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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.

This version of the Mitigation Options Descriptions also has been revised to reflect the results of TWG discussions during the meeting of 8/31/06. Text that has been changed (in option RCI-6) as a result of TWG discussions is shown in **yellow highlights**. Please note

that some additional questions resulting from the discussions of 8/31 are also **shown highlighted and in italics**. Draft text contributed since 8/31 by TWG members is **shown in blue highlights**.

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).

At the request of TWG members, we have also temporarily, for ease of reference during group calls and meetings, numbered the “bullets” in the “Option Design” and “Implementation Measures” sections of the skeleton descriptions below (where there was a long list of bullets). The intent is that these numberings will be reconverted to bullets once final text has been settled upon.

Len Hoey of the State Energy Office has provided additional information on **Related Policies/Programs in Place**. References to “SEP” are to the specific elements in the State Energy Plan. In the text referring to these SEP elements, text in black describes the plan requirement, and the blue print is lists activities conducted or underway for the item. SEO Contract refers to contracts currently in place with the State Energy Office for the services outlined. Many of the items listed are relevant to many of the RCI options and some duplication exists. However, information may not have been included with all relevant options. TWG member review and edits are welcomed (any edits need to be provided in “track changes” mode or by e-mail).

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

Demand Side Management (DSM) programs provide support to either reduce the consumption or demand for conventional sources of electricity and fossil fuels. Examples of DSM programs include implementation of energy efficiency and renewable energy measures, electrical (and in some cases fuel) load control, alternative rate schedules, and research activities. This option 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.

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.

[Initial straw proposal text included here temporarily for reference]

Mitigation Option Design

Elements of this Option Design may include:

1. Efficiency programs for new residences, which may incentivize participation in Energy Star[™], Environments for Living, Systems Vision, HealthyBuilt Home, LEED-H, or other programs.
2. Efficiency programs for existing residences, such as Home Performance with Energy Star. Development of this program should follow a comprehensive survey and analysis of existing residences to determine key strategies that will provide the greatest impact for the least investment.
3. Renewable energy programs for new and existing residences, focusing on development and implementation of cost effective solar water heating, passive solar designs, solar space heating and pool heating (only to replace electric or fossil fuel-based existing pool heating), residential biofuels, photovoltaics, and other strategies.
4. Efficiency programs for new commercial buildings, using commercial Energy Star and LEED-NC as starting points.
5. Efficiency programs for existing commercial buildings, using the work of the State Energy Office's Utility Savings Initiative, ongoing energy audit and technical services,

and previous programs, such as the federally funded Institutional Conservation Program, as well as programs in other states, as sources of information.

6. Efficiency programs for new and existing industrial facilities, based on ongoing efforts of North Carolina State's Industrial Energy Extension Service and Industrial Assessment Center, Advanced Energy's industrial efficiency programs, and other related projects.
7. Renewable energy programs for new and existing commercial buildings and industrial facilities, with the same focus as element 3 above.
8. Load control and demand reduction programs for all sectors.
9. Education, training, consumer outreach, and promotional activities to support the DSM programs.
10. Grants, loans, performance contracting arrangements, and other incentive programs to provide financial support or incentives for implementation of DSM programs.
11. Specific recommendations from the RCI TWG 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)
- **Goals:** Funding level of \$100 million per year to support DSM programs in the state. Annual energy savings generated per year should exceed \$25 million. After ten years, the savings should exceed \$250 million annually.
- **Timing:** Start ramping up programs from existing levels starting in 2007, reaching goal levels by 201[0?]

- **Coverage of parties:**

- Utilities: Through the rate-making process, utilities and the Public Utilities Commission would develop a mechanism to include the cost of DSM programs in the respective utility's rate base, or provide for a separate surcharge that utility customers pay.
- State Agencies: The Public Utilities Commission, the Public Staff, the State Energy Office, the Department of Environmental and Natural Resources, the State Construction Office, and others shall be involved in the design and implementation of the DSM programs.
- Third-party efficiency Providers: North Carolina possesses considerable expertise in its universities, nonprofit organizations, and private consulting and technical service companies to provide services for the DSM programs. The overall effort should seek to develop a statewide "efficiency industry" that would expand beyond the efforts of the DSM programs alone.
- Regulators: The Public Utilities Commission, with input from the Public Staff, would likely be the approving and oversight body for the programs.
- Others: A wide variety of stakeholders would provide input into the development and continued operation of the DSM programs.

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

Implementation Mechanisms

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

1. 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)
2. 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 NOx and power factor requirements on net-metering and availability of information for small customers (5.3).
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)
4. 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)
5. Consumer products programs, may include incentives, retailer training, marketing and promotion, education, etc (6.9)
6. 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

- **SEO CONTRACT, Appalachian State University Energy Center:** The North Carolina General Assembly established the Energy Policy Council in 1975 as a means of addressing state-specific energy issues and concerns. The State Energy Plan is the Council's biannual, comprehensive examination of energy use, energy production and environmental concerns in the state. As in years past, the Appalachian State University Energy Center has been contracted by the State Energy Office to prepare the State Energy Plan based on the recommendations of the Energy Policy Council, updating and revising the Plan for 2007. The Center is also responsible for assisting the State Energy Office in implementing the recommendations of the State Energy Plan. As part of its implementation duties, Appalachian State University performs the following tasks, among others:
 1. Provides data on the potential for energy efficiency in various customer segments, preparing a final analysis and report for submission to the State Energy Office and Energy Policy Council.
 2. Coordinates the North Carolina Fuel Cell Alliance to further expand the fuel cell industry in the state.
 3. Updates economic analysis of standard and renewable electricity technologies due to changes in fuel costs, including projections of renewable electricity potential.
 4. Works with the North Carolina Economic Development Board in creating a strategy that informs the state's businesses and government leaders on the potential of renewable energy industries as part of the state's technology-based economic development strategy.
 5. Works with officials at several North Carolina landfills to conduct technical and economic analysis of landfill energy production for fuel and electricity generation.
 6. Provides input into statewide transportation policy and planning by developing a design for modular biodiesel plants; working with area farmers on production of crops for conversion to biofuels; working with other state transportation efficiency efforts to reduce dependence on petroleum-based transportation; and providing technical support to statewide agencies and universities to displace 20 percent petroleum use in state vehicles.
 7. Provides commercial building efficiency outreach by working with State Construction Office officials to develop new energy standards for State buildings and an evaluation and monitoring system to assure the use of these standards.
 8. Promotes high performance homes by conducting sessions for production builders on new Energy Star® homes; conducting a North Carolina-based Energy Star® conference; developing new home designs based on input from affordable housing groups; and conducting workshops on the Zero Energy Home concept and design.
 9. Furthers energy education by holding meetings with school officials about building energy use, energy-related curricula and energy demonstration projects.

10. Furthers renewable energy initiatives in the western part of the state by purchasing and loaning an anemometer tower to assess wind development sites; providing consultation services for wind assessments; conducting workshops on residential- or farm-scale wind energy; and developing ordinances and working with local officials regarding wind turbine permitting
- **SEP Exec-11:** State agencies and universities, with coordination by the North Carolina Department of Administration, should reduce energy consumption in existing state buildings to save 20% by 2008, 4% per year or more for the next 5 years. The State Energy Office should submit an annual report to the Energy Policy Council, the Governor's Office, the State University System and other major energy users in North Carolina that provides data on energy saved in state buildings and universities by source and cost, energy efficiency activities undertaken in these buildings, the approximate investment in energy efficiency measures, and the overall economic costs and benefits of the program. The program is centered on a goal of reducing energy consumption in state agencies by 20% over a five-year period ending in 2008. Since the program's inception, the Utility Savings Initiative while spending \$2,347,599 (since 2003) has saved the State of North Carolina more than 2,135,260 MMBTU, with \$33 million in avoided costs. The program recently has been expanded to the state's community colleges and will be provided to local governments and public school systems in the near future. The program uses a four-pronged approach to achieve its goal; utility accounting, operations and maintenance, awareness and training and performance contracting. For tracking purposes, energy consumption is indexed by gross square feet to accommodate growth in state facilities.
 - Electric Utilities providing DSM programs include: Progress Energy, Dominion Power, Duke Energy. Programs mostly information only, with a few financing programs¹. 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) **[A recent comment from a TWG member follows: It is inappropriate to have EFL in this location without all of the other programs mentioned in RCI-7 here as well. RCI-7 is where this and the other programs similar to it currently reside in the discussion. *It may very well be that all programs, including Energy Star and NC HBH, should be included in the Demand Side Management discussion, but EFL should not stand alone here.* In NC, the NC**

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 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.

HealthyBuilt Homes (HBH) program has involved more builders in the state than EFL and NC HBH is a deeper, more energy comprehensive program than EFL.]

- 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)
- **SEO CONTRACT, Energy Management Program:** This program, operated in conjunction with the North Carolina State University Industrial Extension Service, provides workshops and industrial energy surveys that identify opportunities and demonstrate techniques for optimizing energy use in various building systems and promoting energy conservation in industrial, institutional, commercial and governmental buildings. Industrial surveys provide comprehensive audits of common system inefficiencies (such as leaky compressed air systems, poorly-adjusted steam traps, etc.) and provide recommendations for energy improvements. The tasks involved in this project include performance of energy surveys, development of energy-saving recommendations, technical assistance, development, implementation and promotion of workshops and educational materials.
- **SEO CONTRACT, The Center for Energy Research and Technology:** The Center for Energy Research and Technology, housed at North Carolina A&T State University, provides education, training, demonstration and technical assistance on energy and environmental technologies. Programs fall under three main areas: technical transfer (outreach), demonstration and the manufactured housing research initiative. Recent projects have included the installation and monitoring of a photovoltaic system installed on residential buildings; collection and analysis of survey data on customer complaints of manufactured homes; a demonstration energy efficient manufactured home; industrial workshops on HVAC operation and indoor air quality; summer "energy camp" programs to introduce secondary school children to various energy systems and encourage their entrance into the energy field; and assessment of wood residues in the state available for energy production.
- **SEO CONTRACT, Energy Efficiency for Nonprofits:** The Nonprofit Energy Efficiency Program works with small- to medium-size private and public nonprofit agencies, including local governments and schools, to install low-cost energy efficiency measures that will reduce operating expenses. Where possible, volunteers from the nonprofit organization are

trained to install the measures under supervision of trained contractors, utility personnel and staff from the State Energy Office and collaborating groups. Emphasis will be placed on measures that have a ten-year or better payback. Energy bills for a selected sample of organizations will be monitored for at least one year following installation to determine actual energy costs savings. A match of \$100,000 was provided by Piedmont Natural Gas for this program

- **SEO CONTRACT, ElectriCities—Energy Auditor:** Energy audits, once a common utility service for residential customers, are now rare offerings. The state’s three major utilities do not offer them, and only a handful of municipal and electric cooperatives offer them. The savings potential from a home energy audit is enormous, however, particularly in light of the rapidly increasing costs of today’s utility bills. ElectriCities of North Carolina, Inc., with support from the State Energy Office, will maintain a two-year program for a circuit riding energy auditor to provide energy audit services to residential customers of municipal electric distribution systems in northeastern North Carolina. The goal of the project is to conduct 1,000 on-site energy audits and to offer 100 energy education workshops with estimated attendance of 1,000 people over the project’s two-year span. In addition, the project will make a Web-based energy audit service available to all ElectriCities residential customers, enabling many more additional audits to be conducted. Savings to consumers will vary, though an average of 15 percent for residential energy costs, or nearly \$300 per household, is a safe assumption. Environmental benefits, based on reduced energy use, will be significant.
- **SEO CONTRACT, Energy Efficiency Field Assistance Waste Reduction Partners:** Waste Reduction Partners is a team of 51 volunteer and retired engineers, scientists and architects that provides waste reduction and energy efficiency assistance to businesses, industries and public facilities in the state’s 37 western-most counties. With support from the State Energy Office, Waste Reduction Partners is serving a critical community need by responding to requests for on-site energy-efficiency technical assistance, strategic energy management planning, and implementation facilitation for western North Carolina industries, businesses and public facilities, including primary and secondary public schools, local governments and state agencies. This assistance is free and supports the objectives of the State Energy Plan and the State Energy Office’s Utility Savings Initiative.
- **SEO CONTRACT, Central and Eastern Waste Reduction Partners:** This initiative will create a Waste Reduction Partners technical outreach program to assist central and eastern North Carolina businesses and institutions in becoming more energy efficient, economically competitive and environmentally sustainable. This project expands on the successful western North Carolina Waste Reduction Partners program of the Land-of-Sky Regional Council of Governments in Asheville, which utilizes the technical expertise of 51 retired volunteer engineers and scientists working in conjunction with program staff.
- **SEP 7-4:** The North Carolina Department of Administration should develop performance contracting procedures and other ways to finance energy efficiency projects for state and local governments, university and public school systems, and public housing. The Department of Administration should provide technical support to implement performance contracting projects and provide quality assurance. **The SEO has developed a standard template RFP and contract templates, as well as procedures, for performance contracting. The SEO and State Construction Office have developed a scope of work for the Museum of**

Art project and for a downtown government complex project. SEO has been providing technical assistance to universities, state agencies, K-12 schools and community colleges which are evaluating potential performance contracting projects.

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:**
- **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

A public benefits charge (sometimes call systems benefits charge) is a fee attributed to electric customers based on their usage of electricity in a given time period. North Carolina has the oldest such program, established in 1980 by the NC Utilities Commission. The original intent of this program was to reduce electric demand in an effort to slow the need for new power plant construction. The current public benefits charge of \$0.003567 translates to approximately three cents per month per average residential customer in NC. The total collected amounts to about \$3.5 million per year. These funds are used for energy efficiency and economic development programs throughout the state. Because of the small amount of funding, efforts have been specialized to serve specific markets in the state. Industrial motors and process heating receive much of the attention in an effort to make our industries more efficient and competitive, thereby retaining and building the job base. The other primary area these funds go to in NC is the residential new construction sector.

While NC already has a public benefits charge, other states have also enacted their own public benefits charges. Most often, these other states have done so as a result of deregulation of electric utilities. In a regulated electric market, each state's utility commission has the authority to require electric utilities to provide some level of energy efficiency programming. With deregulation in many states, the utility commissions often lost the ability to require efficiency programs of the electric utilities. The result in many states was the development of the public benefits charge, which is a non-bypassable charge on electric bills. The funds collected are then provided to a third party to provide energy efficiency programming. It should be noted that the purpose behind public benefits charges is most often to reduce energy consumption in a given state. While efficiency carries significant air quality and GHG benefits, that is rarely a consideration for creation of a program.

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. [Initial straw proposal included here temporarily for reference]

Mitigation Option Design

While NC has a well established public benefits charge and fund, the charge has not changed since its inception in 1980. Since that time, other states that have implemented charges have significantly outpaced that in NC. For states that have implemented a public benefits charge, the average charge is equivalent to \$8.44 per person. If NC were to achieve the national average it

would be the equivalent of a total fund of \$72 million per year; more than 20 times the current fund. The higher funding in other states has allowed them to take the lead and drive energy efficiency both locally and nationally. Because almost all public benefit charges are assessed in cold weather states, the majority of research and program development has been directed to issues faced in the Northeast and Northwest. While some of these programs can be translated to NC, many cannot, due to differing electric rates and climates. Unfortunately, there are no substantial public benefits programs in the Southeast, leaving the area shallow in terms of energy efficiency programs at a time when population growth is pushing electric demand to new highs.

In a 2003 Oak Ridge National Laboratory (ORNL) study, researchers reported a potential for savings of as much as 3,086 MW and 21,700 GWh per year by 2020 if NC adopted every efficiency measure technologically possible. However, these estimates do not address cost-effectiveness of the efficiency programs. We believe a better estimate to be in the range of 333-1,000 MW and 1,700-4,700 GWh. For comparison, a typical coal fired power plant is rated at about 500 MW.

For purposes of policy design, members of the Climate Action Plan Advisory Group recommend that public benefits charges be implemented through the NC Utilities Commission to a third party administrator. The recommendation for a third party administrator is to remove the conflict of interest from electric utilities in the potential for both trying to sell as much power as possible for stockholder return on investment while also trying to reduce consumption through efficiency efforts. A third party administrator removes that conflict.

Elements of this Option Design include:

1. 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)
2. Performance-based Contracting for funding of energy efficiency improvements - Capital costs paid back through energy savings (5.4)
3. Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)
4. Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)
5. 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)
6. 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:** There are two goal levels for this policy recommendation, and the second goal is dependent upon the first. The first goal is to increase the public benefit charge and funding level to the national average, or a total of \$72 million per year. The second goal is to utilize that funding to achieve nearly 1,000 MW in demand and 4,760 GWh in electricity consumption.
- **Timing:** Based on the experience learned in other states, we recommend a three year phase in of public benefits charges. In other states, a dramatic increase in funding levels has led to severe growing pains as administration of such funding was difficult to develop. A three year plan would allow expectations to be more effectively set and realized.
- **Coverage of Parties:** Only investor-owned electric utilities are covered by the NC Utilities Commission. In the current public benefits charge, the municipal utilities and electric cooperatives are also invited to participate. At present, the electric cooperatives participate in the program.

Implementation Mechanisms

As stated above, we believe the most effective implementation method is to work through the NC Utilities Commission to increase funding in the established program. Not all funds must go to the same organization as is currently administering the fund.

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

1. Provide programs with substantial incentives for consumers to participate. (1.2)
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)
- **SEP Exec-8:** The General Assembly should reexamine existing legislation and regulations as pertains to barriers and strategies to develop wind energy while still protecting North Carolina's natural beauty. With SEO and DOE support, a statewide map showing wind development potential has been developed. A mountain wind attitudes study has been completed, showing strong support for wind among local residents. Scenic view protection must be incorporated into wind turbine location. An environmental analysis is being conducted to determine endangered species of plants and animals that could be impacted by wind power development. ASU completed a coastal wind attitudes survey and prepared a report to the Coastal Wind Working Group. Coastal residents also showed support for area wind development although respondents did note concern for placement of wind turbines in national forests and in sounds. A Small Wind Demonstration Center has been established at Beech Mountain, NC. The center currently has 6 wind turbines installed and these are generating electricity for sale to Mountain Electric Coop. A website for information about the project is at <http://www.wind.appstate.edu/swiwind/swi.php> NC Coastal Wind Assessment and Coastal Wind Working Group continue to address regulatory, financial, and environment issues. In addition, a coastal anemometer program has sited 6 anemometers to collect wind data. Additional information is at http://www.ncsc.ncsu.edu/programs/The_Coastal_Wind_Initiative.cfm
- **SEP Exec-9:** The State Energy Office should assess and propose incentives and regulatory or administrative measures for development of renewable electricity generation facilities, solar water heating, passive and active solar space heating, and daylighting. SEO is co-sponsoring, funding, and actively participating in the NC GreenPower Program. The program is currently averaging 20M kwh annually in contributions and should result in significant expansion of renewable electricity generation in NC. Clean Technology Demonstration RFP contracts have been awarded to the following: Appalachian State University (NC Small Wind Initiative), the NEED Project (solar panels in schools), Wake Technical Community College (E85 Infrastructure), and Central Carolina Community College (Biofuels from Cooking Waste). ASU Energy Center has conducted research on potential savings associated with widespread adoption of residential solar water heating systems tied to new construction. This included telephone interviews with solar dealers in NC and national manufacturers. Discussions are underway with several residential developers interested in installing solar water heating systems in new homes. A NC Daylighting Consortium has been established through the NC Solar Center. This consortium has the following goals: identifying and evaluating daylighting resources; adopting standard evaluation protocol; and facilitating the inclusion of daylighting technologies in professional practice to improve building performance in an environmentally sustainable manner. NC HealthyBuilt Homes (HBH), a green builder program, has been developed and promoted to builders. This program offers builders marketing incentives and access to information that supports renewable technologies. Visit the following website for current information:

http://www.ncsc.ncsu.edu/programs/North_Carolina_HealthyBuilt_Homes_Program.cfm.

The HBH program now has 27 builders statewide and 55 homes that are underway. 7 homes have been completed under the program. The HBH is targeted to small and medium sized builders. The first project that used NC HealthyBuilt Homes exclusively has been completed by Mountain Housing Opportunities, Inc. in Asheville. The 15-units in this low-income, green housing development were all certified as HealthyBuilt Homes. Sustainable building concepts and products, such as passive solar design, solar water heating and environmentally-friendly products, were featured in this "Green Building Demonstration" project. Under the Sustainable Community Development RFP, the SEO has issued contracts to Carrboro Collective, Blue Ridge Resource Conservation & Development Council, Altamont Environmental, and Town of Chapel Hill for projects with renewable energy elements. The "Guide to Interconnection of Small PV Systems for NC GreenPower" was published. This guide describes steps necessary for interconnection and notes required forms and documents.

- **SEP Exec-13:** North Carolina should facilitate efforts of local governments to finance energy efficiency and renewable energy projects; specifically, allow bundling of multi-jurisdictional energy efficiency projects to achieve economies of scale and improve opportunities for financing, restructure the underwriting provisions of the State Energy Office's low-interest energy loan program, and provide training in energy efficiency measures to building managers in local government buildings. SEO and DPI co-sponsored training for the state's 117 school districts that will result in preparation of local strategic energy plans for K-12 schools. The Department of Public Instruction sent 51 persons, representing 40 school systems, to three regional SEP workshops in May, 2004. An additional workshop was held in December 2004 for 45 attendees, representing 30 school systems. SEO sponsored four energy efficiency and sustainability workshops for administrators and facility directors of K-12 schools. The workshops for school officials were organized by NEED and DOE's Energy Smart Schools Program. The SEO assisted in planning for the SEQL (Sustainable Environment for Quality of Life) program for local governments in the Charlotte Metro region. Local governments (county, municipal, K-12) were invited and attended SEO performance contracting training. Local governments are encouraged to use the SEO list of qualified energy service companies, RFP template, and other sample documents for performance contracting. Site visits and technical analysis by SEO staff are available to local governments also.

Training in energy efficiency measures under USI is available to local governments. The 2004 Energy Management Diploma class includes several community college, K-12, county and city government energy managers. A contract with Waste Reduction Partners provides local government energy audits in western NC, investigates financing options for energy projects, and offers follow-up technical assistance for strategic planning and implementation. Permanent rules have been approved by the Rules Review Commission for both performance contracting in State-Owned Buildings and for the Energy Improvement Loan Program. The approved Rules will be available on the SEO website in September for performance contracting and in October for the loan program. A standard RFP and an Investment Grade Audit (IGA) template has been reviewed by the Attorney General's Office. A standard Energy Services Agreement is presently being reviewed by AG's Office. Performance Contracting Training for Public Housing Authority staff is scheduled for October 28-29, 2005, in Raleigh. Performance Contracting Training for Community Colleges was held

November 10, 2004, in Enka, NC. Requests for Proposals for Performance Contracting have been evaluated for the Museum of Art, UNC- Greensboro, and the downtown chiller loop which will include more than 10 buildings in the downtown government complex. The Department of Correction has issued an RFP for performance contracting at Nash, Harnett, and Women's prisons. SEO has provided performance contracting assistance to Scotland, Yancey, and Alleghany Counties and to Durham Tech. The DOA Legal Counsel has approved all documents related to the Energy Improvement Loan Program. The first Energy Improvement Loan Program document package was completed and mailed to Franklin Health and Fitness for signature. Once all documents are signed by DOA and the client, they will be the first executed loan since the expansion of the Loan Program to include local government and non-profits.

- **SEP 4-1:** The North Carolina Utilities Commission is encouraged to promote policies that create diversity in energy supply such as natural gas, solar energy, wind energy, biomass, and hydrogen from renewable sources with particular emphasis on in-state energy development. Technical discussions regarding an interconnection policy that details liability, hardware, and rate issues have taken place under facilitation from the NCSC. A detailed docket brief describing these issues has been filed with the NCUC in August 2004. The NCUC annually reviews fuel diversity in generation as a factor of the integrated resource planning process. In addition, the NCUC continues to encourage and support participation in NC GreenPower, a statewide effort to develop renewable generation in NC. NC GreenPower has announced contracts with a number of solar and biomass facilities in the state. A biomass assessment project has been completed by NC A&T. This project characterized crop residues and forest wastes to determine energy content and amount of waste generated and available for use.
- **SEP 7-4:** The North Carolina Department of Administration should develop performance contracting procedures and other ways to finance energy efficiency projects for state and local governments, university and public school systems, and public housing. The Department of Administration should provide technical support to implement performance contracting projects and provide quality assurance. The SEO has developed a standard template RFP and contract templates, as well as procedures, for performance contracting. The SEO and State Construction Office have developed a scope of work for the Museum of Art project and for a downtown government complex project. SEO has been providing technical assistance to universities, state agencies, K-12 schools and community colleges which are evaluating potential performance contracting projects.
- **SEP 9-2:** The State Energy Office should promote and develop guidelines for performance contracts, conduct workshops, and provide technical assistance on developing performance contracting documents. The SEO, in conjunction with the State Construction Office and the Attorney General's Office, has completed a template RFP for use by all state agencies and universities engaged in performance contracting. Template contract documents have received final review by the Attorney General's Office. Currently, ASU, UNCG, NCA&T, DOA, and DOC are developing projects.
- **SEP 8-6:** The State Energy Office should continue its work to formulate and advance mortgage-based incentives for high performance new homes. In 2004, the SEO partnered with Residential Energy Services Network (RESNET), Fannie Mae, Countrywide and Wachovia to promote the Energy Efficient Mortgage Initiative. EEM Media events were

held in Raleigh, Charlotte, Asheville, Wilmington, and Winston-Salem. The EEM recognizes lower operating costs of energy efficient homes and higher home values when homes are energy efficient. The EEM will increase affordability for home buyers, regardless of income, and encourage energy efficient housing in NC. In addition, the program has boosted the number of Energy Star-labeled homes built in NC. A new contract with the (RESNET) is in the DOA approval process. It is intended to continue the promotion of energy efficient/Energy Star residential construction and energy efficient mortgages in NC. RESNET plans to add more lending partners to its existing group of Wachovia Mortgage, Countrywide Home Loans and Fannie Mae.

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

The following GHG benefits are based on the high and low end estimates of energy efficiency potential described earlier. The ORNL study discussed above would provide for higher GHG benefits but we believe a more conservative estimate is in order. The emissions calculator at the Bonneville Environmental Foundation is used to determine GHG emission reduction potential. Further, we have estimated that 75% of GHG emissions are in the form of CO₂.

Potential Energy and Emissions Savings		
Demand Saved (MW)	333	1,000
Energy Saved (GWh)	1,700	4,700
Total GHG Emissions Saved (includes CO ₂)	766,300 tons	3,167,970 tons
Total CO ₂ Emissions Saved	571,000 tons	2,376,000 tons

[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:

1. 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).
2. 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)
3. Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)
4. Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)
5. 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:

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)
2. 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)
3. 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)
- **SEP Exec-11:** State agencies and universities, with coordination by the North Carolina Department of Administration, should reduce energy consumption in existing state buildings to save 20% by 2008, 4% per year or more for the next 5 years. The State Energy Office should submit an annual report to the Energy Policy Council, the Governor’s Office, the State University System and other major energy users in North Carolina that provides data on energy saved in state buildings and universities by source and cost, energy efficiency activities undertaken in these buildings, the approximate investment in energy efficiency measures, and the overall economic costs and benefits of the program. The program is centered on a goal of reducing energy consumption in state agencies by 20% over a five-year

period ending in 2008. Since the program's inception, the Utility Savings Initiative while spending \$2,347,599 (since 2003) has saved the State of North Carolina more than 2,135,260 MMBTU, with \$33 million in avoided costs. The program recently has been expanded to the state's community colleges and will be provided to local governments and public school systems in the near future. The program uses a four-pronged approach to achieve its goal; utility accounting, operations and maintenance, awareness and training and performance contracting. For tracking purposes, energy consumption is indexed by gross square feet to accommodate growth in state facilities.

- **SEP Exec-7:** The General Assembly should evaluate a renewable portfolio standard (RPS) that complements the NC GreenPower program and fosters the development of a renewable electricity market. The RPS would require that all electric utilities increase the percentage of total distributed electricity that comes from renewable sources, such as hydroelectric, wind, solar, waste-derived fuels, and agricultural fuels.
- **SEP Exec-10:** The General Assembly should require that all electric utilities in North Carolina provide generation disclosure of fuel mix percentages and emissions statistics on sulfur dioxide, nitrogen oxides, carbon dioxide, and mercury annually by bill insert and via website. The disclosure information should clarify to the consumer the environmental impact of residential electricity use. The NC GreenPower Program must clarify the extent to which disclosure of fuel mix and emissions is required to maintain the Center for Resource Solutions' national certification as a valid green product. The ASU Energy Center has prepared a disclosure briefing paper with recommendations for legislation requiring suppliers of electricity to report semi-annually, via bill insert, on respective mix of fuels and emissions.
- **SEP Exec-15:** The General Assembly should review options, such as a Public Benefits Fund (PBF) or other means, to enable funding of the recommendations in the State Energy Plan. A report was prepared by ASU Energy Center on evolution of PBFs in other states and presented to the Council 11/20/03. ASU developed a PBF economic analysis model with input from several economists. An evaluation by NREL will be presented to the Council on 3/31/05.
- **SEP Exec-20:** The State Energy Office should organize a statewide effort to develop criteria for a residential high performance building program to reduce the life cycle cost of new and existing buildings. The criteria should utilize provisions from other successful high performance programs, including Energy Star, programs developed by Advanced Energy Corporation, NC Healthy Built Homes, Southface Energy Institute's Earthcraft Home Program, U.S. Department of Energy's Building America program, and others. As a result of our residential energy-efficiency "umbrella" promotion initiative, SEO and ASU has launched an NC Energy Star Website; <http://www.ncenergystar.org>. Through collaboration with representatives of utilities and other organizations who market energy-efficiency housing programs across the state, the SEO will promote all of the current residential energy-efficient programs which meet or exceed the Energy Star standards. An Energy Star Conference is scheduled for December, 2005. A contract, with the Residential Energy Services Network (RESNET), that is intended to promote energy efficient construction and energy efficient mortgages in NC is in the DOA approval process. RESNET will partner with Wachovia Mortgage, Countrywide Home Loans and Fannie Mae to deliver this project.

- **SEP 6-1:** A Solar Schools Program should be developed and incorporate renewable electricity generation, solar water heating, and daylighting to reduce fossil fuel use by schools, improve the quality of education, provide a real-world energy training lab, and make our citizens more aware of the potential for renewable resources. The SEO will fund the NEED Project's Schools Going Solar program in North Carolina. A total of six photovoltaic systems will be installed: five will be grid-tied, while the sixth will be a battery backup, PV-assisted UPS system. This program allows schools to receive photovoltaic installations and solar energy curriculum and training programs to facilitate an understanding of solar energy and its diverse applications. With teacher training, student materials, and the installation of a learning lab, these schools learn about renewable energy, nonrenewable energy, and the impact that energy use has on economics and the environment.
- **SEP 7-1:** North Carolina statutes should require that designers of all new public buildings provide estimates of projected energy consumption and energy costs for the building prior to construction. A beginning point for required estimation of whole building energy use was made through 2001 Session HB 1272. This legislation requires state agencies to use life-cycle cost analysis over the economic life of the facility in selecting the optimum systems in constructing or renovating any *state* facility. ASUEC is preparing an analysis of a sampling of state buildings approved since passage of this requirement.
- **SEP 7-3:** The North Carolina Department of Administration should implement high performance building guidelines developed for North Carolina in all new public buildings and also develop and implement high performance guidelines for new public housing. A pilot program to evaluate state buildings constructed to High Performance Building Guidelines is underway.
- **SEP 7-7:** Local governments should be encouraged to implement the above actions and other energy efficiency programs. Through the EnergySmart Schools Initiative, NEED has delivered three conferences targeted towards school administrators, school business officials, school board members, energy and facilities managers, and curriculum directors to provide information on the best practices found in school districts and resources that the SEO and others can provide to K-12 schools to reduce energy costs. Local governments and schools have been invited and welcomed at a variety of USI training sessions, including five performance contracting workshops and the latest Energy Management Diploma series. Working with DPI, three strategic energy planning workshops were held for K-12 officials. Under USI, a coordinator position will be jointly funded for 05-06 for the Community College system to target 6 pilot colleges for a comprehensive energy efficiency program. A similar arrangement is proposed for DPI. On February 23, 2005, SEO staff members met with the Local Government Commission to encourage the implementation of energy efficiency, renewable and recycling projects by taking advantage of the Energy Improvement Loan Program.
- **SEP 8-3:** At a minimum, the State Energy Office should encourage new manufactured homes to comply with the critical components of the state energy code for site-built residential units and promote Energy Star manufactured homes. The program should include a comprehensive statewide training program on the benefits and details of higher efficiency units. The Center for Energy Research and Technology at NCA&T continues its work with manufactured housing. Palm Harbor Homes and Oakwood Homes provided testimonials confirming that

the research at NC A&T has caused them to produce manufactured homes that save 25% more energy than the regular HUD-built home. The Manufactured Housing Institute also supplied testimonials about the importance of CERT's research for the manufactured housing sector. The Center for Energy Research and Technology at NCA&T is investigating various seer levels energy efficiency heat pumps for manufactured housing. They expect to obtain energy usage data which will be provided to manufactured housing manufacturers, retailers, advocacy groups, utilities and research organizations. In addition, they are planning developing training classes for the set-up contractors who site manufactured homes. East Carolina University's Upgrade & Save Program-Heat Pumps in Manufactured Homes has been expanded to include MH retailers and potential new home buyers in Pitt and sixteen surrounding counties of Beaufort, Bertie, Carteret, Craven, Duplin, Edgecombe, Greene, Halifax, Jones, Lenoir, Martin, Nash, Onslow, Pamlico, Wilson & Wayne. Subsidies are paid to the MH retailers who sell heat pump-upgraded homes. Thirty-seven MH retailers and several HVAC distributors/suppliers in the local are actively involved in this program. As of June, 2005, over 100 manufactured homes have been upgraded to heat pumps. We are working with ECU to expand "Upgrade & Save" to additional eastern NC counties next year. SEO and NC Cooperative Extension Service will provide consumer training on energy measures.

- **SEP 9-4:** The State Energy Office should promote the use of and provide training for commercial building energy analysis software to assist building owners with evaluating the best energy efficiency measures to implement in existing state buildings and other commercial structures. SEO partnered with Southface Energy Institute to conduct eight Commercial Energy Codes training workshops. During the workshops, 180 attendees learned about DOE's commercial energy code software, COMcheck-EZ Software and the COMcheck Prescriptive Packages. Workshops were held in Raleigh, Nags Head, Chapel Hill and Charlotte.

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]

1. 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)
2. 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)
3. 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)
4. Capture and use process heat from industrial and commercial operations (6.6)
5. Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)
6. Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)

7. 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)
8. 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)
9. Focus programs for building energy efficiency on specific market segments: existing homes (weatherization), new construction, apartments, low income, etc. *,** (9.2)
10. Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** (9.12)
11. 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:

1. 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)
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)

3. 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)
4. 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

- **SEO CONTRACT Appalachian State University Energy Center:** The North Carolina General Assembly established the Energy Policy Council in 1975 as a means of addressing state-specific energy issues and concerns. The State Energy Plan is the Council's biannual, comprehensive examination of energy use, energy production and environmental concerns in the state. As in years past, the Appalachian State University Energy Center has been contracted by the State Energy Office to prepare the State Energy Plan based on the recommendations of the Energy Policy Council, updating and revising the Plan for 2007. The Center is also responsible for assisting the State Energy Office in implementing the recommendations of the State Energy Plan. As part of its implementation duties, Appalachian State University performs the following tasks, among others:
 1. Provides data on the potential for energy efficiency in various customer segments, preparing a final analysis and report for submission to the State Energy Office and Energy Policy Council.
 2. Coordinates the North Carolina Fuel Cell Alliance to further expand the fuel cell industry in the state.
 3. Updates economic analysis of standard and renewable electricity technologies due to changes in fuel costs, including projections of renewable electricity potential.
 4. Works with the North Carolina Economic Development Board in creating a strategy that informs the state's businesses and government leaders on the potential of renewable energy industries as part of the state's technology-based economic development strategy.
 5. Works with officials at several North Carolina landfills to conduct technical and economic analysis of landfill energy production for fuel and electricity generation.
 6. Provides input into statewide transportation policy and planning by developing a design for modular biodiesel plants; working with area farmers on production of crops for conversion to biofuels; working with other state transportation efficiency efforts to reduce dependence on petroleum-based transportation; and providing technical support to statewide agencies and universities to displace 20 percent petroleum use in state vehicles.
 7. Provides commercial building efficiency outreach by working with State Construction Office officials to develop new energy standards for State buildings and an evaluation and monitoring system to assure the use of these standards.
 8. Promotes high performance homes by conducting sessions for production builders on new Energy Star® homes; conducting a North Carolina-based Energy Star® conference;

developing new home designs based on input from affordable housing groups; and conducting workshops on the Zero Energy Home concept and design.

9. Furthers energy education by holding meetings with school officials about building energy use, energy-related curricula and energy demonstration projects.
 10. Furthers renewable energy initiatives in the western part of the state by purchasing and loaning an anemometer tower to assess wind development sites; providing consultation services for wind assessments; conducting workshops on residential- or farm-scale wind energy; and developing ordinances and working with local officials regarding wind turbine permitting.
- SEP recommends appliance swapping. Program exists already in NC to dispose of a refrigerator for free. (6.3)

- **SEP Exec-1:** The North Carolina 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, renewable energy equipment, biofuels, and fuel cells. ASU Energy Center has developed info on energy-related jobs and economic impact and has met with industry and economic development leaders to discuss how to bring more energy-related business and jobs to NC. Summary information has been presented to economic developers in four of the seven NC economic development regions to date in 2004. A handbook on renewable energy data available in the database is under development. The NC Solar Center staff provided financial incentives consultation to Carolina Green Energy to support potential development of a coastal NC wind farm. The NC Solar Center and SEO partnership provides services that support companies that produce and/or install renewable energy technologies. A directory of professionals offering services in various categories of renewable technology is available to the public. And, the NCSC offers design reviews, for both residential and commercial developments, that detail energy savings opportunities and encourage use of renewable design features. The NCSC supports the development of renewable energy through training for contractors, trades people, designers, and others on a range of topics that include solar electricity, solar heating, sustainable design, and day lighting.

The Million Solar Roofs program, coordinated through the NC Solar Center, has established 7 partnerships around the state. Partnerships have developed strategic plans that highlight steps to encourage the use of solar technology. A small grants program supports solar technology demonstration projects in local partnerships areas. Hosted by SEO and DENR, an interagency landfill gas steering committee has been meeting to discuss issues and opportunities related to converting landfill gas to energy. The group also has participation from Commerce, NC Solar Center, NC GreenPower, EPA's LMOP, landfill gas developers, and the Carolinas Solid Waste Association. Major issues revolve around regulatory, administrative, and industry proximity. The group sponsored a NC landfill gas conference on December 10, 2004, at the McKimmon Center. As part of this conference, a GIS mapping effort by NC OneMap showcased the proximity of 131 LMOP landfills to potential LFG users. A landfill gas focus group has met to discuss and identify the barriers to LFG development. These barriers are expected to be discussed with the PUC staff to attempt to

resolve the issues. Landfill gas development studies are being conducted for sites owned by Buncombe County, Robeson County, City of Durham, and 20 other sites identified as top prospects for development. The Schools Going Solar project, coordinated through The NEED Project, allows schools to receive photovoltaic installations and solar energy curriculum and training programs in order to facilitate both an understanding of the impact of solar energy and its diverse applications. The NC Schools Going Solar Project will install a total of six systems with the majority of them being placed in Million Solar Roof communities. The NEED Project anticipates installation at all six schools by the end of October 2005. (Move to USI?) Continue to investigate cost-effective solutions for National Guard 25 kW power backup application. Prepare and present power point presentation on hydrogen fuel cells for power backup applications during USI Steering Committee meeting on August, 24th. Meet with Hydrogen Economy Advancement Team, to review RDU airport presentation briefing on August 12th (DENR). Meet with "Fuel Cell Roadmap Team" on August 16th, Chapel Hill. NC A&T State University purchased and installed a PEM Fuel Cell on campus as a demonstration in April 2005. The performance of the fuel cell application will be studied and recommendations made in terms of widespread use of fuel cells. The NC GreenPower program now has over 7,000 participants who are supporting the purchase of almost 17,000 blocks of 100 kWh. This amounts to approximately 20 million kWh annually of greenpower purchases. The program has 11 small PV providers, a 35 kW project planned, 2 landfill operations and a swine waste generator as part of the mass market program. The large volume product has a small hydro aggregation generator, a portion of the Craven Wood Waste output, and a swine waste plant as part of the program. SEO supports the marketing and outreach portion of NC GreenPower as do the utilities and Advanced Energy.

- 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
- **SEO CONTRACT PEM Fuel Cell:** In order to showcase the beneficial uses of PEM fuel cells, the North Carolina Solar Center at North Carolina State University is building a fuel cell demonstration model that will provide supplemental power to the Center's new alternative fuel vehicle garage. Specifically, the operational system will consist of a commercial electrolysis unit powered by photovoltaic panels on the roof of the garage, a low pressure hydrogen storage tank, a commercial PEM fuel cell, and an inverter to convert the fuel cell output to 120 VAC. A benchtop demonstration model featuring see-through, micro-power versions of the main operational system components will further educate the public about the benefits of PEM fuel cells and hydrogen power. The demonstration model will benefit from existing outreach activities of the Center's North Carolina State University Solar House, which has welcomed over 250,000 visitors since it opened in 1981.

- **SEO CONTRACT Landfill Gas Conference:** The objective of the Landfill Gas and Combined Heat and Power: Technologies and Opportunities Conference was to further develop distributed energy projects that utilize landfill gas fuel around the southeastern United States. The North Carolina Solar Center acted as the lead agency, with State Energy Office support, in organizing three of these short conferences to examine landfill gas energy production technologies and to share success stories within the region. The conferences also spotlighted common and potential hurdles to implementing a landfill gas system in a community and how to overcome these hurdles.
- Energy Improvement Loan Program
- 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 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. (1.4)
- 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:

1. 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)
2. State Voices Support for Adoption of More Stringent Federal-level Appliance Efficiency Standards. (2.2)
3. Should be defined broadly enough to include, for example, commercial sector, and IT equipment. (2.2)
4. May wish to consider design for recycling of materials in appliances as part of standards (2.1, 2.2)
5. 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)
 - The state is an Energy Star Partner
- *Existing Federal Appliance Efficiency Standards [2005 Energy Bill]*
- **SEP 7-6:** North Carolina Department of Administration should require that all state facilities with motors larger than 5 horsepower must develop a motor maintenance program. Under the Utility Savings Initiative program, a motor maintenance program is under development with consultation from Advanced Energy Corporation and NCSU Industrial Extension personnel, as well as research into current and best practices.
- **SEP 10-3:** North Carolina should evaluate whether facilities that repair or rewind motors should be certified or otherwise meet a state efficiency requirement. Through USI training, SEO promotes the use of Motor Master Plus software available free from DOE to evaluate replacement with premium efficiency motors instead of rewinding motors. NCSU IES also offers motor efficiency workshops.
- **SEP 10-5:** North Carolina should create investment tax credits and other incentives for new and/or retrofitted manufacturing equipment to encourage modernization and efficiency improvements.
- **SEP 10-9:** The State Energy Office should sponsor workshops on industrial energy efficiency around the state directed at industrial facility operators, design and process engineers, and owners. The workshops will describe the state-of-the-art in efficient technologies and describe the results of ongoing research efforts. The training effort should also address water-conserving practices around the state. Through the Industrial Extension Service, the Energy Management Program provides workshops on industrial energy efficiency throughout the year. Workshops are conducted on the following areas: air compressors, chillers and cooling towers, energy efficient lighting, energy efficient motors and VSD's, HVAC, boilers, preventative maintenance, steam traps and steam systems.

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 in buildings in North Carolina accounts for about one-third of North Carolina's current gross GHG emissions, amending State and/or Local Building Codes to make the requirements for minimum energy efficiency levels in buildings more stringent will have a considerable immediate and ongoing impact in reducing building-sector greenhouse gas emissions.

Mitigation Option Design

North Carolina has building energy codes modeled on the International Energy Conservation Code 2000 for residential and commercial buildings, and enforced by the Building Code Council. An ongoing process of code amendments for new and renovated residential and commercial buildings is proposed as follows.

- North Carolina should adopt more stringent building codes (using cost-effectiveness tests to identify where moving beyond national building codes makes economic sense) to improve the efficiency of energy use in buildings. Improvements in codes can be in areas including but not limited to HVAC² systems, daylighting design to reduce lighting needs, electric lighting design, building envelope design, and using integrated building design strategies.
- North Carolina should move toward adopting 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
- Statewide enforcement of both existing and new building codes should be improved at all levels, and enforcement should be fully implemented within 6 months of statewide code adoption [if applicable].
- North Carolina should continue to update its energy codes regularly. A three-year cycle could be timed to coincide with release of national model codes.
- As appropriate, codes should be modified to remove obstacles to renewable energy use, daylighting and non-conventional energy-efficient Building Materials in buildings where applicable.

² Heating, Ventilation, and Air Conditioning

NOTE: the TWG did not complete discussion of the following elements of option design. They could be included in list above, included as footnotes, excluded or revised.

- 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:**

- *North Carolina Department of Insurance to implement new codes?*
- *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]

ASPECTS THAT NEED ADDITIONAL CONSIDERATION:

Should the following aspects be included in this option or, instead, included with RCI-7 or possibly RCI-1? Decision will need to be made by the TWG, but this decision can be made once the other options are developed further and as costs/benefits calculated.

1. Separate public- and private-sector components of this option (3.1) – potential wording “state of art” (LEVEL NEEDS TO BE DETERMINED) for new and renovated state and state-funded buildings (reasons for treating state buildings separately are leading by example, goal of acquiring the best energy efficiency and GHG savings for public spending, and serve as a pilot to test cost-effectiveness) – existing/proposed actions: Senate Bill 2051, State energy code (for state buildings))

2. Building codes could 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) [Comments from TWG meeting include –

- this is the most cost effective way to make energy efficiency changes and existing buildings have large energy use,
- could backfire and people will resist selling and old buildings stick around longer,
- several TWG members mentioned concern that the resistance to this action might be very strong,
- appliance standards will get at some energy efficiency aspects,
- for this to work politically, the homeowner would need access to financing for this,
- program should be developed so that only cost-effective savings would be included and this could be covered by mortgage savings overall].

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)
- Develop Training and Education programs 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)
 - Trade School and Community College Students (eg, include above skills in curricula) (3.3)
 - Building Code and other Officials in Energy Code Enforcement* (3.4)
- Develop a clearinghouse for information on and access to software tools to calculate impact of energy efficiency and solar technologies for buildings *** (3.14)

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)
- Latest information on Department of Insurance web site indicates ASHRAE 90.1 2004.
- 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)
- **SEP Exec-14:** The State Energy Office should develop programs, in addition to weatherization, to address energy-efficient housing in the low-income sector. The State Energy Office should investigate technologies, incentives, financing options, and regulatory issues regarding minimum efficiency requirements for manufactured housing and promote Energy Star manufactured homes.

The SEO formed the Low Income Residential Energy Program (LIREP), initially focusing on new construction in manufactured homes (MH) and with public housing authorities. The original target audience of Greenville Utilities service area customers included Greenville and approximately 80% of Pitt County. Subsidy money (up to \$500/home) will be paid to the local MH retailers who equip the customer’s new homes with high-efficiency heat-pumps as the primary heating system instead of electric-resistance furnaces. This contract has been completed. LIREP’s Upgrade & Save Program, operated by East Carolina University, has been expanded to include MH retailers and potential new home buyers in Pitt and sixteen surrounding counties of Beaufort, Bertie, Carteret, Craven, Duplin, Edgecombe, Greene, Halifax, Jones, Lenoir, Martin, Nash, Onslow, Pamlico, Wilson & Wayne. Subsidies are paid to the MH retailers who sell heat pump-upgraded homes. The program has active involvement from 37 MH retailers and HVAC distributors/suppliers in the local areas. The program offers “retrofit” assistance (50% of the cost, up to \$1,500) to area MH owners who purchased homes manufactured since 1/1/1998 and before 1/1/2004. Through June, 2005, over 100 manufactured homes have been upgraded to heat pumps. We are working with ECU to expand “Upgrade & Save” to additional eastern NC counties next year. The SEO is partnering with the National Association of Energy Service Companies in a DOE Special Project contract to work closely with three North Carolina PHAs to use performance contracting to finance energy efficiency measures in existing PHA units. This process will save energy when renovating aging housing and equipment. The project provides training, development of a template RFP, and technical assistance from the SEO. SEO is working with Advanced Energy to ensure energy efficient construction in several PHA projects. The

new units will be built to high efficiency levels so that residents are offered guaranteed low monthly utility bills. Two prospective locations have not moved forward due to holdup of HUD Section 8 funding and permitting concerns. Five other locations are in negotiation. SEO's LIREP project with Mountain Housing Opportunities in Asheville is complete. The 15-unit development, which consists of single family and multi-family structures, utilizes energy-efficient sustainable construction. High efficiency heat pumps and solar water heating were incorporated in the revitalization of this existing community. All structures conformed to the NC Solar Center's HealthyBuilt Home standards. Total annual energy savings of 60,760 kWh or \$5,165 are anticipated. Water use reduction measures are expected to save 74,000 gallons annually. Annual pollution reductions of 84,856 lbs. in CO₂, 4,557 lbs. in SO₂ and 369 lbs. in NO_x are expected.

A LIREP contract with Metropolitan Housing & Community Development Corporation in Washington, NC, for 36 low income energy-efficient homes, has been approved. Construction on the units has begun. An RFP to solicit potential projects for the remaining funding under the Low Income Residential Energy Program will be issued in 2006. The "Renewable Energy Project in New Affordable Homes in Western North Carolina", conducted by Appalachian State University, is near completion. This project is intended to increase the use of renewable energy technologies in residential construction, especially in affordable housing. A passive solar home plan books for affordable housing is complete. The project provided design/installation assistance for construction of a Zero Energy Home (ZEH). The ZEH, built by the local Habitat for Humanity chapter in Hickory, is completed. It features a ground-source heat pump, photovoltaic panels, passive solar design and solar water heating. The new Consumer Energy Education program was launched with N.C.S.U.'s Cooperative Extension Service. Under this program, 3 pilot counties (Buncombe, Orange, Edgecombe) will present consumer and extension agent training and schedule 100 energy audits for consumers to educate homeowners about energy efficiency and ways to save money and energy. Three workshops have been scheduled; bids from energy auditors have been received and the program manager, to be based at NCSU has been recommended for hire. Southface-North Carolina Office, under an SEO Special Projects contract, developed informational placards to be placed in high performance homes, including high performance homes for the low income sector. The placards address topics including: improved insulation; air sealing; duct sealing; low-e windows; compact fluorescent lamps; appliances; balanced ventilation; and Energy Star Homes.

- **SEP Exec-20:** The State Energy Office should organize a statewide effort to develop criteria for a residential high performance building program to reduce the life cycle cost of new and existing buildings. The criteria should utilize provisions from other successful high performance programs, including Energy Star, programs developed by Advanced Energy Corporation, NC Healthy Built Homes, Southface Energy Institute's Earthcraft Home Program, U.S. Department of Energy's Building America program, and others. As a result of our residential energy-efficiency "umbrella" promotion initiative, SEO and ASU has launched an NC Energy Star Website; <http://www.ncenergystar.org>. Through collaboration with representatives of utilities and other organizations who market energy-efficiency housing programs across the state, the SEO will promote all of the current residential energy-efficient programs which meet or exceed the Energy Star standards. An Energy Star Conference is scheduled for December, 2005. A contract, with the Residential Energy

Services Network (RESNET), that is intended to promote energy efficient construction and energy efficient mortgages in NC is in the DOA approval process. RESNET will partner with Wachovia Mortgage, Countrywide Home Loans and Fannie Mae to deliver this project.

- **SEP 7-1:** North Carolina statutes should require that designers of all new public buildings provide estimates of projected energy consumption and energy costs for the building prior to construction. A beginning point for required estimation of whole building energy use was made through 2001 Session HB 1272. This legislation requires state agencies to use life-cycle cost analysis over the economic life of the facility in selecting the optimum systems in constructing or renovating any *state* facility. ASUEC is preparing an analysis of a sampling of state buildings approved since passage of this requirement.
- **SEP 7-3:** The North Carolina Department of Administration should implement high performance building guidelines developed for North Carolina in all new public buildings and also develop and implement high performance guidelines for new public housing. A pilot program to evaluate state buildings constructed to High Performance Building Guidelines is underway.
- **SEP 8-1:** The State Energy Office should conduct a study on current compliance levels of residential and commercial buildings with the North Carolina state energy code. The study should make recommendations for improvements in compliance procedures and for energy code changes that are in the best interests of the state. ASUEC surveyed a small sample of 30 recently-constructed average residences to determine relative energy efficiency. Blower door, duct leakage tests, and other data were used to rate the energy performance of the homes. Some homes did not meet state energy code and none meet the preferred Energy Star standard. Southface Energy Institute has also conducted energy analysis of newly constructed western NC homes. Energy simulation software was used to estimate the energy savings which would develop from improved energy codes and increased stringency of enforcement of codes. The energy analysis will also determine whether additional expenditures and resources to improve both the quality of the energy codes and their enforcement are justified. Over the upcoming nine months, ASUEC will analyze 20 additional homes using this software.
- **SEP 8-2:** The State Energy Office should create an Energy Code Enforcement Assistance Program to provide additional energy code enforcement and outreach officials to serve across the state. The state should consider whether adding a state surcharge on all local building permit fees to support the program is feasible. The SEO is planning an initial meeting with representatives from the Department of Insurance and Southface Energy Institute to discuss the enforcement of energy codes throughout the state. SEO contracted with Southface Energy Institute to lead training workshops on building code standards for inspectors in 2004. Eight workshops have been conducted in 2003 and 2004 in four locations around the state. Over 170 persons attended the workshops. Training was also provided to 6 special groups and organizations including ASHRAE, affordable home representatives, and AIA chapters. Southface Energy Institute – North Carolina Office continues to meet and work with the Department of Insurance to develop and implement the enforcement of energy codes throughout the state.

- **SEP 8-3:** At a minimum, the State Energy Office should encourage new manufactured homes to comply with the critical components of the state energy code for site-built residential units and promote Energy Star manufactured homes. The program should include a comprehensive statewide training program on the benefits and details of higher efficiency units. The Center for Energy Research and Technology at NCA&T continues its work with manufactured housing. Palm Harbor Homes and Oakwood Homes provided testimonials confirming that the research at NC A&T has caused them to produce manufactured homes that save 25% more energy than the regular HUD-built home. The Manufactured Housing Institute also supplied testimonials about the importance of CERT's research for the manufactured housing sector. The Center for Energy Research and Technology at NCA&T is investigating various seer levels energy efficiency heat pumps for manufactured housing. They expect to obtain energy usage data which will be provided to manufactured housing manufacturers, retailers, advocacy groups, utilities and research organizations. In addition, they are planning developing training classes for the set-up contractors who site manufactured homes. East Carolina University's Upgrade & Save Program-Heat Pumps in Manufactured Homes has been expanded to include MH retailers and potential new home buyers in Pitt and sixteen surrounding counties of Beaufort, Bertie, Carteret, Craven, Duplin, Edgecombe, Greene, Halifax, Jones, Lenoir, Martin, Nash, Onslow, Pamlico, Wilson & Wayne. Subsidies are paid to the MH retailers who sell heat pump-upgraded homes. Thirty-seven MH retailers and several HVAC distributors/suppliers in the local are actively involved in this program. As of June, 2005, over 100 manufactured homes have been upgraded to heat pumps. We are working with ECU to expand "Upgrade & Save" to additional eastern NC counties next year. SEO and NC Cooperative Extension Service will provide consumer training on energy measures.
- **SEP 8-7:** The State Energy Office should provide training on high performance buildings to builders, subcontractors, architects and engineers, landscape architects, code enforcement officials, utility representatives, building investors, developers, financial institutions, real estate professionals, appraisers, home inspectors, renovation contractors, educators, and prospective homeowners. NCSC holds workshops on building design strategies that promote sustainable design principles. The Healthy Built Homes Program (HBH) is actively reaching out to builder organizations and has marketing incentives for builders who build to HBH standards. RESNET provided high performance building marketing training for utility representatives, appraisers and home energy raters in November, 2003, in Raleigh.
- **SEP 9-1:** The State Energy Office should work with appropriate state agencies to provide a design review service that focuses on energy-efficient components and holistic, high-performance, design strategies for new commercial buildings. The design review procedure should include a systematic life-cycle cost analysis of a variety of energy technologies and strategies for each project. The service should seek to upgrade new buildings to meet high performance building guidelines developed statewide. The NCSC is conducting a limited number of commercial design reviews that focus on addressing LEED requirements and objectives.
- **SEP 9-4:** The State Energy Office should promote the use of and provide training for commercial building energy analysis software to assist building owners with evaluating the best energy efficiency measures to implement in existing state buildings and other

commercial structures. SEO partnered with Southface Energy Institute to conduct eight Commercial Energy Codes training workshops. During the workshops, 180 attendees learned about DOE's commercial energy code software, COMcheck-EZ Software and the COMcheck Prescriptive Packages. Workshops were held in Raleigh, Nags Head, Chapel Hill and Charlotte.

- 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 and other resources are 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 quantifiably higher than existing known code or other government standards for new State- and local government-funded 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- and resource efficient design and construction.

Mitigation Option Design

Elements of this Option Design include:

1. 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)
2. Could also include the promotion of active and passive solar building technologies (3.2)
3. 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)
4. It may be useful to separate public and private sector components of this option (3.2)
5. Apply to existing buildings as well as new (3.2)
6. 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)
7. Support for growth and health of the residential building performance specialist industry. (3.3)
8. Continuing Education for building Design Professionals, including architects, engineers, developers, contractors, urban planners, and realtors(3.3)

9. ~~3.13 Energy efficiency and related education introduced at community colleges and trade schools ***~~
10. ~~Clearinghouse for information on and access to software tools to calculate impact of energy efficiency and solar technologies for buildings *** (3.14)~~
11. ~~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)~~
12. ~~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)~~
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~~

???? 13 shows up in RCI-1

14. ~~Performance based Contracting for funding of energy efficiency improvements—Capital costs paid back through energy savings (5.4)~~
15. ~~Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (suggested during CAPAG meeting #2) (6.7)~~
16. ~~Promotion of Ground source Heat Pumps for Residential and Commercial Heating and Cooling (suggested during CAPAG meeting #2) (6.8)~~
17. ~~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)~~
1. Promotion and Incentives using programs of various types for various sectors:
 - o Separate public- and private-sector components of this option (3.2). Additionally, it is important to review focusing programs for building energy efficiency and renewable, clean, safe energy on specific market segments: existing residential construction (weatherization), new home construction, apartments, low income housing, commercial new construction, commercial renovation construction, etc. *, ** (9.2)
 - o Improved Design and Construction of multiple resources with a focus on energy, e.g. the following examples: * *** (3.2)
 - LEED [Leadership in Energy and Environmental Design, a national building certification program, currently mature in the commercial building arena but with *fairly minimal energy requirements in its current version 2.2*],
 - NC HealthyBuilt Homes [a statewide residential green building certification program with ENERGY STAR as the energy efficiency base

and additional energy requirements for the building envelope/comfort systems/appliances, lighting, renewables and includes IAQ requirements to ensure that EE does not jeopardize human health],

- ENERGY STAR Homes [focused on energy efficiency for the building envelope and comfort systems],
- Environments for Living [a national residential energy efficiency certification program focused on large builders with some indoor air features]
- Performance-based Contracting for funding of energy efficiency improvements - Capital costs paid back through energy savings (5.4)
- Create a Clearinghouse for information on and access to software tools to calculate impact of energy efficiency and solar technologies for buildings *** (3.14)
- Government Agency Requirements and Goals, including procurement goals* (9.1)
- Extend green campus initiatives to all university buildings* (9.8)
- Energy benchmarking, measurement, and tracking programs for municipal and state buildings* (9.9)

2. Energy technologies that should be promoted by this section include but are not limited to:

- 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 criteria and # of points in energy efficiency section (or possibly an optimized energy efficiency section). (3.2)
- Photovoltaic Panels on new commercial buildings and many new homes
- Solar Hot Water Heaters on homes and other buildings. (3.16)
- New and existing building energy technologies
- Provide support for new-to-market technologies, such as Solar Hybrid Lighting (using light guides to bring daylight into building interiors), *where appropriate* in select, potentially high profile, researched and monitored projects for future broad application. (3.18)
- Solar-powered (absorption) Air Conditioning for residential and Commercial Applications (6.7)
- Promotion of Ground-source Heat Pumps for Residential and Commercial Heating and Cooling (6.8)
- 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 *, ** (6.9)

3. Energy education that should be promoted by this section includes but is not limited to:

- Training and Education for Building Construction Phase Professionals (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.
- Continuing Education for Building Design Phase Professionals, including architects, engineers, developers, contractors, urban planners, and realtors
- Energy efficiency, renewables and related education introduced at community colleges and trade schools

~~18. Government Agency Requirements and Goals, including procurement goals* (9.1)~~

~~19. Focus programs for building energy efficiency on specific market segments: existing homes (weatherization), new construction, apartments, low income, etc. *,** (9.2)~~

~~20. Extend green campus initiatives to all university buildings* (9.8)~~

~~21. Energy benchmarking, measurement, and tracking programs for municipal and state buildings* (9.9)~~

[Initial straw proposal text (in strikeouts) included here temporarily for reference]

[Insert text as appropriate]

- **Goals:**

- 15% improvement in energy performance of average new buildings above and beyond the 2006 International Energy Conservation Code, considered to “meet building code”.

- **Incentives** induce 5% of new residential buildings and 2% of commercial buildings *[annually?]* to go to “beyond code” energy use levels that improve energy performance over the average new building (that meets the upgraded building code) by 30%. These numbers will, on average, decrease energy use by 30% across the board above the existing building code requirements and encourage significant examples throughout the state of various building types that use 50% or less energy than is supported by the existing building code.

- It should be noted that a 30% reduction is cost-effective given basic improvements in design, materials and equipment but a 50% reduction in energy use requires a much heavier investment cost and will often require the use of renewable energy strategies (depending on building orientation, placement or exposure). This effort is focused on supporting and growing the market of building professionals in our state who can perform this

work for three reasons in addition to decreasing greenhouse gas emissions: 1) increase availability of capable building professionals for consumers wishing to increase energy performance 2) increase market competition in energy performance improvements 3) provide a base for energy security as energy resources become more expensive and/or scarce

- Energy use reduction mandate for state and locally owned [government?] buildings as follows:
 - 35% energy performance improvement in new buildings based of a specific size (5,000 sf or larger) beginning with any appropriations made in 2007 or thereafter.
 - 15% energy performance improvement in existing buildings of a specific size (5,000 sf or larger) beginning with appropriations for any building improvements to be made in 2007 or thereafter and with the mandate of providing appropriations for all existing building energy performance improvement upgrades at a rate of 5% per year over a 20 year period, at minimum. This mandate may use performance contracting as a vehicle for the energy performance improvements.
 - This policy will be fully implemented by 2027
 - This mandate will include revision of the existing policy which separates construction budgets from maintenance budgets, which discourages the implementation of increased resource efficiency in the construction or alteration of a building, particularly energy resources.
- Provide incentives to Upgrade 20% of existing buildings
 - Residential building energy performance improvements must increase by 15%
 - Commercial building energy performance improvements must increase by 20%
 - This increase in efficiency should bring 20% of existing buildings up to the standard of the 2003 IECC (the current NC code, not the improved codes)
- [Note from TWG Member “I think [targeting just HVAC and lighting] is inappropriate and focuses only on a limited industry—different buildings will require different strategies and more than just the HVAC and lighting industry need to be bolstered in the state”].
- **Timing:** Ramp up starting in 2007 to full effectiveness by 2012, except where noted otherwise
- **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:

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)
2. 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)
- **SEO CONTRACT, The Center for Energy Research and Technology:** The Center for Energy Research and Technology, housed at North Carolina A&T State University, provides education, training, demonstration and technical assistance on energy and environmental technologies. Programs fall under three main areas: technical transfer (outreach), demonstration and the manufactured housing research initiative. Recent projects have included the installation and monitoring of a photovoltaic system installed on residential buildings; collection and analysis of survey data on customer complaints of manufactured homes; a demonstration energy efficient manufactured home; industrial workshops on HVAC operation and indoor air quality; summer "energy camp" programs to introduce secondary school children to various energy systems and encourage their entrance into the energy field; and assessment of wood residues in the state available for energy production.
- **SEP Exec-20 (formerly 8-4):** The State Energy Office should organize a statewide effort to develop criteria for a residential high performance building program to reduce the life cycle cost of new and existing buildings. The criteria should utilize provisions from other successful high performance programs, including Energy Star, programs developed by Advanced Energy Corporation, NC Healthy Built Homes, Southface Energy Institute's Earthcraft Home Program, U.S. Department of Energy's Building America program, and others. As a result of our residential energy-efficiency "umbrella" promotion initiative, SEO and ASU has launched an NC Energy Star Website; <http://www.ncenergystar.org> . Through collaboration with representatives of utilities and other organizations who market energy-efficiency housing programs across the state, the SEO will promote all of the current residential energy-efficient programs which meet or exceed the Energy Star standards. An Energy Star Conference is scheduled for December, 2005. A contract, with the Residential Energy Services Network (RESNET), that is intended to promote energy efficient construction and energy efficient mortgages in NC is in the DOA approval process. RESNET will partner with Wachovia Mortgage, Countrywide Home Loans and Fannie Mae to deliver this project.

- **SEP 7-3:** The North Carolina Department of Administration should implement high performance building guidelines developed for North Carolina in all new public buildings and also develop and implement high performance guidelines for new public housing. A pilot program to evaluate state buildings constructed to High Performance Building Guidelines is underway.
- **SEP 8-3:** At a minimum, the State Energy Office should encourage new manufactured homes to comply with the critical components of the state energy code for site-built residential units and promote Energy Star manufactured homes. The program should include a comprehensive statewide training program on the benefits and details of higher efficiency units. The Center for Energy Research and Technology at NCA&T continues its work with manufactured housing. Palm Harbor Homes and Oakwood Homes provided testimonials confirming that the research at NC A&T has caused them to produce manufactured homes that save 25% more energy than the regular HUD-built home. The Manufactured Housing Institute also supplied testimonials about the importance of CERT's research for the manufactured housing sector. The Center for Energy Research and Technology at NCA&T is investigating various seer levels energy efficiency heat pumps for manufactured housing. They expect to obtain energy usage data which will be provided to manufactured housing manufacturers, retailers, advocacy groups, utilities and research organizations. In addition, they are planning developing training classes for the set-up contractors who site manufactured homes. East Carolina University's Upgrade & Save Program-Heat Pumps in Manufactured Homes has been expanded to include MH retailers and potential new home buyers in Pitt and sixteen surrounding counties of Beaufort, Bertie, Carteret, Craven, Duplin, Edgecombe, Greene, Halifax, Jones, Lenoir, Martin, Nash, Onslow, Pamlico, Wilson & Wayne. Subsidies are paid to the MH retailers who sell heat pump-upgraded homes. Thirty-seven MH retailers and several HVAC distributors/suppliers in the local are actively involved in this program. As of June, 2005, over 100 manufactured homes have been upgraded to heat pumps. We are working with ECU to expand "Upgrade & Save" to additional eastern NC counties next year. SEO and NC Cooperative Extension Service will provide consumer training on energy measures.
- **SEP 8-5:** The State Energy Office should develop a comprehensive, statewide promotional campaign for high performance buildings. The SEO is continuing its efforts to develop a statewide promotion of residential energy efficient/Energy Star construction through a committee of stakeholders/interested parties that was formed in the 2nd quarter of 2004. Jeff Tiller (ASU) serves as Chairperson along with representatives of Energy Star, Progress Energy, the Electric Membership Cooperatives, Duke Power, Greenville Utilities, Advanced Energy, the NC Solar Center and SEO staff. Several meetings have been held and agreement was reached on a promotional initiative that includes an online NC Energy Star website. An Energy Star Conference will be held December, 2005.
- **SEP 8-6:** The State Energy Office should continue its work to formulate and advance mortgage-based incentives for high performance new homes. In 2004, the SEO partnered with Residential Energy Services Network (RESNET), Fannie Mae, Countrywide and Wachovia to promote the Energy Efficient Mortgage Initiative. EEM Media events were held in Raleigh, Charlotte, Asheville, Wilmington, and Winston-Salem. The EEM recognizes lower operating costs of energy efficient homes and higher home values when homes are energy efficient. The EEM will increase affordability for home buyers, regardless

of income, and encourage energy efficient housing in NC. In addition, the program has boosted the number of Energy Star-labeled homes built in NC. A new contract with the (RESNET) is in the DOA approval process. It is intended to continue the promotion of energy efficient/Energy Star residential construction and energy efficient mortgages in NC. RESNET plans to add more lending partners to its existing group of Wachovia Mortgage, Countrywide Home Loans and Fannie Mae.

- **SEP 8-7:** The State Energy Office should provide training on high performance buildings to builders, subcontractors, architects and engineers, landscape architects, code enforcement officials, utility representatives, building investors, developers, financial institutions, real estate professionals, appraisers, home inspectors, renovation contractors, educators, and prospective homeowners. NCSC holds workshops on building design strategies that promote sustainable design principles. The Healthy Built Homes Program (HBH) is actively reaching out to builder organizations and has marketing incentives for builders who build to HBH standards. RESNET provided high performance building marketing training for utility representatives, appraisers and home energy raters in November, 2003, in Raleigh.
- **SEP 8-8:** The State Energy Office should provide training for building professionals on specific targeted technologies including residential daylighting, solar water heating, heat pump water heaters, new insulation products, and advanced HVAC systems and controls. NCSC holds workshops on renewable energy technologies for building professionals. ASU provided training in new technologies to affordable housing and solar industry representatives. A workshop on performance contracting for Public Housing Authorities is scheduled for October, 2004. As a part of its educational outreach, Mountain Housing Opportunities, Inc. held an open house that showcased its “Green Building Demonstration” sustainable building project. They also partnered with NC Healthy Built Homes, Asheville area home builders and the local Green Building Council to offer informational tours of this 15-unit low-income, green housing development. Sustainable building concepts and products, such as passive solar design, solar water heating and environmentally friendly products, are included in the project.
- **SEP 9-1:** The State Energy Office should work with appropriate state agencies to provide a design review service that focuses on energy-efficient components and holistic, high-performance, design strategies for new commercial buildings. The design review procedure should include a systematic life-cycle cost analysis of a variety of energy technologies and strategies for each project. The service should seek to upgrade new buildings to meet high performance building guidelines developed statewide. The NCSC is conducting a limited number of commercial design reviews that focus on addressing LEED requirements and objectives.

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:

1. 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)
2. Training of Building Code and other Officials in Energy Code Enforcement* (3.3)
3. Energy Management Training/Training of Building Operators* (3.3)
4. Continuing Education for building Design Professionals, including architects, engineers, developers, contractors, urban planners, and realtors (3.3)
5. Energy efficiency and related education introduced at community colleges and trade schools *** (3.13)
6. Consumer education programs** *** (Probable overlap with Cross-Cutting TWG) (4.1)
7. Continued funding to meet the expanding role of State Energy Office as a key consumer information outlet. (4.1)
8. Emphasize provision of resources directing consumers to information and technologies for energy-efficiency and climate impacts reduction (4.1)
9. Introduce in School Curriculum *** (Probable overlap with Cross-Cutting TWG) (4.2)
10. Extend green campus initiatives to all university buildings* (9.8)
11. Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** (9.12)

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” (4.1)
- NC Air Aware provides info for teachers, focus on ozone. <http://daq.state.nc.us/airaware/> (4.2)

- **SEO CONTRACT Energy Management Diploma** The Energy Management Diploma Program is a fourteen-day course over approximately six months that trains state, local government, nonprofit, university and community college officials in the development and implementation of effective energy management programs. Upon the successful completion of the course and a written exam, students receive a Diploma in Energy Management from North Carolina State University.
- **SEO CONTRACT Consumer Energy Education Program** The Consumer Energy Education Program, also known as E-Conservation, was created to inform and educate North Carolina consumers about ways to both reduce energy use and increase energy efficiency in the home. Most North Carolina utility companies have eliminated or significantly reduced their consumer energy awareness and education programs. This project is designed to help consumers reduce home energy consumption and assist them in saving money through no- and low-cost energy efficiency measures, behavioral changes and home retrofits. Trained county extension agents offer consumer education workshops, conduct home energy audits, distribute consumer energy kits with information on energy conservation and efficiency, participate in community events, and develop partnerships with other energy professionals. The agents provide ongoing evaluations to determine the effectiveness of the E-Conservation energy education program.
- **SEP 12-15:** The North Carolina Community College System should require that the community colleges' curricula provide a building science course, an energy design course for drafting programs, and a solar/renewable energy technology class. The SEO provided technical assistance to Wilson Tech and A-B Tech in design of curriculum for efficiency and renewable energy areas.
- **SEO CONTRACT Building Operator Certification** This project will promote energy conservation in state and local government, institutional, commercial and industrial buildings throughout the state. This will be accomplished by introducing the Building Operator Certification Program to North Carolina through community-college based training courses. The program will provide training in energy-saving building operating practices and in identification and implementation of energy-conservation projects for building operators (e.g. school facilities staff).
- **SEP 12-12:** The State Energy Office should work in partnership with the State Department of Public Instruction to plan school energy-related initiatives and include a representative for energy-use in school facilities on the Energy Policy Council.
- **SEO CONTRACT National Energy Education Development** The National Energy Education Development Program is dedicated to implementing comprehensive energy education programs in the nation's schools. This will be accomplished by creating effective networks of education, business, government and community leaders to design and deliver objective, multilateral energy education programs. In North Carolina, the project will train 200 teachers and reach 9,000 students directly.
- **SEP 6-1:** A Solar Schools Program should be developed and incorporate renewable electricity generation, solar water heating, and daylighting to reduce fossil fuel use by schools, improve the quality of education, provide a real-world energy training lab, and make our citizens more aware of the potential for renewable resources. The SEO will fund the

NEED Project's Schools Going Solar program in North Carolina. A total of six photovoltaic systems will be installed: five will be grid-tied, while the sixth will be a battery backup, PV-assisted UPS system. This program allows schools to receive photovoltaic installations and solar energy curriculum and training programs to facilitate an understanding of solar energy and its diverse applications. With teacher training, student materials, and the installation of a learning lab, these schools learn about renewable energy, nonrenewable energy, and the impact that energy use has on economics and the environment.

- **SEP 6-2:** The State Energy Office should work with the state's professional licensing boards to develop a certification program for renewable energy installers. The NCSC is a participant in the national photovoltaic installer training program that will result in certification of installers. The NC HealthyBuilt Homes program is developing training workshops for builders. The Renewable Energy Diploma Series is now offering classes through NCSU covering renewable energy technology. These classes include field installation activities.
- **SEP 8-7:** The State Energy Office should provide training on high performance buildings to builders, subcontractors, architects and engineers, landscape architects, code enforcement officials, utility representatives, building investors, developers, financial institutions, real estate professionals, appraisers, home inspectors, renovation contractors, educators, and prospective homeowners. NCSC holds workshops on building design strategies that promote sustainable design principles. The Healthy Built Homes Program (HBH) is actively reaching out to builder organizations and has marketing incentives for builders who build to HBH standards. RESNET provided high performance building marketing training for utility representatives, appraisers and home energy raters in November, 2003, in Raleigh.
- **SEP 8-8:** The State Energy Office should provide training for building professionals on specific targeted technologies including residential daylighting, solar water heating, heat pump water heaters, new insulation products, and advanced HVAC systems and controls. NCSC holds workshops on renewable energy technologies for building professionals. ASU provided training in new technologies to affordable housing and solar industry representatives. A workshop on performance contracting for Public Housing Authorities is scheduled for October, 2004. As a part of its educational outreach, Mountain Housing Opportunities, Inc. held an open house that showcased its "Green Building Demonstration" sustainable building project. They also partnered with NC HealthyBuilt Homes, Asheville area home builders and the local Green Building Council to offer informational tours of this 15-unit low-income, green housing development. Sustainable building concepts and products, such as passive solar design, solar water heating and environmentally friendly products, are included in the project.
- **SEP 9-4:** The State Energy Office should promote the use of and provide training for commercial building energy analysis software to assist building owners with evaluating the best energy efficiency measures to implement in existing state buildings and other commercial structures. SEO partnered with Southface Energy Institute to conduct eight Commercial Energy Codes training workshops. During the workshops, 180 attendees learned about DOE's commercial energy code software, COMcheck-EZ Software and the COMcheck Prescriptive Packages. Workshops were held in Raleigh, Nags Head, Chapel Hill and Charlotte.

- **SEP 10-9:** The State Energy Office should sponsor workshops on industrial energy efficiency around the state directed at industrial facility operators, design and process engineers, and owners. The workshops will describe the state-of-the-art in efficient technologies and describe the results of ongoing research efforts. The training effort should also address water-conserving practices around the state. Through the Industrial Extension Service, the Energy Management Program provides workshops on industrial energy efficiency throughout the year. Workshops are conducted on the following areas: air compressors, chillers and cooling towers, energy efficient lighting, energy efficient motors and VSD's, HVAC, boilers, preventative maintenance, steam traps and steam systems.
- **SEP 12-1** The State Energy Office should develop and sponsor training programs for community colleges and universities in fields related to energy efficiency and high performance buildings. Technical support is being provided to Wilson Tech and a commercial landfill gas company in an effort to use landfill gas at the college and also generate a training curriculum on landfill gas generation and application. A-B Tech is being provided with technical support to train community colleges in energy management and performance contracting.
- **SEP 12-2:** The State Energy Office should assist in the coordination of energy education programs with museums and help create an energy museum "on wheels" using existing resources, such as the Science House at NCSU or the Museum of Life Science, wherever possible. The EV Challenge program utilizes a mobile classroom with exhibits, video, and a red Spitfire (converted from gasoline engine to electric battery) for presentations to high schools across the state.
- **SEP 12-3:** The State Energy Office should sponsor regional "renewable demonstration centers" or, whenever possible, use existing ones (e.g. demonstration centers such as the North Carolina Solar House and the EnergyXchange, museums such as the Museum of Life and Science, Discovery Place). The alternative fuel vehicle demonstration facility at the NCSC is developing new displays to highlight the range of alternative fuels that can be produced. Negotiations are underway with the Museum of Natural Science regarding a renewable energy demonstration.
- **SEP 12-4:** The State Energy Office should create energy internships or apprenticeships for graduating college students and high school students to create the next generation of energy professionals. The SEO has had three interns through the Youth Advocacy & Involvement Office and two volunteers who assisted with special projects for the staff. A verbal agreement has been made with Duke University's Nicholas School of the Environment to support up to four graduate work/study students for a full school year on energy/environmental projects. An energy management student intern will be funded under USI for UNC Asheville for year 05-06.
- **SEP 12-5:** The State Energy Office should provide a statewide award (e.g., a college scholarship) for the most outstanding energy-related science demonstration/experiment at the state science fair.
- **SEP 12-6:** The State Energy Office and the UNC System should help the Education Departments of colleges and universities develop coursework for junior and senior undergraduates and graduate students in energy education. SEO programs include the Model

Solar Fuel Cell Cars project which takes air quality and alternative fuels information to middle school students. An annual competition includes several categories with the overall championship team rewarded with a trip to the national event to represent the state. Several SEO-sponsored programs train current K-12 teachers in energy and environmental issues. These include NEED, EV Challenge, Junior Solar Sprint, and Model Solar Fuel Cell Cars.

- **SEO CONTRACT, Sustainable Design Competition:** The NC Sustainable Building Design Program aims to integrate the foundations and principles of sustainable design into college-level curriculums. The main event in this program is the annual Sustainable Building Design Competition. Through this competition, students create a residential structure that is later built and used as a model “sustainable” house. Student teams are from diverse curriculums and are encouraged to create multi-institutional and cross-curriculum teams. Students enter the workforce experienced in and knowledgeable about energy efficient, sustainable design. The program, now in its sixth year, has involved over 1,200 students, professors and professionals and 10 North Carolina community colleges and universities. Support from the State Energy Office will help ensure the expansion of the current program to include more mainstream sustainable design options through demonstration projects and more participating schools. It is the vision of the competition organizers to recruit five additional schools per year totaling 20 schools by the 2008 academic year. This would impact approximately 2,000 students, professors and professionals by 2008.
- **SEP 12-7:** The State Energy Office and the state’s colleges and universities should help Community Colleges and other vocational schools develop coursework in energy efficiency and renewable energy to help spur the industry; such as training carpentry students in energy efficient, passive solar building design and construction. Include this training in voc-tech courses in high schools. Technical support is being provided to Wilson Tech and a commercial landfill gas company in an effort to use landfill gas at the college and also generate a training curriculum on landfill gas generation and application. A-B Tech is being provided with technical support from the SEO to train community colleges in energy management and performance contracting.
- **SEP 12-8:** The State Energy Office should provide training to licensed professionals in the homebuilding industry focusing on energy efficiency and renewable energy sources to promote industry awareness and implementation of these technologies. A range of workshops is offered by the NCSC on green building topics including; green building, passive solar design, photovoltaics, solar hot water technology, and energy calculations. The Healthy Built Homes program conducts workshops on greenbuilding and provides marketing incentives for builders to incorporate green building practices. Southface conducted Residential and Commercial Energy Code workshops in Nags Head, Chapel Hill, Charlotte, and Raleigh. High Performance Home Workshops were held in Greenville, Raleigh, and Charlotte. RESNET conducted a North Carolina Energy Rater Training Workshop in Raleigh.
- **SEP 12-9:** The State Energy Office should support development of a comprehensive information outreach program for consumer questions about saving energy and using renewables in their homes and businesses; information hotline via a toll-free telephone number; informative Web Page containing a wide array of publications available on-line; resources that include up-to-date information on renewables and energy efficient buildings,

industrial facilities, and vehicles, as well as data on energy sources in the state; information on energy-producing facilities; environmental information related to energy consumption; and other energy-related information. Brief fact sheets to address energy conservation and efficiency issues have been prepared by Waste Reduction Partners. Topics include vending machines, upgrading to T-8 fluorescent lamps, occupancy sensors, computer monitors, drinking fountains and water coolers, and task lighting. Several additional topics are being developed. This information will be helpful to energy managers in a variety of buildings, whether state-owned, K-12 schools, local government, or commercial. An energy conference, accessible to all sectors and audiences seeking energy-related information, was held in March, 2004 and will be held annually in the future. The SEO will broaden its efforts in public education to include a series of consumer-oriented trainings to be conducted through the NC Cooperative Extension Service. Extension agents will be trained and offer training to consumers about home energy efficiency. Outreach tools also include distribution of energy kits to consumers and professional energy audits in pilot counties. In our efforts to continue promoting all of the current residential energy-efficient programs which meet or exceed the Energy Star standards, the SEO and ASU have launched an NC Energy Star Website: <http://www.ncenergystar.org>. The NC Energy Star Website, which is accessible from our own SEO website, offers information and links to utilities and other organizations who market energy-efficiency housing programs across the state.

- **SEP 12-10:** North Carolina should encourage schools to reduce school operating budgets by installing energy efficiency and renewable energy systems. NEED Smart Schools and energy education workshops for K-12 officials were held in Asheville, Chapel Hill, and Wilmington. SEO and DPI held Strategic Energy Planning workshops in four locations for K-12 officials.
- **SEP 12-14:** The State Energy Office should sponsor a program to install solar equipment or other sustainable energy technologies on school buildings in every school district in the state. NEED has been awarded a contract to install photovoltaic systems on six schools in NC. There are also 6 solar charging stations operating at high schools in NC. These charging stations operate in conjunction with the EV Challenge program and provide solar charging of electric cars. Demonstration water source heat pumps have been successfully tested on mobile classroom units by NCSU. In addition, a high performance mobile classroom is being monitored for performance by the NCSC. Both projects have potential for replication in many schools. SEO will fund the NEED Project's Schools Going Solar program in North Carolina. A total of six systems will be installed. Five will be grid-tied while the sixth will be a battery-backup, PV-assisted UPS system.
- **SEP 12-16:** The State Energy Office should establish a central repository for energy information. This energy data and policy analysis center should develop baseline information on energy consumption by state and local governmental entities. The center should also provide policy analysis for existing and proposed state energy policies. A database has been created to record summary utility use and cost data for state agencies and universities. The SEO is also working with the Dept. of Correction to track utility use, costs and inmate populations and square feet of building space with a web-based utility accounting program. Plans are underway to create an integrated database to house information from other agencies.

- **SEO CONTRACT, RFP for Utility Accounting Services:** The purpose of this program is to provide utility data input and collection for state agencies, the University of North Carolina system, community colleges, primary and secondary public schools and local governments. This is not a contract as each individual participant will create their own purchase order referencing this RFP.
- **SEO CONTRACT, State Energy Office Information and Referral Center:** The State Energy Office information and referral center manager will create and manage an on-site and virtual information center. Duties will include acquiring, organizing and disseminating information through the State Energy Office Web site, exhibitions, workshops, conferences, media events, mailings, on-site visits, telephone calls and other activities. This position will be the initial contact for public inquiries and two-way communication about energy information. This position will be responsible for both online and print material selection, printing contracts and publication development and distribution. Additionally, this position will be responsible for developing promotional strategies for State Energy Office information services and collecting and organizing Information and Referral Center statistics.
- 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

NC GreenPower is an independent, nonprofit organization established to improve North Carolina's environment through voluntary contributions toward renewable energy. A landmark initiative approved by the N.C. Utilities Commission, NC GreenPower is the first statewide green energy program in the nation supported by all the state's utilities. The goal of NC GreenPower is to supplement the state's existing power supply with more green energy – electricity generated from renewable resources like the sun, wind and organic matter. The program accepts financial contributions from North Carolina citizens and businesses to help offset the cost to produce green energy.

NC GreenPower differs from a Renewable Portfolio Standard (RPS) in that the RPS requires that electric utilities provide a certain level of renewable energy capacity in their generation mix. NC GreenPower is entirely voluntary, with the revenue going toward paying incremental costs of renewable energy generation. Also, because all power purchased through NC GreenPower is produced inside the state, there are also economic development benefits.

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.

[Initial straw proposal text included here temporarily for reference]

Mitigation Option Design

While NC GreenPower is an existing program, there are several policy options that can be implemented that would greatly increase the effectiveness of the program. The following are suggestions for state policy that is designed to increase both supply and demand for NC GreenPower, thus increasing the climate change mitigation efforts. Most recommendations are also designed to improve economic development in the state.

Demand-Side Policy Recommendations:

- In order to demonstrate leadership in this area, state facilities should be mandated to purchase a certain percentage of their power through NC GreenPower.
- The state should provide economic development incentives for new or expanding businesses to purchase NC GreenPower.
- The state should provide improved tax credits for companies that purchase NC GreenPower blocks or who provide support for employees who do so. An example may be to work with

companies to match employees' purchases of NC GreenPower and receive tax benefits for doing so.

- The state should provide incentives for home builders to include one year of green energy through NC GreenPower with the purchase of new homes.
- The state should provide assistance and participation in consumer and business marketing programs.
- The NC Department of Environment and Natural Resources should work with the U.S. Environmental Protection Agency to ensure that NC GreenPower is an option for air quality violator restitution.
- The state should ensure that the air quality benefits of renewable energy programs such as NC GreenPower are wedded to other benefits such as waste reduction, greenhouse gas emission reductions, and economic development.

Resource-Side Policy Recommendations:

- The state should provide support for research efforts on new and developing renewable energy technologies. This support is designed to foster new technology business in our state.
- The state should provide support for feasibility studies of various renewable energy technologies.
- The state should provide a mechanism for long-term contract guarantees for renewable energy producers. Currently, it is difficult to get financing for some projects due to the lack of long-term contracts.
- The state should provide support for larger renewable energy development projects. In the current program, energy is purchased after customers have signed up for the program. By sponsoring large developments prior to customer sales, the program will have more options and sales tools.
- The state should work to ease ridge laws in the mountains to allow for wind energy development. Further, the state should work with the military to provide for wind energy development in coastal areas currently being blocked.
- The state should provide low or no interest loans for qualified developers of renewable energy projects.

Elements of this Option Design include:

1. 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?*
2. Bulk Purchasing Programs for Energy Efficiency or other Equipment (Public or Private sector) (5.2)

3. 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:** In addition to requiring that state facilities purchase energy through NC GreenPower, the state should set a goal that 10% of the electricity produced in North Carolina be from renewable resources by the year 2015.
- **Timing:** As an ongoing program, NC GreenPower needs only the support of the state as described above to continue to grow.
- **Coverage of Parties:** State facilities, electric utilities, renewable energy producers.
- **Other:** Ensure that the economic value of renewable energy generation produced in the state is included in value judgments along with air quality and other benefits.

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)
- **SEO CONTRACT, NC GreenPower Marketing:** North Carolina GreenPower is a statewide program designed to improve the quality of the environment through development of renewable energy resources using consumers' voluntary purchase of green power through electric utilities in North Carolina. The program revenues provide financial incentives for generators of electricity from renewable sources. The four main objectives of the program are to improve the quality of the environment; increase the amount of generation from renewable and alternative energy sources; maximize the amount of investment in renewable generation; and maximize the number of participants in the program. The objective of the marketing and outreach project is to expand the statewide advertising, communications and education campaign to promote the use and development of renewable energy generated in North Carolina. Particular emphasis is placed on increasing corporate sales activities, through which the program most effectively and more readily can reach its participation goals.

- 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 7-5:** State agencies should lead by example by establishing a certain minimum level of electricity to be derived from renewable sources, such as the North Carolina GreenPower Program, or via installation of state-owned renewable energy projects. The SEO is buying the equivalent of 100% of its annual electrical load from NCGP. DENR is investigating options for NCGP purchase. A meeting was held with the State Budget Office to request clearance for state agencies to participate in the NC GreenPower Program.
- SEP recommends state procurement of environmentally preferable products (9.1)
- **SEP 7-6:** North Carolina Department of Administration should require that all state facilities with motors larger than 5 horsepower must develop a motor maintenance program. Under the Utility Savings Initiative program, a motor maintenance program is under development with consultation from Advanced Energy Corporation and NCSU Industrial Extension personnel, as well as research into current and best practices.
- **SEP 10-3:** North Carolina should evaluate whether facilities that repair or rewind motors should be certified or otherwise meet a state efficiency requirement. Through USI training, SEO promotes the use of Motor Master Plus software available free from DOE to evaluate replacement with premium efficiency motors instead of rewinding motors. NCSU IES also offers motor efficiency workshops.
- **SEO CONTRACT, Heat Pumps in Manufactured Homes:** Historically, nearly one-third of the new homes sited annually in North Carolina are manufactured homes (formerly referred to as mobile homes). Many consumers choose manufactured homes because they offer a more affordable housing option for their families. The benefits of a lower monthly mortgage payment are often negated by the additional monthly operating expenses of an electric-resistance furnace, however. In some instances, the monthly winter utility payment may actually be higher than the monthly mortgage payment. The approximate cost of upgrading a manufactured home from the standard forced-air, electric-resistance furnace with central air conditioning to an energy-efficient heat pump (to provide both heating and cooling) is about \$400 per home. Homeowners who upgrade to an energy-efficient heat pump can expect to save \$375 to \$750 per winter heating season in energy costs. With the support of the State Energy Office, the Eastern Carolina University College of Technology and Computer Science developed an “upgrade and save” program that has secured the participation of 37 manufactured home retailers in 17 eastern North Carolina counties. The program reimburses both retailers and existing manufactured homeowners for the approximate cost to upgrade to an energy-efficient heat pump. Around 130 homes have received upgrades to date. The next phase of the program is detailed below.
- **General Statute 143, Article 3B: Energy Conservation in Public Facilities. Part 1. Energy Policy and Life-Cycle Cost Analysis. 143-64.10. through 143-64.16.**

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

- 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:

1. 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)
2. 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)
3. Incentives for Renewable Energy Applications *** (Solar roofs, water heaters, etc.), including tax incentives (6.1)
4. 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)
5. 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)
6. Integration with Regional Demand Response Initiatives/recommendations* (9.10)
7. Funding of Research and Development for Energy Efficiency, Renewable Energy, Other GHG Reduction Strategies*** (9.12)
8. 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:

1. 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)
2. 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)
3. Voluntary Emissions Targets for Industrial Operations (8.3)
4. 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)
5. 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)
6. 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)
- **SEP Exec-8:** The General Assembly should reexamine existing legislation and regulations as pertains to barriers and strategies to develop wind energy while still protecting North Carolina's natural beauty. With SEO and DOE support, a statewide map showing wind development potential has been developed. A mountain wind attitudes study has been completed, showing strong support for wind among local residents. Scenic view protection must be incorporated into wind turbine location. An environmental analysis is being conducted to determine endangered species of plants and animals that could be impacted by wind power development. ASU completed a coastal wind attitudes survey and prepared a report to the Coastal Wind Working Group. Coastal residents also showed support for area wind development although respondents did note concern for placement of wind turbines in national forests and in sounds. A Small Wind Demonstration Center has been established at Beech Mountain, NC. The center currently has 6 wind turbines installed and these are generating electricity for sale to Mountain Electric Coop. A website for information about the project is at <http://www.wind.appstate.edu/swiwind/swi.php> NC Coastal Wind Assessment and Coastal Wind Working Group continue to address regulatory, financial, and environment issues. In addition, a coastal anemometer program has sited 6 anemometers to collect wind data. Additional information is at http://www.ncsc.ncsu.edu/programs/The_Coastal_Wind_Initiative.cfm
- Integration with Regional Demand Response Initiatives/recommendations is a SEP recommendation* (9.10)
- **SEP 4-1:** The North Carolina Utilities Commission is encouraged to promote policies that create diversity in energy supply such as natural gas, solar energy, wind energy, biomass, and hydrogen from renewable sources with particular emphasis on in-state energy development. Technical discussions regarding an interconnection policy that details liability, hardware, and rate issues have taken place under facilitation from the NCSC. A detailed docket brief describing these issues has been filed with the NCUC in August 2004. The NCUC annually reviews fuel diversity in generation as a factor of the integrated resource planning process. In addition, the NCUC continues to encourage and support participation in NC GreenPower, a statewide effort to develop renewable generation in NC. NC GreenPower has announced contracts with a number of solar and biomass facilities in the state. A biomass assessment project has been completed by NC A&T. This project characterized crop residues and forest wastes to determine energy content and amount of waste generated and available for use.

- **SEP 4-5:** Because the December, 2002, ice storm raised public interest in use of distributed generation (i.e., in facilities used as public shelters, residential housing, etc.), the State Energy Office should study distributed generation and appropriate applications. The Center for Energy Research and Technology conducted four Distributed Generation Workshops: in Greensboro on 10/28/03, in Flat Rock on 3/30/04, in Wilmington on 6/16/04 and in Charlotte on 6/18/04.
- **SEO CONTRACT, The Center for Energy Research and Technology:** The Center for Energy Research and Technology, housed at North Carolina A&T State University, provides education, training, demonstration and technical assistance on energy and environmental technologies. Programs fall under three main areas: technical transfer (outreach), demonstration and the manufactured housing research initiative. Recent projects have included the installation and monitoring of a photovoltaic system installed on residential buildings; collection and analysis of survey data on customer complaints of manufactured homes; a demonstration energy efficient manufactured home; industrial workshops on HVAC operation and indoor air quality; summer "energy camp" programs to introduce secondary school children to various energy systems and encourage their entrance into the energy field; and assessment of wood residues in the state available for energy production.
- **SEO CONTRACT, Million Solar Roofs:** The Million Solar Roofs Partnership, administered by the North Carolina Solar Center at North Carolina State University, helps supports local organizations in eight locations around the state in continuing educational outreach and advocacy projects supporting solar technology deployment. Examples of local projects include educational forums, solar home tours, technology demonstrations, technology workshops, local policy support, tracking local solar installations, and support for North Carolina GreenPower, an independent, nonprofit organization established to improve North Carolina's environment through voluntary contributions toward renewable energy. The partnerships are in Asheville, Charlotte, Fayetteville, Wilmington, Chapel Hill, and the counties of Guilford, Durham and Watauga.
- **SEO CONTRACT, North Carolina Solar Center:** Created in 1988, the North Carolina Solar Center serves as a clearinghouse for renewable energy programs, information, research, technical assistance, and training for professionals and consumers in North Carolina. The Solar Center is operated by the College of Engineering at North Carolina State University. The activities and initiatives funded by this program will move North Carolina closer to a sustainable energy future through technology transfer programs, extensive workforce development programs, and efforts to educate the public and shape government policy. The Center has served as the lead agent of the State Energy Office for nearly two decades in the area of active and passive solar energy, and has in recent years assumed a leadership role in a broader array of renewable power and industrial efficiency technologies, high performance building systems and alternative transportation fuels and technologies.
- **SEP 5-4:** The State Energy Office, Department of Agriculture, and Department of Environment and Natural Resources should support landfill methane gas projects through direct grants and loans based on need, as well as technical assistance. A landfill gas steering committee, formed as a result of the first NC Biomass Conference, has identified landfill gas development barriers and strategies, and held a statewide landfill gas conference for December 10, 2004. As follow-up to the conference the landfill gas committee has met with

NCUC Public Staff to address regulatory concerns relative to developing landfill gas opportunities. SEO continues to support landfill gas projects with four active projects (Avery, Wilkes, Jackson, and Watauga Counties). Also, technical support is being provided to assess feasibility of sites in Wilson and Wayne Counties and in the City of Durham. An earlier project at Yancey-Mitchell landfill has successfully used energy from the landfill for operation of buildings, greenhouse, kiln, and glass-blowing facilities.

- **SEO CONTRACT, UNCA Craft Campus**, The University of North Carolina at Asheville is building a new Craft Campus close to their main campus and downtown Asheville. In addition to providing a central location to display the work of western North Carolina and UNC-Asheville artists, the Craft Campus will serve as a demonstration site to showcase and teach the public about a variety of renewable energy technologies. The campus design team has developed a cohesive, systematic view focusing on green building principles that integrate studio needs, public spaces and on-site energy sources including landfill gas, wind, water and solar power. This will be the only site in North Carolina comprehensively demonstrating the renewable energy and energy efficiency technologies that could impact our lives in the near future.
- **SEO CONTRACT, Sustainable Community—Carrboro Collaborative:** This demonstration project is intended to provide solar-assisted hot water and photovoltaic lighting for the “common house” in the Pacifica neighborhood located in Carrboro, N.C. This highly visible project will be located in a sustainable Orange County subdivision that consists of 46 energy efficient low- to moderate-income homes. The homes in the Pacifica neighborhood will provide this project with a complimentary demonstration of high performance homes. Forty-two of the 46 homes have a passive solar design, 16 have solar hot water systems, 11 have whole house instantaneous hot water systems and 19 have hot water-heated radiant floors. It is projected that local, regional and statewide builders, developers and potential new home purchasers will tour the site to learn about the advantages of solar water heating and photovoltaic lighting. Recent emphasis on alternative, sustainable energy sources coupled with the current increase in fuel costs will help to raise consumer awareness of this sustainable option.
- **SEO CONTRACT, Sustainable Community—Town of Chapel Hill:** The purpose of this project is to provide funding for the purchase and installation of a photovoltaic system at the Town of Chapel Hill’s Fire Station Number 1. This upgrade will be an extension of an earlier sustainable community grant, which the town utilized to successfully complete an energy audit and several efficiency upgrades, including installing energy efficient doors and windows, upgrading the efficiency of the HVAC units, replacing inefficient appliances with Energy Star®-rated appliances and purchasing two solar exterior lights.
- **SEO CONTRACT, SPP Brownfields to Brightfields Solar Demonstration:** “Brightfield” is a term that was coined by the U.S. Department of Energy to describe redevelopment projects that incorporate renewable energy or distributed energy generation systems into the redevelopment of “Brownfields,” or industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination. Such was the case of Lot 86 on the North Carolina State University campus in Raleigh where, during the 1970s and 1980s, the site was used as an agricultural pesticide dump. Carolina Green Energy, formed in 2004 to build renewable energy generation in North Carolina, will build,

own and operate a 35 kW photovoltaic power generation project on Lot 86. The electricity generated will be sold to Progress Energy under an avoided cost contract and the renewable energy certificates will be sold to North Carolina GreenPower under a separate contract. North Carolina GreenPower is the first statewide green energy program in the nation supported by all the state's utilities and administered by a nonprofit corporation. The goal of North Carolina GreenPower is to supplement the state's existing power supply with more green energy, or electricity generated from renewable resources such as the sun, wind and organic matter. All proceeds from this project's electricity sales and green power certificates will be used to cover operational costs, maintenance costs and equipment financing charges.

- **SEO CONTRACT North Carolina Combined Heat and Power Center** Combined heat and power technologies offer many benefits to society. Conventional means of generating electricity typically convert 33 percent or less of the energy available in a fuel source into useful energy for consumers; the other 66 percent of the energy potential is discarded as waste heat. A regional combined heat and power center can help situate power generation technologies near locations that require a heat source. The "waste heat" from generating electricity can be used to satisfy heating requirements. Various technologies can even allow the "waste heat" to be converted so that cooling and dehumidification needs can be met. This project will continue support for the North Carolina Combined Heat and Power Application Center to promote combined heat and power applications throughout the state. This will be accomplished by continuing assessments of potential sites at public and private facilities that could host combined heat and power, assisting in the development of demonstration sites, supporting a broader market acceptance of combined heat and power concepts and technologies, and providing regular monthly status reports tracking progress of the program.
- **SEP 10-8:** North Carolina should create policies and regulations for distributed generation in the state, including incentives for deployment of "clean" distributed generation. After a collaborative process encouraged by the NCUC, investor-owned utilities jointly filed Docket No. E-100, Sub 101 on 6/4/04 which included model small generation interconnection standards, associated application to interconnect, and interconnection contract forms. On 7/12/04, the NCUC issued an order allowing interested persons to intervene in this docket and to file written comments or reply comments. Initial comments were filed by the Attorney General and the NC Sustainable Energy Association. Reply comments are due to be filed by 9/24/04. The SEO has a lead role in the Southeast CHG Applications Center and the NC CHP Center. Both are working to advance distributed generation systems.
- **SEP 12-14:** The State Energy Office should sponsor a program to install solar equipment or other sustainable energy technologies on school buildings in every school district in the state. NEED has been awarded a contract to install photovoltaic systems on six schools in NC. There are also 6 solar charging stations operating at high schools in NC. These charging stations operate in conjunction with the EV Challenge program and provide solar charging of electric cars. Demonstration water source heat pumps have been successfully tested on mobile classroom units by NCSU. In addition, a high performance mobile classroom is being monitored for performance by the NCSC. Both projects have potential for replication in many schools. SEO will fund the NEED Project's Schools Going Solar program in North Carolina. A total of six systems will be installed. Five will be grid-tied while the sixth will be a battery-backup, PV-assisted UPS system.

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- **SEP 8-8:** The State Energy Office should provide training for building professionals on specific targeted technologies including residential daylighting, solar water heating, heat pump water heaters, new insulation products, and advanced HVAC systems and controls. NCSC holds workshops on renewable energy technologies for building professionals. ASU provided training in new technologies to affordable housing and solar industry representatives. A workshop on performance contracting for Public Housing Authorities is scheduled for October, 2004. As a part of its educational outreach, Mountain Housing Opportunities, Inc. held an open house that showcased its "Green Building Demonstration" sustainable building project. They also partnered with NC HealthyBuilt Homes, Asheville area home builders and the local Green Building Council to offer informational tours of this 15-unit low-income, green housing development. Sustainable building concepts and products, such as passive solar design, solar water heating and environmentally friendly products, are included in the project.
- **SEP 7-5:** State agencies should lead by example by establishing a certain minimum level of electricity to be derived from renewable sources, such as the North Carolina GreenPower Program, or via installation of state-owned renewable energy projects. The SEO is buying the equivalent of 100% of its annual electrical load from NCGP. DENR is investigating options for NCGP purchase. A meeting was held with the State Budget Office to request clearance for state agencies to participate in the NC GreenPower Program.
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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:

1. Capture and use of process heat from industrial and commercial operations (6.6)
2. 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)
3. 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)
4. 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)
5. 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)
6. 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)
7. 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)

8. 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)
9. Integration with Regional Demand Response Initiatives/recommendations (SEP recommendation)* (9.10)
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:

1. Focus should be on efficiency improvements that are long lived and require minimal proactive input from the customer once in place.
2. 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)
3. 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)
4. 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)
- **SEO CONTRACT, DPPEA Energy Efficiency Field Assistance Waste Reduction Partners:** Waste Reduction Partners is a team of 51 volunteer and retired engineers,

scientists and architects that provides waste reduction and energy efficiency assistance to businesses, industries and public facilities in the state's 37 western-most counties. With support from the State Energy Office, Waste Reduction Partners is serving a critical community need by responding to requests for on-site energy-efficiency technical assistance, strategic energy management planning, and implementation facilitation for western North Carolina industries, businesses and public facilities, including primary and secondary public schools, local governments and state agencies. This assistance is free and supports the objectives of the State Energy Plan and the State Energy Office's Utility Savings Initiative.

- **SEP 9-5:** The State Energy Office should develop an energy audit program for existing commercial buildings to assist building managers with implementing the most energy efficient and cost effective improvements for commercial renovation projects. **SEO contracted with Waste Reduction Partners to design a Self-Assessment Guide for Energy-Saving Opportunities for use by organizations ranging from non-profits to businesses to public institutions. The guide helps establish priorities and identify measures to be taken. Copies of the guide are available from SEO or Land-of-Sky COG or can be downloaded from SEO's website.**
- 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)
- **SEO CONTRACT, Boiler Technical Assistance Program:** The Boiler Technical Assistance Program helps state-operated and industrial, commercial and institutional facilities measure and improve boiler efficiency and implement boiler-related energy conservation measures. This is accomplished through statewide workshop presentations and on-site boiler surveys. The workshops teach participants how to confront their boiler problems, work through solutions and return to their jobs with the tools to solve their own in-plant problems. The on-site boiler surveys offer boiler system evaluations and technical assistance to those institutions that attend one of the workshops. Potential beneficiaries include industry engineers, systems operators and boiler operating personnel from schools, hospitals, state government agencies and universities.
- **SEO CONTRACT, Energy Management Program:** This program, operated in conjunction with the North Carolina State University Industrial Extension Service, provides workshops and industrial energy surveys that identify opportunities and demonstrate techniques for optimizing energy use in various building systems and promoting energy conservation in industrial, institutional, commercial and governmental buildings. Industrial surveys provide comprehensive audits of common system inefficiencies (such as leaky compressed air systems, poorly-adjusted steam traps, etc.) and provide recommendations for energy

improvements. The tasks involved in this project include performance of energy surveys, development of energy-saving recommendations, technical assistance, development, implementation and promotion of workshops and educational materials.

- **SEO CONTRACT, NC Industries of the Future:** The North Carolina Industries of the Future program will assist North Carolina industry in implementing innovative energy efficiency methods to become more globally competitive. Industrial sector businesses that are large energy users will be targeted for this program, with a focus on the five originally-designated North Carolina Industry of the Future sectors of glass, agriculture, forest products, chemicals and mining. Best practices training workshops will be provided for each of the industry sectors, and assessments for 12 energy-intensive facilities will be distributed among the sectors and other large energy users. Reports on program progress will be presented for the stakeholders to self-assess the progress and effectiveness of the program and to redirect efforts if necessary in order to achieve success.
- **SEO CONTRACT, North Carolina Combined Heat and Power Center:** Combined heat and power technologies offer many benefits to society. Conventional means of generating electricity typically convert 33 percent or less of the energy available in a fuel source into useful energy for consumers; the other 66 percent of the energy potential is discarded as waste heat. A regional combined heat and power center can help situate power generation technologies near locations that require a heat source. The “waste heat” from generating electricity can be used to satisfy heating requirements. Various technologies can even allow the “waste heat” to be converted so that cooling and dehumidification needs can be met. This project will continue support for the North Carolina Combined Heat and Power Application Center to promote combined heat and power applications throughout the state. This will be accomplished by continuing assessments of potential sites at public and private facilities that could host combined heat and power, assisting in the development of demonstration sites, supporting a broader market acceptance of combined heat and power concepts and technologies, and providing regular monthly status reports tracking progress of the program.
- **SEO CONTRACT, Steam Trap Survey Program:** The purpose of this program is to provide steam trap survey services to a variety of North Carolina industrial facilities, commercial businesses, local government and institutional facilities using steam for heating and/or processing. Steam traps are identified, tested and tagged if not working properly. These services enable facilities to cut steam loss, thereby saving energy and money. Program participants receive a fixed amount of funding for each steam trap surveyed. The surveys are conducted by approved firms.
- **SEO CONTRACT, ElectriCities—Energy Auditor:** Energy audits, once a common utility service for residential customers, are now rare offerings. The state’s three major utilities do not offer them, and only a handful of municipal and electric cooperatives offer them. The savings potential from a home energy audit is enormous, however, particularly in light of the rapidly increasing costs of today’s utility bills. ElectriCities of North Carolina, Inc., with support from the State Energy Office, will maintain a two-year program for a circuit riding energy auditor to provide energy audit services to residential customers of municipal electric distribution systems in northeastern North Carolina. The goal of the project is to conduct 1,000 on-site energy audits and to offer 100 energy education workshops with estimated attendance of 1,000 people over the project’s two-year span. In addition, the project will

make a Web-based energy audit service available to all ElectriCities residential customers, enabling many more additional audits to be conducted. Savings to consumers will vary, though an average of 15 percent for residential energy costs, or nearly \$300 per household, is a safe assumption. Environmental benefits, based on reduced energy use, will be significant.

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]