N O R T H C A R O L I N A G E N E R A L A S S E M B L Y

LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE

FINAL REPORT TO THE GENERAL ASSEMBLY AND THE ENVIRONMENTAL REVIEW COMMISSION

MAY 2010

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TRANSMITTAL LETTER

TO THE MEMBERS OF THE 2010 GENERAL ASSEMBLY:

Pursuant to Section 11 of S.L. 2005-442, as amended by S.L. 2006-73, S.L. 2008-81, and S.L. 2009-306, the Legislative Commission on Global Climate Change submits this Final Report to the Environmental Review Commission and the 2010 General Assembly.

Representative Pricey Harrison
Co-Chair

Mr. John L.W. Garrou
Co-Chair

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TABLE OF ACRONYMS USED IN REPORT

Table 1:
Acronyms used in this report

ACEEE	American Council for an Energy-Efficient Economy
AFW	Agriculture, Forestry, and Waste Management (CAPAG Category)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAU	Business as usual
CAFE	Corporate Average Fuel Economy Stds.
CAMA	Coastal Area Management Act
CAPAG	Climate Action Plan Advisory Group
CC	Cross-Cutting Issues (CAPAG Category)
CCX	Chicago Climate Exchange
CDC	Centers for Disease Control and Prevention
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
COHAZ	North Carolina Coastal Hazards Decision Portal
Corps	U.S. Army Corps of Engineers
CRC	Coastal Resources Commission
DAQ	Division of Air Quality of DENR
DENR	Department of Environment and Natural Resources
DHHS	Department of Health and Human Services
EMC	Environmental Management Commission
EPA	U.S. Environmental Protection Agency
ERC	Environmental Review Commission
ES	Energy Supply (CAPAG Category)
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
G.S.	General Statutes
GHG	Greenhouse Gas
HB	House Bill
IPCC	Intergovernmental Panel on Climate Change
LCGCC	Legislative Commission on Global Climate Change
LEED	Leadership in Energy and Environmental Design
LiDAR	Light Detection and Ranging
LRC	Legislative Research Commission
MMTCO2E	Million metric tons of carbon dioxide equivalent
MPO	Metropolitan Planning Organization
MSW	Municipal Solid Waste
NAS	National Academy of Sciences
NOAA	National Oceanic and Atmospheric Admin.

NOx	Nitrogen oxide
PPM	Parts per million
RCI	Residential, Commercial, and Industrial (CAPAG Category)
REPS	Renewable Energy Portfolio Standard
RGGI	Regional Greenhouse Gas Initiative
S.L.	Session Law
SB	Senate Bill
SGA	Southern Governors Association
SHGC	Solar Heat Gain Coefficient
SO2	Sulfur Dioxide
TLU	Transportation and Land Use (CAPAG Category)
UNFCCC	United Nations Framework Convention on Climate Change
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VMT	Vehicle Miles Traveled
VOC	Volatile organic compound

PREFACE

The Legislative Commission on Global Climate Change was established in S.L. 2005-442 to conduct an in-depth study of issues related to global climate change. The authorizing language for the Commission is contained in Appendix A of this report. The Commission consists of 34 members, nine appointed by the President Pro Tempore of the Senate, nine appointed by the Speaker of the House of Representatives, and 16 named members, or their designees, that represent a variety of industries, organizations, and academic institutions. The full Commission membership, including past and current members, is included in Appendix B.

The Commission met on the following occasions:

February 3, 2006
March 7, 2006
April 4, 2006
April 25, 2006
October 3, 2006
November 27, 2006
December 11, 2006
January 12, 2007
February 22, 2007
October 23, 2007
December 4, 2007
January 16, 2008
February 11, 2008
March 5, 2008
April 22, 2008
November 14, 2008
December 9, 2008
January 13, 2009
November 17, 2009
January 13, 2010
March 15, 2010
April 7, 2010
May 6, 2010

Agendas for each of the Commission meetings are included in Appendix C. Copies of the presentations and handouts that were presented to the Commission are available on the Commission's website at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

A complete record of the Commission's proceedings is available in the Legislative Library.

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INTRODUCTION

Background and Acknowledgments:

The Legislative Commission on Global Climate Change (Commission) was established in S.L. 2005-442 to conduct an in-depth study of issues related to global climate change. The Commission consists of 34 members, nine appointed by the President Pro Tempore of the Senate, nine appointed by the Speaker of the House of Representatives, and 16 named members, or their designees. The membership, listed in Appendix B, is broadly expert and philosophically diverse, including legislators, scientists, economists, attorneys, environmental advocates, and representatives from the energy, agriculture, forestry, and manufacturing sectors.

The Commission met in full 23 times over the course of its existence, starting in February 2006 and ending in May 2010, when this final report was adopted. Meetings were held primarily in the Legislative Office Building in Raleigh. The Commission's work was supported by central staff from the Legislative Services Office and was greatly assisted by professionals from the Department of Environment and Natural Resources (DENR), the Department of Commerce, the Department of Transportation, the Department of Crime Control and Public Safety, and the Department of Agriculture and Consumer Services. Experts from institutions of higher education located in the State, including Appalachian State University, Duke University, East Carolina University, North Carolina State University, the University of North Carolina at Asheville, and the University of North Carolina at Chapel Hill were frequently called upon for information and analysis. In addition, national and international experts from a variety of organizations were brought in from around the country to speak to the Commission to help inform its deliberations.

The time committed to this process by the members of the Commission has been significant. Many of the Commission members presented information and issue items to the Commission, provided recommendations for the Commission to consider, and participated in the discussions of the Commission's findings, recommendations, and legislative proposals. The work of the Commission represents the first comprehensive analysis by a legislative body of climate change issues facing North Carolina to date.

The Commission applauds Senator Charles Albertson for being the primary sponsor of the legislation to establish the Commission (SB 1134 (= HB 1191), 2005 Session) and appreciates the General Assembly's decision to enact the legislation and support the efforts of the Commission over the past four years. The Commission also appreciates the leadership of its co-chairs, including John Garrou from 2006 to 2010, Representative Joe Hackney from 2006 to 2007, and Representative Pricey Harrison from 2007 to 2010.

Need for State Action:

Since climate change is a global problem, national and international solutions are needed in order to achieve the most significant reductions in greenhouse gas emissions. Nonetheless, because the effects of climate change on North Carolina will be significant, the General Assembly should not

wait for national or international action before responding to these threats. Moreover, many of the steps to reduce greenhouse gas emissions will require state action.

The Commission concludes that the actions taken by states can have a significant effect on global greenhouse gas levels. The important role states can serve in addressing climate change is illustrated by data from the World Resources Institute indicating that the combined emissions of eight southeastern states (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia) are greater than all but four countries in the world.[1]

The Commission urges the General Assembly to give serious consideration to the findings and recommendations included in this report and to act quickly with regard to the legislative proposals. The Commission hopes that other institutions and agencies involved in climate change deliberations in North Carolina, whether legislative or executive, find the information in the report instructive and useful.

Commission Charge:

The original enabling legislation for the Commission, S.L. 2005-442, provided the Commission with the following purposes and duties:

> *(1) The Commission shall conduct an in-depth examination of issues related to global climate change. This examination shall include all of the following:*
>
> *a. A review of current scientific literature on the possible natural and anthropogenic causes of global climate change.*
>
> *b. A review of actions taken by the federal government and by other states to address global warming.*
>
> *c. An examination of the emissions of greenhouse gases from within the State and the extent to which reductions in the emissions of these gases in the State, region, nation, and worldwide could be expected to affect global climate change.*
>
> *d. An evaluation of the economic opportunities for the State that may result from international, national, and State action to address global climate change and the emerging carbon market.*
>
> *e. The potential impacts of global climate change on the citizens, natural resources, and economy of the State, including agriculture, travel and tourism, recreation, coastal real estate, insurance, and other economic sectors.*
>
> *f. The costs of any action taken by the State to address global climate change on individuals, individual households, local governments, businesses, educational institutions, agricultural operations, the State government, and other institutions and economic sectors.*
>
> *g. The benefits of any action taken by or within the State or other states and at the national or international levels to address global climate change on*

[1] Damassa, T. 2009. Energy by the Numbers (Data Supplement). Washington, DC: World Resources Institute. Available online: http://www.wri.org/publication/southeast-energy-policy.

individuals, individual households, local governments, businesses, educational institutions, agricultural operations, the State government, and other institutions and economic sectors.

(2) If, in the course of its examination, the Commission determines that it would be appropriate and desirable for the State to establish a global warming pollutant reduction goal, the Commission may develop a recommended global warming pollutant reduction goal for the State.

(3) In conducting its examination of global climate change, the Commission shall consider and integrate the findings and recommendations of the study of issues related to the development and implementation of standards and plans to control emissions of carbon dioxide required by Section 13 of S.L. 2002-4.

This charge formed the basis for all of the activities of the Commission. The Commission did not start with a set agenda or any assumptions about climate change. Instead, the Commission attempted to develop a common foundation of information on these topics from which formal recommendations and legislative proposals, if needed, could be developed. To accomplish this task, the Commission proceeded using the following basic framework:

(1) Thorough review of the science of climate change.
(2) Discussion of the economic implications of climate change.
(3) Evaluation of potential impacts of climate change on North Carolina.
(4) Analysis of actions taken to date in North Carolina.
(5) Review of actions taken by other states to address climate change.
(6) Review of actions taken or pending at the national and international level.
(7) Discussion of policy options to consider in North Carolina.

The activities of the Commission are described in greater detail in the Commission Proceedings section of this report. The agendas from each of the Commission's 23 meetings are listed in Appendix C.

Input from the North Carolina Climate Action Plan Advisory Group (CAPAG):

During the time the Commission was meeting, a parallel process was underway in North Carolina. Section 13 of the 2002 Clean Smokestacks Act (S.L. 2002-4) directed the Division of Air Quality of DENR to "study issues related to the development and implementation of standards and plans to control emissions of carbon dioxide (CO2) from coal-fired generating units and other stationary sources of air pollution" and to "evaluate available control technologies and …estimate the benefits and costs of alternative strategies to reduce emissions of CO2." The Division of Air Quality issued its final report pursuant to this study in 2005 and included as one of its recommendations that a public stakeholder process should be started to continue greenhouse gas mitigation planning in the State. Based on this recommendation, DENR embarked on the process of establishing the North Carolina Climate Action Plan Advisory Group (CAPAG). The CAPAG process culminated with the release of a final report in October 2008 entitled "Recommended Mitigation Options for Controlling Greenhouse Gas Emissions." The report included a comprehensive analysis of various mitigation options related to climate change,

including 56 recommended options that are considered to be the most important for mitigating greenhouse gas emissions in North Carolina.

During the Commission's proceedings, the participants and facilitators in the CAPAG process frequently presented and contributed information to the Commission's discussions. The detail and analysis in the CAPAG report was very beneficial to members of the Commission and the CAPAG recommendations formed the framework for much of the Commission's discussions on policy options. A table of the CAPAG recommendations and actions taken in response to those recommendations is included as Appendix E. The CAPAG final report and many supplemental materials are available online at: http://www.ncclimatechange.us/capag.cfm.

Interim Report by the Commission

The Commission prepared a draft interim report in February 2007 that provided a preliminary overview of the activities taken by the Commission. As part of its development of the interim report, the Commission discussed and approved 17 early action recommendations suggested by CAPAG for inclusion in the interim report. Although the interim report was never submitted to the General Assembly by the Commission, the recommendations that were approved for inclusion in the interim report are included in the Previously Approved Recommendations section of this final report.

Development of the Final Report

Following the Commission's investigational work, the Commission developed a set of findings that could be drawn from the information gathered by the Commission. These findings are listed in each section of the Commission proceedings and are also summarized in the Findings section of this report. In addition, the Commission members submitted over 100 possible policy recommendations for the Commission to consider. The comments submitted by Commission members during this time are available on the Commission website. Following discussion of these items at the March and April 2010 meetings of the Commission, a list of recommendations for future consideration was adopted by the Commission, and several legislative proposals were also developed. The recommendations for future consideration and the legislative proposals are provided at the end of this report.

How to Interpret the Commission's Actions on this Report

In adopting this final report, Commission members endorsed the need to take actions to reduce greenhouse gas emissions and adapt to changes in North Carolina's climate. However, the issuance of this report does not reflect unanimity among Commission members on the selected findings, recommendations, or legislative proposals. Instead, it simply means that the majority of the Commission members agreed with most of what is contained in the document. Commission members' reservations reflect the complexity of the issues that the Commission faced, including the time scale involved, the ongoing debates at the international and federal level, and remaining questions about the uncertainty of the science.

While the Commission attempted to find common ground on climate change issues, in other cases the position taken by some Commission members was irreconcilable with the position taken by the majority of the Commission members. As an example, a portion of the Commission's membership did not feel that there was a need for the State to take further action on climate change at this time. A letter expressing this viewpoint was submitted by several members of the Commission on February 5, 2010, and a copy of the letter is included in this report as Appendix D. The differences in perspectives among the Commission member are also highlighted in the comments submitted to the Commission in February and March 2010, which are available on the Commission website at the following links:

- February 5, 2010 Comments and Proposed Recommendations.
- March 15, 2010 Comments on Report and Recommendations.

Testimony and presentations made before the Commission were from many perspectives, including some disputing the basic premise of climate change and the underlying science on which most climate change projections are based. The information presented to the Commission was not necessarily endorsed by each Commission member, but was again designed to provide for a thorough and full discussion of the issues involved in the climate change debate.

Difficulty in Quantifying Costs and Benefits

It is important to note that Commission members would have been more comfortable with the recommendations if more specific information regarding the quantifiable costs and benefits had been available. The CAPAG process and some of the presentations received by the Commission provide useful information on the costs and benefits of various policy recommendations, but detailed analysis of each recommendation was not possible given the time and resource constraints of the Commission. Additional analysis of cost issues will be part of the task of the General Assembly in considering the recommendations and the agencies charged with implementing the recommendations in the report.

References to Pending Legislation

Bills referenced in this report are primarily for illustrative purposes only and should not be interpreted as an endorsement of that legislation by the Commission.

Commission Action on the Findings

The Commission's findings were voted on as a whole set.

Commission Action on the Recommendations for Future Consideration

The recommendations for future consideration were also voted on as a whole set. These recommendations include items submitted by Commission members as proposals that have merit as mitigation or adaptation policy alternatives, but lacked sufficient detail, dealt with issues that were already being addressed in another forum, or were sufficiently controversial that they lacked the general support necessary to be considered as a legislative proposal by the Commission.

Commission Action on the Legislative Proposals

The legislative proposals were voted on as a whole set. The proposals that received approval of the Commission are included in the Legislative Proposals section of this report.

Post-Report Positions by Commission Members

As noted, a majority of the Commission members agree with most of what is contained in this report. However, Commission members are free, as they have been throughout the Commission's deliberations, to rely on the testimony of specific presenters and the findings and recommendations that they find most persuasive and credible. Now that the Commission's work is complete, members remain free to express their own opinions on the report's findings, recommendations, and legislative proposals as they are debated in the future in various forums.

COMMISSION PROCEEDINGS

The Commission conducted a thorough review of climate change issues, including the receipt of over 90 presentations from more than 60 different speakers. In general, the topics that were considered fall within the following categories, each drawn from the Commission's charge:

- Review of the science regarding the causes of climate change.
- Review of the potential impacts of climate change.
- Economic implications and opportunities related to climate change.
- Actions taken in North Carolina.
- Actions taken internationally, at the national level, and by other states.
- Discussion of possible policy options.
- Consideration of other elements of the Commission charge.

These items are discussed in further detail in the following sections:

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REVIEW OF THE SCIENCE REGARDING THE CAUSES OF CLIMATE CHANGE

S.L. 2005-442(1)(a) directed the Commission to conduct a "review of current scientific literature on the possible natural and anthropogenic causes of global climate change." The Commission focused much of its early attention on establishing a base level of understanding of climate change science and the debate over the causes of climate change. The following presentations were focused on developing this background level of understanding on climate change science.

February 3, 2006:

Dr. William H. Schlesinger, Dean of the Nicholas School of Environmental and Earth Sciences, Duke University and James B. Duke Professor of Biogeochemistry, gave a presentation on the state of the science related to global climate change. His presentation covered carbon dioxide (CO2) and the atmosphere and its effect on climate and also considered various kinds of effects this may have on the future economics of this State and on the people who live in this State. Dr. Schlesinger asserted that a correlation between atmospheric CO2 levels and temperature exists and supported the theory that the rise in CO2 levels is due to human activities including fossil fuel combustion and forest destruction. He referenced a statement from the American Geophysical Union, a national society of more than 10,000 earth scientists, which says the temperature of the planet is warming and humans are responsible for warming above and beyond any natural variability one may expect. He presented satellite data that showed warming of about 2° Celsius in the Northern Hemisphere, Alaska, Canada, Northern Europe, and Siberia. He also said that the increase in global surface air temperature is predicted to be between five to nine degrees Fahrenheit by 2060. Dr. Schlesinger discussed the impacts of climate change on sea-level rise, the distribution of trees, rainfall patterns, the occurrence of malaria, and hurricane intensity and frequency.

Dr. Schlesinger's presentation is available at the following link: February 3, 2006, presentation by William H. Schlesinger, Dean, Nicholas School of Environmental and Earth Sciences, Duke University.

March 7, 2006:

Dr. Robert Balling from Arizona State University presented on the state of the science related to global climate change. He asserted that there was no doubt in the scientific community that the earth's temperature is rising and that an anthropogenic link exists. He then talked about the geological temperature record and addressed the effects of climate change on hurricanes and sea levels. Dr. Balling said that there was no evidence about what will happen to the intensity and frequency of tropical storms as a result of climate change. Although he agreed that sea levels are rising, he pointed out that they have been rising for the last 8,000 years. He concluded by saying that he is skeptical that much could be done in North Carolina to impact the global carbon dioxide levels of the atmosphere.

Dr. Balling's presentation is available at the following link: Robert C. Balling, Jr., Professor, Department of Geography, Arizona State University.

Dr. Robert Jackson, a Professor of Biology and Professor of Environmental Science at the Nicholas School of the Environment and Earth Science at Duke University presented to the Commission. Dr. Jackson directs the Center on Global Change in the new Department of Energy at Duke University and the Southeastern Regional Center for the National Institute for Climatic Change Research, which is also located at Duke. He discussed the direct link between human activity and greenhouse gases on the earth's rising temperature. Dr. Jackson pointed out that the Intergovernmental Panel on Climate Change (IPCC), the American Geophysical Union, the National Academy of Sciences, and the American Association for the Advancement of Science all agree that there is a direct link between human activity, greenhouse gases, and warming of the earth. Dr. Jackson provided data, graphs, and references to support his assertions. The graphs illustrated that greenhouse gases and temperature were rising and suggested a correlation between the two. He asserted that in order to stabilize carbon dioxide levels, carbon dioxide emissions would have to be reduced dramatically.

Dr. Jackson's presentation is available at the following link: Robert B. Jackson, Jr., Faculty Director, Center on Global Change; Professor of Biology and Environmental Sciences, Duke University.

Dr. Sethu Raman, a Professor of Meteorology in the Department of Marine, Earth, and Atmospheric Sciences at North Carolina State University, presented to the Commission. At the time of his presentation, Dr. Raman was serving as the State Climatologist and was a member of the Commission. His presentation focused mostly on temperature and precipitation trends in North Carolina. Dr. Raman provided the history of the State Climate Office in North Carolina, in addition to its mission and involvement in various projects. The State Climate Office's mission is to provide the most accurate climate information to the citizens of North Carolina and assist North Carolina State agencies in climate, environmental issues, and other obligations. His presentation addressed the regional and local change in the climate in North Carolina. He presented results on short and long-term climate trends in the State. Based on the data that has been collected, short-term trends indicate warming along the coast, cooling in central North Carolina, a deficit in precipitation in the northern coastal part of North Carolina, and an increase in precipitation in the southern part of North Carolina. Dr. Raman asserted that the density of climate observations needed to be improved in order to be confident about observed trends.

Dr. Raman's presentation is available at the following link: Sethu Raman, State Climatologist and Professor of Meteorology, Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University.

April 4, 2006:

David R. Easterling, Chief of the Scientific Services Division, National Climatic Data Center, National Oceanic and Atmospheric Administration (NOAA), in Asheville, North Carolina,

presented to the Commission on the state of the science related to global climate change. Dr. Easterling provided evidence showing how the climate has changed over the last 100 years and showed examples of observed climate change. Temperature data indicates that global temperatures have risen approximately 0.7° Celsius since the late 1800's. Although it is unclear if global warming is a contributing cause, global precipitation also appears to have increased since the late 1800's. Hurricanes have increased with oscillations in ocean temperatures, sea ice has decreased, snow cover has decreased, and changes in the number of frost days and days exceeding other thresholds have also increased. All of these examples point to warming. Dr. Easterling also discussed climate models and some of the results they have produced, and he stated that changes in cloud cover present one source of the largest uncertainties in climate models.

Dr. Easterling's presentation is available at the following link: David R. Easterling, Chief, Scientific Services Division, National Climatic Data Center, National Oceanic and Atmospheric Administration (NOAA) Asheville, North Carolina.

Dr. Patrick J. Michaels, Research Professor and State Climatologist, Virginia State Climatology Office, University of Virginia, Charlottesville, Virginia, presented his view of the state of the science related to global climate change. He asserted that there is bias and polarization on climate change that is presented to the public. Dr. Michaels presented an alternative perspective on global warming science and cooling data and information on hurricanes. His response to questions regarding how to respond to global warming is that the Kyoto Protocol is expensive and causes long-term economic problems. Dr. Michaels advocated for encouraging global economic development and adaptation to climate change, rather than prevention of climate change. He believes money is better spent adapting to the changes caused by climate change rather than preventing climate change.

Dr. Michaels' presentation is available at the following link: Patrick J. Michaels, Research Professor and State Climatologist, Virginia State Climatology Office, University of Virginia, Charlottesville, Virginia.

Dr. William L. Chameides, Chief Scientist, Environmental Defense, New York, gave a presentation on the state of the science related to global climate change. He supported the view that the increase in atmospheric CO2 is caused by human activity and that the earth is warming. He asserted that a temperature increase of 2° Celsius is likely to be the tipping point (i.e. an irreversible point where it will be impossible for the climate system to recover) for loss of the Greenland ice sheet, the loss of the Amazon tropical rainforest, and the melting of permafrost and release of greenhouse gases from the permafrost. Dr. Chameides believed that in order to avoid this 2° Celsius temperature increase, emissions need to be stabilized globally and the United States must cap greenhouse gas emissions at about 10% of current levels. He promoted a

market-based cap-and-trade program and referenced a paper by Pacala and Socolow[2] that lists 15 existing technologies that could help decrease emissions by 40 to 60% of current levels.

Dr. Chameides' presentation is available at the following link: William L. Chameides, Chief Scientist, Environmental Defense, New York, New York.

Michael MacCracken, Chief Scientist for Climate Change Programs, Climate Institute, Washington, D.C., presented on understanding and projecting future climate change. He discussed the impacts and potential impacts of climate change, and discussed the efforts taken by the states of California and New York in response to climate change. Dr. MacCracken showed highlights of a study that looked at the consequences, both good and bad, of reducing fossil fuel consumption in the southeastern United States. Key issues that came up for the southeast regional assessment were what it would do to agriculture, forests, water quality, air quality, and extreme events. Dr. MacCracken also discussed coastal issues, coral reefs, ecosystems, water distribution, health effects, and the potential impacts on infrastructure.

Dr. MacCracken's presentation is available at the following link: Michael C. MacCracken, Chief Scientist for Climate Change Programs, Climate Institute, Washington, D.C.

January 16, 2008:

Dr. Dolores M. "Dee" Eggers, Commission member and Associate Professor in the Department of Environmental Studies at the University of North Carolina at Asheville, gave an overview of the "Climate Change 2007: Synthesis Report"[3] prepared by the Intergovernmental Panel on Climate Change (IPCC). The IPCC was established by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP) in 1988 to provide scientific information related to climate change. The IPCC is one of the primary sources of technical and scientific information for consideration under the United Nations Framework Convention on Climate Change (UNFCCC).

The Synthesis Report summarized the findings of the Fourth Assessment Report (AR4) on global climate change. The AR4 is organized into the following three Working Group Reports: Science; Impacts & Adaptation; and Mitigation. Dr. Eggers summarized the highlights from each section as follows:

- Working Group I – The Physical Science Basis:
    - The report states that "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level."

[2] Pacala, Stephen; Socolow, Robert H. (2004). "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies". *Science* 305 (5686): 968–972. Abstract online at: http://www.sciencemag.org/cgi/content/abstract/305/5686/968.

[3] IPCC, Climate Change 2007: A Synthesis Report, An Assessment of the Intergovernmental Panel on Climate Change, *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [hereinafter IPCC Report].

- With 91 to 95% certainty, the IPCC concluded that "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations."
- With regard to observed and projected temperature rise, the WGI report found: Anthropogenic (human produced) greenhouse gas emissions have driven up global average temperatures by about 0.75° C during the last century.
- Eleven of the last twelve years (1995 to 2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850).
- Absent sharp near-term emissions reductions, global temperatures are estimated to increase by about 4° C (7.2° F), with the potential to go as high as 7° C (12.6° F) or higher.
- The Working Group I report also reported on important ocean and carbon-cycle issues:
  - Increasing atmospheric carbon dioxide concentrations are causing a chemical change in the world's oceans, making the water more acidic. Acidification harms marine life forms like coral reefs, snails, and other organisms that are vital supports for the food chain.
  - Feedback mechanisms in the global carbon cycle will begin adding previously stored carbon to the atmosphere as the climate system warms. If emissions continue growing as they are now, CO2 feedback is projected to increase global average warming in 2100 by more than 1°C (in addition to existing projections).

- Working Group II – Impacts on North America and Summary for Policy Makers:
  - The report stated that the comparatively small amount of warming that has already occurred is contributing "to the global burden of disease and premature deaths" through temperature and precipitation changes, sea-level rise, and the increasing frequency of extreme events.
  - Regarding future impacts, the IPCC report states that "for increases in global average temperature exceeding 1.5° C to 2.5° C (2.7° F to 4.5° F), there are projected to be predominantly negative consequences for biodiversity and ecosystem goods and services, e.g., water and food supply." Higher levels of greenhouse gases will have a devastating human impact.
  - By mid-century, more than a billion people will face water shortages and hunger, including 600 million people in Africa alone.
  - Weather extremes, food and water scarcity, and climate-related public health threats are projected to displace between 150 million and 1 billion people as climate change unfolds.
  - Damage to ecosystems and wildlife is projected to reach devastating levels.
  - A 1.0° C increase in local temperatures at lower latitudes (especially seasonally dry and tropical regions) is projected to reduce crop productivity, which would increase risk of hunger.
  - Widespread coral mortality is expected with 2.0° C warming and higher.
  - With a warming of 3.0° C or higher, agricultural systems will begin to break down, causing a global decrease in food production potential.
  - With about a 4° C increase in global temperatures, more than 40% of known plant and animal species are projected to go extinct.

- In North America, tens of millions of Americans are likely to face greater risks of injury and mortality due to higher pollution levels, more frequent and more intense heat waves, more intense storms, elevated pollen levels, and increased likelihood of water and insect-borne diseases. Western and Southwestern states, already facing increased water scarcity, are expected to experience inadequate and unreliable water supplies as snowpack diminishes and evaporation increases in both regions, with added stress in the Southwest caused by decreases in precipitation.
- North American forests face more destruction from the increasing incidence of wildfire, insect infestation, and disease. These disturbances could cost wood and timber producers between $1 billion and $2 billion a year during the 21st century.
- Coastal states face rising sea-levels accompanied by greater vulnerability to intense storms and storm surges, coastal erosion, and gradual inundation effects that will also contribute to wetland losses. Storm impacts are likely to be more severe especially along the Gulf and Atlantic coasts, where any increase in destructiveness of coastal storms threatens significant loss of life and property damage.

- Working Group III – Mitigation:
  - The report concluded that "there is substantial economic potential for the mitigation of global greenhouse gas emissions over the coming decades that could offset the projected growth of global emissions or reduce emissions below current levels."
  - The report lays out several climate stabilization scenarios. By stabilizing greenhouse gases at CO2 equivalent concentrations of roughly 450 to 500 parts per million, global temperature rise could be limited to 2 to 2.4° C and sea-level rise due to thermal expansion to 1.4 meters. However, to limit the global temperature rise to these levels requires that global greenhouse gas emissions peak by 2015 and decline to as little as 15% of 2000 levels by the year 2050.
  - The IPCC estimates that stabilizing greenhouse gas emissions at these levels will reduce average gross domestic product (GDP) growth rates by less than 0.12 % per year and notes that "Climate change policies related to energy efficiency and renewable energy are often economically beneficial, improve energy security and reduce local pollutant emissions."
  - Other mitigation options can provide sustainable development benefits such as avoided displacement of local populations, jobs, and health improvement. The scientists found that "in all analyzed world regions, near-term health co-benefits from reduced air pollution as a result of actions to reduce greenhouse emissions can be substantial and may offset a substantial fraction of mitigation costs."
  - The IPCC report indicates that many of the tools needed to start reducing the threat of global warming are available now. "The stabilization levels assessed can be achieved by deployment of a portfolio of technologies that are either currently available or expected to be commercialized in coming decades." The report lists a wide range of technologies that are commercially available and could be used to immediately begin reducing emissions, including the following:

- Energy Supply: Efficiency improvements, along with increased dependence on renewable energy sources and early applications of Carbon Capture and Storage (CCS) would considerably reduce emissions.
- Transportation: Encouraging the production of more fuel-efficient and hybrid vehicles is an easy way to limit emissions from the transportation sector.
- Buildings: Improved residential and commercial building standards, along with widespread implementation of passive and active solar design for heating and cooling would reduce the carbon dependency of buildings.
- Industry: More efficient end-use electrical equipment and heat and power recovery would improve industrial energy efficiency and help firms reduce energy costs. Materials recycling and substitution, and a wide array of process-specific technologies would also help reduce energy usage from this sector.
- Agriculture: Improved crop and grazing land management and restoration of cultivated peat soils and degraded lands would increase soil carbon storage, while improved rice cultivation techniques and livestock and manure management would reduce methane emissions. This sector can also contribute alternative fuels with dedicated energy crops to replace fossil fuel use.
- Waste Management: Landfill methane recovery, waste incineration with energy recovery, and composting of organic waste are some of the options to reduce emissions and energy usage in this sector.

Dr. Eggers' presentation is available at the following link: Dolores M. "Dee" Eggers, Commission member and Associate Professor, Department of Environmental Studies, University of North Carolina at Asheville.

February 11, 2008:

As part of the 2008 Emerging Issues Forum on "North Carolina's Energy Futures," *Dr. Rajendra Pachauri, Chair of the Intergovernmental Panel on Climate Change and Director General of the Energy and Resources Institute,* presented to the Commission. Dr. Pachauri summarized the process used by the IPCC in developing its report, and highlighted the report's key findings, as follows:

- Global greenhouse gas emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.
- CO2 annual emissions grew by about 80% between 1970 and 2004.
- Most of the observed increase in temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.
- Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.
- The IPCC report projects that continued emissions at current levels would lead to further warming of 1.8ºC to 4ºC over the 21st century.
- Other projections and impacts include the following:

- Abrupt or irreversible impacts (loss of ice sheets, species extinction).
- Impacts on vulnerable populations with limited adaptive capacities.
- Threats to stability and human security resulting from limited access to basic human needs (food, water, stable health conditions).
- Reductions in agricultural productivity at low latitudes due to high temperatures, drought, flood conditions, and soil degradation.
- Reductions in water availability for consumption, agriculture, and energy generation due to changes in precipitation patterns, increasing salinity of groundwater, and glaciers melting resulting in decreased river flows.
- Impacts on public health, including: (1) increases in malnutrition and consequent disorders; (2) increased deaths, disease, and injury due to heat waves, floods, storms, fires, and droughts; (3) increased frequency of cardio-respiratory diseases; (4) exacerbation of abundance and/or toxicity of cholera; and (5) increased burden of diarrheal disease.

Dr. Pachauri's presentation described what developing countries are doing to address climate change in relation to what the United States and other industrialized countries are doing and should do in this regard. Dr. Pachauri also discussed what the State of North Carolina should do with regard to climate change.

Dr. Parchauri's presentation is available at the following link: Dr. Rajendra Pachauri, Chair, Intergovernmental Panel on Climate Change, and Director General, the Energy and Resources Institute.

REVIEW OF THE POTENTIAL IMPACTS OF CLIMATE CHANGE

In addition to evaluating the causes of climate change, the Commission evaluated the "potential impacts of global climate change on the citizens, natural resources, and economy of the State, including agriculture, travel and tourism, recreation, coastal real estate, insurance, and other economic sectors." (S.L. 2005-442 (5)(1)(e)). The Commission evaluated this issue as follows:

March 7, 2006:

Dr. Stanley Riggs, a member of the Commission and the Distinguished Research Professor in the Department of Geology at East Carolina University presented to the Commission. He discussed climate and sea-level change, storm and coastal dynamics, beach erosion, and shoreline changes with a particular focus in North Carolina. He asserted that the impact of climate change could be very dramatic, particularly in eastern North Carolina where elevation in some counties is only one or two feet above sea level. Sea levels are presently rising at about 1.5 feet per century, but are predicted to increase to at least 3 to 4 feet per century by 2100. This amount of increase would severely impact up to 50% of the North Carolina coastal zone with substantial shoreline erosion, land loss, and impacts upon the infrastructure on both the barrier islands and mainland; major habitat and ecosystem changes and migrations; shifts in physical, chemical, and biological conditions within the aquatic systems; and significant economic loss to the tourism, agricultural, and forestry industries. He discussed beach, marsh, and wetland erosion in the State; North Carolina's beaches are eroding in response to rising sea level that averages from 3 to 15 feet per year. With regard to tropical storms, Dr. Riggs pointed out that between 1993 and 2005, mid-Atlantic coastal areas experienced the highest tropical storm activity in recorded history.

January 12, 2007:

S. Jeffress Williams, Coastal Marine Geologist with the Woods Hole Science Center, United States Geological Survey, discussed the effects of global climate change as they relate to coastal adaptation. In his discussion, Dr. Williams discussed coastal vulnerability to erosion, storm hazards, and potential sea-level rise. Dr. Williams made the following main points:

1. Sea-level rise is a primary driver of coastal change and we are currently experiencing rising sea levels. As a result, future rates of coastal erosion and inundation will increase.
2. Climate change is warming the oceans. Sea-level rise is accelerating due to thermal expansion and increased glacier and sea ice melting. The future sea-level rise is likely to be on the order of 18 inches higher by the year 2100. Melting on Greenland and the Antarctic could further accelerate this rate.
3. Warming ocean temperatures seem to be increasing the intensity of hurricane activity. This is on top of the natural cycle of hurricane activity that we know about. There seems to be a 25-year cycle for hurricanes; at present we are about 10 years into the current cycle. The year 2005 was among the most active hurricane seasons for the eastern coast of the United States. The science of hurricane frequency is still uncertain; there is still a lot of research that needs to be done.

4. Science should guide coastal management and policy adaptation to climate change. Dr. Williams emphasized that there is a great deal of high quality credible scientific information on what is happening along coastal and ocean shorelines and what is likely to happen in the future. North Carolina has a number of outstanding coastal scientists; in the long term that scientific information needs to be an integral part in any actions to move forward.

Dr. Williams' presentation is available at the following link: S. Jeffress Williams, Coastal Marine Geologist, United States Geological Survey, Woods Hole Science Center.

Debra Hernandez, President of Hernandez and Company, presented the National Academy of Sciences (NAS) report "Mitigating Shore Erosion along Sheltered Coasts."[4] The NAS report was produced at the request of the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (Corps), and the Cooperative Institute for Coastal and Estuarine Environmental Technology. The report focuses on sheltered coastal areas, such as those along bays and estuaries, that are experiencing land loss from erosion and sea-level rise much like ocean beaches. Information on shoreline change is insufficient for sheltered coasts, and decision makers (landowners, contractors, local and state authorities) are generally unaware of alternative erosion mitigation strategies and their effectiveness. Owners of property along sheltered coasts often reinforce their shoreline with bulkheads and other structures to prevent erosion. The cumulative impacts of these individual decisions lead to significant alterations of the coastal ecosystem, causing changes that threaten landscapes, public access, recreational opportunities, natural habitats, and fish populations.

The report evaluated the impacts of shoreline management on sheltered coasts. The report calls for a regional management approach that considers the environmental impacts that could accumulate if hardened structures are permitted on a site-by-site basis. Local proactive shoreline management plans could prevent unintended consequences of site-by-site permitting. In addition, the report recommends changing the current permitting system to remove the default preference for bulkheads and similar structures and allow more flexibility to encourage use of more ecologically beneficial erosion control methods, such as planting of marshes.

Ms. Hernandez's presentation is available at the following link: Debra Hernandez, President, Hernandez and Company.

Douglas Rader, Principal Scientist for Oceans and Estuaries with Environmental Defense, discussed specific implications of climate change for North Carolina's coastline. Mr. Rader discussed impacts to the Albemarle and Pamlico Sounds, in addition to impacts on organisms in North Carolina's waters and soils, such as the gray trigger fish, stripped bass, shads, migratory birds, and herrings. He also addressed what has happened and what is likely to happen to coral reefs globally and touched on the likelihood that the ocean's biogeochemical capacity to produce calcium carbonate will decrease. He asserted that in North Carolina processes that maintain the

[4] National Research Council (2007) *Mitigating Shore Erosion Along Sheltered Coasts* (Natl Acad Press, Washington, DC). Summary of report available online at: http://books.nap.edu/catalog.php?record_id=11764.

coast have been massively altered including water balances on land and the nitrogen and carbon budgets. He pointed out the huge financial opportunity in North Carolina to invest in stock for currently sequestered carbon and peat. Mr. Rader said that a warming world also means changing temperature patterns, altered forests, altered crop potential, altered natural vegetative communities, and altered fisheries. He concluded with numerous policy recommendations, including the following:

- Develop a State Climate Action Plan that would leverage all existing environmental plans.
- Develop flow targets for all rivers and remove or "reoperate" dams accordingly.
- Map and remediate drainage systems and drainage districts.
- Prohibit new public and publicly licensed or permitted infrastructure in flood-prone and storm-surge-prone areas.
- Remediate existing vulnerable or damaging infrastructure as storms occur ("strategic opportunism."
- "Balance" biogeochemical cycles.
- Utilize existing and develop new markets for carbon, nitrogen, water, and habitat.
- Leverage current State investments to more broadly consider climate change impacts.
- Protect and restore oyster reefs and submerged aquatic vegetation as energy absorbing structures.
- Facilitate shoreline retreat and upslope wetland migration.
- Invest in research and monitoring, for example in improved water level monitors, and systems to track invasive species.
- Address inevitable "publicization" of newly submerged lands; ease that transition through mechanisms such as rolling easements.

Dr. Rader's presentation is available at the following link: Douglas N. Rader, Principal Scientist for Oceans and Estuaries, Environmental Defense.

Courtney Hackney, Chair of the Coastal Resources Commission, and Walter Clark, the Coastal Community and Policy Specialist for North Carolina Sea Grant, jointly discussed the implications of sea-level rise for coastal development policy. Dr. Hackney discussed North Carolina policies that are in place with regard to coastal erosion and beach nourishment. He also touched on infrastructure, land use plans, basin sediment management, and cumulative impacts, all with regard to North Carolina coastal management.

Dr. Hackney mentioned that while land use plans are mandated under the State Coastal Area Management Act (CAMA), few plans integrate sea-level rise other than preparation for hurricanes (although this may be subject to change). With regard to hurricane preparedness, Dr. Hackney noted that human safety and health are the primary concerns and that reconstruction of damaged structures is often driven by emotion, not by planned shoreline retreat or response to sea-level rise. The one sector where these considerations are beginning to be utilized in the insurance industry, which has begun considering sea-level rise and coastal form in its risk analysis and establishment of rates.

Dr. Hackney's presentation is available at the following link: Courtney T. Hackney, Chair, Coastal Resources Commission.

Mr. Clark discussed public awareness and the importance of hazard notification to owners of beach property. Mr. Clark discussed some of the requirements for developers of new property to acknowledge the risks of building along the coastal shoreline. For most of the resale property along the coast, only voluntary measures are in place. There may be benefits to examining expanding the requirement to disclose these risks to prospective property purchasers.

Mr. Clark and Dr. Hackney jointly presented a number of recommendations for the Commission to consider, including the following:

- Oceanic and estuarine monitoring stations should be established to measure absolute changes in sea-level rise, to characterize the dynamics of storm surge, astronomical and wind tides, and water flow through the coastal system.
- The State should survey, inventory, and map the State's extensive coastal resources, including land areas within the coastal zone, the ocean and estuarine shore zones, and sub-aquatic bathymetry, sediments, and vegetation.
    - As part of the mapping and inventory process, particular attention should be given to: (1) the geologic and ecologic character of the entire shoreline system; and (2) anthropogenic modifications to the entire shoreline system (for example, hardened shorelines, marinas, and piers).
    - Mapping and inventory tools include bathymetric surveys of inland coastal waters, infrared photography, LiDAR, and topographic surveys of coastal lands.
- Establish baseline information to define a set of environmental change targets. Targets should be short-term (5 to 10 years), mid-term (25 to 50 years) and long-term (50 to 100 years).
    - If the effects of climate change meet or exceed targets, mitigation measures should be required.
- Establish a legislative Blue Ribbon Commission on Adaptation and Climate Change. The Commission would:
    - Develop a comprehensive Climate Change Adaptation Plan.
    - Develop an economic cost/benefit analysis to determine the potential cost of maintaining the "status quo" and of implementing recommendations developed under the Climate Change Adaptation Plan.
- Establish a legislative Coastal Adaptation Program. Among other things, the Program would:
    - Oversee the continuing research, mapping, and inventory efforts described above.
    - Purchase land or conservation easements in low lying "at-risk" areas in the coastal region.
    - Provide incentives (tax, grant, or cost-share) to landowners for the construction of ecologically beneficial erosion control structures on estuarine shorelines.

Mr. Clark and Dr. Hackney stressed that any policy options considered by the Coastal Resources Commission or the General Assembly must balance private property rights, natural resource protection, and the public's checkbook. In addition, the policy choices should always be supported by good science.

Mr. Clark's and Dr. Hackney's presentation is available at the following link: Walter Clark, Coastal Community and Policy Specialist, North Carolina Sea Grant.

January 16, 2008:

Christopher F. Dumas, an associate professor at the University of North Carolina at Wilmington, presented the report "Measuring the Impacts of Climate Change on North Carolina Coastal Resources"[5] prepared for the National Commission on Energy Policy. The study was jointly conducted by the University of North Carolina at Wilmington, East Carolina University, Duke University, and Appalachian State University. Dr. Dumas pointed out that climate change may have significant impacts on North Carolina coastal resources due to sea-level rise, increased erosion, and increased hurricane activity and intensity. In addition, the extensive development in the coastal zone in recent decades has put more people and property at risk. Based on projected rates of sea-level rise and potential hurricane intensity increases, the study found the following impacts over the next 75 years: complete loss of many beaches; losses in property values; lost recreational benefits; business and tourism interruption; agricultural losses; increased damages to forests; and commercial fishing losses. The lost recreational benefits were estimated to total $3.9 billion, and the value of property at risk to sea-level rise in just four counties is $6.9 billion. These estimates assume no increase in storm frequency and assume no adaptation or mitigation efforts are made. The results of this study may help facilitate comparison of policy costs and benefits. Avoiding these potential impacts provides one tool to measure the benefits of adaptation and mitigation policies.

Dr. Dumas' presentation is available at the following link: Christopher F. Dumas, Associate Professor, University of North Carolina at Wilmington.

Travis Madsen, a policy analyst with the Frontier Group, presented the report: "When it Rains, it Pours: Global Warming and the Rising Frequency of Extreme Precipitation in the United States"[6] prepared by Environment America. The study evaluated trends in the frequency of storms with extreme levels of rainfall or snowfall at more than 3,000 weather stations across the contiguous United States over the last 60 years. The study then examined patterns in the timing of heavy precipitation relative to the local climate at each weather station. The study found that storms with extreme amounts of rain or snowfall are happening more often across most of America, and have been consistent with the predicted impact of global climate change. Mr. Madsen stated that global warming is already changing weather patterns in visible ways and that climate models predict that the trend toward increasingly frequent downpours will intensify in the future. At the same time, the number of dry days will also increase, making drought more likely. However, the severity of the trend depends upon our level of greenhouse gas emissions.

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[5] Bin, Okmyung, Christopher Dumas, Ben Poulter and John Whitehead, *Measuring the Impacts of Climate Change on North Carolina Coastal Resources,* 2007. Online at: http://econ.appstate.edu/climate/NC-NCEP%20final%20report.031507.pdf.

[6] Madsen, T., E. Figdor. *When It Rains It Pours: Global Warming and the Rising Frequency of Extreme Precipitation in the United States.* Environment North Carolina. December 2007. Online at: http://cdn.publicinterestnetwork.org/assets/oywshWAwZy-EXPsabQKd4A/When-It-Rains-It-Pours----US---WEB.pdf.

By halting the increase in total U.S. greenhouse gas emissions now and reducing emissions by at least 80% by mid-century, the report estimates that the United States can limit the increase in major storm frequency and thus reduce future risks of flooding and other serious consequences of extreme rainstorms. To address climate change, the U.S. should limit emissions of greenhouse gases, while improving energy efficiency and increasing the use of renewable energy. The report included the following specific recommendations:

- The United States should adopt a mandatory cap on greenhouse gas emissions that reduces total U.S. emissions by at least 15 to 20% by 2020 and by at least 80% 2050.
- If policymakers choose a cap-and-trade program to achieve this goal, it should include auctioning 100% of emission allowances, rather than giving allowances away to polluters.
- The United States should also adopt complementary policies to improve energy efficiency and increase the use of clean, renewable energy.

Mr. Madsen's presentation is available at the following link: Travis Madsen, Policy Analyst, Frontier Group, Environment North Carolina.

November 14, 2008:

Michael R. Bryant, Project Leader for the North Carolina Coastal Plain Refuges Complex at the Alligator River National Wildlife Refuge, discussed global warming adaptation strategies to conserve fish and wildlife habitats and maintain healthy and genetically diverse wildlife populations. Mr. Bryant indicated that the Alligator River National Wildlife Refuge was nearly 6,000 acres in size when it was established 70 years ago, but in 2008 it was less than 5,000 acres. As a result, the Refuge was named as one of the ten most endangered wildlife refuges out of more than 500 wildlife refuges managed by the United States Fish and Wildlife Service (USFWS). From the USFWS perspective and wildlife habitat standpoint, many natural processes that result in land loss can help to restore habitat and protect natural cycles elsewhere. The USFWS seeks to adaptively manage these processes in the way most conducive to protecting the integrity of the natural habitats and ecosystems. In addition, the USFWS seeks to make habitats more resilient to change. Some of these conservation tactics include the following:

- Hydrologic Restoration: restoring the hydrology and associated wetland systems, primarily through mitigation and management of ditches.
- Land Restoration, Reforestation, and Shoreline Transition: protecting existing natural habitat, especially inland and upland of current conservation lands in order to facilitate the movement of species as sea level rises; ensuring that shorelines are not subject to hard armoring and supporting living shorelines.
- Oyster Reef Restoration: restoring oyster reefs in Pamlico Sound to buffer shorelines from storms and rising seas.
- Measuring and Monitoring Project Impacts on Carbon Sequestration: working with experts to develop strategies for establishing a baseline for soil carbon in the system and monitoring the effects of various management tactics on the gain and loss of soil carbon.

Mr. Bryant concluded by emphasizing that these lessons and tools can be equally applied to State agencies and nonprofits with large land holdings that will potentially be affected by climate change.

Mr. Bryant's presentation is available at the following link: Michael R. Bryant, Project Leader, North Carolina Coastal Plain Refuges Complex, Alligator River National Wildlife Refuge

Dr. D. Reide Corbett, Ph.D., an associate professor and Assistant Chair, and Dr. J.P. Walsh, Ph.D., an assistant professor in the Department of Geological Sciences at East Carolina University, presented on estuarine shoreline erosion and coastal hazards in the changing climate of North Carolina. Dr. Corbett and Dr. Walsh stated that the North Carolina coast has been and will increasingly be under the threat of climate change. There are a number of potential consequences of climate change that will have significant impacts on coastal North Carolina, including sea-level rise, increased storms or storm intensity, droughts, floods, land and habitat loss, ecological impacts, and economic impacts. Many of the risks associated with these activities are only getting worse based on population growth. The coastal counties are home to almost 900,000 North Carolinians and many counties have experienced 75 to 150% population growth over the last three decades.

Dr. Corbett and Dr. Walsh discussed the North Carolina Coastal Hazard Decision Portal (NC COHAZ), which is a web-based information system developed to communicate coastal hazards information to North Carolina's coastal communities. It is a one-stop site for useful data, observations, and insights on coastal hazards. The goals of NC COHAZ are to:

(1) Provide a basic review of and information for coastal hazards in the State, including emergency contacts, hazard mitigation plans, and important web sites.
(2) Create tools to enable the public, managers, and scientists to visualize hazard areas and impacts from past events.
(3) Give brief explanations of, and access to, relevant natural and social science data.

Dr. Corbett and Dr. Walsh indicated that North Carolina has a tremendous amount of intellectual capital in the State and should utilize this resource to the fullest extent possible. They concluded with the following recommendations:

- Determine what existing infrastructure is at risk and establish the best methods for adaptation. (State agencies, counties, towns, home owners, etc.)
- Plan carefully about the placement and character of new infrastructure in the coastal zone.
- Determine in advance how to respond once infrastructure is removed by a disaster or is at the end of its engineered life. (Are we going to keep replacing roads and bridges?)
- Create policy that ensures planning, preparation, and action.
- Increase the priority for State agencies such as DENR and the Department of Transportation (DOT) to respond and address coastal hazard risks and provide the agencies with sufficient funds to do so.

With regard to estuarine erosion, they provided the following specific recommendations:

- Manage estuarine shorelines more closely in order to protect sensitive habitat areas and aid property owners.
- Establish baseline information on the state of the estuarine shoreline, habitats, and structures and improve the monitoring of these conditions.
- Develop an explicit policy on the management of the estuarine shoreline (site-dependent hardening).
- Create a shoreline hardening assessment across the State to guide decision-making by property owners and managers.

Dr. Corbett and Dr. Walsh's presentation is available at the following link: Dr. D. Reide Corbett, Ph.D., Associate Professor and Assistant Chair, Dr. J.P. Walsh, Ph.D., Assistant Professor, East Carolina University.

December 9, 2008:

Stephen J. Culver, Professor and Department Chairperson, and David J. Mallinson, Associate Professor, Department of Geological Sciences, East Carolina University, presented the report "North Carolina Coasts in Crisis: A Vision for the Future".[7] Dr. Culver and Dr. Mallinson stated that there is abundant evidence of past climate and sea-level change in North Carolina, which gives us some idea of what to expect in the near future. Using tools such as tide gauge records, LiDAR, and GIS to map geomorphic features, as well as coring and paleoenvironmental reconstructions using fossils and sediments, scientists are able to evaluate past climatic changes and the impacts of projected changes in the future.

According to Dr. Culver and Dr. Mallinson, there is no debate within the scientific community that climate and sea level have changed in the past and will continue to change in the future. Based on the information collected in North Carolina, we can expect sea-levels in North Carolina to rise at least 1.8 to 3 feet by 2100. As sea-level rises and climate changes, North Carolina will be faced with increasing rates of erosion and possibly greater hurricane intensity that can cause catastrophic collapse of the barrier islands and dramatic coastal changes. One big uncertainty in many projections of future sea-level rise is the effects of the reductions in the Greenland Ice Sheet. The sheet contains three million cubic kilometers of ice, which could raise global sea levels by 20 feet.

Dr. Culver and Dr. Mallinson stated that one of the biggest problems the State faces is that we have built static infrastructure on moving land. Many of the shoreline protections measures, including shoreline hardening and beach renourishment, are temporary in nature or can have other significant adverse impacts. Adaptation is the only viable solution.

Dr. Culver and Dr. Mallinson concluded by making the following recommendations for the Commission to consider:

[7] Riggs, S.R., Ames, D.V., Culver, S.J., Mallinson, D.J., Corbett, D.R., and Walsh, J.P., 2008. *North Carolina's Coasts in Crisis: A Vision for the Future.* East Carolina University. Online at: http://curs.unc.edu/curs-pdf-downloads/climatechgsymp/Riggs.pdf.

- Create a commission on adaptation to climate change to review other states' initiatives, to assess the costs and benefits of various responses, and to prepare a science-based strategic plan.
- Initiate a science-based study to assess the socio-economic impact of barrier island breaks.
- Create a Coastal Adaptation Fund to provide sustained research support, to purchase at-risk land or conservation easements, to encourage ecologically beneficial erosion control structures, to inventory coastal resources, and to identify particularly vulnerable coastal areas.
- Convene a panel of experts to assess the capacity of State government to respond, adapt, and mitigate the impacts of climate change.
- Increase support to Sea Grant and other outreach and extension programs to provide practical climate change information.
- Fund university research centers to address climate change and adaptation issues.
- Plan for the adaptive economic development of a "string of pearls" in northeastern North Carolina.
- Plan for the adaptive economic development of "islands of opportunity" in southeastern North Carolina.

Dr. Culver and Dr. Mallinson's presentation is available at the following link: Stephen J. Culver, Professor and Department Chairperson, David J. Mallinson, Associate Professor, Department of Geological Sciences, East Carolina University.

March 15, 2010

Tancred Miller, Coastal Policy Analyst in the Division of Coastal Management of DENR, presented the Coastal Resources Commission's Science Panel Report on projected levels of sea-level rise along the North Carolina coast. Mr. Miller stated that the intent of the Science Panel Report is to provide State planners and policy makers with a scientific assessment of the amount of sea-level rise likely to occur in this century. The Report does not attempt to predict a specific future rate or amount of rise over the next 25 to 50 years. As a comparison, the IPCC's Fourth Assessment Report contains forecasts for global average sea-level rise ranging from 0.18 meters to 0.59 meters (7 to 12 inches) by the year 2100. The Science Panel projects a minimum of 0.38 mm (15 in.) of sea-level rise will occur in North Carolina if there is no further acceleration. The maximum of 1.4 m (55 in.) could occur based on the expectation of accelerated rise; and an anticipated rise of 1 m (39 in.) along the North Carolina coast by 2100 should be adopted as the planning target for North Carolina.

Mr. Miller's presentation is available at the following link: Tancred Miller, Coastal Policy Analyst, Division of Coastal Management, DENR.

Consideration of other impacts

December 11, 2006:

Reverend Michael Cogsdale, the President of the North Carolina Council of Churches and the Rector of Saint James Episcopal Church in Lenoir, North Carolina, presented some perspectives on global climate change from the faith community of North Carolina. The North Carolina Council of Churches represents 25 denominational bodies and 1.5 million people of faith in the State. There has been a movement among the mainline denominations in the past 20 years to develop a new appreciation for the natural environment and a renewed understanding of the sacred writings which call for a commitment to the stewardship of creation. Because the threat of climate change is global and will likely impact the poor and vulnerable the most, it touches on a spiritual problem for communities of faith, in that they must work for the common good of all people. Also, congregations see the care of creation as a religious duty and are looking for ways to respond and channel their desire to care for creation into action. In North Carolina, the faith community is responding to climate change by promoting renewable energy, energy efficiency, and conservation through their affiliation with the Interfaith Power and Light Campaign, by increasing educational opportunities to understand the relationship between love for God and care for creation, by forming interfaith coalitions on climate change issues, by conducting energy audits, and reducing energy use. In closing, Rev. Cogsdale stated that the constituents of the North Carolina Council of Churches are also those of the General Assembly, and that these same people care about the earth beyond the price of gasoline. As a representative of this large organization, Rev. Cogsdale requested that the Commission's recommendations be significant and based on the long-term appraisal of nature's laws and not only the short-term economic gain.

Rev. Cogsdale's presentation is available at the following link: Michael H. Cogsdale, President, North Carolina Council of Churches and Rector at St. James Episcopal Church in Lenoir, North Carolina.

See also the following presentations related to the potential impacts of climate change:

April 4, 2006 presentation by William L. Chameides, Chief Scientist, Environmental Defense, New York, New York. (Discussed on pp. 14-15 of this report).

April 4, 2006 presentation by Michael C. MacCracken, Chief Scientist for Climate Change Programs, Climate Institute, Washington, D.C. on understanding and projecting climate change (Discussed on p. 15 of this report).

January 16, 2008 presentation by Dolores M. "Dee" Eggers, Commission member and Associate Professor, Department of Environmental Studies, University of North Carolina at Asheville, on the Summary of the "Synthesis Report from Climate Change 2007" prepared by the Intergovernmental Panel on Climate Change (IPCC). (Discussed on pp. 15-18 of this report).

February 11, 2008 presentation by Dr. Rajendra Pachauri, Chair, Intergovernmental Panel on Climate Change, and Director General, The Energy and Resources Institute. (Discussed on pp. 18-19 of this report).

ECONOMIC IMPLICATIONS AND OPPORTUNITIES RELATED TO CLIMATE CHANGE

S.L. 2005-442(5)(1)(d) directed the Commission to evaluate the economic opportunities for the State that may result from "international, national, and state action to address global climate change and the emerging carbon market." In addition, subdivisions f. and g. of that subsection directed the Commission to evaluate the following:

f. The costs of any action taken by the State to address global climate change on individuals, individual households, local governments, businesses, educational institutions, agricultural operations, the State government, and other institutions and economic sectors.

g. The benefits of any action taken by or within the State or other states and at the national or international levels to address global climate change on individuals, individual households, local governments, businesses, educational institutions, agricultural operations, the State government, and other institutions and economic sectors."

The Commission evaluated these economic implications and opportunities at the following meetings:

April 4, 2006:

Truman T. Semans, Director for Markets and Business Strategy, Pew Center for Global Climate Change, Washington, DC, was the first of four speakers to report on activities taken by businesses in the State and nationwide to address global climate change. Mr. Semans explained how climate and energy fit into corporate business strategies including: reducing greenhouse gas emissions; capturing competitive advantage in a business opportunity associated with climate change; and constructive, external engagement. Mr. Semans concluded by saying that there are two broad approaches that a company can take to reduce greenhouse gas emissions: (1) promote energy efficiency and reduce greenhouse gas emissions from operations; and (2) reduce the broad footprint of the products and services that a company makes.

Mr. Semans' presentation is available at the following link: Truman T. Semans, Director for Markets and Business Strategy, Pew Center on Global Climate Change, Washington, D.C.

Mr. Robert L. Kee, Senior Vice President, Document Management, Bank of America (BOA), Charlotte, North Carolina, gave his and Bank of America's views on the issue of global climate change. Mr. Kee pointed out that BOA is committed to the long-term sustainability of its business and that of the communities BOA serves. He listed many actions BOA is taking to address sustainability including: setting a goal to reduce paper consumption by 25% over three years, including setting a voluntary goal with the EPA to reduce greenhouse gases by nine percent by 2009 (based on a 2004 benchmark), and launching the Electronification of Paper Program.

Mr. William F. Bailey, Principal Consultant, DuPont, Charlotte, North Carolina, gave a presentation on DuPont's activities with regard to addressing global climate change. Mr. Bailey said that the challenge for DuPont is to address issues such as climate change in a way that makes business sense, upholds its core values, and allows sustainable growth. Mr. Bailey discussed some of the measures DuPont had taken to address climate change. DuPont committed to reduce their greenhouse gas emissions by 65% using a 1990 baseline, hold total energy use flat using the same 1990 baseline, and supply 10% of their total energy needs from renewable resources at a cost that is competitive with the best fossil-derived alternatives. DuPont also provides a broad array of enabling technologies, such as making bio-fuels and bio-based raw materials, which can help their customers reduce their greenhouse gas emissions footprint.

Mr. Bailey's presentation is available at the following link: William F. Bailey, Principal Consultant, DuPont, Charlotte, North Carolina.

Mr. Tom Darden, Chief Executive Officer, Cherokee Investment Partners, Raleigh, North Carolina, spoke about Cherokee Investments' efforts to address global climate change. Cherokee's mission is to "acquire environmentally impaired properties, remediate them and return them to productive use. Cherokee embraces a win-win attitude, enabling our partners, our investors, our employees and the communities we improve to share in the benefits of our work restoring brownfields." For Cherokee, sustainable development requires thoughtful consideration of both the environmental and social aspects of their projects and developments. With regard to Cherokee's actions to address climate change, Cherokee's Raleigh headquarters uses 100% green energy through North Carolina Green Power program. This reduces annual carbon dioxide emissions by 570,000 pounds, or the equivalent of not driving a car 700,000 miles per year. Cherokee aims to switch its other offices to 100% clean energy in 2006 and is planning to implement green energy use in its redevelopments. Regardless of the uncertainty surrounding climate change and whether it is human-induced, there are good business reasons to respond and plan accordingly. In addition, many of the greenhouse gas measures taken to improve air quality and result in other benefits.

Mr. Darden's presentation is available at the following link: Thomas Darden, Chief Executive Officer, Cherokee Investment Partners, Raleigh, NC.

April 25, 2006:

Joseph E. Aldy, a Fellow with Resources for the Future, discussed the primary determinants of mitigation costs and the issues to consider in order to project how the economy, individuals, and firms respond to a climate change policy in order to reduce their emissions of greenhouse gases. Mr. Aldy discussed determinants of mitigation costs, opportunities for investing in more energy efficient technology, and cost implications of policy design. He also explained how one might address uncertainty and risk when designing climate change policy. Mr. Aldy presented examples of successful cap-and-trade programs, such as the acid rain program. He also discussed different kinds of cap-and-trade programs and other policy options in the United States and Europe, ranging from moderate to stringent reductions in carbon dioxide, and how they would impact the economy. Finally, Mr. Aldy highlighted ancillary benefits that would likely result

from addressing climate change, such as improved air quality and reduced congestion and traffic accidents.

Mr. Aldy's presentation is available at the following link: Joseph E. Aldy, Fellow, Resources for the Future, Washington, D.C.

Dr. John C. Whitehead, Associate Professor at the Department of Economics at Appalachian State University talked about what the cost might be if climate change is not mitigated. Dr. Whitehead estimated the damages to North Carolina based on an annual one percent change, which could be the lowest amount of damages North Carolina may face; the total is $34 million in health impacts and $17 million in environmental impacts. Total damages are approximately $50 million, which is about 0.2% of State personal income and approximately $16 per North Carolina household. He estimated the costs to human health would be attributed to heat and storm related deaths, non-melanoma skin cancers, and drinking water contamination. He also estimated costs associated with damaged wetlands, beach erosion, commercial fishing, hurricane damage, and an increased probability of extinction for coastal threatened and endangered species.

Dr. Whitehead's presentation is available at the following link: John C. Whitehead, Associate Professor, Department of Economics, Appalachian State University, Boone, North Carolina.

Dr. Margo Thorning, Vice-President and Chief Economist of the American Council for Capital Formation, discussed the results of various models that attempt to show the costs of implementing near-term reductions in greenhouse gas emissions. In addition, she discussed how the system to reduce greenhouse gas emissions in the European Union (EU) is working. Specifically, Dr. Thorning looked at how the EU is conducting their emissions trading system. Dr. Thorning discouraged the use of a cap-and-trade program in North Carolina and encouraged that a cost-benefit analysis be conducted before adopting any mandatory policies or further policies to address greenhouse gas emission reduction. She asserted that it is essential that research and development be increased. Dr. Thorning also discussed what other countries, such as China and India, are doing to address climate change. Dr. Thorning recommended the following strategies to address both economic growth and climate change:

- Use cost / benefit analysis before adopting policies.
- Reform the federal tax code to accelerate depreciation allowances.
- Remove barriers to developing the world's access to more energy and cleaner technology by promoting economic freedom and market reforms.
- Increase research and development for new technologies to reduce energy intensity.
- Develop carbon sequestration through both natural and man-made technologies.
- Promote nuclear power for electricity.
- Expand bilateral cooperation with developing countries.
- Promote a truly global solution such as the new Asia Pacific Partnership on Development with its focus on economic growth and technology transfer.

Dr. Thorning's presentation is available at the following link: Margo Thorning, Vice President and Chief Economist, American Council for Capital Formation, Washington, D.C.

November 27, 2006:

Tim Toben, a member of the Commission and the Chief Executive Officer of Carolina Green Energy Corporation presented an overview of two reports on the economic impacts of climate change.

The Stern Review Report on the Economics of Climate Change[8] was produced in Great Britain by Sir Nicholas Stern, the Head of Government Economic Services. The study was based on data from the Hadley Center in the United Kingdom, the Energy Forum, the United States Climate Change Science Program, and the Intergovernmental Panel on Climate Change. The conclusions of the report are that the world faces tremendous costs from climate change by delaying action, close to losing five percent of the global Gross Domestic Product (GDP), and that mitigating climate change now would cost less than one percent of the global GDP. Some of the findings include: a decline in crop yields and food shortages; water shortages and flooding; and doubling of the concentrations of greenhouse gas by 2035 from the pre-industrial level. The Stern Review benefits in shifting the world to a low carbon path now would be on the order of 2.5 trillion dollars.

The Stern Review listed several recommendations, including the recommendation that by acting now, the potential exists to avoid the worst impacts of climate change. Moving ahead with actions should include: forming collaborative partnerships among governments, businesses, and individuals; creating effective policy at the state and national level; stabilize energy levels emissions over the next 20 years and between one and three percent after that; establish trade agreements to detect the effectiveness of investment and innovation globally; reduce deforestation; and integrate climate change into development policies. The report also emphasized carbon pricing, taxation, emissions trading or regulation, and technology policy as driving the development and large scale deployment of low carbon and high efficiency products, the promotion of energy efficiency, and the removal of barriers to energy efficiency.

The second report Mr. Toben reviewed was "Impacts on U.S. Energy Expenditures of Increasing Renewable Energy Use," by the RAND Corporation.[9] This report lays out the results of a modeling scenario whereby the United States incorporates 25% renewable energy sources into its energy mix by 2025. The study was built on data from energy demand and supply projections from the U.S. Energy Information Administration. Results and recommendations are based on the analysis of 1,500 test runs that varied future costs and rates of technology changes for fossil fuels and renewable energy. What the RAND Corporation found is that when renewable energy is at 25% of the total energy mix, the total energy expenditures were lower in nearly all cases,

[8] *The Economics of Climate Change. The Stern Review*. by Nicholas Stern,(Cambridge University Press, Cambridge, 2007.) Online at: http://www.hm-treasury.gov.uk/stern_review_report.htm.

[9] Toman, Michael A. & Griffin, James & Lempert, Robert J. & Rand Corporation. & Rand Environment, Energy, and Economic Development (Program). *Impacts on U.S. energy expenditures and greenhouse-gas emissions of increasing renewable-energy use : technical report*, Online at: http://www.rand.org/pubs/technical_reports/2008/RAND_TR384-1.pdf.

based on the assumption that current energy price and cost trends remain constant. Additionally, as long as renewable technology continues to improve at least 20% in the next 20 years, renewables could produce 25% of U.S. electric power and 10% of motor vehicle fuels by 2025 with no additional costs to the economy. Some of the positive effects of incorporating 25% renewables into our energy mix include: a 2.5 million barrel per day cut in U.S. petroleum consumption (equivalent to roughly 10% of projected U.S. consumption); the elimination of one gigaton of carbon dioxide emissions (that would result in a 50% reduction in U.S. contributions to global warming and a reduction in air pollution); and an increase in jobs and economic growth in rural communities. Still, there are several challenges to using renewables such as intermittency, transmission, interconnection, supply, as well as the current costs, which are expected to decline by 45% in the next 20 years.

Mr. Tobin's presentation on the Stern Review and the Rand Corporation report is available at the following link: Tim Toben, Member, Legislative Commission on Global Climate Change and Chief Executive Officer of Carolina Green Energy Corporation.

December 11, 2006:

The Honorable Richard H. Moore, North Carolina's State Treasurer,[10] presented on the investment policy of North Carolina as it relates to global climate change. Treasurer Moore is the fiduciary of the State's public pension funds, comprised of over $70 billion in assets, which he invests on behalf of the State. The investment strategy usually is as such: 58% in public equities, 35% in fixed income, and less than five percent in real estate and alternatives. Because of the amount of money that North Carolina has invested in public equities, good corporate governance and transparency in publicly traded companies are extremely important. One area in particular in which the North Carolina Treasurer's office has focused on within corporate governance and transparency, is the issue of global warming, specifically carbon emissions. If the company that the Treasurer's office has bought stock in is, for example, an insurance or an oil and gas company, they want to know if the company is properly valuing its liabilities. If not, then the company is not being run in a responsible way, or in a way that rewards the ultimate long-term share holders or public pension funds. Mr. Moore pointed out that though the shareholder has no say in the day-to-day operations of a company, they do by extension, through the Board of Directors, whose job it is to run the company. The shareholders and money managers thus have the right and responsibility to ask questions and expect answers of the companies. They have a responsibility to challenge companies about their environmental impacts.

Mr. Moore's presentation is available at the following link: Richard H. Moore, State Treasurer, North Carolina.

[10] Richard Moore was the North Carolina State Treasurer from 2001 to 2009.

April 22, 2008:[11]

David W. Ponder, Graduate Research Assistant with the Departments of Political Science and Criminal Justice, College of Arts and Sciences at Appalachian State University, presented the final results of the macroeconomic analysis conducted on various climate mitigation options recommended by the CAPAG process. Using the Energy Scenario Economic Impact Model developed in 2005 for the North Carolina Energy Policy Council, the study group evaluated 22 bundles representing 30 policy options from the CAPAG process that, if fully implemented, would represent more than 90% of greenhouse gas emissions proposed under CAPAG.

For the period from 2007 to 2020, the revised final findings as to the projected results of implementing the CAPAG recommended mitigation options were estimated as follows:

- Cumulative Annual Net Jobs: 32,424.
- Cumulative Net Income: $5,799,000,000.
- Cumulative Value Added: $7,598,000,000.

Mr. Ponder's presentation is available at the following link: David W. Ponder, Graduate Research Assistant, Department of Political Science/Criminal Justice, College of Arts and Sciences, Appalachian State University.

Dr. David G. Tuerck, Executive Director of the Beacon Hill Institute for Public Policy Research, and Professor and Chairperson of the Economics Department at Suffolk University, presented on the economics of climate change legislation in North Carolina. He began his presentation saying that he did not believe adopting global climate change recommendations would have a positive effect on the economy. He then reviewed several cost-benefit analyses. In one scenario he suggested, the utilities would account for the capital integration and operation costs for projects and that there would also need to be a clearer understanding of what constitutes a social benefit. He added that the only benefit to North Carolina consisted of reduced greenhouse gas emissions from North Carolina, as the State would still reap the consequences of such emissions from other states.

Dr. Tuerck continued that reductions in greenhouse gas emissions fail to offer a positive cost-benefit for the State, and because the net benefits are negative, a legitimate cost-benefit analysis will show net losses rather than gains. Accordingly, the results would be fewer jobs and reduced investments. He suggested that policy officials also consider those goods that would be sacrificed to capture reported savings. Multipliers should also not be used, and legislators and policy officials should not ignore price distortions and remember that job losses are a cost, not a benefit, to the State. Dr. Tuerck said job gains are a proxy for benefits but only when distortions are removed. Losses, he said, are a proxy for costs but only when distortions are created. And new jobs are of benefit only if they add more value than the jobs they displace. He then disputed claims from some prior presentations received by the Commission.

[11] Mr. Ponder also presented draft findings to the Commission on October 23, 2007. Mr. Ponder's presentation of the draft results is available at the following link: David W. Ponder, Graduate Research Assistant, Department of Political Science/Criminal Justice, College of Arts and Sciences, Appalachian State University.

Dr. Tuerck's presentation is available at the following link: David G. Tuerck, Executive Director, Beacon Hill Institute for Public Policy Research, and Professor and Chairperson, Economics Department, Suffolk University.

December 9, 2008:

Paul J. Quinlan, Director of Economic Research and Development for the North Carolina Sustainable Energy Association, presented on the potential growth in green jobs in North Carolina. Mr. Quinlan first explained that the definition of "green jobs" utilized in different studies may vary considerably and result in different values. The United Nations defines green jobs as "work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality." Other organizations may also add additional criteria to the definition of green jobs, including whether the jobs also pay a family or living wage and provide career advancement opportunities.

In October 2008, the U.S. Conference of Mayors Report: Green Jobs In U.S. Metro Areas[12] estimated that there were approximately 751,000 green jobs in the U.S. and approximately 16,300 in North Carolina metro areas. Forecasting to 2038, these numbers were expected to increase to 4.2 million jobs nationwide and 129,200 jobs in North Carolina. This forecast was based on the following assumptions about energy consumption in 2038:

- 40% of electricity will be generated from solar, wind, geothermal, biomass, and incremental hydroelectric power.
- There will be a 35% reduction in energy consumption in the current stock of residential and commercial buildings.
- 30% of gasoline and diesel demand for passenger cars and light trucks will be satisfied by an alternative fuel.
- One indirect job is created for every two direct jobs.

Mr. Quinlan also pointed out that the 2007 American Solar Energy Society Report: Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century[13] utilized a broader definition of green jobs and estimated that nationally there were over 8.5 million jobs in the green industry in 2006 and that by 2030 under the base case scenario, this number would increase to 16.2 million jobs. Under an advanced scenario, 40 million jobs (1 in 4 workers) would be considered green jobs by 2030.

The Center for American Progress also released a report in September 2008 entitled "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy."[14] The report estimated that $100 billion invested over two years in six green infrastructure investment priorities (building retrofitting; mass transit and freight rail; smart grid; wind energy; solar

[12] US Conference of Mayors. *Green Jobs in US Metros Areas. 2008.* Online at: http://www.usmayors.org/pressreleases/uploads/GreenJobsReport.pdf.
[13] American Solar Energy Society, *Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century*. (2007) Online at: http://www.ases.org/images/stories/ASES-JobsReport-Final.pdf.
[14] The Center for American Progress, *Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy*. (2008). Online at: http://www.americanprogress.org/issues/2008/09/pdf/green_recovery.pdf.

energy; and advanced biofuels) would result in 2 million new jobs in the U.S. in 2 years, and that a $2.9 billion in investment in North Carolina would result in 62,015 new jobs. Mr. Quinlan also highlighted the findings of several additional studies specific to North Carolina.

Mr. Quinlan's presentation is available at the following link: Paul J. Quinlan, Director, Economic Research and Development, North Carolina Sustainable Energy Association.

November 17, 2009:

Thomas Peterson, President of the Center for Climate Strategies, presented on the findings of a recent initiative conducted for the Southern Governor's Association (SGA) and an overview of new actions that have occurred at the state and federal levels. The SGA requested information on what the range of climate mitigation options in the SGA region would look like in terms of cost effectiveness. Mr. Peterson stated the study started by looking at the results of five comprehensive climate action planning processes that have occurred in the southern region. He notes this is a region that has 16 states and two territories and is responsible for half of the nation's energy, 40% of the population, and one-third of our U.S. senate representation. The study focused on 23 major policy options that were responsible for about 83% of all of the emissions reductions potential in the region. The analysis for each of these plans was updated and that was based on changes in the forecast of energy prices, the effects of the recession, recent state and federal actions, and other factors. The findings of the analysis included the following:

- SGA regional emissions were estimated to grow 7.5% between 2005 and 2009 and 13.5% between 2005 and 2020, roughly a 10% reduction in overall emissions by 2020 compared to previous estimates. This is reflective of regional and national trends.
- These reduced business-as-usual (BAU) emissions levels are due primarily to effects of recent federal policy (such as the new vehicle fuel economy standard). The forecast is proportionately lower in the short term due to effects of the recession that disappear in the long term.
- For the SGA Region, 23 major climate policy options can significantly reduce greenhouse gases from the following sectors and activities: 1) low carbon heat and power generation; 2) energy efficiency in the residential, commercial, and industrial sectors; 3) transportation and land use improvements; and 4) agriculture, forestry, and waste conservation.
- The cost-effectiveness of individual policy options varies significantly and includes several options (about half of the total) that provide net financial savings (due to energy savings) from -$40 to -80 per million metric ton of CO2 equivalent (MMtCO2e), to several with net financial costs up to about $60/MMtCO2e.
- Region-wide greenhouse gas reduction potentials for the 23 options ranged from a low of 2.5 MMtCO2e in 2020 for the manure management option to a high of more than 200 MMtCO2e in 2020 for the Demand Side Management and Renewable Portfolio Standard options.

The estimates for greenhouse gas reductions and the cost for each of the policy options are summarized in the following table:

Sector	Climate Mitigation Actions	Estimated 2020 Annual GHG Reduction Potential (MMtCO2e)	Estimated Cost or Cost Savings per ton GHG Removed ($)
Agriculture, Forestry and Waste Management Sector			
AFW-1	Soil Carbon Management	9.24	($12.76)
AFW-2	Nutrient Management	3.25	($10.10)
AFW-4	MSW Landfill Gas Management	20.81	($0.42)
AFW-7	Reforestation/Afforestation	87.89	$13.60
AFW-3	Livestock Manure - Anaerobic Digestion and Methane Utilization	2.53	$14.63
AFW-5	Enhanced Recycling of Municipal Solid Waste	84.03	$18.84
AFW-6	Forest Retention	28.22	$19.11
AFW-8	Urban Forestry	16.75	$57.20
Energy Supply Sector			
ES-4	Coal Plant Efficiency Improvements and Repowering	80.04	$10.72
ES-1	Renewable Portfolio Standard	203.93	$19.62
ES-3	Carbon Capture, Storage, or Reuse	61.45	$28.84
ES-2	Nuclear	100.94	$41.55
Residential, Commercial, and Industrial Sector			
RCI-3	Appliance Standards	26.32	($44.29)
RCI-1	Demand Side Management Programs	201.94	($40.33)
RCI-2	High Performance Buildings (private and public sector)	108.33	($36.05)
RCI-4	Building Codes	93.83	($18.00)
RCI-5	Combined Heat and Power	90.99	$1.61
Transportation and Land Use Sector			
TLU-1	Anti-Idling Technologies and Practices	13.13	($83.51)
TLU-2	Vehicle Purchase Incentives, including Rebates	59.04	($70.85)
TLU-3	Mode Shift from Truck to Rail	13.71	($35.52)
TLU-5	Smart Growth/Land Use	33.02	$0.00
TLU-6	Transit	5.54	$12.73
TLU-4	Renewable Fuel Standard (biofuels goals)	40.28	$40.51

Mr. Peterson stated that while many of these policy options indicate long-term net savings, they still require outlays in the short term. This remains a significant issue in terms of the mobilization of investment, particularly in light of the current economic condition many southern states are currently facing.

Mr. Peterson stated that nuclear power is one that has been the subject of interesting discussions because it holds typically somewhere on the right side of these curves which means it is not one

of the lowest cost options. He stated it is viewed as very important because of reliability even though it is more expensive compared to other energy sources.

For the second part of his presentation, Mr. Peterson discussed the analysis of micro- and macro-economic impacts of greenhouse gas mitigation options that the Center for Climate Strategies conducted for the SGA. With regard to the microeconomic analysis, the study made the following findings:

- Studies using static and worst case assumptions, or older data sources, generally show higher costs.
- Studies using more dynamic methods, better case assumptions, and newer data sources generally show lower costs.
- Stakeholder and technical work group participation in analysis significantly affects these choices and results.

With regard to the macroeconomic analysis, the study made the following findings:

- Higher microeconomic cost inputs generally show higher negative impacts on jobs, income, and economic growth.
- However, high microeconomic costs may lead to positive offsets where multiplier effects are stronger for new versus old spending areas (e.g. alternative or indigenous energy).
- Low costs or cost savings, for example from energy efficiency, may reduce jobs and income producing activity in other sectors, but this effect will likely be offset by increased purchasing power and overall expansion in investment from increased savings from within the State and an inflow from the outside.
- A rapid pace of technological change will improve the impacts.

With regard to the economic analysis, the study determined that the outcome of climate policy is not predestined, but can be shaped by the choice of options and their design. Mr. Peterson concluded by suggesting the use of the following strategies to minimize costs and maximize value:

- Use the least-cost, highest co-benefit policy mix.
- Focus on alternative and indigenous energy supply.
- Focus on long-term competitive advantage.
- Minimize displacement and substitution.
- Minimize transaction costs and market obstacles.

Mr. Peterson's presentation is available at the following link: Thomas Peterson, President, Center for Climate Strategies.

ACTIONS TAKEN IN NORTH CAROLINA

The Commission was not acting in isolation in North Carolina. There were a number of prior actions that had already taken place related to climate change and a number of parallel processes currently underway that were looking at similar issues to those being discussed by the Commission. The Commission made efforts to utilize this information and to integrate these efforts.

The Clean Smokestacks Act of 2002

In 2002, the General Assembly enacted the Clean Smokestacks Act (CSA) (S.L. 2002-4; SB 1078, officially titled *Improve Air Quality/Electric Utilities)*, which required significant emissions reductions from coal-fired power plants in North Carolina. Under CSA, power plants must reduce their nitrogen oxide emissions by 77% in 2009 and sulfur dioxide emissions by 73% in 2013. Section 13 of CSA also directed DENR to study "issues related to the development and implementation of standards and plans to implement programs to control emissions of carbon dioxide from coal-fired generating units and other stationary sources of air pollution."

S.L. 2005-442, Sec. 5(3) directed the Commission to "consider and integrate the findings and recommendations" from this study as part of its investigation. The Commission looked at these issues as follows:

On February 3, 2006, *Mr. William G. Ross, Jr., Secretary of Environment and Natural Resources,* reported on the ongoing efforts by DENR to control emissions of carbon dioxide and other greenhouse gases. Examples of these efforts include the CSA, as described above, which established a plan and deadlines for significant reduction of sulfur dioxides, nitrogen oxides, and mercury. The Division of Air Quality (DAQ) of DENR also conducted a study on carbon dioxide emissions that evaluated the science of climate change and options for reducing greenhouse gas emissions. DENR extended their technical efforts by forming the Climate Action Plan Advisory Group (CAPAG), which was established to conduct a facilitated dialogue with a diverse group of parties who were interested in the subject of climate change. Secretary Ross highlighted the partnership between North Carolina and the military, which focused on sustainability of environmental, social, economic, and military issues on an ongoing basis and also the efforts by the Commonwealth of Pennsylvania to recruit a Spanish wind energy company and create local jobs. Secretary Ross concluded by saying that DENR and DAQ wanted to provide the tools and the ability to analyze, on a cost-benefit basis, the steps that our State might take to prepare for global climate change.

Mr. Brock Nicholson, Deputy Director of DAQ, presented the final report on issues related to the development and implementation of standards and plans to implement programs to control emissions of carbon dioxide from coal-fired generating units and other stationary sources of air pollution, as mandated by the CSA. Mr. Nicholson focused his talk on recommendations from the final report on *Carbon Dioxide Emissions Reduction Strategies for North Carolina*.[15] The

[15] Division of Air Quality, DENR. *Carbon Dioxide (CO2) Emissions Reduction Strategies for North Carolina.* September 1, 2005. Available online at: http://daq.state.nc.us/news/leg/co2_final_09022005.pdf.

recommendations from the report fall into three groups: (1) actions that are currently underway and consist of eight listed plans of action; (2) regulations that may not require legislation and; (3) recommendations that require some other direction by entities such as the Commission and the Legislature. Examples of these carbon dioxide reduction recommendations include getting the North Carolina State government to increase its leadership role and intensify efforts outlined in State Energy Plan and to develop a renewable portfolio standard. Mr. Nicholson outlined the next steps for DENR, including: to establish the membership of CAPAG; to implement a greenhouse gas inventory; to work with the LCGCC to develop the CAPAG process; to report the findings and results to the LCGCC, the General Assembly, and the Governor; and to begin implementation of these recommendations. Mr. Nicholson also gave a report on specific activities and plans underway in DAQ to develop and implement standards and plans to control emissions of carbon dioxide and other greenhouse gases.

Mr. Nicholson's presentation is available online at the following link: Brock M. Nicholson, Deputy Director, Division of Air Quality, DENR.

The CAPAG Process

One of the most significant outcomes of the study discussed above mandated by the CSA was the creation of the Climate Action Plan Advisory Group, commonly referred to as CAPAG, by DENR. The CAPAG process was one of the largest and most comprehensive approaches taken by the State to evaluate climate change impacts on the State and possible mitigation options to consider. The CAPAG process was facilitated by the Center for Climate Strategies and evaluated both the environmental and economic implications of the many policy options it considered. The Commission heard reports on the CAPAG process and its findings at the following meetings:

March 7, 2006
Update on activities of DENR and the CAPAG Process

- Brock M. Nicholson, Deputy Director, Division of Air Quality, DENR

April 4, 2006:
Update on activities of DENR and the CAPAG Process

- B. Keith Overcash, Director, Division of Air Quality, DENR

April 25, 2006:
Update on activities of DENR and the CAPAG Process

- Brock M. Nicholson, Deputy Director, Division of Air Quality, DENR

October 3, 2006:
Update on and discussion of activities of the Climate Action Plan Advisory Group

- Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources

November 27, 2006:

Update on activities of the CAPAG Process being conducted by DENR to develop and implement standards and plans to control emissions of carbon dioxide and other greenhouse gases

- Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of environment and Natural Resources

January 12, 2007:
Update on and discussion of activities and possible recommendations of CAPAG

- Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources
- Tom Peterson, Executive Director, The Center for Climate Strategies

October 23, 2007:
Discussion of recommendations considered by CAPAG at its meeting on 16 October 2007

- Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources
- Tom Peterson, Executive Director, Center for Climate Strategies

March 5, 2008:
Presentation of the CAPAG final recommendations

- Thomas D. Peterson, President and CEO, Center for Climate Strategies

The CAPAG process culminated with the release of a final report entitled "Recommended Mitigation Options for Controlling Greenhouse Gas Emissions."[16] The report included 56 recommended mitigation options for the State to consider that, if fully implemented and enforced, would reduce gross greenhouse gas emissions in the State by 47% from the reference case forecast for 2020.

At its February 22, 2007 meeting, the Commission adopted 17 proposals for inclusion as recommendations in the Commission's Interim Report. 16 of the proposals adopted were drawn directly from the CAPAG list of mitigation options that had received unanimous support by CAPAG members and were identified as "early action" items for the Commission to consider. The list of recommendations that were adopted are included in the Recommendations section of this report on pages 104-105.

Since the completion of the CAPAG process, many of the recommendations from the CAPAG report have been enacted by the General Assembly or implemented by executive branch agencies. Appendix E of this report contains a table prepared by DAQ that provides a status of the implementation of the various CAPAG mitigation options.

[16] North Carolina Climate Action Plan Advisory Group (CAPAG), *Recommended Mitigation Options for Controlling Greenhouse Gas Emissions.* October 2008, available online at: http://www.ncleg.net/documentsites/committees/LCGCC/CAPAG%20Final%20Report/CAPAG%20Final%20Report%20-%20Oct.%202008.pdf.

Senate Bill 3: The North Carolina Renewable Energy and Energy Efficiency Portfolio Standard (S.L. 2007-397)

Among the most significant actions related to climate change and renewable energy taken during the course of this Commission's existence was the enactment of S.L. 2007-397 (commonly referred to as SB 3) by the General Assembly, by which North Carolina became the first state in the Southeast to adopt a Renewable Energy and Energy Efficiency Portfolio Standard (REPS). Under this new law, investor-owned utilities in North Carolina are required to meet up to 12.5% of their energy needs through renewable energy resources or energy efficiency measures. Rural electric cooperatives and municipal electric suppliers are subject to a 10% REPS requirement. The following section details the discussions by this Commission prior to and following the enactment of SB 3.

October 3, 2006:

James Kerr, Commissioner of the North Carolina Utilities Commission, presented an update on the Utilities Commission study of a Renewable Energy Portfolio Standard (REPS), which would mandate that a certain percentage of electricity sold in the State come from renewable sources. The Renewable Portfolio Standards Advisory Group was created to discern the impact of a REPS on electric rates as well as the impact on North Carolina's entire economy, including the potential for job creation and the offsetting of negative impacts on industrial rates. In addition to renewables, the Commission and the Advisory Group planned to examine methods for energy efficiency that will also lessen the reliance on traditional energy sources. Commissioner Kerr indicated that the report would be released for comment when the General Assembly convenes in January 2007.

Robert Gruber, Executive Director of the Public Staff for the North Carolina Utilities Commission, also presented a report on the proposal of the Public Staff of the North Carolina Utilities Commission to create a public benefits fund. An increased focus on Demand Side Management (DSM) programs and renewable energy in 2005 and 2006 led the Commission to hold several public hearings on this topic. During these hearings, participants commented that utilities have a disincentive to develop and implement DSM programs. Having an independent, non-utility third party administer the DSM programs, as occurs in Vermont and Wisconsin, prevents the need for special rate treatments to address the problem of lost revenue. Ultimately, DSM programs require an effort both on the part of utilities to spend money on the programs and on the part of the consumer to make changes in behavior.

January 12, 2007:

James Kerr, Commissioner of North Carolina Utilities Commission and Sam Watson, Staff Attorney at the Utilities Commission, reported on the study by the Utilities Commission of the potential for a Renewable Energy Portfolio Standard (REPS) for the State, along with related issues. Commissioner Kerr described that the Utilities Commission was asked by the Environmental Review Commission if they could oversee a study on renewable energy portfolio standards, including the potential costs and benefits of various renewable portfolio standards scenarios. Sam Watson indicated that the goal of the Utilities Commission was to provide an objective view of the issues related to potential REPS in North Carolina.

To conduct the study, the Utilities Commission contracted with LaCapra Associates, Inc.[17] and GDS Associates, Inc.[18] The final report included the following key findings:

- North Carolina has sufficient renewable resources to meet a 5% REPS requirement for new renewable generation.
- It would be difficult to meet a 10% REPS with only new North Carolina renewable supply resources.
- Inclusion of energy efficiency would enable the State to achieve a 10% REPS and would reduce consumers' overall electricity bill. Energy efficiency would have the greatest positive impact.
- The annual displacement of CO2, once a 5% or 10% REPS is achieved, could total at least 7.3 to 13.6 million tons per year, respectively.
- Efforts to reduce CO2 would also potentially displace other emissions related to air quality and health, such as nitrogen oxides, sulfur dioxide, particulate matter, and mercury.
- Renewable generation facilities either do not produce waste or the waste products are more benign than from coal and nuclear fuels.
- Renewable energy resources do not have significant environmental impact from fuel extraction in contrast to the extraction impacts of coal, oil, natural gas, and nuclear fuel.
- An REPS would produce direct economic and environmental benefits to the State.
- An REPS may enable the State to avoid the development of 1,000 megawatts (MW)or more of baseload conventional generation.

The presentation by Commissioner Kerr and Mr. Watson is available at the following link: James Y. Kerr II, Commissioner, and Sam Watson, Staff Attorney, North Carolina Utilities Commission.

October 23, 2007:

George Givens, Commission Counsel, provided an overview of SB 3 (S.L. 2007-397). SB 3 became law on August 20, 2007 and established the first Renewable Energy and Energy Efficiency Portfolio Standard (REPS) in the Southeast.

The legislative analysis of SB 3 is available at the following link: Summary.

The fiscal note for SB 3 is available at the following link: Fiscal Note.

Although SB 3 sets forth a number of details, the electric power suppliers generally may comply with the REPS requirement in a number of ways, including the use of renewable fuels in existing electric generating facilities, the generation of power at new renewable energy facilities, the purchase of power from renewable energy facilities, the purchase of renewable energy

[17] *Analysis of a Renewable Portfolio Standard for the State of North Carolina*, La Capra Associates, December 2006. Available online at: http://www.ncuc.commerce.state.nc.us/reps/NCRPSReport12-06.pdf.

[18] *A Study of the Feasibility of Energy Efficiency as an Eligible Resource as Part of a Renewable Portfolio Standard for the State of North Carolina*, GDS Associates, Inc., December 2006. Available online at: http://www.ncuc.commerce.state.nc.us/reps/NCRPSEnergyEfficiencyReport12-06.pdf.

certificates, or the implementation of energy efficiency measures. Renewable energy facilities include facilities that generate electric power by the use of a renewable energy resource, combined heat and power systems, and solar thermal energy facilities. Renewable energy resource includes: solar electric, solar thermal, wind, hydropower, geothermal, and ocean current or wave energy resources; a biomass resource, including agricultural waste, animal waste, wood waste, spent pulping liquors, combustible residues, combustible liquids, combustible gases, energy crops, or landfill methane; waste heat derived from a renewable energy resource and used to produce electricity or useful, measurable thermal energy at a retail electric customer's facility; or hydrogen derived from a renewable energy resource.

January 13, 2010:
Edward S. Finley, Jr., Chairman of the North Carolina Utilities Commission, reported on the implementation of Senate Bill 3. Commissioner Finley discussed the Utilities Commission's activities under Docket No. E-100 Sub 113 (Rulemaking Proceeding to Implement Session Law 2007-397). Over 24 entities commented on the Utilities Commission's proposed rules, and on February 29, 2008, the Commission issued an order addressing 105 issues that were identified in the comments, and adopted final rules for implementation. Since that time, the Utilities Commission has issued numerous additional orders resolving questions of statutory interpretation.

Commissioner Finley also provided updates on REPS compliance by the electric power suppliers in the State, along with an overview of the opportunities created by SB 3 for renewable energy providers in the State. Under the Utilities Commission rules, a renewable generator must file a registration statement and annual reports with the Utilities Commission in order to qualify Renewable Energy Credits (RECs) for REPS compliance. As of September 30, 2009, the Utilities Commission had issued orders accepting registration of 72 generating facilities as renewable energy facilities or new renewable energy facilities; 106 as of January 1, 2010, including over 30 MW of new solar photovoltaic generating capacity.

Commissioner Finley's presentation is available at the following link: Edward S. Finley, Jr., Chairman, North Carolina Utilities Commission.

Climate change-related actions taken by the General Assembly

Enacted Legislation:
Over the past five years, the General Assembly has considered and enacted a number of measures related to climate change, including the following:

- Energy Savings Contracts:
    - S.L. 2006-190 (SB 402 (=HB 454)) – *Water/Utilities Savings in Govt. Facilities* increased the aggregate total principal amount payable by the State on guaranteed energy savings contracts from $50 to $100 million and extended the maximum length of a financing contract from 12 to 20 years. This act also requires that when a State facility or State-assisted facility of 20,000 gross square feet or more replaces its heating, ventilation, or air-conditioning equipment, it must conduct a

life-cycle cost analysis of the replacement equipment if the equipment is financed with a guaranteed energy savings contract.

  - S.L. 2009-375 (SB 304 (=HB 349)) – *Energy Savings Contracts' Cap/Program Administration* removed the cap on the amount payable by the State for guaranteed energy savings contracts, and requires (1) qualified providers to contribute to the costs of administering the guaranteed energy savings contracts program, (2) life cycle cost analyses of energy conservation measures during investment grade audits conducted by qualified providers, and (3) local governmental units that enter into guaranteed energy savings contracts to report to the State Energy Office.

- State Motor Fleet Requirements:
  - Part I of S.L. 2006-206 (SB 2051) – *State Energy Use Planning/Energy Assistance* directed the Department of Administration to develop a plan for the targeted conversion of fuel dispensing facilities to provide greater availability of biodiesel, ethanol, and other alternative fuels for State-owned fleets in order to attain the 20% requirement for the reduction or displacement of petroleum products consumed by State-vehicle fleets by January 2010.
  - S.L. 2009-241 (HB 1079) – *Energy-Efficient State Motor Vehicle Fleet* requires the Department of Administration to give preference to new passenger motor vehicles that have fuel economy that is in the top 15% of that class of comparable automobiles for passenger motor vehicles purchased by the State.
- State-Owned Facilities:
  - S.L. 2007-546 (SB 668 (=HB 1075)) [as codified by S.L. 2008-203 (SB 1946 (=HB 2532)) – *Energy Conservation in State Buildings* promotes conservation of energy and water use in State, university, and community college buildings. This legislation requires new State, university, and community college buildings and major renovations of these buildings to be designed, constructed, and certified in accordance with specified energy and water efficient construction standards and prohibits the State from purchasing buildings that do not meet those standards at the time of construction or renovation.
- Promotion of Alternative Energy Resources and Technological Advancements:
  - Part III of S.L. 2006-206 (SB 2051) – *State Energy Use Planning/Energy Assistance* established the North Carolina Biofuels Industry Strategic Plan Work Group in order to develop a strategic plan for expansion of biofuels as an industry in the State. The Work Group submitted its final report[19] to the Environmental Review Commission in April 2007. The General Assembly appropriated $4 million to the Biofuels Center of North Carolina in 2009.
  - S.L. 2007-397 (SB 3 (=HB 77)) – *Promote Renewable Energy/Baseload Generation.* Perhaps the most relevant legislation involving green energy in North Carolina, S.L. 2007-397 established the Southeastern United States' first renewable energy and energy efficiency portfolio standard (REPS) in order to promote the development of renewable energy and energy efficiency in the State. This legislation requires electric power providers to use an increasing percentage of renewable energy resources and employ energy efficiency programs (12.5% by

[19] North Carolina's Strategic Plan for Biofuels Leadership, April 2007. online at: http://www.biofuelscenter.org/userfiles/File/NC_Strategic_Plan_for_Biofuels_Leadership.pdf.

2020) to meet the needs of the State's retail electricity customers. Requiring the use of solar energy, swine waste, and poultry waste resources with other available renewable energy resources (including hydropower, geothermal, and wind resources to name a few) will result in reduced emissions of carbon dioxide, a greenhouse gas that significantly contributes to climate change.

- S.L. 2007-323 (Sec. 13.2, HB 1473) – *Establishment of the North Carolina Green Business Fund.* The General Assembly established the NC Green Business Fund in Section 13.2 of S.L. 2007-323 (2007 Appropriations Act) to promote small businesses that develop and expand the biofuels industry, the green building industry, clean technology, and renewable energy products and businesses. Grants are made to private businesses of less than 100 employees, nonprofit organizations, local governments, and State agencies to encourage the expansion of small to medium sized businesses to grow a green economy in the State. The funds are to be used for the following purposes:
  - Maximize development, production, distribution, retail infrastructure, and consumer purchases of biofuels in the State, including the development of biofuels workforce.
  - Develop the green building industry in the State through the development and growth of a market for environmentally conscious and energy efficient, green building processes.
  - Attract and leverage private-sector investments and entrepreneurial growth in environmentally conscious clean technology and renewable energy products and businesses, including the development of workforces in these industries.

  The North Carolina Board of Science and Technology, a division of the Department of Commerce, developed selection criteria and published an open solicitation to accept grant proposals for the fiscal year 2009 solicitation, and awards grants under this program. Maximum grants of $100,000 will be awarded based on eligibility, funding availability, and other requirements. The General Assembly appropriated $5 million to the State Energy Office in 2009 towards this Fund.
- Section 4 of S.L. 2007-523 (SB 1465 (=HB 1254)) – *Swine Farm Environmental Performance Standards* established the Swine Farm Methane Capture Pilot Program administered by DENR and the Utilities Commission. Under the Pilot Program, each electric power supplier that serves a swine farm that is selected to participate in the program must purchase all electricity generated by the swine farm using methane as fuel.
- S.L. 2009-390 (SB 1004 (=HB 1252)) – *Amend Certain Electricity Generation Laws* shortens the time within which the Utilities Commission must render a decision on a petition for a certificate of public convenience and necessity to 45 days from the filing of the petition, where the certificate is for the construction of a natural gas-fueled generating unit, the construction of which will result in the closure of all coal-fired units at the site, thus allowing compliance with reduced SO2 emissions requirements. The legislation also authorizes the Utilities Commission to allow an electric public utility to recover operating costs and investment in a "carbon offset facility" through the savings in the fuel and fuel-

related costs realized by the utility, because it will not be operating or will reduce operation of carbon fuel facilities as a result of the construction or acquisition of the carbon offset facility. A "carbon offset facility" means an electric generating facility that generates electricity using solar electric, solar thermal, wind, hydropower, geothermal, or ocean current or wave energy, and the electricity or equivalent BTUs produced will displace electric generation to the extent that greenhouse gases will be reduced.

- Financing Measures:
  - Section 28.12 of S.L. 2008-107 – *Sales Tax Holiday for Certain Energy Star Rated Appliances* created a State sales tax holiday during the first weekend in November for the following energy star rated appliances: clothes washers; freezers and refrigerators; central air conditioners and room air conditioners; air-source heat pumps and geothermal heat pumps; ceiling fans; dehumidifiers; and programmable thermostats.
  - S.L. 2009-548 (HB 512 (=SB 305)) – *Incentives for Energy Conservation* amends the State's incentives for alternative energy construction by adding equipment and machinery used for combined heat and power and geothermal equipment and fuel cell equipment that qualifies for a 35% tax credit equal to the cost to corporate or individual taxpayers who construct, purchase, or lease renewable energy property that is placed into service. This act also allows the credit to be taken against the gross premiums tax.
- Provision of Authority to Local Governments:
  - S.L. 2009-95 (SB 52) – *Local Energy Efficiency Incentives* provides that counties and municipalities, for the purpose of reducing the amount of energy consumption by new development, may adopt ordinances to grant a density bonus, make adjustments to otherwise applicable development requirements, or provide other incentives to a developer or builder within the county or municipality and its extraterritorial planning jurisdiction if the developer or builder agrees to construct new development or reconstruct existing development in a manner that the county or municipality determines, based on generally recognized standards established for such purposes, makes a significant contribution to the reduction of energy consumption. Generally recognized standards for reduction of energy consumption include: the Leadership in Energy and Environmental Design (LEED) program, the Green Globes program, or another nationally recognized certification program.
  - S.L. 2009-522 (HB 1389) – *Revolving Loan Fund for Energy Improvements* authorizes cities and counties to establish loan programs to finance energy efficiency improvements and the installation of distributed renewable energy sources that are permanently affixed to real property. Qualifying renewable energy sources include: solar electric, solar thermal, wind, hydropower, geothermal, biomass, ocean current or wave energy, waste heat, and hydrogen resources.
  - S.L. 2009-525 (SB 97) – *Critical Infrastructure Assessment Changes* aligns the purposes for which cities and counties may issue bonds payable from special assessments with the purposes for which project development financing may be used and adds the installation of distributed generation renewable energy sources

or energy efficiency improvements that are permanently fixed to commercial, industrial, or other real property to those purposes for which assessment-based financing may be used.

- S.L. 2009-527 (HB 148 (=SB 151)) – *Congestion Relief/Intermodal Transport Fund* establishes a Congestion Relief and Intermodal Transportation 21st Century Fund to provide grants for: public transportation, railroads for intermodal and multimodal facilities and inland ports, State ports for terminal railroads and improved access to military facilities, and expansion of intercity passenger rail service. The law also provides transportation authorities the power, with voter approval, to levy a 1/2% local sales tax to be used only for public transportation systems. (Applies to Triangle Transit Authority for Wake, Durham, and Orange Counties and Piedmont Authority for Regional Transportation for Forsyth and Guildford Counties). Mecklenburg County already has such authority. The law provides the other 94 counties that operate a public transportation system or have a municipality in that county that operates a public transportation system the power, with voter approval, to adopt a 1/4% local sales tax to be used only for public transportation systems. Lastly, the law authorizes increased taxes or provides regional or local taxing powers for transportation-related purposes.
- S.L. 2009-553 (HB1387) – *Solar Collectors on Residential Properties* makes the current prohibitions against ordinances and restrictive covenants that prohibit solar collectors on detached single family residences applicable to all residential property, except that the limitations on restrictive covenants do not apply to certain multi-story condominiums. It also clarifies that these statutes are applicable in historic districts. The law adds an exception for certain multi-story condominiums and allows restrictive covenants for residences where a homeowners' association is responsible for exterior maintenance to specify that the owner installing the solar collector is responsible for damage to the property and maintenance of the solar collector. The limitations on restrictive covenants are prospective only.

Legislation Pending in 2010 General Assembly:

In addition to the enacted legislation listed above, there are a number of other climate change-related items of legislation pending the 2010 General Assembly, including the following:

- HB 28 – *LRC Study GHG Credits for Farming* would provide that the Legislative Research Commission may study the feasibility and advisability of extending credits to the business of farming in the same manner that credits are extended to other businesses in the event North Carolina participates in a market based cap-and-trade program for greenhouse gas emissions adopted either by the federal government or by the State. (HB 28 is currently in the Committee on Rules, Calendar, and Operations of the House).
- HB 282 – *Green School Construction/Loan Fund* would (i) promote energy efficiency in public school buildings and encourage public school participation in the Sustainable Energy-Efficient Buildings Program and (ii) create and appropriate funds to the Green School Construction Loan Fund. The bill provides that local boards of education and local school administrative units would be encouraged to voluntarily participate in the

Sustainable Energy-Efficient Buildings Program. (HB 282 is currently in the House Appropriations Committee).

- HB 906 – *Alternative Fuels Tax Credits* would create a tax credit for alternative-fuel infrastructure and create a tax credit for alternative fuel vehicles and advanced technology vehicles. (HB 906 is currently in the House Finance Committee).
- HB 1050 – *Independent Energy Efficiency Administrator* would create "NC SAVE$ ENERGY" as an independent energy efficiency administrator in the State to administer energy efficiency and energy conservation programs and programs to promote the sustainable use of energy (HB 1050 is currently in the House Energy and Energy Efficiency Committee).
- HB 1075 – *Teach 'Green Science' in High Schools* would direct the State Board of Education to develop an elective high school science course on renewable and alternative energy. (HB 1075 is currently in the House Energy and Energy Efficiency Committee).
- HB 1127 – *Allow Greater Local Energy Efficiency Standards* would allow for the adoption of more stringent building code provisions related to energy conservation by political subdivisions of the State. (HB 1127 is currently in the House Energy and Energy Efficiency Committee).
- HB 1199 – *Energy Efficiency in Buildings if State Funded* would extend the standards governing energy efficiency and water use for major facility construction and renovation projects involving State, university, and community college buildings to major facility construction and renovation projects involving buildings of entities that receive funding in excess of a total of $20,000 in State appropriations. (HB 1199 is currently in the House Appropriations Committee).
- HB 1205 – *Establish North Carolina Commission on Climate Change* would establish the North Carolina Commission on Climate Change. The Commission would consist of 15 members that are either legislators or appointees of the Governor. The Commission would study issues related to global climate change, including legal, economic, and technological issues, and make appropriate reports and recommendations. The bill would also establish a 20-member Advisory Council to assist the Commission as requested. (HB 1205 is currently in the House Environment and Natural Resources Committee).
- HB 1207– *Clean Cars/Vehicle Retirement Program* would improve air quality in the State by establishing a vehicle retirement program to provide incentives for removing older, more polluting vehicles from operation and to establish a consumer education program designed to improve vehicle fuel economy and reduce carbon dioxide emissions. (HB 1207 is currently in the House Environment and Natural Resources Committee).
- HB 1290 – *NC Clean Cars Program* would require the EMC to adopt rules to implement a low-emission vehicle program that is functionally equivalent to California's program. The rules would apply to all motor vehicles beginning with the 2012 model year. (HB 1290 is currently in the House Environment and Natural Resources Committee).
- HB 1440 – *Study Feed-in Rates* would authorize the Joint Legislative Utility Review Committee and the Energy Policy Council to jointly study the feasibility and suitability of establishing feed-in rates to be paid to renewable energy electricity producers by electric power suppliers for each kilowatt-hour of electricity produced. (HB 1440 is currently in the House Rules Committee).
- HB 1441 – *Greenhouse Gas Emissions Reduction Act* would require: (1) DENR to develop, maintain, and publish a greenhouse gas emissions inventory; (2) the State to

reduce greenhouse gas emissions according to a certain schedule; (3) DENR to develop a two step implementation plan to reduce greenhouse gas emissions statewide; and (4) monitoring and reporting to ensure implementation of the greenhouse gas emissions reduction plan according to the prescribed schedule. (HB 1441 is currently in the House Environment and Natural Resources Committee).

- HB 1443 – *Green Building Code* would require new and renovated commercial and new residential buildings to comply with energy conservation standards. (HB 1441 is currently in the House Energy and energy efficiency Committee).
- HB 1597 – *Income Tax Credit for Fuel-Efficient Vehicles* would provide an income tax credit for the purchase price of fuel-efficient vehicles. (HB 1597 is currently in the House Energy and energy efficiency Committee).
- SB 147 (=HB 504) – *Tax Credit for Energy-Efficient Homes* would provide a tax credit to builders of energy-efficient homes. (SB 147 is currently in the Senate Finance Committee).
- SB 456 – *Expand Energy Star Sales Tax Holiday* would expand the energy star qualified products that qualify for the sales and use tax holiday to include: battery chargers; dishwashers; room air cleaners; residential water heaters; boilers; ventilating fans; insulation; air sealing products; windows; doors; skylights; cordless phones; external power adapters; compact fluorescent light bulbs; decorative light strings; and residential light fixtures and provide a $6,000 cap on the price per item. (SB 456 is currently in the Senate Finance Committee).
- SB 567 (=HB 1484) – *Promote Electricity Demand Reduction* would promote the use of electricity demand reduction to satisfy renewable energy portfolio standards. (SB 567 is currently in the House Energy and Energy Efficiency Committee).
- SB 688 (=HB 1290) – *NC Low Emissions Vehicle Program* would direct the EMC to adopt a low-emission vehicle program that is the functional equivalent of California's. (SB 688 is currently in the Senate Commerce Committee).
- SB 1024 – *NC 2050 Sustainability Task Force* would establish the North Carolina sustainability 2050 Task force to develop a North Carolina 2050 Sustainability Plan that plans for sustainable growth and development in North Carolina in the future through the year 2050. (SB 1024 is currently in the Senate Committee on Energy, Science, and Technology).
- SB 1044 (=HB 811) – *Moratorium on Coal-Fired Power Plants* would provide economic relief to electric utility ratepayers during this period of economic recession and the coming recovery period by placing a moratorium on the construction of new coal-fired power plants. (SB 1044 is currently in the Senate Committee on Commerce).
- SB 1068 (=HB 809) – *Permitting of Wind Energy Facilities* would create a parallel permitting process for proposed wind energy facilities in North Carolina. Permits for wind energy facilities proposed to be located in one of the twenty coastal or CAMA counties would be reviewed and acted upon by the Coastal Resources Commission. Permits for wind energy facilities proposed to be located outside the twenty CAMA counties would be reviewed and acted upon by DENR. Permit applicants would be required to include a host of information pertaining to the proposed facility including studies on noise impacts and shadow flicker, impacts to viewsheds, and an explanation of how the facility would not result in significant impacts on ecological systems, natural resources, cultural sites, recreation areas, or historic sites of more than local significance,

fish and wildlife, views from any State or national park, wilderness area, significant natural heritage area, or interference with air navigation routes, air traffic control areas, military training routes, or special use airspace. Permit applicants would be required to provide the permitting entity with a plan to decommission and remove the wind energy facility that includes an estimate of the cost to decommission and remove the facility. The plan would also have to include a proposed description of the condition of the site once the facility has been decommissioned and removed. (SB 1068 is currently in the House Energy and Energy Efficiency Committee).

Other Legislative Bodies Looking at Related Issues:

- *Legislative Study Commission on Urban Growth and Infrastructure Issues*[20] - Part 36 of S.L. 2008-181 (Studies Act of 2008) established the Legislative Study Commission on Urban Growth and Infrastructure Issues, the purpose of which is to determine what measures the General Assembly may take to foster regional water resource and transportation planning, incentive based local land use planning, and more responsive and cost effective planning to accommodate rapid population growth in North Carolina's urban areas. The Commission is required to study the following issues:
  - Options for fostering regional planning for water and transportation infrastructure.
  - Strategies (including additional local land use regulatory tools) for encouraging the use of incentive based planning by urban area local governments.
  - Strategies to help urban communities maximize the benefits of growth and cope with the challenges presented by rapid growth in population, school enrollment, vehicle miles traveled on urban roads and highways, and related demands for other public services while preserving a viable economic climate and building greater regional cooperation.
  - Any other matters the Commission considers necessary in furtherance of the purpose for which it is established.

  The Commission has met throughout the 2009-2010 legislative interim and expects to submit an interim report to the 2010 Regular Session of the General Assembly.

- *Legislative Advisory Subcommittee on Offshore Energy Exploration*[21] - The Legislative Advisory Subcommittee on Offshore Energy Exploration has met 11 times since the Subcommittee was authorized by Speaker Hackney and President Pro-Temp Basnight in April 2009. In fulfilling its charge, the Subcommittee has studied the following regarding both traditional hydrocarbon and alternative energy development:
  - The implications of leasing federal waters off the coast of North Carolina
  - The relevant federal law and legal authority of the State with regard to offshore energy exploration
  - The potential impacts on the nation's energy supply, including best estimates for the availability of resources off the coast
  - The potential financial impact on the State's economy

[20] More information on the Legislative Study Commission on Urban Growth and Infrastructure Issues can be found on the Commission's website at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=45.
[21] More information on the Legislative Advisory Subcommittee on Offshore Energy Exploration can be found on the Subcommittee's website at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=53.

- The environmental impacts of exploration and associated infrastructure

The Subcommittee has completed its fact-finding and is currently preparing the final report to submit to the Legislative Research Commission on or before the convening of the 2010 Regular Session of the General Assembly in May.

- Section 9.12 of S.L. 2008-107 (Modify Appropriations Act of 2007) -- *University of North Carolina to Study Coastal Sounds Wind Energy* required the University of North Carolina to study the feasibility of establishing wind turbines in the Pamlico and Albemarle Sounds including an analysis of energy production potential (including the resulting benefits due to a reduction in dependence on fossil fuel combustion for generation of electricity), siting, ecological impacts, and statutory or regulatory barriers to construction and operation of one or more wind turbines and associated support and interconnection facilities in the coastal sounds. Section 9.14(a) of S.L. 2009-451 -- Coastal Demonstration Wind Turbines (2009 Appropriations Act) authorized the continuation of coastal wind study and appropriated $300,000 to the University of North Carolina in order to contract for the design, permitting, procurement, construction, establishment, operation, and reclamation of up to three demonstration turbines and necessary support facilities in the sounds or off the coast of North Carolina.
- 2008 Studies Act (S.L. 2008-181):
  - Section 6.2 authorized the Environmental Review Commission, in consultation with DAQ, to study the costs and benefits of the adoption of the California Motor Vehicle Emissions Standards in the State.[22]
  - Section 6.2 authorized the Environmental Review Commission to study methods for implementing a State-level permitting system and siting requirements for commercial scale wind energy systems that will ensure that wind energy systems are sited in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources.
- 2009 Studies Act (S.L. 2009-574):
  - Section 6.6 authorized the Environmental Review Commission to study the feasibility and desirability of State government expanding its use of alternative sources of energy for fueling vehicles that are owned or leased by the State as well as for providing energy to power heating, ventilating, and air conditioning (HVAC) systems in buildings owned or leased by the State and to power other systems, motors, and appliances that are owned or leased by the State.
  - Section 6.7 authorized the Environmental Review Commission to study how North Carolina can grow and develop sustainably in the future through the year 2050. The Commission may consider what it means for the State's growth and development to be sustainable, focusing on the following areas: economic development, including transportation and water and sewer infrastructure; the State's natural resources, including its land, water, air, local food supply, and energy supplies; and quality of life issues, including health and education.
  - Section 6.8 authorized the Environmental Review Commission to study the possibility of establishing a Green School Construction Loan Fund to provide no interest loans to local school administrative units for green construction, with

[22] (The results of this study were presented to the Commission at its January 13, 2009 meeting. See the discussion on p. 68-69 of this report).

priority given to projects that will have the greatest impact on reducing the use of energy and water.

- Section 6.15 authorized the Environmental Review Commission to study the possibility of requiring new and renovated commercial buildings and new residential buildings to comply with energy conservation standards.
- Section 7.5 authorized the Revenue Laws Study Committee and the Environmental Review Commission to study renewable energy tax credits and incentives for energy conservation.
- Section 8.3 authorized the Joint Legislative Utility Review Committee and the Energy Policy Council to jointly study the feasibility and suitability of establishing feed in rates to be paid to renewable energy electricity producers by electric power suppliers for each kilowatt hour of electricity produced.
- Section 8.6 authorized the Joint Legislative Utility Review Committee to study the creation of NC SAVE$ ENERGY as an independent energy efficiency administrator for the State to administer energy efficiency and energy conservation programs and programs to promote the sustainable use of energy.
- Section 8.7 authorized the Joint Legislative Utility Review Committee to study the possibility of extending the standards governing energy efficiency and water use for major facility construction and renovation projects involving State, university, and community college buildings to major facility construction and renovation projects involving buildings of entities that receive State funding.

Climate change-related proceedings before the Utilities Commission:

The Utilities Commission has acted on a number of other items that should be considered in discussing actions taken by the State related to climate change, including the following:[23]

- Docket No. E-100 Sub 126 – Integrated Resource Planning (IRP) -Smart Grid Technology Plans.
- Docket No. E-100 Sub 125 -- 2009 REPS Compliance Plans.
- Docket No. E-100 Sub 124 -- Investigation of Integrated Resource Planning in NC 2009.
- Docket No. E-100 Sub 123 -- Standards for Electric Utilities Relating to IRP, Rate Design Modifications to Promote Energy Efficiency Investments, Smart Grid Investments & Smart Grid Information Per Independence/Security Act 2007.
- Docket No. E-100 Sub 121 -- Implementing a Tracking System for Renewable Energy Certificates Pursuant to Session Law 2007-397.
- Docket No. E-100 Sub 120 -- Motion to Establish an Independently Administered Energy Efficiency Program in North Carolina to be Known as NC SAVE$ ENERGY.
- Docket No. E-100 Sub 119 -- 2008 REPS Compliance Plans.
- Docket No. E-100 Sub 118 -- Investigation of Integrated Resource Planning in NC 2008.
- Docket No. E-100 Sub 116 -- Investigation of Rate Structures, Policies, and Measures that Promote a Mix of Generation and Demand Reduction for Electric Power Suppliers in North Carolina.

[23] Information on these dockets can be found on the Utilities Commission website at: http://www.ncuc.commerce.state.nc.us.

- Docket No. E-100 Sub 115A -- Joint Reports to the Environmental Review Commission & the Joint Legislative Utility Review Committee on the Implementation of the Swine Farm Methane Capture Pilot Program.
- Docket No. E-100 Sub 114 -- Investigation of Integrated Resource Planning in North Carolina – 2007.
- Docket No. E-100 Sub 101 -- Joint Petition for Approval of "Model" Small Generation Interconnection Standards & Associated Application to Interconnect & Interconnection Contract Forms.
- Docket No. E-100 Sub 90 -- Investigation of Voluntary Green and Public Benefit Fund Check-Off Programs.
- Docket No. E-100 Sub 83 -- Investigation of Proposed Net Metering Rule.

In addition to these dockets, the investor-owned utilities in the State have filed a number of applications for approval of DSM/EE riders pursuant to S.L. 2007-397 and their IRP filings.

January 13, 2010:
Edward S. Finley, Jr., Chairman of the North Carolina Utilities Commission, in his report on the implementation of SB 3, also discussed a number of other issues related to renewable energy and climate change. Commissioner Finley pointed out that while G.S. 62-133.8(i)(7) requires the Utilities Commission to develop procedures to track and account for renewable energy credits (RECs), G.S. 62-133.8(k), added by S.L. 2009-475 (SB 960), requires the Utilities Commission to, no later than July 1, 2010, develop, implement, and maintain an Internet web site for the online tracking of RECs in order to verify REPS compliance and to facilitate the establishment of a market for the purchase and sale of RECs. S.L. 2009-475 further requires the Energy Policy Council and the Utilities Commission to jointly study and design an online REC trading exchange to facilitate the establishment of a market for purchase and sale of RECs. The Energy Policy Council and the Utilities Commission are required to report their findings and recommendations to the General Assembly by April 1, 2010.

Commissioner Finley also provided an update on the status of the interconnection and net-metering standards adopted by the Utilities Commission.

- *Interconnection:* The Utilities Commission issued orders on June 9, 2008 and December 16, 2008, under Docket No. E-100 Sub 101 approving a revised interconnection standard modeled on the federal small generator interconnection standard and addressing numerous issues, including fees, insurance, liability, and contracts. The new standard is applicable to any size generator and incorporates streamlined procedures for smaller generators. In addition, the Utilities Commission approved a "Fast Track Process" for interconnecting certified (equipment meets national IEEE/UL standards) generators no larger than two MW and a "10 kW Inverter Process" for interconnecting certified inverter-based generators no larger than 10 kW. A utility may require the installation of an external disconnect switch for certified inverter-based generators no larger than 10 kW, but only at the utility's expense.
- *Net Metering:* "Net metering" generally refers to a billing arrangement whereby a customer that owns and operates an electric generating facility is billed according to the difference over a billing period between the amount of energy a customer consumes and the amount of energy it generates. In March 2009, the Utilities Commission issued an

order under Docket No. E-100 Sub 83 making significant amendments to the net metering policy in the State. The current net metering policy is available to any customer that owns and operates a renewable energy facility (solar, wind, hydro, biomass, etc.) that generates electricity with a capacity of up to one MW. Customers may elect to take retail electric service pursuant to any rate schedule available to other customers in the same rate class, and customers may not be assessed any standby, capacity, metering, or other fees other than those approved for all customers on the same rate schedule. In addition, the Utilities Commission rules waive standby charges for any residential customer with electric generating capacity up to 20 kW and for non-residential customers up to 100 kW.

Commissioner Finley's presentation is available at the following link: Edward S. Finley, Jr., Chairman, North Carolina Utilities Commission.

Cliffside Debate:

In May 2005, Duke Energy submitted an application to the North Carolina Utilities Commission seeking a certificate of public convenience and necessity to construct two new 800 MW coal-fired generating units at its Cliffside Steam Generating facility in Rutherford County. On March 21, 2007, the Utilities Commission issued an order under Docket No. E-7 Sub 790 granting a certificate of public convenience and necessity to Duke Energy allowing the construction of one 800 MW unit, subject to certain conditions. These conditions included the following:

1. Duke must retire the existing Cliffside Units 1 through 4 (approximately 200 MW) no later than commercial operation of the new 800 MW unit.
2. Duke shall commit to invest, on an annual basis, 1% of its annual retail revenues in energy efficiency and demand-side management (DSM) programs, and shall also retire other coal-fired generating units on a MW-for-MW basis to account for actual load reduction realized from the new energy efficiency and DSM programs, subject to certain constraints.

In addition to the Utility Commission's actions on Cliffside, the activities of DAQ with regard to the issuance of an air quality permit for the Cliffside facility are worth noting. Although carbon emissions are not yet regulated and the law does not require such a plan, the permit, issued in 2008, requires implementation of a CO2 mitigation plan that will require Duke Energy Carolinas to make the newly installed capacity at the Cliffside facility carbon neutral by 2018. The elements of this plan include:

1. The previously mentioned shutdown of Cliffside Units 1 through 4.
2. Construction of Unit 6 in a manner that will accommodate the installation and operation of future carbon control technologies.
3. The additional shutdown of several of Duke's older coal-fired generating plants throughout the State with a total capacity equal to the capacity of Cliffside Unit 6 (800 MW) by 2018.

Once completed, the retirement of these units and Cliffside units 1 through 4 is projected to offset CO2 emissions from Unit 6 by approximately 4.6 million tons per year. An added benefit of closure of the additional 800 MW of older, less efficient coal-fired plants will be substantial additional reductions in pollutants in other locations in North Carolina by 2018.

Activities by the Department of Environment and Natural Resources (DENR)

DENR Climate Change Initiative:

On January 13, 2010, *David W. Knight, Assistant Secretary for Natural Resources, DENR,* reported on climate initiatives within DENR and provided an update on the activities of the Interagency Leadership Team with regard to climate change.

DENR has prioritized climate change as a key component in the Department's 2009 to 2013 Strategic Plan. The DENR Climate Change Initiative will respond to climate change using both mitigation and adaptation strategies to reduce vulnerability, increase adaptive capacity, and improve resiliency of climate-sensitive resources. Many mitigation recommendations from the CAPAG process are included, in addition to development of adaptation strategies to effectively address potential impacts to the State's natural and built environment.

DENR has established a Climate Change Steering Committee to provide oversight for implementation of DENR's Climate Change Initiative. This team is developing a focused approach to address climate change policy actions at State, regional, and federal levels, while coordinating strategies with other state, federal, and nongovernmental partners.

DENR's Climate Change Steering Committee has organized interagency working groups to focus on the following cross-cutting objectives: 1) Carbon Mitigation will address energy and carbon reduction activities, as well as issues related to green energy development; 2) Sea-level Rise Adaptation on oceanfront and estuarine shorelines; 3) Land Management will address climate-related issues in the interface between natural and built environments.

Discussion is underway about the need for North Carolina to develop a comprehensive State Climate Action Plan that addresses emission reduction and adaptation strategies. DENR is expected to be the lead agency on this effort, and will work closely with other departments to develop the plan.

Mr. Knight's presentation is available at the following link: David W. Knight, Assistant Secretary for Natural Resources, DENR.

North Carolina Interagency Leadership Team:

The North Carolina Interagency Leadership Team (ILT) was established in 2004 when five State agencies and five federal agencies committed to using a collaborative and interdisciplinary approach to developing a transportation system that involves all stakeholders and preserves the historic and natural resources, community values, and economic vitality of the State. The ILT has been working on climate change for several years, researching the science and projected impacts for North Carolina, and discussing how to plan for those impacts.

The "Planning for North Carolina's Future: Ask the Climate Question" Workshop on Climate Change Adaptation, which was held on March 2–3, 2010 in Raleigh, North Carolina, was the result of those efforts and was intended to be the foundation for a planning effort for the State's climate change adaptation future. The workshop examined how North Carolina can reduce its risk while enhancing its resilience to climate changes that are already occurring and that are projected to increase in the future.

Approximately 440 staff from federal, state, and local government agencies, as well as representatives from universities and non-governmental organizations attended the workshop. A summary report, along with videos of the presentations, is archived at www.climatechange.nc.gov.

On March 15, 2010, *David W. Knight, Assistant Secretary for Natural Resources at DENR,* provided a summary of the March 2010 Climate Change Adaptation Workshop sponsored by the North Carolina Interagency Leadership Team and next steps.

Mr. Knight's presentation is available at the following link: David W. Knight, Assistant Secretary for Natural Resources, DENR.

Environmental Management Commission

The Environmental Management Commission (EMC) has considered several issues related to climate change and reductions of greenhouse gas emissions over the past four years, including the following:

Establishment of the Renewable Energy Committee: Section 2(c) of (S.L. 2007-397) authorized the EMC to:

- Establish a procedure for evaluating renewable energy technologies that are, or are proposed to be, employed as part of a renewable energy facility;
- Establish standards to ensure that renewable energy technologies do not harm the environment, natural resources, cultural resources, or public health, safety, or welfare of the State; and
- To the extent that there is not an environmental regulatory program, establish an environmental regulatory program to implement these protective standards.

In response to this legislation, the EMC established a Renewable Energy Committee and launched a scoping process to evaluate whether North Carolina has in place the proper regulatory framework to guide the development of renewable energy facilities. Over the past three years, the Renewable Energy Committee made the following reports to the EMC:

- In March 2009, the EMC approved the Renewable Energy Committee's report entitled "Developing a Wind Energy Permitting Program for North Carolina."[24] The report included a legislative recommendation that the General Assembly establish a clear statement of policy that supports development of wind energy resources in a responsible

[24] Environmental Management Commission, "Developing a Wind Energy Permitting Program for North Carolina" March 2009. Online at: http://h2o.enr.state.nc.us/admin/emc/documents/AG09-19WindEnergyFinal.pdf.

manner. The proposed language in the EMC report formed the basis for the original versions of SB 1068 and HB 809 (Permitting of Wind Energy Facilities).

- In March 2010, the EMC approved the Renewable Energy Committee's report entitled "Report and Recommendations Concerning Forest Resource Impacts of the Woody Biomass Industry in North Carolina."[25] The report stated that North Carolina's woody biomass feedstocks are a valuable renewable resource and are critical to meeting the renewable energy goals in SB 3. Further, the report stated that North Carolina "has an opportunity to ensure that emerging biomass markets protect and enhance natural resources, provide increased revenue for landowners, and provide jobs in rural communities." To capitalize on the opportunity, however, the report indicated that the State needs to provide clear and definitive policies that will allow the market to function without undue environmental impacts. The report included a number of specific recommendations.

Anti-Idling rules: On July 9, 2009, the EMC adopted a rule[26] to reduce unnecessary idling from on-road heavy-duty vehicles. The rules were intended to: comply with federal air quality standards; help reduce localized risks associated with fine particles (PM2.5) and toxics from idling vehicles; and reduce greenhouse gas emissions. The rule limits idling of on-road heavy-duty vehicles to five consecutive minutes in any 60-minute period, but provides exceptions for a number of health, safety, and commerce categories. DAQ estimated that the rule would save up to 9 million gallons of fuel per year and reduce NOx emissions by to 1,300 tons per year. The primary alternative to idling the main engine is installing an Auxiliary Power Unit (APU) and, assuming a $10,000 investment in an APU, DAQ estimated the payback period to be 1.1 years when based upon diesel costs of $2 per gallon and 0.7 years when based upon diesel costs of $3 per gallon. The rule was unanimously approved by the EMC, but received 18 letters of objection and is currently awaiting legislative review pursuant to G.S. 150B-21.3(b1).

Annual Emissions Reporting of Greenhouse Gases: At its November 19, 2009 meeting, the EMC chose not to take action to add mandatory reporting of greenhouse gases by Title V facilities to the Annual Emissions Reporting Rule (15A NCAC 02Q .0207). The proceedings from this meeting are posted at http://h2o.enr.state.nc.us/admin/emc/EMCAgenda2009.htm. DAQ continues to encourage voluntary reporting of greenhouse gas emissions to the Air Emissions Reporting On-line System (AERO). The AERO tool accepts greenhouse gas data, which can be put into the system at the same time as the criteria air pollutants and hazardous air pollutants. DAQ pointed out that there are many benefits of to voluntarily reporting greenhouse gases, including the following:

- Provision of technical assistance on emission calculations.

[25] Environmental Management Commission, Report and Recommendations Concerning Forest Resource Impacts of the Woody Biomass Industry in North Carolina. March 2010. The draft report of this study was distributed to the members of the LCGCC on March 15, 2010, and is available on the Commission website at the following link: EMC Biomass Draft Report. The final report is available online at the following link: EMC Biomass Final Report.

[26] 15A NCAC 02D .1010 Heavy-Duty Vehicle Idling Restrictions. The text of the rule is available online at: http://www.ncair.org/rules/idle/idle_rule_adopted_July9.pdf.

- Advance preparation for EPA's Mandatory Reporting Rule[27] and other federal programs regarding greenhouse gases under development.
- The opportunity to demonstrate good corporate citizenship.
- A more complete picture of one's air emissions.

The EMC also discussed the impacts of the proposed EPA Final Greenhouse Gas Emissions Reporting Rule and its impact on North Carolina facilities in a presentation[28] given to the EMC at its November 2009 meeting.

Energy Policy Council[29]

The Energy Policy Council was first established by the General Assembly in 1975, prompted by the energy crisis the country was experiencing during that time. The Council is charged with overseeing the State's energy policies, including the State Energy Plan and the State Energy Emergency Plan, and providing recommendations for changes in energy policy to the Governor and the General Assembly.

In 2009, the General Assembly reorganized the Energy Policy Council and the State Energy Office, moving the agency from the Department of Administration to the Department of Commerce and making additional changes to the Council's membership and authority (S.L. 2009-446). The Council's membership includes two Senators appointed by the President Pro Tempore of the Senate, two members of the House of Representatives appointed by the Speaker of the House, and 12 public members appointed by the Governor from specific sectors of the State's energy economy, as required by statute.

On January 13, 2010, the Commission received a report from *Tim Toben, Chair of the Energy Policy Council,* on the activities and objectives of the Council. The Council is proceeding on the assumption that there will be carbon constraints in developing its revised and updated State Energy Plan. The Council is developing a workplan to recommend affordable low-carbon energy legislation to be considered by the General Assembly. Mr. Toben noted that private businesses are building these constraints into their future plans, much ahead of what government might be doing. Mr. Toben believes that energy efficiency will be a vital part of all future energy policies.

Mr. Toben's presentation is available at the following link: Tim Toben, Chair, North Carolina Energy Policy Council.

[27] Some North Carolina facilities will be required to report their greenhouse gas emissions directly to EPA due to the Final Mandatory Reporting of Greenhouse Gases Rule that was published on October 30, 2009. See http://www.epa.gov/climatechange/emissions/ghgrulemaking.html. More information about the impacts of the EPA Final Greenhouse Gas Emissions Reporting Rule can be found at

[28] http://daq.state.nc.us/monitor/eminv/gcc/EPA%20Final%20Reporting%20Rule%20and%20Impact%20on%20NC.pdf.

[29] Additional information on the Energy Policy Council and its activities is available on the Council's website at: http://www.energync.net/epc.html.

Building Code Council

The North Carolina State Building Code Council adopts and amends the State Building Code, as authorized by G.S. 143-138. The Commissioner of Insurance has general supervision over the administration and enforcement of the State Building Code, and the Engineering Division of the Office of the State Fire Marshall of the Department of Insurance staff and assist the Building Code Council in its work. The Council meets quarterly to consider proposed amendments to the Building Code and to conduct public hearings on proposals. Proposed changes to the Building Code are considered a rule under the State Administrative Procedures Act (Chapter 150B of the General Statutes) and must proceed through the rule-making process, including possible legislative review of proposed changes to the Code.

Effective July 1, 2006, the base document for the 2006 North Carolina Energy Conservation Code is the 2003 International Energy Conservation Code (IECC). On March 11, 2008, the 2009 North Carolina Energy Conservation Code was adopted. Based on the 2006 IECC (and referencing ASHRAE 90.1-2004 for commercial buildings), the Building Code includes strengthening amendments to the base code, requiring fenestration U-factor and SHGC values of 0.40 across the State. Builders were allowed to use the previous Building Code until June 30, 2009.

The Council is currently in the process of updating the Code, with an anticipated effective date of January 1, 2012. While the 2009 IECC will be used as the base code, the State was awarded a $500,000 federal grant to improve its next Code's stringency by 30% and improve compliance through comprehensive training and enforcement.

April 7, 2010:
Billy Hinton, North Carolina Building Code Consultant with the Evaluation Services Section of the Engineering Division of the Department of Insurance, presented on recent updates to the North Carolina Building Code that were adopted at the March meeting of the Building Code Council and also provided an overview of the U.S. Department of Energy special project award received for improving the North Carolina Energy Conservation Code. Mr. Hinton provided a list of improvements in the proposed 2012 Code as compared to the 2006 IECC.

Mr. Hinton's presentation is available at the following link:
Billy Hinton, North Carolina Building Code Consultant, Evaluation Services Section, Engineering Division, Department of Insurance.

Aranzazu Lascurain, Research Assistant with Representative Pricey Harrison, also provided an update on the opportunities and prospects for improving the energy efficiency of the North Carolina Building Code. Ms. Lascurain stated that buildings account for roughly 40% of the total energy use in the United States and 70% of electricity use. Further, energy efficiency through the adoption and enforcement of strong building energy codes is the quickest, cheapest, and cleanest way to reduce energy consumption and carbon emissions. Ms. Lascurain referred to a recent analysis by the Building Code Assistance Project that made the following findings:[30]

[30] Building Code Assistance Project: North Carolina State Fact Sheet. November 2009. Online at: http://bcap-ocean.org/sites/default/files/North_Carolina_Fact_Sheet.pdf.

- Based on an analysis conducted by the U.S. Department of Energy, changes from the State's current Building Code to the 2009 IECC would result in estimated energy savings of 13 to 16%, or $209 to $234 a year for an average new house at current fuel prices.
- If North Carolina began implementing the 2009 IECC and ASHRAE Standard 90.1-2007 statewide in 2011, businesses and homeowners would save an estimated $221 million annually by 2020 and an estimated $443 million annually by 2030 in energy costs (based upon 2006 energy prices). Additionally, adopting and implementing the 2009 IECC statewide would help avoid roughly 4.2 million metric tons of CO2 emissions by 2030.

Ms. Lascurain's presentation is available online at the following link: *Aranzazu Lascurain, Research Assistant with Representative Pricey Harrison.*

The University of North Carolina System

The UNC Board of Governors adopted a policy in October 2009 that The University off North Carolina shall develop a plan to become carbon neutral as soon as practicable and by 2050 at the latest, with an ultimate goal of climate neutrality. The same policy provides that The University shall develop and implement a comprehensive, multimodal transportation plan designed to reduce carbon emissions and dependency on single-occupant vehicles.

The University of North Carolina at Chapel Hill

In 2007, UNC-CH became a charter signatory of the American College and University Presidents' Climate Commitment, pledging the University to climate neutrality by midcentury.

- An Energy Efficient Lighting Policy was implemented and incandescent bulbs were phased out on campus by January 2008.
- In 2008, the University completed its first comprehensive greenhouse gas emissions inventory. In 2008, the University was responsible for emitting 569,195 metric tons of carbon dioxide—the equivalent of burning 3,263 railcars of coal at a traditional power plant. The largest sources were the University's onsite heat and power plant (more than 60%) and purchased electricity (more than 35%).
- Overall greenhouse gas emissions have increased 37% and emissions per full time equivalent student increased by 19%, during rapid campus expansion since 2000.
- UNC-Chapel Hill has reduced its energy use per square foot of building area by 8% since 2003. On a per square foot basis, carbon emissions have dropped 12%.

In order to achieve climate neutrality by 2050, UNC-Chapel Hill evaluated the most cost-effective options to reduce emissions. The first campus Climate Action Plan, completed in fall 2009, outlines the most promising opportunities over the short-, medium-, and long-term. An interim goal is to reduce greenhouse gas emissions to year 2000 levels by 2020. Seventeen strategies have been identified to halve emissions at low or moderate cost. They include efficiency improvements in new and existing buildings, the introduction of heat recovery chillers, and behavioral changes.

In 2010 Chancellor Thorp appointed an Energy Task Force to identify and evaluate opportunities for reducing carbon emissions more rapidly.

UNC-CH has received a grant of $17.5 million for a Solar Energy Research Center and is collaborating with NCSU, Research Triangle Institute, and other institutions in the Research Triangle Energy Consortium (RTEC) to develop the potential of North Carolina to become a National Solar Energy research and innovation hub.

Other climate-change related activities taking place in the State

Progress Energy's plans to retire coal-fired generating units in North Carolina:

On January 13, 2010, *Caroline Choi, Director of Energy Policy and Strategy for Progress Energy*, reported on Progress Energy's plans to retire eleven coal-fired electric generating units in North Carolina by 2017. These eleven units emitted approximately 28.3 million tons of CO2 and 62,000 tons of sulfur dioxide in 2009. The commitment represents about 30% of the company's coal-fired power generation fleet in North Carolina and will result in significant emission reductions, including carbon dioxide, sulfur dioxide, nitrogen oxides, mercury, and other pollutants.

Ms. Choi's presentation is available online at the following link: Caroline Choi, Director - Energy Policy & Strategy, Progress Energy.

ACTIONS TAKEN BY OTHER STATES, BY THE FEDERAL GOVERNMENT, AND BY INTERNATIONAL BODIES

S.L. 2005-442 (5)(1)(b) directed the Commission to conduct a "review of actions taken by the federal government and by other states to address global warming." The Commission evaluated these activities as follows:

Actions taken by state and local governments

February 3, 2006:
Ms Judith Greenwald, Director of Innovative Solutions, Pew Center on Global Climate Change, presented a report on actions taken by other states and local governmental units in the United States to address global climate change. Specifically, she discussed actions being taken in New York, California, Pennsylvania, and in the southwest. Ms Greenwald said that most states are involved in some sort of regional initiative on either climate change or clean energy: 28 states have climate action plans; a number of states have greenhouse gas reporting programs; 22 states and the District of Columbia have renewable portfolio standards; 27 states have incentives and mandates for promoting ethanol; a number of states have worked together to track renewable energy credits across state lines; and 10 states have formally adopted the California greenhouse gas emissions standards for motor vehicles. Ms Greenwald also asserted that North Carolina state emissions were significant and noted that electricity and transportation sectors are the biggest emitters.

Ms. Greenwald's presentation is available online at the following link: Judith M. Greenwald, Director of Innovative Solutions, Pew Center on Global Climate Change.

November 27, 2006:
Franz Litz, the Climate Change Policy Coordinator in the New York State Department of Environmental Conservation, presented on the development of the Regional Greenhouse Gas Initiative (RGGI) in the Northeast. Mr. Litz emphasized the use of research and regionally relevant studies in order to better understand how climate change will affect each state and its constituents specifically. RGGI is the first mandatory cap-and-trade program for carbon dioxide and power plants. In a cap-and-trade program, the total emissions from a defined source are determined and a cap on emissions is established. Permits are issued per ton up to the limit of the cap, and each source of the pollutant has an emissions and allowance account. The source can reduce its emissions through actual emissions reductions or by buying permits to cover the emissions, whichever option costs less.

Mr. Litz stated that RGGI's target for the emissions reductions in the first five years is to cap emissions at current levels and then to reduce emissions by 10% over the next four years. This program also incorporates offsets, where emissions sources are allowed to purchase certified reductions outside of the covered sectors. The credits from these purchases can be used

interchangeably with the allowances or permits. The five initial types of offsets permitted in RGGI include: natural gas, propane or heating oil efficiency; converting land to forest and proving a reduction; capturing gas from landfills and using it in combustion; methane capture from animal operations, an offset to benefit the electricity sector. New offsets are allowed in the program in order reduce the price pressure of the program. The offset program encourages regional and often in-state investment. As a region, the Northeast offers great potential to make reversing climate change a real goal and to make meaningful strides, more so then if it was a single state initiative. RGGI is continually trying to work with other states and other markets, such as California, as they have found that linking states together leads to a more cost effective program.

Mr. Litz's presentation is available online at the following link: Franz T. Litz, Climate Change Policy Coordinator, New York State Department of Environmental Conservation.

October 3, 2006

Joshua Bushinsky, State Solutions Fellow at the Pew Center on Global Climate Change, presented a report on actions taken or under consideration by other states to address global climate change. He summarized the variety of reasons for which states are taking action on climate change, including concerns about changes in weather patterns causing droughts, intense and frequent storms, and negative impacts on economic development. States are also pursuing the positive effects on economic development that can be achieved by getting ahead of the regulatory curve. There are currently twelve states with targets for reducing greenhouse gas emissions. Those include the states participating in RGGI, as well as California and Arizona. Twenty-two states as well as the District of Colombia have renewable portfolio standards, and ten states over the past six months have adopted either standards or incentives for renewable fuels. States set targets for reduction according to what is achievable, using strategies that have been adopted elsewhere, using current and available technologies, and remaining in line with what scientists believe is necessary to avoid dangerous climactic change.

Mr. Bushinsky provided a summary document that listed the emissions targets contained in various state climate action plans. The document also provided a summary of federal legislation related to climate change and significant international activities related to climate change. The document is available online at the following link: Emission Targets.

Mr. Bushinsky's presentation is available online at the following link: Joshua Bushinsky, State Solutions Fellow at the Pew Center on Global Climate Change.

October 23, 2007:

Patrick Hogan, Solutions Fellow at the Pew Center on Global Climate Change, provided a report on actions taken by other governmental units in the nation related to global climate change during the past year. Mr. Hogan indicated that the outlook for significant international action is unlikely to take place before 2009. At the G8 Summit in June 2007, world leaders called for the establishment in 2009 of a global agreement under the U.N. Framework Convention on Climate Change to address the period of time following the expiration of the Kyoto Protocol in 2012.

The discussions for the next international agreement will take place in Bali in December 2007, with more than 150 countries participating.

Mr. Hogan described the recent meeting in the U.S. of the major economies, during which the issue of voluntary action versus binding commitments was discussed. Most countries feel that at this point voluntary actions are not sufficient. That being said, there is a growing sense among large businesses and industry that climate action by the U.S. is inevitable and possibly desirable.

Mr. Hogan's presentation is available online at the following link: Patrick Hogan, Solutions Fellow, Pew Center on Global Climate Change.

January 16, 2008:

George S. "Tad" Aburn Jr., Director of the Air and Radiation Management Administration in the Maryland Department of the Environment, presented on emissions reduction goals and standards adopted by the state of Maryland. These actions included the following:

- In 2007, Governor O'Malley issued an executive order establishing the Maryland Climate Change Commission, which consists of 15 cabinet secretaries and 5 representatives from the Maryland General Assembly. The Commission was charged with addressing Maryland's climate challenge on all fronts, with three primary areas of concern: mitigation, adaptation, and the improvement of science on the impacts in Maryland. The Commission is expected to issue a final action plan in 2008.
- In 2006, the Maryland General Assembly passed The Healthy Air Act, which was developed with the purpose of bringing Maryland into attainment with the National Ambient Air Quality Standards (NAAQS) for ozone and fine particulate matter by the federal deadline of 2010. The act and the subsequent regulations require significant reductions in emissions of nitrogen oxides (NOx), sulfur dioxide (SO2) and mercury from coal-fired electric generating units and significantly reduces atmospheric deposition of nitrogen to the Chesapeake Bay and other waters of the state. The Healthy Air Act also requires that Maryland become involved in RGGI in order to reduce the state's greenhouse gas emissions.
- In 2007, the Maryland General Assembly enacted the Maryland Clean Cars Program, which adopts California's stricter vehicle emission standards. These standards will become effective in Maryland for model year 2011 vehicles, significantly reducing a number of emissions including volatile organic compounds (VOCs) and NOx. The Clean Cars Program represents the only program that directly regulates CO2 emissions from transportation sources. Transportation is the fastest-growing source of CO2 in the U.S. and CO2 is the most prevalent greenhouse gas in Maryland, where approximately one third of CO2 emissions are emitted from cars.
- In 2007, Governor O'Malley announced the EmPOWER Maryland initiative, which aims to reduce state government energy consumption by 15% by 2015. The initiative is composed of the following seven steps:
    - Improve building operations to maximize energy efficiency.
    - Expand the use of energy performance contracting.
    - Increase the funding to the State Agency Loan program by 50%.

- Require all new state buildings over 20,000 square feet to be more energy efficient.
- Purchase ENERGY STAR® products where available, as well as environmentally friendly cleaning and maintenance products.
- Expand the Community Energy Loan Program by 33%.
- Ensure accountability by requiring additional reporting, tracking, planning, and monitoring activities by state agencies.

Mr. Aburn's presentation is available online at the following link: George S. "Tad" Aburn Jr., Director, Air and Radiation Management Administration, Maryland Department of the Environment.

Mr. Kenneth A. Colburn, Senior Consultant, Center for Climate Strategies, and Mr. Bill Dougherty, Senior Scientist, Center for Climate Strategies, presented on Maryland's efforts to adapt to the effects of climate change. The IPCC defines adaptation to climate change as: "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." In developing its adaptation plan, Maryland evaluated the following questions:

- What are the areas of concern?
- Who/what is affected?
- How far into the future do we look?
- What is the purpose of the process?
- What kinds of outputs are needed?
- What resources are available?

Mr. Colburn and Mr. Dougherty discussed how the approach Maryland is taking could also be applied to North Carolina, taking into account the unique differences between the states.

Mr. Colburn and Mr. Dougherty's presentation is available online at the following link: Kenneth A. Colburn, Senior Consultant, Center for Climate Strategies, Bill Dougherty, Senior Scientist, Center for Climate Strategies.

January 13, 2009:

Robert B. McKinstry, Senior Advisor, Center for Climate Strategies, presented on the efforts to integrate state and regional programs into the emerging federal system for greenhouse gas regulation. Mr. McKinstry stated that it appears much more likely now that the federal government will take action to regulate greenhouse gas emissions, based on the following recent developments:

- The election of President Obama in 2008.
- The Supreme Court's ruling *Massachusetts v. EPA*, which granted standing to states to sue EPA to regulate greenhouse gas emissions as a pollutant under the Clean Air Act, based on the impact of greenhouse gas emissions to the states, as well as the unique status of states in their capacity as quasi-sovereigns.

- In 2008, in response to *Massachusetts v. EPA*, EPA issued an Advance Notice of Proposed Rule Making under the Clean Air Act, which would result in an endangerment finding for six greenhouse gases and may mean economy-wide regulation.

Mr. McKinstry stated that what remains unclear is the role of the states in the likely event of federal action. He described the wide range of actions states have already taken in response to climate change, including the following:

- State emissions inventories and forecasts for greenhouse gas emissions.
- State climate action plans - 31 major initiatives since 2000.
- Statewide and regional greenhouse gas targets and timetables, calling for 50 to 85% reductions by 2040 to 2100.
- A wide range of energy and climate policies and mechanisms, including financing mechanisms, cap-and-trade, and technology-based standards.
- Motor vehicle automobile emissions standards (based on CA standards).
- Development of reporting systems or registries.

Mr. McKinstry highlighted the efforts in North Carolina, including the CAPAG process, and described the potential for North Carolina to participate in a regional approach like the RGGI initiative. Mr. McKinstry pointed out that Florida has already moved forward with participating in RGGI in an observer status. This type of model indicates the potential for other southeastern states to join together in a regional effort.

Mr. McKinstry pointed out some of the problems with a top-down, federal cap-and-trade program, and that there is an important role for states to play. Allowing flexibility at the state level can create improved economic efficiency, greater economic development potential, improved stakeholder acceptability, preserve existing progress that has been made at the state level, and may avoid some of the influence by lobbyists and trade associations that would occur at the federal level.

Mr. McKinstry's presentation is available online at the following link: Robert B. McKinstry, Senior Advisor, Center for Climate Strategies.

Janice L. Godfrey, Environmental Engineer with the Division of Air Quality of DENR, presented on the differences between the greenhouse gas emissions reductions in the California Air Resources Board (CARB) motor vehicle emissions standards and federal Corporate Average Fuel Economy (CAFE) Standards. Ms. Godfrey pointed out that the DAQ analysis assumes the federal standard will be set at 35 miles per gallon by 2020, with a phase-in schedule beginning in 2011, and that CARB's Pavley 1 requirements take effect in 2011 and more stringent Pavley 2 requirements would be phased in starting in 2017. Based on these assumptions, DAQ concluded that the CARB standards would be considerably more effective at reducing greenhouse gases than the new CAFE standards. One key distinction between the CARB standards and the federal standards is that the CARB standards have an explicit greenhouse gas emissions reduction component, while the federal standards are targeted at reducing fuel consumption. Currently, one limiting factor is that EPA denied California's waiver to invoke their own standards. If the

waiver is granted, the CARB standards would reduce greenhouse gas emissions 11.3 million metric tons more than the federal CAFE standard for the period between 2009 and 2020.

Ms. Godfrey's presentation is available online at the following link: Janice L. Godfrey, Environmental Engineer, Division of Air Quality, DENR.

November 17, 2009:
Thomas Peterson, President, Center for Climate Strategies, reported on recent actions taken by the federal government and by state and local governments to address climate change. With regard to federal actions, Mr. Peterson discussed the Energy Security and Independence Act, which included new lighting and fuel standards; new appliance and lighting standards promulgated by the EPA; new CAFE and tailpipe standards; Economic Recovery Act spending on energy efficiency, renewable energy, and improving building codes; and the EPA's proposed greenhouse gas Mandatory Reporting Rule.

With regard to state actions, Mr. Peterson stated that at least 32 states have developed or are implementing mitigation plans and a number of states are developing adaptation plans. At least 29 states have adopted a renewable energy performance standard (REPS), 22 have adopted state efficiency standards, and many states have adopted newer, more stringent building codes. Many states, including California, Connecticut, Hawaii, Massachusetts, Maryland, and New Jersey, have adopted binding state targets for greenhouse gas emissions reductions. Mr. Peterson also described California SB 375, which would require the development of plans and targets to reduce vehicle miles traveled (VMT) in the state.

Mr. Peterson's presentation is available online at the following link: Thomas Peterson, President, Center for Climate Strategies.

National actions

December 4, 2007:
Timothy Profeta, Director of the Nicholas Institute for Environmental Policy Solutions at Duke University, provided an update on federal activities related to global climate change. Mr. Profeta began his presentation by emphasizing the importance of the Commission keeping up to date with what the federal government may or may not do with climate change to make sure that North Carolina is well positioned to take advantage of any opportunities that result from federal action. Mr. Profeta told the commission that the Lieberman-Warner Climate Change Bill, a proposal to cap greenhouse gases, has passed out of subcommittee and is being considered tomorrow in the Senate Environment Public Works Committee. In his opinion, the bill will not be enacted this year, but it will be in its final form. The bill is a proposal to cap greenhouse gas emissions and to reduce emissions levels by 70% by 2050. The bill would include robust measures for the forestry and agriculture sections of the economy. Mr. Profeta indicated that the question of what percentage of credits would be auctioned off or allocated, and the discussion has ranged from 25% to 75%. In addition to the Lieberman-Warner bill, Mr. Profeta informed the Commission that an energy bill is presently in Conference Committee. The significant

provisions in this bill include a federal renewal portfolio standard, fuel efficiency standards for motor vehicles and a robust tax package.

December 9, 2008:
Timothy Profeta, Director of the Nicholas Institute for Environmental Policy Solutions at Duke University, presented on anticipated federal actions on energy and climate change. He said that leadership on the issue from the executive branch has been lacking in the past and that some of the changes in Congress offer a good time for the Obama Administration to assume a leadership role.

Mr. Profeta stated that it is important for the US to take on a larger role in the international climate change debate in order to maintain a leadership position with the UN and the European Union. The presidential campaign brought the pledge to reduce the reliance on foreign oil and Mr. Profeta believes that this, along with some of the other economic issues facing the country, provide an economic opportunity for investment in renewable energy and energy efficiency. In the short term, Mr. Profeta believes that green capital will begin to flow into projects and that a cap-and-trade agreement will be passed for carbon reduction by 80% by 2050. The green capital Mr. Profeta foresees would deal with making public buildings more efficient, including schools, improve highway infrastructure, and transportation funding.

For North Carolina to align itself to take maximum advantage of some of the new federal initiatives, Mr. Profeta outlined the following key focus areas for the State:

- Break down barriers to investment in green economy.
- Demonstrate investment potential through pilot projects.
- Build State capacity to operate in the green economy, both through infrastructure and staffing.
- Create innovative programs to encourage green manufacturing.
- Design a focused program in North Carolina on green energy innovation, akin to RTP.

Mr. Profeta's presentation is available online at the following link: Timothy Profeta, Director, Nicholas Institute for Environmental Policy Solutions, Duke University.

November 17, 2009:
Victor Flatt, Tom & Elizabeth Taft Distinguished Professor of Environmental Law at the School of Law at the University of North Carolina at Chapel Hill, presented on recent federal actions related to climate change. Mr. Flatt discussed the major provisions of key climate change legislative proposals; the impact of those on some state and regional systems and a prognostication about what is happening at the international level, particularly Copenhagen and beyond.

Mr. Flatt stated that for federal legislation, there are two primary templates: (1) The American Clean Energy and Security Act (ACES), also known as the Waxman-Markey bill which passed the House of Representatives in June 2009; and (2) the Kerry-Boxer Bill in the Senate. He stated both pieces of legislation address several things: first, both bills would establish a formula to

reduce the amount of greenhouse gases that may be released in any given year based on a specific formula, and then further reducing that amount over time. Both bills would then require emitters of those gases to surrender compliance documents annually as they emit and to also buy, sell, and trade credits.

Mr. Flatt stated the legislation addresses several things that are related to both the cap-and-trade system and some other issues. First is the cap, how the cap is determined, how is it allocated, the rights to emit and how they are allocated, and whether there is a safety valve in the trading system so that it acts as a price control. He noted there is a large section in both bills about direct energy and efficiency relations and this will have an immediate impact on state energy and efficiency programs. He also noted there are provisions related to climate change adaptation and funding adaptation and the legislation also addresses how the federal climate change policies will relate to many of the international policies.

Mr. Flatt noted that in regards to the cap in the ACES bill that passed, the amount of greenhouse gases that are emitted in the regulated sector would be set 17% below the amount emitted in 2005 by the year 2020 and that 85% of the greenhouse gases emitted nationwide are expected to fall under the cap. He noted it is considered an economy wide cap – it covers industry, transportation sector, and electricity generation sector. The primary areas it does not cover are agriculture and land use. Mr. Flatt also noted the Boxer-Kerry bill proposes a 20% reduction in greenhouse gas emissions from 2005 by 2020, although that is under negotiation and both bills propose an 83% reduction from 2005 levels by 2050. He stated these levels are important in international negotiations, but they are less than those requested or recommended by the IPCC.

Mr. Flatt described the allocation measures under each of the bills, including the portion that would be auctioned and how the revenues that would be generated from auctioning the credits would be utilized. He also stated that many of the moderate democrats and republicans are concerned that the costs of buying credits not be a hidden tax and that it be revenue neutral and should go back to the general public.

Mr. Flatt stated under the current distribution formula reports have indicated that southern states will see a medium impact on the costs of electric power. He stated with respect to refineries and gasoline the additional cost for imports of petroleum, which must hold allowances for the amount of emissions that will be emitted from burning that fuel, is expected to increase the cost of gasoline about eight to twelve cents per gallon and is expected to be passed on to consumers. Mr. Flatt said that for the electricity consumers the average monthly bill is expected to go up $30 to $80 per month depending on the area of the country you are in and the energy mix involved. The Pacific Northwest, on the other hand, will most likely see a reduction in electric bills, since it primarily depends on hydro-electric power.

Mr. Flatt stated the federal bill does pre-empt existing measures enacted by states to the extent that they go below the federal standard or differ from the federal standard in terms of what qualifies as renewable energy. He stated the bill does allow states to require more renewable energy generation within that state and also allows the state to retire credits to tighten the market. Mr. Flatt stated that under ACES, the national cap-and-trade system would pre-empt state or

regional cap-and-trade programs for the first five years, and the Boxer-Kerry bill would also call for a five year pre-emption with a nine month delay.

Mr. Flatt stated that the people who must surrender the allocations when they emit greenhouse gases would be allowed to meet part of their obligation through the use of offsets. He defined offsets as reductions or sequestration of greenhouse gases that occur outside of the regulated system. He noted the offset provisions in these bills are larger than the prior bill further analysis of the market indicates that offsets are likely needed to increase market liquidity and to reduce the volatility of the market, particularly in the initial phases. He also noted that offsets by definition must be additional (cannot be business as usual), measurable, verifiable, and permanent.

Mr. Flatt forecasts that comprehensive federal climate change and a cap-and-trade legislation will be enacted by 2010. The reason he believes that is most likely is it is being driven by the threat or the promise of EPA regulation of greenhouse gases in the absence of a new comprehensive bill. He believes the targets we are seeing currently in the ACES and Boxer-Kerry is probably about where they will be set.

With regard to the potential regulation by EPA, Mr. Flatt stated that originally EPA had indicated that it would to issue its final endangerment finding by March 2010 based on the *Massachusetts vs. EPA* decision, but that EPA recently moved up its plan to release the endangerment finding. He believes it is designed as a message to Copenhagen to show that the U.S. will begin the process of regulating greenhouse gases by the time any international agreement goes into effect.

Mr. Flatt stated that is well-advised for states to move forward with respect to considering information on what is going to happen and the changes that are going to occur. If a state enters into its own cap or limitation of greenhouse gases, it may receive credit under the federal bill. Representative Harrison mentioned during Mr. Flatt's presentation that the Georgetown Climate Center has issued a 12-page analysis of Boxer-Kerry that provides a great summary of where states should be and new opportunities in the federal legislation.[31] The handout indicated many incentives available to states and also identified areas where state actions may be preempted.

Mr. Flatt's presentation can be viewed online at the following link: Victor Flatt, Tom & Elizabeth Taft Distinguished Professor of Environmental Law, School of Law, University of North Carolina Chapel Hill.

International actions

January 13, 2010:
Victor Flatt, Tom & Elizabeth Taft Distinguished Professor of Environmental Law at the School of Law at the University of North Carolina at Chapel Hill, provided an update on federal and international actions related to climate change, including the activities and outcomes of the 15th

[31] Georgetown Climate Center, Overview of State-Related Provisions, Clean Energy Jobs and American Power Act. October 2009. The document is available at the following link: Georgetown Climate Center.

Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen, Denmark.

Mr. Flatt stated that EPA issued its endangerment finding under the Clean Air Act in December, finding that greenhouse gas emissions are an endangerment to human health. At this point, EPA is beginning its process of determining how to go about regulating greenhouse gases. He discussed the 'Tailoring Rule' that would allow exemption of certain small sources of stationary greenhouse gases. He expects that rule to be challenged.

A Senate committee has approved the Boxer-Kerry bill concerning climate change, but has taken no action beyond that. The bill has some characteristics of the emissions bill passed by the House. The Senate plans to consider financial regulation before any bills on climate change, meaning that it will be late April 2010 before climate change legislation might be considered.

With regard to the Copenhagen meeting of the UNFCCC, Mr. Flatt considers the Copenhagen Accord[32] an agreement that has an unclear legal status under international environmental law. The Annex 1 countries, essentially the developed countries and the former Eastern Soviet bloc, will publish by January 30, 2010 what their reduction effort will be by 2020. Each country will set up its own baseline year. Other countries can agree to "national appropriate mitigation actions." Some countries, such as China and India, have agreed to reduce energy intensity but not emissions reductions. Underdeveloped countries which agree to international aid to cope with climate change problems agree to verification inspections.

Mr. Flatt stated that the next meeting of the UNFCCC will be in Mexico City in December 2010, at which time the Copenhagen Accord calls for the positions and actions of the Copenhagen Accord to be made binding under international environmental law.

The ultimate result of Copenhagen, according to Mr. Flatt, may have been the rejection of the UNFCCC process. He said it was obviously difficult to reach agreement among 192 countries. There were major disagreements between developed countries and underdeveloped countries. The final agreement was worked out between China, Brazil, India, South Africa, and the U. S. This group's position was put before the Convention which relies on consensus, and the adoption of a position reached in this manner, he feels, does away with the process of the UNFCCC. Mr. Flatt feels that future actions will come as part of negotiations between countries in the G-20 economic organization.

Mr. Flatt indicated that another major message from Copenhagen was the need to put a price on a carbon and to look for technological breakthroughs. Rather than look to maintaining a 2 degree Celsius global temperature rise, which can not be sustained even with all the various efforts by the countries, we need to change the incentives for technology that would lead to a change in the carbon footprint in the world.

Mr. Flatt said the feeling expressed, particularly from the private sector, that cap-and-trade was a done deal, and that private entities seem to be ahead of the countries in this regard. Commission

[32] UNFCCC Draft decision CP.15, the Copenhagen Accord. Online at: http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf.

member Smith, who also attended the Copenhagen meeting, said that the fact that "negotiations were too political for the negotiators and too technical for the politicians." was evident during the event. Dr. Smith did not agree that the overall process of the UNFCCC would be abandoned. He also noted that there is a great disconnect between the U.S. and the rest of the world on the subject of climate change. He cautioned that the U.S. needs to be more interested and involved in clean technology.

Mr. Flatt's presentation is available online at the following link: Victor Flatt, Tom & Elizabeth Taft Distinguished Professor of Environmental Law, School of Law, University of North Carolina Chapel Hill.

See also the following presentations related to international responses to climate change:

April 4, 2006 presentation by Patrick J. Michaels, Research Professor and State Climatologist, Virginia State Climatology Office, University of Virginia, Charlottesville, Virginia. (Discussed on p. 14 of this report).

January 16, 2008 presentation by Dolores M. "Dee" Eggers, Commission member and Associate Professor, Department of Environmental Studies, University of North Carolina at Asheville, on the Summary of the "Synthesis Report from Climate Change 2007" prepared by the Intergovernmental Panel on Climate Change (IPCC). (Discussed on p. 15-18 of this report).

February 11, 2008 presentation by Dr. Rajendra Pachauri, Chair, Intergovernmental Panel on Climate Change, and Director General, The Energy and Resources Institute. (Discussed on p. 18-19 of this report).

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DISCUSSION OF POSSIBLE POLICY OPTIONS

The Commission spent a considerable amount of time examining possible policy options that may play a role in helping the State mitigate greenhouse gas emissions, as well as technologies and policies that would help the state adapt to and better manage the impacts of climate change on the State.

Mitigation Options:

April 25, 2006:

Dr. David Greene, Corporate Fellow from the Oak Ridge National Laboratory in Knoxville, Tennessee, discussed mitigation options in the transportation sector. The transportation sector is second to industry in greenhouse gas emissions and the largest carbon dioxide emitter. He argued that by using a mix of policy and economic measures, regulatory, and other measures that greenhouse gas emissions from the United States transportation sector could be reduced by 20 to 25% by 2015 and by as much as half by 2030. Dr. Greene discussed, in detail, many of the potential policy and economic measures including shifting people from personal vehicles to mass transit, increasing fuel economy via technology and policy, and using alternative fuels. He also addressed how state policies differ from national policies.

Dr. Greene's presentation is available online at the following link: David L. Greene, Corporate Fellow, Oak Ridge National Laboratory, Knoxville, Tennessee.

Dr. Edward Rubin, Director of the Center for Energy and Environmental Studies in the Department of Engineering and Public Policy at Carnegie Mellon University, discussed greenhouse gas reductions from the electric power sector, options that are available to reduce power sector emissions of greenhouse gases, and some key policy considerations. He pointed out that power plants are a large source of CO2 and that siting of coal-fired power plants are major national and local considerations. Some of the potential options available for reducing CO2 emissions in the power sector include: reducing demand; improving efficiencies in technologies used for power generation, transmission, and distribution; utilizing power generation technologies that use no or low carbon; and employing technologies that might be able to both capture and store or sequester CO2. Dr. Rubin also discussed regulatory policies that would help limit greenhouse gas emissions.

Dr. Rubin's presentation is available online at the following link: Edward S. Rubin, Director, Center for Energy and Environmental Studies, Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, Pennsylvania.

Dr. Marilyn Brown, Interim Director of the Engineering Science and Technology Division of Oak Ridge National Laboratory in Oak Ridge, Tennessee, discussed opportunities to reduce greenhouse gas emissions from the built environment. She first asserted that residential, commercial, and industrial buildings account for 43% of United State's CO2 emissions. Some of her suggestions for reducing greenhouse gas emissions from the built environment include:

improving efficiency; installing electric chromic windows and unconventional water heaters; and preserving land in farm and forest use. Dr. Brown discussed the Energy Policy Act, which was put in place because of policies needed to simulate investments. She claimed that the Energy Policy Act was not sufficient to meet challenges; in particular one flaw is that it does not have mandatory regulations. She promoted Leadership in Energy and Environmental Design (LEED) certification, energy efficiency resource standards, and smart growth. In the long term, Dr. Brown was optimistic for zero-energy buildings. She asserted that greenhouse gas emissions in the building sector could be decreased to today's levels by 2025 if all of the technological opportunities are totaled and the policies investigated in the Pew report are itemized. This would amount to a 10% overall reduction in the nation's greenhouse gas emissions in 2025.

Dr. Brown's presentation is available online at the following link: Marilyn A. Brown, Interim Director, Engineering Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Dr. Dennis W. Hazel, a Professor in the Forestry and Environmental Outreach Program at North Carolina State University, discussed the range of opportunities represented by the forestry and agricultural sectors to address climate change. Forestry is the second largest industry in North Carolina and a $29 billion per year economic additive. Dr. Hazel discussed four ways that forestry and agriculture can contribute solutions to the global climate change issue including: reducing CO2, methane, and NOx emissions; promoting carbon sequestration perhaps by increasing land area; improving the productivity of the land in order to improve carbon sequestration; and substituting farm and forest biomaterials for others. He also provided a list of possible action items including: protecting farmland from permanent conversions; improving feed efficiency; increased use of residential and urban trees; and dedicated crops for ethanol. Dr. Hazel pointed out many economic opportunities for North Carolina, such as the biomass industry and waste salvage.

Dr. Hazel's presentation is available online at the following link: Dennis W. Hazel, Professor, Forestry and Environmental Outreach Program, North Carolina State University.

Dr. Karl Hausker, Senior Advisor for the Center for Climate Strategies (CCS), discussed the CAPAG process and discussed mitigation options that were currently being considered. Dr. Hausker explained that the CCS has a catalog of options that other states are either considering or implementing. Many options are presented to CAPAG, with initial information on the potential greenhouse gas emission reductions that may result, estimates for a cost-per-ton of reduced emissions, and potential impacts on air quality, water quality, energy security, economic development, etc. This information helps CAPAG screen which options to focus on. A subset of 40 to 60 options are selected and work groups conduct a detailed examination on the options. The work groups develop recommendations and analytical support for the options. Finally, this information is presented to CAPAG for consideration and ultimate recommendation in their final report.

Dr. Hausker's presentation is available online at the following link: Karl Hausker, Senior Advisor, Center for Climate Strategies.

October 3, 2006:

Brock Nicholson, Deputy Director of DAQ in DENR, Mitch Peele, Tim Toben, George Everett, Michael Shore, Stephen Smith, and Tom Peterson presented an update on the activities of the CAPAG process. CAPAG has adopted a rigorous approach to choosing strategies and low-hanging fruit for mitigation options for reducing greenhouse gases in North Carolina. After considering a wide range of options, they selected 52 to further examine with a more intensive cost-benefit analysis. Options were selected according to the potential emission reductions compared to the cost of implementation. Some viable options currently on the table include an environmental portfolio strategy, which 22 states have implemented. Other options include building codes to improve energy efficiency, combined heat and power systems, Integrated Gasification Combined Cycle plants, and tax credits for biofuels. In North Carolina's agriculture and forestry sectors, there are many opportunities for programs to both provide incentives to keep land in forests and agriculture and provide greenhouse gas offsets. These should be the areas from whichNorth Carolina has the most to gain from in mitigation scenarios.

November 27, 2006:

Kurt Creamer, the Biomass Program Manager at the North Carolina Solar Center and Animal and Poultry and Waste Management Center at North Carolina State University, gave a presentation on the options for production and use of biofuels in North Carolina. Biofuels offer many potential benefits to North Carolina including reducing tail pipe emissions and greenhouse gas emissions, generating jobs at fuel production plants, and increasing energy security. The most promising energy crops, either currently grown in North Carolina, existing naturally, or easily implemented in growing cycles include: canola for biodiesel; switchgrass for ethanol to be used in coal firing, combustion and gasification to generate electricity; hulless barley for starch based ethanol plants; coastal Bermuda grass, which is already planted in spray fields for its tremendous nutrient uptake potential; and woody biomass because of the expanse of forest in North Carolina. One product with much potential but little scientific research as of yet, is the use of microalgae as a biofuel, though preliminary studies have shown that it produces up to 5,000 to 15,000 gallons of biofuel per year.

The most commonly used type of biofuel is ethanol, which can be produced from sugar crops, including sugar cane, sugar beets, sweet sorghum, and corn. In the United States, ethanol is primarily produced from corn. In 2006 up to 20% of the nation's corn crop went into ethanol production. Ethanol use in North Carolina is roughly 5 million gallons per year, and though there are currently no ethanol production plants in the State, three have been proposed. Biodiesel is produced by a chemical reaction between methanol and a source of oil and fat such as canola oil, soybeans, peanuts, cotton seed, and rendering operations that provide animal fats. Hog waste and poultry litter also present opportunities to capture methane and eliminate the greenhouse gas source and generate electricity. The energy balance of biofuels, the amount of energy inherent in the fuel divided by the amount of energy required to produce it, is best for cellulosic ethanols such as sugarcanes, sugar beet, and switchgrass.

Moving ahead with these findings, the State is working to create a road map for biomass power production and biofuel production. Funding to promote biofuels across the State can be found in several federal programs that promote the use of renewable energy and several State tax credit programs specifically established for the production and distribution of biofuels. However, farmers face a great risk in undertaking this type of project and are not willing to pay the up front costs of conducting feasibility studies. These costs are not accounted for in federal or state programs and present a real barrier to more widespread implementation of biofuel crops and production.

Mr. Creamer's presentation is available online at the following link: Kurt S. Creamer, P.E., Biomass Program Manager, North Carolina Solar Center and Animal and Poultry Waste Management Center, North Carolina State University

December 11, 2006:

Dr. Michael Walsh, the Senior Vice President of the Chicago Climate Exchange (CCX), presented on the Exchange's greenhouse gas emission registry and reduction and trading system, and the potential benefits to North Carolina. CCX is one of two cap-and-trade emissions markets in the world, the other being the European Union. The CCX includes about 250 million metric tons of carbon dioxide equivalent emissions in their cap-and-trade system. It is a voluntary program with no regulatory authority. Members sign a contract and are legally committed to emissions reductions schedules which are created during the negotiations process. The exchange has about 225 members including industries, universities, farmers, governments, smaller business, and non-governmental organizations (NGOs). The exchange began with a four year commitment to cut emissions by one percent per year, in order to get to four percent below the baseline by 2006. The baseline in this case is the average of the emissions included during the years 1998 through 2001. All members of CCX have to include their major emitting activities in the U.S., with entity wide participation. Members must also quantify emissions and conduct an audit, in order to establish a baseline. Then they are given a batch of tradable permits and extra tradable allowances, which can be banked and used in later years. If a member cannot meet its budgeted amount of emissions reductions, it must buy credits from another member, perhaps one with an extra cut from an offset project. All members are audited each spring. CCX is a fully integrated and electronic environmental audit and trading system. The first concept in selecting offsets is to bring in reductions from low-cost sectors and to provide economic development opportunities to those areas that need to be built out. CCX has an open door policy for anyone willing to be audited and make the commitment.

Mr Walsh's presentation is available online at the following link: Michael J. Walsh, Senior Vice President, Chicago Climate Exchange.

Thomas R. Casten, founder and chair of the Alliance for Clean Technology and founder and former Chief Executive Officer of Trigen Energy and Primary Energy Ventures, led a discussion on combined heat and power (CHP) as a method for reducing greenhouse gas emissions and increasing energy efficiency. The Alliance for Clean Technology is a coalition of local power

developers, World Wildlife Fund, Greenpeace, the Sierra Club, the Suzuki Foundation, and other environmental groups, union workers concerned about the loss of jobs, and gas and electric distribution utilities. The mission of the Alliance is to promote clean technology policies to reduce greenhouse gas emissions, to boost the economy, and to buy time for new technologies to improve. Clean technology options that hold great promise include energy recycling, of which CHP is an example. Capturing the exhaust heat from power generation or industrial waste that industries normally throw away has the potential to generate 20% of the United States' electricity.

CHP systems are not more widely used in the United States because industries interested in implementing them face regulatory barriers and interconnection costs and are denied payment for benefits that can be provided such as cleaner technology. This is primarily because the energy generation system has not been updated in several decades. In the United States, 38% of carbon emissions come from electricity generation, whose efficiency peaked 45 years ago. With the system as it is now, electricity received by the end user represents one third of the fuel used to generate it. CHP plants increase efficiency by up to 50%, as they are located on-site and the fuel used to make power results in thermal heat which can be used and distributed. Local generation reduces the need for a central grid and power does not travel long distances which lowers the quantity of electricity lost through power lines. Local generation also stabilizes voltages and reduces vulnerability to extreme weather and terrorism.

In terms of the cost, the up front costs for building local plants are greater than for central generation, however connecting to a grid requires payments for generation and distribution. Denmark pushes for local generation, and with 52% of the country's power generated locally, it is approaching 60% efficiency. Other countries that have already implemented CHP at around 20% of their total electric generation include Portugal, China, Japan, Poland and Germany. In order to encourage implementation of CHP and energy recycling, distribution utilities should be required to interconnect those who qualify as clean technology and include the costs in their base rate, as they provide a public benefit. Regulations should also be changed to address utility bias towards central generation. And finally, there should be incentives for industries to recycle energy, as there are risks involved in the initial phases of implementation. About half of the states in the U.S. have eliminated these barriers, and some states, such as Connecticut, New York, and California are moving towards eliminating standby and interconnection charges.

Mr. Casten's presentation is available online at the following link: Thomas R. Casten, Founder and Chair, Alliance for Clean Technology and founder and former Chief Executive Officer of Trigen Energy and Primary Energy Ventures

Raymond DuBose, the Director of the Energy Services Department at the University of North Carolina at Chapel Hill, gave a presentation on the award-winning energy facilities located on the University campus. The campus facility is composed of a CHP facility which simultaneously generates steam and electricity and distributes thermal and electrical energy throughout the system – a central chilled water system – and central plants and underground systems for the production and distribution of steam. These campus facilities generate a third of the power used on campus, and the remaining two thirds are purchased from Duke Energy. The thermal

efficiency of the UNC Chapel Hill CHP facility – 70% – is twice that of the average U.S. power plant. Some of the innovations of the facility include: using the steam to run a turbine and a generator which meets a third of the peak campus demand; the high pressure steam from the boilers is used for the heating and cooling of all buildings on campus and the hot water in residence halls, the hospital and research labs; use circulating fluid out of bed combustion to burn coal which reduces the release of NOx and SO2; and central chilled water plants, cooled at night when energy prices are low, which use steam to generate chilled water for all campus air conditioning needs.

Mr. DuBose's presentation is available online at the following link: Raymond E. DuBose, Director, Energy Services Department, University of North Carolina at Chapel Hill.

October 23, 2007

Brock Nicholson, Deputy Director of DAQ, Mitch Peele, Tim Toben, George Everett, Michael Shore, Stephen Smith, and Tom Peterson presented an update on the activities of the CAPAG technical work groups. The CAPAG mitigation options are being considered by the following technical work groups:

- Agriculture, Forestry, and Waste
- Energy Supply
- Residential, Commercial, and Industrial
- Transportation and Land Use
- Cross-Cutting Issues

Tom Peterson also provided an update on the next steps in the CAPAG process. Mr. Peterson's presentation is available at the following link: Tom Peterson, Executive Director, Center for Climate Strategies.

December 4, 2007:

William L. Chameides, Dean, Nicholas School of the Environment, Duke University, presented on the extent to which carbon offsets may be reliably identified and quantified. Dr. Chameides defined offsets as "actions that remove or prevent the emissions of greenhouse gases in one location and are used to “offset” an equivalent amount of emissions at another location." Offsets can come from a wide range of activities, including renewable energy projects such as wind farms, biomass energy, or hydroelectric dams. Others include energy efficiency projects, the destruction of industrial pollutants or agricultural byproducts, destruction of landfill methane, and forestry projects. Offset have a significant potential to advance climate mitigation, but also huge potential to frustrate climate mitigation if the offsets are not real. To qualify as a marketable carbon offset, the greenhouse impact of a change in land management must have three critical attributes:

- It must represent a net reduction in greenhouse gas emissions, or a net gain in the amount of carbon stored.
- The offsets must have a legal and specified owner.

- Regulators of any relevant cap-and-trade system and the buyer, as well as the public, must have strong confidence that the offsets have been accurately measured and quantified.

Dr. Chameides provided examples of several different processes and methodologies that are already in place to verify and evaluate the additionality, permanence, and co-benefits that may be associated with offset generation.

Dr. Chameides' presentation is available online at the following link: William L. Chameides, Dean, Nicholas School of the Environment, Duke University.

William C. McDow III, Southern Forest Projects Manager, Environmental Defense, discussed the opportunities for, and recommendations related to, carbon offset projects in the agriculture and forestry sectors of North Carolina. Mr. McDow stated that in order for the State to move ahead, he recommends that the State move quickly to address the following three specific needs:

- Education of landowners who are eligible to engage in carbon offset projects.
- Creation of clear and uniform guidance for carbon offset projects.
- Lowering transaction costs inherent in any offset project

Mr. McDow concluded by stating that if the State acts to take advantage of the opportunities the carbon market may present, it would help some of the State's most economically strapped areas, make North Carolina a leader in climate solutions, and will help maintain the State's natural heritage.

Mr. McDow's comments are available online at the following link: William C. McDow III, Southern Forest Projects Manager, Environmental Defense.

At the December 4, 2007 meeting of the Commission, members of the CAPAG Agriculture, Forestry, and Waste Technical Working Group also presented the draft findings from their working group. The members of the working group participated in the discussion: Stephen Roe, Senior Scientist, E.H. Pechan and Associates, facilitator of the Agriculture, Forestry, and Waste Management Technical Work Group, and lead consultant for Emissions Inventory, Center for Climate Strategies; Dennis W. Hazel, Assistant Professor and Extension Specialist, Department of Forestry and Environmental Resources, NCSU; Christopher B. Hopkins, Outreach Associate, Department of Forestry and Environmental Resources NCSU; Paul Sherman, Director of Air Quality and Energy Programs, North Carolina Farm Bureau Federation and Robert W. Slocum, Jr., Executive Vice President North Carolina Forestry Association.

March 5, 2008:

Thomas D. Peterson, President and CEO, Center for Climate Strategies, presented the Recommended Mitigation Options of the CAPAG group in a consolidated format. The final CAPAG report recommended 56 options for futher study and potential adoption by the State.

Mr. Peterson indicated that the level of support among CAPAG members for these options, although not always unanimous, was very high.

Projected emissions can be reduced significantly if each and every one of the CAPAG's recommendations is completely, strictly and properly implemented and the estimated reductions are fully achieved. The CAPAG report estimates that "full adoption by the state and complete, strict and proper implementation of each and every one of the CAPAG's recommendations is estimated to reduce gross greenhouse gas emissions by approximately 47%, from 256 million metric tons of carbon dioxide equivalent (MMtCO2e) in the reference case forecast to 137 MMtCO2e by 2020, or within 1% of 1990 levels."

Mr. Peterson also provided that the secondary economic impact analysis conducted by the Appalachian State University Energy Center and CCS. The analysis indicated that full implementation of the modeled mitigation option bundles would result in a positive economic impact on North Carolina's economy. By 2020, implementation would result in the creation of more than 15,000 jobs, $565 million in employee and proprietor income, and $302 million in gross state product. For the entire study period, 2007 to 2020, the mitigation options would generate more than $2.2 billion net present value (NPV) in net additional employee and proprietor income and more than $1.2 million (NPV) in net gross state product.

Mr. Peterson's presentation is available online at the following link: Thomas D. Peterson, President and CEO, Center for Climate Strategies.

April 22, 2008:

Robert B. Jackson, Faculty Director, Center on Global Change, and Professor of Biology and Environmental Sciences, Duke University, gave a presentation on the results of the Intergovernmental Panel on Climate Change in the context of creating a greenhouse gas emissions reduction goal for the State of North Carolina. Dr. Jackson indicated that most major scientific organizations and associations have issued official climate change statements saying that the Earth is warming and human activities are creating such warming. Mr. Jackson said that the best consensus is to keep the world from warming would be within a range of 450 to 500 p parts per million (ppm) of atmospheric CO2. He added that currently the United States dominates in emissions but globalization and industrial development in China and India also contribute. Mr. Jackson highlighted a number of policy options, including emissions limitations, improvements in vehicle emissions standards, increased development of renewable energy technologies, and taking advantage of opportunities for carbon sequestration. Dr. Jackson concluded by identifying a number of policy options states and local governments should consider, including building efficiency, water and energy savings programs, improved waste management, lighting standards, motor fleet purchases, and changes to long-range planning and zoning.

Dr. Jackson's presentation is available online at the following link: Robert B. Jackson, Faculty Director, Center on Global Change, and Professor of Biology and Environmental Sciences, Duke University.

Bryan Hannegan, Vice President of Environment and Generation, Electric Power Research Institute, presented on electricity technologies in a carbon-constrained world. Mr. Hannegan stated that reduction efforts are already in effect but that there is much more work to do. The technical potential exists for the U.S. electricity sector to significantly reduce its CO2 emissions over the next several decades. No one technology will be a silver bullet; rather, a portfolio of technologies will be needed. Mr. Hannegan highlighted several key technology challenges, including the following:

- Enabling efficiency, plug-in hybrid electric vehicles (PHEVs), and distributed energy resources (DER) via the smart distribution grid.
- Enabling intermittent renewables via advanced transmission grids.
- Expanded advanced light water nuclear reactor deployment.
- Advanced coal plants with CO(2) capture and storage.

A low-cost, low-carbon portfolio of electricity technologies can significantly reduce the costs of climate policy. Much of the needed technology isn't available yet, so a substantial investment in research, development, and demonstration is required. With regard to nuclear energy, for example, Mr. Hannegan said number of technological advances are required including: materials inspection, repair and replacement; prognostic technologies; more extensive use of digital technology; cable diagnostics and alternative replacements; fuel performance; and spent fuel storage.

Mr. Hannegan emphasized the following five main points:

- You get what you pay for - Non-emitting sources of energy by definition more expensive.
- The traditional regulatory approach unlikely to be effective by itself; a transformation of the entire energy system is needed.
- The focus should on long-term, global, economy-wide changes.
- States alone cannot drive climate change policy. There must be a linkage to national and international policies.
- Flexible, market-based climate policies offer significant economic advantage over sector-specific approaches

Mr. Hannegan's presentation is available online at the following link: Bryan Hannegan, Vice President of Environment and Generation, Electric Power Research Institute.

November 14, 2008:

John D. Wilson, Research Director, Southern Alliance for Clean Energy, presented on four key action areas related to climate change as discussed in the report "Cornerstones: Building a Secure Foundation for North Carolina's Energy Future,"[33] issued by the Southern Alliance for Clean Energy. The four cornerstones described in the report include the following:

- *Energy Efficiency:* Every North Carolina business, community group and individual can lead, beginning with their support of energy efficiency programs. Energy efficiency

[33] Southern Alliance for Clean Energy, *Cornerstones: Building a Secure Foundation for North Carolina's Energy Future.* May 2008. Online at: http://www.cleanenergy.org/images/files/CornerstonesReportFinal1.pdf.

means more than just changing light bulbs and buying hybrid cars. An ambitious energy efficiency strategy means replacing energy-consuming equipment, renovating buildings, and engineering new transportation and power systems.

- *Clean Energy*: North Carolina's ingenuity will be called upon to develop clean energy solutions such as biomass and wind energy to provide homegrown energy independence. After taking into consideration the potential of energy efficiency, North Carolina's wind and other homegrown clean energy resources, such as methane from hog waste, can produce over 20% of electricity generation by 2030.
- *Pollution Capture:* North Carolina's integrity will be demonstrated by using pollution capture to meet its responsibility to prevent as much global warming as possible. North Carolina met its responsibility to public health with the Clean Smokestacks Act, which called upon utilities to use pollution scrubbers to protect people downwind from power plants. Today's larger responsibility calls for North Carolina to capture carbon dioxide for storage in the landscape and deep underground.
- *Long-term Planning:* North Carolina must prepare for the future by anticipating and adapting to the impacts of global warming and providing safer and healthier communities through improved mobility. Our communities can fulfill a commitment to transportation and land use designs that make people's lives safer, healthier and rich with possibilities. Change is already underway, and thoughtful planning will help minimize further global warming pollution and enhance the productivity of our resources."

Mr. Wilson's presentation is available online at the following link: John D. Wilson, Research Director, Southern Alliance for Clean Energy.

December 9, 2008:

R. Christopher Mathis, President of MC2 Mathis Consulting Company, presented on green buildings and green building codes. Mr. Mathis noted that buildings consume the largest portion of electricity in the State, particularly for cooling and lighting purposes. According to EPA estimates, the average American home pollutes the air twice as much as the American car. In 1997 the Department of Energy said that improving building energy by 30% could off-set the plans to build 80 nuclear power plants. Mr. Mathis noted that lighting changes alone could accomplish that.

Mr. Mathis stated that one of the biggest first steps would be to adopt new, energy-efficient building codes, and that the floors set by current codes provide little incentive for builders or homeowners to invest in energy efficient alternatives. Mr. Mathis stated that since only one percent of buildings are newly constructed each year, the biggest impact will come from improving the existing structures. He said that replacing the windows in 60 million homes (half of the existing homes in the United States) that would have the energy-savings equivalent of retiring 300 old coal-fired plants. Mr. Mathis said that we need to have the technology, skilled workforce, and materials to make these changes. He believes that this would translate into people at work, materials being bought, and tax revenues increasing.

Mr. Mathis said that State-owned buildings should set the example of operating more efficiently. Mr. Mathis said energy inflation was regressive, thus he suggested that utility policies need to be

discussed. He proposed rewarding utilities for saving power similar to rewards for producing power. He said that utility companies could prove the delivery of savings and earn a profit on conservation. He pointed out that the United Nations (UN) has reported that current building technologies have the potential to cut energy consumption in half without significant investment.

Mr. Mathis's presentation is available online at the following link: R. Christopher Mathis, President, MC2 Mathis Consulting Company.

January 13, 2009:

Stephen A. Smith, Executive Director, Southern Alliance for Clean Energy, gave a presentation on recycled energy and combined heat and power. Mr. Smith pointed out energy recycling using technologies such as combined heat and power (CHP), combined cooling, heat, and power (CCHP), and waste heat recovery are among the most cost-effective energy resources that we have available, but these energy recycling technologies are currently underutilized. Some of the reasons for this underutilization include the following: (1) electricity from energy recycling systems is often undervalued; (2) interconnection standards not fully standardized and retain unnecessary barriers; (3) non-utilities are barred from selling surplus thermal energy; (4) environmental permitting is perceived as a barrier; and (5) non-utilities cannot use currently use the REPS as an incentive for energy recycling.

Dr. Smith offered the following recommendations for the Commission to consider:

- Offer market price for electricity.
- Remove remaining obstacles to interconnection.
- Authorize sale of thermal energy by non-utilities.
- Provide sound environmental permitting.
- Amend REPS law to allow non-utilities to generate RECs from energy recycling.

Mr. Smith's presentation is available online at the following link: Stephen A. Smith, Executive Director, Southern Alliance for Clean Energy.

At the January 2009 Commission meeting, the Commission held additional discussions on the following specific topics:

- Whether to set a goal to reduce State greenhouse gas emissions.
- Whether to establish energy efficiency standards for buildings constructed with State funds.
- Whether and how to amend the State Building Code in order increase the energy efficiency of buildings constructed or substantially renovated in the State.

Adaptation options:

March 5, 2008:

William E. Holman, Director of State Policy at the Nicholas Institute for Environment Policy Solutions at Duke University, presented some options for State and local governments to

consider with regard to plans for and adaptation to the impacts of global climate change. Mr. Holman's options included the following key categories:

1. Inventory existing federal, State and local programs related to climate change.
2. Improve State-level climate data and research.
3. Plan for droughts and extreme weather
4. Plan for sea-level rise and intense storms
5. Mitigate hazards.

Mr. Holman's handout is available online at the following link: William E. Holman, Director of State Policy, Nicholas Institute for Environment Policy Solutions.

Mack B. Pearsall, Advisory Board Member for Centers for Environmental and Climatic Interaction in Asheville, North Carolina,, presented the "North Carolina Green Cities Plan" by the Centers for Environmental and Climatic Interaction. The report highlights the efforts of the City of Asheville to focus planning attention on climate issues, including declaring that climate change was an important development priority and forming the Centers for Environmental and Climatic Interaction to lead and support the effort. Much of this focus is based on the potential for expanded growth of the National Climatic Data Center in Asheville, the mounting science and concern regarding the changing environment, increases in federal funding related to climate change, and growing demand for products and services related to adaptation and mitigation.

Mr. Pearsall stated that Asheville has set a goal to establish a partnership with the State, the University of North Carolina, the Nicholas Institute at Duke, national foundations, and others to develop and establish a North Carolina Green Cities Plan to develop climate change management initiatives in urban environments.

December 9, 2008:

Sam H. Pearsall, Southeast Regional Manager for Land, Water, and Wildlife at the Environmental Defense Fund, discussed adaptation strategies for rural and conservation lands and waters. Mr. Pearsall stated that climate disruption as a result of climate change presents a severe threat to planetary biodiversity. He bases this conclusion on two factors: (1) the magnitude of the expected changes; and (2) the speed of the expected changes. In the past, during comparable rates of temperature change, accompanied by the emergence of non-analogue ecosystems, many species did not survive the abrupt habitat changes.

Mr. Pearsall stated that we should use a few basic rules of thumb as we develop plans to mitigate against future stress, including: (1) development of theoretical future baselines; (2) adaptation of disturbance regimes to future conditions; and (3) development of pragmatic responses to invasion as species migrate. •Mr. Pearsall stated that we should look for simple and obvious strategies relying at least for now on the tools that we already have available. He also said that relying on corridors and refugia may not work.

Mr. Pearsall focused on the impacts of climate change on the Albemarle-Pamlico Region, which is considered one of the continental areas most severely threatened by rising seas. When salt

water comes in contact with peat soils, it causes them to rot very rapidly. This results in both local and global problems. Locally, as the peat soils rot, the land subsides, and the rate of inundation increases. Globally, the loss of these peat soils results in vast amounts of previously sequestered carbon being released into the atmosphere as carbon dioxide and methane. To avoid these problems, Mr. Pearsall stated that conservation land owners should manage ditches to prevent salt intrusion and prevent drainage of peat lands in dry weather. Management strategies include the use of flash boards and risers, tide gates, soil plugs, and complete hydrological restoration. With regard to stronger storms, Mr. Pearsall stated that one of the best strategies for reducing coastal energy is to build elevated oyster reefs to buffer wave action and to slow currents.

Mr. Pearsall concluded with several recommendations for the State to consider, including the following:

- Increase public education and awareness that the climate is changing and the potential impacts of climate change.
- While working on emissions and carbon offsets, don't overlook our certain and unavoidable need for adaptation strategies.
- Every State agency that manages land or advises land managers should develop strategies for applying its tools to the challenges of adaptation.
- The State should capitalize on the potential for creating new "green" jobs supporting climate change adaptation.
- The University of North Carolina should dedicate significant resources to exploring and developing new land and water management strategies for climate change adaptation.
- New tools are needed for management of the lands and water of the State.
- Develop strategies for mitigating "road dams" and ditches.
- Develop strategies to remove hazardous materials and infrastructure before they are inundated.
- Invest in elevated oyster reefs, soft-armoring, "prestoration," and other appropriate measures.
- Comprehensively map areas likely to be inundated in a business as usual (BAU) scenario.
- Develop strategies to avoid new development in areas likely to be inundated in a BAU scenario.
- Develop a strategy for the orderly retreat from appropriate areas, rather than letting the process be driven by "disasters."
- Develop incentives for landowners and communities to participate in such a strategy.

Mr. Pearsall's presentation is available online at the following link: Sam H. Pearsall, Southeast Regional Manager for Land, Water, and Wildlife, Environmental Defense Fund.

January 13, 2009:

James H. Stephenson, Policy Director with the North Carolina Coastal Federation, presented on policy options related to adaptation for the Commission to consider. Mr. Stephenson presented

the following five general recommendations, similar to those presented by Mr. Holman at the March 5, 2008 meeting of the Commission:

1. Inventory existing federal, State and local programs related to climate change.
2. Improve State-level climate data and research.
3. Plan for droughts and extreme weather
4. Plan for sea-level rise and intense storms
5. Mitigate hazards.

Mr. Stephen's comments are available online at the following link: James H. Stephenson, Policy Director, North Carolina Coastal Federation.

Future role and purpose of legislative commission on climate change

January 13, 2009:

Dr. Dolores M. Eggers, Assistant Professor, University of North Carolina at Asheville, and Michael S. Regan, Policy Manager, for the Environmental Defense Fund, led a discussion of whether to establish a permanent global climate change commission and an advisory council for the commission. Dr. Eggers indicated that the language she proposed was drawn from the existing Commission charge, as well as language from Commissions in several other states, Sweden, and the UN. One of the key issues to be resolved is the membership of both the permanent commission, which would largely be legislative, and the advisory council, which would include a broad range of technical expertise in both adaptation and mitigation options. In addition, determining how the new permanent Commission would interact with other legislative and executive branch bodies that are dealing with climate change-related issues is an important consideration.

Dr. Eggers and Mr. Regan's presentation is available online at the following link: Dr. Dolores M. Eggers, Assistant Professor, University of North Carolina at Asheville, and Michael S. Regan, Policy Manager, Environmental Defense Fund.

OTHER ELEMENTS OF THE COMMISSION CHARGE

Greenhouse Gas Reduction Goal:

Subsection (2) of S.L. 2005-442 authorized the Commission "to develop a recommended global warming pollutant reduction goal for the State" if the Commission, in the course of its examination "determines that it would be appropriate and desirable for the State to establish a global warming pollutant reduction goal."

The Commission discussed the appropriateness and desirability of setting a pollutant reduction goal at the following meetings:

- April 22, 2008 presentation by Robert B. Jackson, Faculty Director, Center on Global Change, and Professor of Biology and Environmental Sciences, Duke University on the results of the Intergovernmental Panel on Climate Change in the context of creating a greenhouse gas emissions reduction goal for the State of North Carolina (discussed on p. 83 of this report).
- January 13, 2009 discussion by Commission on whether to set a goal to reduce State greenhouse gas emissions.

The Commission also heard presentations on regional approaches to establishing greenhouse gas emissions reduction goals at the following meetings:

- November 27, 2006 discussion of the Northeast Regional Greenhouse Gas Initiative (RGGI) by Franz T. Litz, Climate Change Policy Coordinator, New York State Department of Environmental Conservation (discussed on pp. 64-65 of this report).
- January 13, 2009 presentation of the report "New Climate World: Integrating State and Regional Programs into an Emerging Federal System for Greenhouse Gas Regulation" by Robert B. McKinstry, Senior Advisor, Center for Climate Strategies (discussed on p. 67-68 of this report).

Organization and participation in a regional climate change forum in the Southeast:

Section 6 of S.L. 2005-442 authorized the Commission to "work cooperatively with other state and national governments to organize a forum on global climate change, including its causes, impacts, challenges, and opportunities in the southeastern United States. The Commission may also work cooperatively with other State agencies with respect to the agencies' areas of responsibilities regarding greenhouse gas emissions and climate change."

The Commission was not directly involved in the organization of a forum on global climate change in the southeast, but actively solicited information on activities taking place in other states in the Southeast and mid-Atlantic region, as follows:

November 14, 2008

Glen Andersen, Program Principal with the National Conference of State Legislators Environment, Energy, and Transportation Program, provided an overview of various reports on climate change issued by the National Conference of State Legislators.

Mr. Andersen's presentation is available online at the following link: Glen Andersen, Program Principal, National Conference of State Legislators, Environment, Energy, and Transportation Program

See also the following presentations related to climate change-related activities taking place in other Southeast states:

- January 16, 2008 presentation on emissions reduction goals and standards in the state of Maryland by George S. "Tad" Aburn Jr., Director, Air and Radiation Management Administration, Maryland Department of the Environment (discussed on p. 66-67 of this report).
- January 16, 2008 presentation on adaptation to the effects of climate change in the state of Maryland by Kenneth A. Colburn, Senior Consultant with the Center for Climate Strategies and Bill Dougherty, Senior Scientist with the Center for Climate Strategies, (discussed on pp. 67-68 of this report).
- November 17, 2009 summary of "Southern Regional Economic Assessment of Climate Policy Options and Review of Economic Studies of Climate Policy" completed for the Southern Governor's Association, presented by Thomas Peterson, President, Center for Climate Strategies (presented on pp. 37-39 of this report).

In February 2008, the Commission held its business meeting as part of the Emerging Issues Forum entitled: "North Carolina's Energy Futures." The members of the Commission also took part in a number of additional conferences and proceedings related to climate change in the Southeast.

FINDINGS

Findings of Commission adopted by resolution:

On February 11, 2008, the Commission met as part of the Emerging Issues Forum entitled "*North Carolina's Energy Futures*." One of the invited speakers at the Commission was Dr. Rajendra Pachauri, Nobel Prize Winner and Chair of the Intergovernmental Panel on Climate Change. Following Dr. Pachauri's presentation, the Commission adopted by resolution the following findings:

1. **Climate change is real.**

2. **Human activity is a factor in that change.**

3. **The Commission should move forward to address the issues faced by the State.**

Endorsement of Findings by the U.S. Global Change Research Program:

The Commission generally endorses the following findings contained in the U.S. Global Change Research Program's 2009 publication "*Global Climate Change Impacts in the United States*," as follows:[34]

Key findings:[35]

1. **Climate changes are underway in the United States and are projected to grow.**
    a. Climate-related changes are already observed in the United States and its coastal waters. These include increases in heavy downpours, rising temperature and sea level, retreating glaciers, thawing permafrost, lengthening growing seasons, lengthening ice-free seasons in the ocean and on lakes and rivers, earlier snowmelt, and alterations in river flows.
    b. These changes are projected to grow.

2. **Widespread climate-related impacts are occurring now and are expected to increase.**
    a. Climate changes are already affecting water, energy, transportation, agriculture, ecosystems, and health.
    b. These impacts are different from region to region and will grow under projected climate change.

[34] Global Climate Change Impacts in the United States. Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009. Online: www.globalchnage.gov/usimpacts.

[35] Id at 13. The U.S. Global Change Research Program made 10 key findings, 8 of which have been endorsed by this Commission. This Commission did not adopt key findings #1(Global warming is unequivocal and primarily human-induced) and #10 (Future climate change and its impacts depend on choices made today) because this Commission had previously adopted findings on climate change and its relationship to human activity.

3. **Climate change will stress water resources.**
    a. Water is an issue in every region, but the nature of the potential impacts varies.
    b. Floods and water quality problems are likely to be amplified by climate change in most regions.

4. **Crop and livestock production will be increasingly challenged.**
    a. Agriculture is considered one of the sectors most adaptable to changes in climate. However, increased heat, pests, water stress, diseases, and weather extremes will pose adaptation challenges for crop and livestock production.

5. **Coastal areas are at increasing risk from sea-level rise and storm surge.**
    a. Sea-level rise and storm surge place many U.S. coastal areas at increasing risk of erosion and flooding, especially along the Atlantic and Gulf Coasts, Pacific Islands, and parts of Alaska.
    b. Energy and transportation infrastructure and other property in coastal areas are very likely to be adversely affected.

6. **Threats to human health will increase.**
    a. Health impacts of climate change are related to heat stress, waterborne diseases, poor air quality, extreme weather events, and diseases transmitted by insects and rodents.
    b. Robust public health infrastructure can reduce the potential for negative impacts.

7. **Climate change will interact with many social and environmental stresses.**
    a. Climate change will combine with pollution, population growth, overuse of resources, urbanization, and other social, economic, and environmental stresses to create larger impacts than from any of these factors alone.

8. **Thresholds will be crossed, leading to large changes in climate and ecosystems.**
    a. There are a variety of thresholds in the climate system and ecosystems. These thresholds determine, for example, the presence of sea ice and permafrost, and the survival of species, from fish to insect pests, with implications for society. With further climate change, the crossing of additional thresholds is expected.

<u>Findings specific to the Southeast region:</u>[36]

9. **Projected increases in air and water temperatures will cause heat-related stresses for people, plants, and animals.**
    a. Effects of increased heat include more heat-related illness; declines in forest growth and agricultural crop production due to the combined effects of heat stress and declining soil moisture; declines in cattle production; increased buckling of pavement and railways; and reduced oxygen levels in streams and lakes, leading to fish kills and declines in aquatic species diversity.

[36] Id. at 111-116.

10. **Decreased water availability is very likely to affect the region's economy as well as its natural systems.**
    a. Increasing temperatures and longer periods between rainfall events coupled with increased demand for water will result in decreased water availability.

11. **Sea-level rise and the likely increase in hurricane intensity and associated storm surge will be among the most serious consequences of climate change.**
    a. Low-lying areas, including some communities, will be inundated more frequently – some permanently – by the advancing sea. Current buildings and infrastructure were not designed to withstand the intensity of the projected storm surge, which would cause catastrophic damage.
    b. If sea-level rise increases at an accelerated rate (dependent upon ice sheet response to warming) a large portion of the Southeast coastal zone could be threatened.

12. **Ecological thresholds are likely to be crossed throughout the region, causing major disruptions to ecosystems and to the benefits they provide to people.**

13. **Quality of life will be affected by increasing heat stress, water scarcity, severe weather events, and reduced availability of insurance for at-risk properties.**

Findings submitted by Commission Members:[37]

General Findings:

1. Within the scientific community, there exists a level of consensus on climate change indicating that it presents a threat to the future economic health of North Carolina, the physical well-being of its residents, and its natural resources.

2. Failing to act and ignoring impending climate change will result in significant impacts to the State's environment, economy, infrastructure, and society.

3. According to Dr. Pachauri, leaders need to start reducing carbon emissions by 2015 at the latest.

4. North Carolina has been a national leader in energy conservation and environmental stewardship, including the areas of energy efficiency requirements and investments, renewable energy investments, and natural resource conservation, but more can be done. Significant opportunities remain to reduce greenhouse gas emissions statewide, especially from major contributors of greenhouse gas emissions, including electricity production,

[37] Based on comments submitted and discussed by Commission members between February and May 2010. For information on how the Commission's findings were developed, please see the discussion on pages 7-9 of this report entitled "How to Interpret the Commission's Actions on this Report."

transportation, building construction and operation, and the residential and consumer sectors.

5. Full adoption and implementation of the CAPAG recommendations was estimated to reduce gross greenhouse gas emissions by approximately 47% from 256 million metric tons of CO2e in the reference case forecast to 137 million metric tons of CO2e by 2020, or within one percent of 1990 levels.

6. Most of the LCGCC recommendations adopted in 2007 and many of the CAPAG recommendations have been implemented at some level, and the framework for implementing others is in place.

7. The General Assembly is justified in taking further action aimed at reducing greenhouse gas emissions, increasing sequestration to sinks, promoting economic opportunities afforded by climate change, and preparing to adapt to the effects of climate change.

8. Actions to reduce greenhouse gas emissions will reduce North Carolina's reliance on foreign sources of energy, lead to the development of technology, attract new businesses to North Carolina, and increase energy efficiency throughout the State, resulting in benefits to the economy and to individual businesses and residents.

9. In devising measures to achieve reduction of greenhouse gas emissions, North Carolina must strive to not disadvantage North Carolina businesses as compared to businesses in other states.

10. Policies pursued and actions taken by North Carolina will, in concert with complementary policies and actions by other states and the federal government, substantially reduce the global levels of greenhouse gas emissions and the impacts of those emissions as well as directly benefit the State and local governments, businesses, and the State's citizens.

11. The State should take advantage of the enormous level of expertise in the public and private sectors in the State in developing plans to address climate change.

12. Climate change and its impacts occur over long time scales, so the State should address climate change in its long-term planning programs.

13. According to the Stern Review of the Economics of Climate Change, every dollar invested in addressing greenhouse gas emissions will save five dollars.[38]

<u>North Carolina's contribution to greenhouse gas emissions:</u>

[38] *The Economics of Climate Change. The Stern Review*. By Nicholas Stern. Pp. 692. (Cambridge University Press, Cambridge, 2007.) Online at: http://www.hm-treasury.gov.uk/stern_review_report.htm.

14. Greenhouse gas emissions in the State in 1990 were approximately 54 million tons of carbon dioxide equivalent (CO2e), and are expected to increase to about 98 Million metric tons by 2020, or by approximately 83% on a consumption basis.

15. North Carolina's annual CO2 emissions are increasing faster than those of any other state except Arizona.

16. North Carolina ranks 24th in the world for greenhouse gas emissions if one regards each state in the U.S. as if it were a country, and then compares all states and countries.

Impacts to North Carolina:

17. Climate model forecasts suggest an increase in temperature locally to range from 4.5° F under a lower emissions scenario to 9° F under a higher emissions scenario over the next century. The rising temperatures will affect energy use, public health, recreation, and even the types of plants that grow in the State.

18. Increased temperatures are expected to worsen air quality. Two pollutants of chief concern are ozone and fine particulate matter, both of which can enter the lungs and cause health problems.

19. The North Carolina Coastal Resources Commission's Science Panel on Coastal Hazards predicted that by 2100, North Carolina will experience sea-level rise of 0.4 – 1.4 meters (15 – 55 inches) with a likely rise of 1 meter (39 inches). The Panel recommends "that a rise of 1 meter (39 inches) be adopted as the amount of anticipated rise by 2100, for policy development and planning purposes."

20. With more than 300 miles of shoreline along the Atlantic Ocean and more than 6,000 miles of tidal and estuarine shoreline, North Carolina is particularly vulnerable to the threat posed by sea-level rise.[39] Sea-level rise would have detrimental and costly effects, including significant inundation, erosion, flooding, property damage, and increased storm surge.

21. Climate change will put additional strain on both the quality and quantity of already stressed water resources.

Adaptation:

22. The State must seek to better understand and adapt to climate change impacts in order to protect the integrity of the State's natural resources and maximize the economic utilization of these resources without jeopardizing the long-term character of these resources.

[39] CCSP, 2009: Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region. A report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [James G. Titus (Coordinating Lead Author). U.S. Environmental Protection Agency. Online at: http://www.climatescience.gov/Library/sap/sap4-1/final-report/default.htm#finalreport.

23. Many State and federal policies are not coordinated, resulting in reduced effectiveness.

24. Improved data and monitoring, particularly at the local level, will help policy makers.

25. The State should act proactively to adapt.

Electricity and Power Generation:

26. Combustion of coal is one of the predominant contributors of carbon dioxide into the earth's atmosphere.

27. Coal is the most carbon intensive fuel and the dominant source of North Carolina's electricity, comprising approximately (59%) of all electricity generated in the State in 1990, and is projected to produce as much as 54% of the electricity generated in the State in 2020.

28. Coal combustion has a 67% energy waste factor, delivering only approximately 33% electricity.

29. Integrated gasification combined cycle (IGCC) has limited potential in North Carolina due to limited options for carbon storage in the State.

30. North Carolina imports virtually all of its energy, exporting from the State economy over $17 billion per year for petroleum, natural gas, coal, and nuclear material.[40]

31. Nuclear power may be an important option for the State to consider as a possible power generation alternative, based on its reliable generation, reduced emissions of traditional air pollutants, and minimal emissions of greenhouse gases.

Energy efficiency, conservation, and renewable energy:

32. In 2007, the General Assembly enacted Senate Bill 3 (S.L. 2007-397) the first Renewable Energy and Energy Efficiency Portfolio Standard (REPS) in the Southeastern United States, in order to promote the development of renewable energy and energy efficiency in the State. Under the Act, electric power providers in the State must use an increasing percentage of renewable energy resources and employ energy efficiency programs to meet a minimum of 12.5% of the needs of the State's retail electricity customers by 2021.

33. According to reports generated for the Utilities Commission, North Carolina can achieve a 14% reduction in electricity consumption at no cost and meet a 10% renewable energy portfolio standard by 2017 at no increased cost in utility rates.

[40] North Carolina Energy Policy Council and State Energy Office. North Carolina State Energy Report, March 2010. Available on Commission website at the following link: State Energy Report 2010.

34. North Carolina ranked 46th in the nation on energy efficiency spending per capita in 2003.

35. Energy efficiency represents the least-cost opportunity to generate additional electricity cost-effectively, with little or no additional greenhouse gas emissions.

36. Changes in the guiding language for electric utilities in the State may result in increased investments in renewable energy, energy efficiency, and conservation.

37. States that invest in market transformation and technology development programs have enhanced job growth and economic development; a focus on energy efficiency and renewable energy would provide additional benefits to the public such as energy cost savings and reduced greenhouse gas emissions.

38. According to the American Council for an Energy-Efficient Economy (ACEEE), North Carolina stands to gain 38,000 net jobs in 2025 compared to the reference case forecast by making significant investments in energy efficiency technologies and practices. These activities would also save consumers a net $3.6 billion cumulative in lower energy and water bills.

39. While North Carolina's Renewable Energy Portfolio Standard, G.S. 62-133.8, has been interpreted to define any combined heat and power (CHP) system upgrade as an energy efficiency measure, by statute the rate paid to non-utility generators for electricity generated by combined heat and power is only avoided cost. Some states have established market-based rates for electricity that make combined heat and power more attractive to non-utility generators.

40. One additional reason that CHP is not installed more frequently is that G.S. 62-110.2 prohibits the sale of excess hot water and steam to a neighboring facility unless those private contracts are subject to regulation by the North Carolina Utilities Commission.

41. Currently, North Carolina has the potential for a substantial presence of CHP generation. CHP and other energy recycling technologies represent an opportunity to generate additional electricity and thermal energy cost-effectively using the same amount of fuel, with little or no additional greenhouse gas emissions.

42. The utility purchase price for electricity from renewable sources is low in comparison to other states where generation is expanding rapidly.

43. Interconnection requirements vary for facilities that are located in municipal and cooperative utility service territories, and interconnection standards require redundant electrical controls that are not included in national model codes. The costs of these redundant electrical controls can eliminate the cost-effectiveness of smaller projects.

44. According to the State Energy Office, energy efficiency and conservation programs will result in a net increase in jobs in North Carolina, and cost less per kWh saved ($0.03)

than construction of new power plants that would otherwise have to be build to meet increased demand ($0.07).

45. North Carolina has significant undeveloped alternative energy potential from solar thermal, solar photovoltaic, natural gas from anaerobic decomposition of organic material, and wind.

46. In its report entitled "Evaluation of the Natural Resource Impacts of the Woody Biomass Industry in North Carolina" the EMC found that without “proper protections,” the use of woody biomass for energy can have significant impacts in the areas of “land use…, soil nutrient deterioration, water quality degradation, destruction of wildlife habitat, ecosystem disruption, air quality and ash deposition.” The report includes the following findings:
    a. The use of woody biomass for energy production has a broad range of potential impacts.
    b. The differing interpretations of the statutory definition of “renewable energy resource” as applicable to biomass results in uncertainty and confusion.
    c. There are currently no standards or guidelines that require the sustainable management of the utilization of woody biomass.
    d. Current funding sources for forestry and landowner incentive programs may be inadequate.
    e. State policy on woody biomass utilization for electricity production should apply equally to utilization of woody biomass for biofuels production.
    f. Current data collection is inadequate to inform state policy makers and regulators.
    g. Oversight of the impacts of the woody biomass market is currently spread across a number of State entities and agencies.

<u>Buildings Codes and Building Practices:</u>

47. Buildings account for over 40% of electricity used in the State.

48. North Carolina's residential sector consumed 715,851 billion Btus of energy in 2007. The commercial sector consumed 573,467 billion Btus in the same year.

49. Investments in energy saving technology and other green building techniques will result in lower lifecycle building costs than conventional building construction and operating practices.

50. A 30% improvement in U.S. building efficiency would reduce energy bills by $75 million in 15 years and eliminate the need for 80 new nuclear power plants over the next 20 years.

51. If enacted, North Carolina House Bill 1344, “Green Building Code,” would require commercial and residential buildings in North Carolina to meet the latest edition of the standards in the International Code Council’s International Energy Conservation Code (IECC).

52. North Carolina has already enacted legislation to require energy and water efficiency improvements in new and retrofitted state buildings, but there is room to go further. For example, a recent analysis identified ten no-cost or low-cost energy efficiency investments that could cut North Carolina Central University's energy costs by 65%, saving the university $13 million over five years. These investments would avoid the emission of 27,000 tons of carbon dioxide per year.

53. Over 50% of state spending on electricity is accounted for by the UNC system. These public universities face a major financial hurdle limiting their ability to invest in energy efficiency. Current law requires that all utility cost savings be returned to the State's General Fund at the end of each fiscal year. This requirement creates a disincentive for the universities to invest in conservation and efficiency. House Bill 695, introduced last year, would allow universities in the UNC system to keep savings generated from efficiency improvements for reinvestment in additional energy and water saving measures.

Carbon markets and carbon regulation:

54. Uncertainty in the price of carbon and possible carbon regulation has made it difficult for public and private entities to develop action plans to address climate change.

55. Clarity and certainty in the price of carbon at the federal and international level will provide stability in carbon markets and promote development, investment, and innovation.

56. Cap-and-trade regulation of greenhouse gas emissions is most effective when implemented on a federal level.

57. In the international community there is general acceptance of cap-and-trade for carbon regulation, and in the private sector there is already significant activity as greenhouse gas emitters seek arrangements for long-term access to carbon offset markets.

Carbon sequestration and carbon offsets:

58. North Carolina farmers may have significant economic opportunities to participate in carbon markets by offering carbon sequestration services or emissions offsets.

59. North Carolina is losing land forestlands and agricultural lands. Between 1990 and 2002, one million acres of forestry land were lost to non-forest use. Farm acreage also decreased by more than two percent from 2000 to 2004. Some policies to address climate change may help these sectors retain land.

60. North Carolina farmers may have significant economic opportunity for carbon sequestration and soil improvement through bio-char; however, additional research is needed to better understand this opportunity.

61. North Carolina businesses and local governments may have significant economic opportunity (e.g., through profit or fuel price stabilization) for biodiesel production from micro-algae, however, additional research is needed to better understand this opportunity.

Animal Waste Management:

62. Manure management activities are the largest contributor to the State's agricultural greenhouse gas emissions, contributing approximately 50%.

63. Primary emissions from manure management are methane (CH4), which is 19 times more potent than carbon dioxide, and nitrous oxide (N2O), which is 281 times more potent than carbon dioxide.

64. Swine producers can generate income by capturing methane emissions and using them to produce energy, using anaerobic digestion technology. There is also an emerging market for carbon offsets, emissions reductions achieved in industries unlikely to be regulated by climate policy. Nationally, agricultural and landfill methane capture projects represent the largest supply of carbon offsets and the greatest number of projects.

Transportation and Land Use:

65. The transportation sector consumed 27% of total energy used in the State and accounted for one-third of total energy-related CO2 emissions in 2000.

66. Annual vehicle miles traveled, and related greenhouse gas emissions, are increasing at a rate faster than the population due to low-density, uncoordinated land use.

67. Local planners often identify road building as the most powerful factor predicting the location and density of future growth. Currently, DOT long-range planning directly extrapolates existing growth patterns, which are urban sprawl patterns, with little or no public transportation or consideration of increasing pedestrian and bicycle accessibility. As a result, DOT constructs and expands roads based on plans that support and promote increased urban sprawl.

Public Awareness and Education:

68. In a public attitudes survey conducted by the Division of Coastal Management of DENR in 2009, 75% of all respondents believe that sea-level rise is occurring in North Carolina, but only 38% of the respondents believe they will be affected. 66% of the respondents believe the State should be taking steps now to plan and prepare for sea-level rise.

69. The State’s museums, aquariums, zoos, and other facilities are providing information on the impacts of climate change on the State, but more public information and outreach is still needed.

70. There is a shortage of trained professionals to implement energy efficiency and renewable energy projects in the State; and the general education and awareness of the public and business leaders is inadequate to participate effectively in projects to increase energy efficiency.

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PREVIOUSLY APPROVED RECOMMENDATIONS

At its February 22, 2007 meeting, the Legislative Commission on Global Climate Change (Commission) adopted the following proposals for inclusion as recommendations in the Commission's Interim Report.

1. CAPAG Residential Commercial and Industrial Mitigation Option 2 (RCI-2): Expand Energy Efficiency Funds.

2. CAPAG Residential Commercial and Industrial Mitigation Option 3 (RCI-3): Energy Efficiency Requirements for Government Buildings, with the addition of reasonable language from Commission member Bob Slocum, North Carolina Forestry Association, who supplied the following two options on 27 February 2007: "Adherence to energy related guidelines in LEED+ or Green Globes standards." OR "For the purposes of determining LEED certification, credit may be awarded for the use of wood-based materials derived from all credible sources, including the Sustainable Forestry Initiative Program, the Canadian Standards Association, the American Tree Farm System and other credible certified sources programs."

3. CAPAG Residential Commercial and Industrial Mitigation Option 4 (RCI-4): Market Transformation and Technology Development Programs.

4. CAPAG Residential Commercial and Industrial Mitigation Option 5 (RCI-5): Improved Appliance and Equipment Efficiency Standards.

5. CAPAG Residential Commercial and Industrial Mitigation Option 6 (RCI-6): Building Energy Codes.

6. CAPAG Residential Commercial and Industrial Mitigation Option 7 (RCI-7): "Beyond Code" Building Design Incentives and Targets, Incorporating Local Building Materials and Advanced Construction.

7. CAPAG Residential Commercial and Industrial Mitigation Option 8 (RCI-8): Education (Consumer, Primary/Secondary, Post-Secondary/Specialist, College and University Programs).

8. CAPAG Residential Commercial and Industrial Mitigation Option 11 (RCI-11) Residential, Commercial, and Industrial Energy and Emissions Technical Assistance and Recommended Measure Implementation.

9. Energy Supply Mitigation Options 3 and 9 (ES-3 and ES-9): Removing Barriers and Providing Incentives to Combined Heat and Power (CHP) and Clean Distributed Generation (DG). Commission Counsel will send a letter to the North Carolina Utilities Commission (NCUC) on behalf of the LCGCC to request that the NCUC study issues related to interconnection that are barriers to the development of CHP systems. In particular, the LCGCC will request that the NCUC open a docket for the purpose of

establishing an interconnection standard for the power interval between 100 kilowatts and the FERC standard (2 megawatts or 20 megawatts, needs clarification).

10. CAPAG Cross Cutting Issues Mitigation Options 1, 2, and 3 (CC-1, CC-2, and CC-3): Greenhouse Gas Inventories and Forecasts (I&F), State Greenhouse Gas Reporting, and State Greenhouse Gas Registry, with inclusion of "possible consequences" in Mitigation Option CC-1 as recommended by Commission member Dr. Stan Riggs.

11. CAPAG Cross Cutting Issues Mitigation Option 4 (CC-4): State Climate Public Education and Outreach.

12. CAPAG Cross Cutting Issues Mitigation Option 5 (CC-5): State Climate Change Adaptation Strategy, with the inclusion of the following three additions:
    a. Include the State Hazard Mitigation Planning Group (Dr. Boyles).
    b. Address major storm/critical events (Dr. Riggs).
    c. Address coastal hazards disclosure (Rep. Harrison).

13. CAPAG Cross Cutting Issues Mitigation Option 6 (CC-6): Options for State Greenhouse Gas Goals or Targets. The Commission will establish a State greenhouse gas emissions goal when the Commission resumes meeting after the 2007 Session of the General Assembly adjourns.

14. The Commission endorses concept of a Renewable Energy Portfolio Standard (REPS) (similar to that described in ES-2) without setting a specific target percentage.

15. Management of Hog Manure proposal made by Commission member Tim Profeta (NC Commission Member Additional Option 8), as modified on motion of Commission member Dr. Riggs that subsidies be provided for lagoon conversion to achieve greenhouse gas reductions. Mr. Profeta provided draft legislation on this proposal.

16. The Commission recommends that legislation be enacted to change net metering regulations to allow more use as proposed by Commission member Dr. Dee Eggers (NC Commission Member Additional Option No. 17). Dr. Eggers provided draft legislation on this proposal.

17. The following statement will be included in the report of the Commission on motion of Commission member Stephen Smith: "The Commission acknowledges that substantial greenhouse gas reductions can be achieved in the transportation sector. The Commission will continue to study ways to achieve these reductions."

RECOMMENDATIONS FOR FUTURE CONSIDERATION[41]

The General Assembly, through a new permanent Commission or through other existing oversight bodies, should consider the following policy alternatives to potentially mitigate climate change impacts, adapt to the changing climate, and seek to provide long-term benefits to the economy and citizens of North Carolina:

Adaptation:

1. Develop a comprehensive Climate Change Adaptation Plan (CCAP) that includes the following elements:
    a. Designation of a single lead agency to coordinate efforts, but includes the full involvement and cooperation by all other State agencies.
    b. Developed in close coordination with State and federal agencies, commissions, local governments, non-profit organizations, and universities
    c. Provides opportunities for public involvement.
    d. Inventories existing federal, State, local programs, and plans that address adaptation to climate change.
    e. Develops and adopts climate adaptation goals and principles.
    f. Identifies policy recommendations that will protect the long-term environmental and economic health of the State, and set priorities for adaptation that will minimize adverse impacts of climate change.
    g. Identifies methods to better coordinate and integrate State natural hazard planning and regulatory programs.
    h. Conducts an economic analysis to determine the potential costs and benefits of a "status quo" alternative and of implementing recommendations proposed in the CCAP.
    i. Prioritizes recommendations in the plan based on the certainty of impact, and minimization of adverse impacts to citizens, ecosystems, and local economies.
    j. Focuses on adaptation needs resulting from sea-level rise, as well as changes in rainfall and temperature that could alter traditional industries such as agricultural, forestry, and fishing.
    k. Should consider impacts to water quantity and water quality.
    l. Should evaluate the sufficiency of current funding resources related to adaptation and mitigation.
    m. Consider whether to establish a North Carolina hazard mitigation fund.
    n. Pursue federal funding of southeast regional adaptation study.
    o. Should provide significant opportunities for public outreach and education, including the following:
        i. Providing maps of sea-level rise estimates to local governments, realtors, conservation organization, and the public via NC One Map.

[41] For information on how the Recommendations for Future Consideration were developed, please see the discussion on pages 7-9 of this report entitled "How to Interpret the Commission's Actions on this Report."

ii. DENR and the University system should jointly develop a framework for a publicly available database to make economically and environmentally prudent adaptation decisions (mapping, surveys, inventory, and monitoring stations within the North Carolina coastal zone).

p. Study possible policy approaches, including, but not limited to:
   i. Consider the findings and recommendations that resulted from the Beach Management Summit, held in March 2009 in Beaufort, North Carolina hosted by the North Carolina Coastal Federation and the UNC Center for the Study of Natural Hazards and Disasters.[42]
   ii. Increase protection of coastal wetlands and their ability to migrate inland by directing the CRC to prohibit new bulkheads and hard structures in "critical wetland protection areas" or "areas of environmental concern."
   iii. Consider utilizing the consistency provisions of CAMA and federal Coastal Zone Management Act to help resolve conflicts between existing policies and programs.
   iv. Require DCM to report annually on the loss of coastal wetlands due to estuarine shoreline hardening and other uses.
   v. Require applicants for permits to harden the estuarine shoreline outside of areas of environmental concern to mitigate their impacts on wetlands.
   vi. Direct local governments in the coastal plain to develop plans considering how they will adapt to potential changes in tax revenue based on projected increases in sea level over the next century.
   vii. Authorize the use of coastal management grants to local governments to plan for and adapt to sea-level rise.
   viii. Mechanisms to promote the use of "living shoreline" management methods on estuarine shorelines, and explore incentives and regulatory changes that would encourage the use of climate-ready erosion control strategies.
   ix. Direct the North Carolina Albemarle/Pamlico National Estuary Program to review the U.S. EPA's proposed "Climate Ready Estuaries" program and plan for and adapt to climate change and sea-level rise in its work.
   x. Evaluate the disclosure of coastal hazards to prospective purchasers of coastal property.

Energy Efficiency and Conservation:

2. Develop and implement more comprehensive lifecycle cost calculations for energy consumption by new buildings than are currently required under State law.

3. Provide additional financial support and incentives for public and private investments in conservation and efficiency.

[42] A summary of the North Carolina Coastal Federation 2009 Beach Summit findings can be found on the Commission's website at the following link: Beach Summit Findings.

4. Increase implementation and enforcement of existing policies that promote conservation and efficiency.

5. Continue to invest in job creation through conservation and efficiency programs.

Electricity and Power Generation:

6. Develop a comprehensive permitting system for wind energy facilities. SB 1068 (Permitting of Wind Energy Facilities) was introduced during the 2009 Session of the General Assembly).

7. CAPAG Energy Supply Option ES-5: Legislative changes to address environmental and other factors:
    a. Evaluate and revise Utilities Commission guiding language for electric utilities to significantly increase their investment in conservation, efficiency, and renewable energy sources.
    b. Allow utilities to make higher profit from kilowatts saved than kilowatts generated, e.g., through efficiency and conservation programs.
    c. Consider the inclusion of a carbon adder (see CAPAG ES-5) requiring utilities to consider potential future carbon costs when developing their biennial integrated resource plans (IRPs).

8. Encourage or provide incentives for switching from electric to gas appliances, or vice versa, due to differences in delivered efficiency, if potential benefits are demonstrated.

9. Simplify the net-metering sign up process and increase the kWh purchase price for energy from renewable sources under that program.

10. Remove remaining barriers for interconnection.

11. Develop policies to prohibit the construction of new coal-fired power plants that do not capture and sequester carbon dioxide, and set a timetable to phase out existing coal plants that do not capture and sequester carbon dioxide.

12. Make changes to the State renewable energy portfolio standard (REPS) to allow greater use of combined heat and power (CHP) and energy recycling technologies.

13. CAPAG Energy Supply Options ES-3 and ES-9: Remove the barriers to implementation and permitting of energy recycling.

14. Authorize the sale of thermal energy including hot water and steam, to neighboring facilities by revising NCGS § 62-110.2 to authorize the sale of heat, hot water or steam by a third party non-utility up to a cap based on the quantity of energy sold.

15. Provide additional incentives to encourage demand side management (CAPAG RCI-1).

16. Expand existing tax credits and enact new tax incentives to promote increased utilization of combined heat and power.

17. Direct the Utilities Commission to require utilities to investigate and develop energy efficiency (demand side management) initiatives to the maximum cost-effective level, including technologies such as the introduction of smart metering devices for all residential and commercial customers.

18. Consider the feasibility and suitability of establishing a feed-in rate or tariff to be paid to renewable energy producers by electric power suppliers for each kilowatt-hour of energy produced over a fixed term.

19. CAPAG Energy Supply Option ES-7: Public Benefits Fund. Evaluate the potential benefits of a public benefit charge or independent administrator for energy efficiency activities. (House Bill 1050 (Independent Energy Efficiency Administrator) was introduced during the 2009 Session of the General Assembly and the Utilities Commission considered a similar proposal entitled "NC SAVE$ ENERGY" in Docket No. E-100 Sub 120).

20. Ensure sustainable utilization of biomass by clarifying the definition of 'renewable energy resource' in relation to woody biomass" and "require the adoption of forest management guidelines or adoption of third party sustainability standards" utilizing the comments and recommendations provided by the EMC in its report "*Evaluation of the Natural Resource Impacts of the Woody Biomass Industry in North Carolina.*"[43]

21. The General Assembly should direct DENR to examine the positive and negative environmental impacts of increased utilization of biomass five years after implementation of SB 3, or five years after the first commercial production of cellulosic biofuels in the State, whichever comes first.

22. Examine the desirability and feasibility of developing and encouraging new nuclear baseload electric supply in the State.

Development and Transportation:

23. Consideration of additional CAPAG Transportation and Land Use Options (TLU-1 through TLU-13).

24. Change DOT long-range planning for new road construction and road-widening so it reduces annual vehicle miles traveled and anticipates population densities that can support public transportation.

[43] See EMC Report, *supra* note 25.

25. Support a mandate to significantly improve vehicle fuel efficiency in state and local fleets and encourage alternative fuel vehicles, including compressed natural gas vehicles.

26. Continue to promote transportation initiatives that reduce greenhouse gas emissions. Examples include efforts to promote transit use and bike and pedestrian accessibility; programs to reduce vehicle miles traveled; and green vehicle purchase incentives.

27. Consider the implementation of a low emission vehicle program that is functionally equivalent to the most stringent vehicle emissions program in the country. The Commission acknowledges the recent actions by the EPA and the National Highway Traffic Safety Administration to finalize new Corporate Average Fuel Economy (CAFE) standards and the first-ever Clean Air Act greenhouse gas standards for passenger vehicles and light trucks that will apply to model year 2012 to 2016 vehicles. At this time, the California Air Resource Board (CARB) is in the process of considering amendments to its low emission vehicle standards to further reduce greenhouse gas emissions for model year 2017 to 2020 vehicles.

<u>Building practices and Standards:</u>

28. CAPAG Residential, Commercial, and Industrial Option RCI-6: Require the Building Code Council to adopt the latest published version of the International Building Code, in particular the International Energy Conservation Code (IECC), within six months of its publication.

29. Require new, renovated, and expanded commercial and government buildings to comply with the latest version of the IECC.

30. CAPAG Residential, Commercial, and Industrial Option RCI-7: Consider development of "beyond code" building design incentives and targets, incorporating local building materials and advanced construction.

31. Expand existing tax credits for energy efficiency and enact new tax incentives that would promote the construction of energy efficient houses, including modular home and manufactured housing.

<u>Greenhouse Gas Reduction Plan and Emissions Tracking:</u>

32. Adopt a resolution supporting federal legislation related to a national cap on greenhouse gas emissions and comprehensive legislation on climate change and energy.

33. CAPAG Cross-Cutting Issues Options CC-1, CC-2, and CC-3: Develop greenhouse gas inventory and forecast, reporting, and registry. This registry should include emission reductions from renewable energy generation, energy efficiency programs, and other low carbon energy and transportation related measures.

34. Encourage and promote voluntary actions from corporations, individuals, government operations, and municipalities to reduce carbon emissions.

Agriculture/Forestry/Offsets:

35. Study the feasibility and advisability of establishing carbon offset credits program in State for agriculture and forestry practices.

36. Promote development of soil carbon and forest carbon sequestration opportunities in the State.

37. Support continued implementation of S.L. 2007-523 (Swine Farm Environmental Performance Standards), including consideration of the following options:
    a. increased financial support for the lagoon conversion program.
    b. expansion of the swine farm methane capture pilot program.
    c. Mandatory phase-out of existing lagoons that do not meet environmental performance standards.

38. Evaluate potential uses of biochar and microalgae.

39. CAPAG Agriculture, Forestry, and Waste Options AFW-11 and AFW-12: Promote policies that decrease greenhouse gas emissions associated with solid waste management.

Cross-cutting Issues/ Education/Outreach:

40. Encourage additional outreach to provide public education and technical assistance in each category.

41. Make maps, data, and other information related to climate change widely available.

42. Develop training and educational opportunities to improve awareness of climate change impacts, mitigation options, and adaptation measures.

LEGISLATIVE PROPOSALS

Based on the findings and recommendations listed above, the Legislative Commission on Global Climate Change recommends the following legislative proposals for consideration to the 2010 Session of the General Assembly:

1. **Legislative Proposal #1**: *An Act To Establish The North Carolina Commission On Climate Change And To Establish The Advisory Council To The North Carolina Commission On Climate Change, As Recommended By The Legislative Commission On Global Climate Change.*

2. **Legislative Proposal #2:** *An Act To Direct The Department Of Environment And Natural Resources To Develop The North Carolina Climate Change Adaptation Strategy, As Recommended By The Legislative Commission On Global Climate Change.*

3. **Legislative Proposal #3:** *An Act To Direct The Energy Policy Council To Identify, Study, And Recommend Policies To Significantly Increase Energy Efficiency And Conservation, Promote Renewable Energy Resources, And Reduce Carbon Emissions, As Recommended By The Legislative Commission On Global Climate Change.*

4. **Legislative Proposal #4:** *An Act To Direct The Department Of Agriculture And Consumer Services, The Department Of Commerce, And The Department Of Environment And Natural Resources To Evaluate The Carbon Sequestration Potential Of North Carolina's Agricultural Lands, Forestlands, And Other Working Landscapes; Natural And Working Landscapes In The State; To Study Other Opportunities To Develop Carbon Offsets Within The State; And To Study The Feasibility And Advisability Of Establishing A Carbon Offset Program In The State, As Recommended By The Legislative Commission On Global Climate Change.*

5. **Legislative Proposal #5:** *An Act To Appropriate Funds (1) To Establish The Coastal Adaptation Resources Mapping And Monitoring Program And (2) To Expand The North Carolina Environment And Climate Observing Network; In Order To Provide For Monitoring Of The Environmental Impacts Of Global Climate Change In North Carolina And For Improving Weather And Climate Data Collection In North Carolina, As Recommended By The Legislative Commission On Global Climate Change.*

6. **Legislative Proposal #6:** *An Act To Direct State Agencies To Review Their Environmental Programs And Recommend Whether The Environmental Programs Should Include Consideration Of Global Climate Change, As Recommended By The Legislative Commission On Global Climate Change.*

7. **Legislative Proposal #7:** *A House Resolution Requesting The President And The United States Congress To Adopt Legislation That Promotes Jobs And Innovative Energy Development, Strengthens National Energy And Economic Security, Positions The United States To Be An International Leader In The Field Of Clean Energy, And Addresses The Consequences Of Climate Change Without Preempting States' Rights To Control Emissions And To Promote Renewable Energy, As Recommended By The Legislative Commission On Global Climate Change.*

These legislative proposals were approved by the Commission at its May 6, 2010 meeting. The final text of each legislative proposal is listed in the following section.

A BILL TO BE ENTITLED

AN ACT TO ESTABLISH THE NORTH CAROLINA COMMISSION ON CLIMATE CHANGE AND TO ESTABLISH THE ADVISORY COUNCIL TO THE NORTH CAROLINA COMMISSION ON CLIMATE CHANGE, AS RECOMMENDED BY THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

The General Assembly of North Carolina enacts:

SECTION 1. Chapter 120 of the General Statutes is amended by adding a new Article to read:

"Article 12Q.

"North Carolina Commission on Climate Change.

"**§ 120-70.150. Commission established.**

The North Carolina Commission on Climate Change is established.

"**§ 120-70.151. Membership; cochairs; meetings; vacancies; quorum.**

(a) The North Carolina Commission on Climate Change shall consist of 15 members as follows:

(1) Five Senators appointed by the President Pro Tempore of the Senate.

(2) Five Representatives appointed by the Speaker of the House of Representatives.

(3) Five members from the executive branch to be appointed by the Governor.

(b) Members of the Commission shall serve at the pleasure of their appointing officers.

(c) The President Pro Tempore of the Senate shall designate one Senator to serve as Cochair, and the Speaker of the House of Representatives shall designate one Representative to serve as Cochair.

(d) Except as otherwise provided in this subsection, a legislative member of the Commission shall continue to serve for so long as the member remains a member of the General Assembly and no successor has been appointed. A legislative member of the Commission who does not seek reelection or is not reelected to the General Assembly may complete a term of service on the Commission until the day on which a new General Assembly convenes. A legislative member of the Commission who resigns or is removed from service in the General Assembly shall be deemed to have resigned or been removed from service on the Commission. Appointed members shall serve at the pleasure of their appointing officer. Any vacancy that occurs on the Commission shall be filled in the same manner as the original appointment.

(e) A quorum of the Commission shall consist of eight members.

"**§ 120-70.152. Powers and duties.**

(a) The North Carolina Commission on Climate Change shall have the following powers and duties:

(1) To study issues related to global climate change. This study may include consideration of any of the following:

a. Actions taken by the federal government, other states, and other nations regarding global climate change.

b. Economic opportunities that may arise from international, national, and state actions to address global climate change and the emerging carbon market.

c. Existing and potential impacts of global climate change on the citizens, natural resources, ecosystems, and economy of the State, including public health, the environment, agriculture, travel and tourism, recreation, coastal real estate, insurance, and other sectors of the economy.

d. Costs associated with actions taken by the State to address global climate change, including costs to individuals, households, local governments, businesses, educational institutions, agricultural operations, the State, and other institutions and sectors of the economy.

e. Benefits associated with actions taken by the State, the federal government, other states, and other nations to address global climate change, including benefits to individuals, households, local governments, businesses, educational institutions, agricultural operations, the State, and other institutions and sectors of the economy.

(2) To review changes in federal law related to global climate change.

(3) To review changes in technology related to global climate change.

(4) To review existing and potential State law related to global climate change and to determine whether modifications to State law related to global climate change are in the public interest.

(5) To undertake any additional studies related to global climate change as determined by the Cochairs, the President Pro Tempore of the Senate, the Speaker of the House of Representatives, or the Governor.

(6) To make reports and recommendations, including legislative proposals, to the General Assembly and the Governor from time to time as to any matter related to global climate change.

(b) The Commission may seek the assistance of the Advisory Council to the North Carolina Commission on Climate Change established by G.S. 120-70.157.

(c) The Commission may work cooperatively with other global climate change entities and State agencies with respect to their areas of responsibility regarding greenhouse gas emissions and global climate change.

"**§ 120-70.153. Additional powers.**

(a) The North Carolina Commission on Climate Change, while in the discharge of its official duties, may exercise all the powers provided for under the provisions of G.S. 120-19, and G.S. 120-19.1 through G.S. 120-19.4. The Commission may meet at any time upon the call of either Cochair, whether or not the General Assembly is in session. The Commission may meet in the Legislative Building or the Legislative Office Building upon the approval of the Legislative Services Commission.

(b) Notwithstanding any rule or resolution to the contrary, proposed legislation to implement any recommendation of the Commission regarding any study the Commission is authorized to undertake or any report authorized or required to be made by or to the Commission may be introduced and considered during any session of the General Assembly.

(c) The Commission may contract for consultants or hire employees in accordance with G.S. 120-32.02.

"**§ 120-70.154. Compensation and expenses of members.**

Members of the North Carolina Commission on Climate Change shall receive subsistence and travel expenses at the rates set forth in G.S. 120-3.1.

"**§ 120-70.155. Staffing.**

The Legislative Services Officer shall assign as staff to the North Carolina Commission on Climate Change professional employees of the General Assembly, as approved by the Legislative Services Commission. Clerical staff shall be assigned to the Commission through the offices of the Directors of the Legislative Assistants of the Senate and House of Representatives. The expenses of employment of clerical staff shall be borne by the Commission.

"**§ 120-70.156. Funding.**

From funds available to the General Assembly, the Legislative Services Commission shall allocate monies to fund the work of the North Carolina Commission on Climate Change.

"**§ 120-70.157. Advisory Council established.**

The Advisory Council of the North Carolina Commission on Climate Change is established.

"**§ 120-70.158. Powers and duties.**

(a) The purpose of the Advisory Council of the North Carolina Commission on Climate Change shall be to assist the Commission on Climate Change on matters requested by the Commission as the Commission fulfills its duties under G.S. 120-70.152 and G.S. 120-70.153.

(b) The authority granted to the Advisory Council shall be advisory in nature and in no way shall the Advisory Council be construed to have any regulatory authority.

"**§ 120-70.159. Membership; meetings; vacancies; quorum.**

(a) The Advisory Council of the North Carolina Commission on Climate Change shall consist of 24 members as follows:

(1) The President of Duke Power or the President's designee.

(2) The President of Progress Energy or the President's designee.

(3) The President of the North Carolina Chamber or the President's designee.

(4) The President of the Manufacturers and Chemical Industry Council of North Carolina or the President's designee.

(5) The President of the North Carolina Farm Bureau Federation or the President's designee.

(6) The President of the North Carolina Forestry Association or the President's designee.
(7) The Southeast Director of Climate and Air Policy of Environmental Defense or the Southeast Regional Director's designee.
(8) The Executive Director of the Southern Alliance for Clean Energy or the Executive Director's designee.
(9) The Executive Director of the North Carolina Coastal Federation or the Executive Director's designee.
(10) The Executive Director of the North Carolina Conservation Council or the Executive Director's designee.
(11) The Director of the Nicholas Institute for Environmental Policy Solutions at Duke University or the Director's designee.
(12) The Dean of the College of Agriculture and Life Sciences at North Carolina State University or the Dean's designee.
(13) The Dean of the School of Agriculture and Environmental Sciences at North Carolina Agricultural and Technical State University or the Dean's designee.
(14) The Director of the Institute for the Environment at the University of North Carolina at Chapel Hill or the Director's designee.
(15) The Distinguished Research Professor (with expertise in sea level change) in the Department of Geology at East Carolina University.
(16) The North Carolina State Climatologist.
(17) The Executive Director of the North Carolina Sustainable Energy Association or the Executive Director's designee.
(18) The Dean of the School of Public Health at the University of North Carolina at Chapel Hill or the Dean's designee.
(19) A scientific expert on the subject of biodiversity appointed by the Speaker of the House of Representatives, who shall serve at the pleasure of the appointing officer.
(20) A member of the Building Code Council or other expert on the subject of building codes, appointed by the President Pro Tempore of the Senate, who shall serve at the pleasure of the appointing officer.
(21) Two designees appointed by the President Pro Tempore of the Senate, who shall serve at the pleasure of their appointing officer.
(22) Two designees appointed by the Speaker of the House of Representatives, who shall serve at the pleasure of their appointing officer.

(b) The members of the Advisory Council shall elect a Chair, Vice-Chair, and any other officers they consider necessary. The term of office for any elected member shall not exceed one year.

(c) Any vacancy on the Advisory Council shall be filled by the original appointing authority.

(d) Any member of the Advisory Council may hold concurrently any other elected or appointed office, as authorized by G.S. 128-1.1 and Article VI, Section 9, of the Constitution of North Carolina. The authorization provided by this subsection shall not apply to members of the North Carolina Commission on Climate Change.

(e) The Advisory Council shall meet upon the call of the Chair. A majority of the Council shall constitute a quorum for the transaction of business.

"**§ 120-70.160. Expenses of members.**

Members of the Advisory Council of the North Carolina Commission on Climate Change shall receive per diem, subsistence, and travel allowances in accordance with G.S. 120-3.1, 138-5, or 138-6, as appropriate."

SECTION 2. This act is effective when it becomes law.

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A BILL TO BE ENTITLED

AN ACT TO DIRECT THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES TO DEVELOP THE NORTH CAROLINA CLIMATE CHANGE ADAPTATION STRATEGY, AS RECOMMENDED BY THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

The General Assembly of North Carolina enacts:

SECTION 1.(a) The North Carolina Climate Change Adaptation Strategy. – The Department of Environment and Natural Resources shall develop the North Carolina Climate Change Adaptation Strategy, a comprehensive strategy to adapt to the impacts to North Carolina associated with global climate change. The Strategy shall consist of an assessment as provided under Section 2 of this act and a comprehensive plan as provided under Section 3 of this act. The North Carolina Climate Change Adaptation Strategy shall include climate adaptation goals and principles that shall be reflected in the comprehensive plan. The Strategy shall identify a mechanism and process to assess whether any modification to the Strategy is needed based on the latest science or information as it becomes available over time, and, if modification is needed, a process to implement the modification. In developing the Strategy, the Department of Environment and Natural Resources shall seek the participation and cooperation of units of local government, the Department of Transportation, the Department of Crime Control and Public Safety, the Department of Insurance, the Department of Administration, the Department of Agriculture and Consumer Services, the Department of Commerce, the Department of Public Instruction, the Department of Cultural Resources, the North Carolina Wildlife Resources Commission, and any other State agency or commission that might have a role or be affected by global climate change. In developing the Strategy, the Department of Environment and Natural Resources may seek the input of any appropriate federal agency, such as the United States Army Corps of Engineers, the Federal Highway Administration, the Federal Emergency Management Agency, the United States Department of the Interior, the United States Environmental Protection Agency (USEPA), the United States Department of Commerce, the United States Department of Defense, or any other federal agency that might have a role or be affected by global climate change; any university; or any nongovernmental organization.

SECTION 1.(b) Coordination With Local Government and Public Outreach. – In developing the Strategy, the Department of Environment and Natural Resources shall seek input from units of local government regarding the development of the Strategy and shall coordinate with units of local government regarding local plans or programs pertaining to climate change. In developing the Strategy, the Department of Environment and Natural Resources shall seek input from the public and provide public outreach and education to inform the general public of the impacts to North Carolina associated with global climate change and the State's strategy for adapting to these impacts.

SECTION 1.(c) Technical Advisory Committee. – In developing the Strategy, the Department of Environment and Natural Resources may establish a technical advisory committee to assist in developing the Strategy. The technical advisory

committee shall consist of technical experts on North Carolina climate change selected from the scientific community and associated disciplines within the constituent institutions of The University of North Carolina. The technical advisory committee may also consist of technical experts on North Carolina climate change selected from units of local government or nongovernmental organizations.

SECTION 2. The North Carolina Climate Change Adaptation Assessment. – In developing the North Carolina Climate Change Adaptation Strategy, the Department of Environment and Natural Resources first shall conduct an assessment that, based on the best available science, accomplishes at least all of the following tasks:

(1) Identifies the projected impacts to North Carolina's ecosystems associated with global climate change, including at least all of the following potential impacts:
   a. Sea level rise.
   b. More frequent and intense heat waves.
   c. Increased air and water temperature.
   d. Increased intensity and frequency of storms.
   e. Altered rainfall patterns that may result in droughts, floods, and fires.
   f. Shoreline erosion that may result in land loss and other ecosystem change.
   g. Loss of biodiversity.

(2) Determines the range of projections of the impacts identified under subdivision (1) of this subsection and the degree of confidence in these projections.

(3) Identifies which resources of the State, including land, water, air, and biodiversity, are threatened by impacts identified under subdivision (1) of this subsection, giving consideration to at least all of the following resources:
   a. The natural resources of the coastal, Piedmont, and mountain regions of the State.
   b. Public, residential, commercial, and industrial buildings.
   c. Transportation and other essential infrastructure.
   d. Water supplies.
   e. Commercial activities, including agriculture and forestry.
   f. Public health.
   g. Recreational and conservation lands.

(4) Identifies which of the impacts identified under subdivision (1) of this subsection should receive the highest priority to be addressed with adaptation measures based upon the severity or certainty of the impact and the level of the threat to the public, natural resources, or the State or local economies.

(5) Initiates an economic cost and benefit analysis to determine the potential costs of maintaining the status quo compared with the costs of

implementing the North Carolina Climate Change Adaptation Plan under Section 3 of this act.

SECTION 3.(a) The North Carolina Climate Change Adaptation Plan. – Concurrent with conducting the Assessment under Section 2 of this act, the Department of Environment and Natural Resources shall develop the North Carolina Climate Change Adaptation Plan, a comprehensive plan to adapt to the most likely impacts and associated threats that are identified in the Assessment, for the purpose of maximizing the security of North Carolina's citizens, natural resources and biodiversity, essential infrastructure, and economic vitality. The Plan shall provide a strategy that accomplishes at least all of the following:

(1) Develops an inventory of existing federal, State, or local programs and plans that directly or indirectly address adaptation to climate change.

(2) Identifies needed changes to existing planning tools and identifies new planning tools that are needed in order to take into account projected impacts from climate change, including at least all of the following:

a. Floodplain mapping.
b. Steep slope mapping.
c. Basinwide water planning.
d. Coastal zone planning.
e. Beach and shoreline planning.
f. Transportation and other infrastructure planning.
g. Planning regarding public health issues, including planning regarding increased mortality and morbidity from heat waves, additional disease vectors, and diminished air quality.
h. Emergency response and disaster relief planning.

(3) Identifies needed changes to federal, State, and local policies, programs, statutes, and administrative rules in order to implement physical or ecological adaptation measures, stimulate market responses, provide appropriate incentives, and regulate future activities that may be affected by global climate change.

(4) Identifies adaptation measures as short-term, mid-term, and long-term adaptation measures and establishes a method by which adaptation measures are to be prioritized.

(5) Identifies methods to better coordinate and integrate State natural hazard planning and regulatory programs in the Department of Environment and Natural Resources and the Department of Crime Control and Public Safety.

(6) Directs the Department of Environment and Natural Resources or the Division of Emergency Management of the Department of Crime Control and Public Safety to integrate post-disaster planning requirements with hazard mitigation planning requirements into one plan that includes the latest scientific understanding of sea level rise,

erosion, and other coastal hazards and environmental impacts of global climate change.

SECTION 3.(b) Considerations in Developing or Modifying the Plan. – When developing or modifying the Plan, all of the following policy approaches to adaptation may be considered:

(1) Developing plans that address how local governments in the coastal plain can adapt to potential changes in property tax revenue as sea-level increases lead to land loss.

(2) Directing the Coastal Resources Commission to increase protection of coastal wetlands and their ability to migrate inland by the Commission prohibiting new bulkheads and hardened structures in certain areas of environmental concern, as designated by the Coastal Resources Commission under G.S. 113A-113.

(3) Utilizing the consistency provisions of the Coastal Area Management Act (CAMA), Article 7 of Chapter 113A of the General Statutes, and the federal Coastal Zone Management Act, 16 U.S.C. § 1451, et seq., to help resolve conflicts between existing State and federal policies and programs.

(4) Requiring the Division of Coastal Management of the Department of Environment and Natural Resources to report on the loss of coastal wetlands due to estuarine shoreline hardening and other uses to the Environmental Review Commission and any future legislative commission that directly and primarily addresses issues concerning global climate change.

(5) Requiring an applicant for a permit under CAMA to mitigate the applicant's impact on wetlands that may result from any hardening of the estuarine shoreline outside of areas of environmental concern.

(6) Authorizing coastal management grants to units of local government to be used for planning for, and adapting to, sea level rise.

(7) Making maps of sea level rise available on the Internet for the use of units of local government, realtors, conservation organizations, and the general public.

(8) In order to protect the public recreational beaches, identifying options for responding to shore zones that are most vulnerable to storms and sea level rise and develop options that provide for future changes and plans for the short-term and long-term use of public recreational beaches.

(9) Promoting the use of any of the following living shoreline management methods so that estuarine shorelines are able to evolve and migrate in response to rising sea level:

a. Restoring, enhancing, protecting, and mitigating existing wetland or riparian habitat and vegetation.

b. Constructing and managing new wetlands in upslope regions.

(10) Developing incentives and regulatory changes to encourage the use of the Climate Ready Estuaries program, a program developed by the USEPA to train coastal managers to implement economically viable and environmentally sound procedures for portions of the estuaries and barrier islands that are particularly vulnerable to climate variability and change; implement adaptation strategies; share information, and engage and educate the stakeholders and other coastal managers.

(11) Requesting the Albemarle. – Pamlico National Estuary Program, a cooperative program jointly sponsored by the Department of Environment and Natural Resources and the USEPA in cooperation with the Virginia Department on Conservation and Recreation, to review the USEPA's Climate Ready Estuaries program and plan for and adapt to climate change and sea level rise.

(12) Determining any funding needs related to adaptation and mitigation and considering possible funding resources to address such needs.

(13) Pursuing federal funding for a southeast regional adaptation study, a study to assist in the development of relocation and removal strategies that uses the existing authority of the United States Army Corps of Engineers.

(14) Developing plans for geo-zoning of the barrier islands and estuarine shore zone environments within coastal North Carolina.

(15) Identifying the reasons for and against adopting either a strategy of in situ management of adaptation measures as opposed to the strategy of retreating from the high hazard ocean and inlet shorelines and estuarine shorelines.

(16) Determining possible cost-sharing incentives with landowners for the costs of implementing ecologically beneficial adaptive strategies for managing estuarine shorelines in response to rises in sea level.

(17) Identifying new economic opportunities within the eastern North Carolina coastal system, the Piedmont, and the mountain regions of the State based upon the impacts identified under subsection (1) of Section 2 of this act and the resulting adaptations to these impacts.

(18) Directing the Coastal Resources Commission to delineate economically viable and environmentally sound ways to address various scenarios regarding potential sea level rise in each the short term, the midterm, and the long term, based on the information in its 2010 Science Panel report.

(19) Identifying mechanisms for purchasing land or conservation easements on portions of coastal and inlet hazard zones, as well as other portions of the low-lying coastal zone, that are identified as at risk.

(20) Developing and implementing a method of tracking ecosystem changes resulting from climatic shifts, with specific focus on those resources that

have direct economic priorities, such as tourism, agriculture, silviculture, and marine fisheries.

(21) Evaluating the reasons for and against a requirement that sellers of coastal properties disclose potential hazards to buyers and a requirement that this disclosure accompany all real estate transfers of properties within coastal counties that either are directly on ocean, inlet, or estuarine shoreline frontage or are located within a 100-year floodplain.

(22) Evaluating the policy proposals, findings, and recommendations that resulted from the Beach Management Summit, held in 2009 in Beaufort, North Carolina, hosted by the North Carolina Coastal Federation and the UNC Center for the Study of Natural Hazards and Disasters, as these pertain to oceanfront communities adapting to climate change.

SECTION 4. Continued Coordination With Local Government and Public Outreach. – Once the North Carolina Climate Change Adaptation Strategy is developed initially under Section 1 through Section 3 of this act, the Department of Environment and Natural Resources shall continue to coordinate with units of local government regarding the implementation of the Strategy and shall continue to provide public outreach and education to inform the general public of the impacts to North Carolina associated with global climate change and the State's strategy for adapting to these impacts.

SECTION 5. Database Framework. – The Department of Environment and Natural Resources, the universities within The University of North Carolina, and the technical advisory committee, if a technical advisory committee is established under Section 1(b) of this act, jointly shall develop a framework for a database to provide to the general public and others information related to making economically and environmentally prudent adaptation decisions. This database may include maps, surveys, inventories, and other relevant, useful information. The Department of Environment and Natural Resources and the technical advisory committee, if a technical advisory committee is established, may recommend improving the current permanent monitoring stations and may install new permanent monitoring stations within the North Carolina coastal zone, as required to develop the database under this section.

SECTION 6. Report Requirement. – Beginning no later than October 1, 2010, the Department of Environment and Natural Resources shall submit quarterly progress reports to the Environmental Review Commission and to any future legislative commission that directly and primarily addresses issues concerning global climate. No later than January 1, 2013, the Department of Environment and Natural Resources shall submit a final report that shall include the North Carolina Climate Change Adaptation Strategy and any recommendations or legislative proposals to the Environmental Review Commission and to any future legislative commission that directly and primarily addresses issues concerning global climate change.

SECTION 7. Appropriation. – There is appropriated from the General Fund to the Department of Environment and Natural Resources the sum of fifty thousand dollars ($50,000) for the 2010-2011 fiscal year to implement the provisions of this act.

SECTION 8. Effective Date. – This act becomes effective July 1, 2010.

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A BILL TO BE ENTITLED

AN ACT TO DIRECT THE ENERGY POLICY COUNCIL TO IDENTIFY, STUDY, AND RECOMMEND POLICIES TO INCREASE ENERGY EFFICIENCY AND CONSERVATION, PROMOTE RENEWABLE ENERGY RESOURCES, AND REDUCE CARBON EMISSIONS, AS RECOMMENDED BY THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

The General Assembly of North Carolina enacts:

SECTION 1. The Energy Policy Council shall identify, study, and recommend policies to significantly increase energy efficiency and conservation, promote the development of renewable energy resources, and reduce carbon emissions. The Council shall specifically consider:

(1) Revision of the Utilities Commission's guiding language for electric utilities in order to promote significant increases in electric utility investment in energy efficiency, conservation, and renewable energy resources.
(2) Incentives to encourage demand side management.
(3) Incentives to encourage the use of more energy efficient appliances.
(4) Allowing electric utilities to earn more from energy saved through efficiency and conservation programs than from energy generated.
(5) Policies to encourage the development of renewable energy resources in the State.
(6) Simplifying the net-metering sign up process and increasing the purchase price for energy generated from renewable energy resources under the net-metering program.
(7) Removing barriers to interconnection.
(8) Requiring electric utilities to include potential future carbon costs when developing their biennial integrated resource plans.
(9) Prohibiting the construction of new coal-fired power plants that do not capture and sequester carbon dioxide.
(10) Changes to the State renewable energy portfolio standard to allow greater use of combined heat and power and energy recycling technologies.
(11) Removing barriers to implementation and permitting of energy recycling.
(12) Authorizing the sale of thermal energy.
(13) The potential benefits of a public benefit charge or independent administrator for energy efficiency activities.

SECTION 2. The Energy Policy Council may submit an interim report of its findings and recommendations to the Environmental Review Commission and the Joint Legislative Utility Review Committee no later than February 1, 2011, and shall submit a final report of its findings and recommendations to the Environmental Review Commission and the Joint Legislative Utility Review Committee no later than May 1, 2011.

SECTION 3. This act is effective when it becomes law.

A BILL TO BE ENTITLED

AN ACT TO DIRECT THE DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES, THE DEPARTMENT OF COMMERCE, AND THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES TO EVALUATE THE CARBON SEQUESTRATION POTENTIAL OF NATURAL AND WORKING LANDSCAPES IN THE STATE; TO STUDY OTHER OPPORTUNITIES TO DEVELOP CARBON OFFSETS WITHIN THE STATE; AND TO STUDY THE FEASIBILITY AND ADVISABILITY OF ESTABLISHING A CARBON OFFSET PROGRAM IN THE STATE, AS RECOMMENDED BY THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

The General Assembly of North Carolina enacts:

SECTION 1.(a) Definitions. – As used in this act:

(1) "Cap and trade program" means any program that (i) places a limit, or cap, on the total amount of greenhouse gas emissions that is allowed under the specific target for greenhouse gas emissions set under the program, (ii) allocates greenhouse gas emissions as credits to individual businesses so that the total credits allocated equal the cap, (iii) and allows businesses to bank credits for the future or to buy and sell credits based on whether a particular business reduced or increased its greenhouse gas emissions in a given year and the value of the credits in the marketplace.

(2) "Carbon offset" means the credit given for activities that result in the reduction or avoidance of greenhouse gas emissions, or for the sequestration of greenhouse gases. For the purposes of this act, one carbon offset shall be equal to the reduction, avoidance, or sequestration of one metric ton of carbon dioxide emissions or its functional equivalent in other greenhouse gases.

(3) "Carbon sequestration" means the absorption from the atmosphere of carbon dioxide by vegetation and soils; and the storage of carbon in vegetation and soils.

(4) "Greenhouse gas" means any gas that contributes to anthropogenic global warming, including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

SECTION 1.(b) Study. – The Department of Agriculture and Consumer Services, the Department of Commerce, and the Department of Environment and Natural Resources shall jointly evaluate all of the following:

(1) The carbon sequestration or reduced emission potential of all lands, wetlands, and coastal waters, including working and natural landscapes in the State, from the following practices:

a. Alternative farming practices.

b. Soil carbon management and storage.

c. Reduced methane emissions from animal waste management systems.
d. Alternative methods of forest management that can increase carbon sequestration, accounting for changes in the mortality and distribution of tree and other plant species, and the extent to which carbon is stored in trees and wood-based building materials.
e. Avoided conversion of agricultural and forestlands.
f. Protection and enhancement of natural landscapes and diverse ecosystems.
g. Preserving and restoring coastal salt marshes, sea grass beds, oyster reefs, and other fisheries habitats.
h. Sustainable use of forest resources for biomass energy production.
i. Other practices that the agencies find relevant.

(2) Current and developing technologies for carbon sequestration, including the potential use of microalgae and biochar.

(3) Existing carbon sequestration and carbon offset programs and policies, including voluntary programs.

(4) Standards and certification regimes in place for verifying the benefits of carbon sequestration and carbon offset programs, and the feasibility of utilizing State agencies for verification.

(5) The anticipated costs for landowners, farmers, foresters, and other interested parties in the State to participate as offset providers in a cap and trade program for greenhouse gas emissions, including the costs of monitoring greenhouse gas emissions, satisfying reporting requirements, and any other costs.

(6) The anticipated benefits for landowners, farmers, foresters, and other interested parties in the State to participate as offset providers in a cap and trade program for greenhouse gas emissions, including any likely increase in their annual incomes.

(7) Other co-benefits associated with activities related to carbon sequestration in the State, including improved water quality, soil quantity and quality, air quality, and wildlife habitat.

(7) The advantages and disadvantages to the State in developing or implementing its own carbon offset certification programs or carbon offset trading systems in the event a federal cap and trade program for greenhouse gas emissions is enacted.

(8) Any other issues the agencies consider relevant to this topic.

SECTION 1.(c) Consultants. – In the conduct of this study, the agencies may employ independent consultants as provided by G.S. 120-32.02 and G.S. 120-70.44.

SECTION 1.(d) Advisory committee. – The agencies may convene an advisory committee of interested parties to assist in the design and implementation of the study.

SECTION 1.(e) Report. – The agencies may submit an interim report of their findings and recommendations to the Environmental Review Commission no later than September 1, 2011. The agencies shall submit a final report of their findings and recommendations, including any legislative proposals, to the General Assembly on or before April 1, 2012.

SECTION 2. This act is effective when it becomes law.

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A BILL TO BE ENTITLED

AN ACT TO APPROPRIATE FUNDS (1) TO ESTABLISH THE COASTAL ADAPTATION RESOURCES MAPPING AND MONITORING PROGRAM AND (2) TO EXPAND THE NORTH CAROLINA ENVIRONMENT AND CLIMATE OBSERVING NETWORK; IN ORDER TO PROVIDE FOR MONITORING OF THE ENVIRONMENTAL IMPACTS OF GLOBAL CLIMATE CHANGE IN NORTH CAROLINA AND FOR IMPROVING WEATHER AND CLIMATE DATA COLLECTION IN NORTH CAROLINA, AS RECOMMENDED BY THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

The General Assembly of North Carolina enacts:

SECTION 1.(a) The Coastal Adaptation Resources Mapping and Monitoring Program (CARMAP) is established within the Department of Environment and Natural Resources. This program shall be a cooperative program that utilizes the resources within the Department and the constituent universities within The University of North Carolina. This program shall provide the framework for mapping and inventorying the State's extensive coastal and riverine resources, to include the land areas within the coastal zone; the ocean and estuarine shore zones; and sub-aquatic bathymetry; sediments; and vegetation. This framework shall include at least all of the following:

(1) A field survey and inventory of the geologic and ecologic character of the entire shoreline system and maps that indicate the detailed distribution of shoreline types.

(2) A field survey, inventory, and maps that indicate distribution of the anthropogenic modifications of the entire shoreline system, such as any hardened shoreline structures, piers, marinas, or channels.

(3) For each five-year period, a periodic coastal land survey that incorporates high resolution, geo-referenced, infrared aerial photography, and LiDAR topography of the entire coastal zone in order to monitor absolute changes in shorelines, ecosystems, and land use.

(4) A bathymetric survey of the inland coastal waters that can be utilized for detailed modeling of estuarine storm surge, water quality, and sea-level rise, as well as supplying critical data for modeling shoreline erosion, distribution of submerged aquatic vegetation, and ecosystem migration.

(5) The framework for establishing various types of permanent monitoring stations within the State's coastal zone, which shall include at least all of the following monitoring stations:

a. A system of estuarine and riverine stations to measure absolute changes in sea-level rise, characterize the dynamics of storm surges and tides, and monitor water flow and quality through the coastal system.

b. A series of land-based sites in different ecosystems to monitor ecological change of habitats through time, including growth rates, structure and function, freshwater resources, saltwater

intrusion, sedimentation and erosion rates, and any other changes.

c. Define the critical sediment sources and their depositional sinks within the State's riverine, estuarine, and barrier island systems.

d. Develop realistic sediment budgets and monitors for sediment transport directions and rates.

SECTION 1.(b) The Department of Environment and Natural Resources shall make the information collected under CARMAP, as established under this section, available to the general public on the Internet.

SECTION 1.(c) There is appropriated from the General Fund to the Department of Environment and Natural Resources the sum of five hundred thousand dollars ($500,000) for the 2010-2011 fiscal year to fund CARMAP, as established under this section.

SECTION 2.(a) There is appropriated from the General Fund to the State Climate Office the sum of five hundred thousand dollars ($500,000) for the 2010-2011 fiscal year to expand the North Carolina Environment and Climate Observing Network (ECONet), a program supported by the State Climate Office, the Department of Environment and Natural Resources, the Department of Crime Control and Public Safety, and North Carolina State University, in cooperation with federal agencies, for the purpose of providing a database that may be used to improve severe weather management, weather forecasts, energy planning, and natural resource management, as well as assisting agriculture, emergency response, natural resource management, tourism, economic development, education, and other applications that affect North Carolina's citizens.

SECTION 2.(b) The funds appropriated under this section shall be used to locate automated weather and environmental observing stations to counties that do not currently have such stations, thereby expanding ECONet and moving toward the ultimate goal of locating at least one weather and environmental observing station in each county in North Carolina. Data from these stations shall be provided to government agencies to improve severe weather management, weather forecasts, energy planning, and natural resource management and shall be made available to the general public on the Internet.

SECTION 3. This act becomes effective July 1, 2010.

A BILL TO BE ENTITLED

AN ACT TO DIRECT STATE AGENCIES TO REVIEW THEIR ENVIRONMENTAL PROGRAMS AND RECOMMEND WHETHER THE ENVIRONMENTAL PROGRAMS SHOULD INCLUDE CONSIDERATION OF GLOBAL CLIMATE CHANGE, AS RECOMMENDED BY THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

The General Assembly of North Carolina enacts:

SECTION 1. Each State agency shall review its programs, including planning and regulatory programs, that consider environmental impacts and determine whether the program currently considers the impacts of global climate change. For those programs that currently consider the impacts of global climate change, the agency shall describe how the program considers the impacts of global climate change and recommend whether the consideration of the impacts of global climate change should be modified or expanded. For those programs that do not currently consider the impacts of global climate change, the agency shall recommend if and how the program should consider the impacts of global climate change.

SECTION 2. No later than September 1, 2011, each State agency shall report the results of its review and any recommendations to the Department of Environment and Natural Resources. The Department shall compile the results and recommendations and report them to the Environmental Review Commission and to any future legislative commission that directly and primarily addresses issues concerning global climate change no later than November 1, 2011.

SECTION 3. As used in this act, "State agency" means the State of North Carolina or any board, bureau, commission, department, institution, or agency of the State.

SECTION 4. This act is effective when it becomes law.

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Legislative Proposal #7: House Resolution Supporting Comprehensive Federal Climate Change Legislation.

A HOUSE RESOLUTION REQUESTING THE PRESIDENT AND THE UNITED STATES CONGRESS TO ADOPT LEGISLATION THAT PROMOTES JOBS AND INNOVATIVE ENERGY DEVELOPMENT, STRENGTHENS NATIONAL ENERGY AND ECONOMIC SECURITY, POSITIONS THE UNITED STATES TO BE AN INTERNATIONAL LEADER IN THE FIELD OF CLEAN ENERGY, AND ADDRESSES THE CONSEQUENCES OF CLIMATE CHANGE WITHOUT PREEMPTING STATES' RIGHTS TO CONTROL EMISSIONS AND TO PROMOTE RENEWABLE ENERGY, AS RECOMMENDED BY THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

Whereas, most of the world's climate scientists have concluded that greenhouse gasses are causing the Earth's temperature to rise, resulting in global climate change; and

Whereas, in 2006 over 20% of the world's total energy-related carbon dioxide was emitted by the United States, and 87% of greenhouse gas emissions in the United States were related to fossil fuel combustion; and

Whereas, electricity generation and transportation are the two largest sources of total greenhouse gas emissions in the United States and are responsible for approximately 39% and 31%, respectively, of the nation's greenhouse gas emissions from the combustion of fossil fuels; and

Whereas, high oil prices reduce the purchasing power of American consumers, spur inflation, and boost the prices of basic goods and services; and

Whereas, the effects of unchecked climate change pose a threat to our nation's economy, public health, environment, and national security; and

Whereas, potential impacts of climate change include variability of precipitation, sea level rise, inundation of coastal communities, degradation of air quality, damage to infrastructure, and loss of plant and animal species; and

Whereas, climate change will directly affect industries, including tourism, agriculture, forestry, fishing, and skiing, and will disproportionately affect communities with limited resources to adapt and cope; and

Whereas, climate changes are already underway in the United States, are projected to grow, and include increased variability in precipitation, rising temperature and sea level, retreating glaciers, thawing permafrost, lengthening growing seasons, lengthening ice-free seasons in the ocean and on lakes and rivers, earlier snowmelt, and alterations in river flow; and

Whereas, climate change impacts will include increased heat, pests, water stress, diseases, and weather extremes that will pose adaptation challenges for crop and livestock production; and

Whereas, climate change will create health impacts related to heat stress, waterborne diseases, poor air quality, extreme weather events, and diseases transmitted by insects and rodents; and

Whereas, the effects of climate change include the increase of political and social instability in poorer regions of the world, thus presenting potential security challenges for the United States; and

Whereas, clean energy jobs are growing at a rate 250% faster than the rest of the economy; and

Whereas, the United States Energy Information Administration projects clean energy job growth of up to 2,000,000 new jobs resulting from comprehensive clean energy legislation; and

Whereas, the generation of electricity through the use of renewable energy presents opportunities to promote energy self-sufficiency, create jobs and economic benefits, preserve natural resources, and improve the environment; and

Whereas, there is significant global competition for clean energy development that could weaken the United States economy and threaten American innovation without comprehensive clean energy legislation; and

Whereas, thousands of businesses, including, among others, members of the United States Climate Action Partnership and the Clean Economy Network, have joined together calling for comprehensive federal clean energy legislation; and

Whereas, over the past two decades, in the absence of comprehensive federal clean energy legislation, the states have been the true "laboratories of democracy" by advancing clean energy policies; and

Whereas, many states have adopted renewable energy standards and goals that require a significant percentage of a state's electricity to be generated from renewable energy sources such as wind, solar, wave, hydropower, biomass, and biofuels, which sources have led to significant job growth in the clean energy sector of the national economy; and

Whereas, state leadership has resulted in job growth and has reduced reliance on imported energy sources, thus resulting in opportunities for renewed economic development; and

Whereas, in 2002, the General Assembly enacted S.L. 2002-4, commonly referred to as the Clean Smokestacks Act, that directed the public utilities in the State to substantially reduce their emissions of traditional air pollutants and directed State agencies to begin the process of identifying steps to reduce greenhouse gas emissions; and

Whereas, in accordance with the Clean Smokestacks Act, the Division of Air Quality of the North Carolina Department of Environment and Natural Resources has completed studies and made recommendations regarding greenhouse gas emissions and steps that can be taken to reduce emissions in the State; and

Whereas, in 2005, the General Assembly established the Legislative Commission on Global Climate Change to study issues related to global climate change, the emerging carbon economy, and whether it is appropriate and desirable for the State to establish a greenhouse gas emissions pollutant reduction goal; and

Whereas, in 2007, the General Assembly established the first Renewable Energy and Energy Efficiency Portfolio Standard (REPS) in the Southeastern United States in order to promote the development of renewable energy and energy efficiency in the State; and

Whereas, in accordance with the REPS requirements, electric power providers in the State must use an increasing percentage of renewable energy resources and employ energy efficiency programs to meet a minimum of 12.5% of the needs of the State's retail electricity customers by 2021; and

Whereas, in 2007, the General Assembly established the North Carolina Green Business Fund to promote small businesses that develop and expand the biofuels industry, the green building industry, clean technology, and renewable energy products and businesses; and

Whereas, in 2009, the General Assembly established the Legislative Research Commission Advisory Subcommittee on Offshore Energy Exploration to study issues related to oil and natural gas exploration and development off the North Carolina coast, as well as the potential impacts of alternative offshore energy projects on the nation's energy supply, including energy generated from wind, waves, ocean currents, the sun, and hydrogen production; and

Whereas, North Carolina has enacted, expanded, and renewed numerous tax credits and incentive programs in order to promote the development and utilization of renewable energy technologies and facilities in the State; and

Whereas, a national statutory framework for clean energy will provide a predictable regulatory framework that will provide better clarity for decision making and spur innovation in the clean energy sector; and

Whereas, without Congressional action, the United States Environmental Protection Agency has announced its intention to regulate greenhouse gas emissions through administrative rules rather than through legislation; and

Whereas, the United States House of Representatives passed the American Clean Energy and Security Act (H.R. 2454) on June 26, 2009, on a bipartisan vote, and bipartisan members of the United States Senate are currently considering and drafting the Clean Energy Jobs and American Power Act (S. 1733); and

Whereas, the United States Congress has the opportunity to enact comprehensive clean energy jobs and climate legislation that will strengthen our national security, grow clean energy jobs, reduce pollution, and advance America; Now, therefore, Be it resolved by the House of Representatives:

SECTION 1. The General Assembly urges the United States Congress to pass and the President to sign comprehensive clean energy jobs and climate legislation that: (i) creates a unified framework for reducing greenhouse gas emissions; (ii) protects low- and moderate- income Americans from increased energy costs and invests substantially in energy efficiency; (iii) supports alternative sources of energy, including, but not limited to, wind, solar, wave, hydroelectricity, biofuels, advanced nuclear energy research, and clean coal technologies; (iv) acknowledges the carbon-intensive nature of the economy of the United States and includes emissions offsets that protect energy consumers; and (v) does not preempt State legislative efforts to control carbon emissions and to advance clean energy innovations.

SECTION 2. The Secretary of State of North Carolina shall prepare and transmit copies of this resolution to the President of the United States, the President and the Secretary of the United States Senate, the Speaker and the Clerk of the United States House of Representatives, and North Carolina's senators and representatives in Congress.

SECTION 3. This resolution is effective upon adoption.

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APPENDIX A:
AUTHORIZING LEGISLATION

GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2005

SESSION LAW 2005-442
SENATE BILL 1134

AN ACT TO ESTABLISH THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE; TO DIRECT THE COMMISSION TO STUDY ISSUES RELATED TO GLOBAL WARMING, THE EMERGING CARBON ECONOMY, AND WHETHER IT IS APPROPRIATE AND DESIRABLE FOR THE STATE TO ESTABLISH A GLOBAL WARMING POLLUTANT REDUCTION GOAL; AND, IF THE COMMISSION DETERMINES THAT THE ESTABLISHMENT OF A GOAL IS APPROPRIATE AND DESIRABLE, TO AUTHORIZE THE COMMISSION TO DEVELOP A RECOMMENDED GOAL.

The General Assembly of North Carolina enacts:

SECTION 1. Commission Established; Membership. – The Legislative Commission on Global Climate Change is hereby established. The Commission shall consist of 34 members as follows:

(1) Nine members appointed by the President Pro Tempore of the Senate.
(2) Nine members appointed by the Speaker of the House of Representatives.
(3) The President of Duke Power or the President's designee.
(4) The President of Progress Energy or the President's designee.
(5) The President of the North Carolina Citizens for Business and Industry or the President's designee.
(6) The President of the Manufacturers and Chemical Industry Council of North Carolina or the President's designee.
(7) The President of the North Carolina Farm Bureau Federation or the President's designee.
(8) The President of the North Carolina Forestry Association or the President's designee.
(9) The Southeast Regional Director of Environmental Defense or the Regional Director's designee.
(10) The Executive Director of the Southern Alliance for Clean Energy or the Executive Director's designee.
(11) The Executive Director of the North Carolina Coastal Federation or the Executive Director's designee.
(12) The Executive Director of the North Carolina Conservation Council or the Executive Director's designee.
(13) The Dean of the Nicholas School of the Environment and Earth Sciences, Duke University, or the Dean's designee.
(14) The Dean of the College of Agriculture and Life Sciences at North Carolina State University or the Dean's designee.

(15) The Dean of the School of Agriculture and Environmental Sciences at North Carolina Agricultural and Technical State University or the Dean's designee.
(16) The Director of the Carolina Environmental Program at the University of North Carolina at Chapel Hill or the Director's designee.
(17) The Distinguished Research Professor (with expertise in sea level change), Department of Geology at East Carolina University.
(18) The North Carolina State Climatologist.

SECTION 2. Cochairs. – The Commission shall have two cochairs, one designated by the President Pro Tempore of the Senate and one designated by the Speaker of the House of Representatives from among their respective appointees. The Commission shall meet upon the call of the cochairs.

SECTION 3. Quorum. – A quorum of the Commission shall consist of 18 members.

SECTION 4. Vacancies. – Any vacancy on the Commission shall be filled by the original appointing authority.

SECTION 5. Purpose and Duties. – The Commission shall have the following purposes and duties:

(1) The Commission shall conduct an in-depth examination of issues related to global climate change. This examination shall include all of the following:
   a. A review of current scientific literature on the possible natural and anthropogenic causes of global climate change.
   b. A review of actions taken by the federal government and by other states to address global warming.
   c. An examination of the emissions of greenhouse gases from within the State and the extent to which reductions in the emissions of these gases in the State, region, nation, and worldwide could be expected to affect global climate change.
   d. An evaluation of the economic opportunities for the State that may result from international, national, and State action to address global climate change and the emerging carbon market.
   e. The potential impacts of global climate change on the citizens, natural resources, and economy of the State, including agriculture, travel and tourism, recreation, coastal real estate, insurance, and other economic sectors.
   f. The costs of any action taken by the State to address global climate change on individuals, individual households, local governments, businesses, educational institutions, agricultural operations, the State government, and other institutions and economic sectors.
   g. The benefits of any action taken by or within the State or other states and at the national or international levels to address global climate change on individuals, individual households, local governments, businesses, educational institutions, agricultural operations, the State government, and other institutions and economic sectors.
(2) If, in the course of its examination, the Commission determines that it would be appropriate and desirable for the State to establish a global warming pollutant reduction goal, the Commission may develop a recommended global warming pollutant reduction goal for the State.
(3) In conducting its examination of global climate change, the Commission shall consider and integrate the findings and recommendations of the study of issues related to the development and implementation of

standards and plans to control emissions of carbon dioxide required by Section 13 of S.L. 2002-4.

(4) Based on its examination of global climate change, the Commission shall develop findings and recommendations, including any legislative proposals it determines to be appropriate, for consideration by the General Assembly.

SECTION 6. Additional Duties. – The Commission may work cooperatively with other state and national governments to organize a forum on global climate change, including its causes, impacts, challenges, and opportunities in the southeastern United States. The Commission may also work cooperatively with other State agencies with respect to the agencies' areas of responsibilities regarding greenhouse gas emissions and climate change.

SECTION 7. Expenses of Members. – Members of the Commission shall receive per diem, subsistence, and travel allowances in accordance with G.S. 120-3.1, 138-5, or 138-6, as appropriate.

SECTION 8. Staff. – Upon the prior approval of the Legislative Services Commission, the Legislative Services Officer shall assign professional staff to the Commission to aid in its work.

SECTION 9. Consultants. – The Commission may hire consultants to assist with the study as provided in G.S. 120-32.02(b).

SECTION 10. Meetings. – The Commission may meet in the Legislative Building or the Legislative Office Building upon the approval of the Legislative Services Commission.

SECTION 11. Report. – The Commission shall report its findings and recommendations to the General Assembly and the Environmental Review Commission on or before 1 November 2006, at which time the Commission shall terminate.

SECTION 12. Funding. – From funds appropriated to the General Assembly, the Legislative Services Commission shall allocate funds for the purpose of conducting the study provided for in this Part.

SECTION 13. Effective Date. – This act is effective when it becomes law.

In the General Assembly read three times and ratified this the 31st day of August, 2005.

s/ Beverly E. Perdue
President of the Senate

s/ James B. Black
Speaker of the House of Representatives

s/ Michael F. Easley
Governor

Approved 3:15 p.m. this 27th day of September, 2005

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GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2005

SESSION LAW 2006-73
SENATE BILL 1591

AN ACT TO EXTEND THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE, AS RECOMMENDED BY THE ENVIRONMENTAL REVIEW COMMISSION.

The General Assembly of North Carolina enacts:

SECTION 1. Section 11 of S.L. 2005-442 reads as rewritten:

"**SECTION 11.** Reports. – The Commission shall submit an interim report to the General Assembly and the Environmental Review Commission no later than 15 January 2007 and may submit interim reports at other times at its discretion. The Commission shall submit a final report, including any findings and recommendations, to the General Assembly and the Environmental Review Commission on or before 15 April 2008, at which time the Commission shall terminate."

SECTION 2. This act is effective when it becomes law.

In the General Assembly read three times and ratified this the 30th day of June, 2006.

s/ Beverly E. Perdue
President of the Senate

s/ Richard T. Morgan
Speaker Pro Tempore of the House of Representatives

s/ Michael F. Easley
Governor

Approved 3:00 p.m. this 10th day of July, 2006

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GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2007

SESSION LAW 2008-81
HOUSE BILL 2529

AN ACT TO EXTEND THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE, AS RECOMMENDED BY THE ENVIRONMENTAL REVIEW COMMISSION.

Whereas, the Legislative Commission on Global Climate Change was established by S.L. 2005-442 to conduct an in-depth examination of issues related to global climate change; and

Whereas, the Legislative Commission on Global Climate Change has met regularly since its inception in pursuit of its legislative charge; and

Whereas, the Legislative Commission on Global Climate Change needs additional time to carry out its legislative charge; Now, therefore,

The General Assembly of North Carolina enacts:

SECTION 1. Section 11 of S.L. 2005-442, as amended by S.L. 2006-73, reads as rewritten:

"**SECTION 11.** Reports. – The Commission may submit interim reports at its discretion. The Commission shall submit a final report, including any findings and recommendations, to the 2009 General Assembly and the Environmental Review Commission on or before 1 October 2009, at which time the Commission shall terminate."

SECTION 2. This act is effective when it becomes law.

In the General Assembly read three times and ratified this the 2nd day of July, 2008.

s/ Beverly E. Perdue
President of the Senate

s/ Joe Hackney
Speaker of the House of Representatives

s/ Michael F. Easley
Governor

Approved 12:03 P.M. this 11th day of July, 2008

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GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2009

SESSION LAW 2009-306
SENATE BILL 835

AN ACT TO EXTEND THE LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE.

Whereas, the Legislative Commission on Global Climate Change was established by S.L. 2005-442 to conduct an in-depth examination of issues related to global climate change; and

Whereas, the Legislative Commission on Global Climate Change has met regularly since its inception in pursuit of its legislative charge; and

Whereas, the Legislative Commission on Global Climate Change needs additional time to carry out its legislative charge; Now, therefore,

The General Assembly of North Carolina enacts:

SECTION 1. Section 11 of S.L. 2005-442, as amended by S.L. 2006-73 and S.L. 2008-81, reads as rewritten:

"**SECTION 11.** Reports. – The Commission may submit interim reports at its discretion. The Commission shall submit a final report, including any findings and recommendations, to the General Assembly and the Environmental Review Commission on or before October 1, 2010, at which time the Commission shall terminate."

SECTION 2. This act is effective when it becomes law.

In the General Assembly read three times and ratified this the 9th day of July, 2009.

s/ Walter H. Dalton
President of the Senate

s/ Joe Hackney
Speaker of the House of Representatives

s/ Beverly E. Perdue
Governor

Approved 5:21 p.m. this 17th day of July, 2009

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APPENDIX B: COMMISSION MEMBERSHIP

Session Law 2005-442, which established the Legislative Commission on Global Climate Change, provides that the Commission shall consist of 34 members. 18 of these members are appointed by the President Pro Tempore of the Senate and the Speaker of the House of Representatives as indicated below. The remaining 16 members are ex officio voting members designated as indicated on the second part of this membership list.

President Pro Tempore of the Senate Appointments[44]:

John L. W. Garrou, Co-Chair
P. O. Box 5958
Winston-Salem, NC 27113
(336) 245-2500
E-mail: johngarrou@yahoo.com

Senator Charlie Albertson
136 Henry Dunn Picket Road
Beulaville, NC 28518
(910) 298-4923
E-mail: Charlie.Albertson@ncleg.net

Senator Josh Stein
P.O. Box 10382
Raleigh, NC 27605
(919) 715-6400
Josh.Stein@ncleg.net

Senator Jim Jacumin
3690 Miller Bridge Road
Connelly Springs, NC 28612
(828) 397-3723
Jim.Jacumin@ncleg.net

Speaker of the House of Representatives Appointments[45]:

Representative Pricey Harrison, Co-Chair
P.O. Box 9339
Greensboro, NC 27429
(336) 292-1953
E-mail: Pricey.Harrison@ncleg.net

Representative Lucy Allen
312 North Main Street,
Louisburg, NC 27549
(919) 496-5111
Email: Lucy.Allen@ncleg.net

Representative Becky Carney
P.O. Box 32873
Charlotte, NC 28232
(704) 332-1893
E-mail: Becky.Carney@ncleg.net

Representative Alice Underhill
3910 Country Club Road
New Bern, NC 28562
(252) 633-2270
E-mail: Alice.Underhill@ncleg.net

[44] Past appointments by the President Pro Tempore of the Senate include: former Senator Janet Cowell (2006-2008) and former Senator Robert Pittenger (2006-2008).
[45] Past appointments by the Speaker of the House include: Speaker Joe Hackney who served as Commission Co-Chair from January 2006 to January 2007 and former Representative Wilma Sherrill (2006-2008).

Walter Clark, Deputy Director[46]
Blue Ridge Rural Land Trust
Old Orchard Creek Farm
410 Swansie Shepherd Road
Lansing, NC 28643
(336) 384-2774
oldorchard@skybest.com

Representative W. A. "Winkie" Wilkins
210 Fair Oaks Drive
Roxboro, NC 27574
(336) 599-7336
E-mail: Winkie.Wilkins@ncleg.net

Dr. Dolores "Dee" Eggers
Department of Environmental Studies
CPO#2330
University of North Carolina Asheville
Asheville, NC 28804-8511
(828) 251-6654
E-mail: eggers@unca.edu

Honorable Charles C. Thomas
900 Hendersonville Road
Suite 302
Asheville, NC 28803
(828) 274-4002
Email: charles@thomaswealth.com

Dr. Edward W. Erickson
Professor of Economics
Box 8110, North Carolina State University
Raleigh, NC 27695-8110
(919) 513-2876
E-mail: ed_erickson@ncsu.edu

Thomas F. Cecich
113 Kenneth Ridge Court
Apex, NC 27523
(919) 303-6802
E-mail: tom@tfc-assoc.com

Tim Toben
8300 Pickards Meadow Road
Chapel Hill, NC 27516-4861
(919) 280-1103
E-mail: tobent@bellsouth.net

Robert J. Glaser
1029 Wade Ave.
Raleigh, NC 27605-2167
(919) 828-4421
E-mail: rglaser@ncada.com

Ivan Urlaub
P. O. Box 6465
Raleigh, NC 27628
(919) 832-7601
E-mail: ncseapolicy@mindspring.com

Susan Tompkins
815 Hungerford Place
Charlotte, NC 28207
(704) 375-3276
E-mail: Susantompkins@carolina.rr.com

Ex Officio Members:

The President of Duke Power or the President's designee

Dr. George T. Everett
Director of Environmental and Legislative Affairs
Duke Power
225 Hillsborough Place, Suite 160
Raleigh, NC 27603
(919) 235-0955
E-mail: gteverett@duke-energy.com

[46] Walter Clark tendered his resignation from the Commission in 2009.

The President of Progress Energy or the President's Designee	Ms. Caroline Choi Director – Energy Policy & Strategy Progress Energy 410 South Wilmington Street, Suite 1505 Raleigh, NC 27601 (919)-546-3775 E-mail: caroline.choi@pgnmail.com
The President of the North Carolina Citizens for Business and Industry or the President's designee[47]	S. Lewis "Lew" Ebert President and CEO North Carolina Chamber 701 Corporate Center Dr., Suite 400 Raleigh, NC 27607 (919) 836-1410 E-mail: lebert@nccbi.org
The President of the Manufacturers and Chemical Industry Council of North Carolina or the President's designee	A. Preston Howard, Jr. President Manufacturers and Chemical Industry of North Carolina (MCIC) 620 N. West Street, Suite 101 Raleigh, NC 27603 (919) 834-9459 E-mail: preston.howard@mcicnc.org
The President of the North Carolina Farm Bureau Federation or the President's designee	Mitchell A. "Mitch" Peele Director of Public Policy North Carolina Farm Bureau Federation P.O. Box 27766 Raleigh, NC 27611 (919) 788-1004 E-mail: mitch-peele@ncfb.net
The President of the North Carolina Forestry Association or the President's designee	Robert W. Slocum, Jr. Executive Vice President North Carolina Forestry Association 1600 Glenwood Avenue, Suite I Raleigh, NC 27608 (919) 834-3943 E-mail: rwslocum@ncforestry.org

[47] Mr. Barry Eveland represented the North Carolina Citizens for Business and Industry from January 2006 through August 2006.

The Southeast Regional Director of Environmental Defense or the Regional Director's designee[48]	Michael S. Regan Policy Manager, North Carolina Office Environmental Defense 4000 Westchase Blvd., Suite 510 Raleigh, NC 27607 (919) 881-2917 E-mail: mregan@edf.org
The Executive Director of the Southern Alliance for Clean Energy or the Executive Director's designee	Stephen A. Smith, DVM Executive Director Southern Alliance for Clean Energy 29 North Market Street, Suite 604 Asheville, NC 28801 (865)567-7429 E-mail: sasmith@cleanenergy.org
The Executive Director of the North Carolina Coastal Federation or the Executive Director's designee[49]	Dick Bierly Vice President North Carolina Coastal Federation 3609 Highway 24 (Ocean) Newport, NC 28570 (252) 393-8185 E-mail: rhb2@nc.rr.com
The Executive Director of the North Carolina Conservation Council or the Executive Director's designee[50]	Daniel E. Crawford Director of Governmental Relations Conservation Council of North Carolina 112 S. Blount Street Raleigh, NC 27601 (919) 839-0020 E-mail: dan@conservationcouncilnc.org
The Dean of the Nicholas School of the Environment and Earth Sciences, Duke University, or the Dean's designee[51]	Todd Wooten Director, Southeast Climate Resource Center Nicholas Institute for Environmental Policy Solutions Duke University Durham, NC 27708 (919) 613-8701 E-mail: tw78@duke.edu

[48] Michael Shore served as the Environmental Defense designee from January 2006 through January 2009.
[49] Jim Stephenson served as the designee from the North Carolina Coastal Federation from January 2006 through January 2009, and Todd Miller, Executive Director, served on the Commission from November 2009 to April 2009.
[50] Michael Nelson served as the designee from the Conservation Council of North Carolina from January 2006 through January 2009.
[51] Tim Profeta served as the designee from the Nicholas School of the Environment at Duke University from January 2006 through March 2010.

The Dean of the College of Agriculture and Life Sciences at North Carolina State University or the Dean's designee	Dr. Daniel J. Phaneuf Associate Professor of Agriculture and Resource Economics Box 8109 North Carolina State University Raleigh, NC 27695 (919) 515-4672 E-mail: dan_phaneuf@ncsu.edu
The Dean of the School of Agriculture and Environmental Sciences at North Carolina Agricultural and Technical State University or the Dean's designee	Dr. Godfrey A. Uzochukwu Professor of Earth and Environmental Sciences North Carolina Agricultural and Technical State University 261 Carver Hall Greensboro, NC 27411 (336) 334-7030 E-mail: uzo@ncat.edu
The Director of the Carolina Environmental Program at the University of North Carolina at Chapel Hill or the Director's designee[52]	Dr. Richard N. L. "Pete" Andrews Chair, Department of Public Policy University of North Carolina at Chapel Hill 202A Abernethy Hall, CB# 3435 Chapel Hill, NC 27599-3435 (919) 843-5011 E-mail: pete_andrews@unc.edu
The Distinguished Research Professor (with expertise in sea level change), Department of Geology at East Carolina University	Dr. Stanley R. Riggs Distinguished Research Professor Department of Geology, College of Arts and Sciences East Carolina University Room 101, Graham Building Greenville, NC 27858 (252) 328-6015 E-mail: riggss@ecu.edu
The North Carolina State Climatologist[53]	Dr. Ryan Boyles Director and State Climatologist Research III Building, Centennial Campus Box 7236, North Carolina State University Raleigh, NC 27695-7236 (919) 513-2816 Email: ryan_boyles@ncsu.edu

[52] Dr. Doug Crawford-Brown served as the designee from UNC Chapel Hill from January 2006 to December 2007.
[53] Dr. Sethu Raman, the State Climatologist from January 2006 through July 1, 2006, served as a member of the Commission.

Commission Staff[54]

Jeff Hudson, Commission Counsel
Jennifer McGinnis, Commission Counsel
Jennifer Mundt, Commission Analyst
Tim Dodge, Commission Counsel
Mariah Matheson, Commission Assistant

Susan Iddings, Commission Counsel

Research Division
545 Legislative Office Building
300 North Salisbury Street
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(919) 733-2578

Legislative Drafting Division
401 Legislative Office Building
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417A Legislative Office Building
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(919) 733-5775

Ted Harrison, Commission Clerk
2125 Legislative Building
16 West Jones Street
Raleigh, NC 27601
(919) 733-5649

[54] George Givens served as Commission Counsel from 2006 to 2009. The Commission Cochairs and Staff would like to thank Mr. Givens and the following people who contributed to the work of the Commission over the course of its investigation: Mary Watson, Genie Clark, Jessica Proctor, and Deladier Miller.

APPENDIX C:
COMMISSION AGENDAS

February 3, 2006

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Introduction to, and discussion of, the state of the science related to global climate change
  - William H. Schlesinger, Dean, Nicholas School of Environmental & Earth Sciences, Duke University, James B. Duke Professor of Biogeochemistry

- Remarks regarding ongoing efforts by the Department of Environment and Natural Resources (DENR) to control emissions of carbon dioxide and other greenhouse gases
  - William G. Ross, Jr., Secretary of Environment and Natural Resources

- Final report on issues related to the development and implementation of standards and plans to implement programs to control emissions of carbon dioxide from coal-fired generating units and other stationary sources of air pollution (S.L. 2002-4, Sec. 13)
  - Brock M. Nicholson, Deputy Director, Division of Air Quality, DENR

- Report on specific activities and plans of the Division of Air Quality of the Department of Environment and Natural Resources to develop and implement standards and plans to control emissions of carbon dioxide and other greenhouse gases
  - Brock M. Nicholson, Deputy Director, Division of Air Quality, DENR

March 7, 2006

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Continuation of the discussion of the state of the science related to global climate change
  - Robert C. Balling, Jr., Professor, Department of Geography, Arizona State University
  - Stanley R. Riggs, Distinguished Research Professor, Department of Geology, College of Arts and Sciences, East Carolina University
  - Robert B. Jackson, Jr., Faculty Director, Center on Global Change; Professor of Biology and Environmental Sciences, Duke University
  - Sethu Raman, State Climatologist and Professor of Meteorology, Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University

- Update on activities of the Department of Environment and Natural Resources (DENR) and the Climate Action Plan Advisory Group
  - Brock M. Nicholson, Deputy Director, Division of Air Quality, DENR

April 4, 2006

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Update on activities of the Department of Environment and Natural Resources (DENR) and the Climate Action Plan Advisory Group
  - B. Keith Overcash, Director, Division of Air Quality, DENR

- Discussion of the state of the science related to global climate change
  - David R. Easterling, Chief, Scientific Services Division, National Climatic Data Center, National Oceanic and Atmospheric Administration (NOAA) Asheville, North Carolina
  - Patrick J. Michaels, Research Professor and State Climatologist, Virginia State Climatology Office, University of Virginia, Charlottesville, Virginia
  - William L. Chameides, Chief Scientist, Environmental Defense, New York, New York
  - Michael C. MacCracken, Chief Scientist for Climate Change Programs, Climate Institute, Washington, D.C.

- Discussion of activities taken by businesses in the State and the United States to address global climate change
  - Truman T. Semans, Director for Markets and Business Strategy, Pew Center on Global Climate Change, Washington, D.C.
  - Robert L. Kee, Senior Vice President, Document Management, Bank of America, Charlotte, North Carolina
  - William F. Bailey, Principal Consultant, DuPont, Charlotte, North Carolina
  - Thomas Darden, Chief Executive Officer, Cherokee Investment Partners, Raleigh, NC

April 25, 2006

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Discussion of the technology options related to global climate change by sector
  - Transportation sector
    - David L. Greene, Corporate Fellow, Oak Ridge National Laboratory, Knoxville, Tennessee
  - Electricity sector
    - Edward S. Rubin, Director, Center for Energy and Environmental Studies, Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, Pennsylvania
  - Construction and building sector
    - Marilyn A. Brown, Interim Director, Engineering Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee
  - Forestry and agriculture sector

        - Dennis W. Hazel, Professor, Forestry and Environmental Outreach Program, North Carolina State University, Raleigh, North Carolina

- Update on activities of the Department of Environment and Natural Resources (DENR) and the Climate Action Plan Advisory Group (CAPAG)
    - Brock M. Nicholson, Deputy Director, Division of Air Quality, DENR
    - Karl Hausker, Senior Advisor, Center for Climate Strategies, Harrisburg, Pennsylvania

- Discussion of the economic implications of climate change policy
    - The costs of climate policy options
        - Joseph E. Aldy, Fellow, Resources for the Future, Washington, D.C.

    - The costs of inaction,
        - John C. Whitehead, Associate Professor, Department of Economics, Appalachian State University, Boone, North Carolina

    - Economic implications for forestry and agriculture (DEFERRED)
        - Brian C. Murray, Director for Economic Analysis, Nicholas Institute for Environmental Policy Solutions, Duke University, Durham, North Carolina

    - Economic questions regarding climate change
        - Margo Thorning, Vice President and Chief Economist, American Council for Capital Formation, Washington, D.C.
        - The Impact of Voluntary Measures and the Asia Pacific Partnership for Reducing Greenhouse Gas Emissions

    - Costs and benefits of climate policy options (DEFERRED)
        - Karl Hausker, Senior Advisor, Center for Climate Strategies, Harrisburg, Pennsylvania

October 3, 2006

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Report on actions taken or under consideration by other states to address global climate change
    - Joshua Bushinsky, State Solutions Fellow, Pew Center on Global Climate Change
        - Emission Targets
        - Update on State and Regional Action on Climate Change

- Update on the study by the Utilities Commission of a renewable energy portfolio standard
    - James Y. Kerr II, Commissioner, North Carolina Utilities Commission

- Report on the proposal by the Public Staff of the North Carolina Utilities Commission to create a public benefits fund
    - Robert Gruber, Executive Director, Public Staff, North Carolina Utilities Commission

- Update on and discussion of activities of the Climate Action Plan Advisory Group (CAPAG)
    - Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources

- Technical Working Group Updates and Discussion:
    - Agriculture, Forestry, and Waste
        - Mitchell A. "Mitch" Peele
    - Energy Supply
        - Tim Toben and George T. Everett
    - Residential, Commercial, and Industrial
        - Michael Shore
    - Transportation and Land Use
        - Michael Shore
    - Cross-Cutting Issues
        - Stephen A. Smith

- Next Steps for the Climate Action Plan Advisory Group (CAPAG)
    - Tom Peterson, Executive Director, The Center for Climate Strategies

November 27, 2006

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Update on activities of the Climate Action Plan Advisory Group (CAPAG) of the Department of Environment and Natural Resources (DENR) to develop and implement standards and plans to control emissions of carbon dioxide and other greenhouse gases
    - Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources

- Discussion of the Northeast Regional Greenhouse Gas Initiative (RGGI)
    - Franz T. Litz, Climate Change Policy Coordinator, New York State Department of Environmental Conservation

- Discussion of the options for production and use of biofuels in North Carolina
    - Kurt S. Creamer, P.E., Biomass Program Manager, North Carolina Solar Center and Animal and Poultry Waste Management Center, North Carolina State University

- Overview of recent reports on the economic impacts of climate change
    - Stern Review Report on the Economics of Climate Change, Her Majesty's Treasury, United Kingdom
    - Impacts on U.S. Energy Expenditures of Increasing Renewable Energy Use, RAND Corporation
        - Tim Toben, Member, Legislative Commission on Global Climate Change and Chief Executive Officer of Carolina Green Energy Corporation

December 11, 2006

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- The investment policy of North Carolina as it relates to global climate change
    - Richard H. Moore, State Treasurer, North Carolina

- Discussion of the Chicago Climate Exchange's greenhouse gas emission registry and reduction and trading system for greenhouse gases, including a discussion of the benefits to North Carolina agriculture of methane capture offsets at animal operations
    - Michael J. Walsh, Senior Vice President, Chicago Climate Exchange

- Discussion of combined heat and power (CHP) as a method of reducing greenhouse gas emissions and increasing energy efficiency
    - Thomas R. Casten, Founder and Chair, Alliance for Clean Technology and founder and former Chief Executive Officer of Trigen Energy and Primary Energy Ventures
    - Raymond E. DuBose, Director, Energy Services Department, University of North Carolina at Chapel Hill

- Perspectives on global climate change from the faith community of North Carolina
    - Michael H. Cogsdale, President, North Carolina Council of Churches and Rector at St. James Episcopal Church in Lenoir, North Carolina

January 12, 2007

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Discussion of the effects of global climate change as they relate to coastal adaptation
    - Discussion of coastal vulnerability to erosion, storm hazards, and potential sea-level rise
    - S. Jeffress Williams, Coastal Marine Geologist, United States Geological Survey, Woods Hole Science Center

- Presentation of the National Academy of Sciences report Mitigating Shore Erosion along Sheltered Coasts
  - Debra Hernandez, President, Hernandez and Company

- Discussion of the projected impacts of global climate change on coastal ecosystems in North Carolina
  - Douglas N. Rader, Principal Scientist for Oceans and Estuaries, Environmental Defense

- Discussion of the implications of sea level rise for coastal development policy
  - Courtney T. Hackney, Chair, Coastal Resources Commission
  - Walter Clark, Coastal Community and Policy Specialist, North Carolina Sea Grant

- Report on the study by the North Carolina Utilities Commission of a Renewable Energy Portfolio Standard (REPS) for the State of North Carolina and related issues
  - James Y. Kerr II, Commissioner, North Carolina Utilities Commission
  - Sam Watson, Staff Attorney, North Carolina Utilities Commission

- Update on and discussion of activities and possible recommendations of the Climate Action Plan Advisory Group (CAPAG)
  - Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources
  - Tom Peterson, Executive Director, The Center for Climate Strategies

- Proposed recommendations for inclusion in the Interim Report from members of the Commission
  - Stanley R. Riggs, James H. Stephenson, and Walter Clark
  - Dolores "Dee" Eggers
  - Timothy Profeta
  - Michael Shore

October 23, 2007

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Report on actions taken by other governmental units in the nation related to global climate change during the past year
  - Patrick Hogan, Solutions Fellow, Pew Center on Global Climate Change

- Discussion of legislation enacted by the 2007 Regular Session of the General Assembly to provide for a renewable energy portfolio standard (REPS) for the State (Promote Renewable Energy/Baseload Generation, S.L. 2007-397 (Senate Bill 3))
  - George F. Givens, Commission Counsel
    - S.L. 2007-397

        - Summary of Senate Bill 3
        - Fiscal Note of Senate Bill 3

- Discussion of recommendations considered by the Climate Action Plan Advisory Group (CAPAG) at its meeting on 16 October 2007
    - Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources
    - Tom Peterson, Executive Director, Center for Climate Strategies

- Presentation of draft preliminary results of a macroeconomic analysis conducted on various climate mitigation options recommended by CAPAG
    - David W. Ponder, Graduate Research Assistant, Department of Political Science/Criminal Justice, College of Arts and Sciences, Appalachian State University

December 4, 2007

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Update on federal activities related to global climate change
    - Timothy Profeta, Director, Nicholas Institute for Environmental Policy Solutions, Duke University

- Discussion of the extent to which carbon offsets may be reliably identified and quantified
    - William L. Chameides, Dean, Nicholas School of the Environment, Duke University

- Discussion of opportunities for, and recommendations related to, carbon offset projects in the agriculture and forestry sectors
    - William C. McDow III, Southern Forest Projects Manager, Environmental Defense
- Presentation and consideration of the recommendations of the Agriculture, Forestry, and Waste Technical Working Group of the Climate Action Plan Advisory Group (CAPAG)
    - Brock M. Nicholson, Deputy Director, Division of Air Quality, Department of Environment and Natural Resources (DENR)
    - Thomas D. Peterson, President and CEO, Center for Climate Strategies
    - Stephen Roe, Senior Scientist, E.H. Pechan and Associates and Facilitator Agriculture, Forestry, and Waste Management Technical Work Group and Lead Consultant for Emissions Inventory, Center for Climate Strategies
    - Dennis W. Hazel, Assistant Professor and Extension Specialist, Department of Forestry and Environmental Resources, NCSU
    - Christopher B. Hopkins, Outreach Associate, Department of Forestry and Environmental Resources NCSU
    - M. Paul Sherman, Director of Air Quality and Energy Programs, North Carolina Farm Bureau Federation

- Robert W. Slocum, Jr., Executive Vice President North Carolina Forestry Association

January 16, 2008

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

Discussion of strategies to mitigate and adapt to global climate change

- Emissions reduction goals and standards in the state of Maryland
  - George S. "Tad" Aburn Jr., Director, Air and Radiation Management Administration, Maryland Department of the Environment
- Adaptation to the effects of climate change in the state of Maryland
  - Kenneth A. Colburn, Senior Consultant, Center for Climate Strategies
  - Bill Dougherty, Senior Scientist, Center for Climate Strategies

- Report on progress in consolidation of the recommendations of the Climate Action Plan Advisory Group (CAPAG)
  - Thomas D. Peterson, President and CEO, Center for Climate Strategies

- Presentation of the report: "Measuring the Impacts of Climate Change on North Carolina Coastal Resources" prepared for the National Commission on Energy Policy
  - Christopher F. Dumas, Associate Professor, University of North Carolina at Wilmington

- Presentation of the report: "When it Rains, it Pours: Global Warming and the Rising Frequency of Extreme Precipitation in the United States" prepared by Environment America
  - Travis Madsen, Policy Analyst, Frontier Group, Environment North Carolina

- Preparation for the 11 February 2008 meeting of the Commission: Summary of the "Synthesis Report from Climate Change 2007" prepared by the Intergovernmental Panel on Climate Change (IPCC)
  - Dolores M. “Dee” Eggers, Commission member and Associate Professor, Department of Environmental Studies, University of North Carolina at Asheville

February 11, 2008

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

Presentation on the state of the science on global climate change, what developing countries are doing to address climate change in relation to what the United States and other industrialized countries are doing and should do in this regard, and what the State of North Carolina should do with regard to climate change

- Introduction of Dr. Pachauri
    - George F. Givens, Commission Counsel

- Presentation
    - Dr. Rajendra Pachauri, Chair, Intergovernmental Panel on Climate Change, and Director General, The Energy and Resources Institute

March 5, 2008

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Presentation of the recommendations of the Climate Action Plan Advisory Group (CAPAG) (Consolidated format)
    - Thomas D. Peterson, President and CEO, Center for Climate Strategies
        - Draft consolidated CAPAG options

- Presentation of options for State and local governments to consider with regard to plans for and adaptation to the impacts of global climate change
    - William E. Holman, Visiting Senior Fellow, Duke University Nicholas Institute for Environment Policy Solutions

- Presentation of the "North Carolina Green Cities Plan" by the Centers for Environmental and Climatic Interaction
    - Mack B. Pearsall, Advisory Board Member, Centers for Environmental and Climatic Interaction

April 22, 2008

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Presentation of the results of the Intergovernmental Panel on Climate Change in the context of creating a greenhouse gas emissions reduction goal for the State of North Carolina
    - Robert B. Jackson, Faculty Director, Center on Global Change, and Professor of Biology and Environmental Sciences, Duke University

- Presentation on electricity technologies in a carbon-constrained world
    - Bryan Hannegan, Vice President of Environment and Generation, Electric Power Research Institute

- Presentation of final results of the macroeconomic analysis conducted on various climate mitigation options recommended by Climate Action Plan Advisory Group (CAPAG)

    - David W. Ponder, Graduate Research Assistant, Department of Political Science/Criminal Justice, College of Arts and Sciences, Appalachian State University

- Presentation on the economics of climate change legislation in North Carolina
    - David G. Tuerck, Executive Director, Beacon Hill Institute for Public Policy Research, and Professor and Chairperson, Economics Department, Suffolk University

November 14, 2008

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Overview of various reports on climate change issued by the National Conference of State Legislators
    - Glen Andersen, Program Principal, National Conference of State Legislators, Environment, Energy, and Transportation Program

- Discussion of four key action areas related to climate change (energy efficiency, clean energy, pollution capture, and long-range planning), discussed in the publication "Cornerstones," issued by the Southern Alliance for Clean Energy
    - John D. Wilson, Research Director, Southern Alliance for Clean Energy

- Discussion of global warming adaptation strategies to conserve fish and wildlife habitats and maintain healthy and genetically diverse wildlife populations
    - Michael R. Bryant, Project Leader, North Carolina Coastal Plain Refuges Complex, Alligator River National Wildlife Refuge

- Presentation on estuarine shoreline erosion and coastal hazards in the changing climate of North Carolina
    - Dr. D. Reide Corbett, Ph.D., Associate Professor and Assistant Chair
    - Dr. J.P. Walsh, Ph.D., Assistant Professor, East Carolina University

December 9, 2008

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Discussion of green jobs in North Carolina
    - Paul J. Quinlan, Director, Economic Research and Development, North Carolina Sustainable Energy Association

- Discussion of green buildings and green building codes
    - R. Christopher Mathis, President, MC2 Mathis Consulting Company

- Brief discussion on anticipated federal actions on energy and climate change
    - Timothy H. Profeta, Director, Nicholas Institute for Environmental Policy Solutions, Duke University

- Discussion of adaptation strategies for rural and conservation lands and waters
    - Sam H. Pearsall, Southeast Regional Manager for Land, Water, and Wildlife, Environmental Defense Fund

- Presentation of the report "North Carolina Coasts in Crisis: A Vision for the Future"
    - Stephen J. Culver, Professor and Department Chairperson
    - David J. Mallinson, Associate Professor, Department of Geological Sciences, East Carolina University

January 13, 2009

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Presentation of the report "New Climate World: Integrating State and Regional Programs into an Emerging Federal System for Greenhouse Gas Regulation"
    - Robert B. McKinstry, Senior Advisor, Center for Climate Strategies

- Presentation of "Greenhouse Gas (GHG) Emission Reductions Between California GHG Standards and Federal Corporate Average Fuel Economy (CAFE) Standards" (S.L. 2008-181, Sec. 6.2)
    - Janice L. Godfrey, Environmental Engineer, Division of Air Quality, DENR

- Discussion of whether to set a goal to reduce State greenhouse gas emissions

- Discussion of whether to establish a permanent global climate change commission and Global Climate Change Advisory Council
    - Dr. Dolores M. Eggers, Assistant Professor, University of North Carolina at Asheville
    - Michael S. Regan, Policy Manager, Environmental Defense Fund

- Discussion of whether to establish energy efficiency standards for buildings constructed with State funds

- Discussion of whether and how to amend the State Building Code in order increase the energy efficiency of buildings constructed or substantially renovated in the State

- Discussion of adaptation recommendations
    - James H. Stephenson, Policy Director, North Carolina Coastal Federation
        - Memorandum
        - Coastal Hazards Mitigation Program

- Discussion of recycled energy and combined heat and power recommendations
    - Stephen A. Smith, Executive Director, Southern Alliance for Clean Energy

November 17, 2009

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Report on recent federal actions related to climate change
    - Victor Flatt, Tom & Elizabeth Taft Distinguished Professor of Environmental Law, School of Law, University of North Carolina at Chapel Hill

- Report on recent actions taken by state and local governments to address climate change
    - Thomas Peterson, President, Center for Climate Strategies

- Report on legislation related to climate change that was enacted during the 2009 Regular Session or is pending for the 2010 Regular Session
    - Jennifer Mundt, Commission Analyst

January 13, 2010

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Update on federal and international actions related to climate change, including the activities and outcomes of the 15th Conference of the Parties to the United Nations Framework Convention on Climate Change in Copenhagen, Denmark
    - Victor Flatt, Tom & Elizabeth Taft Distinguished Professor of Environmental Law, School of Law, University of North Carolina Chapel Hill
        - Copenhagen Accord

- Report on the implementation of the North Carolina Renewable Energy and Energy Efficiency Portfolio Standards and subsequent proceedings (S.L. 2007-397; Senate Bill 3)
    - Edward S. Finley, Jr., Chairman, North Carolina Utilities Commission

- Report on the activities and objectives of the Energy Policy Council
    - Tim Toben, Chair, North Carolina Energy Policy Council

- Report on Progress Energy's plans to retire eleven coal-fired electric generating units in North Carolina by 2017
    - Caroline Choi, Director - Energy Policy & Strategy, Progress Energy
        - Progress Energy Carolinas plans to retire remaining unscrubbed coal plants in N.C.

- Report on climate initiatives within the Department of Environment and Natural Resources; Update on the activities of the Interagency Leadership Team with regard to climate change
    - David W. Knight, Assistant Secretary for Natural Resources, DENR

- Report on the Division of Emergency Management's development of a statewide risk assessment of sea-level rise and changes in storm frequency and intensity associated with climate change in coastal North Carolina (DEFERRED)
    - John Dorman, Assistant Director, Division of Emergency Management, Department of Crime Control and Public Safety

March 15, 2010

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Summary of the Coastal Resource Commission's Science Panel Report on projected levels of sea level rise along the North Carolina coast; Presentation of the findings of the Division of Coastal Management's Sea Level Rise Scoping Survey *(30 minutes)*
    - Tancred Miller, Coastal Policy Analyst
      Division of Coastal Management, Department of Environment and Natural Resources
        - Sea-level rise assessment report

- Summary of the March 2010 Climate Change Adaptation Workshop sponsored by the North Carolina Interagency Leadership Team and next steps *(30 minutes)*
    - David W. Knight, Assistant Secretary for Natural Resources
      Department of Environment and Natural Resources

- Presentation and discussion of the draft Commission final report, including a discussion of the proposed recommendations submitted by Commission members

April 7, 2010

Handouts and presentations from the Commission meetings are available online at: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=14.

- Update on revisions to the North Carolina Energy Conservation Code; Overview of the U.S. Department of Energy grant to assist the State in the development of an advanced building code
    - Billy Hinton, North Carolina Building Code Consultant
      Evaluation Services Section, Engineering Division, Department of Insurance
- Opportunities and prospects for improving the energy efficiency of the North Carolina Building Code
    - Aranzazu Lascurain, Research Assistant
      Representative Pricey Harrison
    - Building Codes and Energy Efficiency: North Carolina

- Commission discussion of the findings, recommendations, and legislative proposals in the draft Commission final report

Presentation and discussion of the draft Commission final report, including a discussion of the proposed recommendations submitted by Commission members

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APPENDIX D:
LETTER FROM CERTAIN COMMISSION MEMBERS IN RESPONSE TO SOLICITATION FOR RECOMMENDATIONS

February 5, 2010

Representative Pricey Harrison
Co-Chair, Legislative Commission on Global Climate Change
PO Box 9339
Greensboro, NC 27429

John L. W. Garrou
Co-Chair, Legislative Commission on Global Climate Change
PO Box 5958
Winston-Salem, NC 27113

Re: Proposals and Recommendations for the Legislative Commission on Global Climate Change

You requested additional proposals and recommendations for reducing greenhouse gases in North Carolina. As members of the Legislative Commission on Global Climate Change (LCGCC), we believe it is important to keep in mind the recommendations already adopted and the work already accomplished or in process. We need to evaluate the benefits and impacts of these extensive actions before recommending additional mandates.

As a group, we believe that there is great value in being more energy efficient, reducing our environmental footprint, and becoming more energy independent. By continuing our efforts to achieve these goals there will be the added benefit of reducing, avoiding, or sequestering greenhouse gas emissions. Our focus should be on these messages rather than continuing to debate the rates and causes of global warming.

In 2007, the LCGCC adopted a number of recommendations for inclusion in its interim report. The bulk of the adopted recommendations were compiled and unanimously recommended by the Climate Action Plan Advisory Group (CAPAG). While a Commission-approved interim report was never published, the adopted recommendations were noted in the summary provided by Commission Counsel Tim Dodge at the most recent meeting of the LCGCC. Almost all the LCGCC recommendations - and many of the CAPAG recommendations - have been implemented at some level, and the framework for the others is in place, although not fully funded (this is not unexpected, given the current economy).

For example, the General Assembly enacted S.L. 2007-307, a renewable energy portfolio standard (REPS; LCGCC recommendation #14). Enactment of this legislation implemented the mitigation option identified by CAPAG as having the greatest impact on reducing greenhouse gas emissions. North Carolina was the first state in the southeast to adopt such legislation and adjacent states have yet to follow our lead. The General Assembly also approved S.L. 2007-546. This language promotes the conservation of energy and water use in state, university and community college buildings (LCGCC recommendation #2). The Center for Climate Strategies, in coordination with the Department of Environment and Natural Resources, completed a statewide inventory and forecast of greenhouse gas emissions (LCGCC Recommendation #10).

According to the Greenhouse Gas Inventory and Forecast, North Carolina's greenhouse gas emissions on a per capita basis and per unit of gross product were below the national average. These lower-than-national-average emissions of greenhouse gas emissions in the state (due in part to our significant nuclear generation capacity) are in spite of the extensive use of air conditioning in our geographical area and our position as a major manufacturing state. Even though North Carolina has been doing better than the national average in terms of greenhouse gas emissions, the significant steps taken by the General Assembly further improve our status. Thus, we believe that while North Carolina is in good company nationally in terms of our efforts to control greenhouse gas emissions, we are leaders in our region where the competition for jobs and growth is intense.

Additional notable actions that will address many of the other recommendations made by the CAPAG include the adoption of:

- anti-idling rules by the North Carolina Environmental Management Commission (TLU-8);
- tax incentives for renewable energy facilities and targets for specific renewable energy resources (ES-1, ES-3);
- statutory changes to facilitate citing of renewable energy facilities, (ES-9);
- tax incentives for biofuels production and establishment of a biodiesel production goal (TLU-6);
- federal standards for small generator interconnections as well as improvements to the net metering rules by the North Carolina Utilities Commission (ES-3, ES-9, LCGCC recommendation #9); and
- a mandatory greenhouse gas emissions reporting protocol by the US EPA (CC-2).

Of the top ten mitigation options identified by the CAPAG that would achieve the greatest reductions in greenhouse gas emissions, eight of the ten have been implemented or have the mechanisms in place but await sufficient funding.

Until the full benefits of the existing actions have been achieved and all of the recommendations already adopted have been adequately funded, more recommendations are unnecessary. We need to evaluate the benefits and impacts of the actions already taken before more mandates are adopted. As an example, the first comprehensive renewable energy targets under Senate Bill 3 will only come into play in 2012 (set aside target for solar in 2010).

North Carolina is demonstrating strong leadership in reducing greenhouse gas emissions. This Commission, along with the legislative and executive branches, has created a substantial body of work and put significant long-term initiatives in motion. Our state is dealing with the worst recession in a generation and facing record unemployment levels. As state leaders and employers work together to create more jobs, we believe that now is not the time to recommend additional mandates on our economy but to evaluate where we stand and to ensure the effectiveness of what is under way.

Thank you for your consideration of our views.

Sincerely,

Thomas F. Cecich
Caroline Choi, Progress Energy
S. Lewis (Lew)Ebert, North Carolina Chamber
George T. Everett, Duke Energy Carolinas
A. Preston Howard, Jr., Manufacturers and Chemical Industry Council
Mitchell A. (Mitch) Peele, North Carolina Farm Bureau Federation
Robert W. Slocum, Jr., North Carolina Forestry Association

cc: Mariah Matheson, Commission Assistant

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APPENDIX E:
SUMMARY OF ACTIONS ON CAPAG RECOMMENDATIONS:

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Residential, Commercial, and Industrial (RCI)					
RCI–1	Demand Side Management Programs for the RCI Sectors - Recommended Case: "Top-Ten States" EE Investment	Yes		No	77.1	Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS) Energy Policy Council - Energy Efficiency Subcommittee
RCI–2	Expand Energy Efficiency Funds	Yes		Yes	54.8	Energy Policy Council - Energy Efficiency Subcommittee Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS) Session Law 2007-381, SB 581: Bldg. Permit Fee Reductions/Rebates…
RCI–3	Energy Efficiency Requirements for Government Buildings	Yes		Yes	6.4	Session Law 2007-546, SB 668: Energy Conservation in State Buildings
RCI–4	Market Transformation and Technology Development Programs	Yes		Yes	10.5	
RCI–5	Improved Appliance and Equipment Efficiency Standards	Yes		Yes	5.3	Energy Policy Council - Energy Efficiency Subcommittee
RCI–6	Building Energy Codes	Yes		Yes	23.1	Energy Policy Council - Energy Efficiency Subcommittee Session Law 2008-203, SB 1947-HB2532: Codify Energy Efficiency in Public Buildings

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Residential, Commercial, and Industrial (RCI)					
RCI–7	"Beyond Code" Building Design Incentives and Targets, Incorporating Local Building Materials and Advanced Construction	Yes		Yes	34.2	Session Law 2007-381, SB 851: Building Permit Fee Reductions/Rebates to Promote Energy Efficient Building Construction Energy Policy Council - Energy Efficiency Subcommittee
RCI–8	Education (Consumer, Primary/Secondary, Post-Secondary/ Specialist, College and University Programs)	Yes		Yes	Not Applicable (NA)	
RCI–9	Green Power Purchasing (required for state facilities) and Bulk Purchasing Programs for Energy Efficiency or Other Equipment	Yes			3.5	
RCI–10	Distributed Renewable and Clean Fossil Fuel Power Generation	Yes			33.5	Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS)
RCI–11	Residential, Commercial, and Industrial Energy and Emissions Technical Assistance and Recommended Measure Implementation	Yes		Yes	14.9	
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS				218.7	

Table prepared by the Division of Air Quality of DENR, last updated March 3, 2010. Please refer to the CAPAG final report at: http://www.ncclimatechange.us/capag.cfm for a full description of each of the CAPAG mitigation options.

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Energy Supply (ES)					
ES-1	Renewable Energy Incentives	Yes			0.33	Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS) Session Law 2009-548, HB 512: Incentives for Energy Conservation Session Law 2009-553, HB 1387: Solar Collectors on Residential Properties
ES-2	Environmental Portfolio Standard					
ES-2a	Original Analysis	Yes			288.7	
ES-2b	20% Combined Target	Yes			166.2	
ES-2c	Load Growth Offset Target	Yes			160.3	
ES-3	Removing Barriers to Combined Heat and Power and Clean Distributed Generation	Yes		Yes	20.1	Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS) Energy Policy Council - Energy Efficiency Subcommittee
ES-4	CO_2 Tax and/or Cap-and-Trade					
ES-4a	Electric Sector Only		Yes		20.4	
ES-4b	Economy-wide		Yes		47.7	
ES-5	Legislative Changes to Address Environmental and Other factors	Yes			NA	
ES-6	Incentives for Advanced Coal					Energy Policy Council - Energy Supply Subcommittee
ES-6a	Replacement of New 800 MW Pulverized Coal Plant	Yes			31.0	Session Law 2009-390, SB 1004: Amend Certain Electricity Generation Laws
ES-6b	Replacement of Existing 800 MW Pulverized Coal Plant	Yes			42.9	Progress Energy Carolinas plans to retire select unscrubbed coal plants in N.C.

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Energy Supply (ES)					
ES-7	Public Benefit Charge		Yes		24.4	
ES-8	Waste to Energy	Yes			0.02	Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS) Energy Policy Council - Energy Supply Subcommittee
ES-9	Incentives for Combined Heat and Power and Clean Distributed Generation	Yes		Yes	NA	Energy Policy Council - Energy Supply Subcommittee Session Law 2009-522, HB 1389: Revolving Loan Fund For Energy Improvements
ES-10	NC GreenPower Renewable Resources Program	Yes			0.95	
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS				375	
	REDUCTIONS FROM RECENT ACTIONS (None)				0	
	SECTOR TOTAL PLUS RECENT ACTIONS				375	

Table prepared by the Division of Air Quality of DENR, last updated March 3, 2010. Please refer to the CAPAG final report at: http://www.ncclimatechange.us/capag.cfm for a full description of each of the CAPAG mitigation options.

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Transportation and Land Use (TLU)					
TLU-1a	Land Development Planning		Yes		58.2	Energy Policy Council – Low Carbon Transportation Subcommittee Session Law 2009-95, SB 52: Various Localities Energy Development Incentives DENR is coordinating a Land Use Planning and Development Working Group
TLU-1b	Multi-Modal Transportation and Promotion (formerly TLU-2)	Yes			52.4	Energy Policy Council – Low Carbon Transportation Subcommittee
TLU-3a	Surcharges to Raise Revenue		Yes		15.7	
TLU-3b	Rebates/ Feebates to Change Fleet Mix		Yes		2.8	
TLU-4	Truckstop Electrification	Yes			NA	
TLU-5	Tailpipe Greenhouse Gas Standards		Yes		44.5	Proposed Federal Rule: Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards for Model Years 2011 – 2016
TLU-6	Biofuels Bundle	Yes			35.4	Energy Policy Council – Low Carbon Transportation Subcommittee
TLU-7	Procure Efficient Fleets	Yes			NA	Energy Policy Council – Low Carbon Transportation Subcommittee Session Law 2009-241, HB 1079 – Energy Efficient State Motor Vehicle Fleet
TLU-8	Idle Reduction/Elimination Policies	Yes			2.2	Energy Policy Council – Low Carbon Transportation Subcommittee Division of Air Quality Rule Awaiting Legislative Review - Heavy-Duty Vehicle Idling Restrictions (15A NCAC 02D 1010)

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Transportation and Land Use (TLU)					
TLU-9	Diesel Retrofits	Yes			13.5	Session Law 2007 – 420, SB 1277: State diesel vehicles, Warrantees/B20 Fuel
TLU-11	Pay-As-You Drive Insurance		Yes		42.0	
TLU-12	Advanced Technology Incentives	Yes			NA	
TLU-13	Buses – Clean Fuels	Yes			NA	Session Law 2007 – 423, SB 1452:Diesel School Buses to Use Minimum B20
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS				232.3	
	REDUCTIONS FROM RECENT ACTIONS (None)				0	
	SECTOR TOTAL PLUS RECENT ACTIONS				232.3	

Table prepared by the Division of Air Quality of DENR, last updated March 3, 2010. Please refer to the CAPAG final report at: http://www.ncclimatechange.us/capag.cfm for a full description of each of the CAPAG mitigation options.

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Agriculture, Forestry, and Waste (AFW)					
AFW-1	Manure Digesters & Energy Utilization	Yes			6.4	Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS) Session Law 2007, SB 1465: Methane Capture Pilot Program
AFW-2	Biodiesel Production (incentives for feedstocks and production plants)	Yes			5.1	Session Law 2007-206, SBl 2051 and HB 1990: Establish the Biofuels Center of NC/Funds
AFW-3	Soil Carbon Management (including organic prod. methods incentives)	Yes			3.0	
AFW-4a	Preservation of Working Land–Agricultural Land	Yes			2.6	
AFW-4b	Preservation of Working Land–Forest Land (formerly AFW-7)	Yes			36	
AFW-5	Agricultural Biomass Feedstocks for Electricity or Steam Production	Yes			0.2	
AFW-6	Policies to Promote Ethanol Production	Yes			38	Clean Transportation Program Clean Fuel Advanced Technology 2006-09, NC Solar Center/NCSU Session Law 2005-276, State Fleet Petroleum Displacement Plan Requirement Various North Carolina Alternative Fuel Incentives
AFW-8	Afforestation and/or Restoration of Nonforested Lands	Yes			15	
AFW-9&10	Expanded Use of Forest Biomass and Better Forest Management	Yes			48	
AFW-11	Landfill Methane and Biogas Energy Programs	Yes			20	Session Law 2007-397, SB 3: Renewable Energy and Energy Efficiency Portfolio Standard (REPS)

Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Agriculture, Forestry, and Waste (AFW)					
AFW-12	Increased Recycling Infrastructure and Collection	Yes			4.1	
AFW-13	Urban Forestry Measures	Yes			34	
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS				213	
	REDUCTIONS FROM RECENT ACTIONS (None)				0	
	SECTOR TOTAL PLUS RECENT ACTIONS				213	

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Mitigation Option Name		CAPAG Level of Support		Approved By LCGCC	Cumulative GHG Reductions 2007–2020 $MMtCO_2e$	Implementation Status
		Unanimous Consent	Supermajority Consent			
	Cross-Cutting Issues (CC)					
CC-1	Greenhouse Gas Inventories and Forecasts	Yes		Yes	NA	Division of Air Quality Developing State Specific Emissions Inventory Projection Tool DENR is coordinating a Carbon Mitigation Working Group
CC-2	Greenhouse Gas Reporting	Yes		Yes	NA	EPA EHG Mandatory Reporting Rule for Facilities Emitting Greater Than 25,000 metric tons CO2e per year
CC-3	Greenhouse Gas Registry	Yes		Yes	NA	DENR Serves as state board member and reporter of department's carbon footprint.
CC-4	Public Education and Outreach	Yes		Yes	NA	DENR led efforts for workshops, information tools, and other resources related to climate change mitigation and adaptation
CC-5	Adaptation	Yes		Yes	NA	DENR is leading state effort to develop a Climate Action Plan for NC DENR is coordinating a Sea Level Rise Working Group
CC-6	Options for Goals or Targets (for CAPAG in support of LCGCC)	Yes		Yes	NA	

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