Phase II, 80 percent for NO_x, and 90 percent for mercury by 2010 as well as stabilizing CO_2 to 1990 level by 2010, with an additional 10 percent reduction by 2020.

- *Lower cost of compliance*: A multi-pollutant cap yields a lower total program cost compared with a pollutant-by-pollutant approach. In addition, modeling analyses by ICF and others show that carbon allowance prices are lower under a multi-pollutant cap compared with regulating carbon alone, suggesting that the total compliance cost to meet the carbon target is lowered when requirements to reduce other pollutants are imposed simultaneously.
- *Control of old, grandfathered coal-fired power plants*: A multi-pollutant cap on power plants in New York State will directly affect older, inefficient coal plants exempted under the Clean Air Act. Carbon caps, as well as caps on other emissions, would be a significant constraint on less efficient plants and may promote compliance strategies such as reducing generation and switching to clean, efficient technologies (e.g., natural gas combined cycle and biomass co-firing). With a carbon cap of 25 percent below 1990 levels, ICF projects that over 6,000 GWh of generation would be powered by biomass co-firing, maintaining the total output from coal plants compared to the reference case; generation from old oil and gas steam units would decline slightly, by less than one percent in 2010 and 2020.
- *Opportunities for enhanced reliability of electricity supply.* Although New York's electricity system is highly reliable, reliability has been a major concern in New York, particularly in New York City. Reliability problems in some cases are caused by bottlenecked transmission, not capacity shortage. A carbon cap is anticipated to reduce generation from the less efficient old fossil-fueled plants that could contribute to reliability problems. Old coal and oil generation capacity will be replaced with new, efficient generation from natural gas or other less carbon-intensive fuels. As demonstrated in a CCAP study, if sited in areas with transmission constraints, new, efficient power plants can not only alleviate the reliability pressure but also reduce the emissions and costs from electricity generation.[69] The State can adopt policies and measures (e.g., tax incentives and streamlined permitting process) to expedite the market deployment and siting of cleaner, efficient generating capacity. Nevertheless, expansion of wind generation may require additional backup power resources because wind units have much lower capacity factors because of the intermittent nature of the wind resources.

Policy Incentives for Repowering. In addition to the electricity sector carbon cap, the State should encourage repowering of old, inefficient coal-fired power plants through: financial incentives, a prioritization mechanism in the Article X siting process for new or renovated plants at existing power plant sites, and voluntary agreements or Consent Orders for plants under enforcement action by DEC. This combination of incentives will provide benefits in the form of GHG and local air pollutant emissions reductions, increases in in-state electricity generation and lower power imports. New York State has amended its power plant siting law (Article 6X) to provide expedited regulatory treatment for repowering facilities on existing generation sites.

[69] Source: Morris, C., Shelby, P. *Clean Power, Clean Air and Brownfield Redevelopment.* Washington, DC: CCAP, 2001.

Some incentive policy options to consider include the following:

- *Financial assistance and investment tax credits for repowering projects.* The State could consider financial incentives to overcome the cost barrier of renovating existing coal plants as new natural gas combined cycles. However, the potential for free riders who would repower to NGCC anyway to meet the carbon cap needs to be considered in designing the incentives.

- *Public-private initiative to encourage repowering,* such as power-purchase agreements and local taxation agreements (e.g., Payment in Lieu of Taxes, or PILOTS).

- Negotiate repowering agreements as part of ongoing DEC and Attorney General settlement discussions or litigation with power plants in New York State.

Renewable Policy

Implementing a Renewable Portfolio Standard. New York State has significant potential indigenous resources for wind power, solar power, and sustainable biomass. New York should take aggressive steps to encourage electric generation from these and other clean-energy technologies. The renewable policy should include a combination of policies and measures, including an RPS that requires six percent of the electricity generation to come from renewable sources in 2010 ramping up to eight percent by 2020. Renewable energy sources should be defined as generation technologies that produce electricity using solar thermal energy; photovoltaics; wind; fuel cells; geothermal energy; methane waste; sustainable biomass; and new, low-impact-certified hydropower. [70]

Many states, such as New Jersey, Massachusetts, Connecticut, Maine, Arizona, Texas, Nevada, and New Jersey, have signed the RPS into law. Bills with the RPS are pending in Kansas, Nebraska, Iowa, New Mexico, Vermont, and Wisconsin. New York could also implement the RPS through legislation and adopt policy measures toward meeting the goal. The State could establish a green power credit market and allow in-state renewable power suppliers or generators to purchase and trade green tags.

A suite of policy programs has been implemented to encourage the development and use of renewable energy resources in New York. Governor Pataki's Executive Order 111 requires that

[70] On February 19, 2003, the PSC issued a proceeding for an RPS in New York State. The proceeding calls for 25 percent of electricity supplies in the State to come from renewable resources, including hydroelectric power. This level appears to be roughly consistent with CCAP's recommendation for an RPS that requires six percent of electricity supplied in the State to come from renewable energy renewable energy sources in 2010, ramping up to eight percent by 2012 and thereafter. The renewable energy sources recommended by CCAP include wind, landfill gas, biomass and solar energy, excluding hydro energy. The IPM base case projects that electricity generation from hydropower will account for approximately 18.3 percent of total generation in 2010 and 16.5 percent of generation in 2020. The gap between current hydroelectric generation and the 25 percent figure is roughly consistent with the renewable portfolio standard recommended by CCAP. Details for the design of the RPS still need to be resolved.

State facilities must purchase 20 percent of their energy from renewable energy sources by 2010. NYSERDA supported the construction and operation of 48.1 MW of wind energy plants by 2001, with over 210 MW of wind capacity expected by 2006 under the SBC program. In addition, NYSERDA has invested $1.4 million to spur the commercial harvesting of willows as a sustainable fuel source. Approximately 500 acres of willows have been planted to date, with enough biomass to add about 0.75 MW of electricity generation capacity. Co-firing of the first commercially harvested willow was planned at the Dunkirk power plant in Western New York in 2002. Built on the success of the existing programs, additional policy incentives can help New York achieve an aggressive renewable agenda that boosts employment and economic development.

As illustrated by ICF's IPM modeling analysis, the RPS requirement of six percent in 2010 and eight percent in 2020 will significantly reduce carbon emissions, lower wholesale electricity prices and reduce power imports from business-as-usual levels. IPM modeling shows that on average, an RPS lowers the wholesale electricity generation price by 0.4 mills/kWh in New York in 2010 and 2020. However, as discussed in the section above, the RPS will entail increased capital investments in renewable energy and increases in retail electricity rates of two mills/kWh and 4.4 mills/kWh in 2010 and 2020, respectively. The portion of the average retail electricity price that covers transmission, distribution and other retail charges equals $61.77 per MWh in New York, as reported by the Energy Information Administration. Adding $61.77 per MWh to the wholesale firm electricity price projections by ICF will provide reasonable projections of retail prices. Because the RPS adder will be paid at the retail level, distributed across retail customers, not at the wholesale level, the RPS adder should be applied to the average retail price to determine the correct percentage change in electricity prices resulting from the RPS. The net impact of an RPS on retail electricity prices, including the RPS adder, would be 1.8 percent in 2010 and by 3.9 percent in 2020. The State should implement the RPS in tandem with a carbon cap for the electricity sector because inclusion of RPS requirements will significantly ease compliance with the cap, reduce power imports, and develop a new industry in the state.

New York has significant potential for renewable energy. Wind energy potential studies show that New York has approximately 5000 MW of wind energy potential, much of it concentrated in upstate farming areas. A wind energy potential map developed by *True Wind Solution,*[71] shows locations with average wind speeds capable of supporting commercially viable wind energy facilities in New York. Solar PV is also found to have strong potential to meet summer peak time demand in Long Island, New York City, Lower Hudson Valley, and elsewhere. In a report commissioned by Oak Ridge National Laboratory and completed in January 2001, ICF Consulting concluded that biomass fuels could be substituted for coal in sufficient quantities to replace 3.4 to 10.2 percent of New York's coal-fired generation by 2010. In another study commissioned by the National Renewable Energy Laboratory, OnLocation Inc. concluded that biomass co-firing could account for 3.7 percent to 10.7 percent of New York's generation within the same time frame. In the ICF modeling analysis, biomass co-firing was capped at 100 MW of coal capacity. The model selected all of the available capacity and would have selected more if it had not been constrained. On the basis of these studies, biomass potential is probably greater

[71] See http://www.abacuswave.com/truewind/.

than that assumed in the model, indicating that a higher percentage RPS above the six to eight percent requirement may be justifiable.

A comprehensive renewable energy agenda will result in significant economic development for the agricultural sector and provide much-needed fuel diversity over the next decade. Among many benefits are the following:

- *Potential Economic and Employment Benefits*. Significant economic benefits to New York State would result from widespread use of renewable energy sources. Jobs would be created in a new industrial sector, making New York a leader in renewable energy technology. A boost with renewable industries will significantly increase employment opportunities to meet the increased demand for renewable equipment, new plant construction, operation, and maintenance. Wind and biomass projects stand to provide an economic development boon to New York's agricultural sector.
- *Energy Diversity, Reliability, and Security.* Natural gas is currently projected to meet most of the increased need for electric generation. Increased use of wind, solar power, and other renewable energy sources can provide valuable fuel diversification and could exert downward pressure on natural gas prices, thus reducing the costs of electricity. The ICF modeling analysis projects that implementation of the RPS will lower total natural gas consumption and slightly reduce natural gas prices, which translate into annual savings of $165 million in 2010 and $175 million in 2020. Total system costs would be higher, but will likely be spread over all generation, reducing the impact on any one group of customers. Moreover, the fact that renewable generation sources are often distributed instead of centralized will alleviate the need to build new centralized power plants. Additionally, renewable resources enhance energy security in New York.
- *Environmental and Human Health Benefits.* Renewable energy sources, in most instances, emit no pollution, and therefore render significant human health benefits. The avoided emissions will reduce human health damages from NO_x, SO_2, particulate, and ozone pollution, and helps to mitigate acid rain pollution and water pollution in New York.

Other Recommended Renewable Energy Policies and Measures. Many barriers exist for renewable energy technologies; if left unchecked, these barriers could prevent a sustainable market for renewable energy sources in New York. Barriers range from high initial costs and uncounted environmental benefits to interconnection problems. To level the playing field and ensure the success of a robust renewable agenda, New York State should consider the following actions in addition to the RPS:

- *Extend EE measures that displace electricity generation.* (See Chapter V for details, including measures to encourage renewable energy.)
- *Environmental Disclosure and Green Pricing.* In addition to the environmental disclosure, New York State should implement a green pricing program to greatly enhance customer awareness and support for renewable energy technologies. Many surveys have shown that customers are willing to pay more for electricity from clean and renewable sources. Supportive market rules are important for allowing effective customer choice.

Electricity customers who switch suppliers could be given a shopping credit that includes avoided retail overhead costs, as enacted in Pennsylvania.

- *Net Metering.* The New York State Public Service Commission (PSC) should require distribution utilities to allow customers to interconnect small wind turbines (up to 100 kW) and commercial scale solar PV systems (up to one MW) without requiring any special metering (no ratchet meters) or unreasonable interconnection costs, and with bill netting on an annual basis. Alternatively the State can support legislation to extend the existing net metering to commercial-scale solar PV and small wind.
- *Minimize Interconnection and Electricity Rate Barriers.* At present, builders who pursue onsite generation face barriers related to interconnection. To assure that the clean DG market reaches its true potential, the PSC should modify utility regulation so utilities are not threatened by onsite generation. The best way to do this is to remove the linkage between distribution-related revenues and kWh sales over their system. See discussion in Chapter V for more detail.
- *Public Awareness and Consumer Education.* The State should launch voluntary programs to educate consumers about the environmental and other benefits associated with renewable energy and promote consumer green power purchase to foster a green market in New York.
- *Green Power Credit (Green Tag) Market.* New York should also establish a green power credit market and allow renewable power suppliers or generators to purchase and trade green power credits. The renewable credit trading will create flexibility in compliance with the State RPS by allowing those facilities that have produced less than the required percentage to buy credits from those who produce more.

Carbon Scrubbing and Disposal

Stabilization of atmospheric CO_2 levels will eventually require significant reductions in CO_2 emissions. Capture and disposal of carbon dioxide, often referred to as sequestration, will likely need to be a part of the solution. Today, a variety of sequestration technologies are on the drawing board, some needing further development, others coming on line in the next decade assuming the right economic incentives are in place.

Technologies for carbon capture and disposal already exist, and are practiced, often for reasons other than CO_2 mitigation. At present, CO_2 is being captured from natural gas wells, which need to remove the CO_2 prior to sale of the gas. In Norway, in response to the domestic carbon taxes of $50/ton, some companies are taking measures to inject the CO_2 into an aquifer deep under the North Sea. Injection into existing oil fields often has economic incentives of its own. For example in West Texas, CO_2 is used for enhanced oil recovery, and nearly half of the gas will stay permanently in the field. CO_2 is shipped to these sites from sources in Southern Colorado about 500 miles away.

In New York, a number of geologic formations are potential sites for carbon disposal. Western New York has a number of sedimentary basins with deep aquifers, some of which have the total thickness of overlying sediments exceeding 10,000 ft. This includes an equivalent of Mt. Simon Sandstone and several other candidates. In eastern New York there are also deep aquifers but

these formations are less ideal for CO_2 injection than those in western New York. The Oriskany deep saline formation is present under a good portion of the entire southern half of the State of New York. However, this aquifer has a very long history of hydrocarbon production of oil and natural gas. Fractures and other damage to the caprock have occurred over the past century of hydrocarbon recovery and may not be suitable for carbon sequestration. In southwestern New York, some coal bed seams could also be candidates for CO_2 disposal.

The costs for carbon capture and sequestration varies, depending on the vintage of fossil plants, the combustion technology used, disposal options, and transport distance. Retrofitting an existing power plant for CO_2 capture is relatively expensive. New integrated coal gasification combined-cycle (IGCC) plants could capture their CO_2 relatively easily. The cost of capturing CO_2 initially could be about $10 to $20 per ton. Transport may add another $10, and disposal is inexpensive at five dollars per ton. Carbon capture at the power plants would lead to zero emissions of other pollutants from smokestacks. EPA cost estimates for eliminating fine particulates from coal-fired power plants are comparable to our estimates for CO_2 capture and disposal. Consequently, some of the economic penalty could be compensated for by these additional benefits.

For this analysis, the Center assumes that by 2020, ten percent of New York's new coal capacity is IGCC with carbon capture and sequestration technology. The GHG reduction benefits are estimated to be 0.18 MMTCE in 2020, at a cost of $30/ton of carbon. This option was not included in the ICF modeling analysis.

Since sequestration into permanent sinks allows for easy accounting, the price of carbon sequestration should be feasible to include into the price of carbon-based fuels. The above numbers would suggest a long-term change in the price of electricity from 0.25 to three cents per kWh. The larger range is due to wide variations in carbon efficiency, ranging from an efficient natural-gas-driven plant to an old, inefficient coal plant.

Implementation. New York should carry out more research and feasibility studies to examine the reservoirs in New York. More data need to be collected and analyzed on the condition of the formations, sensitivity of the ecosystem surrounding the sites, and potential environmental impact of the carbon injection.

Smaller scale implementations could start in the next ten years from new coal capacity additions. The next step would be to phase in power plants that can capture CO_2 more easily. Several such designs are under consideration. Capture from the air requires a dedicated research and development effort, but could drastically change the outlook on sequestration options. Long-term methods such as mineral carbon sequestration could be implemented in New York but are likely to take at least another decade to reach technological maturity.

Generation Portfolio Standard to Protect Against Leakage of Carbon Reductions

The ICF modeling found that despite increases in power imports from PJM and Ontario into New York under Policy Scenario 3, emissions in these two regions do not show significant increases because the additional imports are primarily from natural gas-fired combined-cycle capacity in PJM East and Ontario. Accounting for the changes in emissions in New York, PJM, Ontario and New England as a result of carbon policies in New York, the net carbon reduction in the region as a whole is 1.4 MMTCE in 2010 and 1.8 MMTCE in 2020, compared to emission reductions of 1.3 MMTCE in 2010 and 2.1 MMTCE in 2020 in New York only. A New York-only carbon cap of 25 percent below 1990 levels is expected to lead to no net additions in carbon emissions from power imports in 2010 and only a small amount in 2020.

As shown in ICF's analysis of Policy Scenario 4 of a 25 percent cap below 1990 levels in New York (Policy Scenario 3) plus a stabilization cap in New England, emission leakage in the neighboring regions due to power imports is more noticeable. Carbon emissions in New York and New England both fall to meet the aggregate reductions dictated by the two caps. However, power imports from PJM and Ontario into New York are projected to increase substantially by 52 percent in 2010 and by 137 percent in 2020. These higher imports lead to some net increase of carbon emissions in surrounding areas, offsetting some of the carbon reductions in New York and New England. Emission increases in PJM and Ontario due to the power imports totals 0.7 MMTCE in 2010 and 1.4 MMTCE in 2020. If this emission leakage were subtracted entirely from New York reductions, the net reduction in New York would be 1.6 MMTCE in 2010 and 2.0 MMTCE in 2020. Net reductions for all four regions – New York, New England, PJM and Ontario – total 2.6 MMTCE in 2010 and 4.1 MMTCE in 2020.

If the New York electricity cap of 25 percent below 1990 levels is to be fully effective in concert with coordinated actions in New England states, a policy mechanism is needed to address emissions leakage in the neighboring regions. One option is setting a Generation Portfolio Standard (GPS) to govern carbon emissions rates associated with power sales to New York consumers. Modeled on the RPS, this mechanism would require that generation sold into the New York retail market would meet a specified emissions standard measured in carbon per kWh sold. The standard should be set at a level sufficient to ensure that it results in emissions reductions. The system needs to be designed in such a way that it does not discriminate against any retailer. All retailers, whether delivering kWh from in-state generation or from imported generation, should meet the same standard. New England and New Jersey have considered a similar approach and are currently monitoring all retail sales including imports through a disclosure requirement.

Emissions Tracking/Registry

Power suppliers or electricity generation providers who sell power in New York should report sources, generation mix, and GHG emissions for State and sectoral inventories.

As required by the US Department Energy, all the utilities and non-utility power plants report fuel consumption and electricity generation data by fuel type on a monthly and annual basis.[72] The reporting provides a good basis for estimating GHG emissions associated with electricity generation in New York. In addition, the Title IV units also report their CO_2 emissions to the EPA as part of the CEM requirements. Under the New York inventory and registry, a New York lead agency should request collection of the fuel consumption, electricity generation, and emissions data.

In addition, power plants that undergo repowering should report to the sectoral and State inventories their repowering activities, including annual fuel inputs by type, generation technologies, and efficiencies of old and new facilities, as well as estimates on GHG emissions prior to and post repowering.

The Independent System Operator (ISO) and PSC should require the electricity suppliers and generators who sell power in New York to report electricity generation from renewable sources, including type of renewable generation, source of generation, amount of renewable generation in MWh, as well as the amount in relation to total power supply (i.e., percent). In addition, the electricity suppliers shall provide verification to demonstrate that the renewable generation is from qualified sources. If the renewable power is purchased from out-of-state sources, the power suppliers shall provide adequate information on the source of generation and prove that the sources are qualified under RPS requirements in New York.

For the other policy measures implemented, the implementing agencies (i.e., the State agencies, NYSERDA, PSC) should track and report their activities toward the goals related to renewable investment, purchase, and regulatory changes, and report the outcomes in terms of renewable generation in MWh (State renewable purchase), funding on renewable energy in dollars per year (SBC), tax credit in dollars per kW or kWh, increase in net metering in kW and changes in interconnection regulation and stand-by rates. In addition, the implementing agencies should also quantitatively report the benefits of these measures in changes in renewable installation (kW or MW) and generation (MWh).

[72] Utilities and nonutility generators are requested to fill out Form EIA759 Monthly Power Plant Report, EIA900 Monthly Non-Utility Report, and EIA860B Annual Electric Generator Form.

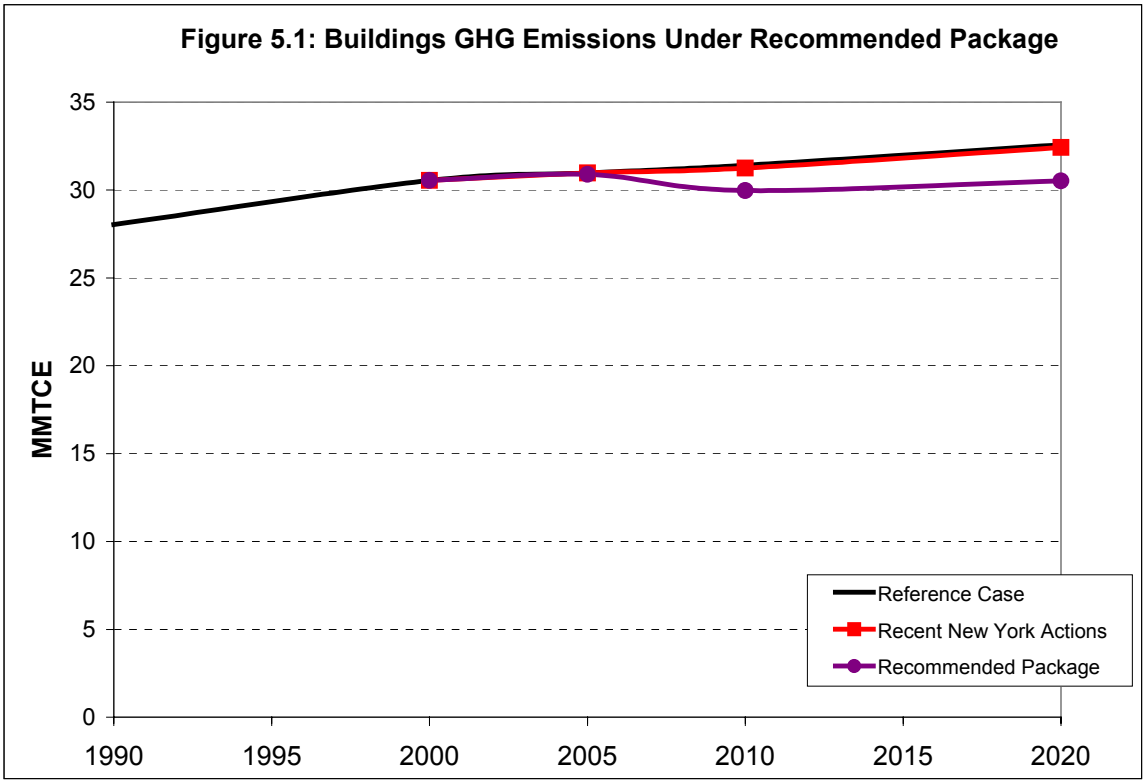
V. BUILDINGS

A. SECTOR SUMMARY

Analysis by the Buildings and Industry working group found that the buildings sector could reduce emissions from the baseline by 0.58 MMTCE in 2010 and 1.07 MMTCE in 2020. These projected reductions are in addition to those achieved in the electricity sector and achieve a net cost savings for every ton of carbon reduced. Total reductions from the buildings sector, including efficiency measures displacing power sector emissions, would come to 1.28 MMTCE in 2010 and 1.89 MMTCE in 2020, resulting in a four to six percent reduction from the adjusted[73] emissions baseline and a seven to nine percent increase from 1990 levels in 2010 and 2020 (Figure 5.1). These reductions are smaller than we previously calculated in our bottom-up assessment because the power sector reacts to lower demand levels by purchasing less new natural gas combined cycle generation. In addition, we assume currently planned actions and others that displace electricity in excess of the "moderate efficiency" scenario modeled by ICF would help to meet a power sector cap but would not achieve incremental emissions reductions unless a tougher cap were adopted. The recommended actions are cost-effective but require high-level political support to extend existing efficiency measures and foster new initiatives. Additional cost-effective actions in this sector may also be available. The following actions are recommended for implementation:

- Extend existing end-use efficiency programs that target power-sector emissions, with special emphasis on incentives to make rebuilding of the World Trade Center and surrounding areas models of energy efficient design.
- Establish a new efficiency program to target emissions from oil and gas end use, and evaluate the possibility of new incentives or requirements for use of biofuels in stationary boilers.
- Implement high-efficiency appliance standards for an array of residential, commercial, and institutional appliances and review these standards every five years.
- Remove barriers to combined heat and power (CHP) and other clean distributed generation through policy changes and economic incentives.
- Educate commercial and residential owners and operators about energy- and cost-saving opportunities through enhanced training for building operators and by producing targeted public service announcements on energy efficient mortgages and recycling.
- Establish an emissions reduction goal for the buildings sector and track progress toward the goal.

[73] Baseline is adjusted for recent actions taken by the state displacing oil and gas but not for recent actions displacing electricity generation, as these latter actions were not included in electricity sector modeling and therefore would not be additional.



MMTCE = million metric tons of carbon equivalent

Impact on and Benefits for New York

New York has much to gain from investments today in a more energy efficient future. New York's experience in implementing energy efficiency programs bears this out. While consumers will likely face higher first costs for new appliances and may continue to pay a system benefit charge on their power rates from 2006 through 2010 as well as a new charge on oil and gas purchases, New York's benefits will greatly exceed the costs in the medium and long terms. Key advantages of efficiency investments include cost savings to energy consumers, lower reliance on imported oil, lower susceptibility to fluctuations in energy costs, significant reductions in greenhouse gas (GHG) and other emissions, and lower costs for the power sector to meet an electricity-sector carbon cap.

On the cost side, assuming use of a financing mechanism that adds a surcharge on energy costs, costs to residential and commercial electricity consumers could average from 1.6 to 1.65 mills/kWh from 2006 to 2010, about a 1.4 percent increase in average statewide retail prices. This surcharge is higher than the current average SBC surcharge due to the decline in electricity purchases from implementation of efficiency measures (the surcharge is spread out over a smaller number of kWhs) and because SBC, NYPA and LIPA charges are assumed to be distributed equally across the state. Costs to residential and commercial consumers of oil and gas are projected to be 0.4 percent of residential oil costs and 0.2 percent of residential gas costs, assuming that half the value of the program is applied to oil distribution and half to gas distribution.

Residential and commercial end users taking advantage of new incentive programs and technical assistance will have their upfront costs subsidized through government incentives, and will reap cost savings associated with lower energy spending. New York receives an annualized net benefit of over $850 million from implementation of energy efficient measures. These cost savings will ultimately boost the competitiveness of businesses in New York and could lead to higher consumer spending, benefiting the State economy.

Views of the Task Force

The Task Force agreed with the thrust of recommendations in this sector. Although the recommended actions are cost-effective, there is a need to pull together financial resources to support implementation. Some of the government representatives on the Task Force expressed interest in considering direct appropriations to fund future energy efficiency measures that displace electricity, in lieu of extending the existing public benefit fund program. In response to this concern, the recommendation focuses on the level of public funding needed rather than recommending a single mechanism to produce that funding level.

B. OVERVIEW

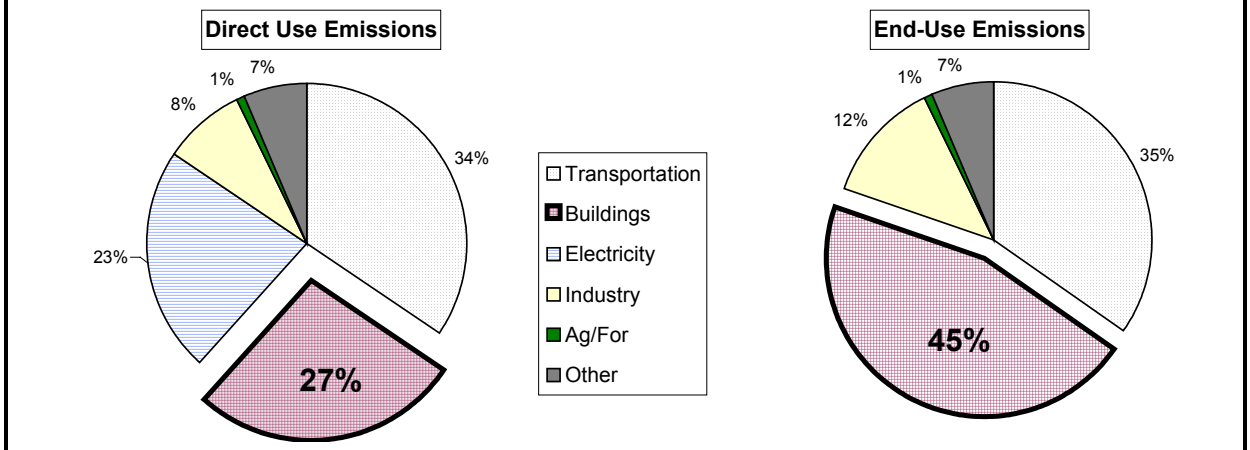
Buildings-Sector Emissions

The buildings sector includes the full spectrum of commercial and residential buildings found in New York. Emissions from this sector include direct emissions from boilers and furnaces used for heating and onsite distributed generation, indirect emissions associated with electricity consumed in buildings, and emissions from refrigerants. In all, as shown in Figure 5.2, the buildings sector is responsible for nearly one-half (45 percent) of the State's GHG inventory in year 2000, after factoring in the share of electricity-sector emissions used by commercial buildings and residences. Counting only direct emissions, the buildings sector is responsible for about one quarter (27 percent) of the total inventory (see Figure 5.2). The remaining discussion of the buildings-sector inventory includes emissions from the generation of electricity used by this sector.

The buildings sector's GHG emissions increased by 2.5 MMTCE between 1990 and 2000 and are expected to continue to increase in the 2010 and 2020 timeframes by a total of 2.02 MMTCE (see Table 5.1). This increase is largely due to projected increases in emissions from direct fuel combustion as indirect (power sector) emissions from electricity use in buildings are expected to remain fairly constant, in part due to implementation of energy efficiency measures that displace electricity generation. Despite a projected growth in emissions in 2020 versus today's levels, the buildings sector share of the statewide inventory is expected to decline to 43 percent in 2020.

This emissions inventory, revised from earlier versions reported to the New York Greenhouse Gas Task Force, reflects the more conservative assumptions used in the final power sector modeling runs. As a result of these changes, indirect electricity emissions used in the buildings sector are higher than before in the 2010 and 2020 timeframes. See the electricity sector chapter for details on the new assumptions and other improvements that led to this new reference case.

Figure 5.2: 2000 Buildings Sector Emissions Comparison



Note: Direct fuel-use attributes emissions according to where they are generated and end-use allocates emissions from electricity to the end-user.

Table 5.1: Commercial and Residential Inventory (MMTCE)

Emissions Source	1990	2000	2010	2020
Direct fuel combustion	15.24	17.13	18.21	18.66
Indirect electricity	12.77	12.32	11.84	12.55
Nonfuel combustion	0.02	1.10	1.36	1.36
Total	**28.04**	**30.55**	**31.41**	**32.57**

MMTCE = million metric tons of carbon equivalent.

The above inventory figures include emissions reductions from reducing electricity generation associated with implementation of the current System Benefit Charge (SBC) and end-use efficiency programs offered by the New York Power Authority (NYPA) and Long Island Power Authority (LIPA). Several newer end-use efficiency measures now under way were not included in the original New York State Energy Research and Development Authority (NYSERDA) inventory, including reductions associated with the Governor's Executive Order 111 to improve energy efficiency in State buildings by 35 percent and the new State Energy Code. The new code, which went into force in July 2002, requires efficiency improvements for new and remodeled buildings. Other recent actions include reductions in oil and gas emissions associated with the current SBC program. Emissions reductions from these newer actions (see Table 5.2), labeled "recent New York actions," come to nearly one MMTCE in 2010 and 2020. However, because the actions that displace electricity sector emissions were not factored into the power sector modeling (specifically, the power sector cap was not lowered to account for the implementation of these measures), only the recent actions displacing oil and gas are counted towards the overall statewide target. Recent actions displacing electricity should be viewed as measures that facilitate achievement of the proposed power sector cap and/or measures that could justify selection of a more aggressive power sector cap. Recent actions displacing oil and gas are subtracted from the commercial and residential inventory, resulting in the adjusted inventory shown in Table 5.3. The sector baseline adjusted for recent actions displacing oil and gas is used for evaluating the effectiveness of recommended policy measures in the commercial and residential buildings sector.

Table 5.2: Recent New York Actions in Addition to Those in the Inventory (MMTCE)		
	2010	**2020**
Executive Order 111 (35 percent efficiency improvements in State buildings)	0.34	0.34
The New State Energy Code (implemented starting July 2002)	0.45	0.45
Combined Heat and Power funded by System Benefit Charge (SBC) funds	0.05	0.05
SBC funds displacing residential oil and gas	0.01	0.01
SBC funds displacing commercial oil and gas	0.14	0.14
Recent actions displacing electricity	**0.83**	**0.83**
Recent actions displacing oil and gas	**0.16**	**0.16**
Total	**0.99**	**0.99**

MMTCE = million metric tons of carbon equivalent.

Combining the original inventory (Table 5.1) with recent New York actions (Table 5.2) results in the following adjusted emissions baseline (Table 5.3). Emissions in 2010 are expected to be 0.71 MMTCE higher than current (2000) levels, while emissions in 2020 are expected to be about 1.87 MMTCE higher than current levels. Emissions reductions of 3.21 MMTCE (2010) and 4.38 MMTCE (2020) are needed to achieve 1990 levels.

Table 5.3: Adjusted Inventory—Commercial and Residential (MMTCE)				
	1990	**2000**	**2010**	**2020**
Total Adjusted Emissions	28.04	30.55	31.25	32.42

MMTCE = million metric tons of carbon equivalent.

Two other issues related to the buildings-sector inventory include the sector's heavy reliance on oil and gas, and the relative efficiency of New York's economy versus that of other states.

The commercial and residential sectors are responsible for a sizeable share of oil and gas use through direct combustion of these resources. Commercial and residential buildings were responsible for ten percent and 13 percent of the State's consumption of petroleum products in year 2000, respectively, totaling nearly one-quarter of the State's petroleum consumption. The commercial and residential shares of natural gas consumption are even higher, estimated at 22 percent and 32 percent, respectively, for a total of over half the State's natural gas consumption in 2000. These figures fluctuate from year to year with the relative prices of the two fuels, because a limited amount of dual fuel capability exists in large apartment buildings and in the commercial sector. The buildings sector clearly relies heavily on both oil and gas resources, making these sectors vulnerable to a situation in which foreign oil supplies become limited and natural gas prices spike at the same time. The availability of dual fuel capability, albeit limited, moderates reliability concerns for these sectors.

New York ranks high in total energy consumed by the residential and commercial sectors. The residential sector ranks third in energy consumption, behind California and Texas, and the commercial sector ranks second, behind California. New York ranks fourth for total energy consumption, behind Texas, California, and Ohio. When population is factored in, however, the picture is quite different. New York ranks 50th (of 51 jurisdictions, including the District of Columbia) in per capita energy consumption. Only the State of Hawaii consumes less energy on a per capita basis.[74] This information suggests that New York uses its energy efficiently relative to other states, assisted by high density, availability of alternative transportation modes, predominance of less energy-intensive industry, and success of existing energy efficiency incentive programs. High levels of energy consumption in New York, however, provide opportunity for further progress.

Factors Affecting Building-Sector Emissions

Approaches for reducing GHG emissions from the buildings sector include measures to reduce direct emissions from onsite fuel combustion or refrigerant use and actions to reduce indirect emissions associated with electricity consumption. Direct emissions may be reduced through onsite electricity generation (e.g., CHP), burning lower carbon fuels in onsite boilers or generators, building renewable power generation for use onsite, improving efficiency of onsite units, and installing end-use efficiency measures that reduce onsite fuel use. Options for reducing indirect emissions from electricity purchases include decisions to purchase green power and efficiency measures that reduce electricity consumption. Renewable and green power options, except for CHP, are evaluated in the Electricity chapter. To date, New York has placed most emphasis on efforts to reduce end-use electricity consumption. The GHG inventory, however, shows that onsite generation is responsible for a greater share of this sector's GHG emissions**.** Efforts should be placed on addressing both direct and indirect emissions. Given the small share of emissions from refrigerants such as HFCs and the lack of commercially available replacement refrigerants and technologies,[75] reducing direct non-carbon emissions from this sector is a low priority**.**

Although the US Department of Energy's Energy Information Administration (EIA) estimates fuel use for the commercial and residential sectors as a whole, no bottom-up inventory exists, even on a sample basis, to validate this information; nor is commercial and residential fuel use disaggregated by building type or geographic location. In addition, a key challenge in identifying GHG reduction opportunities from the buildings sector is a lack of data on which specific business and household appliances contribute the most to current electricity demand and how different choices on window treatments and building envelope affect appliance operation.

[74] Energy Information Administration. *State Energy Data Report 1999.* Washington, DC: U.S. Department of Energy, 2000.
[75] Office of Air Resources. *U.S. High Global Warming Potential Gas Emissions 1990–2010: Inventories, Projections, and Opportunities for Reductions*. Washington, DC: U.S. Environmental Protection Agency, 2001.

C. Analysis of Mitigation Options

The Buildings and Industry working group identified about 20 separate measures that could be implemented to reduce the buildings sector's GHG emissions. More than ten of these measures were evaluated quantitatively, including estimates of cost-effectiveness (cost per ton of carbon-equivalent reduced) and the amount of carbon emissions reduced (in million metric tons carbon equivalent, or MMTCE). Estimates of carbon emissions reductions were developed on a "bottom-up" basis looking at the effectiveness of similar programs and different levels of technology penetration. These estimates do not assume the dynamic interactions that would occur within the power sector. For a list of quantified measures and their estimated emissions reductions and cost, see Table 5.4. The remaining actions are recommended for further evaluation.

Table 5.4: Buildings Sector GHG Reduction Opportunities:

Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Reference Case	**28.04**	**30.55**	**30.98**	**31.41**	**32.57**	
Recent New York Actions:						
Executive Order 111 (35 percent efficiency improvement)			0.17	0.34	0.34	
New State Energy Conservation Code			0.22	0.45	0.45	
CHP funded by SBC			0.02	0.05	0.05	
SBC residential (oil & gas)			0.01	0.01	0.01	
SBC commercial (oil & gas)			0.07	0.14	0.14	
Total			**0.49**	**0.99**	**0.99**	
Proposed Actions:						
Low Scenario						
Building Operator Training			0.00	0.01	0.02	-733.15
SEER 13 A/C Standards			0.00	0.01	0.04	-367.21
Other Appliance Standards w/ State Authority			0.04	0.56	1.18	-748.14
Efficient Conductor Sizing			0.00	0.00	0.01	-564.74
CHP Moderate			0.05	0.22	0.58	-424.38
SBC extension			0.00	0.44	0.42	-228.88
Oil & Gas End Use			0.00	0.26	0.26	-64.22
NYPA LIPA extension			0.00	0.13	0.12	-103.92

Table 5.4: Buildings Sector GHG Reduction Opportunities:						
	Estimated Reduction Potential (MMTCE)					
AL Recycling			0.02	0.02	0.02	-110.50
Total			**0.11**	**1.66**	**2.65**	
Medium Scenario						
Implement Low Scenario Actions			0.11	1.66	2.65	
CHP High Impact			0.08	0.29	0.73	-420.41
Appliance Standards Requiring Fed'l Waver			0.00	0.02	0.36	-737.21
Total			**0.19**	**1.97**	**3.74**	
High Scenario						
Implement Low and Medium Scenario Actions			0.19	1.97	3.74	
SBC expansion			0.00	0.44	0.42	-228.88
NYPA LIPA expansion			0.00	0.13	0.12	-103.92
Green Building Tax Credit			0.00	0.65	0.76	1,303.62
Total			**0.19**	**3.19**	**5.04**	

With assistance from the Buildings and Industry working group, the Center for Clean Air Policy divided the suite of quantified measures into "low," "medium," and "high" groupings according to the ease with which they could be implemented. Those entered into the "low" category were cost-effective and could be implemented with an affirmative government commitment. Those entered as "medium" were also cost-effective but would need a greater level of commitment. Those entered as "high" were either perceived to be very challenging given the current state budget context (expansion of existing efficiency measures) or were not cost-effective from a GHG standpoint. In the case of the Green Building Tax Credit, while not cost-effective for GHGs alone, this measure should be evaluated from a co-benefits standpoint.

The total emissions reductions that could be achieved by actions within the buildings sector depends on 1) the extent to which actions that displace power sector emissions are considered in establishing a power sector cap, and 2) the extent to which the power system reacts to the lower demand levels by postponing investments in new, clean power generation in favor of operating existing marginal units.

In this instance, implementation of the low options would result in carbon emissions at three percent above 1990 levels in 2010 and 2020. Implementation of the low and medium actions would result in carbon emissions at one percent above 1990 levels in 2010 and one percent below 1990 levels in 2020. Implementation of all the measures that were quantified for this sector (low, medium, and high) would result in carbon emissions at one percent below 1990

levels in 2010 and five percent below 1990 levels in 2020. We recommend implementation of all low and medium measures, but not the high measures, for reasons previously described.

Because the recommended power sector cap was set at a level (25 percent below 1990 power sector emissions) that assumes demand reductions associated with just a subset of the buildings sector measures, only a subset of the estimated kilowatt-hour savings achieved through recommended actions in the buildings sector will translate into emissions reductions.. Moreover, because the power sector reacts to the lower demand levels by postponing new investment in natural gas combined cycle generation, the full estimated reductions from the recommended actions (shown in Table 5.4) are not realized.

The recommended buildings sector measures, combined with the recommended power sector cap of 25 percent reduction from 1990 levels, would result in emissions reductions from buildings sector actions of 1.28 MMTCE in 2010 and 1.89 MMTCE in 2020, a four to six percent reduction from the adjusted[76] emissions baseline and a seven to nine percent increase from 1990 levels in 2010 and 2020. These numbers suggest it might be appropriate to set a growth target for this sector if 1990 is the selected base year. If a more stringent power sector target were later adopted, there would be substantial opportunity to achieve additional emissions reductions through cost-effective energy efficiency measures, including several measures already being recommended as well as others that were suggested by members of the buildings and industry work group but not quantified. In the future, some of the actions not recommended because they are not politically feasible in the current budget climate (expansion of existing efficiency programs) or because they are not cost-effective for carbon alone but could be cost-effective when viewed in a multiple benefits context (green building tax credit) could also prove valuable to achieving significant emissions reductions from this sector, when these actions assist in making the power sector cap more stringent. These actions should be reevaluated at a later date.

Although the bottom-up analysis indicates that a growth target is probably most realistic in the near-term, a more aggressive target may be possible when unquantified actions are factored in, particularly in the 2020 timeframe. The ultimate goal for the buildings sector might also consider how the sector goal is used in the context of achieving a statewide target. Setting a less stringent target, for example, would facilitate greater participation by the buildings sector in a State emissions trading program while providing an added incentive for emissions reductions. A more stringent "challenge" target should be considered, especially for the 2020 timeframe. A challenge target could encourage the State and private sector to continuously identify new actions to boost end-use efficiency. This issue is discussed below, where we recommend that New York State set a target for the buildings sector.

[76] Baseline is adjusted for recent actions taken by the state displacing oil and gas but not for recent actions displacing electricity generation, as these latter actions were not included in electricity sector modeling and therefore would not be additional..

D. AVOIDING DOUBLE COUNTING OF BUILDINGS SECTOR MEASURES

When combining emissions reductions from the various sectors into the summary of emissions reductions in New York, double counting is possible between sectors that reduce electricity demand (buildings and industry) and the electricity sector. Most of the recommended buildings- and industry-sector actions that displace electricity generation were included in the electricity-sector modeling runs. This was done because efficiency measures are among the most cost-effective carbon-reduction actions evaluated and appeared likely to be included in the final recommendations; and because the model does not estimate a demand response from higher electricity prices. These end-use efficiency actions make achievement of the electricity-sector cap easier and lower the cost of compliance for the power sector. In effect, reductions that would otherwise have been made by the electricity sector in meeting a given cap level are instead made by end-use efficiency. Conversely, if the assumed level of efficiency is not implemented, the power sector pays the price by having to achieve greater emissions reductions than were projected. This layering of efficiency and electricity-sector measures ultimately lowers the total amount of reductions from what is achieved when counting the two sets of measures separately.

Most of the recommended building-sector actions that displace electricity-sector emissions were already counted in the electricity-sector modeling; therefore, they cannot be counted again as a separate energy efficiency measure. Consequently, the summary of measures provided in Table 2.1 (and reiterated below in Table 5.5) is limited to end-use efficiency emissions reductions from New York State's buildings sector that do not displace power sector emissions in New York. These include:

- Actions that displace oil and gas end uses, in whole or in part;
- Actions that displace electricity generation and fuel combustion in other states (e.g., aluminum recycling); and
- Actions that displace thermal output from off-grid CHP, because the IPM model only factors in the electricity produced by grid-connected CHP units.

Table 5.5: Creditable and Recommended Buildings-Sector Actions Additional to Power-Sector Modeling

	MMTCE in 2010	MMTCE in 2020
Moderate CHP not attached to grid (portion displacing oil and gas)	0.11	0.29
Oil and gas end use	0.26	0.26
Aluminum recycling	0.02	0.02
Appliance standards (portion displacing natural gas)	0.05	0.14
High impact CHP not attached to the grid (portion displacing oil and gas)	0.15	0.37
TOTAL	**0.58**	**1.07**

MMTCE = million metric tons of carbon equivalent; IPM = Integrated Planning Model

In addition, several actions were recommended (or are already being implemented) that displace electricity generation but were not used in establishing the power sector cap level. These actions, while still helpful to consumers in reducing electricity demand and costs, would not achieve any additional emissions reductions beyond the power sector cap unless the cap itself were made more stringent. These measures, shown in Table 5.6, include:

- Actions that displace electricity-sector emissions that were not included in the ICF modeling; and
- Recent efficiency actions that have already been implemented by New York State, because the ICF baseline was not adjusted to account for these measures.

Table 5.6: Non-Creditable and Recommended Buildings-Sector Actions, Including Recent Actions, Additional to Power Sector Modeling		
Appliance standards requiring a federal waiver	0.01	0.24
High impact CHP attached to grid (portion displacing electricity)	0.15	0.37
Recent efficiency actions already implemented by New York	0.83	0.83
TOTAL	**0.99**	**1.44**

MMTCE = million metric tons of carbon equivalent
NOTE: These actions would only become creditable if the power sector cap is lowered (made more stringent).

E. RECOMMENDED PACKAGE OF ACTIONS

Recommended actions within the buildings sector include a wide array of measures and mechanisms for advancing energy efficiency in buildings, including incentive programs, policy changes, new regulations, and education. The recommended package also includes actions to facilitate tracking of GHG reductions and recognition for achievements within the sector. These actions are summarized in Table 5.7.

The cost of the recommended buildings-sector measures is significant, totaling $872 million in 2010.[77] This cost figure includes the incremental cost of advanced technologies and some of the more significant government incentive programs, but in some cases excludes costs associated with program administration or development of new regulations. The government share of the quantified costs in 2010 is estimated at $297 million. Estimated annualized cost savings greatly exceed the higher first costs, however. In 2010, the estimated net benefit is $1,410 million, resulting in a net savings of $538 million.[78] Overall, the recommended measures produce a net benefit for every ton of carbon reduced.

[77] The first costs of most recommended efficiency programs are at their peak in 2006–2010. After 2010, benefits would exceed costs by a larger amount.
[78] Note that benefit figures assume constant electricity prices differentiated by the type of consumer. If end-use efficiency programs result in a small (one mill/kWh) price increase as modeled by ICF, the benefits of efficiency

Table 5.7: Buildings Sector GHG Reduction Opportunities:						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Reference Case	**28.04**	**30.55**	**30.98**	**31.41**	**32.57**	
Recent NY Actions			**30.98**	**31.25**	**32.42**	
Recommended Package						
Moderate Energy Efficiency Programs and Regulations Included in Power Sector Modeling						
SBC extension			*N/A*	*N/A*	*N/A*	-228.88
NYPA LIPA extension			*N/A*	*N/A*	*N/A*	-103.92
Efficient Conductor Sizing			*N/A*	*N/A*	*N/A*	-564.74
CHP Moderate (portion displacing power)			*N/A*	*N/A*	*N/A*	-424.38
SEER 13 A/C Standards			*N/A*	*N/A*	*N/A*	-367.21
Other Appliance Standards w/ State Authority			*N/A*	*N/A*	*N/A*	-748.14
Appliance Standards Requiring Federal Waiver[79]			*N/A*	*N/A*	*N/A*	-737.21
Building Operator Training			*N/A*	*N/A*	*N/A*	-733.15
subtotal[80]			*0.00*	*0.70*	*0.83*	
Incentive Programs Additional to Moderate Scenario						
Oil & Gas End Use			0.00	0.26	0.26	-64.22
CHP Moderate			0.02	0.11	0.29	
AL Recycling			0.02	0.02	0.02	-110.50
subtotal			*0.04*	*0.39*	*0.57*	

measures increase but utility bills as a whole would not capture the entire cost savings as consumers would pay more for remaining power.

[79] Only a small portion of this option is included in the moderate power sector efficiency scenario. Most of the reductions associated with this measure are additional to the moderate scenario, but cannot be counted separately unless the power sector cap is made more stringent.

[80] Subtotal amount is the buildings sector share of the moderate efficiency modeling scenario.

Table 5.7: Buildings Sector GHG Reduction Opportunities:						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Policy Changes to Encourage Efficiency						
CHP High Impact[81]			0.04	0.15	0.37	-420.41
subtotal			*0.04*	*0.15*	*0.37*	
New Regulation to Advance Efficiency						
Appliance Standards Displacing Oil & Gas			0.00	0.04	0.13	
subtotal			*0.00*	*0.04*	*0.13*	
Total Recommended Actions			**0.08**	**1.28**	**1.89**	
Total Emissions (MMTCE)			**30.89**	**29.97**	**30.52**	
Reduction Compared to 1990 Levels (increase)			**(10%)**	**(7%)**	**(9%)**	

Most of the recommended actions should be implemented in the next several years, either to provide for a seamless transition with existing initiatives or to take advantage of efficiency opportunities that are currently available and economically cost-effective.

Energy Efficiency Incentive Programs That Reduce Electricity Consumption

The first category of recommended buildings-sector actions includes financial incentives, technical assistance, and education to encourage end-use efficiency that reduces electricity consumption.

Extend Efficiency Programs in New York. New York has had great success in encouraging efficient use of power resources through its SBC fund and end-use efficiency programs offered by NYPA and LIPA. These broad-based programs currently distribute nearly $290 million per year and target a variety of efficiency opportunities within their respective geographic regions. Sample SBC incentive programs include providing a $75 cash bounty to residential consumers who surrender an old room air conditioner and purchase a new Energy Star unit, providing free or reduced cost electric-reduction measures to low-income residents and building owners of low-income properties, and financial incentives for building owners to offset between 50 percent and 70 percent of the incremental capital costs of energy efficient equipment. The SBC program is

[81] Only a portion of these actions is creditable in addition to power sector modeling. We assume that half of the CHP reduces electricity (and therefore would only count if the power sector cap were lowered) and that half reduces oil and gas.

funded by a volumetric charge on electricity consumption by participating customers. Currently, this charge averages 1.4 mills per kWh.[82] The benefits of the SBC program ultimately accrue to consumers who take advantage of the various incentive programs, as well as to the State's electricity system as a whole in terms of reduced electric demand. NYPA and LIPA offer similar types of programs with slightly different funding mechanisms.

The recommendation here is for an extension of energy efficiency spending to displace power-sector emissions statewide at the current level of $277 million per year for five years (government share). We assume diminishing returns such that this level of funding achieves only 80 percent of the benefits achieved previously. Despite these diminished returns, enhanced energy efficiency is still the most cost-effective way for the State to achieve significant GHG reductions from the power sector. Implementation of extended end-use efficiency programs could occur through a regulatory proceeding or through the State budget process.

The analysis looked at increasing energy efficiency in New York through extension of current SBC, NYPA, and LIPA efficiency programs, although other funding mechanisms are possible. Specifically, we looked at continuing existing programs at the same funding level for a five-year period from 2006 to 2010. While the total funding level remains the same, the estimated average cost on a per kWh basis is higher than that for the current SBC program due to lower overall demand levels (spreading costs across fewer kWh) and inclusion of NYPA and LIPA costs in a statewide average. On the basis of past experience and factoring in diminishing returns, we expect these programs to achieve significant reductions, on the order of 0.57 MMTCE in 2010 at a net cost savings per ton of carbon reduced.[83] These programs are also expected to result in significant air quality co-benefits. Costs and benefits from the recommended efficiency measures are provided in Table 5.8. Costs and benefits from the current SBC, NYPA, and LIPA efficiency programs are also provided for comparison.

We also evaluated expansion of existing efficiency programs (a doubling of costs and benefits associated with program extension). While cost-effective, given the state's current budget concerns, expansion of efficiency measures was determined not to be politically viable. If state budget conditions change in the coming years, we recommend that efficiency options be considered for expansion, along with an associated tightening of the power sector cap.

[82] Each power company party to the SBC program has to raise a portion of the $150 million fund. Company collection amounts were assigned on the basis of 1999 operating revenues, and actual charges on customer bills differ across companies, depending on their assigned collection amount and electricity sales over the course of the year. Although 1.4 mills/kWh is the average, the range is from 0.9 to 1.7 mills/kWh.

[83] Note that the cost per ton of carbon reduced is sensitive to the level of cost sharing. Data were available for the SBC program, which specified that industry spent $2 for every one dollar spent by NYSERDA (a cost share of 2:1). CCAP does not have specific cost share numbers for the NYPA and LIPA programs but assumes a cost share of 0.5:1.

Table 5.8: Costs and Benefits of Current and Recommended Efficiency Programs		
	Current	**Recommended**
Total Cost Per Year (2006–2010)[84] Cost to Government Cost to Private Sector	$640,500,000 277,000,000 363,500,000	$640,500,000 277,000,000 363,500,000
*Annualized Costs**	273,589,536	273,589,536
*Annualized Cost Savings**	–464,822,964	-371,858,371
Annualized Net Costs	–191,233,428	–98,268,835
Cost to consumers (SBC only) mills/kWh	0.9 to 1.7	1.6 to 1.65**

* Annualized costs and cost savings for the recommended extension of efficiency programs are based on the years 2003 through 2020. Current program costs and cost savings are shown over the same timeframe to facilitate comparison.
** These figures are based on the average charge that would be needed to achieve the total funding level. They do not factor in the differential collection amounts for the various companies.
SBC = System Benefit Charge.

As noted earlier, we assume that future increments of energy efficiency from the SBC, NYPA, and LIPA programs will result in 20 percent fewer benefits than previous increments as a result of diminishing returns. This assumption is conservative, considering the possibility of technological advances, high availability of efficiency opportunities, and the possibility for better targeting of program expenditures**.** Another factor affecting the future effectiveness of energy efficiency measures is power-sector carbon intensity (carbon emissions/kWh generation). We assume as a proxy declining intensity levels corresponding to the old ICF reference case, encompassing all fossil generation in New York but not imports and exports. To the extent that imported power has different carbon intensity than the NY fossil average, using New York emissions would over- or underestimate efficiency benefits.[85] While power-sector carbon intensity levels change with implementation of new power-sector carbon control measures such as a cap on carbon dioxide (CO_2) emissions, our assessment shows using new intensity standards from the recommended power sector case (25 percent cap with moderate efficiency and a renewable portfolio standard) would have little impact on the final result (affecting overall emissions reductions by less than three percent when compared with the old ICF reference case).

To encourage selection of efficiency measures that reduce CO_2 emissions and to develop a more precise understanding of the emissions reduced from end-use efficiency programs, we recommend that New York State consider the results of a CCAP study, currently in progress, that seeks to identify the relative effectiveness of alternative energy efficiency and renewable energy measures from the standpoint of reductions in CO_2 and other emissions. This study is looking at the likely timing of different energy efficiency and renewable energy projects and the marginal

[84] The recommended duration for the program is 2006 to 2010, but benefits occur over a longer time horizon. "Total cost per year" reflects the costs for each year of the five-year program. "Annualized costs" are shown for comparison with annualized benefits.
[85] The old reference case intensity levels are comparable to the new intensity levels under the recommended policy package.

units displaced to identify ways to enhance emissions reductions. This information should be considered, along with other criteria of interest to the State, in selecting new projects and in estimating the results of efficiency programs. In addition, program costs, including industry cost share, should be tracked where it is not already so that cost per ton can be evaluated for alternative expenditures, enabling better targeting in the future.

Encourage Efficient Sizing of Conductors. This measure involves providing interim incentives to building owners to increase the size of a conductor in a circuit from two inches to 2.5 inches, thereby reducing by about 35 percent the energy losses that result from resistance of the conductor to the flow of electricity. Although efficient conductor sizing should ultimately be made part of building codes, new codes are just coming into place this year. This change might not be implemented for another five years. Financial incentives could be provided on an interim basis to build familiarity with the technology. The level of the incentive could range up to the full incremental cost for the larger conductor and could take the form of a tax credit or application of SBC funds.

For the purposes of this analysis, the assumed level of penetration is 1,200 efficient conductor sizings per year (affecting 4,000,000 square feet of space) and we assume installation within a pipe (the common practice) rather than installation of a self-contained unit. This level of penetration assumes that about half of new commercial construction, including offices and hotels, would be outfitted with efficiently sized conductors. This estimate is probably high under an incentive-based program, but would be low in the case that more efficiently sized conductors become part of building codes.

At less than $1/100^{th}$ of an MMTCE, the emissions reductions associated with this new measure are relatively small. The measure appears to be cost-effective, however, with cost savings outweighing costs for every ton of emissions reduced. The cost of this measure is estimated to be under one million dollars in 2010, not including program administration costs.

Encourage Economic Combined Heat and Power. Additional incentives are needed to encourage end users to undertake CHP that is economic but not being implemented. This is the "moderate impact" CHP case. One option is a tax incentive providing subsidies on the basis of kWhs of electricity and MBtus of heat produced. The size of the incremental incentive could vary depending on the size of the CHP system. An alternative approach would be to assist with the capital cost of establishing CHP. Technical assistance could also play an important role in overcoming barriers to implementation of CHP.

The quantitative estimates developed for the moderate-impact CHP case assume financial or technical assistance to take advantage of CHP. These estimates yield 337 MW of CHP by 2010 and 750 MW by 2020, half the CHP believed to be economically and technologically viable in those timeframes without the policy changes described below. With these assumptions, the moderate-impact CHP case achieves carbon reductions of 0.22 MMTCE in 2010 and 0.58 MMTCE in 2020 at a net cost savings per ton of carbon reduced. Co-benefits would include reductions in other emissions beyond carbon.

We assume that only half of the reductions achieved by CHP in the moderate-impact scenario are additional to the CHP that comes in under power-sector modeling. The power-sector modeling includes CHP that is attached to the grid but not units used for self-generation.

Make the World Trade Center a Model of Energy Efficient Construction. The new World Trade Center and surrounding buildings in lower Manhattan should serve as a world model of energy efficient, low-emitting construction. Key features that should be considered include advanced energy efficiency technologies and sustainable design features, including daylighting, high performance windows, building-integrated photovoltaics, combined heat and power, and clean distributed generation. We evaluated the effects of a quite modest (10–15 percent) improvement over the new energy code (35 percent improvement over the old code) applied to ten million square feet. of space.[86] The result was a 0.007 reduction in MMTCE in 2010 and 2020 at a net cost savings compared with business-as-usual efficiency levels (equivalent to five percent better than the old code). Incremental construction costs for the modest efficiency improvement were estimated to be $25 million. The funding for this measure could come from the State's energy efficiency programs displacing electricity, oil, and gas.

Energy Efficiency and Other Measures Displacing Oil and Gas End Use

This second category of actions for reducing emissions in the buildings sector includes developing and implementing a program to encourage efficiency measures that reduce onsite end-use emissions of oil, gas, and coal—responsible for about 60 percent of the buildings-sector emissions inventory. This comes to 23 percent of the State's oil use and 54 percent of the State's gas use. Although no program currently exists with this emphasis, the existing SBC program has reduced a small amount of onsite oil and gas emissions in its efforts to reduce electricity use. (See the planned-actions discussion for detail on the oil and gas emissions reduced from implementation of the SBC program.) Focusing specifically on measures that displace oil and gas could result in significant opportunities for emissions reductions. To take advantage of these opportunities, the initiatives and studies described in the following sections are recommended.

Establish a New Efficiency Program Targeting Oil and Gas End Use Emissions. This initiative would entail developing and implementing a new, comprehensive, incentive-based program to reduce onsite emissions from oil and gas by improving energy efficiency or other means. Programs could focus on residential, small and medium-sized commercial, institutional, and industrial customers who use oil and gas for heating, domestic hot water, or production processes. Modeled after the SBC program, this effort could take advantage of economies of scale and facilitate one-stop shopping for efficiency opportunities. NYSERDA could expand an oil and gas efficiency strategy into several of its SBC programs, including the Commercial/ Industrial Performance Program; the New Construction Program; the Energy Smart Loan Fund; Smart Equipment Choices, Technical Assistance Services, and Home Energy Performance with Energy Star. An additional program focusing on the building envelope should be added. The proposed total cost of this program is $20 million per year for five years starting in 2006. Funds

[86] Total tenant space in the two towers and other buildings of the original World Trade Center was ten million square feet. Additional office space was also destroyed as a result of the September 11 attack. Total square footage to be redeveloped may exceed 13 million. To be conservative on the potential benefits, we limited our analysis to ten million square feet.

could come from charges on gas distribution systems and oil sales to residential, commercial, and industrial customers. If half the charge were applied to oil distributors with the remaining costs applied to gas distributors, the increased cost to residential consumers is projected to be roughly 0.4 percent of oil utility bills and 0.2 percent of gas utility bills between 2006 and 2010. Estimated GHG emissions reductions are 0.26 MMTCE in 2010 and 2020, at a net cost savings for each ton of carbon reduced. Co-benefits include the increased comfort of building occupants, reductions in other emissions, and reduced dependence on foreign oil.

Evaluate Options for Using Biodiesel in Stationary Sources. This option, identified late in the process and not discussed by the full Task Force, entails replacing diesel fuel used in boilers and distributed-generation units with a blend of diesel and biomass, or "biodiesel." NYSERDA has several studies underway or under consideration to examine the performance of this blended fuel in residential, industrial, and distributed-generation facilities. We recommend that New York State move forward with these existing studies and examine the effects on emissions (including GHGs, nitrogen oxides, fine particulates, hydrocarbon emissions, carbon monoxide, and air toxics) and costs (first, operating, maintenance, and replacement). On the basis of these studies, New York should decide whether or not to encourage or require more widespread use of biodiesel fuels in stationary sources to reduce GHG emissions. Preliminary analysis of a new biodiesel requirement suggests that significant emissions reductions are possible, estimated at 0.08 MMTCE in 2010 and 0.38 MMTCE in 2020 assuming use of a two percent/98 percent biofuel/diesel blend in 2010 and the equivalent of a ten percent/90 percent biofuel/diesel blend in 2020. Assuming the current costs of biodiesel fuel blends, however, the cost-effectiveness of this measure may be significantly higher than that of others recommended in this chapter. Consequently, reductions associated with policy actions to boost biodiesel penetration are shown in Table 2.4.

Incentive Programs to Enhance Recycling

Enhanced recycling achieves important efficiencies in reducing the need for raw materials and the lifecycle effects associated with these materials, resulting in a reduction in GHG emissions. Although New York has control over the action (whether or not to enhance current recycling levels), the emissions reduced may largely occur outside of New York, in areas where raw materials are collected and processed. New York achieves important co-benefits in having to pay less in disposal costs and, in the case of aluminum, receiving a net cost savings.

Enhance Aluminum Recycling in New York. Enhancing current levels of aluminum recycling achieves a net carbon benefit of 4.11 metric tons of carbon equivalent for each short ton of aluminum recycled.[87] A ten percent boost in aluminum recycling rates (from about 72 percent[88] to 82 percent) would achieve carbon reductions on the order of 0.02 MMTCE at a net cost savings for retailers and distributors, assuming the enhanced recycling comes from increased use of an automated, reverse-vending machine deposit-refund system. According to recycling experts in New York, the State has been moving toward this type of system over the last several years because its associated operating costs are lower than those of other types of aluminum recycling mechanisms.

[87] U.S. EPA Waste Reduction Model assumptions.
[88] Average beverage container recycling rate for all states with deposit refund programs.

Several incentives are possible to boost recycling. One option is to increase the redemption value from five cents to ten cents for all beverage containers, as is done in Michigan (where the beverage-container redemption rate is 95 percent). This increase may raise opposition from beverage manufacturers and distributors, however. Another option is to expand the redemption program to non-carbonated beverages, such as iced-tea containers (which are currently excluded). This would have a relatively modest impact because iced tea represents a small percent of total beverages sold. Other options might include consumer education and tax incentives. Consumer education to link aluminum use with climate change could result in renewed consumer interest in recycling. (See education recommendations, below.) Additional analysis is needed to identify a viable, cost-effective approach to encouraging aluminum recycling in New York.

Policy Changes to Encourage Energy Efficiency

Certain regulatory changes are needed to take advantage of the full economic and technical potential of combined heat and power (along with other clean distributed generation such as renewable energy). Recommended policy changes include those described in the sections that follow.

Encourage Clean and Efficient Onsite Generation Through Electricity Policy Changes. Power distribution companies (load-serving entities) in the New York market have an incentive to maintain current power demand levels (and oppose efforts to reduce power demand) to the extent that revenues and the ability to cover fixed transmission and distribution charges are tied to sales. One way to dissuade customers from moving to cleaner and more efficient onsite generation is through application of high charges for standby, or backup, power. Power distribution companies explain that these charges are needed to ensure sufficient capacity for end users during times when onsite generation is not operating. On the other hand, reducing demand through enhanced efficiency could ease power distribution companies' ability to meet peak power demands. Moreover, the power that would have been sold to the consumer installing clean and efficient generation can be used to meet other system needs.

One way to address the standby charge disincentive is to change the regulatory framework that sets guidelines for how electric generators can charge for transmission and distribution of power. One proposal being considered under a current regulatory proceeding on standby charges is to require power generators to reduce standby charges on average by two-thirds. Current standby charges depend on a variety of factors, including the time of day and season of the year, and vary substantially from one company to another.

An alternative approach, which gets at the root of the issue but entails more disruption in the current rate structure, involves implementing an annual revenue adjustment mechanism with each power generator to better align the interests of power generator stockholders with customer and societal end-use efficiency goals. A revenue adjustment mechanism would enable power generators to true up with customers at the end of the year to capture any transmission and distribution expenditures not covered by rates due to reduction in demand. Consumers that purchase electricity from the grid would continue to pay fixed charges in proportion to their

electricity demand, but at a slightly higher rate, the following year. Consumers that reduce demand through CHP or other avenues would not pay transportation and distribution charges and would be charged something closer to market rate for back-up power. Electricity shareholders would be made whole in that fixed charges continue to be paid by consumers.

The quantitative estimates developed for the high-impact CHP case assume that a two-third reduction in standby charges could encourage 337 MW of CHP by 2010 and 900 MW of CHP by 2020, half the CHP additional to the moderate case that is believed to be economically and technologically viable. With these assumptions, the high impact CHP case achieves carbon reductions of 0.29 MMTCE in 2010 and 0.73 MMTCE in 2020 additional to the moderate scenario CHP case at a net cost savings per ton of carbon reduced. However, half of these emissions reductions are assumed to displace power sector emissions and cannot be credited to the sector unless the power sector cap is lowered. The remaining emissions are assumed to displace oil and gas emissions. Co-benefits would include reductions in other emissions beyond carbon.

We assume that only half of the reductions achieved by CHP in the high impact scenario are additional to the CHP that comes in under power-sector modeling. The power-sector modeling includes CHP that is attached to the grid but not units used for self-generation.

A current New York Public Service Commission regulatory proceeding is currently in advanced stages of reviewing alternative approaches for reducing regulatory barriers to CHP and other clean distributed generation. The alternative rate structures now under consideration clearly move in the direction of reducing regulatory cost barriers. A separate regulatory proceeding is being considered for February 2003 to look at the revenue-decoupling issue.

To understand the effectiveness of this and other recommended measures to encourage CHP (and other clean distributed generation), New York should begin tracking the number, size, and efficiency ratings of these units as well as annual information on heat input, fuel type and amount, and usable output (both thermal and electric) provided by CHP units in New York.

Evaluate Options to Streamline the Air Permitting Process for Clean and Efficient CHP Units. New York should evaluate options for streamlining the air permitting process to encourage clean and efficient CHP units. One option would be to enable CHP units that are pre-certified by the manufacturer as cleaner and more efficient than new natural gas combined-cycle units using the best available control technology to have expedited permitting. This rulemaking would not exempt these units from all siting and permitting requirements. Long waits for permitting have a larger effect on small CHP units than on larger units. Moreover, shorter wait times for very clean units could encourage new distributed generation to come in cleaner and more efficient than would otherwise be the case. To accommodate the interests of local groups, further restrictions may be desirable to define when streamlined permitting would be available, depending on the location of the proposed CHP unit. The cost of this study was not estimated.

New Regulations to Advance Energy Efficiency

New regulations establishing new appliance standards and building codes can play a key role in fostering the replacement of existing inefficient technologies with high-efficiency alternatives, and ensuring that new building designs keep pace with technological improvements. Because many appliances last for ten years or more and new buildings will be around for many decades, new standards and codes can have a long-term impact on efficiency levels. We recommend including regulation in the form of appliance standards, as well as regular review of standards and codes, in the mix of tools for advancing efficiency in New York.

Implement High-Efficiency Appliance Standards. NYSERDA supported the proposed federal residential Central Air Conditioner standard of Seasonal Energy Efficiency Rating (SEER) 13. The State of California has asked for a waiver from federal preemption to implement the SEER 13 standard because of the US Department of Energy's decision to implement a national standard of SEER 12. New York could follow suit. New York could set its own standards for several other appliance and equipment types, and could request waivers from the federal government for still others. Table 5.9 lists recommended standards where they have been developed or issued by other entities; where no model standard or specification exists, a suggested technology or improvement level is provided along with the data source. In these instances, New York policymakers could work with counterparts in such states as California, Massachusetts, and Minnesota to develop appliance standards that balance efficiency and economics.

Establishing the standards listed in Table 5.9 will reduce GHG emissions significantly at a net benefit per ton of carbon reduced, and ultimately a net cost savings to consumers. Appliance owners would pay the higher first cost for new appliances, estimated at $126 million per year, as new technology purchases are made.[89] Cost savings on the order of $684 million per year would accrue to the owners or users of the technologies over the expected life of the appliances.[90] Government costs to establish new standards were not estimated. Assuming staged implementation of appliance standards in New York between 2005 and 2010, implementation will result in a reduction of 0.6 MMTCE in 2010 and 1.6 MMTCE in 2020. Significant reductions in emissions of other pollutants would also be expected. Certain measures (e.g., efficient commercial clothes washers) would also reduce water consumption.

New York has several options for implementation of appliance standards. As a first step, New York should investigate its ability to establish appliance standards through changes to code. In any instances in which this is not possible, New York could pursue legislation.

Finally, New York State should consider avenues for enabling consumers and storeowners to get credit or other compensation for the purchase or sale of new, efficient appliances. The State should consider options for tracking the effectiveness of appliance standards on the basis of

[89] This is the annualized value covering the years 2003 to 2020, multiplied by 0.95 to account for a small amount of advanced appliances that are starting to enter the market in absence of state requirements. Appliance standards are assumed to take effect between 2005 and 2010, depending on whether a federal waiver is needed and expert judgment by Andrew Delaski at the Appliance Standards Awareness Project.

[90] This is the levelized annual value covering the years 2003 to 2020.

Table 5.9: Recommended Appliance Standards		
Appliance	**Recommended Standard**	**Waiver Needed?**
Central air conditioning and heat pump	SEER 13 (based on DOE Final Rule)	Yes
Commercial packaged air conditioner and heat pump	EER 11 (based on CEE Tier 2)	Yes
Distribution transformers	NEMA standard	No
Commercial refrigerators and freezers	CEC standard	No
Ice makers	FEMP specification	No
Vending machines	2016 kWh*	No
Beverage merchandisers	2197 kWh*	No
Electronic equipment and power supplies	Energy Star specifications	No
Exit signs	Energy Star specifications	No
Traffic signals	Energy Star specifications	No
Torchiere lamps	CEC standard	No
Furnace and heat pump fans	0.11 W/cfm (based on best current systems)	Yes
Ceiling fans	Energy Star specifications	No
Packaged large heating, ventilation and air conditioning	EER 10 (based on CEE Tier 2)	No
Unit and duct heaters	82 percent Seasonal Efficiency (similar to commercial furnace standard)	No
Commercial clothes washers	CEC standard	No

* From Arthur D. Little study assuming 32 percent energy savings and a 2-year payback.
CEC = California Energy Commission; CEE = Consortium for Energy Efficiency; DOE = US Department of Energy; FEMP = Federal Energy Management Program; NEMA = National Electrical Manufacturers Association; SEER = Seasonal Energy Efficiency Rating; W/cfm = watts per cubic feet per minute.

available sales data. Tracking and crediting issues are discussed in more detail at the end of this chapter.

Review Appliance Standards Every Five Years. In order to keep up with technological improvements, it is recommended that New York review appliance standards within five years after an improved standard is issued for a given appliance, and every five years thereafter.

Standards for new appliances should also be considered periodically. Reviews should consider payback times and likely emissions reduced, among other factors. Although costs and benefits have not been estimated for new appliance standards resulting from future reviews, this measure seems important to achieve additional emissions reductions from the buildings sector, especially in the 2020 timeframe.

Continuous Review of Building Energy Codes. Continuous review and periodic upgrade of the building energy code, a process already established, could provide substantial GHG reductions over the long term. Each code should be reviewed at least every five years, but could be reviewed more frequently. As is the case with appliance standards, building codes have an important effect on the efficiency of commercial and residential buildings. One item that should be considered in the next review round is a requirement for efficient conductor sizing. Although costs and benefits of new building codes resulting from future reviews have not been estimated, this measure would likely be important in achieving additional emissions reductions from the buildings sector, especially in the 2020 timeframe.

Education and Training to Boost Energy Efficiency

Education can play an important role in helping markets function efficiently. In many instances, economic efficiency improvements are not implemented because the opportunity is not recognized or because of a lack of expertise to implement the change. Targeted education can help in overcoming these knowledge barriers. Specific recommendations include those described in the following sections.

Provide for Enhanced Building Operator Training. This recommended action would seek to ramp up existing New York training programs to serve a larger number of building operators (including maintenance technicians, lead custodians, maintenance foremen, and plant engineers), who typically have little formal training in building efficiency. This training includes such topics as where to find and how to use building codes; how to read utility meters and bills; how to maximize heating, ventilation, and air conditioning controls; when to call for help; and a host of other operation and maintenance improvement techniques.

Cost and kWh savings estimates have been taken from a building operator training course operating in New England under the direction of the Northeast Energy Efficiency Partnership (NEEP). The total cost of the NEEP program in New England is $1,400 per student (paid by the student), which covers instruction fees, logistical support, textbooks, presentation materials, and other costs. The annual energy savings is 26,500 kWh per certified student. Assuming that this program is ramped up over time to train 1,000 students per year, and that the benefits of the training last only for five years, New York could expect to reduce 0.01 MMTCE in the year 2010 and 0.02 MMTCE in 2020 at a net benefit for every ton of carbon reduced. As with other efficiency measures evaluated, other emissions would also be reduced through implementation of building operator training.

One model for tracking kWh savings from building operator-training programs is provided by the Northwest Energy Efficiency Alliance (NWEEA). NWEEA closely tracks energy savings resulting from student training and certification, down to the specific measures implemented.

Details can be found in the program's Market Progress Evaluation Reports.[91] This tracking system could be replicated in New York.

Educate Consumers on Energy Efficient Mortgage Program. Energy efficient mortgages provide a win-win opportunity for new homeowners and the environment. This program, offered by Fannie Mae, uses expected energy-efficiency cost savings achieved from meeting a high efficiency standard to enable consumers to qualify for a larger home mortgage or lower monthly mortgage costs. Emissions reductions are quantified and aggregated by Fannie Mae using standard assumptions, and ultimately sold to the international carbon market. Proceeds from sales of carbon reductions are used to sponsor additional efficiency incentives. Although this mortgage product is available, it has not been well publicized. A targeted public service announcement supported by State efficiency expenditures would help publicize this important program. Costs and benefits of an energy efficient mortgage education program have not been estimated.

Educate Consumers on the Greenhouse Gas Benefits of Recycling. Interest in recycling has waned in the last several years due to decreased attention to the issue and consumer complacency. A new public education campaign linking recycling to GHG reductions could result in renewed interest. Costs and benefits of improving efficiency were estimated above, under incentive programs for recycling.

Setting and Tracking Progress Toward a Buildings-Sector Goal

Beyond implementation of specific actions to reduce emissions associated with the buildings sector, additional actions are recommended to ensure that the buildings sector contributes to the State target, to encourage continued implementation of efficiency measures, and to ensure that responsible parties receive recognition for their actions. These actions would incur relatively small costs to government and industry that have not been estimated. New York should consider taking actions toward setting and meeting a buildings-sector goal, as described in the following sections.

Establish an Emissions Reduction Goal for the Buildings Sector. Earlier we described the level of reductions possible from the buildings sector, assuming implementation of recommended actions. A sector goal could be set at the level of what is known to be possible. Alternatives would be to set a goal that is somewhat easier than what is possible to foster trading across sectors, or to set a goal that is more aggressive than what was estimated to be possible, requiring New York State to look to some of the stretch options at its disposal. We believe that any of these approaches could be justified. The important thing is that a goal be set to ensure that emissions from the buildings sector are being tracked and reduced as an integral component of the State target.

The buildings-sector goal could be for specific points in time, such as 2010 and 2020, in line with the statewide goal. Alternatively, it could be set as a continuous line starting from current year emissions. This latter approach could encourage early actions and better enable New York

[91] See http://www.nwalliance.org/projects/commercial.asp, "building operator certification."

to evaluate whether additional actions should be taken to stay on track toward meeting the State target.

Track Progress Toward the Buildings-Sector Goal. New York State should track progress against the buildings-sector goal on both a bottom-up and top-down basis. The bottom-up information would include reports from electricity and energy suppliers on sales to end-users (see below for a fuller discussion of recommended reporting), whereas the top-down assessment would include EIA fuels sales data. Having both of these data sets would enable New York to verify the EIA data with actual on-the-ground information and better disaggregate the emissions from the buildings sector by type and location of end user. If the numbers are inconsistent, New York may want to consider adjusting the sector baseline to reflect the higher degree of accuracy provided by in-state reporting. Where progress is not as expected, New York should consider how to improve upon existing actions and determine whether new actions are needed. To the extent that end-use data are disaggregated, New York will be better able to target programs to end user types and locations having higher carbon intensities. Moreover, sample information at the user level on which appliances contribute to total building emissions will also assist with targeting of new programs. A related recommendation on advanced metering is described below.

Require Fuel and Electricity Suppliers to Report Sales to End Users. New York State needs to improve on the current inventory and enable better targeting of future projects by collecting data on fuel and electricity sales to end users. New York State currently relies on data collected by the EIA on the total amounts of different fuels used in residential and commercial buildings on an aggregate basis. These data are based on small surveys instead of a comprehensive bottom-up assessment. The Center's experience in undertaking both bottom-up and top-down inventories in Slovakia showed a 15 percent difference between the two approaches. Our research found that the bottom-up inventory showed more emissions. To support an accurate and robust tracking system, New York should develop an improved inventory on the basis of full reporting of actual fuel sales in the State. This more extensive inventory can also be used to judge the accuracy of relying on EIA data in future years.

A second limitation of the current inventory is that it provides little information to guide targeting of future projects when additional emissions reductions are needed. Key data that would help the State target new projects include information on fuel and electricity use in different types of buildings and in different geographic areas.

To address both of these data needs, New York should require reporting of fuel and electricity sales at finer levels of detail, including by subsector (building type) and geographic region (county). New reporting would be needed to understand the differences in use of oil and gas by location and type of building. Specifically, New York should require fuel suppliers, such as oil jobbers and natural gas distribution companies, to report their sales by location (e.g., by county) and type of end user (e.g., type of building). These data should be combined with similar sales data from electricity generators. This level of reporting is ideal as larger wholesale suppliers, such as natural gas pipelines, may be unable to identify end users; whereas data on lower levels, such as buildings and households, will be too cumbersome.

Develop Advanced Metering Projects With Representative End Users. As part of New York's energy efficiency programs, the State should continue to work with representative commercial and residential establishments to implement advanced metering programs. The goal of this effort should be to improve understanding of opportunities for reducing GHG emissions in this sector and the extent to which the added knowledge that comes from advanced metering leads to efficiency improvements.

Facilitate Crediting and Recognition for Emissions Reductions in Buildings Sector

An added incentive for taking action within the buildings sector could be created by setting up a system for recognizing all registered emissions reductions or crediting emissions reductions in excess of the sector goal. Specifically, New York should establish ownership of efficiency actions and determine methodologies for aggregation. To enable New York State and other actors to take credit for GHG emissions reductions associated with funding and implementation of end-use efficiency measures, recycling, and other small-scale, end-user projects, the State should establish who should be credited and how to credit multiple small-scale projects. Also, a mechanism to credit buildings sector actions that displace power sector emissions would need to be established. One approach would be to establish an efficiency set-aside program within a power sector cap-and-trade system. The costs of these deliberations are likely to be relatively small, but have not been estimated.

Further Evaluations

Finally, given the time constraints associated with the Task Force process, a handful of measures exist, including incentives for white or light-colored roofs and targeted tax incentives for equipment-specific upgrades, which were not evaluated but could prove to be cost-effective. White or light-colored roofs are expected to lower electricity bills in affected buildings by reducing summertime peak demand levels. If widely implemented, this measure could provide more generalized cooling that could lower electricity bills in a given region. The costs and benefits of this option needs to be studied more to understand whether this measure is likely to be advantageous in New York. Targeted tax incentives for equipment-specific upgrades would seek to identify cost-effective opportunities for energy savings in New York. This measure should be evaluated in light of the results of a forthcoming market study of energy efficient opportunities and recommendations for new appliance standards.

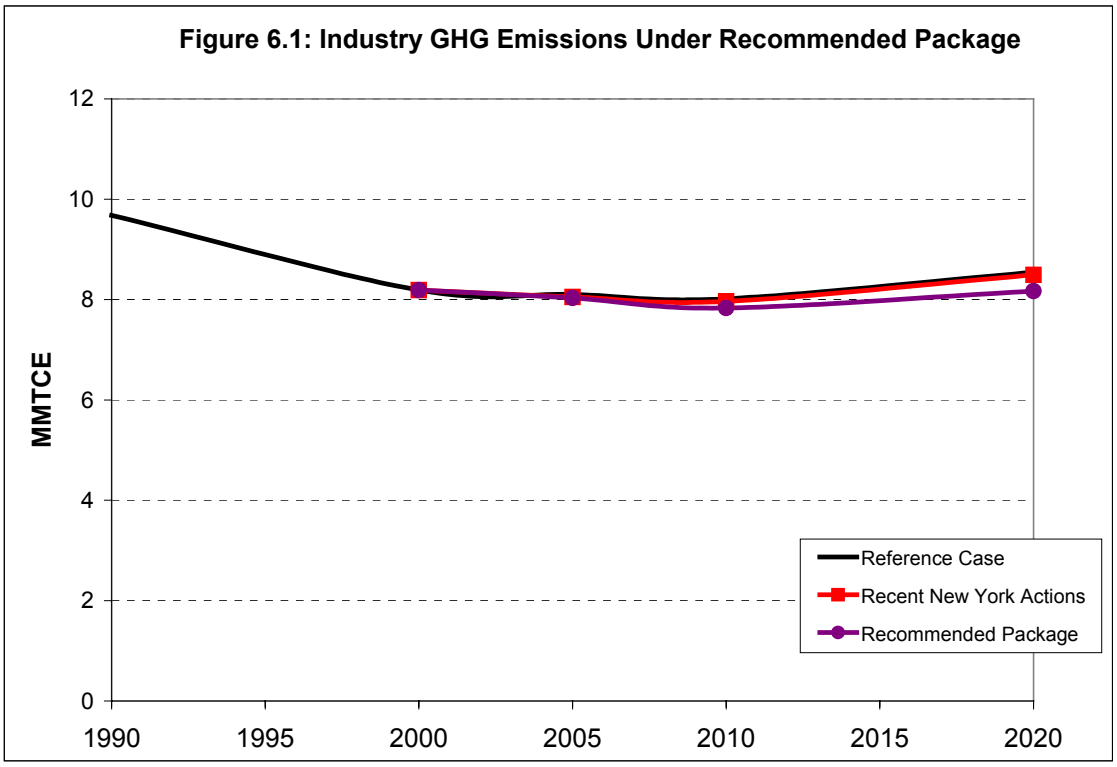
VI. INDUSTRY

A. SECTOR SUMMARY

Analysis by the Buildings and Industry working group found that the industry sector could reduce emissions from the baseline by 0.10 MMTCE in 2010 and 0.25 MMTCE in 2020. These projected reductions are in addition to those achieved in the electricity sector and achieve a net cost savings for every ton of carbon reduced. Total reductions from the industry sector, including efficiency measures displacing power sector emissions, come to 0.13 MMTCE in 2010 and 0.32 MMTCE in 2020. Because the industry reference case shows a decline in absence of new policy measures, these industry sector actions help achieve emissions reductions of 19 percent below 1990 levels in 2010 and 16 percent below 1990 levels in 2020 (see Figure 6.1). Although cost-effective, the recommended measure (negotiated agreements) will require up-front time to implement. Actual reductions will depend on total participation levels and the greenhouse gas (GHG) reduction commitments made by industry. Additional cost-effective actions within this sector may also be available, but were not thoroughly investigated. The following actions are recommended for implementation:

- Negotiate GHG-reduction agreements with industry to address 50 percent of total GHG emissions from this sector by 2010.
- Implement energy efficiency incentive programs and other technical assistance targeted to industrial appliances and processes.
- Establish mandatory reporting requirements covering most industry emissions.

Figure 6.1: Industry GHG Emissions Under Recommended Package



MMTCE = million metric tons of carbon equivalent

Impact on and Benefits for New York

New York industry has much to gain from investments today in a more energy efficient future. Although energy prices may increase from 2006 to 2010 to cover the costs of new and extended energy efficiency programs and new appliances will have higher first costs, the benefits to New York industry of new and extended efficiency measures will greatly exceed the costs in the medium and long terms. Key advantages of efficiency investments include cost savings to industrial energy consumers that take advantage of incentive programs, lower reliance on imported oil, lower susceptibility to fluctuations in energy costs, and significant reductions in GHG and other emissions.

On the cost side, the decision on whether to participate in the negotiated agreement program is purely voluntary and would only be taken where industry believes benefits will outweigh costs. Industrial end users that choose to participate in the negotiated agreement program and take advantage of new incentives and technical assistance will have their up-front costs subsidized through government incentives, and will reap cost savings through lower energy spending. Applying the results of the Department of Energy commissioned *Scenarios for a Clean Energy Future* study on a prorated basis to New York, implementation of negotiated agreements and associated measures for energy efficiency is expected to result in a net benefit to New York of $81 million per year. These cost savings will ultimately boost the competitiveness of industry in New York.

In addition to costs associated with participation in negotiated agreements, industry could experience higher energy costs on a temporary basis in association with implementation of the broad-based energy efficiency programs discussed in the buildings chapter, depending on the chosen financing mechanisms. Assuming use of a financing mechanism for new energy efficiency programs that adds a surcharge to energy costs, costs to industry electricity consumers could range from 1.6 to 1.65 mills/kWh, just over a three percent increase in power prices above BAU levels.[92] Costs to industrial consumers of oil and gas are also expected to increase. For example, the increase in industry natural gas utility bills is estimated at 0.2 percent.

Implementation of negotiated agreements would reduce emissions by 0.13 MMTCE in 2010 and 0.32 MMTCE in 2020. A small portion of these reductions is used to help meet the power-sector cap, reducing power-sector compliance costs. The remaining 0.10 MMTCE in 2010 and 0.25 MMTCE in 2020 are additional to the modeled power-sector cap. In addition to achieving reductions in carbon, co-benefits in the form of lower emissions of nitrous oxides, sulfur dioxide, and mercury are also expected. Measures that target oil, gas, and electricity consumption in industry would also lower energy consumption statewide, reducing the State's reliance on foreign oil and susceptibility to fluctuations in electricity and natural gas prices.

[92] These figures assume the cost of the efficiency programs are distributed equally to consumers across the state. Given historical pricing practices, industry would likely bear a smaller than average share of this cost. In addition, to the extent that industry shoulders the current SBC, NYPA and LIPA programs, the incremental cost of supporting new and extended efficiency measures would be much smaller.

Views of the Task Force

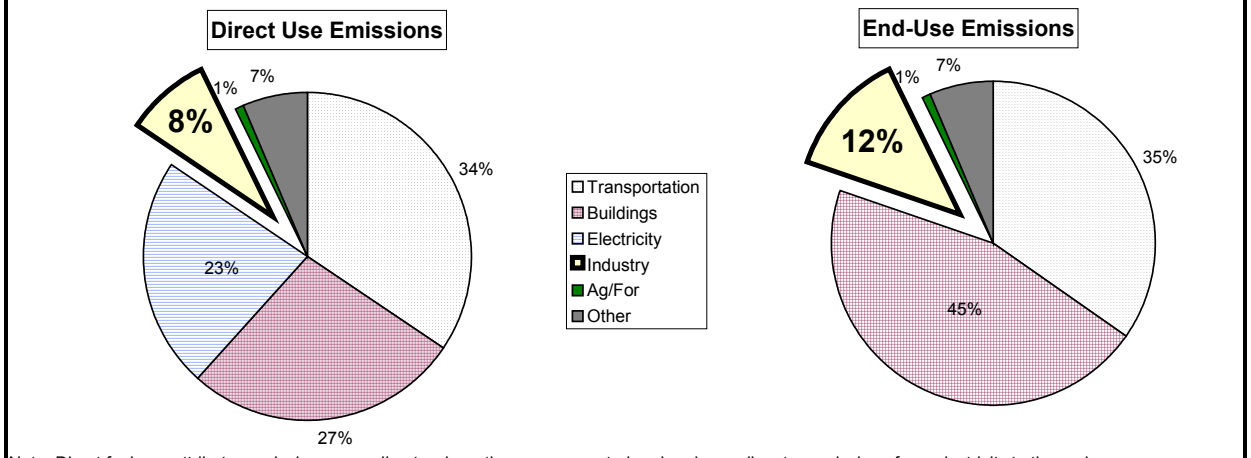
The Task Force expressed strong support for new efforts to negotiate agreements with industry to reduce GHG emissions. Members expressed strong sentiment that the agreements should be designed to preserve and enhance industry competitiveness and enable industry growth through use of energy efficiency benchmarking, adjustable baselines or other means. The Task Force also indicated support for new industry reporting and the possibility of receiving credit or other recognition for emissions reductions in excess of corporate commitments.

B. OVERVIEW

Industry Sector Emissions

The industrial sector encompasses the full variety of manufacturing industries in New York. Emissions from this sector include direct emissions from boilers and furnaces used for heating and onsite distributed generation, indirect emissions associated with electricity consumed during operation of industrial processes, and non-combustion emissions from cement production, limestone use, soda ash use, aluminum production and CO_2 manufacture. In all, the industry sector was responsible for about 12 percent of the State's GHG inventory in 2000, including industry's share of electricity generation (Figure 6.2). Not counting electricity generation, industry was responsible for eight percent of the State's 2000 GHG emissions inventory. The remaining discussion of the industry-sector inventory includes emissions from electricity generation used by this sector.

Figure 6.2: 2000 Industry Sector Emissions Comparison



Note: Direct fuel-use attributes emissions according to where they are generated and end-use allocates emissions from electricity to the end-user.

The State's GHG forecast projects that industry-sector emissions will decline by 1.66 MMTCE between 1990 and 2010 and then increase by 0.52 MMTCE between 2010 and 2020 (Table 6.1). 2020 emissions are projected to be 1.14 MMTCE below 1990 levels. The industry-sector share of the total State inventory will decline to 11 percent in 2020, mainly due to reduced electricity consumption and the lower carbon intensity of power-sector emissions in the 1990 to 2000

period. Direct fuel-combustion emissions are expected to increase slowly between now and 2020 (by about six percent).

Table 6.1: Industry Inventory (MMTCE)				
Emissions Source	**1990**	**2000**	**2010**	**2020**
Direct fuel combustion	4.39	4.50	4.53	4.78
Indirect electricity	4.31	2.72	2.51	2.79
Nonfuel combustion	0.98	0.97	0.98	0.98
Total	**9.68**	**8.19**	**8.02**	**8.54**

MMTCE = million metric tons of carbon equivalent.

Some oil and gas efficiency improvements resulting from the SBC program were not included in the above baseline. Emissions reductions from these newer actions (see Table 6.2), labeled "recent New York actions," are subtracted from the industry sector inventory, resulting in the adjusted inventory shown in Table 6.3. The sector baseline adjusted for recent actions is used for evaluating the effectiveness of recommended policy measures in the industry sector.

Table 6.2: Recent New York Actions Additional to Original Inventory (MMTCE)		
	2010	**2020**
System Benefit Charge funds displacing industrial oil and gas	0.05	0.05
Total	**0.05**	**0.05**

MMTCE = million metric tons of carbon equivalent.

When combined with the original inventory, this recent New York action results in the slightly adjusted emissions baseline in Table 6.3. Clearly, the industry-sector emissions projected for 2010 and 2020 are well below 1990 levels.

Table 6.3 Adjusted Inventory—Industry (MMTCE)				
	1990	**2000**	**2010**	**2020**
Total Adjusted Emissions	**9.68**	**8.19**	**7.97**	**8.49**

MMTCE = million metric tons of carbon equivalent.

Mitigation Opportunities

Approaches for reducing GHG emissions from the industry sector include implementing measures that reduce direct emissions from onsite fuel combustion or production processes and measures that reduce indirect emissions associated with electricity consumption. Measures for reducing direct emissions associated with onsite fuel combustion include improving efficiency of onsite electricity generation by building combined heat and power (CHP), burning lower carbon fuels in onsite boilers or generators, building renewable power generation for use onsite, improving efficiency of onsite units, and undertaking end-use efficiency measures that reduce

onsite fuel use. Options for reducing indirect emissions from electricity purchases include decisions to purchase green power and implementing efficiency measures that reduce electricity consumption. Although options are available for reducing process gas emissions, these options were not analyzed as part of this study. To date, most emphasis in New York has been placed on efforts to implement electric end-use efficiency measures. The GHG inventory, however, shows that onsite oil, gas, and coal generation is responsible for the largest share of this sector's GHG emissions. Efforts going forward should be placed on addressing both direct and indirect emissions.

A key challenge to reducing emissions from industry is a lack of company-by-company emissions data. Although EIA reports fuel use in New York industry as a whole, there is no easy way to disaggregate this information by industry sector and by company. Determining which sectors and companies could gain the most from targeted efficiency measures through industry benchmarking or other means is therefore difficult. Without disaggregated data, potential reduction commitments are difficult to make and assess.

Although many measures for reducing emissions cut across industry sectors (such as those relating to boilers and motors), others are process-specific. Depending on the approach used by government to encourage or require reductions in industry, finding efficiency solutions for specific processes may be more time-consuming than implementing other available GHG reduction measures.

C. Analysis of Mitigation Options

The Buildings and Industry working group identified negotiated agreements as a crosscutting measure for reducing GHG emissions from industry in New York. Additional targeted measures were suggested but not quantitatively analyzed. The estimated emissions reductions and cost-effectiveness of negotiated agreements are shown in Table 6.4. These estimates were developed on a "bottom-up" basis looking at the effectiveness of similar programs. They do not assume the dynamic interactions that would occur within the power sector as a result of lower electricity demand. Members of the Buildings and Industry working group ranked negotiated agreements as a low option because it is cost-effective, voluntary and unlikely to encounter important barriers to implementation.

Implementation of negotiated agreements, assisted in large part by the expected decline in industry emissions under the Reference Case and recent New York actions, is projected to achieve reductions in the industry sector on the order of 1.82 MMTCE in 2010 (19 percent below 1990 levels) and 1.524 MMTCE in 2020 (16 percent below 1990 levels). These figures include indirect emissions reductions from reduced electricity consumption.

The Task Force expressed strong support for new efforts to negotiate agreements with industry to reduce GHG emissions. There was a strong sentiment that the agreements should be designed to preserve and enhance industry competitiveness and enable industry growth through use of energy efficiency benchmarking, adjustable baselines, or other means. The Task Force also indicated support for new industry reporting and the possibility of receiving credit or other recognition for emissions reductions in excess of corporate commitments.

Table 6.4: Industrial Sector GHG Reduction Opportunities:						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Reference Case	**9.68**	**8.19**	**8.10**	**8.02**	**8.54**	
Recent New York Actions:						
SBC industrial (oil & gas)			0.03	0.05	0.05	
Total			**0.03**	**0.05**	**0.05**	
Proposed Actions:						
Low Scenario						
Negotiated Agreements			0.02	0.13	0.32	(323.48)
Total			**0.02**	**0.13**	**0.32**	
Medium Scenario						
Total			**0.02**	**0.13**	**0.32**	
High Scenario						
Total			**0.02**	**0.13**	**0.32**	

D. Avoiding Double Counting of Industry-Sector Measures

When combining emissions reductions from the various sectors into the summary of emissions reductions in New York, an issue of double counting exists in sectors that reduce electricity demand (e.g., buildings and industry) and the electricity sector. Most of the recommended buildings- and industry-sector actions that displace electricity generation, including negotiated agreements, were included in the electricity-sector modeling runs. This was done because many of these actions appeared likely to be included among final recommendations, and because the model does not estimate a demand response from higher electricity prices. These end-use efficiency actions make achieving the electricity-sector cap easier and reduce the cost of compliance for the power sector. In effect, reductions that would otherwise have been made by the electricity sector in meeting a given cap level are instead made by end-use efficiency. Conversely, if the assumed level of efficiency is not implemented, the power sector pays the price by having to achieve greater emissions reductions than were projected. This layering of efficiency and electricity-sector measures ultimately lowers the total reductions from what is achieved when counting the two sets of measures separately.

The portion of recommended industry-sector actions that displace electricity-sector emissions were already counted in the electricity-sector modeling, and therefore cannot be counted again as a separate industry-sector measure. The summary-level reporting of end-use efficiency emissions

reductions from the industry sector in New York State is limited to actions that displace oil and gas end uses, in whole or in part.

The portion of the negotiated agreement action that displaces oil and gas is shown in Table 6.5.

Table 6.5: Industry-Sector Actions Additional to Power-Sector Modeling		
	MMTCE in 2010	**MMTCE in 2020**
Negotiated agreements	0.10	0.25
TOTAL	**0.10**	**0.25**
Reduction (increase) from 1990 levels	**19 percent**	**15 percent**

MMTCE = million metric tons of carbon equivalent.

E. Description of Recommended Actions

New York State should move forward with negotiated agreements, given their cost-effectiveness, likely acceptance, and the strong interest expressed by at least one industry Task Force representative. To achieve the full estimated reduction potential of negotiated agreements, complementary incentives should also be implemented, including mandatory reporting, financial incentives to implement efficiency measures, and removal of barriers to implementation of efficiency measures. Many of these complementary measures were recommended under the Buildings chapter. Recommended industry actions are summarized in Table 6.6.

Table 6.6: Industrial Sector GHG Reduction Opportunities:						
Actions	**Estimated Reduction Potential (MMTCE)**					**Incremental Cost per MtCE ($2000)**
	1990	**2000**	**2005**	**2010**	**2020**	
Reference Case	**9.68**	**8.19**	**8.10**	**8.02**	**8.54**	
Recent NY Actions			**8.05**	**7.97**	**8.49**	
Recommended Package:						
Negotiated Agreements			0.02	0.11	0.34	-323.48
Total Recommended Actions			**0.02**	**0.11**	**0.34**	
Total Emissions (MMTCE)			**8.03**	**7.86**	**8.16**	
Compared to 1990 Levels			**-17%**	**-19%**	**-16%**	

Negotiated Agreements With Industry

Negotiated agreements with industry and related companion measures are recommended for implementation in New York.

Negotiate Greenhouse Gas Reduction Agreements With Industry. New York State should take a leading role in developing negotiated agreements with individual companies or entire industry sectors for the primary purpose of reducing emissions of GHGs. New York State should set a goal of negotiating agreements with companies and sectors representing at least 50 percent of New York's industrial GHG emissions by 2010.

Under a negotiated agreement, industrial sources commit to a cap on GHG emissions or to meet an energy efficiency or carbon intensity standard in exchange for regulatory certainty, positive public relations opportunities, permitting flexibility, financial incentives or other benefits. Negotiated agreements are entered on a voluntary basis but compliance is mandatory once the agreement is made. In the event that an agreement ends (one party pulls out for breach of faith), the industry party would lose the regulatory incentives offered by the agreement.

Negotiated agreements are designed to provide a high degree of flexibility in how targets are met. In the event that a company is participating in good faith but doesn't meet its target or other interim commitment, remedies could be worked out within the context of the agreement. For example, extra time could be provided to meet the target or purchase allowances.

Several models are available that illustrate alternative approaches to negotiated agreements. These models include New Jersey's Silver and Gold Track program, the Netherlands Energy Efficiency Benchmarking Covenants, and the covenant approach being used in Quebec, Canada. Under New Jersey's program, companies agree to a 3.5 percent reduction in GHG emissions from 1990 levels in exchange for public relations benefits and permitting flexibility. Under the Netherlands program, industry sectors agree to "best in the world" energy efficiency standards in exchange for regulatory certainty on carbon. The Quebec covenant program is expected to establish different targets for different companies, ranging from 0.5 percent to three percent annual reductions from current levels, in return for regulatory certainty. The baselines under the Quebec program are adjustable, meaning that increases and decreases in production or production capacity will result in corresponding changes to the emissions baseline. These and other design issues would need to be decided in early phases of this program and should consider the competitiveness and continued growth of New York industry as a primary criterion.

Implementation of negotiated agreements is recommended to occur in phases. For example, companies or industries wanting to demonstrate leadership or get a head start on the competition could pilot the commitment phase prior to widespread application.

The cost-effectiveness of negotiated agreements was evaluated by prorating the federal Clean Energy Futures (CEF) evaluation of this measure to New York State on the basis of New York State's industrial GHG emissions as a percent of national industrial GHG emissions. Total reductions were reduced by one-half to account for the likelihood that not all companies and sectors would participate. The resulting reductions from implementing negotiated agreements in

New York is estimated at 0.13 MMTCE in 2010 and 0.32 MMTCE in 2020, at a net cost savings per ton of carbon reduced.

The CEF study makes several assumptions that are worth mentioning. For example, it assumes participation by 13 major energy-intensive sectors, including agriculture, mining, construction, food, paper, chemicals, glass, cement, steel, aluminum, metals-based durables, other manufacturing, and petroleum refining. New York has a different mix of industry sectors than does the nation as a whole. In particular, the State has fewer energy-intensive industries than the rest of the country. Major emitting sectors in New York include forest products, chemicals, instruments and related products, glass/stone/clay, information and communication products, and food processing. The CEF study also assumes a number of companion options, listed in Table 6.7.

Implement Efficiency Measures Targeted to Industry. In line with the CEF negotiated-agreements program aligning industry agreements with incentives and technical assistance, we recommend that a portion of the energy efficiency measures displacing electricity, oil, and gas discussed under the buildings sector be targeted to assisting New York companies and industry sectors that participate in negotiated agreements.

Setting and Tracking Progress Toward an Industry-Sector Goal

Establish an Emissions Reduction Goal for the Industry Sector. A goal for the industry sector as a whole is recommended in addition to goals or agreements with individual companies and industry sectors. This larger industry goal will provide a useful reference point for New York State in developing individual negotiated agreements and can help New York ensure that committed reductions from this sector are integrated into the statewide target. The actual goal for the industry sector should be at least as high as our estimate of what is possible with implementation of negotiated agreements. A higher goal would help the State meet the aggressive statewide target of five percent below 1990 emissions levels.

The industry-sector goal could be for specific points in time, such as 2010 and 2020, in line with the statewide goal. Alternatively, it could be set as a continuous line starting from current year emissions. This later approach could better enable New York to evaluate whether additional actions should be taken to stay on track.

Establish Mandatory Reporting for Industry. To develop an improved understanding of emissions and emissions trends within the industry sector, and to facilitate development and tracking of negotiated agreements, annual mandatory reporting is necessary to track the types, amounts, and suppliers of fuels consumed; amounts and suppliers of electricity purchases; and emissions of non-carbon GHGs in the State. Reporting should separate emissions that occur on site (direct emissions reductions) from those that occur at power generation facilities or other off-site emission sources (indirect emissions reductions). New York State should establish a threshold reporting level that covers most GHG emissions from the industry sector, starting with companies that are already subject to Title V reporting requirements. Companies emitting below the threshold would be encouraged to report on a voluntary basis.

New York should develop standard reporting methods to be used to ensure that reporting is transparent and to minimize the cost. This should include use of a standard emissions baseline formula as well as decisions on who reports and what is reported.

TABLE 6.7: NEGOTIATED-AGREEMENT COMPANION MEASURES IN CLEAN ENERGY FUTURES STUDY

Expanded Challenge Programs - Motor and compressed air - Steam - Combined heat and power (CHP)	Expanded education, technical assistance, training, tools, financial incentives, and removal of permitting barriers.
Expanded Energy Star Programs - Buildings and Green Lights - Climate Wise	Development of best-practices management tools and benchmarking information, resulting in a 50 percent increase in floor space covered by Energy Star buildings and Green Lights. Expansion of Climate Wise to glass, steel, aluminum, and selected light industries.
Expanded Pollution Prevention Programs	Expanded effort leads to increased recycling in the steel, aluminum, paper, and glass industries.
Information Programs - Expanded assessment programs - Product labeling and procurement	Increased number of industrial assessment centers and assessments. Development of labels for two products.
Expanded State Programs - State industrial energy efficiency programs - Clean Air Partnership Fund	Current State programs expanded to include information dissemination, audits, demonstration programs, and R&D. Participation grows to 30 states. Expanded use of integrated approaches for complying with the Clean Air Act (CAA) and expanded demonstration of new technologies.
Expanded ESCO/utility programs - Standard performance contracting (line charge)	Expanded to 30 states and increased efforts to target small industrial customers.
Financial Incentives - Tax incentives for energy managers - Tax rebates for specific industrial technologies - Investment tax credit for CHP systems	Tax rebates covering 50 percent of energy manager salary to 5000 medium and large energy-using industries by 2020. Increased rebates focus on implementation of advanced technologies. CHP tax credit extended to 2020.
Regulations - Motors standards and certification - State implementation plans	Mandates and enforces upgrade of all motors to EPACT standards by 2020. Promote national motor repair standard. Identifies control measures and regulations to adopt and enforce control strategies.
Research and Development (R&D) Programs - Expanded demonstration programs - Industries of the Future - Other Office of Industry Technology (OIT) R&D programs	Demonstration programs expanded in current sectors and extended to mining and construction. Increased number of demonstration programs. Increased R&D efforts in all industries currently in Industries of the Future program. Other OIT R&D efforts increased in areas related to improving industrial efficiency.

Deciding Methods for Recognizing and Crediting Reductions from Industry. Methods need to be established for recognizing and crediting GHG emissions reduced by industry. One option would be to allow all reported reductions to receive public recognition and baseline protection. Only companies that have negotiated agreements with New York State could receive credit for reductions below their commitments. This stipulation would provide an added incentive to participate in the negotiated agreement program. A set-aside or other system would need to be developed as part of the power sector trading program to avoid double counting.

Further Evaluations

Because of time constraints on the Task Force process, a handful of measures that could prove cost-effective were not evaluated. These measures include implementation of "conservation transfers" where the New York Power Authority invests in efficiency projects at the sites of customers taking advantage of low-cost hydropower and targeted tax incentives for equipment-specific upgrades. In each of these cases, we recommend further study and analysis to determine the likely costs and emissions reductions in New York State. In the latter case, a market study is already underway that will shed light on new opportunities for cost-effective energy efficiency.

VII. TRANSPORTATION AND LAND USE

A. SECTOR SUMMARY

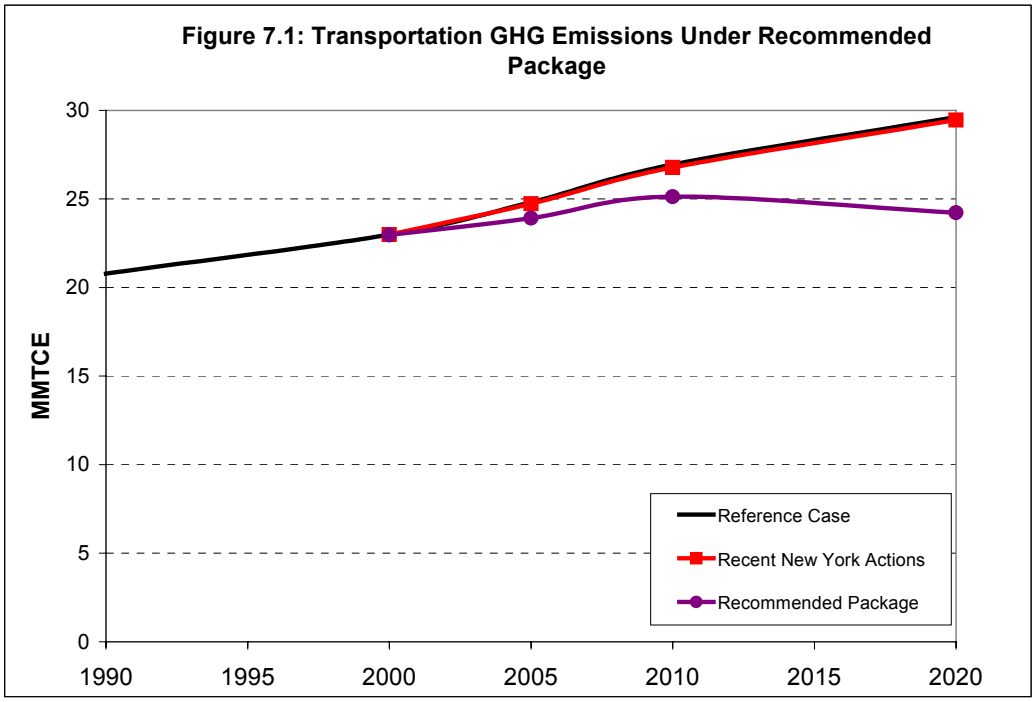
Analysis by the Center with input from the Transportation and Land Use working group found that this sector can reduce emissions by 1.64 million metric tons of carbon equivalent (MMTCE) in 2010, with total emissions 20.9 percent *above* 1990 levels, and reductions of 5.23 MMTCE in 2020, with total emissions 16.5 percent *above* 1990 levels, through implementation of the actions recommended in this chapter (see Figure 7.1).

We recommend that New York implement the following actions:

- **Slow the growth of vehicle miles traveled (VMT).** The State should shift funding to more GHG-efficient alternatives such as transit and smart growth, and should harmonize other State funding and incentives with GHG reduction and Quality Communities Goals. GHG reporting should be required in the State Environmental Quality Review Act (SEQRA), Transportation Improvement Programs (TIPs), and long-range transportation plans (LRPs). The State should assist municipalities and metropolitan planning organizations (MPOs) with integrated land use and transportation planning, and should initiate an annual competitive grant solicitation for local governments and private companies to propose GHG reduction ideas. The GHG and air-quality effects of major private developments should be tracked, and by 2007 the State should decide on implementing a GHG offsets requirement.
- **Reduce vehicle GHG emission rates.** New York should follow California's lead and set GHG emissions standards for new light-duty vehicles beginning with the 2009 model year. Section 209 of the federal Clean Air Act permits California to establish emissions standards for new light-duty vehicles that are more stringent than the federal standard and Section 177 allows other states to adopt the identical California standard. While New York cannot adopt GHG tailpipe standards before California finalizes their standards, the State should undertake the necessary background work to the adoption of the new California standards once they are finalized. If implementation of the California standards faces significant delays, New York should introduce a revenue-neutral, GHG-based "feebate" program for new cars and light trucks in which low-GHG vehicles receive a rebate and high-GHG vehicles pay a fee. The Center recommends that the State provide other incentives to enhance demand for GHG-efficient vehicles; foster deployment of advanced-technology vehicles; modify Clean Fleets goals to maximize GHG reductions; and encourage best practices in enforcing speed limits, conducting driver training, and encouraging vehicle maintenance, including low rolling resistance tires and oil.
- **Expand use of low-GHG fuels.** All diesel fuel sold in New York State should contain two percent biodiesel by 2010. As additional supply becomes available, the State should increase the percentage of biodiesel so that half of all diesel sold in New York consists of 20 percent biodiesel by 2020. The State should also maximize use of biodiesel in its own fleets and encourage biodiesel use in municipal and private fleets. New York State should also develop a biofuels program with incentives for producers.

- **Improve multimodal freight efficiency.** The State should invest in key freight rail infrastructure such as the Cross-Hudson tunnel, should raise bridges to accommodate double-stack containers, and should expand the Brooklyn port to facilitate intermodal transfers. New York should also continue to encourage the Legislature to pass rail taxation reform and should reduce truck emissions by promoting the deployment of truck-stop electrification technology; enforcing truck speed limits; and consider increasing truck tolls and/or highway user fees.
- **Improve aviation efficiency and promote high-speed rail.** We recommend that New York provide incentives for low-GHG airport ground and gate equipment and evaluate the potential for high-speed rail to displace short-haul flights.
- **Establish a New York State Transportation Emissions Reduction Entity.** The establishment of a New York State transportation emissions reduction entity would greatly facilitate the implementation of the recommended actions. Reducing GHG emissions from transportation will require the involvement of multiple State agencies, including the New York State Department of Transportation (NYSDOT), the New York State Energy Research and Development Authority (NYSERDA), and the New York State Department of Environmental Conservation (DEC). One State entity focused on transportation emissions reductions could improve coordination of multi-agency efforts and focus or redirect State funding toward climate-friendly projects. Such an entity will require a dedicated funding mechanism and authority sufficient to implement the policies and measures recommended in this chapter. Proposed goals for this entity would be to reduce transportation GHG emissions to 20 percent above 1990 levels by 2010, ten percent above 1990 levels by 2020, and 1990 levels by 2030.

Figure 7.1: Transportation GHG Emissions Under Recommended Package



MMTCE = million metric tons of carbon equivalent

Impacts On And Benefits For New York

The transportation measures recommended in this report would strengthen the New York economy and continue the State's exemplary record of environmental leadership in the transportation sector.

Economic Effects. Slowing VMT growth and reducing vehicle GHG emissions rates will lower consumer fuel expenditures and reduce New York's dependence on imported petroleum. Targeting State transportation expenditures to strengthen communities and maximize use of existing infrastructure will reduce long-term costs by avoiding inefficient infrastructure expenditures. The California legislation on tailpipe GHG emissions requires that the standards be cost effective and economical to vehicle owners taking into account full life-cycle costs. Since California has not yet defined the level of the new GHG tailpipe standards, it is not possible to ascertain actual program costs, but other analyses in California and Canada enable us to estimate the economic impacts of the GHG tailpipe standard to range from a benefit of $36 per MTCE to a cost of $143 per MTCE.[93] The alternative GHG-based "feebate" program would result in low short-term costs for a one-state approach, and net benefits for a long-term or multistate approach. Research, development, and deployment of advanced vehicles will bolster New York's technology sector in a competitive and lucrative market. The requirement for two percent biodiesel by 2010 could increase diesel prices by about one cent per gallon (depending on federal support and production improvements). Biofuel production and use incentives, however, will strengthen New York's agricultural sector and help preserve valuable farmland. These benefits would be achieved by reorienting existing financial resources and capitalizing on synergies with complementary initiatives such as federal and State tax credits for brownfield redevelopment, and open space protection efforts.

Quality of Life Improvements. Increasing the transportation choices available to all New Yorkers will reduce time in traffic, improve air quality, enhance public health and safety, and foster a more efficient and equitable transportation network. VMT reductions can also enhance equity and environmental justice by reducing mobile-source pollution in key exposure areas and protecting important lands.

Demonstrating Continued Leadership. By creating a New York State transportation emissions reduction entity, New York would demonstrate continued leadership on the most important challenge facing transportation in the United States, and even the world. New York State currently has the most energy efficient transportation sector in the United States due in large part to transportation infrastructure investments and supportive land use planning in the New York City region that enable high levels of transit use, walking, and bicycling. New York State has also been a leader in adopting new technologies and clean fuels.

[93] California has not yet defined the specific levels of the tailpipe GHG standards. Cost estimates based upon: California Energy Commission and California Air Resources Board. *Task 3 Petroleum Reduction Options.* Staff Draft Report, March 2002 and Canada Transportation and Climate Change Table, *Transportation and Climate Change: Options for Action*, November 1999.

Views of the Task Force

The Task Force concluded that the transportation sector is the dominant source of GHG emissions in New York and poses the State's most significant challenge to reducing emissions. There was near-unanimous support for redirecting transportation spending toward more efficient modes and providing tools and incentives to encourage VMT reductions. There was significant discussion on the optimal policy approach to reducing sector GHG emissions. The Task Force considered an Executive Order on VMT reduction, a transportation efficiency fund, and a transportation emissions reduction office at NYSDOT. At the final Task Force meeting, a member expressed the need for a NYSERDA-like entity to address transportation emissions, noting the key role that NYSERDA and Energy $mart have played in reducing GHG emissions from electricity generation. Although there was insufficient time to develop the idea at that meeting, the Center continued to develop the transportation emissions reduction entity idea in conjunction with other Task Force and Transportation working group members.

The Transportation and Land Use working group initially proposed increasing motor fuel taxes by one cent per year (for ten years), with revenues devoted to reducing transportation-related GHG emissions. Although supported by a majority of the working group, this measure was strongly opposed by State officials and subsequently dropped. There was broad agreement that shifting revenues from the existing Petroleum Business Tax or Motor Fuel Excise Tax to fund such activities could be more feasible.

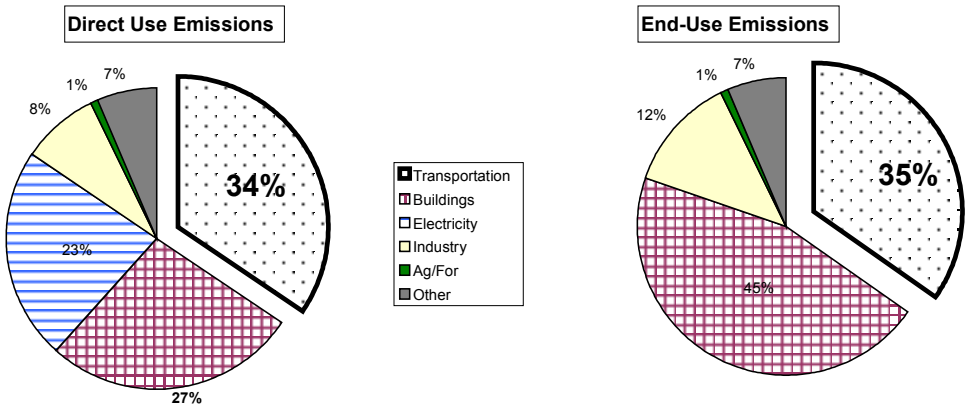
Task Force members indicated that New York could not set light-duty vehicle GHG emissions standards before California regulations go into effect. The alternative proposal of a GHG-based feebate program in New York received general support, with the intention of expanding to a regional program to include other northeastern states. The automotive industry representative on the Task Force was opposed to tailpipe standards and feebates, and other Task Force members saw them as a second-best approach necessary because of lack of federal action on motor-vehicle GHG emissions.

Members of the Task Force gave strong support to enhancing research and development and deployment (RD&D) efforts, as well as the development of an aggressive biofuels program in New York. Members expressed concern about requiring GHG offsets from major development projects (such as "big-box" retail stores), so the recommendation was modified to begin with reporting of projected GHG emissions by major private developments above a certain size and then allowing the State to decide whether the magnitude of emissions justifies a new approach to require offsets. Task Force members agreed on the priority of reducing emissions from freight, although there was little discussion of specific policy proposals.

B. OVERVIEW

The transportation sector is responsible for more than one-third of GHG emissions in New York, and represents the fastest-growing source of GHG emissions in the State. Figure 7.2 illustrates the GHG emissions contribution from the transportation sector. ("End use" emissions allocate emissions from power generation to each sector.)

Figure 7.2: 2000 Transportation Sector Emissions Comparison



Note: Direct fuel-use attributes emissions according to where they are generated and end-use allocates emissions from electricity to the end-user.

GHG emissions from motor vehicles are a function of three key variables: vehicle miles of travel (VMT), fuel economy (miles per gallon), and fuel carbon content. Similar terms apply for aviation, rail, and marine emissions. VMT growth is the dominant variable in the growth of transportation-sector emissions. Modest improvements in fuel economy and penetration of lower carbon fuels have somewhat offset the effects of VMT growth.

The State's GHG forecast projects that transportation-sector emissions will increase by 6.15 MMTCE between 1990 and 2010 and then increase by 2.68 MMTCE between 2010 and 2020 (Table 7.1). VMT in New York State increased 20 percent from 1990 to 2000 and are expected to increase 15 percent from 2000 to 2010, and another 12 percent from 2010 to 2020.[94] Average vehicle fuel economy increased by about seven percent from 1990 to 2000, and is expected to increase by one percent from 2000 to 2010, and five percent from 2010 to 2020. Use of alternative fuels (natural gas, LPG, and biofuel) is currently modest, but slated to increase from 0.02 percent to 0.80 percent in 2010 and 0.98 percent in 2020. The 2010 zero emissions vehicle (ZEV) mandate will lead to an increase in the use of alternative fuels and may help boost the alternative fuel vehicle inventory in the Northeast. Use of diesel fuel is expected to increase from 15 percent in 1990 to 20 percent in 2010. Although light-duty diesel vehicles are more carbon-efficient than gasoline vehicles, it is unclear whether the projected growth is due to increased truck VMT or a shift from gasoline to diesel passenger cars.

[94] Note that the New York State population grew 5.5 percent from 1990 to 2000. Thus, most VMT growth is caused by other factors, such as increased travel distances due to sprawl and increased leisure travel.

Table 7.1: Transportation Greenhouse Gas Baseline			
Year		**MMTCE**	**Percent Above 1990**
1990	**Base**	20.79	
2000	**Current**	22.98	10.5
2010	**Projected**	26.94	29.6
2020	**Projected**	29.62	42.5

MMTCE = million metric tons of carbon equivalent.

Context

New York State currently has the most energy efficient transportation sector in the United States, due in large part to transportation infrastructure investments and supportive land use planning in the New York City region that enable high levels of transit use (one-third of US ridership), walking, and bicycling. New York devotes nearly all of its transportation resources to maintaining existing infrastructure, with approximately equal amounts of funding for highways and transit. New York has also been a leader in adopting new technologies and clean fuels.

Baseline Issues

Baseline emissions for the transportation sector include all in-State emissions for ground transportation, and exclude international aviation and marine 'bunker' fuels per international reporting conventions.

Transportation fuel *sales* and fuel *consumption* data in New York differ because an estimated 18 percent of gasoline and diesel consumed in New York is purchased out of state, due to commuters, delivery vehicles, and through-traffic. New York VMT grew 20 percent from 1990 to 2000, whereas New York transportation fuel sales *decreased* four percent during this same period. Fuel sales data underestimate New York transportation GHG emissions by 15 percent, and provide an inadequate baseline for measurement of transport mitigation actions.

The Center's review of state-based VMT data in the region shows them to be reliable and consistent across time and states. The discrepancy between fuel sales and VMT is unique to New York and New Jersey, which leads us to conclude that the discrepancy is due primarily to vehicles driven in New York that refuel in New Jersey. Combining New York and New Jersey data fuel sales and VMT data eliminates the discrepancy and corrects peculiar fuel economy data for the two states that contradict regional and national data.[95] We summed VMT in New York and New Jersey and divided that by total Btu of transportation fuel sales in the two states to calculate average fuel economy. We then applied this average fuel economy number to New York VMT data to calculate gasoline and diesel *consumption* and associated GHG emissions.

[95] Fuel economy in New York was calculated to have increased 19 percent from 1990 to 1999, but to have decreased by 11 percent in New Jersey. Fuel economy increased 3 percent for the country as a whole over the same time period. In the combined New York–New Jersey case, fuel economy increased seven percent from 1990 to 1999.

Calculating GHG emissions from fuel sales compared to VMT-based consumption would make meeting a statewide target easier by about 15 percent (3.5 MMTCE in 2010, and 3.8 MMTCE in 2020), but leads to underestimation of proposed VMT reduction measures due to the artificially low baseline. A VMT-based fuel consumption baseline provides a more accurate and credible demand projection that is consistent with emissions measurement methods used by NYSDOT and MPOs.

Task Force transportation GHG calculations differ from those reported in the State Energy Plan (SEP) because the Task Force's focus is on GHG emissions from fuel consumption in New York, whereas the SEP data are based on in-State fuel sales.

Tracking GHG emissions from the transportation sector requires both VMT and fuel economy (mpg) data. NYSDOT has reliable VMT data, but to our knowledge, no independent estimate of the fuel economy exists for the New York fleet of vehicles. In the future NYSDOT should develop a robust methodology to calculate the fleet fuel economy and apply it to VMT data to calculate fuel consumption and GHG emissions.[96] Until then, we propose using regional fuel sales and VMT data to calculate average regional fuel economy, and then applying this to New York VMT data to calculate GHG emissions. Our analysis of the regional data found that combining New York and New Jersey data yielded consistent and reasonable fuel economy data. If regional travel trends change, a different combination of regional data may be appropriate.

Recent New York Actions

Recent New York Actions are estimated to reduce GHG emissions from the baseline forecast by 0.17 MMTCE per year due to regional TIPs.[97] Recent New York actions such as ULEV (Ultra-Low Emissions Vehicle) requirements, the LEV II (Low-Emission Vehicle) mandate, and enhanced inspection and maintenance programs also result in GHG reductions, although the specific GHG effects of these measures have not been quantified.

C. ANALYSIS OF MITIGATION OPTIONS

This report reflects a year of discussion and analysis by the Transportation and Land Use working group of the New York Climate Change Task Force on more than 50 measures that can reduce GHG emissions from transportation sources in New York.[98] We have grouped the measures into five categories of policy actions: (1) slow VMT growth, (2) reduce vehicle GHG emission rates, (3) increase use of low-carbon fuels, (4) improve freight efficiency, and (5) reduce GHG emissions from aviation, including promotion of high-speed rail.

Policy measures were grouped into low, medium, and high categories. The categorization was based primarily on the ease of implementation—financial, technical, administrative, or political—as well as level of GHG reductions. In general, low measures face few implementation

[96] Presumably, on-road fleet data in MPOs models would assist in this effort.
[97] Note these savings do not account for 'induced demand' effects, which are discussed later in this chapter.
[98] Many of the original 50 measures were consolidated into fewer categories, and others were dropped from consideration (e.g., vehicle scrappage, pay-as-you-drive insurance, and truck driver training).

barriers, medium measures face some implementation barriers (including cost), and high measures face significant implementation barriers (e.g., cost, technical, administrative). In many cases, the difference among the levels reflects the level of intensity of implementation. Figure 7.3 and Table 7.2 summarize the measures the working group considered.

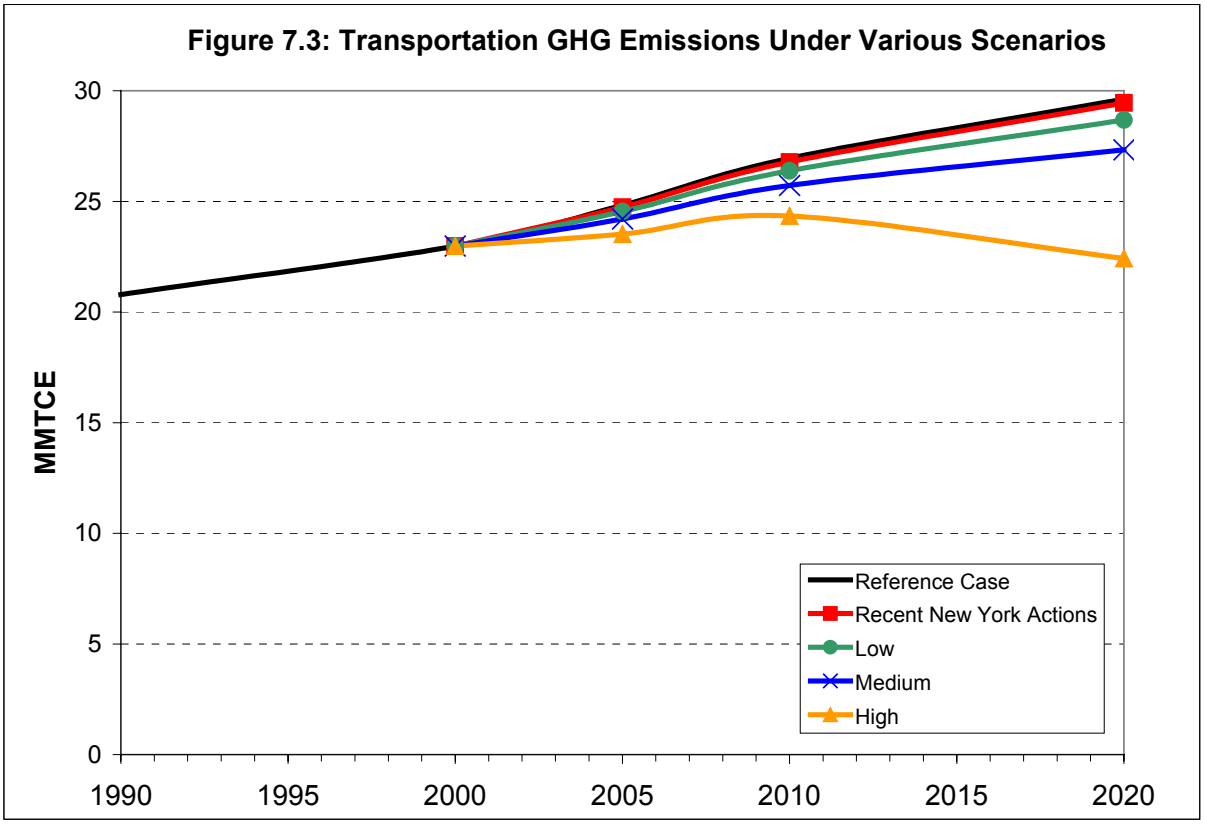


Table 7.2: Transportation Sector GHG Reduction Opportunities:						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Reference Case	**20.79**	**22.98**	**24.82**	**26.94**	**29.62**	
Recent New York Actions						
TIP Actions			0.08	0.17	0.17	
Total				**0.17**	**0.17**	
Proposed Actions:						
Low Scenario						
VMT Measures						
Smart Growth/Transit				0.25	0.41	$0 - $275
Vehicle GHG Emissions Rates						
Advanced Vehicle RD&D				0.07	0.16	$76
Driver Training				0.01	0.01	$62
Vehicle Maintenance				0.01	0.01	($143) - $186
Enforce Car Speed Limits				0.01	0.02	$26
Fuel Measures						
Biodiesel in State Fleets				0.00	0.00	$200
B-2 by 2010. B-20 by 2020				0.02	0.09	$200
Ethanol				0.01	0.04	$34 - $68
Freight Measures						
Truck Stop Electrification				0.01	0.03	$37
Total			**0.20**	**0.39**	**0.77**	
Medium Scenario						
VMT Measures						
Smart Growth/Transit				0.49	0.82	$0 - $275
Commuter Choice				0.13	0.26	($2,244) - $0
Bike and Ped Infrastructure				0.02	0.02	$0 - $352

Table 7.2: Transportation Sector GHG Reduction Opportunities:						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Pay as you Drive Insurance				0.01	0.05	($39)
Vehicle GHG Emissions Rates						
Advanced Vehicle RD&D				0.14	0.31	$76
Driver Training				0.02	0.02	$62
Vehicle Sales Tax Credit				0.00	0.01	$633
Clean Fleets: Emphasize GHGs				0.01	0.02	$141
Vehicle Maintenance				0.03	0.03	($143) - $186
Enforce Car Speed Limits				0.05	0.07	$26
Low Friction Engine Oil				0.00	0.00	$19
Tires (low rolling resistance, inflation)				0.00	0.02	($338) - ($260)
Fuel Measures						
Biodiesel in State Fleets				0.00	0.01	$200
B-2 by 2010. B-20 by 2020				0.03	0.18	$200
Ethanol				0.05	0.19	$34 - $68
Freight Measures						
Truck Stop Electrification				0.01	0.04	$37
Enforce Truck Speed Limits				0.01	0.01	$211
Hudson Rail Crossing & Brooklyn Port				0.01	0.01	$2,745
Aviation and High Speed Rail						
Airport Ground Equipment				0.05	0.06	$120
Total			**0.53**	**1.06**	**2.12**	
High Scenario						
VMT Measures						
Smart Growth/Transit				0.66	1.09	$0 - $275
Commuter Choice				0.26	0.51	($2,244) - $0
Bike and Ped Infrastructure				0.03	0.05	$0 - $352
Gasoline Tax ($0.10)				0.13	0.25	-

Table 7.2: Transportation Sector GHG Reduction Opportunities:						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Pay as you Drive Insurance				0.10	0.50	($39)
Endorse Congestion Pricing				0.01	0.05	$286
Vehicle GHG Emissions Rates						
Advanced Vehicle RD&D				0.27	0.63	$76
Driver Training				0.05	0.05	$62
Vehicle Sales Tax Credit				0.00	0.01	$633
Clean Fleets: Emphasize GHGs				0.01	0.02	$141
Vehicle Maintenance				0.06	0.06	($143) - $186
GHG-Based Feebates				0.20	2.59	($77) - $3
Tailpipe GHG Stds (beyond feebates)				0.25	0.15	($36) - $143
Enforce Car Speed Limits				0.14	0.21	$26
Low Friction Engine Oil				0.01	0.02	$19
Tires (low rolling resistance, inflation)				0.01	0.07	($338) - ($260)
Fuel Measures						
Biodiesel in State Fleets				0.01	0.01	$200
B-2 by 2010. B-20 by 2020				0.07	0.36	$200
Ethanol				0.06	0.23	$34 - $68
Freight Measures						
Truck Stop Electrification				0.02	0.05	$37
Enforce Truck Speed Limits				0.02	0.03	$211
Hudson Rail Crossing & Brooklyn Port				0.04	0.06	$2,745
Aviation and High Speed Rail						
Airport Ground Equipment				0.05	0.06	$120
Total			**1.22**	**2.43**	**7.03**	

Selection Criteria

The Task Force proposed several criteria to assess GHG reduction measures: cost-effectiveness, GHG impact, ancillary effects, economic development effects, compatibility with other programs, feasibility, permanence and growth potential, equity effects, public and political support or concern, and transferability to other states. These criteria were not formally applied to generate a rank-order list, but were central to the working group's deliberations.

- **Cost.** Incremental GHG-reduction costs are difficult to quantify for many transportation measures. For example, while investing in new transit infrastructure can require significant expenditures, it would be simplistic to attribute the full project costs to GHG reductions. Instead, transit project costs should be apportioned across the range of project benefits: GHG reduction, air quality improvement, economic development, congestion relief, etc. Further research and analysis is necessary to develop cost-effectiveness data for VMT reduction policies that can be compared on a consistent basis with vehicle technology and fuel measures. We have referenced some cost numbers from other studies, but caution that the valuation methodologies are not transparent—that is, it is not obvious that incremental costs were assessed consistently.[99]

  In addition, many billions of federal, state and local dollars are spent on transportation and other core infrastructure every year. Since the transportation funds will be spent anyway, simply shifting a portion of the funding to support efficient modes of travel and location-efficient development patterns can result in significant reductions in GHG emissions at zero to low incremental cost.
- **GHG Impact.** We calculated GHG effects for each measure using the best available information. To the extent possible, we used New York-specific analysis, but in many cases we applied impact rates from other studies and scaled them to New York. We focused more analytical attention on measures that could have a significant GHG impact.
- **Ancillary Effects.** In addition to GHG benefits from reducing transportation fuel use, we considered energy security benefits, air pollution reductions, improved public health and safety, and land use planning initiatives that preserve open space.
- **Economic Development Effects.** We placed high priority on actions that can strengthen the economy of New York State. Reducing VMT or vehicle GHG emissions rates conserves fuel and keeps money in the New York economy. Incentives for New York companies to develop advanced vehicle technologies help create jobs and grow markets. Incentives for an indigenous biofuel industry will preserve jobs in the State's agricultural sector. Finally, Quality Communities initiatives and transit investments can bolster the State economy by avoiding unnecessary infrastructure expenditures.
- **Compatibility With Other Policies.** We considered the extent to which a measure reinforces or enhances the effectiveness of other programs or is required for other measures to work. Because no single policy or measure will address the magnitude of GHG emissions from the transportation sector, we were strategic in crafting a

[99] Cost numbers come from two primary sources: (1) California Energy Commission and California Air Resources Board. *Task 3 Petroleum Reduction Options.* Staff Draft Report, March 2002; and (2) Canadian Transportation Climate Change Table. *Transportation and Climate Change: Options for Action.* November 1999. A few cost estimates came from Transportation working group members: NYSDOT, NYSERDA, Ford, and CCAP.

comprehensive and complementary package of options that reinforce each other. For example, transit investments will have a much greater effect on GHG emissions if coupled with targeted land use planning policies and supportive analytical tools.

- **Feasibility.** Ease of implementation and administration was a primary concern in working group discussions. We did not, however, shy away from measures that may be challenging to implement if they were deemed important in terms of GHG impact, ancillary benefits, or in support of other measures.
- **Equity Effects.** Economic, social, and regional equity are key criteria to consider. The working group did not engage in any specific impact assessments, but did take these matters into consideration. A concerted effort was made to balance transportation improvements across the State, particularly in small cities and towns.

In developing our policy recommendations, we considered all of these criteria, but it was beyond the scope of this effort to delve into specific analyses on each. We have integrated our key recommendations into consolidated components, which together provide a comprehensive policy package.

Our recommendations include most of the low and medium measures and several of the high measures. New York should be able to implement the low measures with relative ease, as improvements would require only extending or strengthening existing efforts. The medium measures will take some effort but are necessary to achieve significant GHG reductions in the sector. The high measures we recommend are particularly important for reversing the detrimental trends in VMT, vehicle GHG emissions rates, and fuel mix. Implementing these measures will require considerable effort and present an opportunity for New York to demonstrate its progressive leadership on transportation and environmental issues. Most of the medium and high measures cannot easily be implemented in the near term. Some require new legislation (e.g., a new transportation emissions reduction entity), others may be contingent on policies in other states (e.g., California GHG tailpipe standards), and others may depend on federal policies and incentives (e.g., biodiesel imports). In the discussion of the individual recommendations we provide more detail on implementation opportunities and challenges.

D. DESCRIPTION OF RECOMMENDED ACTIONS

Tables 7.3 and 7.4 summarize the recommended GHG emissions reduction actions for the transportation sector.

Table 7.3: Recommended Transportation Sector GHG Reduction Actions						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
BAU	**20.79**	**22.98**	**24.82**	**26.94**	**29.62**	
Recent New York Actions						
TIP Actions			0.08	0.17	0.17	
Total				**0.17**	**0.17**	
Recommended Actions:						
VMT Measures						
Smart Growth/Transit				0.658	1.087	$0 - $275
Commuter Choice / Transit Benefits				0.128	0.256	($2,244) - $0
Bike and Ped Infrastructure				0.030	0.045	$0 - $352
Endorse Congestion Pricing				0.005	0.023	$286
subtotal				**0.821**	**1.411**	**($348) - $235**
Vehicle GHG Emissions Rate Measures						
GHG Tailpipe Standards (or GHG-based Feebates)				0.200	2.590	($77) - $143
Advanced Technology Vehicle RD&D				0.274	0.314	$76
Enforce Current Speed Limits – Cars				0.047	0.070	$26
Driver Training				0.023	0.037	$62
Vehicle Maintenance				0.028	0.030	($143) - $186
Vehicle Sales Tax Credit				0.005	0.007	$633
Clean Fleets: Emphasize GHGs				0.005	0.015	$141
Low Friction Engine Oil				0.003	0.005	$19
Tires				0.003	0.017	($338) - ($260)
subtotal				**0.588**	**3.086**	**$11 - $102**
Low GHG Fuel Measures						
Biodiesel in State Fleets				0.007	0.010	$200
B-2 by 2010. B-20 by 2020				0.065	0.355	$200
Ethanol				0.046	0.185	$34 - $68
subtotal				**0.118**	**0.551**	**$135 - $148**

Table 7.3: Recommended Transportation Sector GHG Reduction Actions						
Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Freight Measures						
Hudson Rail Crossing & Brooklyn Port				0.036	0.055	$2,745
Truck Stop Electrification				0.018	0.054	$37
Enforce Current Speed Limits – Trucks				0.010	0.013	$211
Multimodal Rail Investment, Truck Tolls				?	?	?
subtotal				**0.064**	**0.121**	**$1,595**
Aviation and High Speed Rail Measures						
Airport Ground Equipment				0.050	0.063	$120
High Speed Rail				?	?	?
subtotal				**0.050**	**0.063**	$120
Total Recommended Actions			**0.82**	**1.64**	**5.23**	**($94) - $231**
Total Emissions (MMTCE)			**23.92**	**25.13**	**24.22**	
Compared to 1990 Levels				**+20.9%**	**+16.5%**	

Table 7.4: Summary of Recommended New York Transportation Policy Actions

	Inventory and Registry	Emissions Trading	Negotiated Agreements	Regulatory programs	Funding Mechanisms	Voluntary Programs
Vehicle Miles Traveled	• State level • Regional • Major projects • Fleets • Passenger Mode Split • Vehicle load factors			• Report GHGs in SEQRA, TIP, long-range plans • Report GHGs from major development, consider requiring offsets	• Invest more in GHG-efficient alternatives, and less in GHG polluting modes • Identify dedicated funding stream for a new transportation emissions reduction entity • GHG-reduction grants • Quality communities • Brownfields • Open space Congestion pricing	• Land-use and transportation planning • Employer commute programs
Land Use	• State land-use change inventory					
Funding	• Transit, walk, bike, TDM • Highway					
Vehicles	lbs CO_2 per mile: • Light duty • Heavy duty • On-road fleet • New vehicles • Fleets			• Vehicle GHG standards OR • Revenue-neutral GHG-based feebates	• Deployment of advanced tech vehicles • Tax credits • GHG-based registration fees	• Driver training • Maintenance • Oil, tires
Fuels	• Sales by fuel type • Calculate fuel consumption based on VMT and fleet mpg			• Two percent biodiesel by 2010, ten percent by 2020	• Incentives for New York biofuel producers	• Biofuels in State, local and private fleets
Freight and Aviation	• Freight mode split • Freight load factors • Long distance passenger mode split				• Rail infrastructure • Rail tax reform • Incentives for airport ground and gate equipment • Consider raising truck tolls or highway use tax	• Explore high-speed rail versus short flights

GHG = greenhouse gas; SEQRA = State Environmental Quality Review Act; TDM = transportation demand management; TIP = transportation improvement program.

Establish a New York State Transportation Emissions Reduction Entity

We propose that a New York State transportation emission reduction entity would have a mission to work with NYSDOT and other State agencies to stabilize transportation GHG emissions while improving air quality, increasing energy efficiency, strengthening New York's economy and promoting Quality Communities. The organization would require a dedicated funding stream and authority sufficient to achieve significant GHG reductions from the transportation sector.

Goals. The transportation emissions reduction entity would have specific goals of reducing transportation GHG emissions to 20 percent above 1990 levels by 2010, ten percent above 1990 levels by 2020, and to 1990 levels by 2030. The organization would advance its mission by identifying and implementing policies and measures to:

- Slow VMT growth in New York State.
- Reduce per mile vehicle GHG emissions in New York State.
- Increase use of low-GHG fuels in New York State.
- Increase the share of low-GHG freight modes (rail and marine) in New York.
- Increase the share of high-speed rail for medium-distance passenger travel in New York.

Role of a New York State Transportation Emissions Reduction Entity. This organization would be in a unique position to examine the full set of options that can reduce GHG and air pollutant emissions from transportation, and identify synergies among a broad range of agency efforts. The entity could serve as a central body that would enhance and coordinate a number of functions and initiatives underway at NYSDOT, NYSERDA, DEC, and other State agencies, including Quality Communities, Context-Sensitive Solutions, sustainable development studies, brownfield redevelopment, Advanced Vehicle RD&D, Clean Fleets, and the ZEV mandate. The entity would also dramatically increase targeted support to New York communities and local jurisdictions in need of improved transportation efficiency and Quality Communities assistance.

Throughout this chapter we recommend specific roles and responsibilities for a transportation emissions reduction entity, including a detailed discussion of how it could best coordinate with NYSDOT and other State agencies. The exact design and functions of a new entity need further analysis by the State and the Legislature. **The emissions reduction recommendations are *not* contingent on the creation of a new entity. If New York decides not to establish such an entity, the recommendations in this report should be implemented by existing State agencies and authorities.**

Structure. The proposed transportation emissions reduction entity would serve as a central State body with a comprehensive approach to reducing transportation emissions. It would work closely with key State agencies to develop a broad set of emissions reduction strategies and coordinate implementation. The Commissioner of NYSDOT would chair the organization's board, which could include the following members:

- Commissioner, New York State Department of Transportation
- Commissioner, New York State Department of Environmental Conservation
- President, New York State Energy Research and Development Authority

- Secretary of State
- Chairman, Empire State Development Corporation
- Commissioner, New York Department of Agriculture and Markets
- Commissioner, New York State Department of Health
- Commissioner, the New York State Department of Housing and Community Renewal.

Potential Funding Sources. The proposed transportation emissions reduction entity will require direct funding for research, analysis, outreach, implementation efforts, and competitive grants to public- and private-sector entities. The entity could be funded by reallocating existing resources or by identifying new revenue streams. With the NYSERDA/Energy $mart example in mind, the Task Force supported the idea of a Transportation Systems Benefit Charge to fund transportation emissions reduction. The Transportation working group initially proposed increasing motor fuel taxes by one cent per year, with revenues devoted to transportation-related GHG reduction measures. Although supported by the majority of the Transportation working group, this measure was strongly opposed by State representatives on the Task Force because of implementation concerns.[100] There was broad agreement that shifting revenues from the existing Petroleum Business Tax or Motor Fuel Excise Tax to fund transportation GHG emissions reductions could be a more feasible option. The Legislature could consider other budgetary approaches to funding such an entity.

Passenger VMT Reduction Measures

A targeted package of policies can slow the growth rate of vehicle miles traveled (VMT). The approach is simple: Improve, expand, and encourage use of more GHG-efficient modes (transit, bicycling, walking); and discourage use of less efficient modes (single-occupancy vehicles). The recommended policy measures discussed below are estimated to result in GHG emissions reductions of 0.82 MMTCE in 2010 and 1.41 MMTCE in 2020. The recommended policy measures are estimated to result in VMT reductions (from the reference case) of 5.1 percent in 2010 and 8.5 percent in 2020. These VMT savings are consistent with a broad range of land use and transportation analyses in New York and other states.[101]

[100] An increased gasoline tax would also provide a "price signal" as an incentive to reduce VMT.

[101] For example, the New Visions Plan for the Albany region is projected to result in a seven to 14 percent VMT reduction in the financially constrained scenario. (Capital District Transportation Committee, *New Visions 2021*, Draft approved October 2000.) The "LUTRAQ" effort in Portland, Oregon calculated potential VMT reductions of six to eight percent in the Portland region from new transit and coordinated land use planning. (Cambridge Systematics, Inc. and Parsons, Brinckerhoff, Quade & Douglas. *Making the Land Use Transportation Air Quality Connection: Analysis of Alternatives*. Vol. 5. Prepared for Thousand Friends of Oregon. May, 1996.) An integration of MPO analyses in California indicated potential state-wide VMT reductions of three to ten percent. (Parsons Brinckerhoff, for the California Energy Commission. *California MPO Smart Growth Energy Savings MPO Survey Findings.* September, 2001.) VMT and GHG reductions from proposed smart growth and transit actions in New York were calculated by applying the results of specific MPO studies to each urban region of the State. For the New York City region, we estimated VMT reductions to be 5.5 percent in 2010 and eight percent in 2020. For the Albany region, we estimated VMT reductions of 10.7 percent in 2010 and 13.9 percent in 2020 (based on the New Visions study). For other regions of the state, we estimated VMT reductions at half the level of the Albany: 5.3 percent in 2010 and 6.9 percent in 2020. As a conservative estimate, we assumed no VMT savings

In addition to GHG reductions, VMT reductions save energy, improve air quality, promote public health and safety, and help relieve traffic congestion.

Weighted-average economic effects of the recommended VMT reduction measures range from a benefit of $348 per MTCE cost savings to a cost of $235 per MTCE. ***Nearly all of the measures result in low incremental cost, as they entail reorientation of existing funding and programs.*** These cost estimates do not include economic and environmental benefits such as from reduced congestion or improved air quality.

New York State has the most energy efficient transportation sector in the United States due in large part to transportation infrastructure investments and supportive land use planning in the New York City region that enable high levels of transit use, walking, and bicycling. Achieving significant mode splits for transit, walking, and bicycling, however, does not require New York City level density or infrastructure. Communities in New York and across the country are discovering that better integration of land use and transportation planning can increase transportation choices and make transit and walking convenient and attractive. The basic concepts are simple: design facilities for pedestrian accessibility, encourage mixed land uses, and increase transportation choices. In a rural area, action can include revitalizing traditional town centers by providing development incentives. In suburban areas, closed or underutilized shopping malls can be converted into mixed-use developments with housing, offices, and retail components. Design modifications for major road projects (such as limiting the number of interchanges) and land use planning improvements (such as clustering development) can support multimodal transportation choices. In urban areas, VMT growth can be slowed by improving transit service and investing in bicycle and pedestrian infrastructure.[102]

Slowing VMT growth calls for targeted infrastructure investments, integration of land use and transportation planning, and incentives that encourage sustainable land use development and efficient transportation modes. Our recommendations for slowing VMT are as follows:

- Invest more in GHG-efficient alternatives and less in GHG-inefficient modes by:
  - incorporating GHG effects as a key criteria in NYSDOT funding decisions,
  - identifying and funding strategic transportation investments that can slow VMT growth, and
  - limiting funding or requiring modifications for projects with high GHG impacts.
- Require GHG reporting in SEQRA, TIPs, and Long Range Transportation Plans.

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from the 28% of vehicle miles traveled in rural areas of the state, even though these may include some high growth areas.

[102] There is a robust technical literature linking land use patterns, activity location and transportation infrastructure with travel behavior (VMT) and emissions. Key studies referenced include: 1) Ewing, R., Pendall, R., and D. Chen, for Smart Growth America. *Measuring Sprawl And Its Impact Volume I.* October 2002. 2) Ewing, R., and R. Cervero, "Travel and the Built Environment – Synthesis," *Proceedings of the 2001 Annual Transportation Research Board Meeting*. 3) Frank, L. "Land Use Impacts on Travel Choice and Vehicle Emissions in the Central Puget Sound: Methodology and Findings," Transportation Research - Part D., March 2000. 4) Apogee/ Hagler Bailly, for the US EPA. *The Effects of Urban Form on Travel and Emissions: A Review and Synthesis of the Literature.* April 1998.

- Assist municipalities and MPOs with integrated land use and transportation planning.
- Harmonize other State funding and incentives with GHG and Quality Communities goals:
  - target infrastructure investments in GHG-efficient locations,
  - provide incentives to promote development in GHG-efficient locations,
  - target open space funds to concentrate growth,
  - work with employers to enhance employee commute options, and
  - implement congestion pricing on East River bridges in New York City.
- Initiate an annual competitive grant solicitation for local governments and private companies to propose GHG reduction ideas.
- Require reporting of the GHG and air-quality effects of major private developments, as well as deciding by 2007 on implementing a GHG offsets requirement.

Our detailed recommendations follow.

Invest More in GHG-Efficient Alternatives and Less in GHG-Inefficient Modes. On the basis of preliminary Task Force recommendations, the New York State Energy Plan calls for NYSDOT to "redirect transportation funding toward energy efficient transportation alternatives, including public transportation, walking, and bicycling; and provide incentives to encourage greater use of related alternatives that improve transportation efficiency."[103]

Infrastructure investments are one of the most powerful tools available to New York State to influence VMT and GHG growth. New York State should adopt policies to ensure that new infrastructure investments are consistent with GHG and Quality Communities goals. This is certainly *not* to imply that any project that increases GHGs should be rejected. Instead, the State should attempt to minimize climate impacts by incorporating GHG emissions as key criteria in State transportation and infrastructure investment decisions.[104]

NYSDOT should increase the share of transportation funding devoted to GHG-efficient modes, such as transit, ridesharing, bicycling, and walking (see box on GHG-Efficient Alternatives). Funding priorities should be based on VMT and GHG analyses conducted by NYSDOT and MPOs (see below). New York should decrease the share of transportation funding for GHG-inefficient modes, such as highway and road projects that promote conventional single-occupant vehicle travel. In addition to its own resources, New York can leverage federal transportation funds by choosing to provide or withhold matching funds for projects that are eligible for federal funds. The State should implement a tracking system to monitor total transportation expenditures over time, in categories such as transit, ride-sharing, bicycle, pedestrian, transportation demand management (TDM), land use planning, and highway investment. The portion of highway funds used for efficient activities such as bike lanes or Context Sensitive Solutions should be counted with the GHG-efficient modes. It is important to note that increased federal support for transit

[103] New York State Energy Planning Board. *New York State Energy Plan and Final Environmental Impact Statement*. June 2002, p. 1-43.

[104] It is not intended that GHG emissions would be the sole criteria for infrastructure funding decisions – other factors such as economic development and air pollution would remain central to the decision making process.

would allow New York to achieve an even greater shift toward funding GHG-efficient modes.

The transportation emissions reduction entity should examine results of the NYSDOT and MPO analyses of GHG emissions from transportation plans, regionally significant projects, and smart growth analyses to identify the most effective investments for slowing VMT growth. The State should directly fund promising projects, in addition to the grant solicitation discussed below.

NYSDOT and other State agencies should use the MPO GHG analyses (see below) to determine which road or infrastructure projects are expected to increase GHG emissions. For projects expected to significantly increase GHG emissions, NYSDOT should consider limiting or withholding funding and require an alternatives analysis to determine whether the project can be modified to mitigate GHG emissions. For economically important projects, the State should offer additional resources to reduce GHG emissions, such as increasing transit access or assisting with design alternatives (for example, land use planning around interchanges).

GHG-Efficient Alternatives

Transit. Identification of specific transit investments for reducing passenger vehicle VMT and GHG emissions is beyond the scope of this report. The guiding principle for the State should be to give funding priority to those service improvements and expansions that offer the greatest GHG reductions. NYSDOT/MPO efforts to report GHG provide an excellent starting point for identifying promising projects. Also appropriate is consideration of secondary effects from projects that strengthen central urban areas and attract growth to GHG-efficient locations.

Many priority transit investments in the New York City area are well known, such as the Second Avenue Subway, the World Trade Center redevelopment, and East Side Access. Improved bus service in other urban areas without rail is also crucial. Key improvements include converting road lanes to express bus lanes, introducing signal prioritization, optimizing routes, purchasing new vehicles, and hiring new drivers as well as setting up multi-year funding mechanisms for public transit. To maximize VMT benefits, transit stations must be designed for convenient bicycle and pedestrian access (see below). Transit vehicles and stations also should be designed to be attractive and comfortable to riders.

Ride-sharing. Carpools and vanpools are important alternatives to single-occupancy vehicles. NYSDOT should assist employers in designing ride-sharing programs and incentives. NYSDOT should examine where HOV lanes can improve the time competitiveness of transit, vanpools, and carpools. To have the greatest impact on VMT and GHGs, conversion of existing lanes is preferable to adding new road capacity.

Bicycle and Pedestrian. Bicycle paths are practical for consumers and shoppers – not just recreational users. NYSDOT should provide safe bicycle parking at transit stations and install bicycle racks on buses. NYSDOT should work with employers to provide incentives for employees who bike to work. The State should place priority on promoting pedestrian-friendly land use planning and design, including inter-connected streets, safe crossings, and mixed-use development.

Require GHG reporting in SEQRA, TIPs, and Long Range Transportation Plans. On the basis of the Task Force's initial recommendations, NYSDOT has started to work with MPOs to calculate GHG emissions from transportation plans and regionally significant projects. These analyses will provide the fundamental building blocks for making transportation investment decisions that account for GHG impacts. We recommend that NYSDOT, and MPOs work together to identify and pursue alternative low-GHG scenarios.

NYSDOT, and MPOS should account for 'induced demand' in GHG analyses. Projects that improve traffic flow through road-widening or traffic management strategies may reduce fuel use and GHG emissions in the *short-term* if vehicles operate at more efficient speeds with less braking and accelerating. Research into the phenomenon of induced demand, however, shows that increasing or improving road capacity attracts more drivers and development thereby increasing VMT and eroding GHG benefits. NYSDOT should provide technical assistance and tools to ensure that the GHG analyses account for induced demand. NYSDOT and MPOs should incorporate short-term and long-term multipliers to account for induced demand and to avoid counting short-term GHG reductions while ignoring long-term GHG increases.[105]

Assist Municipalities and MPOs with Integrated Land Use and Transportation Planning. Communities and regions need planning tools and funding to develop alternative growth visions that foster efficient land use and strategic infrastructure investments. We recommend that NYSDOT and the proposed transportation emissions reduction entity:

- Provide funding for MPO regional visioning efforts and smart growth analyses that assess VMT and GHG effects.
- Provide technical assistance and funding for alternative scenario analyses for major transportation projects;
- Build on Quality Communities Recommendation 33, "Continue to encourage community transportation planning and coordination";
- Expand funding for sustainable development studies that help communities visualize relationships between land use and transportation decisions; and
- Expand transportation planning grants for preparing the transportation element of a comprehensive plan, visioning effort, or Context Sensitive Solution;

Harmonize Other State Funding and Incentives With GHG and Quality Communities Goals. The State should coordinate funding mechanisms for reducing GHG emissions from the transportation sector with complementary funding and incentives in the State. As an initial step, the State should develop priority-funding criteria to promote growth in GHG-efficient locations. Criteria could include the level of existing infrastructure, economic growth potential, proximity to transit, density, and mix of land uses. Projects meeting the criteria should be eligible for additional State funds.

[105] Short-term capacity elasticities range from 0.3 to 0.5, whereas long-term elasticities range from of 0.7 to 0.8. See, for example, Cervero, R. 2001. *Induced Travel Demand: An Urban and Metropolitan Perspective.* (Paper presented at the Conference on Working Together to Address Induced Demand, Eno Transportation Foundation and the U.S. Environmental Protection Agency.)

According to recent research, regional accessibility is one of the most important factors in reducing VMT.[106] In other words, central locations generate less VMT per capita than remote ones. Development in central areas maximizes the use of existing infrastructure (transportation, utilities, schools, etc.), and prevents duplicative investments. GHG-efficient locations include rural town centers as well central urban areas. NYSDOT and the transportation emissions reduction entity should work with Empire State Development and the Department of State to harmonize economic development incentives with GHG and Quality Communities goals.

For example, New York State should maximize the use of state and federal brownfield redevelopment incentives, with priority placed on 'infill' development and redevelopment in core urban areas. New York should conduct a study on the potential economic and environmental benefits from available brownfield sites across the state. The State should also provide tax credits to promote pedestrian-friendly, mixed-use and transit-oriented development to complement the Quality Communities Initiative. Finally, the State should maximize the use of federal incentives to keep jobs in Lower Manhattan and consider strengthening complementary State incentives.

The State's open-space initiative can also support more efficient transportation. Governor Pataki has set a goal of preserving one million new acres of land over the next decade. By strategically targeting open-space protection funds, the State can steer growth away from ecologically valuable land and help concentrate growth in more efficient patterns.

DEC and other State agencies should develop policy recommendations for helping New York preserve its open space in the most efficient manner. Their analysis should include VMT-based GHG impacts as key assessment criteria for prioritizing open space spending and policies. DEC should also coordinate with the Department of Agriculture and Markets to assess the extent to which biofuel production can protect strategic farmland from encroaching residential and commercial development.

Finally, the State should pilot a Hybrid transfer of development rights (TDR) program to explore its potential as an implementation mechanism.[107]

NYSDOT should work with New York employers to promote efficient employee commuting, including commuter choice, transit benefits, and vanpooling. The federal Commuter Choice program allows employers or employees to pay up to $100 per person in pretax wages toward transit, vanpool, and carpool costs. NYSDOT should work with large employers to encourage increased participation in Commuter Choice and provide incentives to employers who provide transit benefits for their employees. Increased participation in Commuter Choice will encourage low-GHG modes of commuting, ease congestion by shifting employee travel from peak to off-peak, and bring more federal money into New York. NYSDOT should work to implement the following goals by 2010:

[106] Ewing, R., Pendall, R., and D. Chen, for Smart Growth America. *Measuring Sprawl And Its Impact Volume I.* October 2002.
[107] For more on Hybrid TDR, contact Jim Tripp of Environmental Defense (jtripp@environmentaldefense.org).

- Forty percent of private employers (up from 15 percent) participate in the federal Commuter Choice program and offer alternative work schedules—flex time, compressed work weeks, or telecommuting for at least one day per week.
- Ten percent of employers provide a transit/ridesharing benefit of two dollars per day.
- Seventy-five percent of New York State offices are bike-commuter ready, providing lockers, showers, and bike racks.

In addition, the State should consider providing a tax credit to employers who provide transit and ride-sharing benefits for their employees, and New York State should encourage State employees to participate in Commuter Choice and consider providing employee transit/ridesharing benefits.

NYSDOT should also assist employers in developing vanpool programs and initiate vanpool pilot projects in areas with sufficient employment concentration that are underserved by transit, such as the I-287 corridor, the Long Island Expressway, and any promising upstate corridors.

NYSDOT should coordinate with the New York City Department of Transportation and the Metropolitan Transportation Authority to analyze and implement congestion pricing on East River bridges in New York City. Any revenues generated should be used to fund transit and ride-sharing in the affected corridor. Implementation of congestion pricing on East River Bridges would yield 0.005 MMTCE in emissions reductions by 2010.

New York State should initiate an Annual Competitive Grant Solicitation for Local Governments and Private Companies to Propose Ideas for GHG Reduction. A grant program would be a valuable source of flexible funding that can be used to strategically expedite funding for core project elements. Grant funds could be used for a broad array of efforts, such as improving pedestrian crossings in small towns, enhancing highway projects with focused land use development around interchanges, increasing the frequency of bus service in mid-size towns, and providing bike lockers at commuter rail stations. In some cases grants might be used to test an idea, such as piloting pay-as-you-drive insurance. In other cases grants might be needed to fund a key infrastructure investment.

New York should also require reporting of GHG and air-quality effects of major private developments, and decide by 2007 on the usefulness of implementing a GHG offsets requirement. Large private developments such as shopping malls and office parks can generate significant transportation emissions. The Governor should introduce legislation adding a new statute to the Environmental Conservation Law requiring reporting of GHG and air-quality effects from VMT associated with new developments. The legislation should direct the State to use the reported emissions effects to assess the extent to which major private developments generate VMT, air pollution, and GHGs. By 2007, the State should decide whether the magnitude of emissions justifies an emissions offsets requirement.

Should the offset requirement go forward, defining the regulatory threshold level, quantification methodology, and offset requirements will be critical. NYSDOT should develop a quantification methodology to ensure consistent VMT and fuel economy calculations, including default values for specific regions or site types. The threshold definition, for example, could be based on VMT

for a typical 'big box' retail or a suburban office park with more than 100 parking spaces. Offsets could be based on the requirement that 25 percent of VMT to new retail developments be by transit, biking, or walking. At employment centers, vanpools, carpools, and telecommuting should be counted toward this target. Developments unable to meet the target would need to purchase offsets credits for emissions above the target level.[108] Revenues generated from the sale of emissions offsets should be applied to transportation emissions reduction efforts, such as competitive grants discussed above. For economically important projects, NYSDOT could offer assistance in mitigating emissions by increasing transit access, enhancing employee commute incentives, or modifying project design.[109]

Rationale. In addition to GHG benefits, VMT reductions improve energy security, keep money in the New York economy, reduce air pollution, and improve public health and safety. VMT reduction also enhances equity and environmental justice by reducing mobile source pollution in key exposure areas. By adopting measures that reduce statewide VMT, New York would show continued leadership on probably the most important challenge facing transportation in the United States, and the world. By reducing VMT growth rates, New York residents will benefit from a better quality of life due to more and improved travel options, fewer accidents, and reduced congestion. Quality Communities initiatives and transit investments can bolster the State economy and help the State avoid unnecessary infrastructure expenditures. Land use planning initiatives will also help preserve critical open space. Weighted average economic effects of the recommended VMT reduction measures range from a savings benefit of $91 per MTCE to a cost of $64 per MTCE. Nearly all of the measures result in low incremental cost, as they entail reorientation of existing funding and programs. Note that these cost estimates do not include economic and environmental benefits such as from reduced congestion or improved air quality.

Vehicle GHG Emissions Rates Measures

The recommended policy measures discussed below are estimated to result in GHG emissions reductions of 0.59 MMTCE in 2010 and 3.09 MMTCE in 2020.[110] Weighted average costs of the set of recommended GHG-efficiency improvement measures range from $11 to $102 per MTCE (see Table 7.3 above). Note that these cost estimates do not include economic and environmental benefits such as job creation or improved air quality.

Advances in vehicle technology offer significant opportunities to reduce GHG emissions from motor vehicles. Many cost-effective technologies are available today and even more promising breakthroughs are expected for the future. It is important to reduce vehicle GHG emissions rates

[108] The offset charge could be based on the average price of carbon for the State or for the transportation sector.
[109] We can look to Connecticut for an example in which a developer was required to offset VMT-related emissions from a major new development. A new casino development in Connecticut was required to reduce NO_x emissions due to VMT-related emissions from casino customers. (The casino earned NO_x offset credits by installing fuel-cell generators that provide emissions-free power for casino operations.)
[110] We have not included GHG effects from the federal fuel economy goal of saving 5 billion gallons of gasoline by 2010, proposed in H.R. 4, due to uncertainty of the final legislative outcome. Moreover, it is expected that the proposed extension of the dual-fuel vehicle credit represents a loss of about 5 billion gallons of gasoline because many dual-fuel *capable* vehicles only burn gasoline.

(pounds of CO_2 per mile) in the short term because significant vehicle-fleet turnover and associated GHG savings can take a decade or more. Given the long-term nature of the climate-change problem, many analysts are looking forward to major technology advances that can start to slow transportation-sector GHG emissions. In both the short and long terms, vehicle GHG emissions rate improvements are a crucial complement to VMT reduction measures. New York will need to look to short-term solutions such as vehicle maintenance, medium-term solutions such as GHG tailpipe standards or GHG-based feebates, and long-term solutions such as R&D on fuel-cell vehicles.

Follow California's Lead on Regulating GHG Emissions from New Light-Duty Vehicles. Governor Davis of California recently signed legislation (AB 1493) directing the California Air Resources Board to develop regulations to achieve "the maximum feasible and cost-effective" reduction of GHG emissions from cars and light trucks. The standards will take effect in 2006 and start with the 2009 model year. New York cannot set its own emissions standards for new light-duty vehicles, but, per the Clean Air Act, can follow California on setting GHG (or any new emissions) standard for new light-duty vehicles. While New York cannot adopt GHG tailpipe standards before California finalizes their standards due to Clean Air Act requirements, the State should undertake the necessary background work to enable New York to adopt the new California standards once they are finalized.[111] New York already has experience implementing California vehicle emissions standards. By following California's lead, New York would show national leadership on reducing GHG-emissions from mobile sources and avoid reinventing the wheel in terms of policy design and implementation. Improved vehicle GHG performance will reduce consumer fuel expenditures and preserve money in the New York economy.

California has not yet defined the specific levels of the tailpipe GHG standards. Due to lack of more specific information on California's tailpipe standard, we have applied the California Energy Commission's feebate analysis model outputs to the New York fleet to determine GHG savings from this measure. Based on our GHG-based feebate analysis below, new cars will emit 0.03 fewer pounds of CO_2 per mile than the reference case in 2010 and 0.20 fewer punds of CO_2 per mile in 2020 under tailpipe standards. Light trucks, will emit 0.05 fewer pounds of CO_2 per mile in 2010 and 0.26 pounds of CO_2 per mile in 2020 compared to the reference case.[112] For the New York fleet, these savings translate into 0.20 MMTCE in 2010 and 2.59 MMTCE in 2020.[113]

Introduce a Revenue-Neutral, GHG-Based Feebate Program for New Light-Duty Vehicles. If implementation of the California standards faces significant delays, we recommend that the Governor introduce legislation establishing a revenue-neutral GHG-based "feebate" program for

[111] The 1990 Clean Air Act Amendments allow California the opportunity to provide leadership in reducing emissions from mobile sources. Title II, Section 209 authorizes California to implement mobile source emissions reductions polices and programs that are more stringent than federal Clean Air Act requirements. Upon the adoption of such a standard by California, Section 177 permits other states to follow suit and adopt the identical policy, which is often referred to as the "California standard."

[112] The reference case forecast is based on: US Department of Energy/Energy Information Administration, *Annual Energy Outlook 2002*, December, 2001.

[113] Actual GHG emissions savings from a GHG tailpipe standard might be lower in 2010 due to California's planned start date of 2009. By 2020, the full savings would be expected.

new cars and light trucks sold in New York, beginning in 2005, and begin discussions as soon as possible with other northeastern states about joint introduction of a regional program. In a GHG-based feebate program, consumers pay a fee for purchasing vehicles that emit more CO_2 per mile than a set threshold level, and receive a rebate for purchasing vehicles that emit less CO_2 per mile. The threshold level should be set to decrease every year to preserve the price signal and to maintain revenue neutrality. The fees and rebates could be scaled up over time, although the savings estimates we present assume full fees and rebates starting in 2005. Savings from a New York-only effort would be 0.20 MMTCE in 2010, and assuming a multi-state effort by 2020, we project savings of 2.59 MMTCE in 2020.

The GHG-based feebate program should be designed to be revenue-neutral, with fees collected by New York State offsetting rebates paid out. Achieving revenue-neutrality requires modeling consumer response to price signals for different classes of vehicle, which is typically an iterative process. Although a full analysis is beyond the scope of the Task Force effort, we have applied the results of modeling done by the California Energy Commission (CEC) to estimate effects in New York. The State may want to error on the side of revenue generation to ensure adequate funding for rebates.

The CEC analysis used one feebate schedule for all light-duty vehicles, so that the fees and rebates are based purely on vehicle GHG performance. An alternative approach would be to set different threshold levels for cars and light trucks to encourage purchase of the lowest GHG-emitting vehicle within a vehicle class, without forcing someone who needs a pick-up truck to purchase a car. A potential drawback to this two-tiered approach is that for the same GHG performance (measured in terms of pounds of CO_2 per mile), a consumer would receive a rebate for an SUV, but would pay a fee for car. For example, as highlighted in Table 7.5, the purchaser of a car that emitted 0.80 pounds of CO_2 per mile would pay $1,000, but the purchaser of a light truck that emitted 0.80 pounds of CO_2 per mile would receive a rebate of $1,000. Under the combined approach, 0.80 pounds of CO_2 per mile is the iteratively determined, revenue-neutral balance point where no feebate is required.

We recommend that the state assess the pros and cons of the combined and separate approaches to determine which best balances equity and environmental concerns. In addition to this fundamental design issue, other technical, administrative and legal issues should be considered:

- As a key part of program design, the State should examine any legal issues surrounding a State GHG-based feebate system. The proposed GHG-based feebate system for New York is unique because of its emphasis on GHG performance as opposed to fuel economy. GHG performance can be achieved through: catalyst recalibration to reduce NO_x or methane, transmission modifications, low rolling resistance tires, HFC reductions from air conditioners, improved aerodynamics, low-GHG fuels, and engine efficiency improvement.[114]

[114] In 1992, the State of Maryland passed a law to create a fuel-efficiency surcharge or credit on the purchase of passenger cars. The National Highway Traffic Safety Administration challenged the law on the ground that federal law preempts state law on the issue of *disclosure* of vehicle fuel economy. The Maryland Attorney General argued that although the state has the right to encourage consumer purchase of fuel-efficient cars, it cannot use labels that refer explicitly to vehicle fuel economy to inform consumers purchase decisions. The Maryland law is currently

Table 7.5: Greenhouse Gas (GHG)-Based Feebate Schedules Based on California Energy Commission Analysis
(GHG feebate: $10,000 per lb CO_2 equivalent per mile, rounded from CEC rate)

lb CO_2 per mile	equivalent mpg[115]	Combined	Cars	Lt Trucks
2.00	9.8	$12,000	$13,000	$11,000
1.25	15.7	$4,500	$5,500	$3,500
1.00	19.6	$2,000	$3,000	$1,000
0.95	20.7	$1,500	$2,500	$500
0.90	21.8	$1,000	$2,000	**$0**
0.85	23.1	$500	$1,500	($500)
0.80	24.6	**$0**	$1,000	($1,000)
0.75	26.2	($500)	$500	($1,500)
0.70	28.1	($1,000)	**$0**	($2,000)
0.65	30.2	($1,500)	($500)	($2,500)
0.60	32.7	($2,000)	($1,000)	($3,000)
0.50	39.3	($3,000)	($2,000)	($4,000)
0.55	35.7	($2,500)	($1,500)	($3,500)
0.50	39.3	($3,000)	($2,000)	($4,000)
0.45	43.6	($3,500)	($2,500)	($4,500)
0.40	49.1	($4,000)	($3,000)	($5,000)

- In order to prevent light-duty vehicle market and price fluctuations, New York could phase-in the GHG-based feebate program with annual increases in fees and rebates beginning in 2005.
- New York should work toward more regional coordination with other northeastern states (and perhaps Canada) to reinforce program effectiveness.[116]

Note also that 'leakage' from out-of-state vehicle purchases is not a major concern because all cars registered in New York must meet California emissions standards – unless New Yorkers went to Vermont or Massachusetts to purchase high-GHG vehicles. In this case, the fee could be levied upon vehicle registration. The State and the Legislature would, however, need to consider how to prevent providing rebates to out-of-state purchases of low-GHG vehicles, such as requiring proof of New York residency.

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dormant. For further information, see 77 Opinions of the Attorney General (1992), Opinion No.92-020 (June 24, 1992).

[115] This is the equivalent on-road fuel economy for a gasoline vehicle with the associated GHG emissions rates.

[116] To send a stronger price signal for the purchase of low-GHG vehicles, the State could go even further than a regional approach and lobby for a national GHG-based feebate system.

Applying the CEC GHG-based feebate rate to a New York-only program, we calculate that new cars will emit 0.03 fewer pounds of CO_2 per mile than the reference case in 2010 and 0.06 fewer pounds of CO_2 per mile in 2020. For light trucks, this will be 0.05 fewer pounds of CO_2 per mile 2010 and 0.08 pounds of CO_2 per mile in 2020. These savings translate into 0.20 MMTCE in 2010 and 0.75 MMTCE in 2020. Higher savings can be achieved by pursuing a multi-state GHG-based feebate program. We assume that by 2020 most states (and potentially Canadian provinces) will participate in a GHG-based feebate program, resulting in savings of 2.59 MMTCE in 2020.[117] Under such a program, by 2020, new cars would emit 0.20 fewer pounds of CO_2 per mile and new light trucks 0.26 fewer pounds of CO_2 per mile.

Provide Market Transformation Incentives to Enhance Demand for GHG-Efficient Vehicles. NYSDOT should work with car dealers to promote the sale of GHG-efficient vehicles, including a voluntary labeling program and incentives for prominent display of low-GHG vehicles. When New York's tax credits for alternative-fuel vehicles (AFV) expire in December 2002, we recommend that the State extend these credits after revising them on the basis of GHG performance. For cars, a reasonable qualifying level might be GHG emissions less than 0.5 pounds CO_2 per mile, and 0.7 pounds CO_2 per mile for light trucks. The tax credits will help offset the higher costs associated with new technology, cleaner-fuels and AFVs. As the vehicles gain consumer acceptance and production volumes increase, the cost differential between low-GHG vehicles and conventional vehicles will be reduced or eliminated and the tax credits should be phased out or modified to encourage even lower GHG vehicles. In addition, we recommend that New York study Congressional action (likely to be additional or revised legislation for AFV tax credits) and ensure that its tax credits are complementary with federal action.

Restructuring tax credits for all vehicles that reduce CO_2 emissions would likely require legislative change. Revised tax credit language should make it clear that the goal is to encourage the purchase of GHG-efficient vehicles.

To encourage the purchase and use of low-GHG vehicles, New York should modify motor vehicle registration fees such that the low-GHG vehicles pay reduced annual fees and high-GHG vehicles pay increased annual fees. Current annual vehicle registration fees in New York are modest, but by ramping them up over time the State can create a greater cost differential (and greater incentive for consumers) toward the purchase of low-GHG vehicles. This would provide a modest, annual incentive for existing vehicles and complement proposed incentives affecting vehicle purchase decisions.

Deployment of GHG-Efficient Vehicle Technologies. The State should increase funding for NYSERDA's advanced vehicle RD&D efforts, with an emphasis on deployment strategies and incentives, taking maximum advantage of federal matching funds. NYSERDA should continue to assist manufacturers with the deployment of GHG-efficient vehicle technologies for taxis, buses, delivery vehicles, trucks, and clean light-duty diesel vehicles. The Task Force's savings calculations are based on deployment of the following low GHG vehicles: 12,500 taxis, 325

[117] Savings based on CEC analysis of a national GHG-based feebate program.

buses, 5,000 delivery vehicles, 5,000 trucks, 5,000 clean-diesel passenger cars and 5,000 diesel cars operating on biodiesel.[118]

For example, the NYSERDA Advanced Technology Taxi Program has a goal of shifting all 25,000 New York City taxis to GHG-efficient models by 2010. This action will help stimulate manufacture of taxi vehicles and power trains in New York State that incorporate new technology to achieve energy and environmental benefits for all consumers. NYSERDA expects to sign milestone contracts with manufacturers in New York State as a way to grow the market for such taxis. Current program goals include the deployment of 1,250 pilot vehicles that will be in operation by 2003 (initial pilot vehicles will be sold to taxi owners for the same price as conventional taxis).

Modify Clean Fleets Goals To Maximize GHG Reductions. New York should require all State vehicle purchases to be low-GHG and the most efficient in their class.[119] 'Right-sizing' vehicles is also important: for example, an SUV is not necessary for going to a meeting. To further expand Clean Fleets goals, the State should partner with local and private fleets to encourage voluntary Clean Fleets programs.

Best Practices for Vehicle Efficiency. The following measures represent cost-effective policies that New York can adopt and implement in the near term and that have been shown to reduce GHG emissions from vehicles:

- Fully enforce car and truck speed limits.[120] This measure may require additional or shifted police resources. Reducing peak speeds will reduce GHG emissions, improve air quality, and enhance public safety.
- Incorporate teaching of efficient-driving techniques in drivers' education courses for new drivers as well as in refresher courses for licensed drivers. The curriculum should emphasize that efficient driving speeds reduce fuel and maintenance costs. The State should also consider more efficient-driving training courses, which have been shown to yield significant fuel savings in Europe.
- Encourage proper vehicle maintenance (possibly in conjunction with lessons on efficient driving). Beyond teaching such information in drivers' education, the State should implement an educational campaign, for example, with help from the Ad Council. This effort will help reduce GHG emissions while benefiting drivers via decreased vehicle operating and repair costs.
- Provide information on and incentives for low-rolling resistance tires and low-friction engine oils, and encourage maximum penetration of these technologies in State vehicles.

Rationale. The proposed package of market transformation incentives will reduce New York's dependence on imported oil, keep money in the State economy, reduce GHG emissions and improve air quality. The economic impacts of GHG tailpipe standards are calculated to range

[118] The development and deployment of selective catalyst control technologies, catalytic converters, and cleaner fuels are an important component of NYSERDA's clean vehicle efforts.
[119] The current State fleet consists of some 25,000 vehicles.
[120] Savings for truck speed limit enforcement are in the freight section.

from a benefit of $36 per MTCE to a cost of $143 per MTCE. The alternative GHG-based "feebate" program would result in short-term costs of three dollars per MTCE for a one-state approach, and net benefits of $35 to $77 for a long-term or multistate approach .[121] Many of the NYSERDA RD&D programs will have direct economic benefits for New York in terms of technical job and training facilities. Research partnerships with State universities will strengthen key institutions and enhance the State's technical resources. Weighted average costs of the recommended GHG-efficiency improvement measures range from $11 to $102 per MTCE (Table 7.3).

Low-GHG Fuel Measures

The recommended Low-GHG fuel policy measures are estimated to result in GHG emissions reductions of 0.12 MMTCE in 2010 and 0.55 MMTCE in 2020. Weighted average costs of the recommended low-GHG fuel measures range from a $135 to $148 per MTCE, assuming current biofuel production costs and federal subsidies (Table 7.3). Note that these cost estimates do not include economic and environmental benefits such as from job creation or improved air quality.

We recommend New York create a State biofuels program for the production and use of renewable, low-GHG biofuels. The State's strong agriculture-sector positions the State well for developing an indigenous biofuels program. Further, the State's use of diesel-powered fleet vehicles, potential marine applications, and NYSERDA's current RD&D efforts provide an immediate market for biofuels produced in New York. New York can also import biofuels at reasonable cost and increase the available supply for use in State-chosen applications. This section details our recommendations for developing a market for biodiesel and for producing and importing the necessary biofuels to reduce GHG emissions in New York.

Environmental Effects of Biofuels. The GHG benefits in this section are based on full life-cycle emissions from using crops such as soybeans and corn to produce biodiesel and ethanol transportation fuels. Life-cycle emissions calculations take into account emissions from crop production, fuel refinement, transport, and combustion, as well as carbon sequestration during crop growth. Depending on production processes, biofuels provide net GHG reductions because carbon sequestered during the process of growing corn and soybeans offsets a portion of the emissions from production, transport, and combustion of biofuels. The latest studies indicate that corn ethanol and biodiesel reduce life-cycle GHG emissions by some 18 percent compared with gasoline and diesel fuels. Potential life-cycle GHG emissions benefits of cellulosic ethanol from biomass is two to three times those of current corn-based ethanol.[122]

Biodiesel, produced from soybeans, contains no sulfur and thus provides additional air-quality benefits. Biodiesel has been shown to reduce sulfur dioxide (SO_2) and particulate matter (PM) as well as carbon monoxide, hydrocarbon emissions, and other toxic pollutants such as formaldehyde, benzene, and toluene. Levels of oxides of nitrogen (NO_x) have been shown to

[121] The CEC analysis included consumer welfare loss, which is much lower than fuel cost savings.
[122] "Effects of Fuel Ethanol Use on Fuel-Cycle Energy and Greenhouse Gas Emissions", ANL/ESD-38, by M. Wang. *GREET Model,* U.S. DOE's Argonne National Lab, available at: <http://greet.anl.gov/publications.html>.

increase slightly when biodiesel is used, although replacing seals on a regular basis, retarding engine timing and adding cetane timers have been proven effective at offsetting such increases.[123]

The use of ethanol fuel could potentially exacerbate other environmental concerns. Using ethanol blends in light-duty vehicles causes the fuel to become more volatile during the summer months, potentially increasing ozone formation. New York currently receives a waiver from the federal government for violation of emissions of volatile organic compounds (VOCs) for the summer months of May to October. Despite this waiver, it should be noted that DEC is concerned about the air-quality effects of expanding the use of ethanol in New York.

Costs of Biodiesel. Biodiesel is currently more expensive than conventional diesel fuel, although not prohibitively so. Biodiesel is sold in two blends. B2 is two percent biodiesel, 98 percent diesel, and has a price premium of about $0.01 to $ 0.02 per gallon. B20 is 20 percent biodiesel, 80 percent diesel, and the price premium ranges from between $0.10 to $0.20 per gallon.[124]

Currently, New York buys B20 for its fleets at a $0.10 per gallon premium. Industry experts expect biodiesel costs to decline in the near future as production levels rise and technological improvements take effect. Bulk purchase orders can also decrease the costs of biodiesel.[125] Federal support to producers of biodiesel will also affect biodiesel prices.[126]

Expanding the Use of Biodiesel in New York. Several recommended biodiesel initiatives and projects will help expand the use of biodiesel in New York.

New York should follow the lead of Minnesota and other states in adopting a renewable fuel standard that requires all diesel fuel sold in New York to contain a small percentage of biodiesel. The Governor should introduce legislation requiring all diesel fuel sold in New York to contain two percent biodiesel by 2010, and increasing the percentage of biodiesel as additional supply becomes available.[127] Such a statewide renewable fuel standard would result in reductions of 0.065 MMTCE by 2010 and 0.355 MMTCE by 2020, displacing 26 million gallons of diesel fuel by 2010, and 146 million gallons of diesel fuel by 2020. A renewable fuel standard could provide additional GHG reductions from stationary sources such as boilers.[128]

Biodiesel is already on the road in New York: NYSERDA has a number of pilot projects for both light- and heavy-duty fleet vehicles. We recommend several actions to strengthen NYSERDA's current pilot projects and increase biodiesel use.

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[123] Global Environment and Technology Foundation. *Potential Effects of Ethanol Blends and Biodiesel Fuels on Ambient Air Quality.* April 12, 2002.

[124] "Options for Expanding Biodiesel in New York," internal memo, NYSEDA, April 2002. The cost range is consistent with DOE values of $0.13 to $0.22/gal for B20 (*Clean Cities Fact Sheet.* Washington, DC: U.S. Department of Energy. May 2001).

[125] A recent purchase order of 2.1 million gallons biodiesel by the National Park Service resulted in a $0.04/gal premium; see Global Environment and Technology Foundation, *op cit*.

[126] Biodiesel producers receive a Federal subsidy of $1.00 per gallon of B100 only for any additional volumes beyond previous year production. This translates into $0.20 per gallon of B20 and $0.02 per gallon of B2.

[127] We estimate that by 2020, 50 percent of all diesel fuel sold in the State would be B20.

[128] See Chapter VI of this report.

- Execute an Office of General Service (OGS) contract for enough additional B20 to supply the entire state fleet of diesel vehicles. State agencies consume 5.8 million gallons of diesel fuel a year. In its next annual contract, OGS plans to purchase three million gallons of B100, for state fleets and passenger ferries in New York City. Current efforts are planned in New York City for the use of biodiesel in marine ferries. The state also should consider using biodiesel in all passenger marine vessels and, where appropriate, freight vessels. This measure would result in an annual reduction of 0.007 MMTCE.[129]

- Strengthen the Thruway Authority's effort to use B20 in its fleets, which is currently displacing 260,000 gallons of diesel per year. The State will also need to develop biodiesel infrastructure and storage facilities as part of the pilot.

- Work with Connecticut and other states to request that the federal government modify the Energy Policy Act (EPACT) to allow biodiesel full credit as an alternative fuel vehicle. Currently, agencies affected by EPACT receive full credit for purchasing vehicles with bi-fuel capability (generally gasoline and compressed natural gas), without showing any evidence of how much of the alternative fuel is ever used in the vehicle. Full credit for the use of biodiesel would lower the costs of complying with EPACT, while ensuring the use of a cleaner burning fuel, which is in keeping with the intent of EPACT.

- Fund pilot programs for B20 use in high-mileage local government and private-sector fleets such as school buses, garbage trucks, and delivery vehicles. The State can also build on New York City's Postal Service experience with mail delivery trucks operating on B20, and create similar pilot programs for transit buses and school buses.

New York Biofuel Production. New York has the potential soybean capacity to produce up to seven million gallons of B100 by 2010 (0.02 MMTCE) and 29 million gallons by 2020 (0.07 MMTCE). This would produce enough B20 for all state fleets and could potentially supply a portion of the B2 needed to meet the renewable fuel standard discussed above. Total biodiesel requirements under the renewable fuel standard are 31 million gallons of B100 in 2010 and 158 million gallons of B100 in 2020. Remaining biodiesel demand would need to be covered by imports.

In addition to GHG reductions from State-produced biodiesel, such a program would provide an economic boost to the State's farm industry. The federal Commodity Credit Corporation (CCC) is a financial support program for farmers who grow energy crops (soybeans and corn) that are used in the production of renewable fuels. Recently, the CCC was reauthorized for a three-year period ending in 2006. Such a program directly benefits New York farmers who produce biodiesel and ethanol and thus the State should consider encouraging the federal government to continue to fund the CCC beyond the program's anticipated sunset date.

Land Requirements for the Production of Biofuels.

[129] Note these GHG benefits are in addition to the State fleet measures discussed in the previous section.

Biodiesel -- By 2010, we have assumed that ten percent of current land used to grow corn for feed (115,000 acres) could be converted into soybean production for biodiesel, as well as one-third of fallow land (525,000 acres). Associated biodiesel production would displace 27 million gallons of diesel fuel and reduce GHG emissions by 2010 by 0.07 MMTCE.

NYSERDA should create a private-sector based, sustainable biodiesel production and distribution program for New York. This program would, at a minimum, provide technical assistance and capacity building for in-State producers of biodiesel. We recommend that New York also consider tax credits for biodiesel producers and distributors who meet environmental, efficiency, and cost-effective biodiesel production requirements. Such a production and distribution program will help create jobs in Upstate New York with limited outlay of State resources.

Waste oils -- Waste vegetable oil can be easily converted into biodiesel—approximately seven pounds of waste vegetable oil are needed to create one pound of biodiesel. According to reported data and NYSERDA, New York has excess waste vegetable oil. The State should fund a pilot project to pick up, process, and refine waste oil. This project would ideally include a program working with high-volume fast-food restaurants to collect and refine their excess oil. A waste-oil program would provide GHG reductions of 0.004 MMTCE by 2010.

Corn-based Ethanol -- As with biodiesel, we have assumed that ten percent of land currently used for growing corn could be dedicated to ethanol production. We have also assumed that the State's ethanol production could be bolstered by converting one-third of current fallow land to grow corn for ethanol. Such efforts could potentially displace 117 million gallons of gasoline each year and reduce GHGs by 0.05 MMTCE (additive with savings from soybean biodiesel).

The New York Corn Growers Association (NYCGA) recently released a report on ethanol production in New York that profiles the economic and environmental benefits of developing an in-State ethanol production industry. After a thorough review of the NYCGA report and other relevant data sources, NYSERDA should consider working with the NYCGA and other ethanol groups to secure independent funding for in-State ethanol production.[130]

Cellulose-based Ethanol -- NYSERDA should continue pilot projects and research efforts with the ultimate goal of cellulosic-based ethanol replacing corn-based ethanol. If it can become cost-competitive with petroleum, cellulosic ethanol will provide substantial GHG benefits.

Ethanol made from cellulose (e.g., from woody crops, wood waste, switchgrass, agricultural residues, municipal solid wastes) generates negligible amounts of GHGs in comparison to fossil fuels or ethanol made from corn. Corn requires more cultivation and more fertilizer (and associated GHG emissions) than woody crops and the fertilizer used for growing corn generates significant GHG emissions through manufacturing. Also, by-products from the wood-to-alcohol conversion process can be used to generate electricity, resulting in a net energy gain from the production process of cellulosic ethanol. In vehicles, cellulosic ethanol could most likely be first used primarily as a blending component for gasoline, with added value as an octane enhancer

[130] New York Corn Growers Association. *Technical Report on NYCGA Ethanol Analysis* July 30, 2001.

and oxygenate. No engine modifications would be required for use in blends of up to ten percent ethanol.

Production of cellulosic ethanol is not currently near commercial status, and is prohibitively expensive. A process that may dramatically reduce costs is under development by the US Department of Energy (DOE) National Renewable Energy Laboratory. Land requirements could ultimately limit cellulosic ethanol production in New York.

Biofuel Imports. Depending on federal policies and incentives, State production, and statewide demand for biofuels, the State may choose to import biofuels. By 2020 the projected US supply of biodiesel is six billion gallons.[131] A large amount of biodiesel is produced in Massachusetts, which, if imported, could reduce the time and cost of implementing a biodiesel program and provide a source of fuel stability to offset any crop or production fluctuations in the near-term. Ideally, any imports would offset low State production volumes in the early stages of the program and be used to meet increased long-term demand within New York's transportation sector. Ethanol imports could potentially come from Midwestern states or potentially Brazil, which is a large producer of ethanol.

Rationale. A New York biofuels industry offers numerous benefits for the State and its citizens. Using biofuels would reduce New York's dependence on imported petroleum and subsequent economic vulnerability from international oil price fluctuations. In addition, growing energy crops will help keep the State farm economy strong by stabilizing prices and preserve agriculture-based jobs while allowing New York to take advantage of federal subsidies. By working with New York universities in designing biofuels RD&D programs and cellulosic ethanol research facilities, NYSERDA can contribute to the growth of a new biofuels industry in the State. Weighted average costs of the recommended low-GHG fuel measures range from $135 to $148 per MTCE, assuming current biofuel production costs and Federal subsidies (Table 7.3).

Freight Measures

The recommended freight measures are estimated to result in GHG emissions reductions of 0.06 MMTCE in 2010 and 0.12 MMTCE in 2020, excluding GHG savings from multimodal freight system improvements (rail, marine), truck tolls, driver training, and best practices, which were not quantified. Weighted average costs of the recommended low-GHG fuel measures come to $1,595 per MTCE, assuming that the costs of a cross-Hudson rail tunnel is counted only for GHG reduction benefits (Table 7.3). These cost estimates do not include economic and environmental benefits such as reduced congestion, decreased wear and tear on roads, or improved air quality.

[131] *Clean Cities Fact Sheet.* Washington, DC: U.S. Department of Energy. May 2001.

Ground freight (freight trucking and freight rail) accounts for 19.4 percent of total transportation carbon emissions and energy use in the United States.[132] Freight movement in all modes is expected to double by 2020. [133] For New York, freight is a valuable component of the economy and a key component of growth in the State.

New York State should place high priority on addressing the rapid growth in GHG emissions from freight. Developing a comprehensive plan to improve the efficiency of freight movement in New York was beyond the scope of the Task Force's mandate. It will be crucial for NYSDOT and the proposed transportation emissions reduction entity to capitalize upon existing freight initiatives such as the New York Metropolitan Transportation Council's Regional Freight Plan Project,[134] and the Comprehensive Port Improvement Plan for the Port of New York and New Jersey.[135]

Any policy action designed to reduce freight emissions should be part of a fully integrated approach, taking into account efficiency, cost-effectiveness, congestion, and the importance of freight to the New York economy. The recommendations in this section include a set of price signals and a technology package for trucks as well as the adoption of measures designed to increase the use of multiple modes of transportation in New York's freight system.

Cross-Hudson Freight Rail Tunnel. A Cross-Hudson rail tunnel would provide a vital link between New York City and surrounding communities. Currently, the primary movement of goods across the Hudson is limited to the George Washington and Verrazano Narrows bridges. A direct rail freight tunnel would have positive effects for New York by decreasing the region's dependence on trucking, improving air quality, and reducing wear and tear on highway infrastructure. The project is proposed to be completed in three phases:

Phase 1: Railcar float system/TSM – reduction of 16 million VMT/year
Phase 2: Rail Tunnel – reduction of 44 million VMT/year
Phase 3: Rail Tunnel with Expanded Brooklyn Port – reduction of 93 million VMT/year

A cross-Hudson freight tunnel would improve multi-modal freight capacity in the tri-state region and enable mode shifts from truck to rail and barge, resulting in additional VMT and GHG reductions in New York and surrounding states. In the near term, the New York City government should work closely with the New York City Economic Development Corporation (NYCEDC) and NYSDOT, as well as the Port Authority of New York and New Jersey, to coordinate the potential for a Cross-Hudson freight tunnel and assess the potential for financial support from the federal government.

Multi-modal Freight Investments. A set of system-level freight investments are needed in New York to effectively reduce GHG emissions from freight transport. The expansion of multi-modal

[132] Jeffrey Ang-Olson and Will Schroeer, ICF Consulting. "Energy Efficiency Strategies for Freight Trucking: Potential Impact on Fuel Use and Greenhouse Gas Emissions." *Proceedings of the 2001 Annual Transportation Research Board Meeting*.
[133] Federal Highway Administration website, <http://www.ops.fhwa.dot.gov/freight/environmental_factors.htm>.
[134] NYMTC's Regional Freight Plan is available at: <http://webservices.camsys.com/nymtcfreight/>.
[135] More information on "CPIP" is available at: <www.cpiponline.org/>.

freight transport options (e.g. rail, shipping, waterways, and any of these in combination with road transport) should be considered or expanded where cost-effective, with the goal of reducing truck VMT. Key recommendations include the following:

- Implement NYSDOT's vertical clearance programs (including double stack clearance where needed) which currently provides a minimum clearance of 17 feet 6 inches for container-on-flatcar and trailer-on-flatcar and 20 feet 6 inches of clearance for structures between Montreal and New York City.
- Develop dedicated "inland distribution networks" to move port commodities through limited terminal space rapidly and efficiently, combining water- and land-based modes.
- Create a freight intermodal center at the Pilgrim State Hospital site to improve access to Long Island.
- Encourage warehouse and distribution center development in the existing metropolitan areas (i.e., create global freight villages).
- Consider shifting garbage hauling in NYC from truck to barge.

The Port Authority has planned a series of freight rail investments, allocating $25 million each to New Jersey and New York to upgrade their joint cross-harbor float system. This financial support is critical to the revitalization of the freight rail system, especially if an expanded port is to be coupled to an efficient inland distribution system. For the Cross-Harbor float system to operate properly, the New Jersey facility that feeds NYCEDC's 65th Street facility must be upgraded, and clearance and track work on the Bay Ridge line must proceed.

Rail Taxation Reform. The passage of Governor Pataki's rail taxation reform bill would make New York's rail property tax system comparable to surrounding states and encourage maintenance and investment in rail infrastructure. Current State property tax assessment procedures result in New York's track and rail yards being overvalued when compared with surrounding states' rail infrastructure. The Governor's bill would change tax assessment procedures, leading to lower property tax payments by rail companies for current infrastructure while sheltering future rail improvements from incremental tax increases for a period of up to ten years. This readjustment of tax assessment procedures is designed to encourage investment and upgrades in current track/rail infrastructure and to prevent private carriers from removing valuable track to simply avoid paying high property taxes. By reassessing property tax rates to be more in line with neighboring states, New York can create incentives for private investment in track and rail facilities within its borders.

Marine Freight. New York State should adopt the "green port" goals for ports statewide, based on the Comprehensive Port Improvement Plan (CPIP), including:

- Reduce or minimize potential future increases in regional VMT and mobile source emissions from port improvement related activities.
- Achieve air quality conformity with regional and State Implementation Plans.
- Promote rail/truck/barge mode split that will support reduced port-related VMT and improve air quality.
- Promote mass transit to port-related work facilities.

The State should also undertake clean fuel and emissions control efforts to maximize air quality benefits.

Truck-Stop Electrification. Truck-stop electrification (TSE) enables trucks to plug into electric outlets similar to power outlets at marinas and recreational vehicle parks. In addition to reducing GHG emissions, TSE reduces petroleum consumption, improves air quality, reduces noise pollution in communities adjoining parking areas, improves driver health (from improved rest and reduced exposure to pollutants), and reduces engine maintenance requirements.

A statewide program to install 1,000 TSE-equipped parking spaces would stimulate competition by vendors to provide the best design configurations of TSE that meet the needs of all stakeholders. When new parking and trucking facilities are built, the State should provide incentives to equip them with TSE. Simultaneously, incentives could be provided to add TSE to existing parking spaces. An example is the Hunt's Point Cooperative Market in the South Bronx, where 28 electric hook-ups were to be in place by late 2002. This program is expected to save 2,000 tons of diesel fuel from formerly idling delivery trucks and to reduce air pollutant emissions in the low-income neighborhood where Hunt's Point is located.

Enforce Truck Speed Limits. The State can reduce GHG emissions by enforcing truck speed limits. If trucks operating in New York reduce their speeds, truckers would also save diesel fuel and reduce fuel costs.

Consider Increasing Tolls or Highway User Fees. In New York, freight trucks account for 78 percent of the ton-miles for goods shipped within New York and out of state.[136] Shifting freight transportation movement from long-distance, heavy-duty truck delivery to more efficient modes such as rail and barge could help limit truck VMT growth and provide GHG, energy, and air-quality benefits. In this regard, the State should consider increasing tolls and the Highway Use Tax for trucks driving into and through New York. This increase could reduce truck VMT while raising revenues for other GHG emissions reduction efforts. The toll program could be implemented along the lines of the EZ-Pass system operated by the Port Authority of New York and New Jersey, which uses a computerized system to automatically collect tolls at certain points along heavily traveled roads.

Aviation and High-Speed Rail Measures

The recommended measures in aviation are estimated to result in GHG emissions reductions of 0.05 MMTCE in 2010 and 0.06 MMTCE in 2020. GHG savings from high-speed rail were not quantified. Weighted average costs of the recommended low-GHG fuel measures come to $120 per MTCE (Table 7.3). These cost estimates do not account for air quality or other benefits.

Total emissions attributed to ground support equipment (GSE), ground-access vehicles, and aircraft comprise about two to three percent of total emissions for a typical metropolitan area.

[136] New York State Energy Plan and Final Environmental Impact Statement. June 2002, Figure 12, page 2–77.

The share of emissions from aviation is expected to increase rapidly as air travel grows. Over 50 percent of the total air pollutant emissions at airports are from vehicles that operate on or near airport grounds. GHG emissions from airport-related sources should be reduced through concerted efforts on two fronts: ground support equipment (GSE) and high-speed rail.

Ground Support Equipment. New York should develop a program focused on GSE that would reduce GHGs and other pollutants at New York State airports by introducing approximately 1,000 alternatively fueled vehicles and electric fixed-gate equipment. This program should seek to leverage investment in vehicles fueled by compressed natural gas, electric, hybrid-electric, propane, and biofuel as well as investments in recharging and refueling infrastructure.

A statewide investment in clean GSE could be implemented through competitive grants covering a portion of the incremental cost of new vehicles and a portion of the cost of infrastructure. Eligible entities could include airport authorities, municipalities that own and operate airports, airlines, and companies that provide transportation serving airports. Both airport and offsite vehicles could be eligible, as well as charging units and fueling stations. Electric fixed-gate equipment that replaces aircraft auxiliary power units could also be eligible.

High-Speed Rail. High-speed rail service can reduce passenger-car VMT and short-haul air travel, both of which can lead to reductions in GHG emissions in the region. New York should examine and implement, where applicable, strategies to encourage the use of high-speed rail. The State currently has two high-speed rail corridors: Amtrak's Acela and the New York State Empire Corridor. Currently, the Empire Corridor has high-speed service between New York City and Schenectady and is working to extend high-speed service to connect western and northern New York, Chicago, Toronto, and Montreal to New York City. The Empire Corridor is expected to increase rail ridership by as much as 150 percent.

The GHG-emissions reduction potential of high-speed rail depends on the displaced transportation mode type, the emissions profile of the replaced mode, and the emissions profile of the train service. For example, increased ridership may result in either fewer passenger car VMT or less air travel between the connecting cities. The emissions reductions from each of these modes can be significant.

Setting and Tracking Progress Toward a Transportation-Sector Goal

Bottom-up analysis of the Center's recommendations indicates that they can reduce emissions by 1.64 MMTCE in 2010, with total emissions 20.9 percent *above* 1990 levels, and reductions of 5.23 MMTCE in 2020, with total emissions 16.5 percent *above* 1990 levels.

The proposed New York State transportation emissions reduction entity goals are consistent with this analysis: Reduce transportation GHG emissions to 20 percent above 1990 levels by 2010, ten percent above 1990 levels by 2020, and to 1990 levels by 2030.

The actions recommended in this chapter would contribute to State reductions of less than one percent below 1990 levels by 2010. Given that the Task Force called for reductions of five percent below 1990 levels, more reductions from this sector will likely be necessary. A number

of measures mentioned in this chapter were either not quantified or could be implemented more aggressively to achieve further GHG reductions in 2010. These include the following:

- Commuter choice/transit benefits (0.13 MMTCE, with more aggressive implementation).
- Speed limit enforcement (0.09 MMTCE, with more aggressive implementation).
- Freight rail-system improvements (not quantified).
- Truck driver training/best practices (not quantified).
- Marine passenger and freight (not quantified).
- Truck tolls (not quantified).
- High-speed rail (not quantified).

The following measures were not included in the recommendations, but could be considered in the future:

- Pay-as-you-drive insurance (0.10 MMTCE).
- Vehicle scrappage (0.005 MMTCE).

The emissions reductions recommended in this chapter (1.64 MMTCE in 2010, and 5.23 MMTCE in 2020) can also be expressed as goals, in percentage terms for each key component of transportation emissions for 2010 and 2020, where appropriate.[137]

- **VMT:** Slow projected VMT growth 3.5 percent by 2010 and another six percent by 2020.
- **MPG:** Increase *fleet* fuel economy 0.5 percent by 2010 and another ten percent by 2020.
- **Fuel mix:** Decrease fuel GHG intensity 3.5 percent in 2010 and another one percent by 2020.
- **Passenger mode split:** Increase share of transit, walk, and bike use for short trips; increase share of rail and bus for long trips.
- **Freight mode split:** Reduce share of truck freight and increase share of rail and barge freight.

Emissions Tracking. New York State should track transportation GHG emissions to monitor progress in meeting sector goals and the State target, and to evaluate the effectiveness of emissions reduction policies. As discussed in the beginning of this chapter, transportation GHG emissions should be tracked on the basis of fuel *consumption* data, as opposed to fuel *sales* data. This will require both VMT and fuel economy (mpg) data, as discussed earlier.

- **VMT.** Vehicle Miles Traveled represent the fundamental variable for calculating motor vehicle GHG emissions. NYSDOT and MPOs should continue to track VMT on both the State and regional level, using the latest statistical techniques to achieve an accurate statewide aggregation. NYSDOT should develop methodologies to track VMT by broad vehicle categories (e.g., cars, light trucks, heavy-duty trucks). The State should track

[137] To reach 1990 levels would require nine to ten percent improvement (each) in VMT, mpg, and fuel mix by 2010, and an additional two to three percent improvement by 2020.

VMT at the MPO level because of the important role MPOs play in regional transportation planning. Strategic enhancements of VMT data could also provide insight into travel demand growth in specific parts of the region (e.g., near transit-oriented developments, near major shopping centers, etc.). Finally New York should monitor and track the VMT created and associated with public and private fleets as well as major development projects

- **Fuel Economy.** NYSDOT should develop a robust methodology to calculate the average fuel economy of all vehicles sold and operated in the State. This should include current, on-road light- and heavy-duty vehicles; State and municipal fleets; and private high-mileage fleets (i.e., delivery and shipping fleets). Until a robust methodology is developed, we recommend that NYSDOT use both regional fuel sales and VMT data to calculate average regional fuel economy, as described in the baseline discussion above.
- **Vehicle GHG Emissions Rates.** NYSDOT should track pounds of CO_2 per mile for new light- and heavy-duty vehicles,
- **Fuel Consumption.** Total fuel consumption in New York State should be calculated on the basis of VMT and fuel economy data. Fuel sales data are important for calculating emissions from nonroad vehicles and for cross-checking fuel sales trends with calculated fuel consumption data.
- **Fuel mix and GHG Content.** New York State should track fuel use by fuel type in order to calculate average GHG content of fuels sold in New York. For biofuels, this will require keeping current with lifecycle assessments (i.e., emissions and sequestration from crop production, fuel refinement, fuel transport, and fuel combustion).
- **Passenger mode split.** New York State should track the share of passenger mode split (car, transit, vanpool, walk, and bike) on the basis of VMT and trips, as well as vehicle occupancy. The mode split should be tracked for New York as a whole, for all NYSDOT regions, and for major urban areas. New York should also track passenger mode split for long-distance travel (air, rail, bus, and automobile).
- **Freight mode split.** The State should track the share of freight transported in New York by truck, rail, and barge in terms of VMT, ton-miles, and economic value.
- **Freight load factors.** The State should track freight load factors to identify empty back-hauls or under-utilized capacity.
- **Transportation Funding.** The State should track the share of state and federal funding for each mode or alternative: highway, transit, walk, bike, ride sharing, and TDM.

VII. AGRICULTURE AND FORESTRY

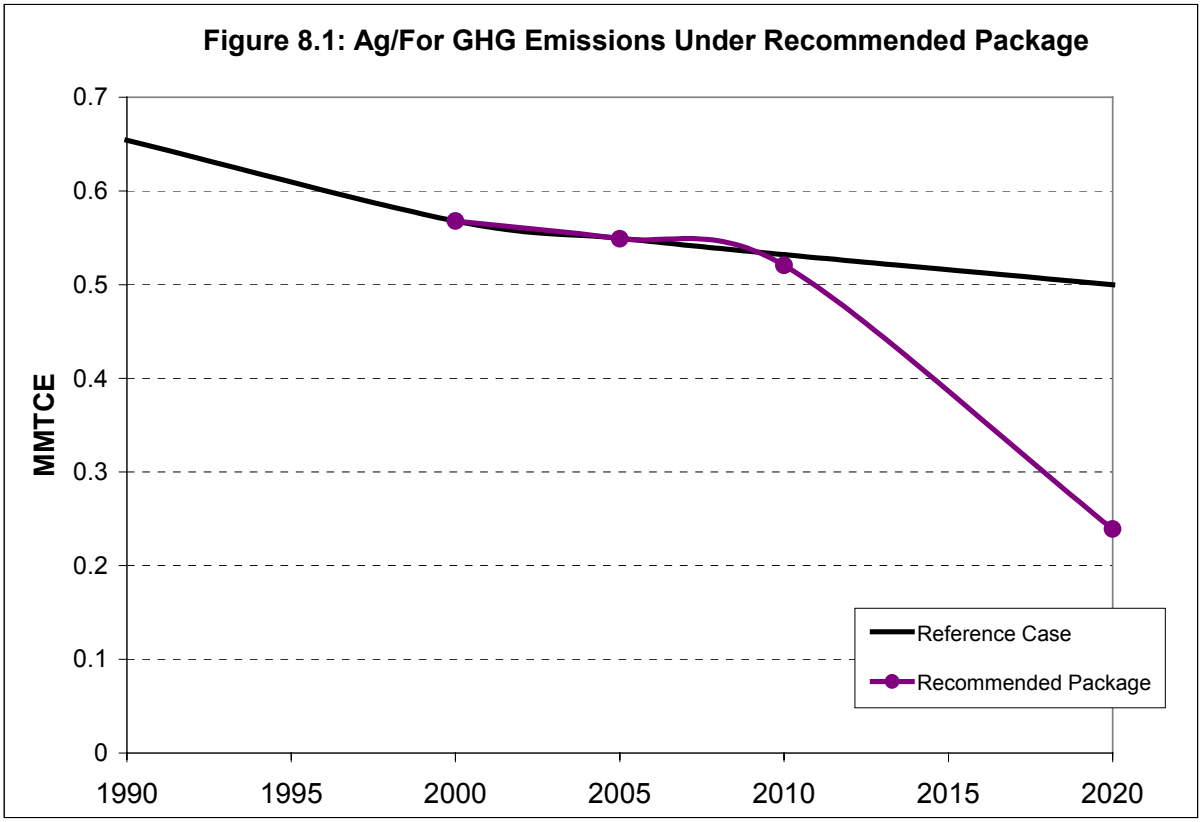
A. SECTOR SUMMARY

Analysis by the Center with input from the Agriculture and Forestry working group found that this sector can reduce emissions by 0.011 million metric tons of carbon equivalent (MMTCE) in 2010, 20 percent below 1990 levels, and 0.26 MMTCE in 2020, 58 percent below 1990 levels, through implementation of the actions recommended in this chapter (see Figure 8.1). Members of the Task Force supported the Center's recommended package of actions for this sector.

To reduce greenhouse gas (GHG) emissions, New York should take the following actions:

- Expand the New York Agricultural Environmental Management program by improving nutrient management plans on all large farms and more than 22 percent non Combined Animal Feeding Operations (CAFO) sized farms by 2010 and 50 percent of non-CAFO-sized farms by 2020; installing digesters on 15 percent of large farms by 2010 and 35 percent by 2020; and consider actions to expand conservation tillage.
- Plant a sufficient quantity of trees per year so that by 2020 more than three million properly planted trees will have survived to a sufficient size to decrease energy demand in the surrounding area, and consider actions to increase the State's carbon sinks.
- Improve the State's land-use inventory to allow for better tracking of actions at the entity level and to support future actions.

Figure 8.1: Ag/For GHG Emissions Under Recommended Package



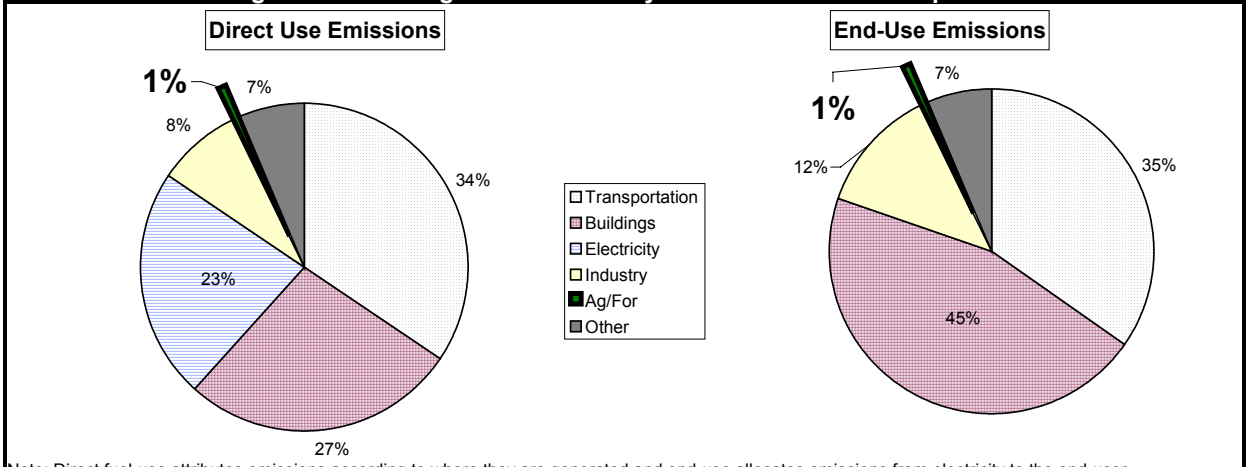
MMTCE = million tons of carbon equivalent

B. OVERVIEW

Agriculture and Forestry-Sector Emissions

Emissions from the agriculture and forestry sector are a minor share of the State's GHG emissions. Due to this relatively small contribution to the State's emissions, reduction opportunities are limited. In 2000, GHG emissions from this sector were less than one percent of the State's total emissions (Figure 8.2).

Figure 8.2: 2000 Agriculture/Forestry Sector Emissions Comparison



Note: Direct fuel-use attributes emissions according to where they are generated and end-use allocates emissions from electricity to the end-user.

The agriculture and forestry sector contains a variety of emissions sources and sinks. For purposes of this report, the reference case includes only GHG emissions, not emissions reductions from carbon sinks.[138] Therefore, the emissions trend from this sector results from methane (CH_4) emissions from domesticated animals, nitrous oxide (N_2O) and CH_4 emissions from manure management, and carbon dioxide (CO_2) and N_2O emissions from agricultural soil management. Table 8.1 shows the historic and predicted reference case emissions for this sector, by source.

Table 8.1: New York Agriculture/Forestry Greenhouse Gas Emissions (MMTCE)

	1990	2000	2010	2020
Agriculture and forestry baseline	**0.65**	**0.57**	**0.53**	**0.50**
Domesticated animals	0.323	0.310	0.286	0.264
Manure management	0.082	0.079	0.073	0.068
Agricultural soil management	0.249	0.179	0.173	0.168

MMTCE = million metric tons of carbon equivalent.

[138] Carbon sinks are stores of carbon emissions that result from biomass, such as trees and vegetation.

In 2000, the largest source of GHG emissions in the sector resulted from domesticated animals—54 percent—followed by agricultural soil management—31 percent—and manure management—14 percent. GHG emissions from all sources in this sector are predicted to decrease due to declines in harvested cropland, fertilizer and lime use, and cattle in New York.

Emissions (and sinks) from the forestry sector are associated with decreases (and increases) from the carbon content of New York's forests. Although an important potential source of reductions and increases in GHG emissions, reductions from sinks were not included in the sector and State targets. Net reductions in GHG emissions from forest sinks in New York were estimated at 0.79 MMTCE in 1990. For the 2010 and 2020 reference case emissions, the working group assumed that the net emissions reductions from sinks will be zero because New York's forests are maturing and increases in forest cover would be offset by decreases in other locations due to development patterns.

Factors Affecting Agriculture Emissions

Agricultural operations emit GHGs through both direct operations, such as electricity and gasoline use, and indirect operations, such as animal methane releases, fertilizer use, and animal waste emissions. In addition, altering the method by which agricultural land is managed can lead to increases or decreases in the annual CO_2 flux of these lands. Although these agricultural activities in New York emit GHGs, three downward trends explain the decline in the sector's GHG emissions.

The first factor driving the decline in GHG emissions from agriculture is a reduction in the quantity of farmland used. By reducing the amount of land in agriculture, a declining quantity of emissions are expected from such activities as irrigation, tillage practices, or the fallowing of land. Total farmland acreage in New York declined by seven percent during the 1990s and the amount of harvested cropland declined by three percent over the same period. Table 8.2 shows the downward trend in acreage of agricultural land over that period.

Table 8.2: NY Farms and Farmland by Type (thousand acres)

	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**91-'00** (% change)
Land in Farms	**8,300**	**8,200**	**8,100**	**7,900**	**7,900**	**7,800**	**7,800**	**7,800**	**7,800**	**7,700**	**-7%**
Total Cropland	5,270	5,140	5,080	5,000	5,000	4,980	4,980	4,980	5,030	4,960	-6%
Harvested	*3,500*	*3,522*	*3,503*	*3,562*	*3,446*	*3,482*	*3,510*	*3,519*	*3,643*	*3,385*	*-3%*
Pasture	*740*	*720*	*700*	*690*	*710*	*700*	*680*	*670*	*640*	*630*	*-15%*
Other	*778*	*652*	*631*	*502*	*590*	*550*	*540*	*540*	*500*	*690*	*-11%*
Permanent Pasture	720	740	710	680	680	670	670	670	640	630	-13%
Woodland	1,690	1,700	1,660	1,600	1,600	1,580	1,580	1,560	1,530	1,520	-10%
Other	620	620	650	620	620	590	590	590	600	590	-5%

Source: NY Agricultural Statistics Service, *New York Agricultural Statistics: 2000-2001.*

The second factor is the decline in the total quantity of cattle and calves in New York State, as the declining number of cattle results in fewer emissions from animal digestion and manure decomposition. Agriculture in New York State is predominately focused on dairy products—dairy accounts for about 56 percent of the State's agricultural cash receipts.[139] The number of cattle in larger herds (500 or more head) has increased. The increase in cattle and calf concentrations has implications for the ease of implementing the mitigation actions, because the sources of emissions are concentrated. Table 8.3 shows these two trends.

Table 8.3: Cattle and Calves, by herd size (thousand head)

	1-49	50-99	100-499	500+	*Total*
1992	170	331	893	146	**1540**
1993	185	339	847	169	**1540**
1994	194	298	820	178	**1490**
1995	145	290	841	174	**1450**
1996	176	294	823	177	**1470**
1997	148	296	784	252	**1480**
1998	158	275	767	282	**1482**
1999	161	248	774	277	**1460**
2000	161	248	774	277	**1460**
2001	152	235	731	262	**1380**
% change) 1992 - 2001	*-1%*	*-29%*	*-1%*	*79%*	***-1%***

Source: NY Agricultural Statistics Service, *New York Agricultural Statistics: 2000-2001*, see: <www.nass.usda.gov/ny/bulletin/2001/01-bulle.htm>.

The third factor is the reduction in fertilizer use in New York State, because lower fertilizer use reduces the amount of nitrogen added to the soils and results in fewer N_2O emissions. Between 1991 and 2000, fertilizer use in New York declined from about 575,000 to 522,000 tons, or nine percent. GHG emissions are therefore expected to decline. This trend is expected to continue in the future.

Factors Affecting Forestry Emissions

Plants reduce GHG emissions through the process of photosynthesis, whereby carbon dioxide, water and sunlight are converted to oxygen, plant fiber and other plant products. In the process, the flow of carbon to the atmosphere is reduced, and the stock of carbon above ground (in plant fiber) and below ground (in soil carbon) is increased. Trees, shrubs and grasses can increase above and below ground carbon in carbon sinks that endure until the soil is disturbed or the plants are combusted or decay. Depending on the plant and soil type, carbon can remain sequestered for very long periods, and current fossil fuel supplies (coal, oil, gas) were formed

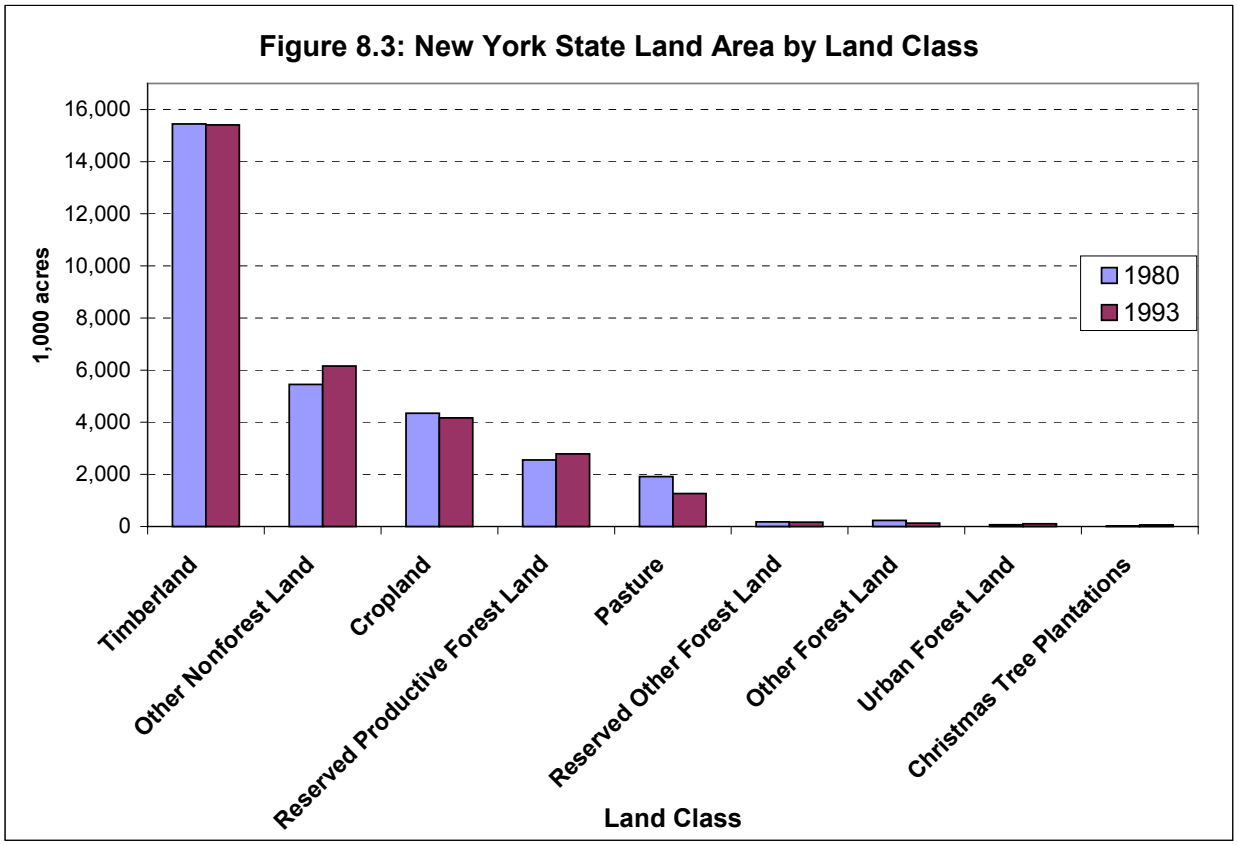
[139] See <www.nass.usda.gov/ny/aboutny.pdf>.

over millions of years by accumulation and compression of plant fiber below ground. Forest fires and land clearing releases carbon to the atmosphere that otherwise would remain sequestered. Properly planted trees in urban areas can decrease energy use by reducing wind speed in winter, and by shading buildings and lowering air temperatures in summer. Improperly planted trees in urban environments can actually increase energy use by shading buildings in winter and adding humidity in summer. Tree effects on wind in summer may or may not be beneficial, depending on air temperature. Optimizing building and tree configurations for maximum energy conservation requires balancing the positive and negative tree influences over an average year.

The emissions-reduction and sequestration potential of New York's forests are affected by two factors. First, 62 percent of New York's land area is currently under tree cover.[140] Figure 8.3 shows the distribution of New York land by land-use over time. Total forest acreage in New York has remained relatively flat over this period, but urban growth has encroached on agricultural and pasture land. In the future, the amount of forest cover is expected to remain relatively constant, with increases in forest cover being offset by declines in other parts of New York. An additional factor to keep in mind when considering GHG mitigation options is the amount of urban areas under forest cover. As Figure 8.3 shows, only 0.3 percent of the State's land area is under urban tree cover, whereas more than 25 percent is currently under tree cover.[141] Recent estimates have concluded that a significant opportunity exists to increase the State's urban forest cover.[142]

Last, current forest land is under the direct control of a variety of ownership types. Private landowners are the dominant landowner type in New York; a limited amount of land is currently under control of government entities.[143] Therefore, actions aimed at improving or increasing sequestration from carbon sinks should focus on private nonindustrial landowners.

[140] U.S. Forest Service. *1993 Forest Inventory*. Available at: < www.fs.fed.us/ne/fia/states/ny/tables/ny001.html>.
[141] More than seven percent of the State is an urban area (Dwyer et al., 2000, and Nowak et al., 2001).
[142] A recent study conducted in the New York City metropolitan area showed that up to 32 percent of the urban areas in the area could support new tree plantings. A more reasonable estimate was ten percent of the urban area (Luley and Bond, *A Plan to Integrate Management of Urban Tree into Air Quality Planning.* Naples, New York: *2002*).
[143] U.S. Forest Service. *1993 Forest Inventory*. Available at: < www.fs.fed.us/ne/fia/states/ny/tables/ny001.html>.



C. ANALYSIS OF MITIGATION OPTIONS

A number of mitigation opportunities within the sector can either contribute to reductions in other sectors or reduce the sector's GHG emissions. Agricultural practices use fossil-fueled equipment for their daily operations. Actions that reduce the use of these equipment can lead to subsequent reductions in emissions. The forestry and agriculture sector can also lead to reductions in emissions from other sectors through actions such as on-farm energy production and biomass production for fuel use. In addition, actions taken within the sector can lead to reductions in the sector's direct GHG emissions. The Agriculture and Forestry working group identified more than 25 separate measures for the sector. Actions that could lead to reductions in other sectors were analyzed within the context of the sector in which the benefits would accrue. For example, the Electricity working group discussed on-farm energy production as a part of its discussion of renewable energy. The Agriculture and Forestry working group discussions highlighted three specific actions—nutrient management, manure management, and urban forestry—for analysis. The analysis includes estimates of cost-effectiveness (dollar per ton of carbon-equivalent reduced) and the total quantity of GHG emissions reduced (in million metric tons carbon equivalent, or MMTCE).

With collaboration from the Agriculture and Forestry working group, the Center grouped the quantified measures into low, medium, and high categories. In considering the grouping of the options, the Center combined the selection criteria, mentioned in Chapter I, with the expert judgment from the Center and points made in discussions within the working group. Options were grouped according to the ease with which they could be implemented. For agriculture, options were classified according to the ease of implementation, as measured by the number of farms involved and the concentration of benefits. Therefore, low options required participation of a limited number of farms of large sizes. High options, on the other hand, required participation of a large number of less concentrated farms. For urban forestry, the scenarios were similarly classified according to ease of implementation. In this case, low required a small quantity of urban tree plantings and therefore low implementation barriers. Table 8.4 provides a summary of the results of this analysis.

The decline in emissions predicted under the reference case means that the sector emissions in the base case will be below current levels. Therefore, the actions undertaken by the sector to mitigate emissions will lead to greater reductions below current levels. Implementation of the low scenario would result in emissions levels of 20 percent below 1990 levels in 2010. Under the medium scenario, emissions levels are estimated at 20 and 50 percent below 1990 levels in 2010 and 2020. In the high scenario, the sector's emissions would be 21 percent below 1990 levels by 2010 and 65 percent below by 2020. The significant increase in emissions reductions between 2010 and 2020 is attributed to the actualization of the benefits of the urban tree planting program (see below for greater discussion).

Table 8.4: Agriculture/Forestry Sector GHG Reduction Opportunities						
Actions	**Estimated Reduction Potential (MMTCE)**					**Incremental Cost per MtCE ($2000)**
	1990	**2000**	**2005**	**2010**	**2020**	
Reference Case	**0.65**	**0.57**	**0.55**	**0.53**	**0.50**	
Proposed Actions:						
Low Scenario						
Nutrient Management			0.0037	0.0099	0.0109	400
Manure Management			-	-	-	145
Urban Forestry			-	-	0.0821	70
Total			**0.0037**	**0.0099**	**0.0930**	
Medium Scenario						
Nutrient Management			0.0002	0.0111	0.0136	400
Manure Management			0.0003	0.0003	0.0007	145
Urban Forestry			-	-	0.1643	70
Total			**0.0004**	**0.0114**	**0.1786**	
High Scenario						
Nutrient Management			0.0111	0.0143	0.0209	400
Manure Management			0.0003	0.0007	0.0014	145
Urban Forestry			-	-	0.2464	70
Total			**0.0114**	**0.0150**	**0.2687**	

Figure 8.4 compares the three policy scenarios with the sector's reference case emissions levels.

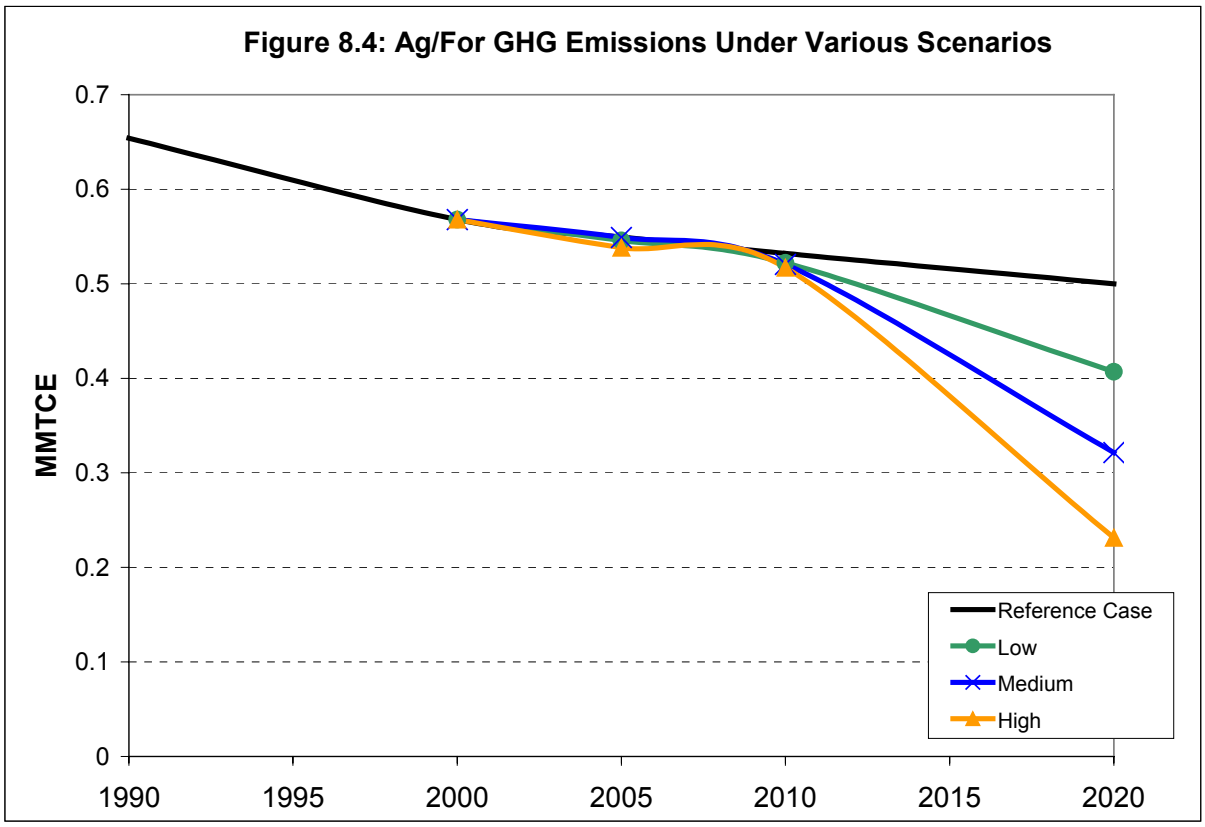


Figure 8.4: Ag/For GHG Emissions Under Various Scenarios
MMTCE
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Reference Case
Low
Medium
High

D. RECOMMENDED PACKAGE OF ACTIONS

In considering the recommended set of actions for the agriculture and forestry sector, the Center combined its expert judgment with input from the Task Force. The key factors driving the choice of recommend actions include ease of implementation, scope of potential co-benefits, complementarity to existing State goals, and program costs. For the chosen agriculture options, these criteria were applied on the basis of the number of farms to which the program would be applied; effects on water quality and other environmental criteria; support of existing New York agriculture programs to reduce the environmental impact of agriculture; and annual costs of the program. For the forestry actions, these criteria were applied on the basis of the quantity of trees planted, or land managed in forests; enhancement of co-benefits, such as aesthetics, reductions in the urban heat island effect, and air pollutants; complementarity with the State's current urban tree planting efforts; and cost per ton of carbon reduced. The Center recommends a package of actions within the agriculture and forestry sector to mitigate the State's GHG emissions. These actions include expansion of the Agricultural Environmental Management (AEM) program, consideration of actions to expand conservation tillage, implementation of forestry actions, and improvement of the State's land-use inventory. Table 8.5 shows the quantified results of the recommended package. These quantified actions and other recommended actions are described in the following section.

Table 8.5: Agriculture/Forestry Recommended Actions

Actions	Estimated Reduction Potential (MMTCE)					Incremental Cost per MtCE ($2000)
	1990	2000	2005	2010	2020	
Reference Case	**0.65**	**0.57**	**0.55**	**0.53**	**0.50**	
Recommended Package:						
Nutrient Management			0.0002	0.0111	0.0136	400
Manure Management			0.0003	0.0003	0.0007	145
Urban Forestry			-	-	0.2464	70
Total			**0.0004**	**0.0114**	**0.2607**	

Table 8.6 provides a summary of the implementation pathways for the recommended measures. For the agriculture and forestry sector, the actions would be implemented through funding mechanisms. The financing for all options is in the form of direct funding through grants or loans, including funding to pay for technical assistance to landowners.

Table 8.6: Agriculture/Forestry Implementation Matrix

Inventory and Registry	Emissions Trading	Negotiated Agreements	Regulatory programs	Financing mechanisms	Voluntary Programs
Improved land-use/ change inventory				Nutrient management Manure digesters Consider Expanding conservation tillage Urban tree planting Forest protection	

Expand the Agricultural Environmental Management Program

New York State should expand AEM by working with farmers to implement nutrient management actions in their management plans and by installing digesters on farms. To this end, New York should introduce the medium scenario described above. Once fully implemented, such a program would reduce GHG emissions by 0.012 MMTCE per year in 2010 and 0.014 MMTCE by 2020. In addition, this program reduces fertilizer use in New York and potentially leads to a reduction in nonpoint pollution in New York's water bodies.

Improve Nutrient Management. One aspect of expanding AEM would be to require integrating GHG-reduction activities into the best-management plans on all 563 CAFO and more than 1,700 (22 percent) non-CAFO farms by 2010. By 2020, 3,819 (50 percent) of non-CAFO-sized farms should implement GHG-reducing best management plans (BMPs). By New York law, all CAFO farms must complete implementation of the practices prescribed in their nutrient management plans by 2005. This program would therefore ensure that these farms implement GHG-reduction activities in their required implementation plans. The program would also seek to include a growing number of non-CAFO farms into a similar implementation path.

The GHG emissions reductions expected from this action are 0.012 and 0.015 MMTCE in 2010 and 2020, respectively.[144] The cost of this option is expected to be $400 per MTCE.[145] Although this option does not seem as cost-effective as other options, improving nutrient management can lead to improvements in other environmental criteria. Actions that improve nutrient management are expected to yield reductions in nutrient runoff into water bodies.

The two largest impediments to greater planning and implementation of BMPs are the availability of funding and technical assistance. Current programs provide financial assistance through the Clean Water/Clean Air Bond Act and the Environmental Protection Fund. In addition, increased technical assistance through training and certification of public- and private-sector planners is needed. With current efforts, program requests are two to four times greater than appropriated resources. Additional State resources will be needed to fully implement this program. Estimates developed by the working group suggested that a total cost for this program would be $21 million per year.[146] A 60 percent cost share was assumed, so the State portion would be almost $14 million per year. A greater State cost share may be required to fully implement this program.[147] Typically, funding for this type of program requires short-duration expenditures on planning and implementation (typically five years of funding per farm). Funding to individual farms may not need to continue after the initial incentives.

Improve Manure Management on Farms. The working group discussed a number of options to improve manure management on New York's farms. The Center quantitatively analyzed one such option, the installation of digesters. Additional actions could be undertaken to reduce emissions from manure management. To improve the manure management practices, New York should support the installation of digesters on 56 (ten percent) of CAFO farms by 2010 and 113 (20 percent) of CAFO farms by 2020. Since a limited number of farms may oppose installation of digesters, this recommendation focuses on installation on a small number of farms. This limitation gives New York State the opportunity to focus installation on farms with fewer barriers to implementation. As implementation produces noticeable benefits to both the farmers and the surrounding communities, expanding this program to a growing number of farms may become easier. Additional actions, such as increasing aerobic decomposition, can lead to reductions in methane emissions.[148]

The installation of digesters on the recommended number of farms is expected to yield GHG emissions reductions of 0.0003 MMTCE in 2010 and 0.0007 MMTCE in 2020. This figure does not include emissions reductions resulting when the electricity generated from digesters offsets electricity use elsewhere. A project on a New York State dairy farm offset 70 kWh per year in

[144] Benefits could be larger or smaller, depending on the location of the project. A pilot project in western New York yielded nitrogen reductions of 40 pounds per acre, whereas a project in central New York yielded nitrogen reductions of 74 pounds per acre. The analysis assumed a conservative estimate of 40 pounds per acre.
[145] This cost could be lower because the recommended package focuses on the larger farms, which could yield greater returns for lower expenditures. In addition, it does not accurately reflect the fact that CAFO-sized farms are already required to implement their BMPs.
[146] This calculation assumes that 25 percent of these farms have currently introduced BMPs, so funding would not be needed on these farms.
[147] This cost share is less than the 75 percent base level set in legislation and the 90 percent maximum by law.
[148] Methane from animal wastes can be decreased by increasing the amount of oxygen in the decomposition process—aerobic decomposition.

electricity as a result of the installation of a 1,000-cow digester.[149] Enabling the production of energy as a part of the installation of digesters is key to improving its affordability. Pending legislation in New York State to allow net metering on farms is an important step toward making digesters affordable in New York. Emissions reductions from the other manure management programs were not quantified as a part of this process because the reductions are not well enough established to yield an estimate. Although installation of digesters was estimated to cost $145 per MTCE, other co-benefits are expected that make this option desirable. Actions that improve manure management can lead to reductions in noxious odors and ammonia emissions.[150] In addition, improved manure management can lead to reductions in water pollution resulting from the deep percolation of excess nutrients and nutrient runoff.

Installation of digesters will likely require upfront funding and technical assistance from New York State.[151] This funding could take the form of either direct payments or subsidized loans that account for the time lag in the benefits from electricity generation. The exact form of the funding mechanism could be worked out through the current AEM Steering Group process. Installation of digesters is expected to cost $200,000 on an average-sized farm. The cost of such a program would therefore be more than one million dollars per year, for a total cost of around $11 million by 2010 and an additional $11 million by 2020. With a cost share of 60 percent, New York State's contribution is expected to be $120,000 per farm—around $810,000 per year. Although installation of digesters can yield positive returns to farms by enabling the sale of electricity produced from digesters (or offsetting the use of on-farm energy use), benefits are expected over a long period of time. Enticing participation may require greater State cost-share to overcome initial barriers and to encourage the involvement of the less eager farmers.

Develop an Expanded Conservation Tillage Project. Reducing or eliminating tillage, such as by converting from moldboard plowing to direct seeding (including no-till and ridge-till practices), can reduce GHG emissions by allowing for reaccumulation of soil carbon lost through plowing and reducing fuel use. Although 17.5 percent of US farmers are currently using no-till practices, conservation tillage has not been largely introduced on New York farms.[152] National studies have estimated that converting one acre of cropland from conventional tillage to conservation tillage would increase sequestration by 0.16 to 0.32 metric tons of carbon per year.[153] As an order of magnitude, utilization of conservation tillage on all of New York's 3.4 million acres of cropland could increase sequestration by 0.5 to 1.1 MMTCE per year. Although utilization of conservation tillage on all farmland is extremely unlikely, this estimate demonstrates the maximum that can be expected from conservation tillage in New York. Additional benefits from conservation tillage include reductions in fuel-use, soil erosion, and equipment maintenance costs. Despite these potential co-benefits, a number of concerns have been expressed with

[149] Mosher, M.; Mattocks, R.P.; Gettier, S.; and Roos, K. *Benefits, Costs and Operating Experience at Seven New Agricultural Anaerobic Digesters*. Available at: <www.epa.gov/outreach/agstar/library/ben.html>.
[150] In some areas, ammonia emissions contribute to ozone formation.
[151] This support could be complimented with assistance from the Ag Star program sponsored by the U.S. EPA, USDA, and DOE (see: <www.epa.gov/outreach/agstar/index.html>).
[152] Conservation Technology Information Center, 2000. *2000 Crop Residue Management Survey.* Available at: <www.ctic.purdue.edu>.
[153] Lal et al. *Potential of U.S. Cropland for Carbon Sequestration and Greenhouse Effect Mitigation,* 1998.

conservation tillage.[154] New York State should provide funding for conservation tillage pilot projects to assess the effects and barriers of its utilization. Costs of a pilot program depend on the scope of the chosen pilot project. Discussions in the working group highlighted possible funding levels for this project of one million dollars per year through 2010.

Implement Forestry Actions

New York should implement the high scenario discussed above by expanding the State's urban forest cover and seeking to maintain the State's current forest base. In addition, New York should consider a number of actions to increase carbon sequestration in the State's forests, such as sustainable management of current forests and afforestation and reforestation of marginal land.[155]

Plant Three Million Urban Trees by 2010. New York should implement the high scenario discussed above by planting a sufficient quantity of trees per year so that by 2020 more than three million properly planted trees will have survived to a sufficient size to decrease energy demand in the surrounding area. Depending on the actual survival rates in New York, this action could require planting around 3.45 million trees over this period.[156] Efforts early in the planting can greatly increase the survival rate and therefore reduce the amount of trees needed to achieve the recommended level. Although GHG reductions will not fully materialize until the tree grows to proper height, early planting combined with proper care can ensure emissions reduction benefits in later years.[157]

A fully implemented urban tree-planting program of this extent would lead to reductions in GHG emissions of 0.25 MMTCE by 2020. These emissions reductions are based upon decreases in energy demand resulting from the urban trees. It does not include the emissions reductions resulting from carbon sequestration. This program would also lead to reductions in other air emissions. A recent study suggested that a similar tree planting system could lead to reductions of carbon monoxide (CO), nitrous oxide (N_2O), ozone (O_3), particulate matter of ten microns or less (PM_{10}), and SO_2.[158] In addition, planting programs in urban areas should have few barriers to implementation since many communities are actively pursuing tree planting programs for reasons other than climate change, such as aesthetics.

To implement this program, New York will need to ensure additional funding both for the direct costs of the trees and for technical assistance. Limited funding is currently available from the US

[154] Many farmers are concerned that no-till might delay soil warming in the spring, cause weed problems, reduce crop yields, or allow soil compaction. Also, switching to no-till requires obtaining access to thousands of dollars of new equipment and changing farming methods.

[155] Afforestation is the planting of trees on land that has never been forested, such as marginal cropland and pasture. Reforestation is the replanting of trees in areas where forest was previously cleared.

[156] This calculation assumes a survival rate of 85 percent.

[157] Reductions will rise as the tree grows; however, the emissions reductions assumed in this report are not fully expected until the tree is ten years old.

[158] The study looked at a program to increase new canopy cover of over 125,000 acres in New York Metropolitan region. Reductions per day were estimated at: CO, 1.1; NO_2, 4.0; O_3, 10.2; PM10, 5.5; and SO_2, 1.9 metric tons. See Luley and Bond, *A Plan to Integrate Management of Urban Trees into Air Quality Planning*, Naples, New York: 2002.

Forest Service and a matching grant from New York State. Requests for financial assistance have exceeded available funding, however.[159] New York will also need to provide technical assistance to ensure that trees are properly planted to ensure survival and greatest emissions reduction potential. The key factors that affect the ability of a tree to provide direct shading of a building include placement relative to building and relative to seasonal solar angle; type; species foliage characteristics; height; and crown form, spread, and density.[160]

Consider Actions to Increase Carbon Sequestration in New York. The working group considered several actions to increase carbon sinks. No specific actions in this regard were analyzed, however. Two options were discussed: increase New York's forest cover and encourage sustainable management of current forestland. New York has approximately 11 million acres of nonforest land that could potentially be converted to forest .[161] Converting all of this land to forest cover is unlikely, because some acreage is being put to a variety of uses, including athletic fields, roads, crop production, and pasture land. Conversion of some marginal land to forest cover is feasible. Due to lack of data availability this more feasible option was not analyzed. Another option discussed in the working group was the sustainable management of the current forests in New York. This option may have more viability since a large portion of New York's land is currently under forest cover. The realization of this benefit is likely minimized because some portions of New York's forests may already be incorporating these benefits. For this reason and the lack of data concerning the potential of this option in New York, the working group did not quantitatively analyze any options in this regard. Interest was expressed in evaluating the potential and feasibility of this option in future discussions.

A number of key factors were assessed to determine the desirability of these programs, including magnitude and timing of benefits; ancillary benefits; competing land-use priorities; costs of implementation; distribution of costs and benefits; and uncertainty and risk.[162] New York should assess the merits of actions to improve the carbon sequestration of its forests. At a minimum, New York should work to protect its current forest cover because reductions in forest cover will increase GHG emissions and erode New York's chances of achieving a target. To this end, New York is already a leader in the protection of open space through its creation of the Adirondack and Catskill Forest Preserves, management of approximately 324,000 acres of State park, and dedicated funding for conservation under the Environmental Protection Fund. Governor Pataki's recent support for protecting an additional one million acres of land will further advance New York's goal of protecting open space and efforts to mitigate climate change.

[159] The Department of Environmental Conservation administers the New York State Urban and Community Forest Program.
[160] Abdollahi, Ning, and Appeaning, eds. *Global Climate Change and Urban Forest*, 2000.
[161] This includes six million acres of "other" nonforest land, four million acres of cropland, and one million acres of pasture land.
[162] For more information on the key issues surrounding increasing carbon sinks from forestry actions in states, see: Center for Clean Air Policy, *Climate Change Mitigation Options in Massachusetts' Land-Use Change and Forestry Sector.* Washington, DC: Center for Clean Air Policy, 2001.

Improve the State's Land-Use Inventory

Improving the State's land-use inventory is an important step toward accurately accounting for emissions increases and decreases from various land-use and agriculture-sector activities. As a first step, New York should convene a meeting of State and federal statistical experts, land-use planners, and policy makers to assess the currently available data sources, identify the functions and requirements of an effective inventory system, and develop a process to implement the system. Key components of a comprehensive and robust land-use inventory include improving the frequency and resolution of the State's land-use inventory; expanding the inventory to cover agricultural soil management; and linking the inventory to land-use inventories used in other sectors, such as those used for transportation planning purposes.

New York State currently has developed base-year inventories of net GHG sequestration from biomass and soil carbon stock changes on forest land, and GHG emissions from enteric fermentation by livestock, manure management, and agricultural soil management (N_2O only). No base-year estimate of net GHG fluxes from agricultural soil carbon management has been developed. Estimates of forest land currently occur every ten or so years and are aggregated from samples on a limited number of land areas. To fully understand the fluxes in forest land and the changes resulting from policies aimed at increasing carbon sequestration, New York will need to update these inventories more frequently and provide greater detail on the current structure of and activities on smaller land parcels. Although estimates of agricultural land are conducted every year, they are based on samples from a limited number of farms. To develop a better picture of current activities and changes resulting from chosen policies, New York should develop methods to provide greater detail on activities being undertaken by New York farmers.

APPENDICES

APPENDIX 1: GOVERNOR PATAKI'S PRESS RELEASE

FOR IMMEDIATE RELEASE:
June 10, 2001

GOVERNOR ANNOUNCES CREATION OF GREENHOUSE GAS TASK FORCE

Seeks Federal Action on Four Pollutants, Orders Energy Efficiency at State Facilities

Governor George E. Pataki today announced the formation of a New York State Greenhouse Gas Task Force to develop policy recommendations for greenhouse gas emissions and global warming. The Task Force will be comprised of representatives from the business community, environmental organizations, State agencies, and universities.

The Governor also called on the federal government to take action on emissions of sulfur dioxide, nitrogen oxides, carbon dioxide and mercury, and announced an Executive Order that mandates energy efficiency measures at State facilities and encourages alternative energy purchases.

"I am committed to positioning New York State as a national leader on the critically important issue of reducing greenhouse gases," Governor Pataki said. "In addition to creating this important new Task Force, I also urge the federal government to immediately take action to further reduce emissions of sulfur dioxide, nitrogen oxides, mercury and carbon dioxide.

"New York has the most aggressive program in the nation to combat acid rain, and we urge the federal government to support our efforts by instituting a nationwide program that will result in major reductions in these four pollutants," the Governor said. "Greenhouse gases are a global concern that need to be addressed at the national and international levels, and I look forward to working with our Congressional delegation and the White House on this vital environmental issue."

The Governor's Executive Order requires State agencies to implement energy efficient practices at State buildings, increase purchases of energy efficient products though the State procurement process and follow "green building" standards during new construction or substantial renovation projects.

The Executive Order encourages alternative energy production by mandating that State agencies purchase no less than ten percent of the overall State facility energy requirements from renewable "green" power sources such as wind, solar, biomass, geothermal or fuel cells by 2005. The "green" power mandate will increase to 20 percent by 2010.

"With this new Executive Order, New York State is setting an example for the rest of the nation by promoting energy conservation

and efficiency, reducing demands on our energy grid, and lowering greenhouse gas emissions," Governor Pataki said.

The 16-member New York Greenhouse Gas Task Force will be chaired by the Governor's Senior Policy Advisor John P. Cahill. Other members include: Martin Zimmerman, Vice President, Ford Motor Company; John Adams, President, Natural Resources Defense Council; David Lyon, Vice President, Corning Incorporated; Paul Elston, Chair, League of Conservation Voters; Darlene
Kerr, President, Niagara Mohawk Power Corporation; James T.B. Tripp, General Counsel, Environmental Defense; Michael C. Finnegan, Managing Director, J.P. Morgan Chase & Co.; Brenda Pulley, Vice President, Alcan Aluminum; David Wooley, Senior Fellow at Pace University Center for Environmental Legal Studies; John Reese, Director of Government Affairs, Orion Power New York; J. Kevin Healey, a New York-based attorney who has specialized in greenhouse gas emissions and climate changes in conjunction with the New York Bar Association.

State agency representatives on the Task Force include: Erin M. Crotty, Commissioner, Department of Environmental Conservation (DEC); William M. Flynn, President of the New York State Energy Research and Development Authority (NYSERDA); Maureen Helmer, Chairman of the New York Public Service Commission (PSC); Joseph Boardman, Commissioner, Department of Transportation (DOT); and Nathan Rudgers, Commissioner, Department of Agriculture and Markets.

"Governor Pataki has consistently demonstrated strong leadership on environmental issues, and with today's action, the State is taking a significant step to confront an issue of national and international importance," Task Force Chair Cahill said.

The work of the Task Force will be facilitated by Ned Helme, Executive Director of the Center for Clean Air Policy in Washington, D.C. The Center, founded in 1985 by a bipartisan group of state governors, works to promote innovative market-based solutions to major environmental and energy issues.

The Task Force will report back to Governor Pataki with specific policy recommendations on or before November 15, 2001, so that these initiatives can be considered for incorporation in the New York State Energy Plan, a draft of which will be completed in December 2001. A final report from the Greenhouse Gas Task Force is due by March 2002, and the final energy plan will be released in the spring of 2002.

"It is crucial that everyone work together to address these important environmental and energy issues at the State, national and global level," the Governor said. "The steps I have announced today will lower greenhouse gas emissions and also reduce energy costs, making us less dependent on energy imported from outside New York and helping to protect our air quality."

APPENDIX 2: WORKING GROUP PARTICIPANTS

Name	Organization
Electricity Generation	
Paul Powers	Public Service Commission
Jia Li	CCAP
Rob Sliwinski	Dept. of Environmental Conservation
Paul Elston	NY League of Conservation Voters
Ashok Gupta	Natural Resources Defense Council
John Reese	Reliant Energy
Dave Wooley	Pace Energy Project, American Wind Energy Association
Buildings / Industry	
Peter Smith	NYSERDA
Hugh Porteus	Alcan Aluminum
Stacey Davis	CCAP
Tim Johnson	Corning
Ashok Gupta	Natural Resources Defense Council
Transportation / Land Use	
Steve Winkelman	CCAP
Tim Johnson	Corning
Gary McVoy	Department of Transportation
Dave Shaw	Dept. of Environmental Conservation
Val Washington	Environmental Advocates
Jim Tripp	Environmental Defense
Greg Moreland	Ford Motor
Lambert Gingras	NY League of Conservation Voters
Agriculture / Forestry	
Dave Fellows	Dept. of Ag and Markets
Catherine Leining	CCAP
Jake Schmidt	CCAP
Frank Dunstan	Dept. of Environmental Conservation
Jim Tripp	Environmental Defense
John Mutter	Lamont Doherty
Doug Schmidt	Dept. of Environmental Conservation
Registry / Trading	
Kevin Healy	RSPAB, LLP
Tom Peterson	CCAP
Jake Schmidt	CCAP
Rob Sliwinski	Dept. of Environmental Conservation
Andrew Aulisi	Environmental Defense
Dave King	Niagra Mohawk
Dale Bryk	Natural Resources Defense Council

APPENDIX 3: FULL LIST OF OPTIONS CONSIDERED

The Working Groups discussed a host of measures for their sector. A number of these were analyzed by the Center; however, some were not analyzed for a variety of reasons as discussed in the individual sector chapters. Listed below is the complete list of measures that were discussed by each Working Group.

Electricity

- Renewable Portfolio Standard (RPS)
- Income tax credit for landowners and farms and small businesses who purchase small wind turbines
- Solar tax credit expanded to include commercial scale PV systems up to one megawatt
- Net metering law expanded to include small wind turbines and commercial PV systems
- Carbon Cap and Trade system
- Carbon taxes
- Electric Rate Adjustment Mechanism (ERAM)
- Adopt a multi-pollutant strategy
- Information Technology for Demand-Side Management
- Environmental Externalities and Full-Cost Accounting
- Carbon Dioxide Emission Limits for Power Plants
- Carbon capture and sequestration
- Landfill gas recovery
- Nuclear power plant re-licensing
- Re-powering of plants

Buildings and Industry

- Oil/Gas End-Use Efficiency Program
- Extend SBC for five years beyond 2006 (includes Home Depot approach, expansion option & prioritizing CO_2 reductions
- Expand SBC
- Extend NYPA/LIPA funding for EE
- Combined Heat & Power (CHP) advanced scenario
- CHP moderate scenario
- Negotiated Agreements w/ Industry
- Revenue Decoupling to facilitate CHP and customer-sited clean DG
- Energy-Efficient Mortgage
- Expand Green Building Tax Credit
- Targeted tax incentives for equipment-specific upgrades
- Building Operator Training
- Building/Energy Code--Beyond Planned Action
- Conservation Transfers (NYPA invests in efficiency projects at customer sites)
- Increase Recycling
- Energy-Efficient Conductors/Cables
- Light-Colored Roofs (rooftop gardens?)

- Rooftop PVs
- Improve Appliance Standards for central A/Cs and heat pumps
- Improve other appliance standards
- Support Federal Energy Efficiency Legislation
- World Trade Center
- Pilot real-time pricing and advanced metering
- Replicate NJ options
- Better target efficiency spending
- Biodiesel in stationary sources

Transportation and Land-Use

- Smart Growth/Transit
- Commuter Choice / Transit Benefits
- Bike and Ped Infrastructure
- Gasoline Tax ($0.10)
- Pay as you Drive Insurance
- Endorse Congestion Pricing
- Advanced Technology Vehicle RD&D
- Diesel and Biodiesel Cars & Lt Trucks
- Driver Training
- Vehicle Sales Tax Credit
- Clean Fleets: Emphasize GHGs
- Vehicle Maintenance
- Car & Lt Truck GHG Stds
- Feebates
- Enforce Current Speed Limits – Cars
- Low Friction Engine Oil
- Tires
- Biodiesel in State Fleets
- B-2 by 2010. B-20 by 2020
- Ethanol
- Truck Stop Electrification
- Enforce Current Speed Limits – Trucks
- Hudson Rail Crossing & Brooklyn Port
- Airport Ground Equipment
- Vehicle Scrappage
- Low Sulfur Diesel
- Pay-as-you drive Insurance
- Import Brazilian Ethanol
- Traffic Calming
- Road Infrastructure
- "Fix it First"
- Smart Growth Legislation
- Freight Aviation

- Low Sulfur Diesel

Agriculture and Forestry

- Include on-farm energy production in green power program
- Reduce wind power transmissions barriers to on-farm energy production
- Expand net metering for on-farm energy
- Reduce power distribution costs for on-farm energy
- Remove utility tariff barriers
- Biogas systems byproduct market development
- Federal production tax credit
- NY State tax credit for fuels and power from farms
- Improved biomass production systems
- Incentives for biodiesel and ethanol
- Nutrient management
- Manure management
- Conservation tillage pilot project
- Install additional digesters
- Provide additional tax incentives for sustainable management of forests
- Afforest/reforest and timber stand improvement
- Technical assistance to forest landowners
- Reimburse localities for 480-A
- Increase urban forestry
- Acquisition of threatened forest land
- Acquisition of working forests/easements
- Increase use of recycling of wood
- Improve agriculture and forestry land information resources

APPENDIX 4: CCAP RECOMMENDATIONS FOR DRAFT STATE ENERGY PLAN

Dear Mr. Flynn:

As you know, Governor Pataki asked the Center for Clean Air Policy to co-chair the New York Greenhouse Gas Task Force and to facilitate the task force discussion as it develops New York's recommendations for achieving significant reductions in New York's greenhouse gas emissions. The recommendations which will be submitted to the Governor in June, although not a consensus document, will be based on input from the Task Force as well as our own expertise in air, energy and greenhouse gas issues. Although the work of the Task Force was delayed due to the attack of September 11, we have begun by identifying the range of opportunities for reducing GHG emissions in the state and developing criteria for evaluating these options. We have started to analyze the potential reductions and other impacts of these options, but additional work lays ahead in order to translate this list into a cohesive strategy for New York.

As a result of the fundamental relationship between energy use and greenhouse gas emissions, we are providing the preliminary results of our efforts for public comment in the draft NY State Energy Plan (SEP). The SEP sets overall guidance for state energy policy and will influence New York's energy choices, reliability and environmental impacts, including impacts on climate change, for the next decade and beyond. So although our current recommendations and options do not constitute a final greenhouse gas reduction strategy, we would like to share our progress to date. As outlined below, many of the options still under consideration are alternatives to achieving the same goal and require additional analysis to determine which policies achieve GHG reductions while maintaining a robust state economy.

There was , however, general consensus among the Task Force that the state should adopt a target for reducing GHG emissions and begin to put together the infrastructure needed to develop an on-going inventory and a registry -- as a means to document creditable reductions. These recommendations are reflected in "1" and "2" below. In your capacity as Chairman of the New York State Energy Planning Board, please include these preliminary policy recommendations and additional options in the Draft SEP so that they may be made available for public comment. The Center, in concert with the Task Force, will continue to work to define the best combinations of options for consideration in the final SEP in the spring. We look forward to the results of public review of the SEP to assist this process.

We recommend the following fourteen policy measures and options as important first steps in the state's effort to address global climate change:

1. **Commit to a statewide greenhouse gas (GHG) emission target with near-term (e.g., 2010), mid-term (e.g., 2020), and long-term (e.g., 2050) stages.** The state should develop a binding target with sectoral goals, as well as appropriate policy mechanisms to ensure credibility and effectiveness of its efforts, including: economy-wide and/or sector-specific cap and trade programs (that could be implemented in stages), and/or sector-wide or company-wide negotiated agreements. In establishing the statewide target and sectoral goals,

the state should consider: a) technical and economic feasibility, b) the need for appropriate transition approaches, c) the long-term goal of stabilizing global atmospheric GHG concentrations, and d) the potential for acting in concert with other states to agree upon a regional GHG target. In establishing appropriate economy-wide or sector based programs for implementation of the target the state should also consider the need for participation by all sectors, opportunities for intersectoral actions, and interactions with other policies and measures.

2. **Develop a GHG emission and sequestration inventory and registry that:** 1) maintains an annual statewide GHG emissions inventory of six GHG gases (CO2, CH4, N2O, HFC, PFCs, and SF6) and carbon sequestration to track progress against state and sectoral targets and goals, and 2) creates a comprehensive emissions registry that accurately tracks emissions and accounts for increases and decreases in GHG emissions and sequestration by public and private entities. In establishing the statewide inventory and registry, the state should design a system that will support future emissions trading and other cross-sectoral actions, including crediting of public and private emissions reductions, harmonize with other state, regional, national, and international GHG registries, be credible and efficient in ensuring net reductions and ease of operation, and provide the opportunity for financial exchanges in New York City to play a leader role in any domestic or international trading programs.

3. **Incorporate energy efficient technologies, sustainable transportation services and site design features into the reconstruction of the World Trade Center.** As the recovery and reconstruction of the World Trade Center disaster area proceeds, New York will be presented with an opportunity to greatly expand upon the efficient "green" building practices and renewable energy installations already in place at the adjacent Battery Park City. The Trade Center site re-design should include sustainable transportation elements, such as improved pedestrian connection, with the surrounding neighborhood and better integration of transit and commuter rail access. The redevelopment and transition effort should emphasize the importance of keeping jobs and services in central, transit accessible locations in order to prevent suburban sprawl and minimize use of transportation fuels. The reconstruction of the World Trade Center disaster area will receive close international attention. By incorporating energy efficient construction practices, utilizing dispersed renewable energy technologies, and enhancing transit and pedestrian accessibility the state will provide world-wide leadership on greenhouse gas emission reduction techniques while also increasing the energy security of New York City.

4. **Evaluate a phased CO2 cap-and-trade system for the electric power sector and, as appropriate, in other sectors on a state or regional basis.** Governor Pataki has endorsed efforts by Congress to provide regulatory certainty and clear price signals through a federal multiple pollutant cap on NOX, SO2, Hg and CO2. By extending the state's current Acid Rain Initiative, which requires additional reductions in NO2 and SO2 by 2007, to include a phased-in cap on CO2 emissions, the state will: a) ensure that the electricity industry makes investments that are the most cost-effective for multiple pollutant reductions; b) protect ratepayers and the industry from stranded environmental investments that reduce NOX and SO2 at the cost of rising CO2 emissions; c) provide the appropriate price signal for expanded investment in efficiency and renewable energy sources; d) provide the infrastructure and

experience needed to expand a sectoral cap and trade program to other sectors of the economy e) develop the infrastructure and experience to participate in international trading of GHG emissions; f) join other states in providing leadership and a model for the federal government. In designing a cap and trade system for the electric power sector the state should consider how to dovetail state actions with national and regional multiple pollutant policies and the impact of a state CO2 cap on electricity prices, regional competitiveness and state-wide economic development.

5. **Significantly increase the amount of indigenous renewable energy in the state energy portfolio** (including solar, wind, expansion at existing hydro sites, waste methane, geothermal, and sustainable biomass). Although Governor Pataki's Executive Order No. 111 committing the state to increase purchases of renewable generation is an important first step, it should be followed with: a) commitments by the New York Power Authority (NYPA) and the Long Island Power Authority (LIPA) to enter into additional long term power purchase agreements from renewable sources of power, b) removal of existing regulatory disincentives to renewable generation (including establishing reasonable interconnection costs and supplementary power tariffs), c) consolidation and enhancement of existing tax incentives for renewable energy, d) support for a robust retail market for "green power", and e) efforts to attract renewable energy technology manufacturing and development to New York state. The state should view a renewable portfolio standard (RPS) as a second best choice in lieu of an appropriately designed cap and trade program. But this option, as well as expanded funding from the System Benefit Charge (SBC), could be explored as an alternative in further Task Force deliberations, and soliciting comment on such alternatives through the SEP process could be helpful.

6. **Maximize development of cost-effective combined heat and power and other forms of clean, efficient distributed generation** by providing technical and financial assistance to qualifying projects, developing performance-based emission and certification standards for new distributed generation which encourage technological improvements and reduced emissions, and eliminating regulatory disincentives for distributed generation. Distributed generation is expected to play an increasingly important role in providing power in NY and the US, with the potential to provide increased reliability, reduced transmission congestion and losses and lower rates. However, to ensure that these new technologies also provide cleaner air and reduced GHG emissions, the state should ensure that the regulatory environment encourages the cleanest and most efficient forms of distributed generation.

7. **Initiate rate reform for electricity distribution companies to align the public policy interests in energy efficiency, combined heat and power, and dispersed renewable generation with the financial interests of utility shareholders and ratepayers.** The NY PSC should continue its efforts to improve rate design to ensure that customers receive accurate price signals concerning the cost of electricity (time-of-use rates, back-up power rates, and recovery of fixed costs in retail rates) and also ensure that utilities and their shareholders are not penalized for the efficient use of electricity, and increased reliance on clean technologies such as combined heat and power and dispersed renewable generation.

8. **Adopt a specific plan to develop an indigenous biofuel industry to produce, refine, and market transportation and other fuels from New York biomass sources.** The state has an important opportunity to develop significant new agricultural markets while increasing the amount of indigenous fuels in the state energy portfolio, and reducing the emission of greenhouse gasses and other pollutants. The production of transportation and other fuels from sources such as waste vegetable oils, waste cellulose, soybeans and corn is technically feasible and advances multiple state policy priorities. Woody biomass and grasses may hold significant promise over the long term. The development of a state biofuel program must take into account the relative costs, applications, and life-cycle greenhouse gas benefits of different fuels, as well as the VOC emission impacts of certain biofuels. A biofuel program should be considered for action in concert with other Northeast states.

9. **Expand state efforts to improve efficiency of energy-use in all sectors.** The current Systems Benefit Charge (SBC) and LIPA/NYPA efficiency programs have been very successful and should be extended beyond the current 2005 expiration date. At the same time, program financing should be expanded and re-prioritized to focus upon those efficiency measures that are most effective at reducing GHG emissions. The SBC programs that could be expanded include those aimed at reductions in fuel combustion emissions from oil and gas boilers in commercial and industrial facilities and those offering energy-efficient mortgages. Also, the state should consider further strengthening energy-efficiency building codes and product standards. In addition, the State should provide increased funding for urban forestry projects that can mitigate the urban "heat island" effect and greatly increase building energy efficiency over the long term.

10. **Develop a program that allows businesses to enter into agreements to meet energy efficiency targets in exchange for a package of benefits.** Other jurisdictions have had some success in utilizing agreements whereby businesses commit to energy efficiency targets in exchange for a package of benefits. Benefits could include access to low cost power (conservation transfer approach), enhanced operational flexibility, enhanced regulatory certainty, technical support, and public relations opportunities. The state should work with business and industry groups to develop a program that will engender widespread involvement from businesses.

11. **Redirect transportation funding toward energy efficient transportation alternatives (transit, walking, and bicycling) and provide incentives to encourage use of efficient alternatives.** The state should demonstrably increase the share of transportation funding that is dedicated to improving the quality and time competitiveness of mass transit, and reducing vehicle miles traveled (VMT). Strategic investments include funding for new transit vehicles (bus and rail), additional drivers, and priority bus lanes to improve time competitiveness, as well as new rail investments for long-term VMT reductions. The state should also continue to develop policies, guidelines, and incentives that improve walking and bicycling infrastructure and safety. The state should consider implementing revenue-generating and revenue-neutral incentives such as congestion pricing, feebates, efficiency-based registration fees, or a modest gasoline tax. When revenues are generated these could be redirected into mass transit and VMT reducing projects.

12. **Incorporate greenhouse gas emissions into transportation and land use planning decisions.** The State Environmental Quality Review Act (SEQRA), Long Range Transportation Plans, Transportation Improvement Programs (TIP), and the Statewide Transportation Improvement Program (STIP) processes should be amended to include greenhouse gas emissions as a key decision-making criterion. Amendments should include: a) measurement of off-site VMT generated by new development, b) consideration of requirements for CO2 offsets, and c) incentives for encouraging the incorporation of smart growth elements in comprehensive plans (e.g., transit-oriented development, mixed use, brownfield redevelopment, and open space protection). The state should also establish a clearinghouse of best practices, land use and transportation assessment models, and data sources for use by localities to develop smart growth plans that minimize VMT and GHG emissions. Authority to withhold state funds from projects that have not attempted to minimize VMT, energy use and CO2 emissions would be a valuable tool as well to encourage climate friendly projects.

13. **Target open space funding to prevent suburban sprawl, promote Quality Communities, and reduce VMT.** The state Department of Environmental Conservation and the Office of Parks Recreation and Historic Preservation, and the New York Department of Transportation should strategically direct open space funding to protect open space in a coordinated manner that reduces VMT and supports Quality Communities goals. In order to implement this policy the state should establish a comprehensive state and local land use change inventory to track development patterns that impact transportation demand. The state should also establish targeting criteria for investments that reduce energy use, transportation demand and greenhouse gases. These efforts will bolster community efforts to protect open space and direct growth in a manner that maximizes use of existing infrastructure (roads, transit, schools, utilities, etc.) and services, and minimizes redundant investments. In addition, urban open space initiatives could promote enhancement of public parks and urban forestry efforts that can mitigate the urban "heat island" effect as discussed in recommendation [seven], above.

14. **Expand research, development and deployment (RD&D) of energy and GHG efficient vehicle technologies, add GHG goals to vehicle tax credits and incentives, and coordinate with other states to encourage improvements in vehicle fuel economy.** State funds should be directed to enhancing the development and deployment of energy and GHG efficient vehicles such as hybrid-electric taxis, hybrid buses, and advanced urban delivery vehicles. State tax credits for advanced technology vehicles should be extended and reoriented to maximize GHG reductions. Similarly the state should incorporate GHG minimization into Clean Fleets goals. The state should complement these incentives with marketing and labeling programs to encourage use of energy and GHG efficient vehicles. The state should also consider partnering with other states to improve fuel economy of cars, light trucks, and sports utility vehicles sold in New York through negotiation with vehicle manufacturers, or by encouraging the federal government to raise CAFE standards for cars and light trucks.

Thank you for your consideration of these preliminary recommendations and options. We look forward to working with you to ensure that the next New York SEP appropriately reflects the impact that energy generation and use has on global climate change.

Sincerely,

Edward Helme
Executive Director
Center for Clean Air Policy

APPENDIX 5: NEW YORK GREENHOUSE GAS REFERENCE CASE

Table A.2, below, shows the reference case emissions for New York. Emissions from electric generation were developed from a modeling run conducted by ICF consulting using the Integrated Planning Model (see Chapter IV for greater details). Transportation emissions from fuel combustion developed by the Center using vehicle miles traveled data (see Chapter VII for greater details). All other emissions data developed by NYSERDA for their report, *Patterns and Trends.*

Table A.1: Total GHG Emissions by Source for New York State, 1990-2020 (in MMTCE)

Source	1990	2000	2010	2020
Fuel Combustion	**57.886**	**60.476**	**64.198**	**68.530**
Electric Generation	17.464	15.331	14.520	15.470
Transportation	20.789	22.981	26.942	29.619
Residential	8.628	9.952	10.546	10.551
Commercial	6.616	7.714	7.660	8.113
Industrial	4.389	4.498	4.530	4.777
Other Sources	**5.418**	**6.992**	**7.342**	**7.325**
Cement Production	0.337	0.329	0.329	0.329
Limestone Use	0.161	0.216	0.216	0.216
Soda Ash Use	0.053	0.050	0.050	0.050
Aluminum Production	0.403	0.337	0.337	0.337
Electric Trans. & Dist.	0.848	1.083	1.083	1.083
CO_2 Manufacture	0.022	0.037	0.044	0.044
Refrigerant Substitutes	0.017	1.104	1.359	1.359
Natural Gas and Oil Systems	0.477	0.695	0.807	0.807
Municipal Waste Management	2.381	2.502	2.502	2.502
Domesticated Animals	0.323	0.310	0.286	0.264
Manure Management	0.082	0.079	0.073	0.068
Agricultural Soil Management	0.249	0.179	0.173	0.168
Municipal Wastewater	0.065	0.071	0.083	0.098
Sinks	**-0.790**	**-0.790**	**0.000**	**0.000**
Forest Management & Land-Use Change	-0.790	-0.790	0.000	0.000
Total GHG Emissions (w/ sinks)	**62.51**	**66.68**	**71.54**	**75.86**
Total Emissions (w/o sinks)	***63.30***	***67.47***	***71.54***	***75.86***

Table A.2, below, distributes emissions from the generation of electricity to the end-user according to the percentage of electricity used by each end-user category.

Table A2: Electricity Emissions by End-User (in MMTCE)

	1990	2000	2005	2010	2020
Electricity	**17.46**	**15.33**	**11.67**	**14.52**	**15.47**
Residential	*5.21*	*4.74*	*3.69*	*4.70*	*5.04*
Commercial	*7.57*	*7.58*	*5.76*	*7.15*	*7.49*
Industrial	*4.31*	*2.72*	*2.05*	*2.51*	*2.79*
Transportation	*0.38*	*0.29*	*0.17*	*0.15*	*0.16*

Appendix 6: ICF Consulting Modeling Results

Table A.3: Scenarios Analyzed

Scenario	Northeast State Policies	Energy Efficiency Penetration and Demand in New York (NY) and New England (NE)	Regional CO_2 Cap (New York and New England)	Regional RPS (New York and New England)
Reference Case	Yes	Existing Actions NY: 1.0 percent NE: 1.5 percent	None	None
Policy Scenario 1	Yes	Moderate NY: 0.58 percent NE: 1.0 percent	None	None
Policy Scenario 2	Yes	Existing Actions NY: 1.0 percent NE: 1.5 percent	None	NY-Only RPS 2005: 1 percent 2010: 6 percent 2012+: 8 percent
Policy Scenario 3	Yes	Moderate NY: 0.58 percent NE: 1.0 percent	NY-only: 25 percent below 1990 levels in 2010 NE: none	NY-Only RPS 2005: 1 percent 2010: 6 percent 2012+: 8 percent
Policy Scenario 4	Yes	Moderate NY: 0.58 percent NE: 0.7 percent	NY: 25 percent below 1990 levels in 2010 NE: 1990 levels in 2010	NY-Only RPS 2005: 1 percent 2010: 6 percent 2012+: 8 percent

Figure A.1: New York Electric Demand Alternative Growth Rate Forecasts

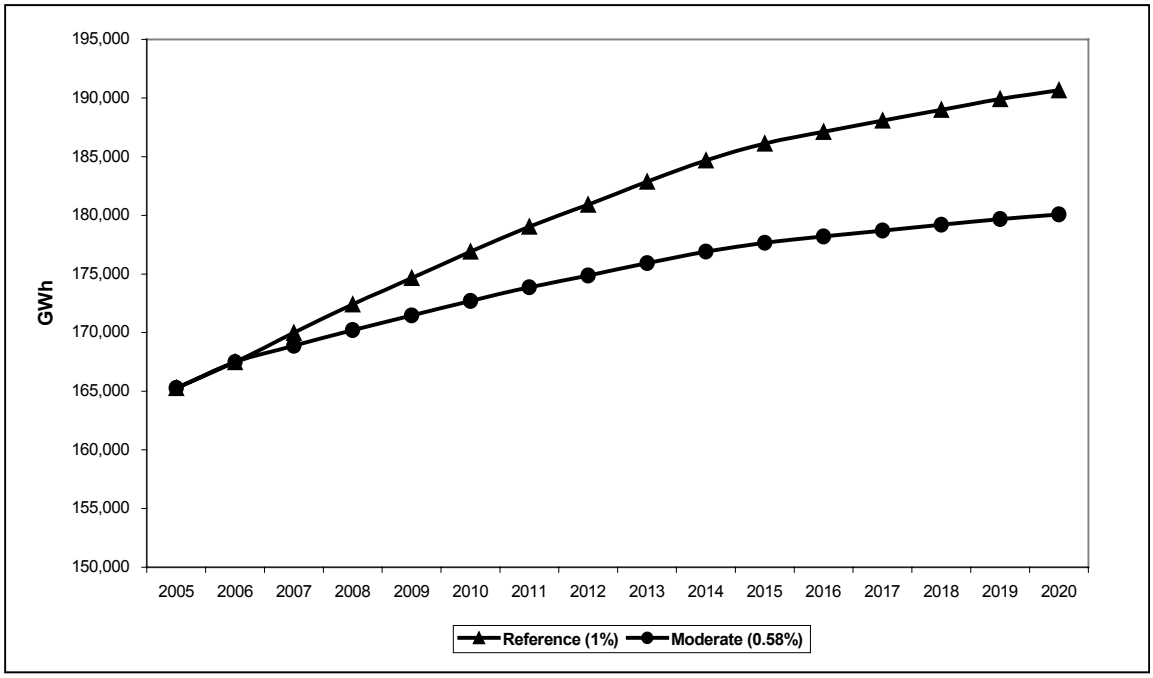


Figure A.2: New York Carbon Emissions Forecasts Across Scenarios

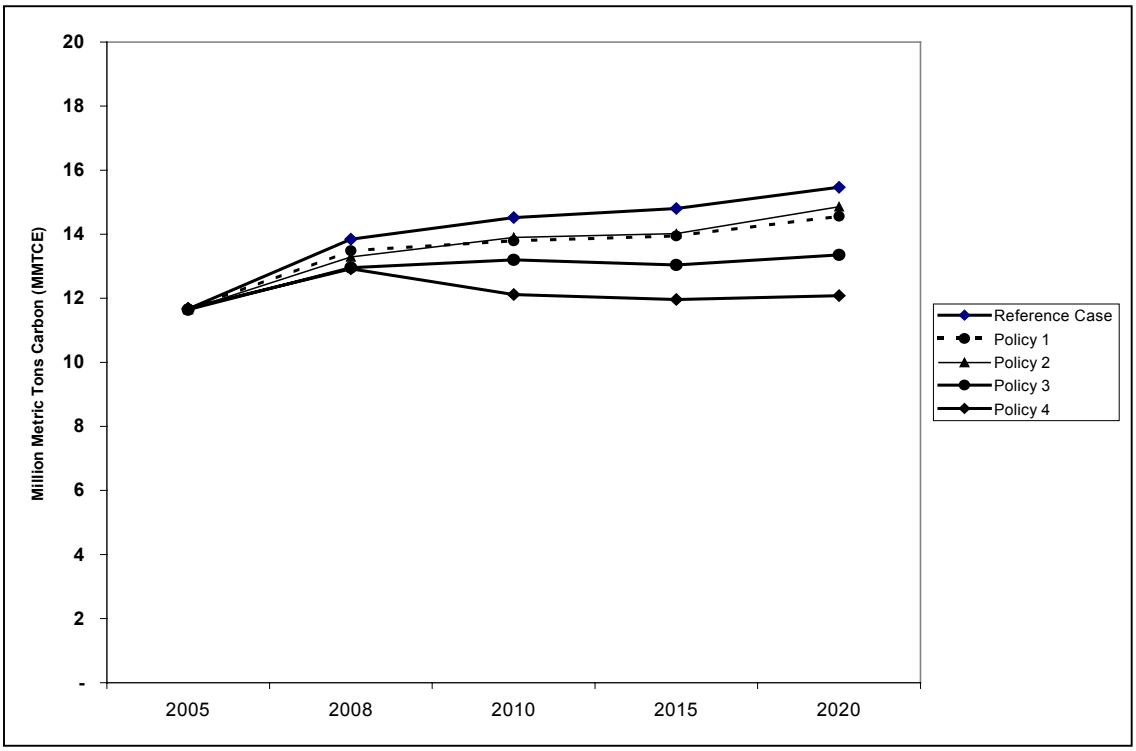


Figure A.3: New York Marginal Wholesale Energy Prices

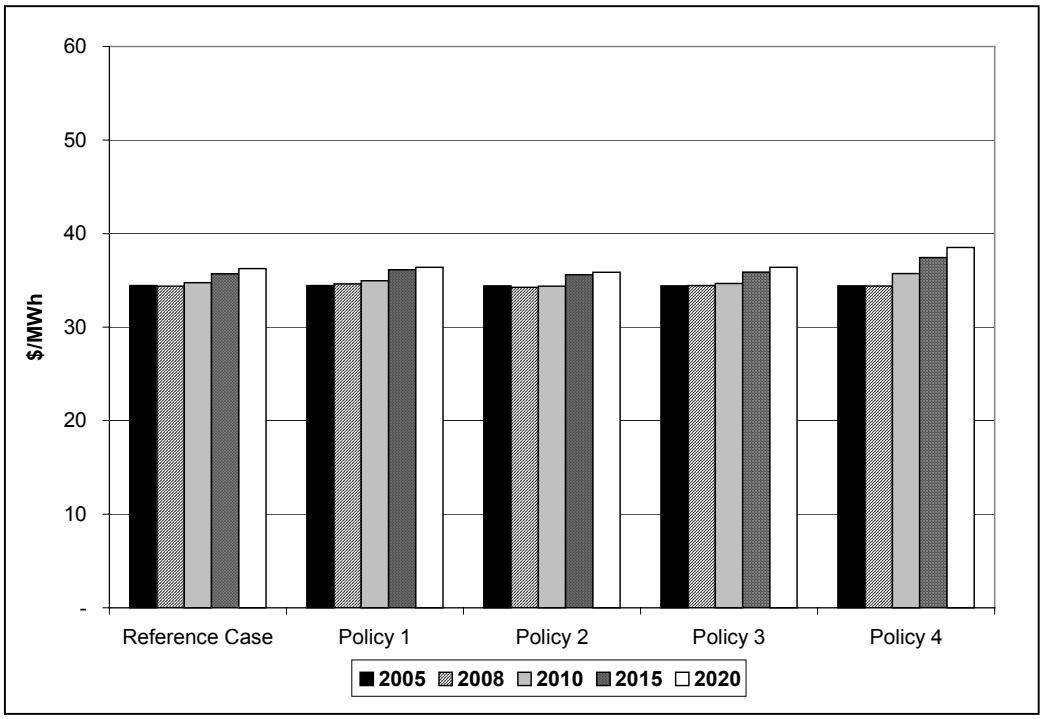


Figure A.4: Net Present Value of Total System Costs in New York and New England – 2000$ in 2002 (2005-2020)

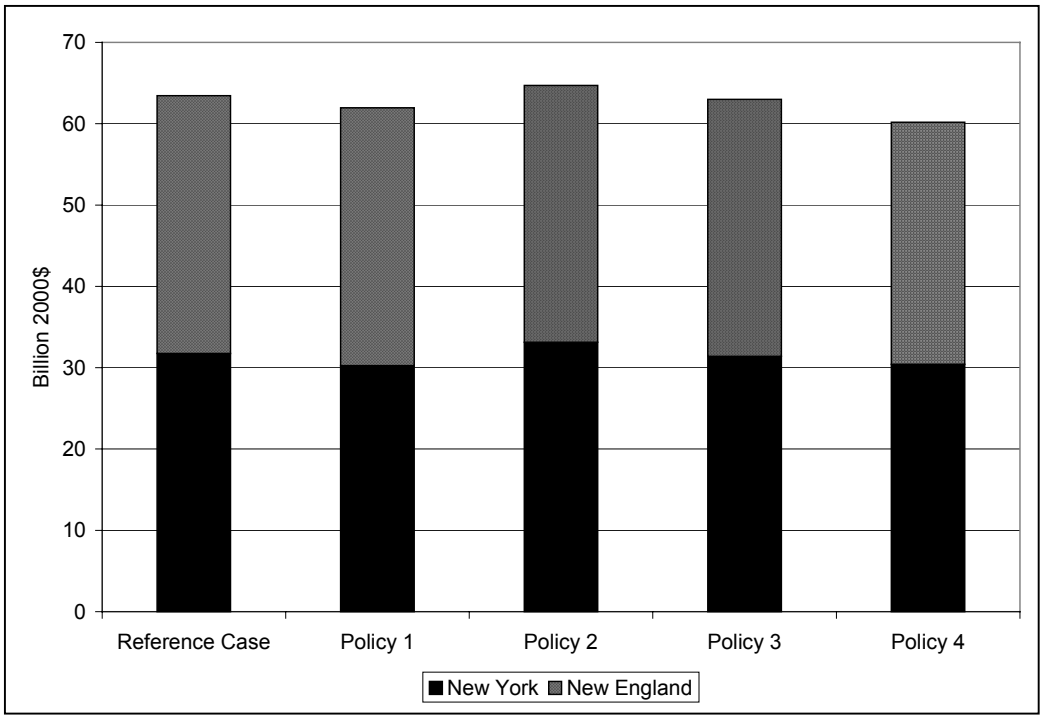


Figure A.5: New York Generation Mix Across Scenarios – 2010

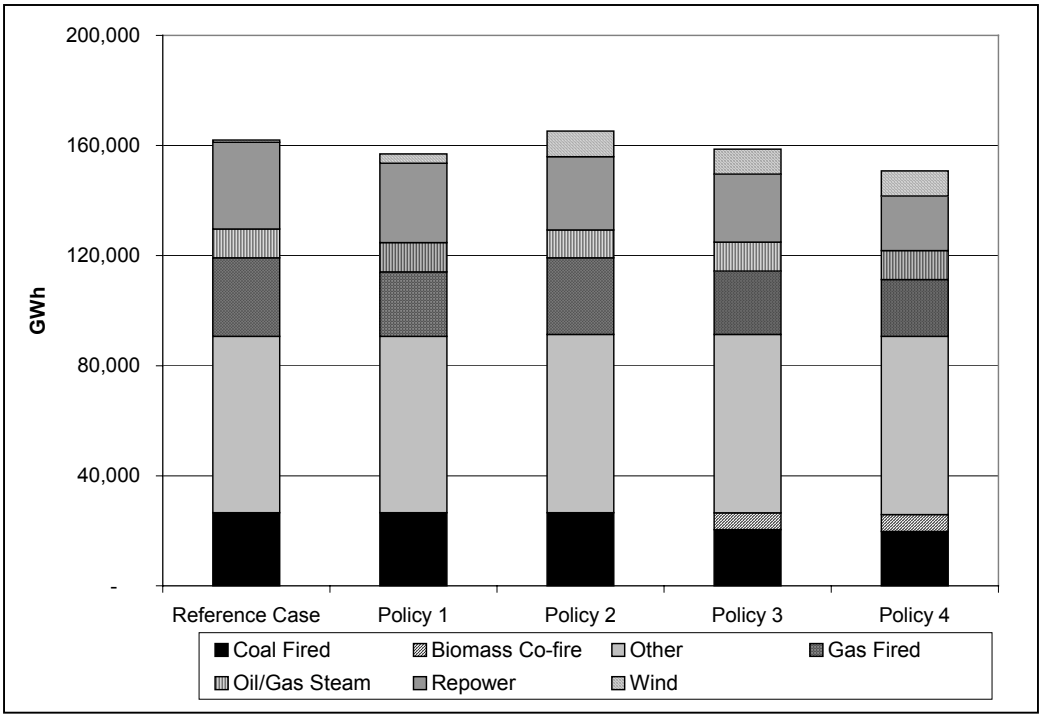


Figure A.6: Electricity Imports into New York Across Scenarios

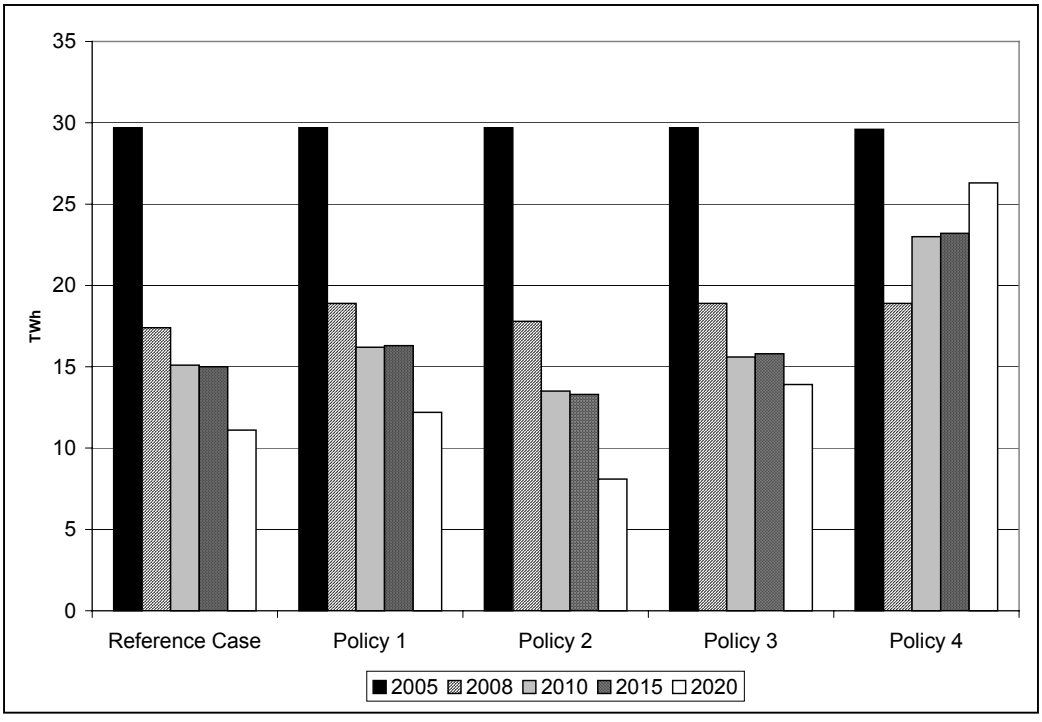


Figure A.7: Regional Carbon Emissions in 2010

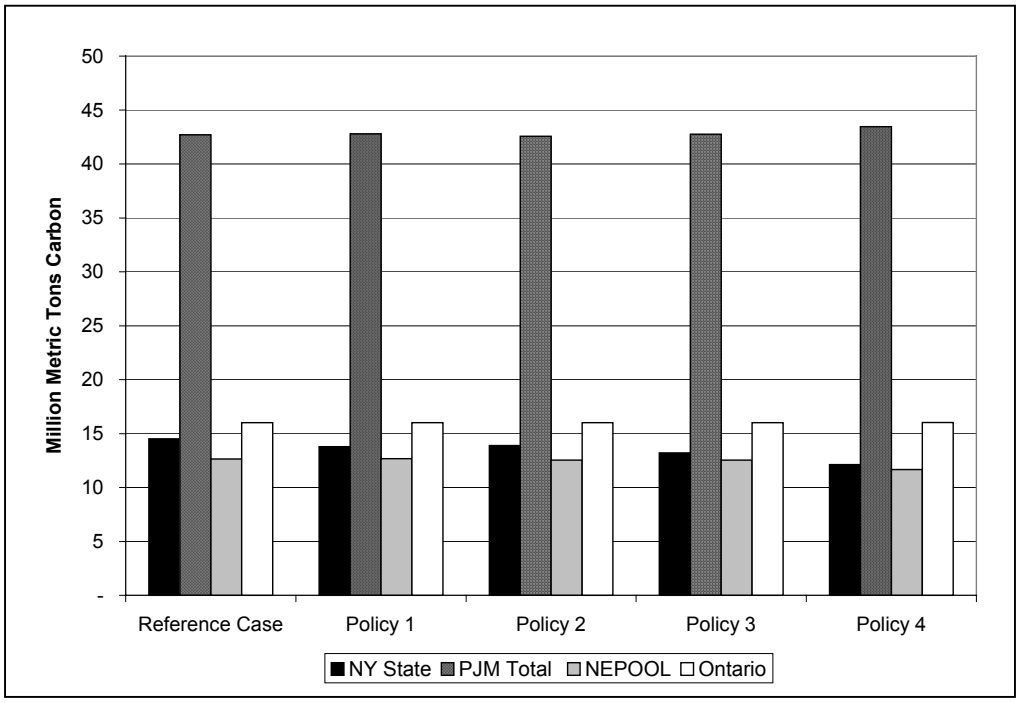


Table A.4: Total Regional Carbon Emissions Decline in 2010 Even Though Imports Increase into New York

Regional Emissions in 2010 (Million Metric Tons Carbon)					
	Reference Case	Policy 1	Policy 2	Policy 3	Policy 4
NY State	14.5	13.8	13.9	13.2	12.1
PJM Total	42.7	42.8	42.6	42.8	43.4
NEPOOL	12.6	12.7	12.5	12.5	11.7
Ontario	16.0	16.0	16.0	16.0	16.0
Total region	85.9	85.3	85.0	84.5	83.2
% Change from Reference Case					
Total region	-	-1%	-1%	-2%	-3%

Figure A.8: Cumulative Capacity Additions by 2010 Across Scenarios in New York

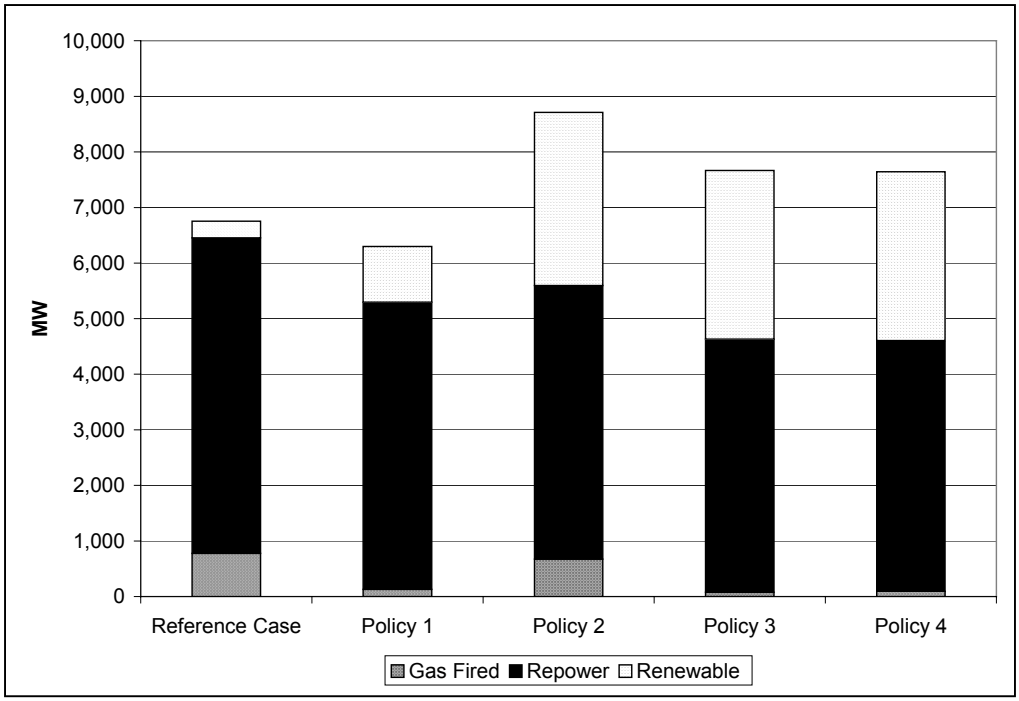


Figure A.9: NPV Asset Value Impacts on Existing New York Units Across Scenarios (2005-2020)

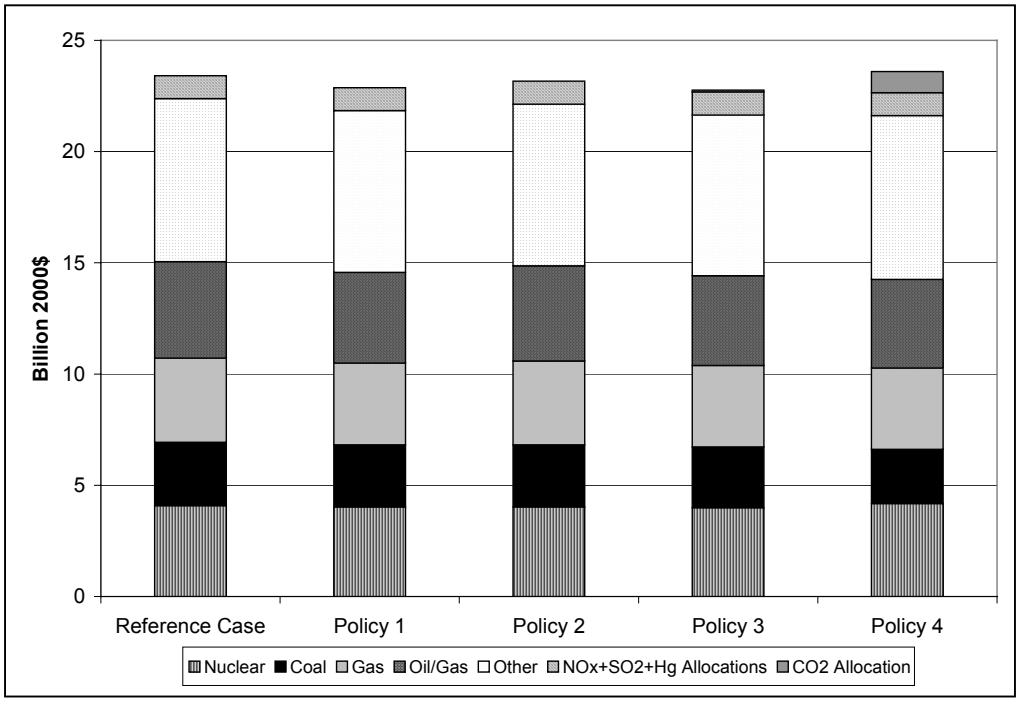


Table A.5: Historical Emissions and Required Reductions to Achieve Carbon Caps in 2010

Regional Emissions in 2010 (Million Metric Tons Carbon)					
	1990 Levels	Regional Cap*	2010 Reference Emissions	2010 Reductions to Achieve Cap	% Reduction Required in 2010
New York	17.5	13.1	14.5	1.4	10%
New England	11.3	11.3	12.6	1.3	10%
NY + NE	28.8	24.4	27.2	2.74	10%

***** In the regional cap case, NY and New England are required to take different caps: the NY Cap is set at 25 percent below its 1990 emissions and the New England Cap is set at the 1990 emissions.

- From Reference Case Emissions forecast in the year 2010, NY would need to reduce its emissions by 1.4 MMTCE or ten percent to meet a 25percent cap. New England would need to reduce its emissions by 1.3 MMTCE or ten percent to meet the 1990 level cap, comparable to NY's reduction to meet the 25 percent cap.

Figure A.10: Carbon Policy Impacts on New England Generation Mix

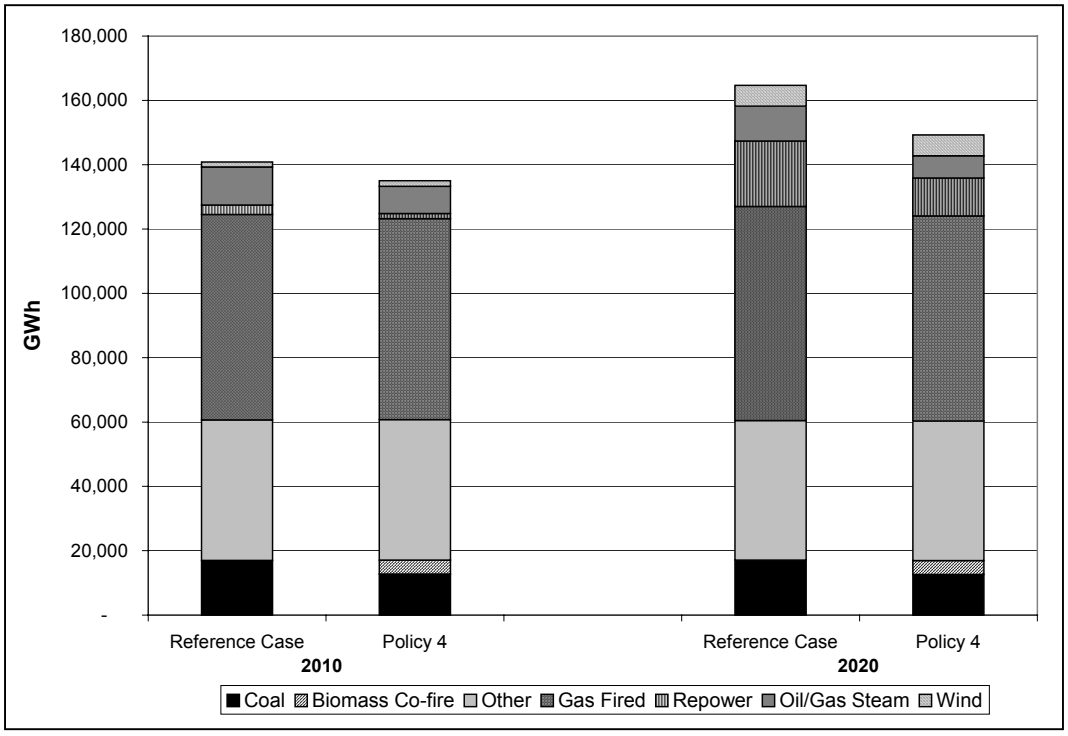


Figure A.11: NPV Asset Value Impacts on Existing New England Units Across Scenarios in 2002

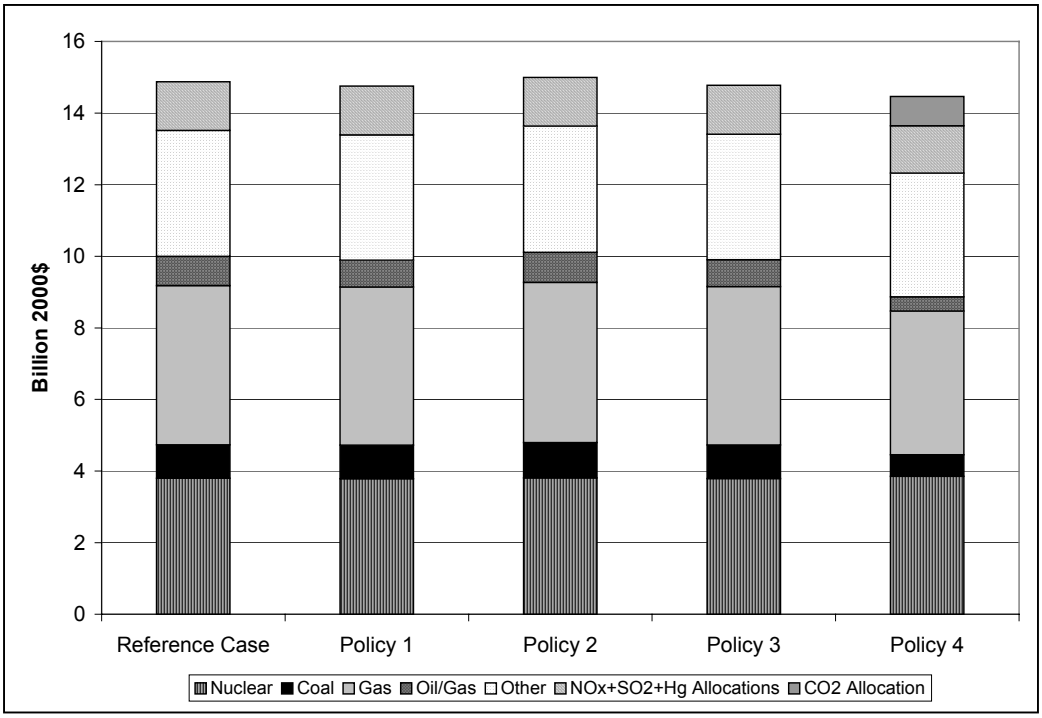


Figure A.12: Cumulative Compliance Decisions by 2010 Across Scenarios

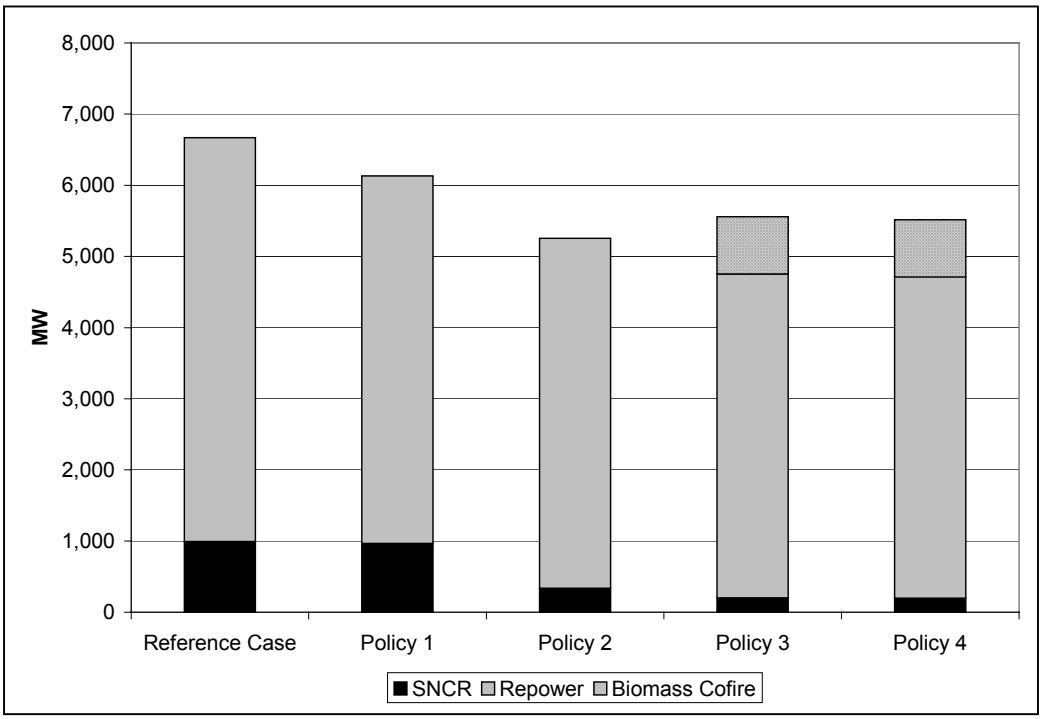


Table A.6: RPS Impacts on Carbon Emissions and System Costs

	Reference Case		Policy 2		Absoluate Change		Percent Change	
	2010	2020	2010	2020	2010	2020	2010	2020
Regional Carbon Emissions (MMTCE)	**85.9**	**95.4**	**85.0**	**94.4**	**-0.9**	**-0.9**	**-1%**	**-1%**
NY Carbon Emissions (MMTCE)	14.5	15.5	13.9	14.9	-0.6	-0.6	-4%	-4%
Carbon Emissions from Importing Regions* (MMTCE)	71.4	79.9	71.1	79.6	-0.2	-0.3	-0.3%	-0.4%
Cumulative Wind Plant Additions in NY (MW)	**300**	**1447**	**3113**	**4404**	**2813**	**2957**	**938%**	**204%**
Total Regional System Costs (Million $)**	**17,213**	**22,744**	**17,369**	**23,137**	**156**	**393**	**1%**	**2%**
NY System Costs (Million $)	4,269	5,114	4,500	5,615	231	501	5%	10%
Importing Regions (Million $)	12,944	17,631	12,869	17,522	-75	-108	-1%	-1%

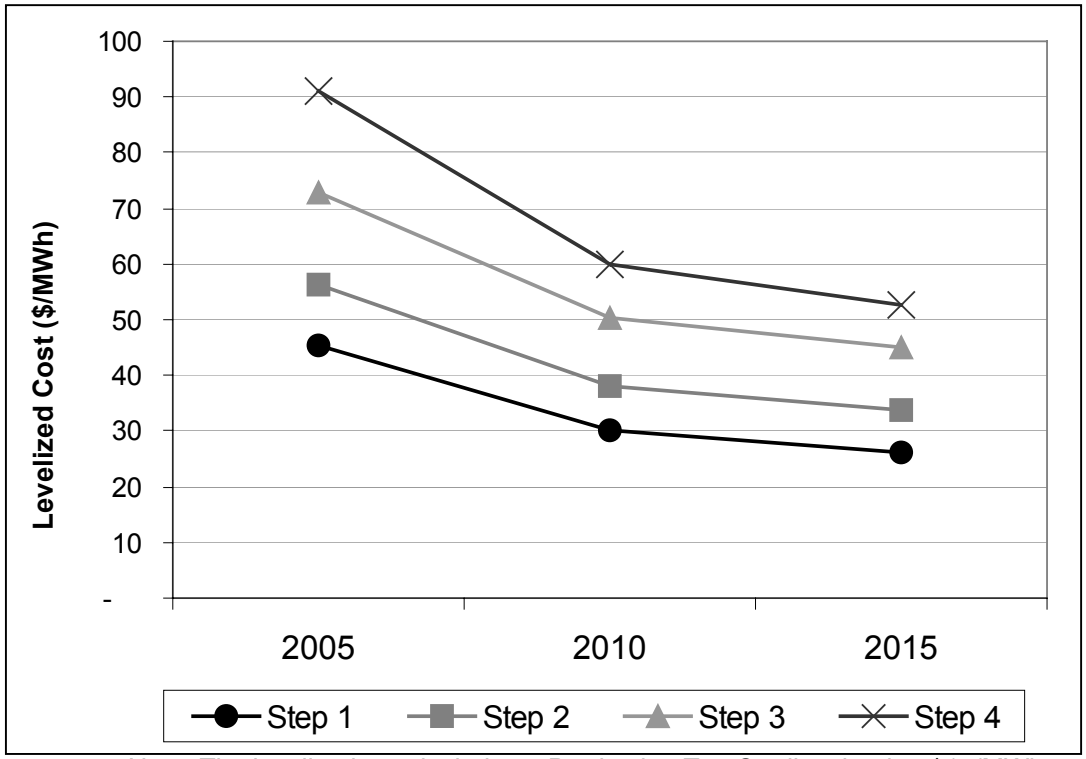
* Includes PJME, PJMW, PJMS, New England, and Ontario.
** System costs include fuel, VOM, FOM, and annualized capital expenses. Includes NY, PJM, New England, and Ontario.

Table A.7: New York Wind Resource Availability Assumptions

a. Based on conversations with the GHG Task force and members of NYSERDA, the following wind resource assumptions were employed in the analysis for New York.
b. Wind cost and performance assumptions were based on EIA and NREL data sources. In addition, a production tax credit of $17/MWh was assumed to extend throughout the study period for new wind plants.

Wind Resource Limits Applied in the Anaysis (MW)					
Region	**Step 1 1.0 Cost Multiplier**	**Step 2 1.2 Cost Multiplier**	**Step 3 1.5 Cost Multiplier**	**Step 4 2.0 Cost Multiplier**	**Total Resource Availability**
Upstate NY	1,000	500	1,000	1,500	4,000
Downstate NY	75	500	500	-	1,075
Total NY	**1,075**	**1,000**	**1,500**	**1,500**	**5,075**

Figure A.13: Levelized Cost of New Wind Plants in Upstate New York



Note: The levelized cost includes a Production Tax Credit valued at $17/MWh.

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