Chapter 5
Overview of Mitigation Policy Development

To assist with the development of policy options, the Climate Action Council (Council) convened three external advisory panels to assist and advise in areas requiring special expertise or knowledge: technical analysis, multi-sector integration, and 2050 visioning. The 2050 Visioning Advisory Panel, the Integration Advisory Panel, and five Technical Work Groups have provided direct input to the Climate Action Plan.

The Technical Work Groups served as advisors to the Council and consisted of Council member-agency staff and additional public, private, and non-profit sector stakeholders with specific interest and expertise. Policy options described in this interim report are principally the product of Technical Work Group deliberations, with feedback and guidance from the Integration Advisory Panel, Council, and public commenters. The Technical Work Groups, which were charged with developing policies to reduce greenhouse gas (GHG) emissions or enhance sequestration of carbon dioxide (CO_2), developed policy option scenarios that were analyzed in order to estimate GHG reduction potentials and net savings or costs.

Policy Options and Vision Map

The development of policy options has been informed by the results of the visioning process described in Chapter 4. The portfolio of policy options provides New York State with a comprehensive set of choices that could place the state on the path to the vision of a low-carbon future. A ‘mapping’ of policy options and the core vision strategies is presented as Figure 5-1.

Figure 5-1 –Policy Options and Vision Strategies Map

POLICY OPTIONS	CORE VISIONING STRATEGIES						
	Maximize Energy Efficiency & Conservation	Near- Zero-Carbon Electricity Generation	Smart Electric Transmission, Distribution & Storage	Carbon-Free Transportation Systems	Net Energy-Neutral Buildings	Low-Carbon Liquid Fuels	Carbon Sink Maintenance / Enhancement
RESIDENTIAL, COMMERCIAL/INSTITUTIONAL AND INDUSTRIAL							
Building Codes, Appliance Standards, & Enforcement, RCI-7	■	■		■	■		
Building Commissioning, Benchmarking, & Upgrades, RCI-8	■				■		
Energy Efficiency Incentives, RCI-2	■				■		
Customer-Sited Renewable Energy Incentives, RCI-3		■			■	■	
Industrial Process Incentives, RCI-11	■	■			■		
Workforce Training & Development, RCI-6	■	■	■	■	■	■	■
Outreach, Education, and Behavior Change RCI-5	■	■	■	■	■	■	■
Rate Restructuring & Flexible Metering, RCI-10	■	■	■	■	■		
Energy Efficiency and Clean Energy Fund, RCI-1	■	■	■		■	■	
Tax Structure & Private Financing, RCI-4	■	■			■	■	
Research, Development, & Demonstration, RCI-9	■	■	■		■	■	
TRANSPORTATION & LAND USE							
Vehicle Efficiency, TLU-1	■		■	■		■	
Vehicle Incentives & Disincentives, TLU-2	■		■	■		■	
Fleet Incentives & Disincentives, TLU-3	■			■			
Alternative Fuel & Infrastructure, TLU-4	■		■	■		■	
Research, Development, & Demonstration, TLU-5	■			■		■	
Decreased Travel & Less Commuting, TLU-6	■			■			
Mass Transit & Rail, TLU-7	■			■			
Freight Strategies, TLU-8	■			■			
Priority Growth Centers, TLU-9	■			■			■
Transit-Oriented Development, TLU-10	■			■			■
Location Efficient Land Use, TLU-11	■			■			■
Intergovernmental & Regional Initiatives, TLU-12	■		■	■			
POWER SUPPLY & DELIVERY							
Renewable Portfolio Std & Renewable Incentives, PSD-2		■		■	■		
Cap-and-Invest & Low-Carbon Portfolio Std, PSD-6	■	■	■	■	■	■	■
Siting and Permitting of New Generation, PSD-1		■		■	■		
New Facility Emissions and Nuclear Power, PSD-10	■	■		■	■		■
Existing Fossil Plant Policies, PSD-8	■	■		■	■		
Distribution Network Upgrade, PSD-4	■	■	■	■	■		
Transmission Network Upgrade, PSD-5	■	■	■	■	■		
Energy Storage, PSD-3		■	■	■	■		
Research, Development, & Demonstration, PSD-9	■	■	■	■	■	■	■
AGRICULTURE, FORESTRY & WASTE							
Production of Sustainable Feedstock for Bio-Energy, AFW- 1		■		■	■	■	■
Conversion of Sustainable Feedstock for Bio-Energy, AFW-2		■		■	■	■	
Maximize Waste Reduction, AFW-3	■						
Integrated Farm Management, AFW-4	■	■					■
Farm Efficiency & Renewable Energy, AFW-6	■	■			■		■
Conserve Open Space, AFW-5							■
Improved Forest Management, AFW-7				■			■
Local Food Production, AFW-8	■						
Research, Development, & Demonstration, AFW-9	■	■				■	■

Analysis Methodology

The analysis of policy scenarios is intended to establish the potential GHG reductions for the policies amenable to quantitative analysis and the direct costs to achieve those reductions. The approach to the analysis was full transparency—all data sources, methods, key assumptions, and key uncertainties were documented and subjected to stakeholder review. The Interim Report presents the first stage of the analysis, which consists of evaluating each policy on a stand-alone basis. The next stage will evaluate the policies on an integrated basis (i.e., after accounting for any overlaps between the policies). A third stage will consist of a macroeconomic analysis that will include consideration of indirect effects on employment, income, gross state product, and consumer energy costs.

The details of the stand-alone analysis methodology are presented in the Quantification Memo found in Appendix E and are summarized below.

Overall framework for the Analysis: The overall framework for the analysis of individual options was consistent across all four Work Group areas: Power Supply and Delivery (PSD); Residential, Commercial/Institutional and Industrial (RCI); Transportation and Land Use (TLU); and Agriculture, Forestry and Waste Management (AFW). It is important to note that not all options were deemed amenable to analysis (e.g., R&D and other enabling policies). Hence the framework below applies only to a subset of policies.

Analysis period: The overall period of analysis is 2011 through 2030.

Baseline GHG emissions: As a starting point, the analysis relies on the comprehensive inventory and forecast of New York State GHG emissions summarized in Chapter 3 and described in great detail in the *New York Greenhouse Gas Emissions Inventory and Forecast* report. This Inventory and Forecast is based upon a GHG emissions inventory for 2008 and forecast to 2030 for all emission source sectors prepared by NYSERDA. The GHG reduction impact of each policy is measured relative to this baseline. The forecast assumes New York does not adopt any new policies or measures to mitigate GHG emissions beyond those already in place or recent actions that have been approved but for which emissions reductions have not yet been realized. The forecast does not take into account the effects of a changing climate.

Emissions Coverage: The analysis considers six GHGs: CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Emissions are presented using a common metric, carbon dioxide equivalent (CO_2e), which accounts for the relative contribution of each gas to global average radiative forcing. Emission factors are used based on the assumptions used by NYSERDA in the development of the baseline and can be found in Appendix E.

Geographic distribution of emission reductions: Emission reductions associated with policies in the Climate Action Plan are presented based upon the direct emissions at the point of release to provide an apples-to-apples comparison with the Inventory and Forecast. For many policies these direct emissions can seriously understate the GHG benefits, so in the detailed Policy Options Documents developed by the Technical Work Groups, emissions reductions were also

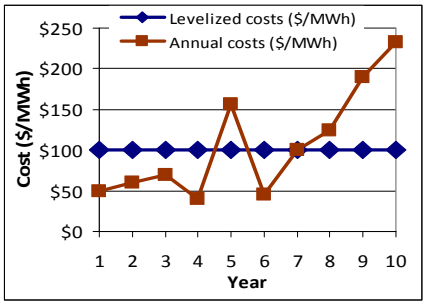
tracked regardless of where they occur. Referred to as a "fuel cycle" approach, this framework allows for the quantification of the GHG reduction impact of policies no matter where they occur, either within or beyond New York State borders.

Costing approach: Estimating the costs of achieving GHG reductions for the options focused on the direct (or microeconomic) costs and savings borne by New York State households and businesses (e.g., the additional cost of energy efficient equipment and the fuel savings associated with that equipment). Indirect (or macroeconomic) costs such as the number of jobs created and lost or the impact on Gross State Product are not considered in this report but will be included in the final report.

Analytical Outputs: There are several key outputs of the analysis, namely annual GHG reductions for the years 2020 and 2030; cumulative GHG reductions over the 2011-2030 period; the net cost or savings to achieve these reductions on a present value basis; and the cost per metric ton of CO_2e avoided. Note that net savings are shown as 'negative costs' throughout this report.

Box 1: Overview of levelized costs

Levelized cost is defined as a constant annual cost that is equivalent on a present value basis to the actual annual costs. That is, if one calculates the present value of levelized costs over a certain period, its value would be equal to the present value of the actual costs of the same period. This is illustrated in the figure below. The present value of the levelized costs is exactly equal to the present value of the annual costs. Levelized costs allows for a ready comparison of technologies in any year, something that would be more difficult to do with differing annual costs.



Methodological Approach

The methodological approach applied to the analysis of options in all Work Groups is briefly described in the bullets below.

- *Major cost categories:* These include net capital/equipment costs, operations and maintenance (O&M), fuel, interconnection costs, and costs of financing.
- *Discounting:* Discounting begins in the initial year of the analysis period (2011) and applies a 5% real annual discount rate. The discount rate is kept constant for the evaluation of all GHG mitigation options. Risk and uncertainty are accounted for by calculating option-specific cash flows that account for policy, practice, or technology differences.
- *Treatment of capital costs:* Capital investments are represented in terms of their "levelized cost" over the project period (see Box 1 for an overview of the concept of levelized costs). In the case of certain technologies (e.g., solar photovoltaics) where capital costs have been declining, technology learning effects were included.
- *Emission Reductions:* Emission reductions for individual policies are calculated relative to baseline emissions based on the change (reduction) in emissions activity (e.g., physical energy units) or sequestration that the policy achieves.
- *Cost-effectiveness:* The cost effectiveness for each quantified policy is determined by dividing the present value cost by the cumulative (undiscounted) reduction in tons of GHG emissions.

- *End effects:* For GHG mitigation options whose lifetimes extend beyond the end of the analysis period (i.e., beyond 2030), only costs and benefits that fall within the analysis period are included in the analytical results.
- *Non-GHG (external) impacts and costs:* Environmental co-benefits such as reductions in criteria air pollutants that lead to improved public health outcomes are considered in a qualitative manner only in this report. The final report will include an in-depth examination of the major environmental co-benefits of these policy options.
- *Uncertainty / Sensitivity Analysis:* Key uncertainties and feasibility issues were identified and where possible subjected to sensitivity analysis on a policy by policy basis. These include energy and carbon price forecasts, discount rate[1], cost and performance assumptions, technology learning, and other parameters. Given the uncertainty surrounding federal climate legislation, the analysis assumed no future cost of carbon.

When quantifying the GHG emission reduction potentials of several of the PSD, RCI, and TLU mitigation policies, direct emission calculations exclude CO_2 emissions associated with the use of bioenergy, which includes the combustion of biogenic materials such as ethanol, biodiesel, and woody biomass. Historically, many national and international reporting protocols treat bioenergy as "carbon neutral." While there is now general scientific consensus that this assumption is incorrect, consensus on how to properly assign the appropriate carbon intensity is lacking.

On June 3, 2010, EPA published the final Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule. In that Rule, EPA acknowledged the Agency did not have sufficient information to address the issue of the carbon neutrality of biogenic materials and has called for a rigorous review of carbon accounting procedures. New York State will continue to follow the development of carbon accounting procedures and will update the GHG emission reduction calculations as interactions between the policies and their potential to achieve GHG reductions are analyzed.

Climate Action Plan Goals

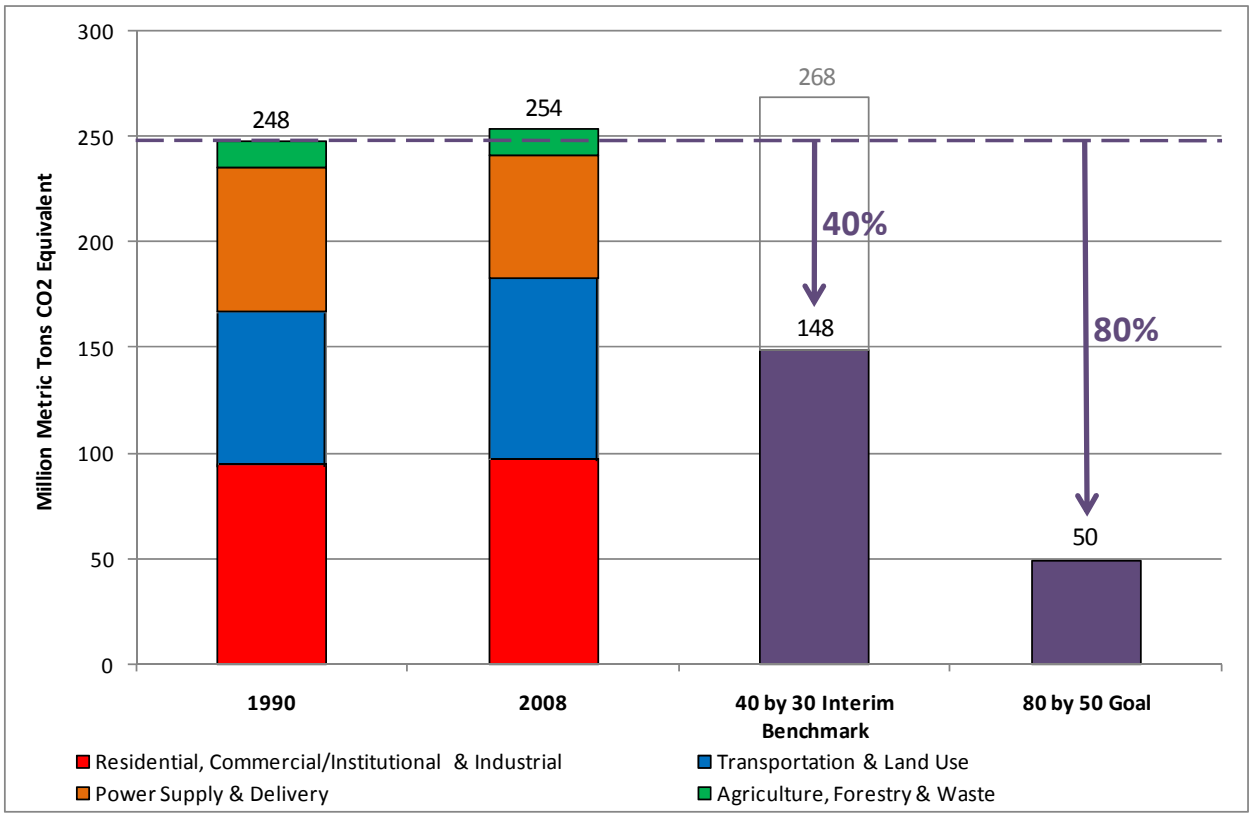
In August of 2009, Governor David A. Paterson signed Executive Order 2009-24 establishing the goal of reducing GHG emissions from all New York State sources to 80 percent below 1990 levels by 2050. To support development of a plan that will demonstrate New York's ability to meet this goal, the Council established an interim benchmark to reduce GHG emissions from all New York State sources to 40 percent below 1990 levels by 2030. This benchmark was provided to the Technical Work Groups so that the stakeholders would have a near-term target by which they could measure progress towards the 80 by 50 goal.

The 1990 reference emission levels, along with current levels, are presented in Figure 5-2. The forecasted GHG emission level for 2030, 268 million metric tons, is also presented along with

[1] Public-sector projects that result in durable, long-lasting effects, such as the expansion of transit and other infrastructure projects with long life-spans, may be evaluated with a lower discount rate than what is commonly used in the private sector. For example, the U.S. Department of Transportation allowed for the use of a 3% discount rate for its benefit-cost analyses under the Transportation Investment Generating Economic Recovery (TIGER) grant program, which is part of the federal government's $878 billion stimulus program.

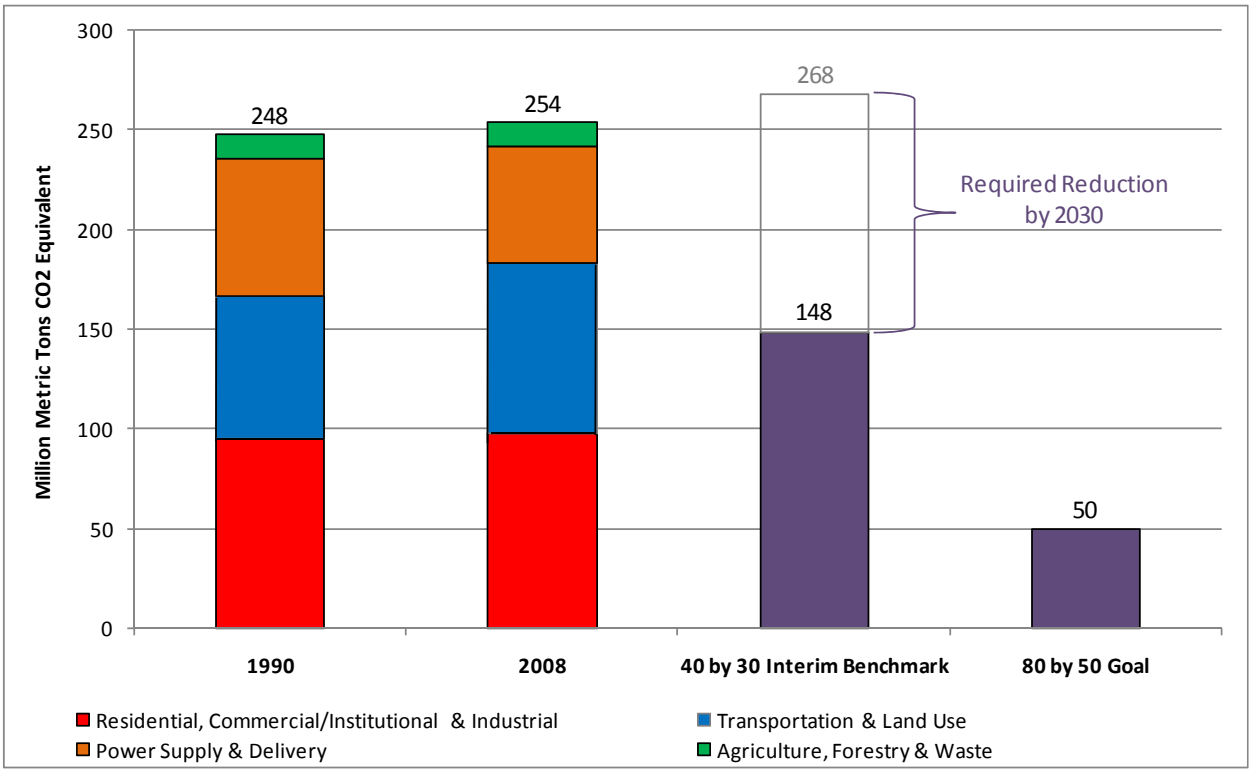
the emission limits implied by the 2030 benchmark (148 million metric tons) and the 2050 goal (50 million metric tons).

Figure 5-2. New York State GHG Emission Levels (1990 and 2008) and Forecast (2030) with Benchmark and Goal



The required emission reduction for 2030 is therefore 120 million metric tons, as shown in Figure 5-3. While the precise pathway to the 80 by 50 goal is not discernible at this time, the interim benchmark does provide a plausible mid-point target for the purpose of policy evaluation.

Figure 5-3. Required Emission Reduction by 2030 and 2050



Preliminary Results

Table 5-1 presents preliminary quantitative analysis of the mitigation policy options relative to the 2030 benchmark year. The preliminary analytical results presented here describe the potential effectiveness of the mitigation policy options on a stand-alone basis, without considering interactions among policies or overlapping emissions reductions. Table 5-1 presents an estimate of the total annual GHG emission reduction anticipated by 2030 as a result of the individual policy options (i.e., as measured by Millions Metric Tons CO_2e). In order to make this estimate, specific targets and goals were developed, where possible, for individual policy options. This is referred to as a "policy scenario". Note, not all policy options are amenable to this type of quantification. The results also present an estimate of the total cost or savings of the policy option through 2030, as measured by net present value (NPV). This reflects the total capital costs, anticipated operation and maintenance costs/savings, and fuel costs/savings associated with the policy. As with any NPV analysis, a negative NPV reflects a savings and implies an economically desirable investment. Table 5-1 also presents an indicator of cost-effectiveness for the policy option, as measured by \$/ton CO_2e avoided; this provides a metric to determine which policy options will deliver the most CO_2e on a dollar-for-dollar basis. As with NPV, a negative \$/ton CO_2e implies that we save money as we reduce GHGs.

While further analysis is needed to better understand a more full range of economic impacts and to eliminate potential overlap, some general observations can be made from the analysis to date:

- No single policy can deliver the level of emission reduction needed to achieve a 40 by 30 target. A portfolio of policies will be needed to reduce emissions from the many different GHG sources throughout our economy.

- A linear path to achieving 80 by 50 may not be feasible. We may need to further ratchet up the stringency of the policies over time to increase the rate of emission reduction, as technologies and markets mature.

- There are a number of policies —particularly in the Buildings, Industry, and Transportation sectors —that represent cost-effective ways to take a meaningful step toward a low-carbon future. These "No Regrets" policies, which are primarily efficiency policies, could represent options for early action. Further analysis of benefits and costs, and strategies to finance and/or fund will be needed.

- Energy efficiency policies alone, however, will not deliver the level of emission reduction needed to achieve a 40 by 30 target (and ultimately the 80 by 50 goal). To make appreciable progress toward these aggressive goals and to break our dependence on finite fossil-fuel resources, the State will need to continue to strategically advance low-carbon energy supply-side policies and infrastructure investments, particularly focusing on policies that provide significant co-benefits to New Yorkers (e.g., improvements in local air quality, opportunities for economic development and job creation).

Table 5-1. Preliminary Results of Policy Scenario Analyses.

Policy No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value: Cost/Savings (Million $)	Net Cost/Savings per Avoided Emissions ($/tCO_2e$)
		2020	2030	Total 2011–2030		
RCI-2	Energy Efficiency Incentives	3.0	17	120	-$29	$0
	Combined Heat and Power (CHP) Incentives	0.2	1.1	7.1	$14	$2
RCI-3	Solar Electricity Incentives	0.7	3.3	22	$4,400	$200
	Solar Thermal Incentives	0.5	2.8	21	$2,600	$130
	Bioenergy Incentives	5.1	5.1	84	-$5,100	-$61
RCI-7	Enhanced Building Codes, Appliance Standards, and Enforcement	1.4	6.3	43	-$1,200	-$27
RCI-8	Building Commissioning, Benchmarking, and Upgrades	2.3	3.3	34	-$790	-$23
RCI-11	Industrial Process Incentives	1.2	2.6	26	-$2,500	-$95
TLU-1	Vehicle Efficiency Standards	5.3	17	130	$7,900	$62
TLU-2	Vehicle Incentives and Disincentives	0.9	2.0	20	-$2,300	-$120
TLU-3	Fleet Incentives and Disincentives	0.2	0.6	5.6	-$750	-$130
TLU-4	Alternative Fuel Related Measures and Infrastructure – Low Carbon Fuel Standard (LCFS)	3.9	8.5	84	$6,700	$79

Policy No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value: Cost/Savings (Million $)	Net Cost/Savings per Avoided Emissions ($/tCO_2e$)
		2020	2030	Total 2011–2030		
TLU-6	Commuter & Traveler Assistance	1.0	1.0	18	-$15,000	–$870
	Parking Pricing—					
	Upstate	0.3	0.3	0.5	$720	$1,400
	NYC Metro Region	0.4	0.4	0.8	-$480	-$610
	Telecommuting	1.0	1.0	18	-$15,000	-$870
	Congestion Pricing	0.2	0.2	2.4	-$1,100	-$460
TLU-7	Expand Transit	3.7	4.9	64	$25,000	$390
TLU-9	Priority Growth Centers	0.1	0.3	2.6	-$1,600	-$610
TLU-10	Transit-Oriented Development / Transit Supportive Development	0.3	0.5	5.7	-$5,000	-$870
TLU-11	Location Efficient Land Use	0.6	1.2	13	-$11,000	-$870
PSD-2	Renewable Portfolio Standard (RPS) and Incentives for Grid-Based Renewable Generation	2.8	7.9	64	$1,700	$27
PSD-4	Distribution System Upgrades	0.3	0.8	6.3	-$460	-$73
PSD-6	Low Carbon Portfolio Standard (LCPS): High Penetration of Renewables	7.3	29	220	$5,600	$26
AFW-3	Maximize Waste Reduction, Recycling, and Composting—In-State Only	0.5	0.7	8.0	$280	$35
AFW-4	Integrated Farm Management Planning and Application	0.3	0.6	6.5	-$201	-$31
AFW-5	Conserve Open Space, Agricultural Lands and Wetlands	4.5	5.5	95	$1,500	$16
AFW-6	Increase On-Farm Energy Efficiency and Renewable Energy	0.2	0.4	3.8	$3	$1
AFW-7	Forest Restoration	2.3	4.7	49	$290	$6
	Urban Forestry	1.0	2.0	22	$3,200	$140
	Reforestation	1.8	2.4	34	$1,200	$36

The data presented in Table 5-1 are also illustrated graphically in Figure 5-4. Figure 5-4 shows the potential annual emission reductions in 2030 and the net-savings or net-cost per ton CO_2e avoided for each policy. The 2030 benchmark goal has been drawn as a line in the figure to provide a basis for judging effectiveness of each policy. Some general observations can be made:

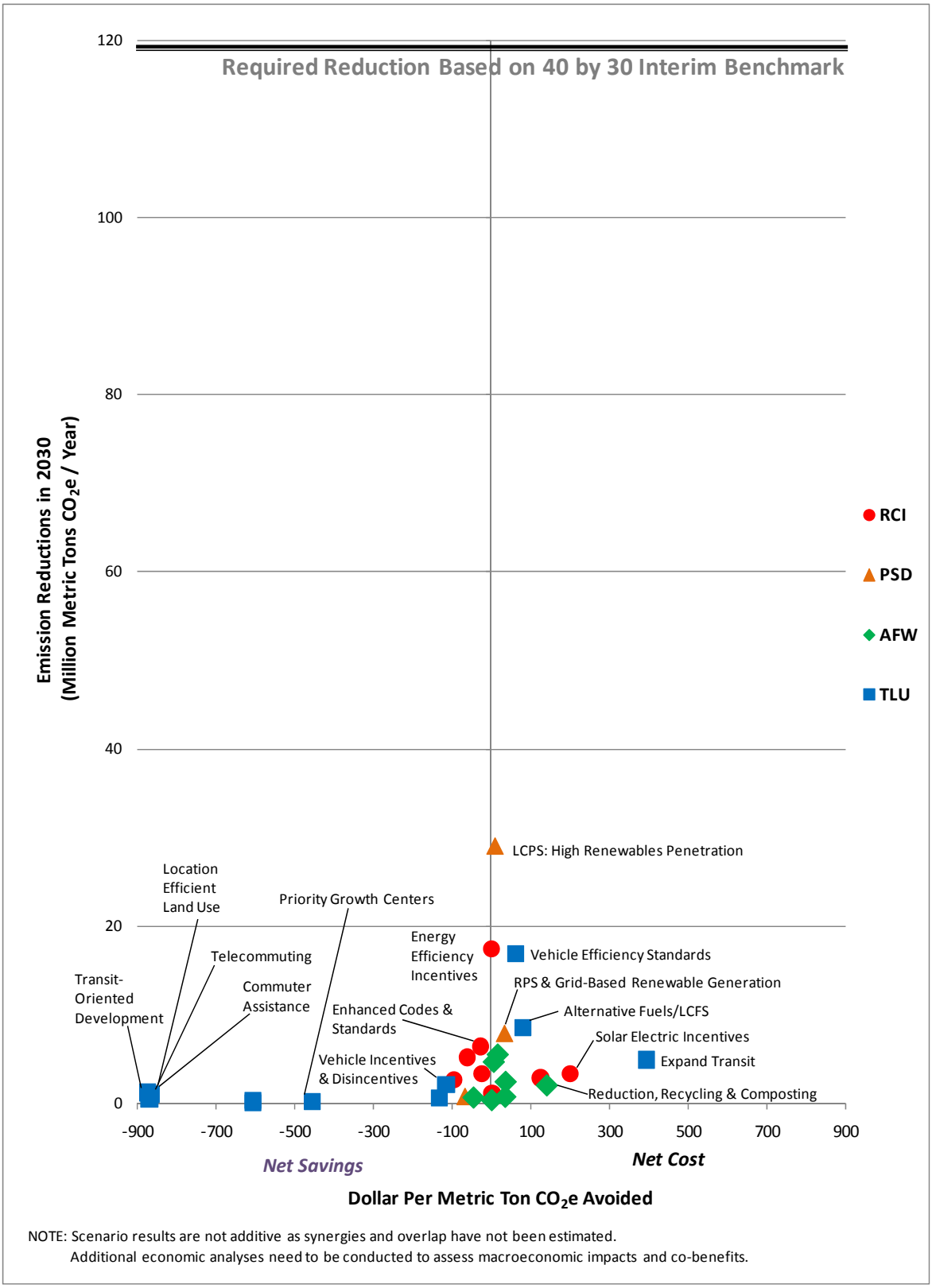
- Policies that provide the largest potential emission reductions in 2030 include the low-carbon portfolio standard (PSD-6), increased vehicle fuel efficiency standards (TLU-1), building energy efficiency incentives (RCI-2), and a low-carbon fuel standard (TLU-4).

- Polices that provide the largest savings per avoided metric ton of emissions include smart growth policies (TLU-9, -10, and -11), and commuter assistance (TLU-6).

- Policies that provide both significant emission reductions and net savings include building energy efficiency incentives (RCI-2), improved building codes and standard (RCI-7), and vehicle incentives (TLU-2).

The petroleum and non-petroleum fuel savings associated with these policies are presented in Table 5-2 and Table 5-3. Based on the estimated reductions in 2030 derived from the scenario analysis and on current consumption levels, RCI-2 would save enough electricity to power 4.6 million homes and enough home heating oil and natural gas to heat more than 1.9 million homes for a year. Similarly, based on the estimated reductions in 2030 derived from the scenario analysis and on current consumption levels, TLU-1 would save enough motor gasoline to power 7.3 million cars for a year.

Figure 5-4. Policy Scenario Analytic Results



NOTE: Scenario results are not additive as synergies and overlap have not been estimated.
Additional economic analyses need to be conducted to assess macroeconomic impacts and co-benefits.

Table 5-2. Preliminary Fuel Savings from Petroleum Products.

Policy No.	Policy Option	Annual Petroleum Products (Millions of Gallons of Gasoline Equivalent)	
		2020	2030
RCI-2	Energy Efficiency Incentives	58	360
RCI-3	Customer-Sited Renewable Energy Incentives	230	340
RCI-7	Enhanced Building Codes, Appliance Standards, and Enforcement	36	160
RCI-8	Building Commissioning, Benchmarking, and Upgrades	50	68
RCI-11	Industrial Process Incentives	54	120
TLU-1	Vehicle Efficiency Standards	1,000	3,500
TLU-2	Vehicle Incentives and Disincentives	100	220
TLU-3	Fleet Incentives and Disincentives	26	69
TLU-4	Alternative Fuel Related Measures and Infrastructure – Low Carbon Fuel Standard (LCFS)	870	2,000
TLU-6	Commuter & Traveler Assistance	110	120
	Parking Pricing		
	Upstate	3.0	3.0
	NYC Metro Region	5.0	5.0
	Telecommuting	110	120
	Congestion Pricing	18	18
TLU-7	Expand Transit	670	900
TLU-9	Priority Growth Centers	13	36
TLU-10	Transit-Oriented Development / Transit Supportive Development	49	100
TLU-11	Location Efficient Land Use	110	230

Table 5-3. Preliminary Fuel Savings from Non-Petroleum Fuels.

Policy No.	Policy Option	Annual Electric Energy (GWh)		Annual Natural Gas (BCF)		Annual Other Fuels (BBtu)	
		2020	2030	2020	2030	2020	2030
RCI-2	Energy Efficiency Incentives	5,300	32,000	22	130	2,700	8,900
RCI-3	Customer-Sited Renewable Energy Incentives*	2,300	11,000	60	83	0	0
RCI-7	Enhanced Building Codes, Appliance Standards, and Enforcement	2,000	9,500	11	51	1,100	5,100
RCI-8	Building Commissioning, Benchmarking, and Upgrades	3,200	4,900	16	23	630	860
RCI-11	Industrial Process Incentives	230	460	7	14	3,900	8,700

Other Fuels include non-petroleum fuels such as coal and wood.

*Other fuel savings do not include the increased consumption of biofuel associated with RCI-3. This consumption amounts to an increase of 90,000 BBtu.