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[SUMMARY TABLE THAT WILL ULTIMATELY BE APPENDED TO MITIGATION OPTIONS DOCUMENT AS QUANTIFICATION IS COMPLETED]

Table x.
Residential Commercial and Industrial Technical Work Group
Summary List of Pending Mitigation Options

#	Mitigation Option Name	2010 GHG Savings (MMtCO ₂ e)	2020 GHG Savings (MMtCO ₂ e)	2007-2020 GHG Savings (MMtCO ₂ e)	Cost-Effectiveness (\$/MtCO ₂ e)
RCI-1	Demand Side Management Programs for the Residential, Commercial and Industrial Sectors				
RCI-2	Expand Energy Efficiency Funds				
RCI-3	Energy Efficiency Requirements				
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 Mandatory Programs, Incorporating Local Building Materials and Advanced Construction				
RCI-8	Education (Consumer, Primary/Secondary, Post-Secondary/ Specialist, College and University Programs)				
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				
RCI-11	Residential, Commercial, and Industrial Energy and Emissions Audits and Recommended Measure Implementation				

NOTES TO RCI TWG Members: This document presents initial, partial drafts of Mitigation Option Descriptions for those options that you and the CAPAG have designated as being high priority for elaboration and further analysis. As we discussed during the RCI TWG call of 8/10/06, what we have done, to provide a starting point for TWG discussion and development of mitigation options descriptions, is to take the text from the “long list” Catalog of Options we worked with for the first several TWG calls, match it to the “short list” (high priority) options into which the long list options were consolidated, and put it into the relevant portions of the Options Description Template. We’ve also at some points in the Template added generic text in *italics* for you to consider as a starting point for some Options Descriptions, as well as some questions, also in *italics*, for you to consider as you think about how these Options should be defined.

Numbers in parentheses (“#.#”) identify text as coming from entries in the original “long list” catalog of options (for example, the “Residential, Commercial, and Industrial (RCI) Technical Work Group Catalog of State Climate Mitigation Options”, posted for the

6/29/06 RCI TWG call on

[http://www.ncclimatechange.us/Residential Commercial Industrial.cfm](http://www.ncclimatechange.us/Residential_Commercial_Industrial.cfm)).

As in the Catalog of Options, the following definitions apply:

* 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.

*** Options marked with a triple asterisk (***) indicate options that are included in or consistent with recommendations by the North Carolina Legislative Commission on Global Climate Change

Acronyms used in several places in this document:

CAPAG – Climate Action Plan Advisory Group

CSA – Clean Smokestacks Act of 2002

DENR – Department of Environment and Natural Resources

DSM - Demand Side Management

HVAC – Heating, Ventilation, and Air Conditioning

RCI – Residential, Commercial, and Industrial

SEP – State Energy Plan

TWG – Technical Working Group

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

Mitigation Option Description

This mitigation option sets goals for increasing the efficiency of use of electricity, natural gas, and other fuels in North Carolina, and considers program and funding mechanisms that might be used to achieve these goals. Efficiency improvements can be obtained through energy efficiency programs, funds, and/or requirements. This option focuses on what are typically termed DSM activities, and is designed to work in tandem with other strategies under consideration by the RCI TWG and by other TWGs that can also encourage efficiency gains.

Mitigation Option Design

Elements of this Option Design include:

- Demand Side Management (DSM) Programs for electricity, natural gas, propane, fuel oil (1.1) * ***
- *Provide incentives within DSM programs to [a]dd photovoltaic panels on new commercial buildings and many new homes; add solar hot water heaters on homes and other buildings. (Suggested by CAPAG member, part of “Vision of NC Future”; not clear if intent was as a voluntary or mandatory option)) (3.16)*
- Appliance Recycling/Pick-Up Programs*. Consider as an implementation strategy providing waiver of dumping and disposal fees where appliances are replaced with Energy Star appliances. These types of programs would target retiring of working but inefficient appliances (6.3)
- *Include in DSM programs [s]olar-powered (absorption) air conditioning for residential and commercial applications (suggested during CAPAG meeting #2) (6.7)*
- *Include in DSM programs [p]romotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)*
- *Include in DSM programs [f]ocus on specific enduses/technologies: window AC units, lighting, water heating, plug loads, networked PC management, power supplies, motors, pumps, boilers, etc. *, ** (6.9)*
- *Include in DSM programs LED, other efficient lighting (1.1)*

[Insert text as appropriate]

- **Goals:** *X% of projected electricity/gas/other sales saved through efficiency programs?
Y% of utility revenue spent on efficiency programs?*
- **Timing:** *Start ramping up programs from existing levels starting in 20XX, reaching goal levels by 20YY?*

- **Coverage of parties:**
 - *Utilities?*
 - *State Agencies?*
 - *Third-party efficiency Providers?*
 - *Regulators?*
 - *Others?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Comprehensive State Survey of Energy and Water Efficiency Features in Existing Residential and Commercial Buildings - To provide information on the potential for energy efficiency in NC buildings (3.21)
- Review of 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)* Review could consider the impact of NO_x and power factor requirements on net-metering and availability of information for small customers (5.3).
- Utility Rate Reform - At CAPAG Meeting on 5/23, it was suggested that there is a need to look harder at rate issues in NC, including decoupling (of utility revenues from sales) and rate design, with a specific focus on the impacts of rate design on greenhouse gas emissions (5.5)
- Implementation should include utility incentives to provide substantial programs, and also substantial incentives for consumers to participate. TWG members noted that that energy efficiency programs should be “cost justified” (1.1)
- Consumer products programs, may include incentives, retailer training, marketing and promotion, education, etc (6.9)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** - Could include R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia (9.12)

Related Policies/Programs in Place

- Electric Utilities providing DSM programs include: Progress Energy, Dominion Power, Duke Energy. Programs mostly information only, with a few financing programs¹.

¹ Other ongoing programs in North Carolina that are relevant to this option include the Industrial Extension Service (IES) at NCSU, energy and water efficiency programs at the Division of

http://www.seea.us/PDFs/SEEA_DSM.pdf Gas utilities and other fuel provider organizations include Piedmont Natural Gas, Scana - Public Service Company North Carolina (PSCNC), North Carolina Propane Gas Association, North Carolina Petroleum Marketers Association, and Carolina Fuel Institute. (1.1)

- At the 5/23 CAPAG meeting, the Environments for Living program (<http://www.eflhome.com/>) was noted as an example, with builders having built 80,000 homes in the South and Southwest under the program in the last five years. Also, it was noted that solar water heating is included in the NC Green Power Program. (3.16)
- 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) (5.3)
- SEP recommends appliance swapping. Program exists already in NC to dispose of a refrigerator for free. (6.3)
- 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/> (6.9)
- State Energy Office is involved in federal Industries of the Future. CSA recommendation A-5: Promote and Support Efforts to Establish North Carolina as a World Leader in GHG, Non-Carbon Fuels and Energy Efficiency Technologies SEP recommends further incentives for high efficiency motors (6.9)

Types(s) of GHG Reductions

[Insert text as appropriate]

Principally, the reduction in GHG emissions (largely CO₂) from avoided electricity production and avoided on-site fuel combustion. Less significant are the reduction in CH₄ emissions from avoided fuel combustion and avoided pipeline leakage. Other GHG impacts are also conceivable, but are likely to be small (black carbon, N₂O) and/or very difficult to estimate (materials use, life cycle, market leakage, etc.).

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**

Pollution Prevention and Environmental Assistance (DPPEA), Western Waste Reduction Partners (WRP) and other similar programs. The North Carolina State Energy Office also offers a number of programs in many sectors.

- **Quantification Methods:** The CAPAG suggests reviewing the interplay of approaches in RCI-1 through RCI-3 when analyzing these options

- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- Co-benefits could include transmission/distribution system costs reduction (1.1)

Costs

Feasibility Issues

- TWG members noted that costs and performance vary substantially between measures *that might be considered for DSM programs*, that some *measures* may present low capital costs and higher operating costs (or vice versa), and that there is uncertainty about the costs and savings for some measures. (1.1)
- Interaction with appliance standards and utility programs (6.9)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-2 Expand Energy Efficiency Funds

Mitigation Option Description

This mitigation option involves the collection of Energy Efficiency Funds, through an additional fee collected on utility bills, a tax, or some combination of methods. The collected Funds are then disbursed to assist Residential, Commercial, and Industrial energy consumers in implementing energy efficiency improvements on their premises, or to fund programs to support energy efficiency improvements and/or greenhouse gas emissions reductions.

Mitigation Option Design

Elements of this Option Design include:

- Expand Energy Efficiency Funds (for example, Public Benefit Funds) administered by State agencies, utilities, or 3rd parties (such as Advanced Energy Corporation)** *** (May wish to consider breaking this option into public and private components) (1.2)
- Performance-based Contracting for funding of energy efficiency improvements - Capital costs paid back through energy savings (5.4)
- Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)
- Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)
- Focus on specific enduses/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 *, ** (6.9)
- Reinvestment Fund* (providing financing for energy-efficiency and other GHG emissions-reduction efforts) Use in part to create infrastructure to deliver energy- efficiency *and* renewable technologies. Allow state agencies to keep net savings from energy efficiency actions or to reinvest savings in energy-efficiency or other projects. It was also noted that the Reinvestment Fund could take the form of a Special fund for capital for businesses developing renewable energy sources, such as the Pennsylvania “Energy Harvest” program. It was suggested that other programs adopted by Pennsylvania may also be applicable to NC. (9.3)

[Insert text as appropriate]

- **Goals:** *X mils/kWh collected for fund? Y% of projected electricity/gas/other sales saved through efficiency programs covered by fund?*

- **Timing:** *Start ramping up fund collection, distribution from existing levels starting in 20XX, reaching goal levels by 20YY?*
- **Coverage of parties:**
 - *Utilities?*
 - *State Agencies?*
 - *Third-party efficiency Providers?*
 - *Regulators?*
 - *Others?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Provide programs with substantial incentives for consumers to participate. (1.2)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** - Could include R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia (9.12)

Related Policies/Programs in Place

- CSA recommendation LT-5, *Develop a Public Benefits Fund* (1.2)
- 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. (1.2)
- 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/> (6.9)
- The State Energy Office’s has a low interest energy loan program, [for which the] SEP recommends restructuring the underwriting provisions. It was noted during the 5/23 CAPAG meeting that the NC Tax Credit for Renewable Technology Investment had “sunsetted” (lapsed), and should be brought back (or replaced with a program with similar goals). (9.3)

Types(s) of GHG Reductions

[Insert text as appropriate]

As with RCI-1, this option would principally yield reductions in GHG emissions (largely CO₂) from avoided electricity production and avoided on-site fuel combustion. Less significant are the

reduction in CH₄ emissions from avoided fuel combustion and avoided pipeline leakage. Other GHG impacts are also conceivable, but are likely to be small (black carbon, N₂O) and/or very difficult to estimate (materials use, life cycle, market leakage, etc.).

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:** The CAPAG suggests reviewing the interplay of approaches in RCI-1 through RCI-3 when analyzing these options.
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- Co-benefits could include transmission/distribution system costs reduction. (1.2)
- Would help to provide local employment and grow renewable energy use (9.3)

Costs

Feasibility Issues

- Costs for this option are uncertain, depending on measures included (1.2)
- Interaction with appliance standards and utility programs *needs to be taken into account* (6.9)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-3 Energy Efficiency Requirements

Mitigation Option Description

This mitigation option would require utilities to achieve specified levels of improvement in the efficiency of energy use by their customers, and would require public agencies to improve their efficiency of energy use.

Mitigation Option Design

Elements of this Option Design include:

- Energy Efficiency Requirements (e.g. Utility Savings Goals or Energy Portfolio Standards)
** May wish to consider breaking this option into public and private components (1.3).
- Add Photovoltaic Panels on New Commercial Buildings and Many New Homes; Add Solar Hot Water Heaters on Homes and Other Buildings. Suggested by CAPAG member, part of “Vision of NC Future”. (not clear if intent was as a voluntary or mandatory option) (3.16)
- Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)
- Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)
- Focus on specific enduses/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 *, ** (6.9)

[Insert text as appropriate]

- **Goals:** *Requirement of X% of projected utility electricity/gas/other sales saved through efficiency programs? Requirement of Y% of utility revenue spent on customer-sited efficiency? For public agencies, required Z% improvement in overall energy efficiency?*
- **Timing:** *Start ramping up efficiency efforts from existing levels starting in 20XX, reaching goal levels by 20YY?*
- **Coverage of parties:**
 - *Utilities?*
 - *State Agencies?*
 - *Third-party efficiency Providers?*
 - *Regulators?*
 - *Others?*

- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** - Could include R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia. (9.12)
- Comprehensive State Survey of Energy and Water Efficiency Features in Existing Residential and Commercial Buildings - To provide information on the potential for energy efficiency in NC buildings (3.21)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** (9.12)

Related Policies/Programs in Place

- CSA recommendation LT-4, Continue to Establish and Expand Efforts to Formulate and Adopt Renewable Portfolio Standards and Environmental Portfolio Standards. May wish to tie to or repeat current NC legislation proposals (Urlaub/Kalland) The North Carolina Utilities Commission has a study on the costs and benefits of an RPS underway (1.3)
- At the 5/23CAPAG meeting, the Environments for Living program (<http://www.eflhome.com/>) was noted as an example, with builders having built 80,000 homes in the South and Southwest under the program in the last five years. Also, it was noted that solar water heating is included in the NC Green Power Program. (3.16)
- 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/>. (6.9)
- The State Energy Office is involved in federal Industries of the Future. CSA recommendation A-5: “Promote and Support Efforts to Establish North Carolina as a World Leader in GHG, Non- Carbon Fuels and Energy Efficiency Technologies”. SEP recommends further incentives for high efficiency motors (6.9)

Types(s) of GHG Reductions

As with RCI-1 and RCI-2, this option would principally yield reductions in GHG emissions (largely CO₂) from avoided electricity production and avoided on-site fuel combustion. Less significant are the reduction in CH₄ emissions from avoided fuel combustion and avoided pipeline leakage. Other GHG impacts are also conceivable, but are likely to be small (black carbon, N₂O) and/or very difficult to estimate (materials use, life cycle, market leakage, etc.).

[Insert text as appropriate]

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- Co-benefits could include transmission/distribution system costs reduction (1.3).

Costs

Feasibility Issues

- Costs for this option are uncertain, depending on the measures included (1.3)
- *Potential* [i]interaction with appliance standards and utility programs (6.9)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-4 Market Transformation and Technology Development Programs

Mitigation Option Description

Market transformation is a relatively new term for energy efficiency programs that focus on voluntary efforts implemented by non-utility organizations to encourage greater uptake by consumers (residential, commercial, and industrial, as well as the professionals that service energy-using equipment) of cost-effective energy conservation practices. Programs to develop technologies to improve energy efficiency and/or to expand the use of renewable energy sources are also a part of this mitigation option.

Mitigation Option Design

This option would include the formation of a regional market transformation organization, modeled on the successful Northwest Energy Efficiency Alliance (NEEA), possibly together with nearby states. This organization would be a useful complement to the electricity and natural gas efficiency options RCI-1 through RCI-3. Such an organization could focus on products and sectors in a manner that could complement what would otherwise be provided through utility or public benefit-charge funded efficiency programs.

Elements of this Option Design include: [The TWG may wish to edit this list to separate the types of programs/approaches to be included and the types of appliances/equipment/devices covered]

- Market transformation and technology development programs - Could include market transformation for improved electric motors and drives, heat pumps. Could include industry/government partnerships. May also wish to include mobile homes under this option (1.4)
- Incentives for Renewable Energy Applications *** (Solar roofs, water heaters, etc.), including tax incentives. Incentives could reduce first cost to a specific payback level; could be coupled with requirements for new buildings (6.1)
- Appliance Recycling/Pick-Up Programs* Consider as an implementation strategy providing waiver of dumping and disposal fees where appliances are replaced with Energy Star appliances. This program would target retiring of working but inefficient appliances. (6.3)
- Capture and use process heat from industrial and commercial operations (6.6)
- Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)
- Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)
- Focus on specific enduses/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 *, ** (6.9)

- Small-source Aggregation (to achieve reductions for groups of smaller-volume energy consumers). For example, programs allowing the aggregation of commercial or residential consumers to set joint emissions targets, pursue *savings through bulk purchases of efficient equipment*. (8.4)
- Focus programs for building energy efficiency on specific market segments: existing homes (weatherization), new construction, apartments, low income, etc. *,** (9.2)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** (9.12)
- Direct or Indirect support for commercialization and production; Indirect support for development*** (9.13)

[Insert text as appropriate]

- **Goals:**
- **Timing:** *Set up agency/agencies in 20XX? Start activities in 20YY?*
- **Coverage of parties:**
 - *Retailers?*
 - *Non-profit consortia?*
 - *Consumers associations?*
 - *State agencies?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Specific implementation measures mentioned as possible for this option include tax credits, low/no interest loans, and similar financial incentives to business, industries and commercial firms to upgrade their equipment (including manufacturing and pollution control equipment) to more energy efficient technologies. The latter approach is especially important for small manufacturers, and could just be access to micro-loans. (6.1)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** - Could include R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia (9.12)
- Could include patent protection, R&D tax credits, production subsidies or tax credits to firms bringing new technologies to market, tax credits or rebates for new technology buyers, government procurement, and demonstration projects (9.13)

- Comprehensive State Survey of Energy and Water Efficiency Features in Existing Residential and Commercial Buildings - To provide information on the potential for energy efficiency in NC buildings (3.21)

Related Policies/Programs in Place

- SEP recommends appliance swapping. Program exists already in NC to dispose of a refrigerator for free. (6.3)
- 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/>. (6.9)
- State Energy Office is involved in federal Industries of the Future. CSA recommendation A-5: *Promote and Support Efforts to Establish North Carolina as a World Leader in GHG, Non- Carbon Fuels and Energy Efficiency Technologies*. SEP recommends further incentives for high efficiency motors
- NC Weatherization Assistance Program, for low income earners; SEP recommends extending weatherization (9.2)

Types(s) of GHG Reductions

[Insert text as appropriate]

GHG impacts are similar in nature to those noted for RCI-1 through RCI-3 above.

Estimated GHG Savings and Costs per MTCO_{2e}

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- Co-benefits could include transmission/distribution system costs reduction. (1.4)
- Programs could help to lower capital and installation costs (6.1)

Costs

Feasibility Issues

- Interaction with appliance standards and utility programs (6.9)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-5 Improved Appliance and Equipment Efficiency Standards

Mitigation Option Description

Appliance efficiency standards reduce the market cost of energy efficiency improvements by incorporating technological advances into base appliance models, thereby creating economies of scale. Appliance efficiency standards can be implemented at the state level for appliances not covered by federal standards.

Mitigation Option Design

This mitigation option could involve the replication of standards adopted in other states for appliances not covered by federal standards. It also could involve the State, possibly together with other states in the region, advocating for stronger federal appliance efficiency standards where this is technically feasible and economically justified.

Elements of this Option Design include:

- Development of State-level Appliance Efficiency Standards* One or both of 2.1 and 2.2 should be defined broadly enough to include, for example, commercial sector, and IT equipment. (2.1)
- State Voices Support for Adoption of More Stringent Federal-level Appliance Efficiency Standards. (2.2)
- Should be defined broadly enough to include, for example, commercial sector, and IT equipment. (2.2)
- May wish to consider design for recycling of materials in appliances as part of standards (2.1, 2.2)
- Include water use reduction as a criterion for appliance efficiency improvement (9.11)

[Insert text as appropriate]

- **Goals:** *Increase stringency of standards in [areas] to the level of those in [other states with aggressive standards]?*
- **Timing:** *Develop new standards by 20XX? Standards in force by 20YY?*
- **Coverage of parties:**
 - *State codes and standards enforcement agencies?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- *Appliance Standards promulgated by legislation or developed administratively*
- *Assistance programs to help low-income consumers with purchase of appliances meeting more stringent standards, so as to reduce the higher-first-cost burden of higher-efficiency appliances on those consumers*
- *Elevated energy standards for appliances and equipment purchased by public agencies*

Related Policies/Programs in Place

- State Energy Plan (SEP) recommends ENERGY STAR from 2008 on (2.1)
- *Existing Federal Appliance Efficiency Standards [2005 Energy Bill]*

Types(s) of GHG Reductions

[Insert text as appropriate]

GHG impacts are similar in nature to those noted for RCI-1 through RCI-3 above.

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- *Reduction in water use for some appliance upgrades*

Costs

Feasibility Issues

- Feasibility enhanced by ongoing efforts in nearby states (2.1)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-6 Building Energy Codes

Mitigation Option Description

Building energy codes specify minimum energy efficiency requirements for new buildings or for existing buildings undergoing a major renovation. As energy use (largely electricity and gas) in buildings in North Carolina accounts for a significant fraction of current emissions, amending State and/or Local Building Codes to make the requirements for maximum energy use in buildings more stringent will have a considerable immediate and ongoing impact in reducing building-sector greenhouse gas emissions.

Mitigation Option Design

[Mention of current level of energy codes in North Carolina] An ongoing process of code amendments for new and renovated residential and commercial buildings is proposed as follows.

- *Building codes will be amended to reduce the building energy needs in areas including but not limited to HVAC² systems, daylighting design to reduce lighting needs, electric lighting design, building envelope design, using integrated building design strategies.*
- *North Carolina should update its energy codes regularly. A three-year cycle could be timed to coincide with release of national model codes. Local adoption of new statewide codes should occur within 6 months of statewide code adoption [if applicable].*
- *North Carolina should adopt innovative features of California's latest Title 24 building energy codes and similar advanced codes being implemented in other states, such as lighting efficiency requirements in new homes that go beyond the codes in force, as appropriate to conditions in the State.*

Elements of this Option Design include:

- Improved Building Codes, including improved enforcement of codes* (3.1)
- It may be useful to separate public- and private-sector components of this option (3.1)
- A TWG member suggests that building codes include a requirement that existing homes and commercial buildings at resale are upgraded to meet an energy efficiency standard, and financing programs be provided to help with the costs of those upgrades. (3.1)

² Heating, Ventilation, and Air Conditioning

- Training and Education for Builders and Contractors (e.g. HVAC₄sizing, duct sealing, energy analysis program, C&D waste recycling, renewable energy system installation, water distribution systems) * (3.3)
- Option could include introduction of related skills in the Trade School and Community College Curricula (see below) (3.3)
- Training of Building Code and other Officials in Energy Code Enforcement* (3.4)
- Energy efficiency and related education introduced at community colleges and trade schools *** (3.13)
- Clearinghouse for information on and access to software tools to calculate impact of energy efficiency and solar technologies for buildings *** (3.14)
- Improved enforcement of building codes (3.15)
- *Include in codes the use where possible use of Solar Hybrid Lighting (using light guides to bring daylight into building interiors) (Suggested at CAPAG meeting) (3.18)*
- Increase Flexibility within Building Codes for Use of Non-conventional Energy-efficient Building Materials Suggested at CAPAG meeting; straw bale construction an example. (3.19)
- Focus on specific enduses/technologies: window AC units, lighting, water heating, plug loads, networked PC management, power supplies, motors, pumps, boilers, etc. *, ** (6.9)
- Focus programs for building energy efficiency on specific market segments: existing homes (weatherization), new construction, apartments, low income, etc. *,** (9.2)
- Integration with Regional Demand Response Initiatives/recommendations* (9.10)

[Insert text as appropriate]

- **Goals:**
 - Could include X%/yr improvement mandate (3.1)
 - Cap on Consumption of Energy per Unit Area of Floorspace for New (?) Buildings. (Suggested at CAPAG meeting.) Would include reduction of cap figure over time, ensuring continuous improvement. (3.17)
- **Timing:** *New codes adopted in 20XX? In force by 20YY? Updated every Z years?*
- **Coverage of parties:**
 - *State and Local building code enforcement agencies?*
 - May wish to include Mobile Home Manufactured Industry in discussion of this issue
 - *Appliance Manufacturers?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Consumer products programs, may include incentives, retailer training, marketing and promotion, education, etc (6.9)

Related Policies/Programs in Place

- 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 of *building code improvements* have been undertaken by Jeff Tiller at ASU. Building codes are enforced by the Building Code Council and the North Carolina Department of Insurance (3.1)
- Advanced Energy Corporation, NC Solar Center, and others have ongoing programs in this and similar areas (3.3)
- Training of Building Code and other Officials in Energy Code Enforcement* (Recommended in State Energy Plan) (3.4)
- Advanced Energy Corporation is currently reviewing nine calculators *for assessing building energy efficiency and solar technologies for buildings*. Availability of tools could be widened. (3.14)
- 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/> (6.9)
- State Energy Office is involved in federal Industries of the Future. CSA recommendation A-5: *Promote and Support Efforts to Establish North Carolina as a World Leader in GHG, Non- Carbon Fuels and Energy Efficiency Technologies* SEP recommends further incentives for high efficiency motors (6.9)
- NC Weatherization Assistance Program, for low income earners SEP recommends extending weatherization (9.2)
- Integration with Regional Demand Response Initiatives/recommendations is a SEP recommendation* (9.10)

Types(s) of GHG Reductions

[Insert text as appropriate]

- *CO₂ reduction from avoided electricity production and avoided on-site fuel combustion.*
- *Modest reduction in CH₄ emissions from avoided fuel combustion and avoided natural gas pipeline leakage, relatively small reductions in N₂O, Black Carbon emissions from avoided fuel consumption.*

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- Potential to also yield water savings, comfort/air quality improvements. (3.1)

Costs

Feasibility Issues

- Interaction with appliance standards and utility programs (6.9)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-7 “Beyond Code” Building Design Incentives and Mandatory Programs, Incorporating Local Building Materials and Advanced Construction

Mitigation Option Description

Energy efficiency in existing buildings and in non-government-funded new buildings must be substantially improved. This mitigation option provides incentives and targets to induce the owners and developers of new and existing non-government buildings to markedly improve the efficiency with which energy is used in those buildings, along with provisions for raising targets periodically and resources to help achieve the desired building performance. This option also provides energy efficiency targets that are much higher than code standards for new State-funded and other Government buildings, includes elements to encourage the improvement and review of efficiency goals over time, and to encourage flexibility in contracting arrangements to encourage integrated energy-efficient design and construction.

Mitigation Option Design

Elements of this Option Design include:

- Promotion and Incentives for Improved Design and Construction (e.g. LEED (Leadership in Energy and Environmental Design, a national building certification program), green buildings, Healthy Built Homes, ENERGY STAR Homes) * *** (3.2)
- Could also include the promotion of active and passive solar building technologies (3.2)
- LEED Certification for State and Local Government Buildings and Universities, and Other Buildings Constructed with State Funds. LEED buildings should include minimum # of points in energy efficiency section (or possibly an optimized energy efficiency section). (3.2)
- It may be useful to separate public- and private-sector components of this option (3.2)
- Apply to existing buildings as well as new (3.2)
- Training and Education for Builders and Contractors (e.g. HVAC sizing, duct sealing, energy analysis program, C&D waste recycling, renewable energy system installation, water distribution systems) * (3.3)
- Support for growth and health of the residential building performance specialist industry. (3.3)
- Continuing Education for building Design Professionals, including architects, engineers, developers, contractors, urban planners, and realtors(3.3)
- 3.13 Energy efficiency and related education introduced at community colleges and trade schools ***

- Clearinghouse for information on and access to software tools to calculate impact of energy efficiency and solar technologies for buildings *** (3.14)
- Add Photovoltaic Panels on New Commercial Buildings and Many New Homes; Add Solar Hot Water Heaters on Homes and Other Buildings Suggested by CAPAG member, part of “Vision of NC Future”. (not clear if intent was as a voluntary or mandatory option) (3.16)
- *Include Solar Hybrid Lighting (using light guides to bring daylight into building interiors) as a measure to be included as appropriate in efficient designs.* (Suggested at CAPAG meeting) (3.18)
- Comprehensive State Survey of Energy and Water Efficiency Features in Existing Residential and Commercial Buildings - To provide information on the potential for energy efficiency in NC buildings
- Performance-based Contracting for funding of energy efficiency improvements - Capital costs paid back through energy savings (5.4)
- Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)
- Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)
- Focus on specific enduses/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 *, ** (6.9)
- Government Agency Requirements and Goals, including procurement *goals** (9.1)
- Focus programs for building energy efficiency on specific market segments: existing homes (weatherization), new construction, apartments, low income, etc. *,** (9.2)
- Extend green campus initiatives to all university buildings* (9.8)
- Energy benchmarking, measurement, and tracking programs for municipal and state buildings* (9.9)

[Insert text as appropriate]

- **Goals:**

- *X% improvement in energy performance of average new buildings? Incentives induce Y% of new buildings (residential and commercial?) to go to “beyond code” efficiency levels?*
- A TWG member recommends support of an energy use reduction mandate for all publicly owned buildings, 40% new and 10% existing by {set date}.
- *Upgrade Z% of existing buildings (residential and commercial?) per year to an energy efficiency standard equal to ????*
- *Target all building energy use, or just HVAC, lighting?*

- **Timing:** *Ramp up starting in 20XX to full effectiveness by 20YY?*
- **Coverage of parties:**
 - *State agencies?*
 - *Local governments and other public entities?*
 - *Building code enforcement?*
 - *Architects, building designers, engineers, developers, builders, contractors?*
 - *Retailers of energy-efficient products?*
 - *Manufacturers of alternative building products?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies Could include R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia *** (9.12)
- Direct or Indirect support for commercialization and production; Indirect support for development. Could include patent protection, R&D tax credits, production subsidies or tax credits to firms bringing new technologies to market, tax credits or rebates for new technology buyers, government procurement, and demonstration projects*** (9.13)

Related Policies/Programs in Place

- The Energy Independence Act, S2051 filed May 2006, requires facility projects that receive state funding to reduce energy purchases by 20% by 2015. (3.2)
- NC Green Building Technology database provides searchable database on case studies (3.2)
- S2001, H1272 required state government to review the use of High Performance Building guidelines in 7 buildings. (3.2)
- Examples of existing programs: NC Healthy Built Homes, Healthy Building Resource Center Environments for Living In addition to those listed, groups offering programs and other services related to building energy efficiency and related programs include CERT at NCA&T, Appalachian State, Southern Research Institute, RTI, and others. (3.2)
- 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 (3.2)
- Advanced Energy Corporation and NC Solar Center, and others have ongoing programs in this and similar areas (3.3)

- Advanced Energy Corporation is currently reviewing nine calculators *for assessing building energy efficiency and solar technologies for buildings*. Availability of tools could be widened. (3.14)
- At the 5/23CAPAG meeting, the Environments for Living program (<http://www.eflhome.com/>) was noted as an example, with builders having built 80,000 homes in the South and Southwest under the program in the last five years. Also, it was noted that solar water heating is included in the NC Green Power Program. (3.16)
- 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/> (6.9)
- State Energy Office is involved in federal Industries of the Future. CSA recommendation A-5: “Promote and Support Efforts to Establish North Carolina as a World Leader in GHG, Non- Carbon Fuels and Energy Efficiency Technologies”. SEP recommends further incentives for high efficiency motors (6.9)
- SEP recommends state procurement of environmentally preferable products (9.1)
- NC Weatherization Assistance Program, for low income earners SEP recommends extending weatherization (9.2)
- Extend green campus initiatives to all university Buildings is a SEP recommendation (9.8)
- Energy benchmarking, measurement, and tracking programs for municipal and state buildings is a SEP recommendation (9.9)

Types(s) of GHG Reductions

[Insert text as appropriate]

- *CO₂ reduction from avoided electricity production and avoided on-site fuel combustion.*
- *Modest reduction in CH₄ emissions from avoided fuel combustion and avoided natural gas pipeline leakage, relatively small reductions in N₂O, Black Carbon emissions from avoided fuel consumption.*

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- Potential to also yield water savings, comfort/air quality improvements (3.2)

Costs

Feasibility Issues

- Interaction with appliance standards and utility programs (6.9)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-8 Education (Consumer, Primary/Secondary, Post-Secondary/Specialist, College and University Programs)

Mitigation Option Description

This mitigation option reflects the realization that the effectiveness of emissions reduction activities in many cases depends on providing information and education to consumers, as well as to future consumers (primary and secondary school students), regarding the energy and greenhouse gas emissions implications of consumer choices. In addition, in order to effectively implement many of the other RCI options above, specific and targeted education, outreach, and licensing requirements will be required for professionals in a variety of building-related trades in order to ensure that those professionals have the expertise to support aggressive GHG mitigation options in North Carolina.

Mitigation Option Design

Elements of this Option Design include:

- Training and Education for Builders and Contractors (e.g. HVAC sizing, duct sealing, energy analysis program, C&D waste recycling, renewable energy system installation, water distribution systems) * (3.3)
- Training of Building Code and other Officials in Energy Code Enforcement* (3.3)
- Energy Management Training/Training of Building Operators* (3.3)
- Continuing Education for building Design Professionals, including architects, engineers, developers, contractors, urban planners, and realtors (3.3)
- Energy efficiency and related education introduced at community colleges and trade schools *** (3.13)
- Consumer education programs** *** (Probable overlap with Cross-Cutting TWG) (4.1)
- Continued funding to meet the expanding role of State Energy Office as a key consumer information outlet. **[NEED TO CHECK IF THIS IS PART OF CSA recommendations, or a TWG recommendation]** (4.1)
- Emphasize provision of resources directing consumers to information and technologies for energy-efficiency and climate impacts reduction (4.1)
- Introduce in School Curriculum *** (Probable overlap with Cross-Cutting TWG) (4.2)
- Extend green campus initiatives to all university buildings* (9.8)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** (9.12)

- Direct or Indirect support for commercialization and production; Indirect support for development*** (9.13)

[Insert text as appropriate]

- **Goals:**
- **Timing:** *Education/Training option X in place by 20YY to coincide with need to support Option Z?*
- **Coverage of parties:**
 - *Code enforcement agencies*
 - *Building professional trade groups?*
 - *Community colleges?*
 - *Universities?*
 - *Primary/Secondary Schools?*
 - *Public Information Agencies?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- *For enhanced funding of R&D on energy efficiency and other means of GHG emissions reduction, [c]ould include R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia (9.12)*
- *Direct or Indirect support for commercialization and production, and Indirect support for development [c]ould include patent protection, R&D tax credits, production subsidies or tax credits to firms bringing new technologies to market, tax credits or rebates for new technology buyers, government procurement, and demonstration projects (9.13)*

Related Policies/Programs in Place

- Advanced Energy Corporation and NC Solar Center, and others have ongoing programs in this (training and education for builders and contractors) and similar areas (3.3)
- *Training of building code and other officials is recommended in State Energy Plan (3.4)*
- SEP recommends training programs for state building operators and for private building operators (3.6)
- CSA Recommendation A-7: “Public Education on Climate Change” [NEED TO CHECK THAT “Continued funding to meet the expanding role of State Energy Office as a key consumer information outlet” IS PART OF CSA recommendation] (4.1)

- NC Air Aware provides info for teachers, focus on ozone. <http://daq.state.nc.us/airaware/> (4.2)
- Extending the green campus initiative to all university buildings is a SEP recommendation (9.8)

Types(s) of GHG Reductions

[Insert text as appropriate]

These education and information programs are crucial in enabling and supporting GHG emissions reductions in a number of RCI areas, but their direct GHG reduction impacts are very difficult to assess.

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

Costs

Feasibility Issues

- Potential contribution of consumer education programs to reducing GHG emissions is difficult to estimate (4.1)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-9 Green Power Purchasing (required for state facilities) and Bulk Purchasing Programs for Energy Efficiency or Other Equipment

Mitigation Option Description

This option comprises a variety of strategies to increase the production and delivery of low-GHG power sources, above and beyond levels achieved through Renewable Portfolio Standards.

Mitigation Option Design

Elements of this Option Design include:

- Green Power Purchasing* (Consider pricing of green power so that it is less expensive to consumers than conventional power, reflecting its climate benefits.) Consider adding feature to emphasize purchase of green power generated in NC (5.1) *Would this element include making green power more available to private purchasers? Would it include mandatory requirements for public-sector consumers?*
- Bulk Purchasing Programs for Energy Efficiency or other Equipment (Public or Private sector) (5.2)
- Government Agency Requirements and Goals (including procurement)*. (9.1) *Would this element include requirements and goals both for green power and for purchase of energy-using products?*

[Insert text as appropriate]

- **Goals:** *Government agencies purchase X% of their power as green power by 20YY? Goal of consumers using Y% green power generated in-state by 20ZZ?*
- **Timing:**
- **Coverage of parties:**
 - *State Agencies?*
 - *Consumer consortia?*
 - *Renewable energy providers?*
 - *Utilities?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Interaction with RPS option (*green power purchase*). Will require development of Green Power supplies, thus will need to be coordinated with Energy Supply group Mitigation Options. (5.1)
- *Bulk purchasing programs* may interact with utility programs. May wish to use in combination with standards for appliance purchases by state agencies. (5.2)

Related Policies/Programs in Place

- 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) (5.1)
- SEP recommends state commit to state-use purchases of 25% growing to 100% (10% as near-term goal for State—next 3 years?) (5.1)
- SEP recommends state procurement of environmentally preferable products (9.1)

Types(s) of GHG Reductions

[Insert text as appropriate]

GHG impacts are similar in nature to those noted for RCI-1 through RCI-3 above.

Estimated GHG Savings and Costs per MTCO_{2e}

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- In some cases green power has been more resistant to cost swings than conventional power (5.1)

Costs

Feasibility Issues

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-10 Distributed Renewable and Clean Fossil Fuel Power Generation

Mitigation Option Description

Distributed generation with clean combined heat and power systems improves the overall efficiency of fuel use as well as providing electricity system benefits. Implementation of these systems should be encouraged through a combination of regulatory changes and incentive programs.

Mitigation Option Design

Elements of this Option Design include:

- Review existing 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)
 - * Review could consider the impact of NO_x and power factor requirements on net-metering and availability of information for small customers. (5.3)
- Utility Rate Reform At CAPAG Meeting on 5/23, it was suggested that there is a need to look harder at rate issues in NC, including decoupling (of utility revenues from sales) and rate design, with a specific focus on the impacts of rate design on greenhouse gas emissions (5.5)
- Incentives for Renewable Energy Applications *** (Solar roofs, water heaters, etc.), including tax incentives (6.1)
- Clean Combined Heat and Power: * Consider use of waste heat from new electricity generation units to substitute for fossil-fueled heat in the RCI sectors. In some cases of industrial CHP, it may be necessary to assess the impact of CHP presence on given distribution circuit. New and existing technologies allow CHP to be used in residential, commercial sectors as well, so these sectors should be included. Examples cited at the 5/23 CAPAG meeting include stacks of newly-developed ½ watt fuel cells, 1 kW residential CHP providing hot water, and micro-turbines for residential and small commercial applications. (6.2)
- Promotion of distributed generation by renewables and clean fossil fuels (including micro-turbines, internal combustion engines, and fuel cells***) Renewables options can go beyond use on/in buildings-only (e.g., by NC DOT) (6.5)
- Integration with Regional Demand Response Initiatives/recommendations* (9.10)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** (9.12)
- Direct or Indirect support for commercialization and production; Indirect support for development*** (9.13)

[Insert text as appropriate]

- **Goals:** *Implementation of XX% of North Carolina's CHP potential by 20YY? ZZZ MW of clean CHP/Distributed generation by 20AA? XX thousand additional SHW installations by 20YY? XXX additional MW of distributed renewable generation by 20ZZ?*
- **Timing:** *Implement changes in regulation necessary to encourage technologies by 20XX? Implement incentive program by 20YY?*
- **Coverage of parties:**
 - *Regulators?*
 - *Utilities?*
 - *State Agencies?*
 - *Industry Associations?*
 - *Providers of CHP Equipment?*
 - *R&D Associations?*
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Incentives could reduce first cost to a specific payback level; could be coupled with requirements for new buildings. Specific implementation measures mentioned as possible for this option include tax credits, low/no interest loans, and similar financial incentives to business, industries and commercial firms *to adopt CHP/distributed generation/renewables*. The latter approach is especially important for small manufacturers, and could just be access to micro-loans. (6.1)
- Support for switching to less carbon-intensive energy resources (coal and oil to natural gas or biomass, electricity to solar water heating or space/process heat) (8.1)
- Voluntary Emissions Targets for Industrial Operations (8.3)
- Could include (*CHP/distributed generation-related/renewables*) R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia (9.12)
- Could include patent protection, R&D tax credits, production subsidies or tax credits to firms bringing new (*CHP/distributed generation-related/renewables*) technologies to market, tax credits or rebates for new technology buyers, government procurement, and demonstration projects (9.13)
- Include methane capture and use in CHP systems at sewage treatment plants as a specific focus.

Related Policies/Programs in Place

- 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) (5.3)
- SEP recommends the Department of Commerce and the State Energy Office should encourage and support economic development of energy-related enterprises whose products are intended to increase energy efficiency or use renewable resources, such as providers of specialized insulation and window products, heating and air conditioning equipment and controls, distributed generation equipment, solar and wind energy equipment, biofuels, and fuel cells. (6.5)
- Integration with Regional Demand Response Initiatives/recommendations is a SEP recommendation* (9.10)

Types(s) of GHG Reductions

- *CO₂ reduction from avoided electricity production and avoided on-site fuel combustion less additional on-site CO₂ emissions from fuel used in CHP systems.*
- *Other gases: modest potential changes in emissions of CH₄: from avoided fuel combustion and avoided natural gas pipeline leakage, net of any additional on-site emissions or additional leakage from increased gas use, likely relatively small reductions in emissions of N₂O from avoided fuel combustion, net of any increased on-site emissions, and also some possible small net changes in emissions of black carbon, depending on the balance between avoided and additional consumption of oil, coal, and biomass fuels, and of emission control*

[Insert text as appropriate]

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

- Programs could help to lower capital and installation costs (6.1)
- Utility system co-benefits (6.2)
- Cost savings and decreased impacts of transmission and distribution (6.5)

Costs

Feasibility Issues

- *Cost-effectiveness* dependent on price of natural gas
- Interconnection an issue (6.2)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]

RCI-11 Residential, Commercial, and Industrial Energy and Emissions Audits and Recommended Measure Implementation

Mitigation Option Description

This mitigation option includes providing residential, commercial, and industrial-sector energy audits to identify options for reducing fossil energy use and reducing non-energy emissions of GHGs, along with following up on recommendations by helping to provide incentives, expertise, and information to implement recommended options.

Mitigation Option Design

Elements of this Option Design include:

- Capture and use of process heat from industrial and commercial operations (6.6)
- Participation in Voluntary Industry-Government Partnerships 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.” A state recognition and reward program can be an effective tool for emissions reduction. This could be part of the existing Environmental Stewardship Initiative (ESI, see www.p2pays.org/esi). “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>. (7.1)
- Process Changes/ Optimization. Improving manufacturing so as to require less energy and/or release less GHG process gases to the atmosphere. Impact, cost likely highly process-specific (7.2)
- Leak Reduction /Capture, Recovery and Recycling of Process Gases (gases used in industrial processes) For example, solvents used in electronics industry, recovery of refrigerants, reduction of leaks in refrigeration equipment (7.3)
- Use of Alternative Gases (other HFCs, hydrocarbon coolants/refrigerants, foam blowing agents, etc.) For example, use of lower Global Warming Potential gases in specific applications, such as hydrocarbons in place of HFCs in commercial refrigeration Note that some of these changes may affect energy use as well (7.4)
- Focus on Small and Medium Enterprises (SMEs)* (Provide resources for small and medium businesses to evaluate and pursue energy efficiency/GHG emissions reduction activities) (9.5)
- Industrial ecology/ by-product synergy by including full circle of industrial by-product use within other industrial processes For example, promote review and modification of industrial processes to encourage waste reduction, highly efficient use of materials and energy. (9.6)

- Industrial Audits* *** (For example, make available/encourage use of industrial audits to identify energy-efficiency, other GHG emissions savings opportunities) This option may require additional support for implementation of energy savings (9.7)
- Integration with Regional Demand Response Initiatives/recommendations (SEP recommendation)* (9.10)
- *Identify opportunities for water use reduction and consider the impacts of water use reduction on energy needed for (and GHG emissions due to) reduced transmission/distribution/treatment of water and wastewater (9.11)*

[Insert text as appropriate]

- **Goals:**
- **Timing:**
- **Coverage of parties:**
- **Other:** [Insert text if/as appropriate]

Implementation Mechanisms

Potential implementation mechanisms and supporting activities for this mitigation option include:

- Focus should be on efficiency improvements that are long lived and require minimal proactive input from the customer once in place.
- Negotiated Emissions or Energy Savings Agreements. SEP recommendation. For example, agreements between government and industrial or other large GHG emitters to reduce emissions on a specific time-frame * (8.5)
- Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** Could include R&D contracts with private firms, grants and contracts with universities, Intramural R&D conducted at government labs, R&D contracts with private/public consortia (9.12)
- Direct or Indirect support for commercialization and production; Indirect support for development*** Could include patent protection, R&D tax credits, production subsidies or tax credits to firms bringing new technologies to market, tax credits or rebates for new technology buyers, government procurement, and demonstration projects (9.13)

Related Policies/Programs in Place

- There are a number of efforts in NC being coordinated by Industrial Extension programs. In addition, technical assistance on pollution prevention and manufacturing efficiencies is provided by DPPEA, WRP and others. (7.2)
- 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/> This type of assistance is also currently provided by DPPEA and WRP, as well as the IES. In addition, the types of activities suggested in options

9.6 and 9.7 are also provided by DPPEA and WRP, and could be included in the demand side management recommendation as part of RCI-1 (9.5)

- 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/> Waste Trader, an on-line waste exchange system, and Biomass Trader, a similar system for biomass, are joint projects between DPPEA and SEO that are relevant to *this* option (see www.p2pays.org for more information). (9.7)

Types(s) of GHG Reductions

GHG impacts are likely similar in nature to those noted for RCI-1 through RCI-3 above, except that to the extent that voluntary emissions reduction efforts included as a part of this option target non-energy emissions, GHG impacts will vary on a case-by-case basis.

[Insert text as appropriate]

Estimated GHG Savings and Costs per MTCO₂e

[Insert text as appropriate]

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Key Uncertainties

[Insert text as appropriate]

Additional Benefits and Costs

Benefits

Costs

Feasibility Issues

- Impact, cost of process changes/optimization likely highly process-specific (7.2)

Status of Group Approval

[Pending or Completed]

Level of Group Support

[Insert text as appropriate]

Barriers to Consensus

[Insert text as appropriate]