



Residential, Commercial and Industrial Technical Work Group Teleconference Meeting #3

June 6, 2006



Today's Agenda

- Call to order
- Roll Call of Technical Work Group (TWG) members
- Review and approval of last call summary (TWG Call #2)
- Discussion of prioritization of list of potential state actions
- GHG Global Warming Potentials
- Review and discussion of the draft North Carolina greenhouse gas (GHG) emissions inventory and forecast for the Residential, Commercial and Industrial Sectors
- Call to the public
- Proposed agenda items for next meeting
- Announcements

Catalog of State Actions

- Refer to handout
 - Note updates from TWG and CCAG input
 - Complete initial review (Sections 8 and 9)
- Approach for identifying initial “priorities for analysis” by TWG voting:
 - Email ballot will be sent out by CCS to TWG members
 - One vote per person per option
 - 10 votes total per person to be cast prior to next call
 - Add comments (for example, with regard to possible consolidation of policies) with your votes as needed
 - Return to David Von Hippel or Alison Bailie
 - CCS will compile results for discussion at next TWG call

GHG Global Warming Potentials

Gas	Atmospheric Lifetime	100-year GWP ^a	20-year GWP	500-year GWP
Carbon dioxide (CO ₂)	50-200	1	1	1
Methane (CH ₄) ^b	12±3	21	56	6.5
Nitrous oxide (N ₂ O)	120	310	280	170
HFC-23	264	11,700	9,100	9,800
HFC-125	32.6	2,800	4,600	920
HFC-134a	14.6	1,300	3,400	420
HFC-143a	48.3	3,800	5,000	1,400
HFC-152a	1.5	140	460	42
HFC-227ea	36.5	2,900	4,300	950
HFC-236fa	209	6,300	5,100	4,700
HFC-4310mee	17.1	1,300	3,000	400
CF ₄	50,000	6,500	4,400	10,000
C ₂ F ₆	10,000	9,200	6,200	14,000
C ₄ F ₁₀	2,600	7,000	4,800	10,100
C ₆ F ₁₄	3,200	7,400	5,000	10,700
SF ₆	3,200	23,900	16,300	34,900

See Appendix I in the Inventory & Forecast Report

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

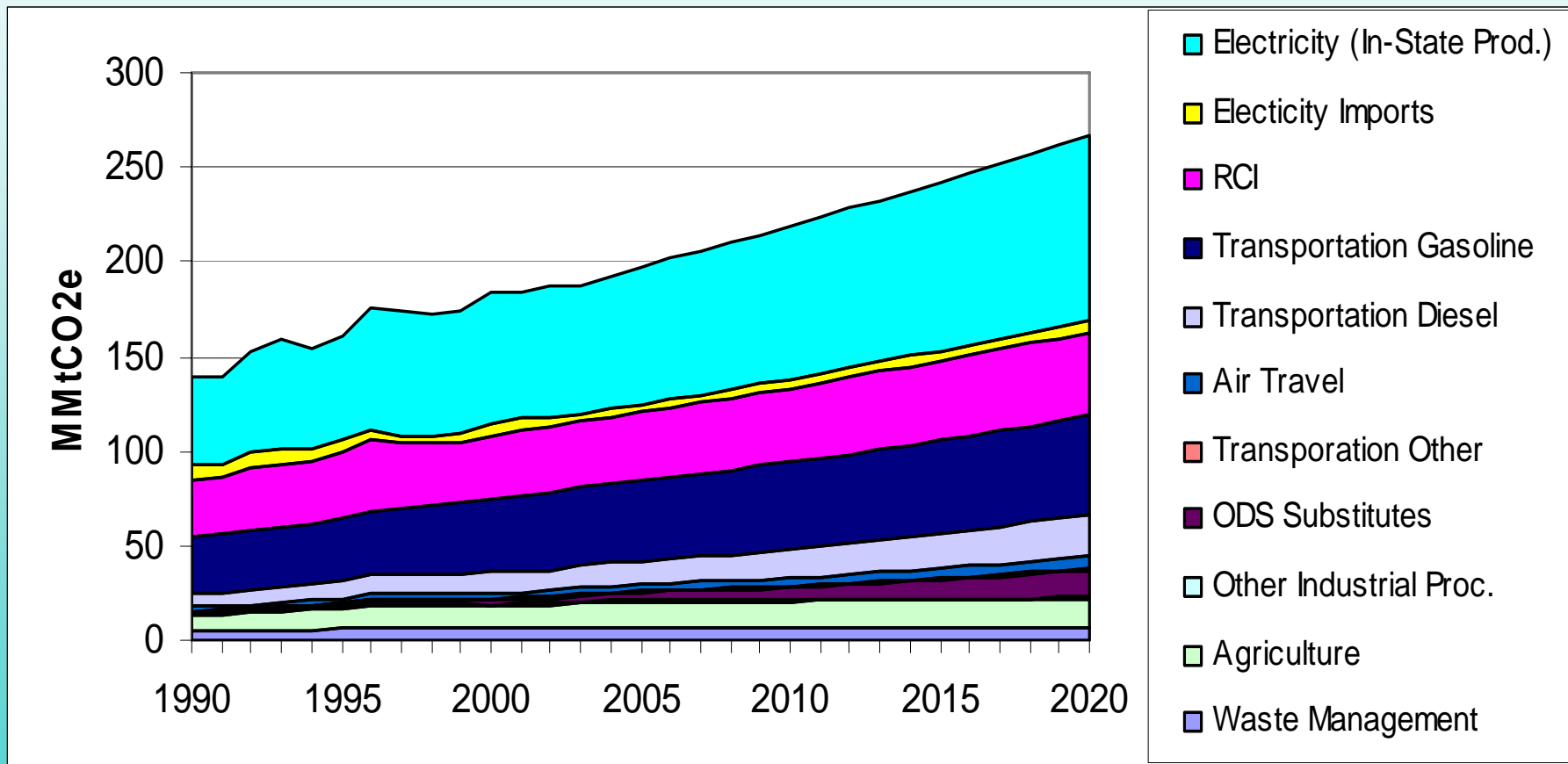
Inventory Approach

- 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



RCI – Fuel Use

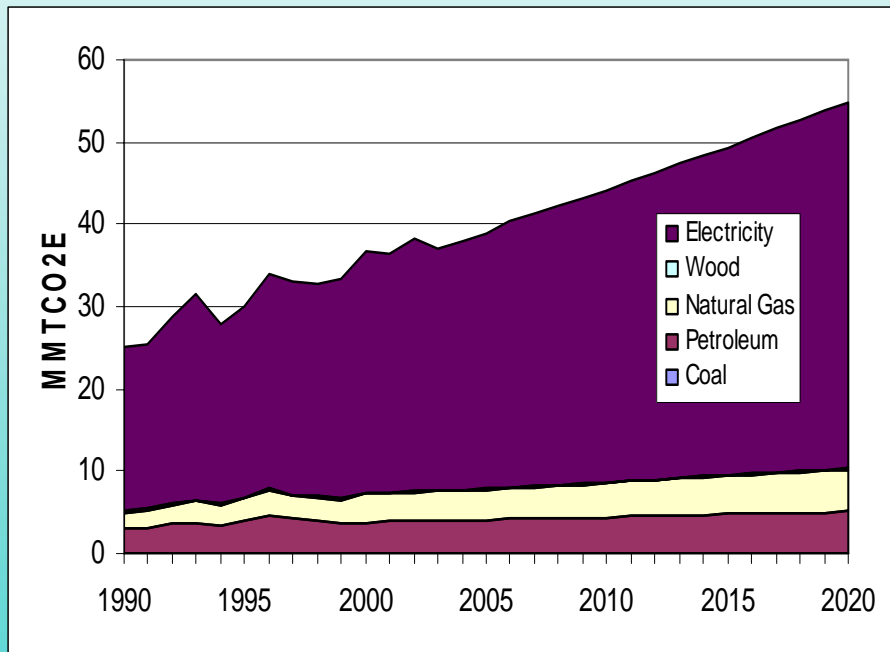
- Emission Sources:
 - Combustion of fuels
 - Coal, petroleum, natural gas, wood
 - Equipment
 - Residential – water heaters, stoves, fireplaces, furnaces
 - Comm./Ind. – boilers, furnaces, water or process heaters

RCI – Fuel Use

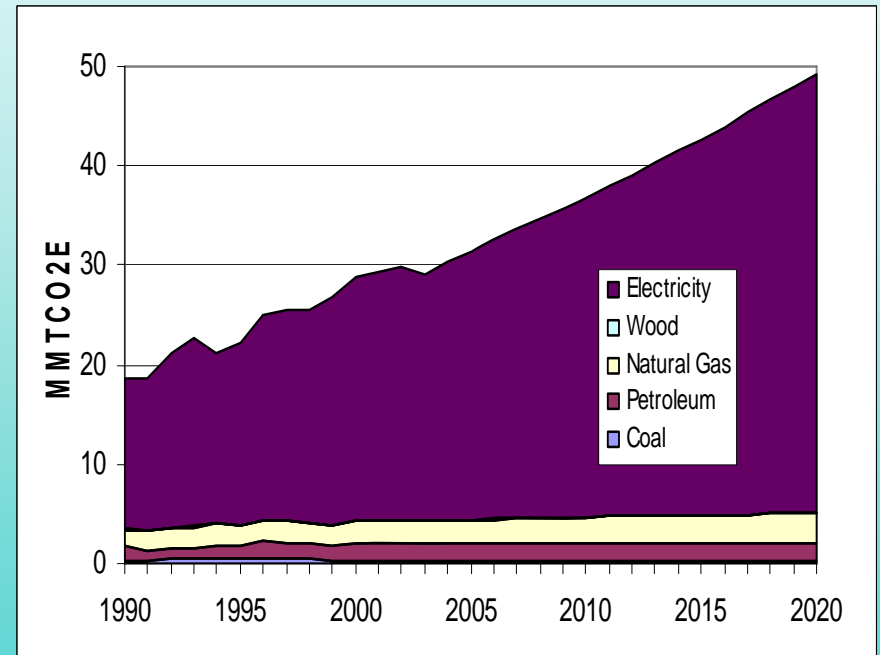
- Emission Sources:
 - Excludes industrial non-energy fuel use
 - Feedstocks for chemical manufacturing processes
- Emissions from Electricity Generation
 - Attributed to RCI sectors in proportion to the fraction of total statewide electricity use consumed by RCI

RCI - Residential, Commercial

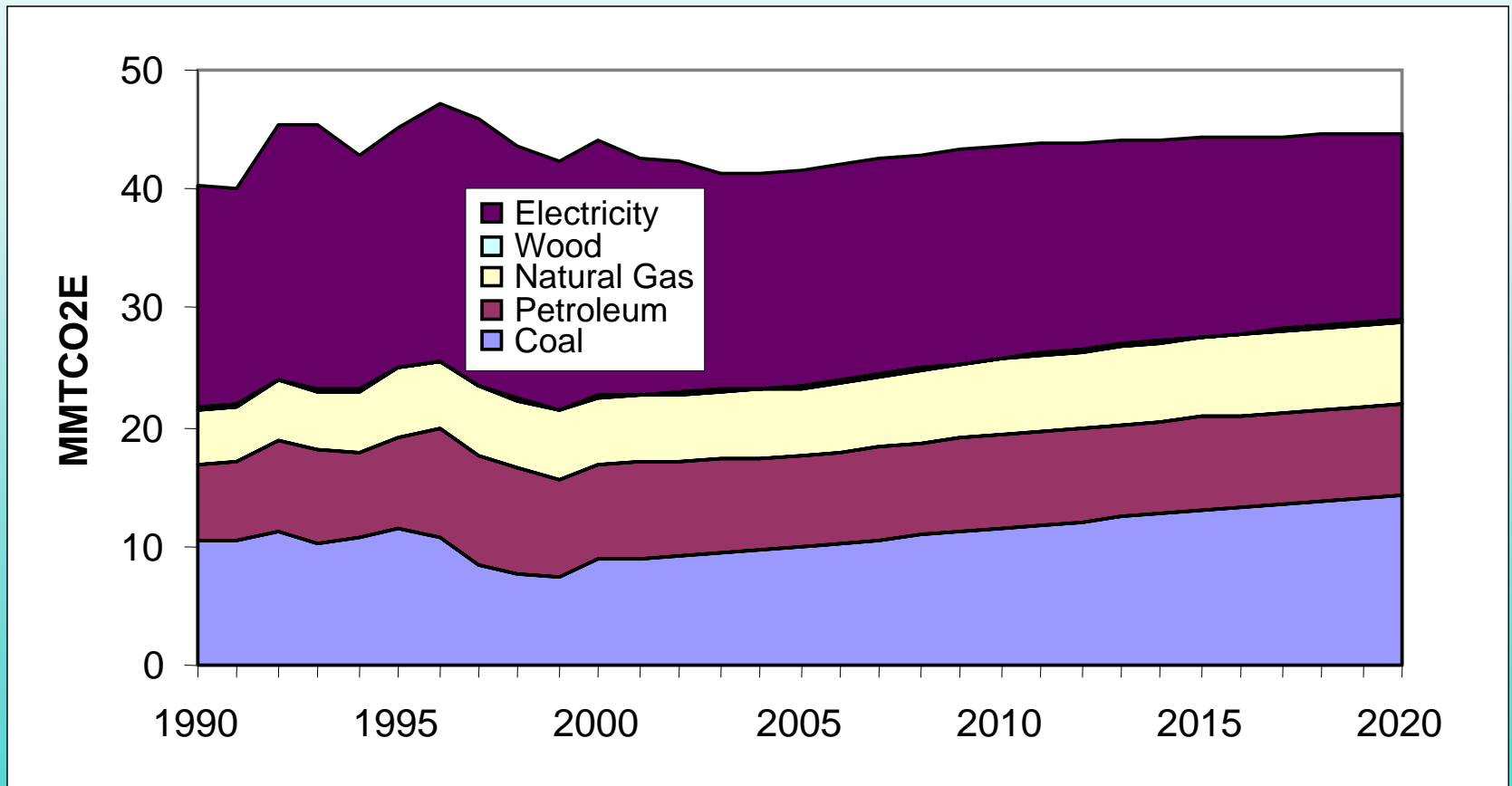
Residential Sector



Commercial Sector



RCI - Industrial



RCI – Fuel Use

- Inventory (1990–2000):
 - Data Sources
 - Total annual NC fuel use by sector & fuel type
 - Energy Information Administration (EIA) / State Energy Data (SED), 2001
 - Replaced 2000 EIA/SED fuel use in EPA’s State GHG Inventory Tool (SGIT)
 - Industrial non-fuel use adjustments to total fuel use:
 - National non-fuel use from EIA/SED, 2001
 - Value of shipments from U.S. Bureau of Census’ Annual Survey of Manufacturers for NC and U.S.

RCI – Fuel Use

- Inventory (1990–2000):
 - Methods
 - Amount Emitted = Activity Level × Emission Factor (EF) × Global Warming Potential (GWP)
 - Industrial / Chemical Manufacturing:
 - Non-fuel use subtracted from total fuel use for:
 - » Distillate & residual oil, petroleum coke, & natural gas
 - NC non-fuel use = ratio of NC-to-national value of shipments × national non-fuel use
 - Value of shipments not available for 1990/1991; used 1992 data as surrogate

RCI – Fuel Use

- Ref. Case Projections (2001–2020):
 - Data Sources
 - Fuel consumption forecasts by sector and fuel type:
 - North Carolina Energy Outlook (NCEO), 2003
 - Methods
 - NCEO provides fuel use in 5-year increments
 - (e.g., 2005, 2010, 2015, & 2020)
 - Growth factors:
 - Calculated for each 5-year increment relative to 2000
 - Interpolated for other years (e.g., 2001 – 2004)
 - Projection year emissions = Year-specific factor x 2000 emissions

RCI – Fuel Use

- Key Assumptions and Uncertainties
 - Inventory
 - SGIT average emission factors do not capture differences in emissions from different combustion technologies
 - State Energy Data for North Carolina – allocation of fuel consumption to end-use sectors
 - Non-energy fuel consumption based on national consumption estimates adjusted for North Carolina
 - Reference Case Projections
 - Does NCEO provide accurate forecasts through 2020?

RCI – Natural Gas Transmission & Distribution

- Emission Sources:
 - Transmission pipelines
 - Large diameter, high-pressure pipelines
 - Move gas from source
 - CH₄ emissions from chronic leaks from pipeline fittings, compressor stations, vents
 - Distribution pipelines
 - Generally small diameter, low-pressure pipelines
 - Move gas from transmission lines to RCI customers
 - CH₄ emissions from chronic leaks from pipeline fittings, meters, regulators, and mishaps

RCI – Natural Gas Transmission & Distribution

- Inventory (2000):
 - Data Sources
 - Transmission
 - North Carolina Utilities Commission (NCUC)
 - Distribution
 - U.S. Office of Pipeline Safety (OPS)
 - Methods
 - Amount Emitted = Activity Level × EF × GWP
 - Emissions not estimated for 1990 – 1999
 - Emissions for 2000 < 1 MMTCO₂e
 - Focused resources on preparing emissions for categories with higher emissions

RCI – Natural Gas Transmission & Distribution

- Ref. Case Projections (2001–2020):
 - Data Sources
 - Natural gas consumption forecasts for RCI sector
 - North Carolina Energy Outlook (NCEO), 2003
 - Methods
 - NCEO provides fuel use in 5-year increments
 - (e.g., 2005, 2010, 2015, & 2020)
 - Growth factors:
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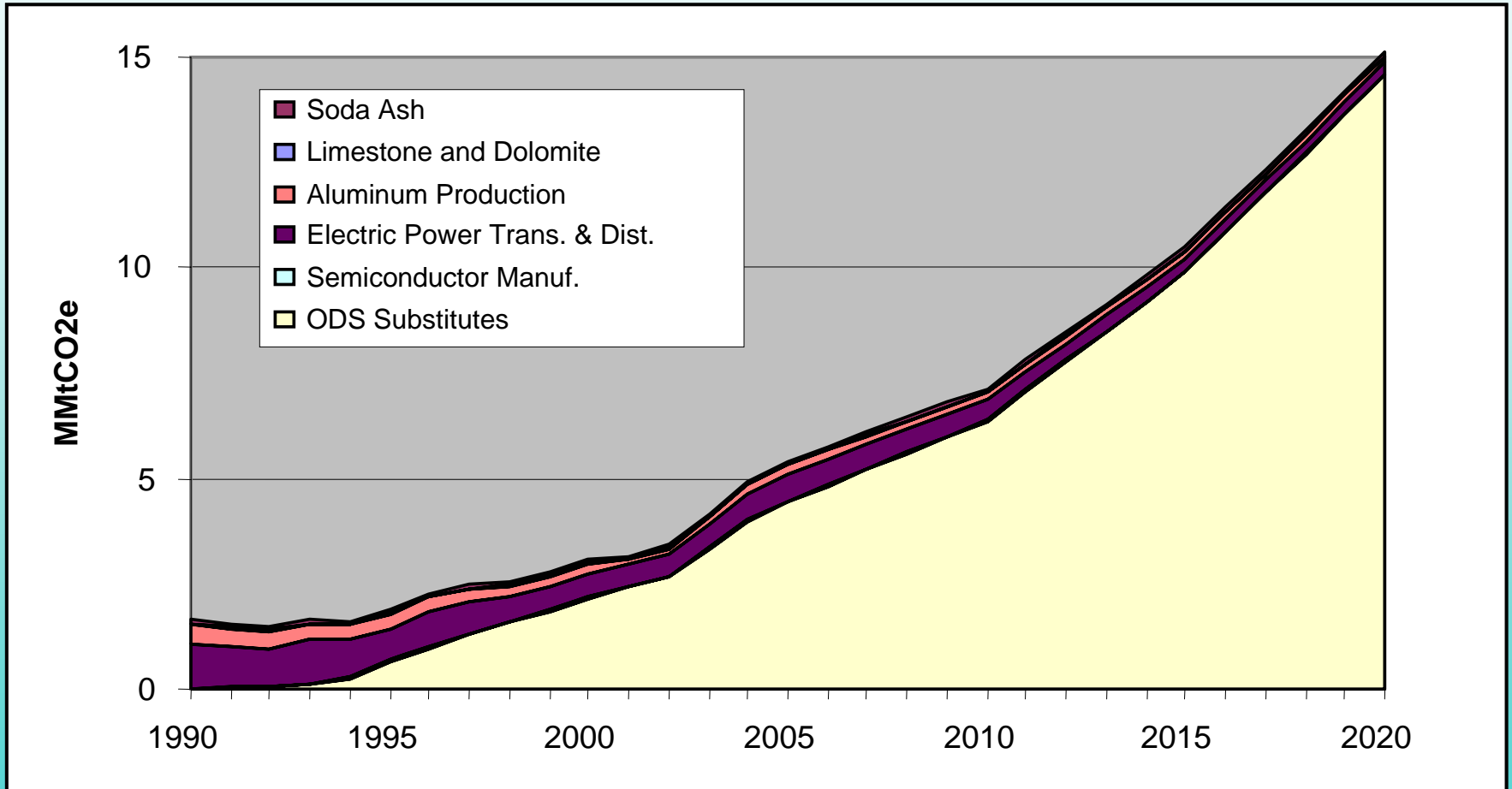
RCI – Natural Gas Transmission & Distribution

- Key Assumptions and Uncertainties
 - Natural gas consumption forecasts

Industrial Processes

Emission Category	CO₂	PFC	HFC	SF₆
Soda Ash Consumption	x			
Limestone and Dolomite Consumption	x			
Aluminum Production		x		
Consumption of Substitutes for Ozone Depleting Substances (ODS)		x	x	
Semiconductor Manufacture		x	x	x
Electric Power Transmission & Distribution Systems				x

Industrial Processes



Industrial Processes

Emissions Category	Inventory Data Sources
Soda Ash Consumption	USGS, <i>Minerals Yearbook: Soda Ash</i>
Limestone and Dolomite Consumption	USGS, <i>Minerals Yearbook: The Mineral Industry of North Carolina</i>
Aluminum Production	USGS, <i>Minerals Yearbook: Aluminum</i>
Consumption of Substitutes for Ozone Depleting Substances (ODS)	National emissions – <i>Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2000</i> (EPA, 2002)
Semiconductor Manufacture	National emissions – (EPA, 2002) Value of shipments (NC and U.S.) - <i>1997 Economic Census</i> (U.S. Census Bureau)
Electric Power Transmission & Distribution Systems	National emissions – (EPA, 2002) Electricity Sales (NC and U.S.) – <i>Electric Power Annual 2000 Vol. 1</i> (EIA, 2000)

Industrial Processes

Emissions Category	Inventory Methods
Soda Ash Consumption	Consumption x Emission Factor
Limestone and Dolomite Consumption	Consumption x Emission Factor
Aluminum Production	Amount produced x Emission Factor
Consumption of Substitutes for Ozone Depleting Substances (ODS)	National Emissions x ratio of NC to U.S. population
Semiconductor Manufacture	National Emissions x ratio of NC to U.S. value of semiconductor shipments
Electric Power Transmission & Distribution Systems	National Emissions x ratio of NC to U.S. electricity sales

Industrial Processes

- Ref. Case Projections (2003–2020):
 - Data Sources
 - National Emissions Projections
 - U.S. Climate Action Report (U.S. Dept. of State)
 - NC Population Projections
 - North Carolina Energy Outlook (NCEO), 2003

Industrial Processes

- Ref. Case Projections (2003–2020):
 - Methods
 - Growth factors based on national growth rates:
 - Aluminum Production
 - ODS Substitute Consumption
 - Semiconductor Production
 - Electric Power Transmission and Distribution Systems
 - Growth factors based on NC population projections:
 - Soda Ash Consumption
 - No growth assumed (held constant at 2002 level)
 - Limestone and Dolomite Consumption

Industrial Processes

- Key assumptions and uncertainties
 - Inventory
 - Emission factors
 - Allocation of national emissions to state
 - ODS Substitute Consumption
 - Semiconductor Manufacture
 - Electric Power Transmission and Distribution Systems
 - Reference case projections
 - Growth rates
 - National growth rates
 - NC population projections
 - No growth

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

- Public Input?
- Announcements?

Next TWG Call

- Agenda
 - Further review of mitigation options list (if needed), work on setting priorities, consolidation/reorganization if appropriate
 - Further review of inventory and forecast (if needed)
- Time and date?