North Carolina

Climate Action Plan Advisory Group

Energy Supply Technical Work Group Teleconference Meeting #1

April 11, 2006

ncdenr
North Carolina Department of Environment and Natural Resources

CCS
CENTER FOR CLIMATE STRATEGIES

Today's Agenda

- Call to order
- Introduction of Technical Work Group (TWG) members
- Review of TWG organization and logistics
- Review and discussion of list of potential state actions
- Review and discussion of the draft North Carolina greenhouse gas (GHG) emissions inventory and forecast for Energy Supply
- Discussion of next steps toward identification of priorities for analysis of options
- Call to the public
- Proposed agenda items for next meeting
- Announcements

Part 1 - TWG Process

- Schedule
- TWG roles
- Tasks

CAPAG Schedule

- CAPAG meetings through 2007
- TWG discussions between CAPAG meetings
- Final Work Products
  - Proposed policy recommendations
  - GHG inventory & forecast
  - Final Report to DENR

Sector Based TWGs

- Energy Supply (power generation)
- Residential, Commercial, Industrial (energy use and industrial process)
- Transportation and Land Use
- Agriculture and Forestry
- Cross Cutting Issues (reporting, registries, education)

Roles & Responsibilities

- DENR convenes CAPAG
- CAPAG makes recommendations to DENR and supports Legislative Commission
- Technical work groups advise CAPAG
- Public input to CAPAG
- CCS provides facilitation, technical analysis to CAPAG and TWGs, final report to DENR

TWG Tasks

- Identify potential mitigation options
- Identify early priority options for analysis
- Craft straw proposals policy options, including policy design and implementation methods
- Approve methods for cost-benefit analysis
- Assist with data and analysis
- Assist with evaluation of additional issues, such as co-benefits, detailed cost breakdowns, as needed
- Identify and develop alternative approaches for policy options, as needed
- Contribute to drafting of language for the final report

First TWG Meetings

- Review/expand list of potential options
- Identify initial priorities for analysis
- Review emissions inventory & forecast
- Review proposed technical work plan and meeting schedule
- Prepare suggestions for next CAPAG meeting

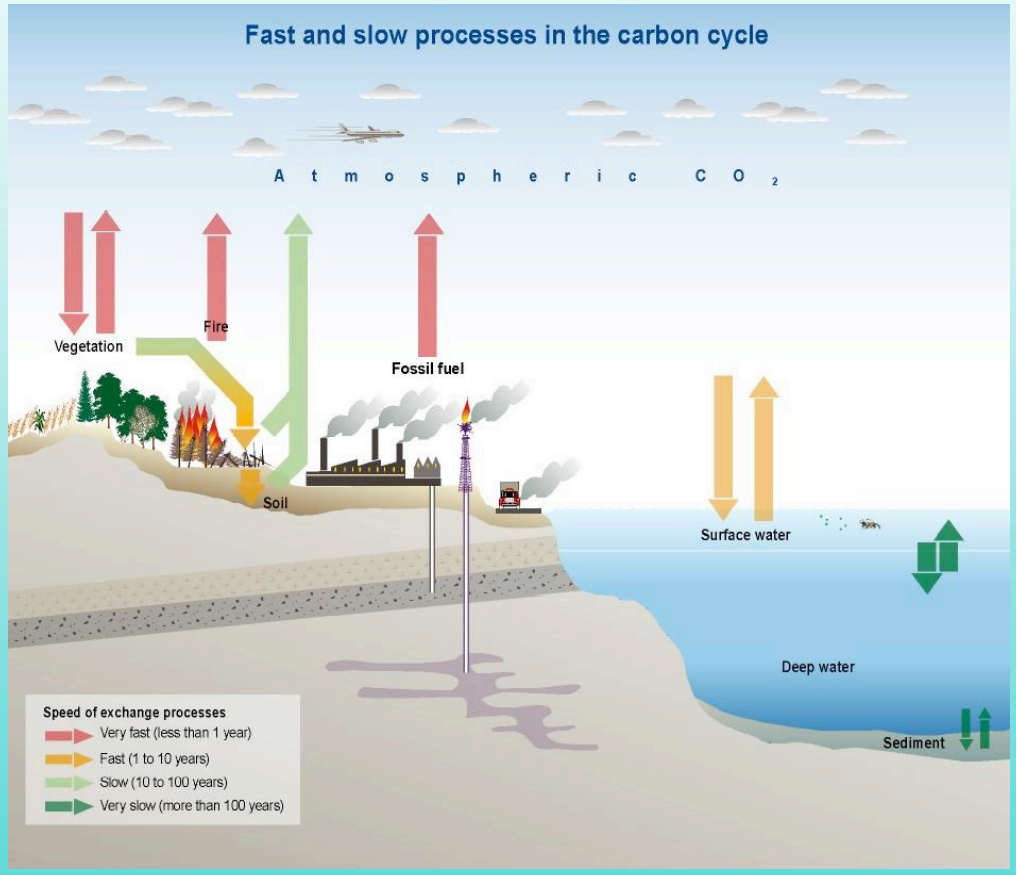
DENR/CAPAG Assistance to Study Commission

- Provides inputs and responses to fact finding requirements of Section 5 - b, c, d, f...
  - Emissions assessments
  - Potential policy actions
  - Potential implementation mechanisms
  - Economic analysis of policy options
  - Alternatives to address potential conflicts
- Responds to questions of the GWC as they relate to state policy actions

Part 2 - GHG Mitigation Options

- Sector based actions
- Implementation mechanisms

Carbon Cycle



GHG Pathways

- CO2
  - Photosynthesis > carbon pools > combustion > dispersion
- CH4
  - Plant/animal organic matter > anaerobic decomposition > dispersion
  - Carbon pools > carbon combustion & fugitive release > dispersion
- N2O
  - Carbon combustion > dispersion
  - Nitrogen deposition > decomposition > dispersion
  - Nitrogen fixing plants > nitrification > dispersion
- HFC's, SFC's, PFC's (ODS)
  - Chemical manufacturing > fugitive release, process dispersion
- Black Carbon
  - Carbon pools > combustion > dispersion

Mitigation Sectors

- Agriculture
- Forestry
- Electricity and Fuel Production
- Residential, Commercial, Industrial (Energy Use and Industrial Process)
- Transportation and Land Use
- Waste Management - Bio Waste

Implementation Mechanisms

- Voluntary Agreements
- Technical Assistance
- Information and Education
- Financial Incentives
- Codes and Standards
- Market Based Approaches
- Reporting and Registries
- Others…

Key Actions… Energy Production

- Expand low emitting and renewable sources
- Displace/reduce high emitting sources
- Reduce line losses
- Capture and store carbon (sequestration)
- Remove particulates (black carbon)

Part 3 - NC GHG Inventory & Forecast

- Overview
- Preliminary findings for the Energy Supply sector

NC GHG Emissions

- Inventory and Reference Case Projections 1990-2020 to support mitigation planning
  - Initial estimates by CCS for further discussion and revision
  - Not a baseline for reporting or compliance
  - Provided in transparent, review draft format
  - Uses best available references and assumptions
  - Results may change with modification of data sources, methods, assumptions

Coverage

- Six gases per U.S. EPA and UNFCCC guidelines
  - Carbon Dioxide (CO2), Methane (CH4), Nitrous Oxide (N2O, Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF6)
  - Black Carbon not included at this time
- All major emitting sectors
  - Electricity Consumption (production + imports)
  - Residential, Commercial, Industrial (RCI) –
    - Fuel Use & Natural Gas Transmission / Distribution Systems
    - Industrial Processes
  - Transportation
  - Agriculture and Forestry
  - Waste Management

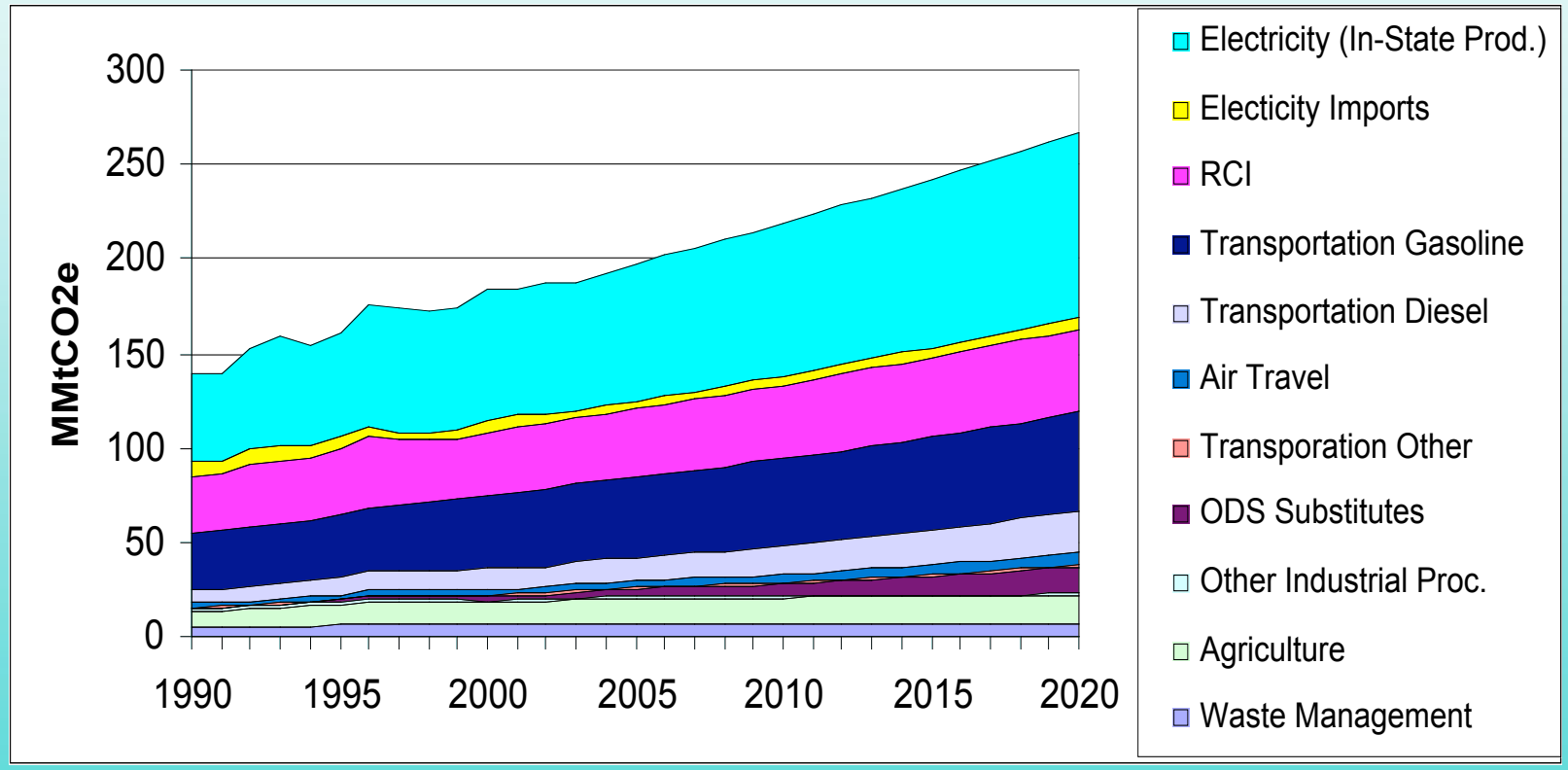
Inventory Approach

- Historical estimates from 1990-2000 or the most recent year possible
- Standard U.S. EPA and UN methodologies, guidelines, and tools, augmented as needed for North Carolina
- Emphasis on transparency, consistency, and significance
- Preference for North Carolina or regional data, where available
- Consumption and production-basis emissions from electricity and heat generation
- Simplified approach used for initial analysis to support general planning needs
- All units expressed as million metric tons carbon dioxide equivalent (MMTCO2e)

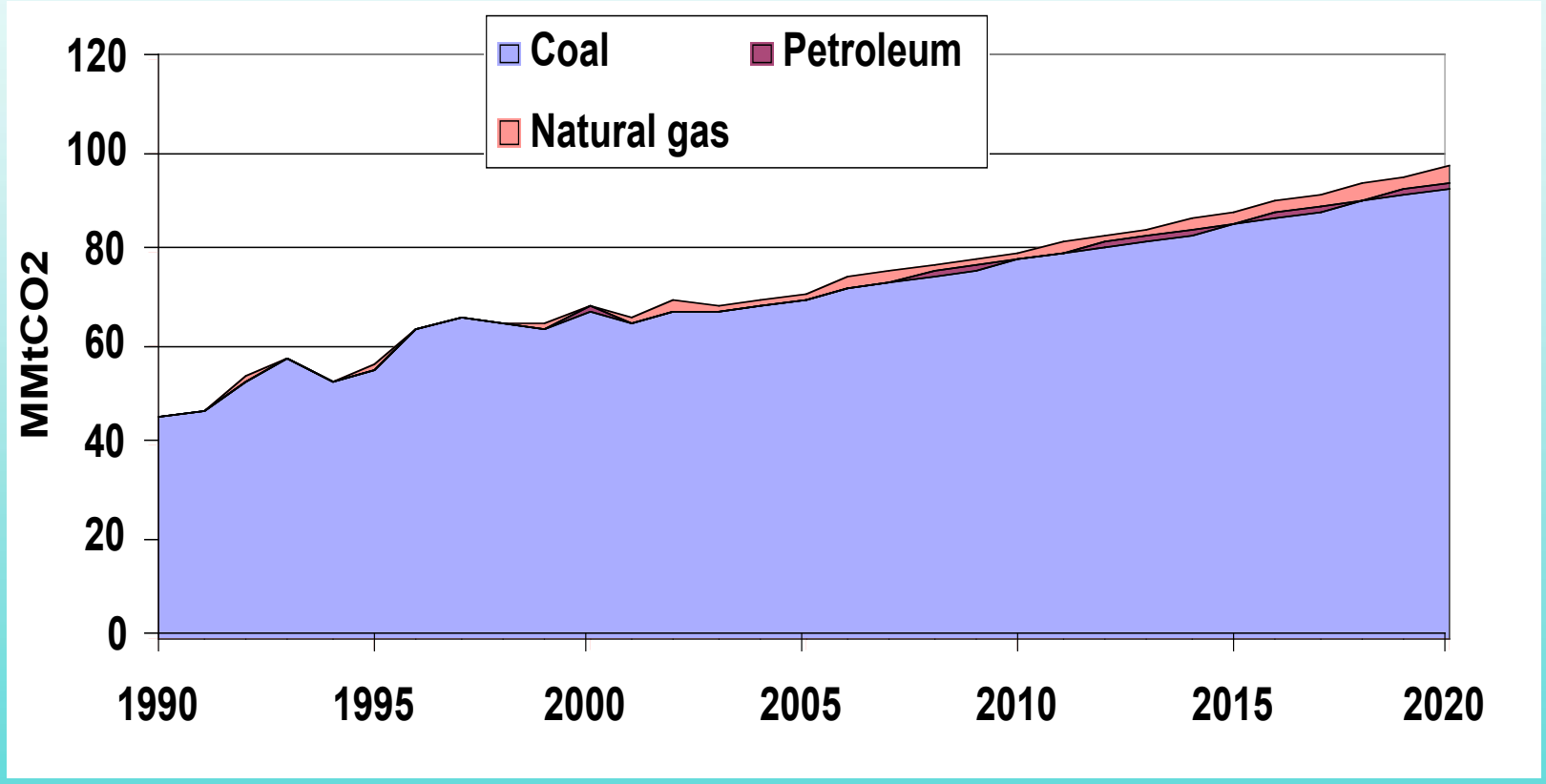
Projection Approach

- Forecast of emissions from most recent year to years 2010 and 2020
- Reference case assumes no major changes from business-as-usual
  - Includes approved policies and actions
  - Typically assumes constant technology and market choices
  - Uses extrapolation where modeling is not available
- Emissions growth driven by many factors

NC GHG Emissions 1990-2020



Electricity Consumption



Electricity

- Data Sources
  - EIA's State Energy Data System
  - EPA SGIT
  - *North Carolina Energy Outlook 2003*
  - Annual Report of the North Carolina Utilities Commission Regarding Long Range Needs for Expansion of Electric Generation Facilities for Service in North Carolina, July 2005
- Methods
  - Apply growth assumptions in following slides to current electricity generation and consumption data

Electricity

- Key Assumptions and Uncertainties
  - 1.5% to 1.7% growth in generation
  - Mix of generation from new non-renewables (or from uprates or plant improvements at existing plants):
    - 81% coal
    - 14% natural gas
    - 4% nuclear (from uprates)
    - 1% petroleum

Electricity Forecast Assumptions and Data Sources

Variable	Assumption	Source
Electricity sales	1.5% - 1.7%	Annual Report of the North Carolina Utilities Commission Regarding Long Range Needs for Expansion of Electric Generation Facilities for Service in North Carolina, July 2005
Electricity generation	1.4% - 1.6%, based on reported growth in new capacity (as a proxy for growth in generation)	Ibid
Transmission and Distribution losses	10% losses are assumed, based on average statewide losses, 1994-2000	US EPA Emission & Generation Resource Integrated Database
New Renewable Generation Sources	0.33% annual growth in renewables. New renewables assumed to be either biomass or wind split according to the following: 75%/25% biomass/wind for 2004 to 2010, 50%/50% for 2010 to 2020.	*North Carolina Energy Outlook 2003*

Electricity Forecast Assumptions and Data Sources

Variable	Assumption	Source
New Non-Renewable Generation Sources (2004-2010)	Average over the period 2004 – 2020 (varies somewhat by year): 81% coal 14% natural gas 4% nuclear (from uprates) 1 % petroleum.	*North Carolina Energy Outlook 2003*
Heat Rates	The assumed heat rates for new gas and coal generation are 7000 Btu/kWh and 9000 Btu/kWh, respectively	Based on estimates used in similar analyses. For example, the Oregon Governor's Advisory Group on Global Warming
Operation of Existing Facilities	Existing facilities are assumed to continue to operate as they were in 2003. Assume small improvements in existing facilities that lead to higher capacity factors and more generation.	*North Carolina Energy Outlook 2003*

Black Carbon

- One of two carbonaceous aerosol species
  - BC and Organic Carbon (OC)
- Also known as light absorbing carbon (LAC), and elemental carbon (EC)
- Absorbs solar energy and warms the troposphere (like GHG's)

Sources of Black Carbon

- Fossil Fuel Combustion
- Biomass Combustion
- Other (Minor) Sources

Public Input, Announcements

Next TWG Call

- Agenda
  - Further review of mitigation options list
  - Further review of inventory and forecast
- Time and date