WWW.NCCLIMATECHANGE.US

Memo

To:	North Carolina Legislative Commission on Global Climate Change
From:	The Center for Climate Strategies and North Carolina Department of Environment and Natural Resources
CC:	North Carolina Climate Action Plan Advisory Group and Technical Work Group Members
Subject:	Interim Report to the North Carolina Legislative Commission on Global Climate Change and Current Status of CAPAG Recommendations
Date:	February 20, 2007

Background

The North Carolina Climate Action Plan Advisory Group (CAPAG) process was created to provide comprehensive recommendations for a state climate action plan to the North Carolina Department of Environment and Natural Resources (DENR). It is structured to be complementary to the North Carolina Legislative Commission on Global Climate Change (Commission) as this body considers economic opportunities for action to reduce state greenhouse gas (GHG) emissions.

The CAPAG and Commission processes are integrated in a number of ways to accomplish these joint objectives:

- A number of Commission members serve as CAPAG members.
- The CAPAG has received feedback from Commission members regularly in the course of its deliberations since February of 2006.
- DENR and the Center for Climate Strategies (CCS) have provided regular issue briefings and progress reports to the Commission since its startup during the same period.
- Most importantly, the CAPAG process has served as the primary mechanism for identifying and analyzing potential mitigation options and economic opportunities for both DENR and the Commission.

In formulating mitigation options for consideration as final recommendations, the CAPAG has relied extensively on joint fact-finding and policy development assistance from CAPAG

members and other participants in five sector based Technical Work Groups (TWGs) that cover the following economic sectors:

- Energy Supply (ES), including heat and power generation;
- Residential, Commercial and Industrial (RCI), including stationary source energy demand and process emissions);
- Transportation and Land Use (TLU);
- Agriculture, Forestry and Waste Management (AFW); and
- Cross Cutting Issues (CC), including emissions reporting, registries, education, adaptation and goals.

Current Progress

At present, the CAPAG has developed a total of 53 draft GHG mitigation options as potential state climate action plan recommendations, including 16 "early consensus" actions approved at its last meeting (below). The full set of 53 CAPAG mitigation options include a variety of actions that could be implemented by administrative and or legislative means, depending on the measure. They were derived from an initial list of over 300 possible state actions across all economic sectors identified by the CAPAG with facilitative and technical assistance from CCS, in coordination with DENR, based on existing and planned actions in North Carolina and other states. The CAPAG has met five times in person and the TWGs have held 54 teleconference calls and or in person meetings. At least two additional meetings of the CAPAG are scheduled along with additional TWG meetings to continue the process of finalizing recommendations for a final report.

At its fifth meeting on January 24, 2007, the CAPAG began the process of approving draft mitigation options. A total of 52 options were presented, including detailed review of 26 options that had received full TWG review. Of these 26 fully reviewed draft mitigation options, 16 were approved as final recommendations through early consensus of the CAPAG, subject to additional clean up and revision of text and analysis. A number of questions and suggested changes were identified for options reviewed but not approved at this meeting. In addition, CCS has developed new analysis for subsequent review for several options not fully reviewed at the last CAPAG meeting, including those in Transportation and Land Use, and Agriculture, Forestry and Waste TWGs. Two new options were added to the list of "priority for analysis" options of the CAPAG, one of which (urban forestry) has been designated as a new stand alone option and the other (organic farming) as a component of an existing option (soil carbon buildup). Additional analysis of secondary economic impacts, including jobs, is planned for a set of options to be determined by the CAPAG.

Early Consensus CAPAG Recommendations

Early consensus actions of the CAPAG were identified through formal group vote at its fifth meeting on January 24, 2007. Draft mitigation options that received no objections to adoption during voting by the CAPAG are considered final recommendations, and are also referred to as early consensus options. Additional rounds of voting to determine consensus levels for will occur on remaining options. Additional details on this early set of final CAPAG recommendations are

included in the attached summary tables and supplemental policy templates. This current list of 16 final CAPAG recommendations includes the following actions:

Residential, Commercial and Industrial:

- RCI-2, Expand Energy Efficiency Funds
- RCI-3, Energy Efficiency Requirements for Government Buildings
- RCI-4, Market Transformation and Technology Development Programs
- RCI-5, Improved Appliance and Equipment Efficiency Standards
- RCI-6, Building Energy Codes
- RCI-7, "Beyond Code" Building Design Incentives and Targets, Incorporating Local Building Materials and Advanced Construction
- RCI-8, Education (Consumer, Primary/Secondary, Post-Secondary/ Specialist, College and University Programs)
- RCI-11, Residential, Commercial, and Industrial Energy and Emissions Technical Assistance and Recommended Measure Implementation

Energy Supply:

- ES-3, Removing Barriers to CHP and Clean DG
- ES-9, Incentives for CHP and Clean DG

Cross Cutting Issues:

- CC-1, GHG Inventories and Forecasts
- CC-2, GHG Reporting
- CC-3, GHG Registry
- CC-4, Public Education and Outreach
- CC-5, Adaptation
- CC-6, Options for Goals or Targets (for CAPAG in support of LCGCC)

Draft CAPAG Mitigation Options Still Under Consideration

The remaining 37 draft pending CAPAG mitigation options (not yet approved) will be considered and voted on by members at upcoming CAPAG meetings in May, July and possibly the fall. As a result, the list and results of analysis for mitigation options that are still pending and contained in this interim report should be considered draft.

Draft pending CAPAG mitigation options are listed below:

Residential, Commercial and Industrial:

- RCI-1, Demand Side Management Programs for the Residential, Commercial and Industrial Sectors

a. Alternative Case 1: Mid-Range EE Investment
b. Alternative Case 2: High-Range EE Investment

- RCI-9 Green Power Purchasing (required for state facilities) and Bulk Purchasing Programs for Energy Efficiency or Other Equipment
- RCI-10, Distributed Renewable and Clean Fossil Fuel Power Generation

Energy Supply:

- ES-1, Renewable Energy Incentives
- ES-2, Environmental Portfolio Standard
- ES-4, CO2 Tax and/or Cap-and-Trade
- ES-5, Legislative Changes to Address Environmental & Other Factors
- ES-6, Incentives for Advanced Coal
- ES-7, Public Benefit Charge
- ES-8, Waste to Energy
- ES-10, NC Greenpower Renewable Resources Program

Transportation and Land Use:

- TLU-1a, Land Development Planning
- TLU-1b, Multi-modal Transportation & Promotion
- TLU-3a, Feebates to raise revenue
- TLU-3a, Feebates to change fleet mix
- TLU-4, Truck-stop Electrification
- TLU-5, Tailpipe GHG Standards
- TLU-6, Biofuels Bundle
- TLU-7, Procure Efficient Fleets
- TLU-8, Anti-idling
- TLU-9, Diesel Retrofits
- TLU-10a, Fuel tax incentives (50 cents/gallon)
- TLU-10b, Fuel tax incentives (10 cents/gallon)
- TLU-11, Pay As You Drive Insurance
- TLU-12, Incentives for Advanced Tech Vehicles

Agriculture, Forestry and Waste:

- AFW-1, Manure Digesters & Energy Utilization
- AFW-2, Biodiesel Production (incentives for feedstocks and production plants)

- AFW-3, Soil Carbon Management (including organic farming incentives)
- AFW-4, Preserve Agricultural Land
- AFW-5, Agricultural Biomass Feedstocks for Electricity or Steam Production
- AFW-6, Policies to Promote Ethanol Production
- AFW-7, Forest Protection – Reduced Clearing and Conversion to Nonforest Cover
- AFW-8, Afforestation and/or Restoration of Nonforested Lands
- AFW-9&10, Expanded Use of Forest Biomass and Better Forest Management
- AFW-11, Landfill Methane and Biogas Energy Programs
- AFW-12, Increased Recycling Infrastructure and Collection
- AFW-13, Urban Forestry Measures

The full list of 53 CAPAG options are summarized in detailed tables at the end of this memo (Tables 3-7), including analysis of estimated GHG reduction potential, and costs or cost savings for each option. In addition, detailed mitigation option templates and supporting reference materials are contained in technical appendices to this memo for all 53 mitigation options for each of the five TWGs. These are posted to the project website as follows:

- Technical Appendix 1: Residential, Commercial and Industrial Appendix, with Annexes
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10927.pdf
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10926.pdf
- Technical Appendix 2: Energy Supply Appendix, with Annex
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10925.pdf
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10924.pdf
- Technical Appendix 3: Transportation and Land Use Appendix
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10928.pdf
- Technical Appendix 4: Agriculture and Forestry Appendix
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10921.pdf
- Technical Appendix 5: Cross Cutting Issues Appendix, with Annex
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10923.pdf
  - http://www.ncclimatechange.us/ewebeditpro/items/O120F10922.pdf

For a quick read of mitigation options, Commission members should particularly focus on the following key elements of these mitigation option templates:

- Option description,
- Option design (goals, timing, coverage of parties), and
- Implementation mechanism(s)

Additional Recommendations by Commission Members

Several recommendations for early action were submitted by individual members of the Commission to the Commission Chairs on January 31, 2007 and are summarized in Table 2. Most of these suggested mitigation options are already included in the design and or analysis of the 53 CAPAG mitigation options (as noted in Table 2), but some may require additional design components or analysis by the CAPAG. CCS looks forward to working closely with the Commission to provide additional support for the evaluation of these suggestions by Commission members, as needed.

Table 1. NC LCGCC Member Additional Options

Suggestion #	GHG Mitigation Action	Notes	Recommended By
1)	Renewable Portfolio Standard combined with Energy Efficiency Standards amounting to a 20% Energy Supply and Offset Mix (REPS) by the year 2020	Under consideration by the CAPAG, and will require some additional analysis. This is generally consistent with RCI-1 and RCI-2, though we will need to consider the need for aligning the goals of ES-2 with RCI options (which we would have had to do anyway. Linked to several AFW options covering animal waste to methane energy, landfill gas to energy, agricultural waste to energy, forestry biomass to energy. Note linkage to feedstock supplies for this option coming out of AFW-5, 9, 10 and 11.	Toben, Shore
2)	Increase funding to the Forest Development Program (FDP) by $5 million.	Under consideration by the CAPAG and appears to be covered under the AFW's forestry options (AFW8-10).	Slocum
3)	Increase Allowable Tractor-Trailer Truck Weights on state roads to 90,000 lbs., for units with 6th axle.	Not under direct consideration by the CAPAG and will require additional analysis.	Slocum
4)	Increase Funding for Agricultural Development and Farmland Preservation Trust Fund; provide at least $40 million annually. Through some funding mechanism (or combination of mechanisms), provide at least $40 million annually to the Agricultural Development and Farmland Preservation Trust	Under consideration by the CAPAG and covered under AFW-4 and 7.	Slocum

	Fund to support long-term conservation of our farm and forest land resources:		
5)	Expand Allowable Range of Forest Biomass Under the NC Green Power. Expand the NC Green Power program to include all available sources and not just a very limited subset of forest biomass: C	Under consideration by the CAPAG under RCI-9 and covered under AFW-9&10.	Slocum
6)	Remove the barriers that prevent start-up and retrofit/adaptive operations of government, commercial, industrial and institutional cogeneration and tri-generation plants throughout North Carolina.	Under consideration by the CAPAG. Covered in general in the mitigation option design and implementation measures in RCI-10, but could be included in slightly more detail. No particular impacts on modeling.	Cowell
7)	Remove barriers preventing micro-cogeneration at the household and small-business level.	Under consideration by the CAPAG, and will require additional analysis. Covered in general in the mitigation option design and implementation measures in RCI-10, but could be included in slightly more detail. No particular impacts on modeling. Covered also in the mitigation option design and implementation measures in ES-3 and ES-9. The effect of the second would need to be incorporated into ES analysis after RCI consideration.	Cowell
8)	Management of Hog Manure.	Under consideration by the CAPAG under AFW-1 (anaerobic digesters and energy utilization). This has a direct link with ES-1 and ES-2.	Profeta
9)	Consider the Biofuels Group Recommendations.	Under consideration by the CAPAG. Covered under the AFW ethanol and biodiesel options.	Peele, Shore
10)	Fund NC Farm Bureau, NC GreenPower	Under consideration by the CAPAG under ES and AFW options.	Peele
11)	Revolving Loan Fund for Green School Construction.	Not under consideration by the CAPAG, and will require additional analysis. Suggests a “Revolving Loan Fund for Green School Construction”, which could fairly easily be added as an implementation measure for RCI-3 (which also could be more explicit in its application to	Garrou

		schools).	
12)	5% RPS with Other Energy Conservation Measures.	Under consideration by the CAPAG. Tangential relation to RCI options, as it recommends biomass power generation, which is a part of RCI-10 (so no additional work required, some assumptions could be changed).	Clark
13)	Encourage Development of "Low Hanging Fruit" Renewable Options.	Under consideration by the CAPAG under various ES, TLU and AFW options.	Clark
14)	Voluntary and incentive-based activities and programs suggested by other member of the Legislative Commission could be implemented to determine their impact.	Under consideration by the CAPAG under various options.	Everett, Choi
15)	CO2 equivalent emissions reduction. Draft bill that directs the State to design an emissions reduction program by 2010, and sets the goals reduce emissions (from what level?) by 60% by 2025, and 80% by 2050.	Generally consistent with what we have so far in terms of overall reduction potential from the 53 options as currently configured, but would require additional analysis to go beyond 2020 to the 2025 time period.	Eggers
16)	Draft bill directing NC DOT to make plans public, consider and analyze climate impacts of plans.	TLU-1a focuses more on local growth plans; although there is some overlap, this recommendation would best be seen as a useful complement to TLU-1a. Linkage to AFW-4 and AFW-7 (Ag and Forestry land protection measures). Could be mentioned as implementation measures/goals in RCI-7 and RCI-8.	Families Together
17)	Draft bill to change NC net metering regulations to allow more use, streamline regulations.	Covered and included, in a more general way than the bill, in the mitigation option design and implementation measures in RCI-10.	Eggers
18)	This list of options prepared by environmental NGOs includes several that overlap with RCI, ES, TLU and AFW options.	Generally covered but may require additional analysis. The REPS option includes energy efficiency, and mentions a range of target investment (as a fraction of utility revenue). It also includes a specific target for a combination of solar hot water and solar PV. Several education options are mentioned. In	Shore, Smith, Stephenson, and Urlaub

		general, most of the options included here appear in some form in RCI, but some could be made more explicit as parts of goals or implementation measures within RCI option write-ups. In particular, a goal is cited for State Lead by Example, that isn't really explicit enough (as to whether it applies to new and/or existing buildings, and as to the scope of what "government" includes) to know whether the existing RCI-3 goal is consistent with it.	
19)	Fuel Savings Measures (idle reduction)	Covered: TLU-4, Truck Stop Electrification, and TLU-8, Anti-Idling.	Shore, Smith, Stephenson, and Urlaub
20)	Appropriate funds for research and development of microalgae for fuel.	Covered: algal oil feedstock for biodiesel production is recognized within AFW-2, as an example of new feedstock source needed to meet the in-state production targets. We assume that the R&D addressed in this bill ($500k/yr) would be covered within the incentives estimated to be needed to promote production to achieve the targets for AFW-2 (discounted costs range from $5MM-$33MM/yr).	Eggers
21)	Incentives for Carbon Reduction Technologies in Agricultural Sector, including bio char.	Covered under AFW-1.	Smith, Shore
22)	Formulation of a climate adaptation strategy for North Carolina.	Covered under CC-5.	Riggs, Stephenson and Clark
23)	More analysis of options is needed under Section 5 of the LCGCC	Costs and GHG reduction benefits for options have been calculated to the specifications of the CAPAG and its TWGs, as reflected in the mitigation option templates and reference materials. Additional analysis of costs and secondary economic impacts and other co-benefits is possible, depending on need. GHG reductions from specific actions are cumulative in their contribution toward reduced global GHG atmospheric concentrations. Results of reduced GHG	Pittenger, Everett, Choi, Howard, and Slocum

		concentrations have been established by the Intergovernmental Panel on Climate Change (IPCC) and affirmed by the US National Academies of Science (NAS).	

Cumulative Results of CAPAG Options

Climate mitigation action plans support implementation of a number of programs jointly over time. As a result, the overall potential effectiveness of a plan requires analysis of the combined or cumulative impact of the actions. The cumulative impacts of implementing all 53 of the CAPAG mitigation options were calculated by CCS by integrating of the stand alone results for each of the options (reported in the policy templates and attached summary tables) to remove double counting and adjust for supply and demand and other interactions between potentially overlapping measures. Because many options overlap in some fashion, the cumulative impact of all options combined is substantially less than the simple addition of individual options.

Table 3 provides a summary the potential cumulative impacts of all 53 CAPAG mitigation options, if implemented, in comparison to reference case emissions projections for North Carolina. These data have not been reviewed by the CAPAG or TWGs and should be considered preliminary draft estimates. Projected North Carolina reference case emissions are provided from the latest draft of the North Carolina GHG Emissions Inventory and Forecast (a full draft of this report is posted to the project website) using four separate GHG accounting approaches:

- Consumption Net (activities of associated with energy and materials consumed in state, and including carbon sequestration)
- Consumption Gross (activities of associated with energy and materials consumed in state, not including carbon sequestration)
- Production Net (activities of associated with energy and materials produced in state, and including carbon sequestration)
- Production Gross (activities of associated with energy and materials produced in state, not including carbon sequestration)

A comparison of reference case emissions and the potential results of CAPAG actions are also summarized in Figure 1 using a *net consumption* based system, the standard accounting system used by states for GHG mitigation.

Preliminary draft analysis of state emissions reductions from CAPAG options show that projected state emissions in 2020 would be 49 percent lower with action than without action.

These findings assume that all options would be fully implemented, and that future reference case emissions would not be higher than current estimates in the draft North Carolina GHG inventory and forecast. Quantification of costs or cost savings has been completed for most of the 53 mitigation options, but some have not yet been reviewed by the CAPAG. As a result, CCS has not yet assembled an aggregate net cost analysis of the 53 CAPAG mitigation options.

Table 2. North Carolina Emissions Projections (MMTCO2e) With and Without Action

Consumption Basis Net	**1990**	**2000**	**2010**	**2020**
Projected NC Reference Case GHG Emissions	115.4	159.8	198.0	241.1
Current Estimates of Total CAPAG GHG Reductions			27.24	117.46
Projected Emissions After CAPAG Reductions			170.8	123.7
Consumption Basis Gross	**1990**	**2000**	**2010**	**2020**
Projected NC Reference Case GHG Emissions	138.5	183.5	221.8	264.9
Current Estimates of Total CAPAG GHG Reductions			27.24	117.46
Projected Emissions After CAPAG Reductions			194.5	147.4
Production Basis Net	**1990**	**2000**	**2010**	**2020**
Projected NC Reference Case GHG Emissions	107.8	153.9	190.0	231.1
Current Estimates of Total CAPAG GHG Reductions			27.24	117.46
Projected Emissions After CAPAG Reductions			162.8	113.7
Production Basis Gross	**1990**	**2000**	**2010**	**2020**
Projected NC Reference Case GHG Emissions	131.0	177.6	213.8	254.9
Current Estimates of Total CAPAG GHG Reductions			27.24	117.46
Projected Emissions After CAPAG Reductions			186.5	137.4

Figure 1. North Carolina Emissions Projections (MMTCO2e) With and Without Action

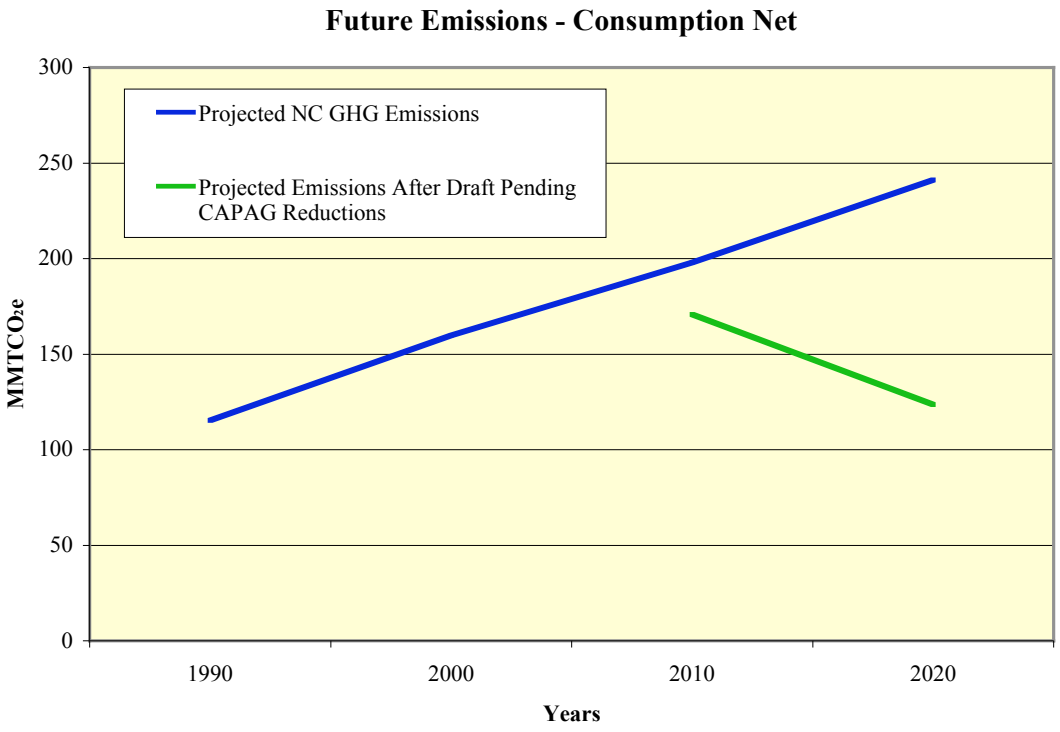

Table 3.
Residential, Commercial and Industrial Technical Work Group
Summary List of Mitigation Options

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2007–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Status of Option
		2010	2020	Total 2007-2020			
RCI-1	Demand Side Management Programs for the Residential, Commercial and Industrial Sectors						
	--Alternative Case 1: Mid-Range EE Investment	0.6	3.9	26.1	-$631	-$24	Pending
	--Alternative Case 2: High-Range EE Investment	3.0	18.3	121.4	-$2,927	-$24	Pending
RCI-2	Expand Energy Efficiency Funds	1.5	8.2	55.8	-$1,346	-$24	Completed
RCI-3	Energy Efficiency Requirements for Government Buildings	0.0	1.7	9.6	-$130	-$14	Completed
RCI-4	Market Transformation and Technology Development Programs	0.0	2.1	10.7	-$339	-$32	Completed
RCI-5	Improved Appliance and Equipment Efficiency Standards	0.0	1.0	5.4	-$336	-$62	Completed
RCI-6	Building Energy Codes	0.6	4.4	28.7	-$490	-$17	Completed
RCI-7	"Beyond Code" Building Design Incentives and Targets, Incorporating Local Building Materials and Advanced Construction	0.5	2.9	20.4	-$293	-$14	Completed
RCI-8	Education (Consumer, Primary/Secondary, Post-Secondary/ Specialist, College and University Programs)	*Not quantified*					Completed
RCI-9	Green Power Purchasing (required for state facilities) and Bulk Purchasing Programs for Energy Efficiency or Other Equipment	0.0	0.4	2.5	-$9	-$4	Pending

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2007–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Status of Option
		2010	2020	Total 2007-2020			
RCI-10	Distributed Renewable and Clean Fossil Fuel Power Generation	1.1	3.9	29.4	$28	$1	Pending
RCI-11	Residential, Commercial, and Industrial Energy and Emissions Technical Assistance and Recommended Measure Implementation	0.7	2.8	20.4	-$662	-$32	Completed
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS with RCI-1 Alternative Case 1: Mid-Range EE Investment	5.1	31.3	209.2	-$4,208	-$20	
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS with RCI-1 Alternative Case 2: High-Range EE Investment	5.5	35.0	232.0	-$4,736	-$20	
	REDUCTIONS FROM RECENT ACTIONS						
RCI-1	Demand Side Management Programs for the Residential, Commercial and Industrial Sectors	1.7	4.6	38.7			
RCI-2	Expand Energy Efficiency Funds	0.2	0.4	3.7			
RCI-6	Building Energy Codes	0.0	0.0	0.0			
RCI-9	Green Power Purchasing (required for state facilities) and Bulk Purchasing Programs for Energy Efficiency or Other Equipment	0.0	0.0	0.3			
	SECTOR TOTAL PLUS RECENT ACTIONS with RCI-1 Alternative Case 1: Mid-Range EE Investment	7.0	36.4	251.6			
	SECTOR TOTAL PLUS RECENT ACTIONS with RCI-1 Alternative Case 2: High-Range EE Investment	7.4	40.1	274.4			

Table 4.

Energy Supply Technical Work Group

Summary List of Mitigation Options

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2007–2020 (Million $)	Cost-Effective-ness ($/tCO_2e$)	Status of Option
		2010	2020	Total 2007-2020			
ES-1	Renewable Energy Incentives	0.0	0.0	0.2	$3	$13.2	Pending
ES-2	Environmental Portfolio Standard	5.7	37.7	244.6	-$3,081	-$12.6	Pending
ES-3	Removing Barriers to CHP and Clean DG	0.4	1.6	11.6	$66	$5.7	Completed
ES-4	CO_2 Tax and/or Cap-and-Trade	Under preparation					
ES-5	Legislative Changes to Address Environmental & Other Factors	Under preparation					
ES-6	Incentives for Advanced Coal	0.0	8.3	66.7	$2,135	$32.0	Pending
ES-7	Public Benefit Charge	0.7	4.5	28.4	-$685	-$24.1	Pending
ES-8	Waste to Energy	0.00	0.01	0.08	-$4	-$49.9	Pending
ES-9	Incentives for CHP and Clean DG	Combined with ES-3					Completed
ES-10	NC Greenpower Renewable Resources Program	0.0	0.0	0.2	$1	$7.9	Pending
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS (combined with RCI)	6.4	53.3	335.13	TBD	TBD	
	REDUCTIONS FROM RECENT ACTIONS (table to be added below)	TBD	TBD	TBD	TBD	TBD	
	SECTOR TOTAL PLUS RECENT ACTIONS	TBD	TBD	TBD	TBD	TBD	

Table 5.
Transportation and Land Use Technical Work Group
Summary List of Mitigation Options

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Status of Option
		2012	2020	Total 2008-2020			
TLU-1a	Land Development Planning	2.6	8.0	50.3	*Expected net savings*		Pending
TLU-1b	Multi-modal Transportation & Promotion	2.8	3.0	31.3	*Expected net savings*		Pending
TLU-3a	Feebates to raise revenue	Included in 1b			*Expected net savings*		Pending
TLU-3a	Feebates to change fleet mix	0	< 0.5	2.0	TBD	TBD	Pending
TLU-4	Truck-stop Electrification	Included in TLU-8			TBD	TBD	Pending
TLU-5	Tailpipe GHG Standards	0	8.09	40.5	TBD	-$100	Pending
TLU-6	Biofuels Bundle	1.14	3.25	20.8	TBD	TBD	Pending
TLU-7	Procure Efficient Fleets	Included in TLU-6					Pending
TLU-8	Anti-idling	0.1	0.2	1.9	TBD	-$22	Pending
TLU-9	Diesel Retrofits	TBD	TBD	TBD	TBD	TBD	Pending
TLU-10a	Fuel tax (50 cents/gallon)	6.4	13.9	95.2	*Expected net savings*		Pending
TLU-10b	Fuel tax (10 cents/gallon)	1.3	2.8	19.0	*Expected net savings*		Pending
TLU-11	Pay As You Drive Insurance	2.3	5.3	35.8	*Expected net savings*		Pending
TLU-12	Incentives for Advanced Tech Vehicles	NA	NA	NA	TBD	TBD	Pending

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Status of Option
		2012	2020	Total 2008-2020			
TLU-13	Buses – Clean Fuels	Included in TLU-6					Pending
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS	15.4	42.84	277.8	TBD	TBD	
	REDUCTIONS FROM RECENT POLICY ACTIONS	TBD	TBD	TBD	TBD	TBD	
	SECTOR TOTAL PLUS RECENT POLICY ACTIONS	TBD	TBD	TBD	TBD	TBD	

Table 6.
Agriculture, Forestry, and Waste Management Technical Work Group
Summary List of Mitigation Options

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2007–2020 (Million $)	Cost-Effective-ness ($/tCO_2e$)	Status of Option
		2010	2020	Total 2007-2020			
AFW-1	Manure Digesters & Energy Utilization	0.2	0.9	6.3	$387	$67	Pending
AFW-2	Biodiesel Production (incentives for feedstocks and production plants)	0.2	0.8	5.1	$286	$56	Pending
AFW-3	Soil Carbon Management (including organic farming incentives)	0.4	0.4	4.9	$-26	$-5	Pending
AFW-4	Preserve Agricultural Land	0.2	0.3	2.6	$294	$114	Pending
AFW-5	Agricultural Biomass Feedstocks for Electricity or Steam Production	0.003	0.01	0.1	0	$0	Pending
AFW-6	Policies to Promote Ethanol Production	0.9	6.9	38	$200	$5	Pending
AFW-7	Forest Protection – Reduced Clearing and Conversion to Nonforest Cover	1.7	4.3	31	TBD	$2	Pending
AFW-8	Afforestation and/or Restoration of Nonforested Lands	0.2	2.4	15	$18	$3	Pending
AFW-9&10	Expanded Use of Forest Biomass and Better Forest Management	1.4	3.6	37	TBD	$11	Pending
AFW-11	Landfill Methane and Biogas Energy Programs	0.2	1.9	13	TBD	TBD	Pending
AFW-12	Increased Recycling Infrastructure and Collection	0.2	0.5	4.1	$4	$1	Pending
AFW-13	Urban Forestry Measures	TBD	TBD	TBD	TBD	TBD	Pending
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS	5.72	21.89	156.86	TBD	TBD	
	REDUCTIONS FROM RECENT ACTIONS (table to be added below)	TBD	TBD	TBD	TBD	TBD	

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value	Cost-Effective-ness	Status of Option
		2010	2020	Total 2007-2020	2007–2020 (Million $)	($/tCO$_2$e)	
	SECTOR TOTAL PLUS RECENT ACTIONS	TBD	TBD	TBD	TBD	TBD	

Table 7.

Cross Cutting Issues Technical Work Group

Summary List of Mitigation Options

	Mitigation Option	GHG Reductions ($MMtCO_2e$)			Net Present Value	Cost-Effective-ness ($/tCO_2e$)	Status of Option
		2010	2020	Total 2007-2020	2007–2020 (Million $)		
CC-1	GHG Inventories and Forecasts	*Not Quantified*					Completed
CC-2	GHG Reporting	*Not Quantified*					Completed
CC-3	GHG Registry	*Not Quantified*					Completed
CC-4	Public Education and Outreach	*Not Quantified*					Completed
CC-5	Adaptation	*Not Quantified*					Completed
CC-6	Options for Goals or Targets (for CAPAG in support of LCGCC)	*Not Quantified*					Completed