



www.ncclimatechange.us

RESIDENTIAL, COMMERCIAL & INDUSTRIAL (RCI) Sector GHG (Greenhouse gas) Reduction Policy Options

Prepared for RCI Technical Working Group (TWG) Call #2, May 9, 2006, 10:30 AM

Potential Emission Reductions <u>1/</u>	Potential Cost or Cost Savings <u>1/ 2/</u>
High (H): At least 1 Million Metric Tons (MMT) carbon dioxide equivalent (CO ₂ e) per year by 2020 (~1% of current NC emissions)	High (H): \$50 per Metric Ton CO ₂ e (MTCO ₂ e) or above
Medium (M): From 0.1 to 1 MMT CO ₂ e per year by 2020	Medium (M): \$5-50/MTCO ₂ e
Low (L): Less than 0.1 MMT CO ₂ e per year by 2020, or 1 MMT CO ₂ e by 2050	Low (L): Less than \$5/MTCO ₂ e
Uncertain (U): Not able to estimate at this time	Uncertain (U): Not able to estimate at this time
<u>1/</u> Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently from other measures.	
<u>2/</u> Costs are denoted by a positive number. Cost savings (i.e., “negative costs”) are denoted by a negative number.	

NOTE: This version of the “Options Catalog” includes **in highlighted text** RCI suggestions from TWG following made during and following RCI TWG Call #1. Also included are rough, initial notations on potential emissions reduction and potential cost or net cost savings compiled by Center for Climate Change staff. These estimates are intended to give TWG members an approximate idea of the savings and costs that can be expected from policy options, but are NOT intended as definitive categorizations, and are open to re-estimation as needed.

Definition of “Priorities for Analysis”:

- **High:** High priority options will be analyzed first.
- **Medium:** Medium priority options will be analyzed next, time and resources permitting.
- **Low:** Low priority options will be analyzed last, time and resources permitting.

* Options marked with an asterisk (*) indicate options that are at least partially “base case” policies, i.e., that have been considered or undertaken at some level in North Carolina.

** Options marked with a double asterisk (**) indicate options that are included as recommendations in the September 1, 2005 NC DENR Report under the Clean Smokestacks Act of 2002.

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-1	Energy Efficiency Programs, Funds, and Goals					
1.1	Demand Side Management (DSM) Programs for electricity, natural gas, propane, fuel oil*		High	Cost Savings/ Low Cost	Co-benefits include transmission/distribution system costs reduction. Significant potential overlap with many other options.	Electric Utilities providing DSM programs include: Carolina Power and Light – Progress Energy, Dominion Power, Duke Energy. Programs mostly information only, with a few financing programs http://www.seea.us/PDFs/SEEA DSM.pdf

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-1	Energy Efficiency Programs, Funds, and Goals (continued)					
1.2	Energy Efficiency Funds (e.g. Public Benefit Funds) administered by State agency, utility, or 3rd party (e.g. Energy Trust)**		High	Cost Savings/ Low Cost	[As above]	CSA recommendation LT-5, <i>Develop a Public Benefits Fund</i> NCUC is presently investigating several issues involving DSM and Energy Efficiency in the current Integrated Resource Planning Docket No. E-100, Sub 103. This investigation includes Public Benefit Funds.
1.3	Energy Efficiency Requirements (e.g. Utility Savings Goals or Energy Portfolio Standards) **		High	Cost Savings/ Low Cost	[As above]	CSA recommendation LT-4, <i>Continue to Establish and Expand Efforts to Formulate and Adopt Renewable Portfolio Standards and Environmental Portfolio Standards</i> May wish to tie to or repeat current NC legislation proposals (Urlaub/Kalland)
1.4	Market transformation and technology development programs		High	Cost Savings/ Low Cost		Need more info on definition (TWG Member Suggestion)
RCI-2	Appliance Standards					
2.1	Development of State-level Appliance Efficiency Standards*		Low-High	Cost Savings/ Low Cost	Feasibility enhanced by ongoing effort in nearby states	State Energy Plan (SEP) recommends ENERGY STAR from 2008 on
2.2	State Voices Support for Adoption of More Stringent Federal-level Appliance Efficiency Standards		Low-High	Cost Savings/ Low Cost	Potential overlap with previous option	(Elaboration based on TWG Member request)

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-3	Buildings					
3.1	Improved Building Codes*		High	Cost Savings/ Low Cost	Potential to also yield water savings, comfort/air quality improvements.	<p>NC has building energy codes modeled on IEC 2000 for residential and commercial and enforced by Building Code Council, SEP R-4 recommends reviewing compliance and potential improvement. Analyses have been undertaken by Jeff Tiller at ASU Will want to make more specific as TWG work continues</p> <p>Building codes are enforced by the Building Code Council and the North Carolina Department of Insurance</p>

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-3	Buildings (continued)					
3.2	Promotion and Incentives for Improved Design and Construction (e.g. LEED ¹ , green buildings, Healthy Built Homes) *		Medium/ High	Cost Savings/ Low Cost	Potential overlap with previous option [co-benefits as above]	<p>NC Green Building Technology database provides searchable database on case studies http://www.ncgreenbuilding.org/site/ncg/index.cfm?</p> <p>S2001, H1272 required state government to review the use of High Performance Building guidelines in 7 buildings. http://www.ncga.state.nc.us/Sessions/2001/Bills/House/HTML/H1272v6.html</p> <p>NC Healthy Built Homes http://healthybuilthomes.org/</p> <p>SEP recommends : a. ENERGY STAR home requirements by county. b. energy efficient mortgages. c. develop further programs to support privately funded projects d. Require high performance building standards for permits to build privately funded school projects</p> <p>A TWG member recommends support of an energy use reduction mandate for all publicly owned buildings, 40% new and 10% existing by {set date}.</p>

¹ LEED = Leadership in Energy and Environmental Design, a national building certification program.

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-3	Buildings (continued)					
3.3	Training and Education for Builders and Contractors (e.g. HVAC ² sizing, duct sealing, energy analysis program, C&D waste recycling, renewable energy system installation, water distribution systems) *		Medium	Cost Savings/ Low Cost	[As above]	Advanced Energy Corporation has ongoing programs in this and similar areas
3.4	Training of Building Code and other Officials in Energy Code Enforcement*		Medium	Cost Savings/ Low Cost		Recommended in State Energy Plan
3.5	Building Commissioning and Recommissioning, including Energy Tracking and Benchmarking		Medium	Cost Savings/ Low Cost		
3.6	Energy Management Training/Training of Building Operators*		Medium	Cost Savings/ Low Cost		SEP recommends training programs for state building operators and for private building operators
3.7	Increased Use of Blended Cement (substituting fly ash or other pozzolans for clinker reduces CO ₂ emissions)		Low/ Medium	Cost Savings/ Low Cost	May provide modest avoided waste disposal co-benefit, depending on standard practice	(TWG member suggests should be in Section 6)
3.8	Reduction of Emissions from Diesel Engines Used in New Construction Developments		Low	Low Cost		For example, require all new diesel engines for construction equipment meet low emission standards within 5 years

² HVAC = Heating, Ventilation, and Air Conditioning

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-3	Buildings (continued)					
3.9	Support for growth and health of the residential building performance specialist industry.		Uncertain	Cost Savings/ Low Cost		TWG member input
3.10	Continuing Education for building Design Professionals, including architects, engineers, developers, contractors, urban planners, and realtors		Uncertain	Cost Savings/ Low Cost		TWG member input (originally suggested for section 4)
3.11	Promote work scheduling and telecommuting as means of reducing building energy consumption		Uncertain	Uncertain		For example, can moving to 4 10-hour workdays from 5 8-hour shifts save energy? How can telecommuting that affect building use efficiency (would need co-ordination with Transport TWG)? TWG member input
3.12	Promotion of the use of locally created and available building materials		Uncertain	Uncertain		TWG member input
RCI-4	Education and Outreach					
4.1	Consumer education programs** (Probable overlap with Cross-Cutting TWG)		Uncertain	Cost Savings/ Low Cost		Potential contribution difficult to estimate CSA Recommendation A-7: Public Education on Climate Change
4.2	Introduce in School Curriculum (Probable overlap with Cross-Cutting TWG)		Uncertain	Cost Savings/ Low Cost		[As above] NC Air Aware provides info for teachers, focus on ozone. http://daq.state.nc.us/airaware/

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-5	Pricing and Purchasing					
5.1	Green Power Purchasing*		Medium/ High	Low - High		The North Carolina Green Power Program has been in place for approximately 3 years. It solicits voluntary contributions from utility customers for use in subsidizing green power purchases in North Carolina (TWG member input) SEP recommends state commit to state-use purchases of 25% growing to 100% Interaction with RPS option.
5.2	Bulk Purchasing Programs for Energy Efficiency or other Equipment (Public or Private sector)		Low - High	Cost Savings/ Low Cost		May interact with utility programs. May wish to use in combination with standards for appliance purchases by state agencies.
5.3	Net-metering policies (for example, for electricity consumers who install on-site combined heat and power or, distributed generation fueled with renewable or fossil fuels) *		Low / Medium	Cost Savings/ Low Cost		Policy on net metering has been established by the NCUC, and corresponding tariffs approved, in Docket No. E-100, Sub 83. The establishment of Small Generator Interconnection Standards in Docket No. E-100, Sub 101 is designed to streamline the process for customers seeking to install net metering applications, as well as other small renewable energy generation applications.(TWG member input)

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-5	Pricing and Purchasing (continued)					
5.4	Time of Use Rates (including, for example, rates that vary by time of day so as to provide consumers with signals to reduce peak demand, or to offer incentives for on-peak distributed generation)*		Low / Medium	Cost Savings/ Low Cost	Significant utility system co-benefits	Time-of-use rates and real time rates for electric customers are currently in place. Time of use rates have been in effect for at least the last twenty years, and, with the exception of Dominion NC Power, real time rates have been available for at least the last ten years.(TWG member input)
RCI-6	Technology-Specific Policies					
6.1	Incentives for Renewable Energy Applications (Solar roofs, water heaters, etc.)		High	Medium/ High	Programs could help to lower capital and installation costs	Incentives could reduce first cost to a specific payback level; could be coupled with requirements for new buildings
6.2	Clean Combined Heat and Power *		High	Cost Savings - Medium Cost	Cost dependent on price of natural gas; interconnection an issue; utility system co-benefits.	SEP recommendation Consider use of waste heat from new electricity generation units to substitute for fossil-fueled heat in the RCI sectors.
6.3	Promotion and Tax or Other Incentives (e.g. Energy Star, credits for solar hot water)		High	Cost Savings/ Low Cost	Interaction with appliance standards, utility programs.	
6.4	Appliance Recycling/Pick-Up Programs*		Low	Cost Savings/ Low Cost	Long-term impact uncertain	SEP recommends appliance-swapping Consider as an implementation strategy providing waiver of dumping and disposal fees where appliances are replaced with Energy Star appliances

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-6	Technology-Specific Policies (continued)					
6.5	White Roofs, Rooftop Gardens, and Landscaping (including Shade Tree Programs)*		Medium/ High	Cost Savings/ Low Cost	Results likely to vary substantially with design	SEP recommends developing and implementing further programs to promote 'Cool Cities' and white roof Programs. May wish to include a requirement for government buildings to have white roofs.

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-6	Technology-Specific Policies (continued)					
6.6	Focus on specific end-uses/technologies: window AC units, lighting, water heating, plug loads, networked PC management, power supplies, motors, pumps, boilers, etc. Consumer products programs, may include incentives, retailer training, marketing and promotion, education, etc *, **		(By option, range from Low to High)	Cost Savings/ Low Cost	Interaction with appliance standards, utility programs.	<p>In 1980 the North Carolina Utility Commission (NCUC) established a systems benefit charge, creating a non-profit corporate to administer the funds with the charter "to encourage energy efficient economic development in North Carolina." The non-profit Advanced Energy operates programs for subsidized and market-rate home construction, and provides energy efficiency assistance to North Carolina industry. http://www.advancedenergy.org/</p> <p>State Energy Office is involved in federal Industries of the Future.</p> <p>CSA recommendation A-5: <i>Promote and Support Efforts to Establish North Carolina as a World Leader in GHG, Non-Carbon Fuels and Energy Efficiency Technologies</i></p> <p>SEP recommends further incentives for high efficiency motors</p>

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-7	Non-Energy Emissions (HFCs, PFCs, SF₆, CO₂ Process Emissions)					
7.1	Participation in Voluntary Industry-Government Partnerships		Uncertain	Medium		For example, Climate Leaders, a USEPA program (see that "...encourages companies to develop long-term comprehensive climate change strategies and set [GHG] emissions reduction goals." ³)
7.2	Process Changes/Optimization (Improving manufacturing so as to require less energy and/or release less GHG process gases to the atmosphere)		Uncertain	Uncertain		Impact, cost likely highly process-specific
7.3	Leak Reduction /Capture, Recovery and Recycling of Process Gases		Medium	Uncertain		For example, solvents used in electronics industry, recovery of refrigerants, reduction of leaks in refrigeration equipment
7.4	Use of Alternative Gases (other HFCs, hydrocarbon coolants/refrigerants, etc.)		Medium/High	Low/Medium		For example, use of lower Global Warming Potential gases in specific applications, such as hydrocarbons in place of HFCs in commercial refrigeration
7.5	Cement Industry: Use of Alternative Fuels					Option removed since no cement plants in NC

³ "Companies participating in Climate Leaders set a corporate-wide GHG reduction goal and inventory their emissions to measure progress". See <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsNationalPartnerships.html>

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-8	GHG Emissions-Specific Goals and Policies					
8.1	Support for switching to less carbon-intensive fuels (coal and oil to natural gas or biomass)		Medium/High	Cost Savings/ Medium Cost	Cost dependent on relative fuel prices	Instances where fuel-switching is applicable (for example, electricity to natural gas for water heat, fossil fuels to biomass for space/process heat)
8.2	Industry-Specific Emissions Cap and Trade Programs		Medium/High	Low/ Medium	Highly dependent on specification of trading systems	For example, participation of industrial consumers in a statewide or regional program of trading emissions allowances
8.3	Voluntary Emissions Targets for Industrial Operations		Uncertain	Uncertain		
8.4	Small-source Aggregation (to achieve reductions for groups of smaller-volume energy consumers)		Uncertain	Uncertain		For example, programs allowing the aggregation of commercial or residential consumers to set joint emissions targets, pursue
8.5	Negotiated Emissions or Energy Savings Agreements*		Uncertain	Uncertain		SEP recommendation. For example, agreements between government and industrial or other large GHG emitters to reduce emissions on a specific time-frame

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-9	Other					
9.1	Government Agency Requirements and Goals (including procurement)*		Uncertain	Cost Savings/ Low Cost		Potential overlap with other options SEP recommends state procurement of environmentally preferable products
9.2	Focus policies and programs for building energy efficiency on specific market segments: existing homes (weatherization), new construction, apartments, low income, etc. *,**		Medium/ High	Cost Savings/ Low Cost		Potential overlap with other options NC Weatherization Assistance Program, for low income earners SEP recommends extending weatherization
9.3	Reinvestment Fund* (providing financing for energy-efficiency and other GHG emissions-reduction efforts)		Uncertain	Cost Savings/ Low Cost		Potential overlap with other options State Energy Office's has low-interest energy loan program, SEP recommends restructuring the underwriting provisions
9.4	Municipal Energy Management (programs of energy-efficiency improvement coordinated at the municipal level)		Uncertain	Uncertain		Potential overlap with other options
9.5	Focus on Small and Medium Enterprises (SMEs)* (Provide resources for small and medium businesses to evaluate and pursue energy efficiency/GHG emissions reduction activities)		Uncertain	Uncertain		Potential overlap with other options Industrial Assessment Center at NC State University provides energy conservation and cost reduction assessments to small to medium sized enterprises http://www.mae.ncsu.edu/Centers/IAC/

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-9	Other (continued)					
9.6	Industrial ecology/ by-product synergy		Uncertain	Uncertain		For example, promote review and modification of industrial processes to encourage waste reduction, highly efficient use of materials and energy.
9.7	Industrial Audits* (For example, make available/encourage use of industrial audits to identify energy-efficiency, other GHG-emissions savings opportunities)		Medium/ High	Cost Savings/ Low Cost		Industrial Extension Services at NC State University provides surveys and audits of industrial operations to provide suggestions on cost savings from energy efficiency http://www.ies.ncsu.edu/energysurveys/
9.8	Extend green campus initiatives to all university buildings*		Medium	Cost Savings/ Low Cost		SEP recommendation
9.9	Energy benchmarking, measurement, and tracking programs for municipal and state buildings*		Medium	Cost Savings/ Low Cost		SEP recommendation
9.10	Integration with Regional Demand Response Initiatives/recommendations*		Medium	Cost Savings/ Low Cost		SEP recommendation
9.11	Water use reduction		Low/ Medium	Cost Savings/ Low Cost		TWG member input

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
RCI-10	Solid Waste and Wastewater Management					
10.1	Solid Waste Source Reduction		Medium/High	Uncertain		
10.2	Solid Waste Recycling		High	Uncertain	Materials recovery, reduction of energy requirements for raw materials production	
10.3	Separation and Composting of Organic Materials in Solid Wastes		Uncertain	Uncertain	Co-production of soil amendments	
10.4	Capture/Use in buildings or industry of Methane from Landfills		Uncertain	Uncertain	Fossil fuel displacement a co-benefit	
10.5	Capture/Use of Methane from Wastewater Treatment		Uncertain	Uncertain	Fossil fuel displacement a co-benefit	