

South Carolina Climate, Energy and Commerce Advisory Committee

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Energy Supply (ES)
Technical Work Group Meeting #5
September 20, 2007

Office of the Governor
The Center for Climate Strategies

Agenda

- Call to order and roll call
- Review and approval of prior call summary
- Review of CECAC process
- Discussion of next steps for TWG
- Proposed date, time, and agenda items for next meeting
- Review of Inventory and Forecast
- Recommendations for Adjustments to Inventory and Forecast
- Public Input and Announcements

Stepwise Planning Process

1. Develop inventory and forecast of emissions
2. Identify a full range of possible actions
3. Identify initial priorities for analysis
4. Develop straw proposals
5. Quantify GHG reductions and costs/savings
6. Evaluate externalities, feasibility issues
7. Develop alternatives to address barriers
8. Aggregate results
9. Iterate to final agreements
10. Finalize and report recommendations

TWG Next Steps

- Today:
 - Review the South Carolina emissions inventory and projections (I&F)
 - Develop recommendations for revision to I&F
- Next meeting:
 - Review CECAC priority policy options
 - Assign volunteers and a lead for each of the priority policy options
- After next meeting:
 - Develop Straw Proposals: first two sections of the policy options template

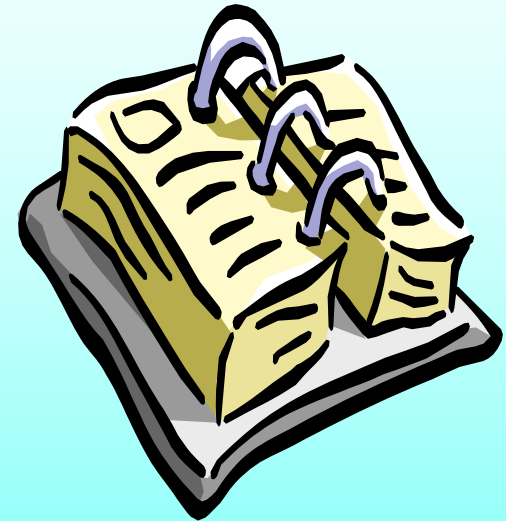
Next TWG Meeting

- Date and Time

- Thursday, October 11, 3:30 – 5:00 PM

- Agenda

- Review CECAC priority options for first round of analysis
- Assign volunteers and a lead for each of the policy options



SC GHG emissions inventory and forecast

Inventory Approach

- Standard US EPA and UN methodologies, guidelines, and tools
- Emphasis on transparency, consistency, and significance
- Preference for South Carolina or regional data, where available
- Consumption and production-basis emissions from electricity generation
 - Very simplified approach used for preliminary analysis

Projection Approach

- Reference case assumes no major changes from business-as-usual (BAU)
 - Includes approved policies and actions to the extent possible
- Current methodology: growth assumptions from existing sources
 - State population and employment forecasts
 - US Census and Bureau of Labor & Statistics
 - US Energy Information Administration

Coverage

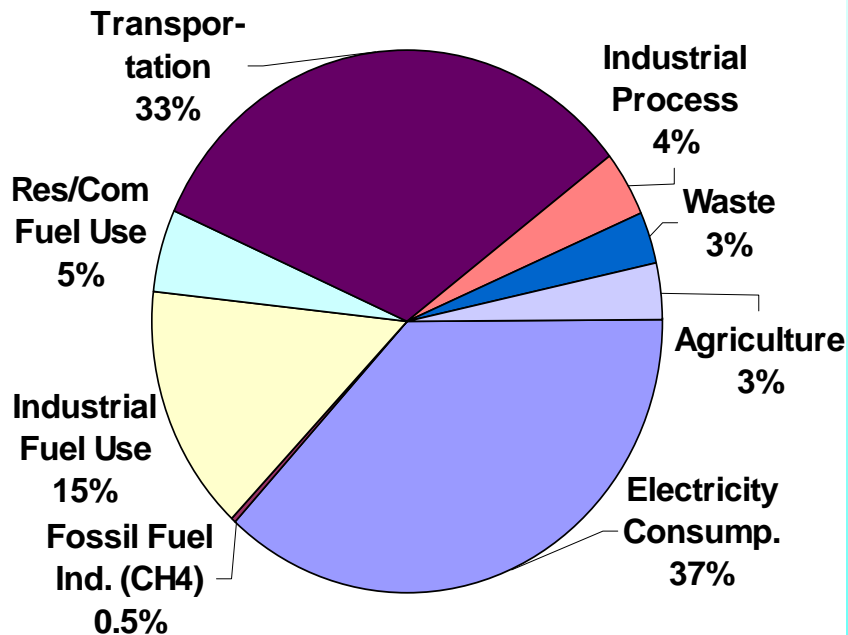
- Six gases per USEPA and UNFCCC guidelines
 - Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF₆)
- All major emitting sectors
 - Electricity Supply & Demand (Consumption Based)
 - Residential, Commercial, Industrial (RCI) Fuel Use
 - Industrial Non-Fuel Use Processes
 - Transportation (onroad and nonroad)
 - Natural gas pipeline transmission & distribution
 - Agriculture, Forestry, and Waste
- Emissions expressed as CO₂ equivalent
 - 100-year global warming potentials
 - CO₂ = 1; CH₄ = 21; N₂O = 310; HFC-23 = 11,700; SF₆ = 23,900

Key Points

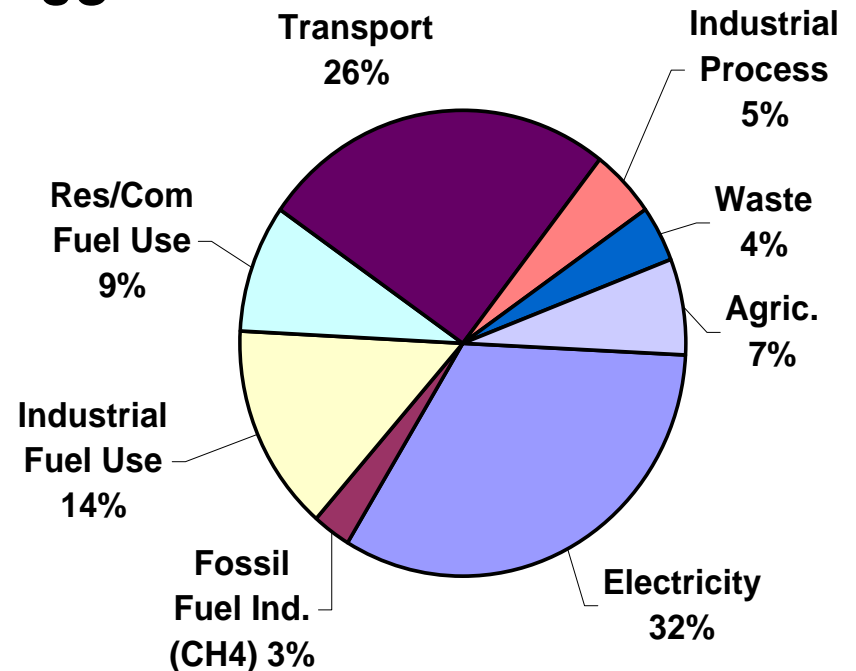
- Preliminary draft for CECAC and TWG review and revision, as needed
- Helpful for diagnosis of GHG emissions, but not a baseline for modeling or compliance for individual options
- Consumption and Production methods
- Net and Gross methods

Preliminary Results: South Carolina & US Gross Emissions By Sector, Year 2000

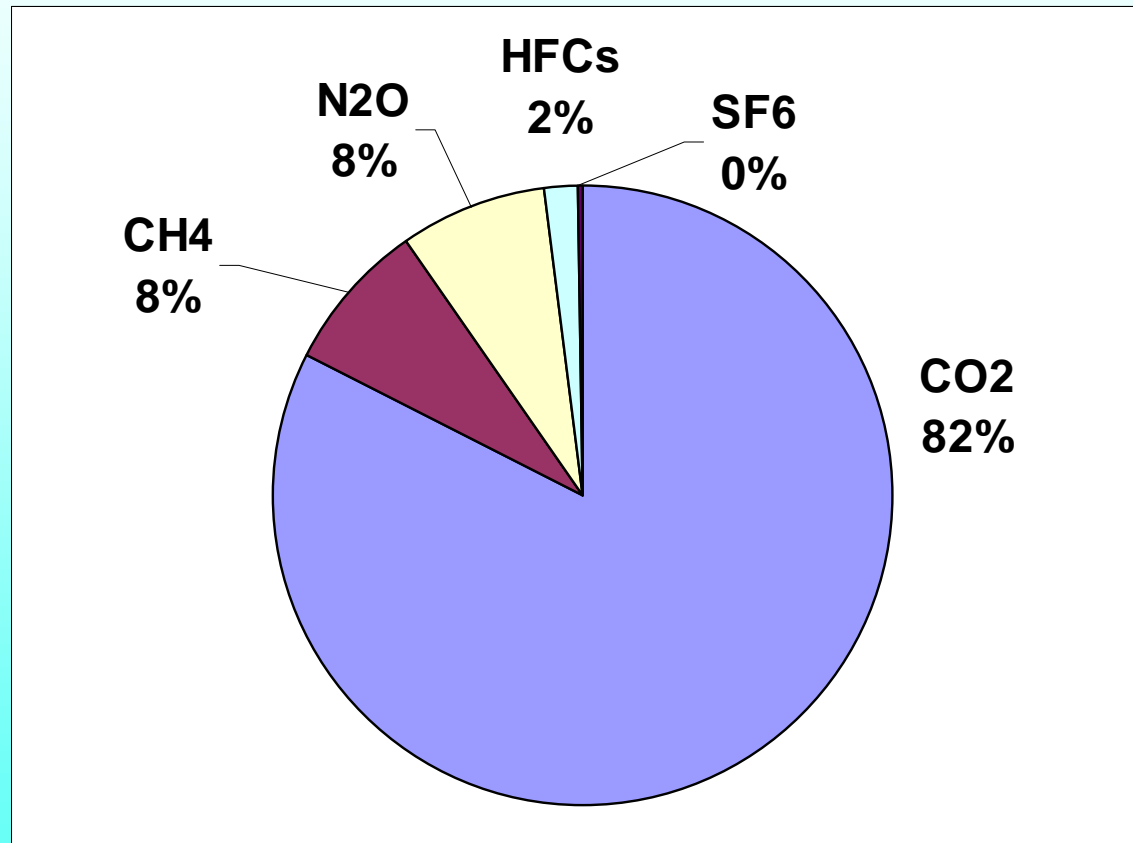
South Carolina



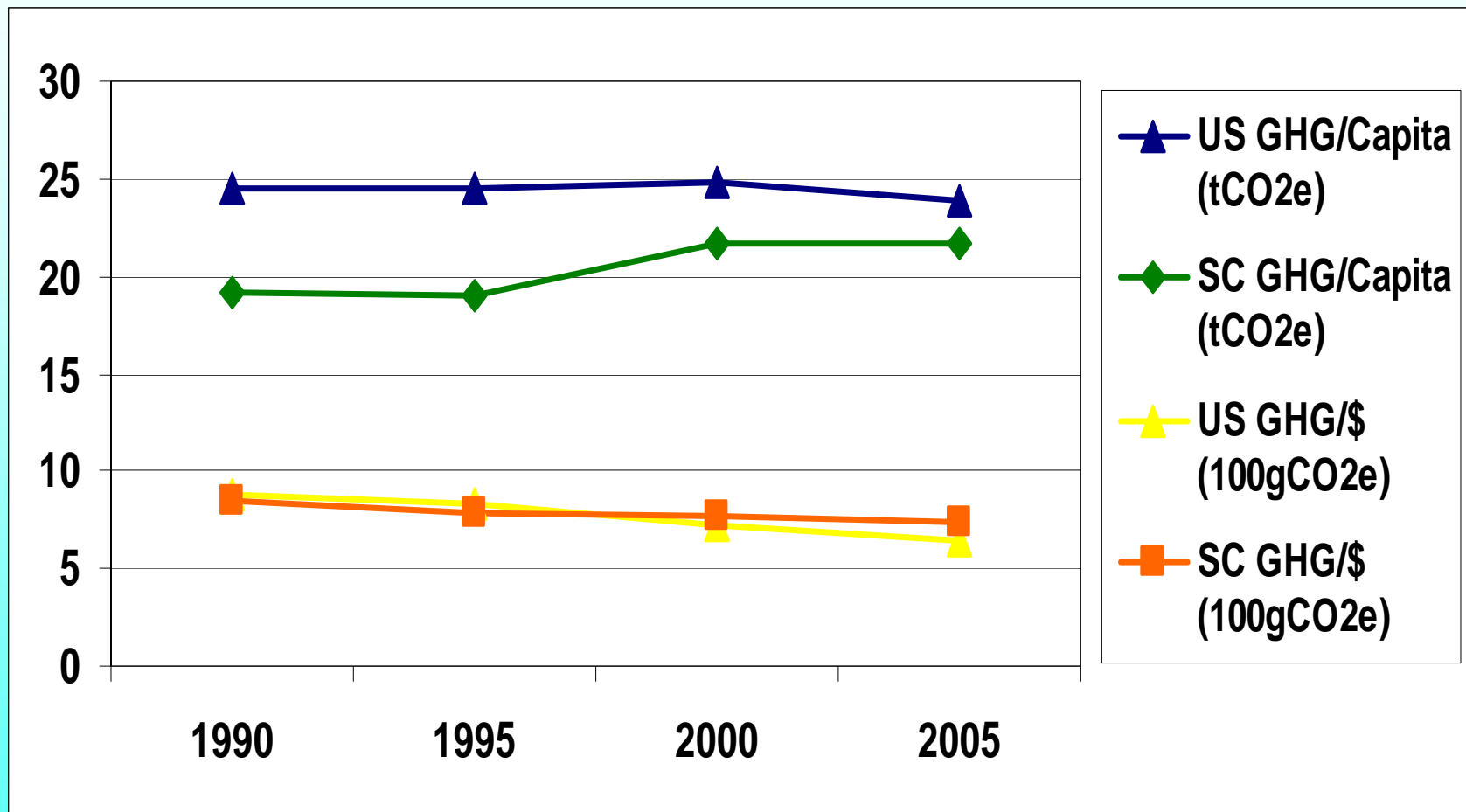
US



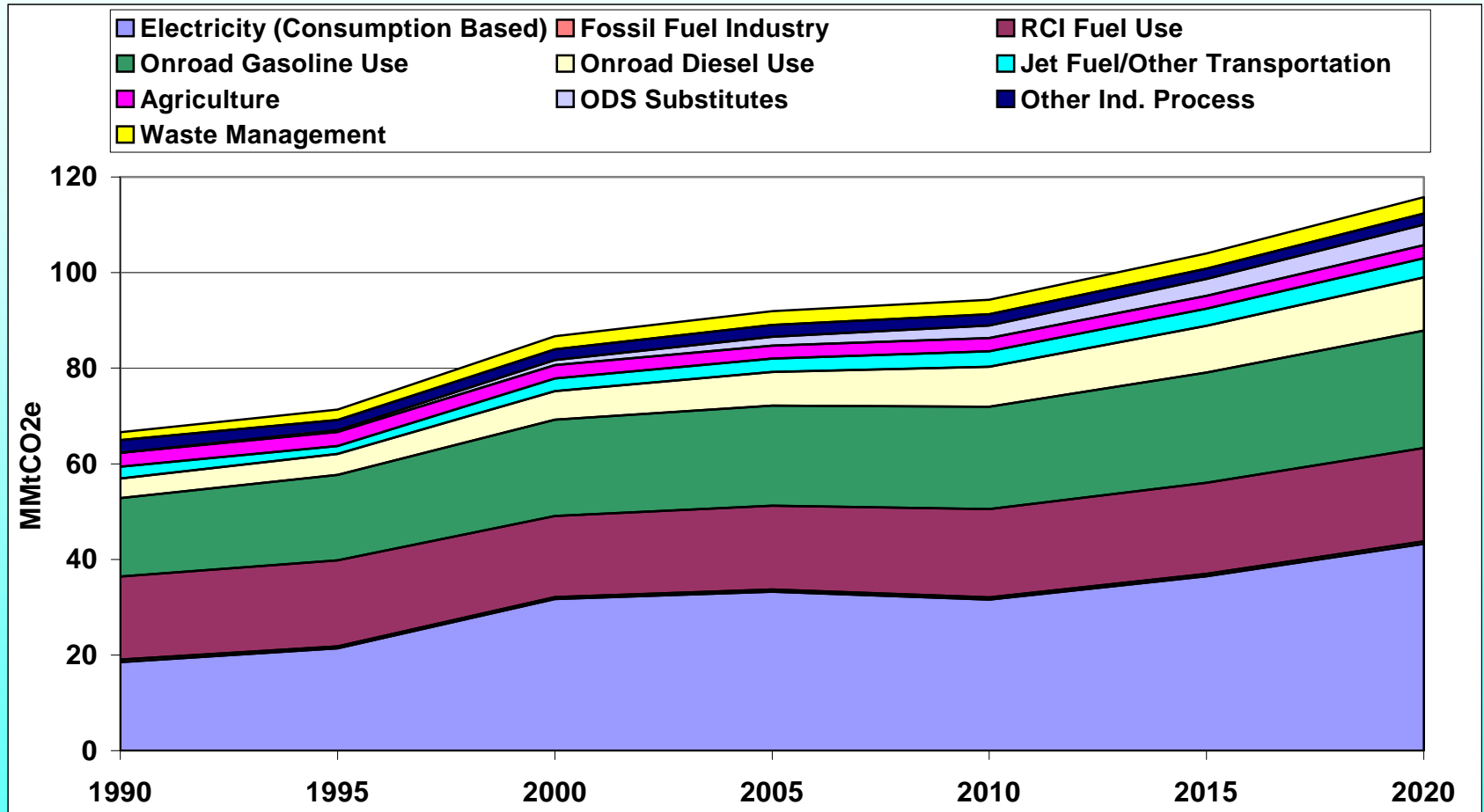
Preliminary Results: South Carolina Gross Emissions by GHG, Year 2000 (MMtCO₂e Based)



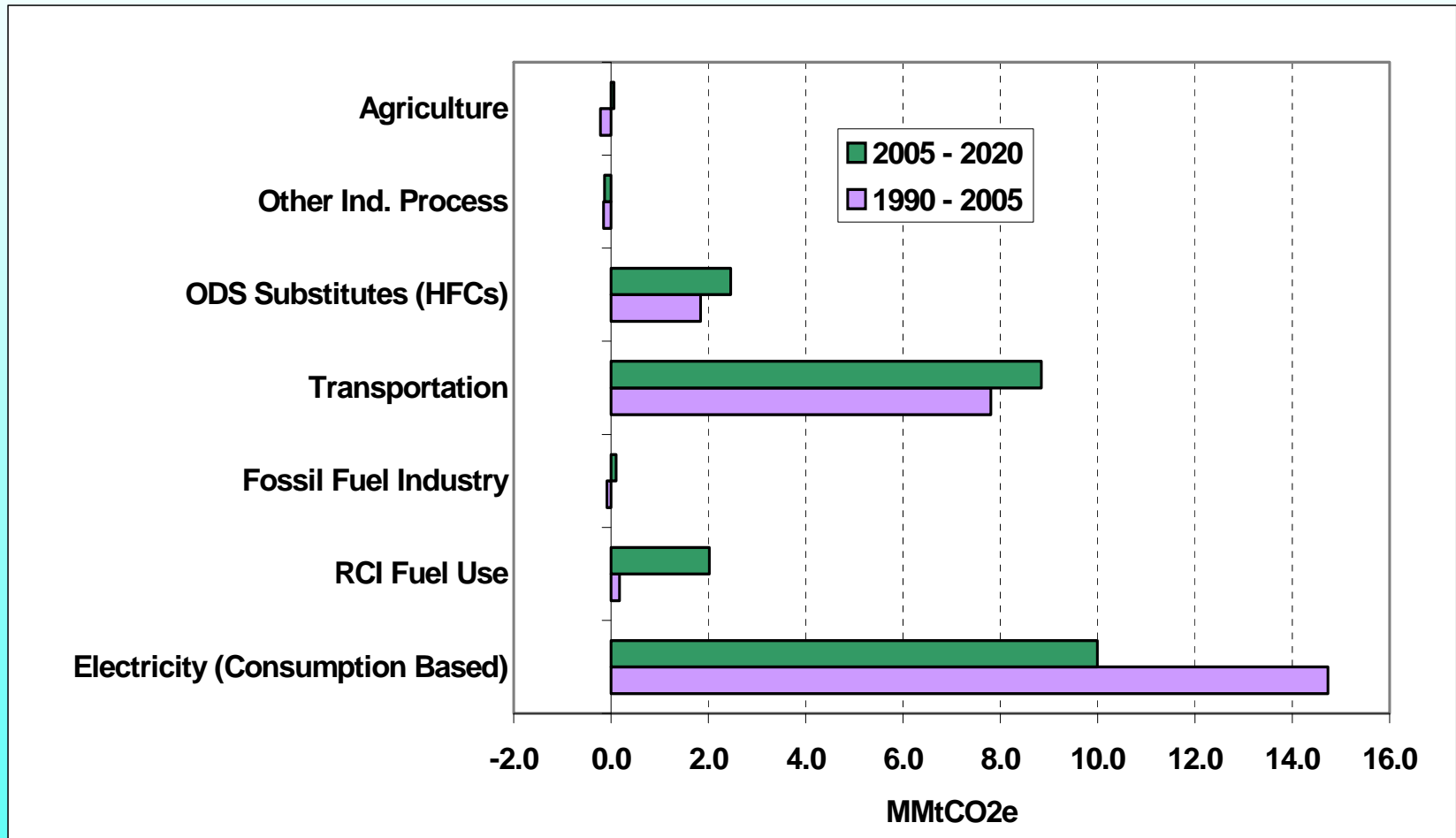
Preliminary Results: Per Capita and GSP/GDP Gross GHG Emissions, 1990-2005



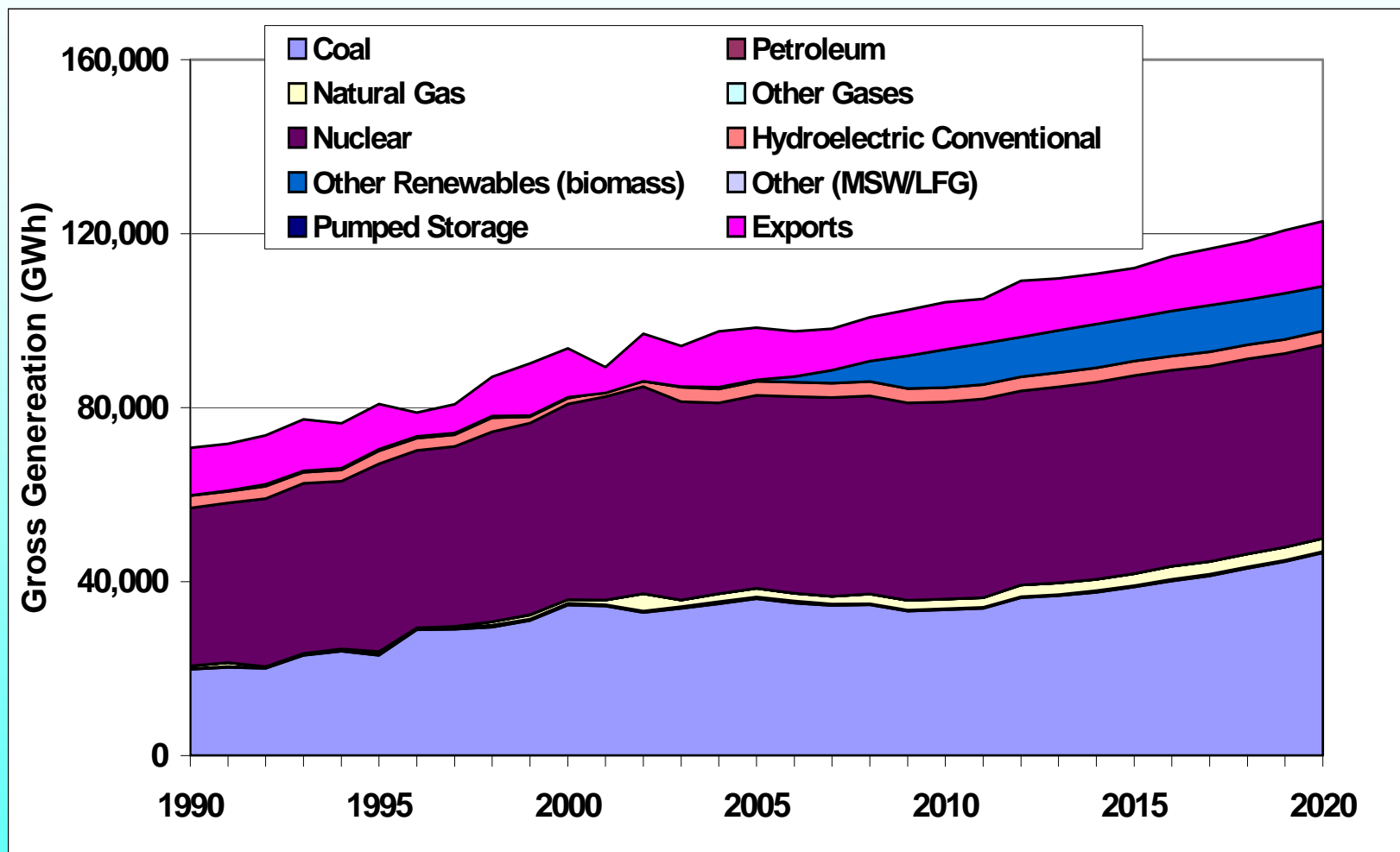
Preliminary Results: South Carolina Gross GHG Emissions By Sector 1990-2020



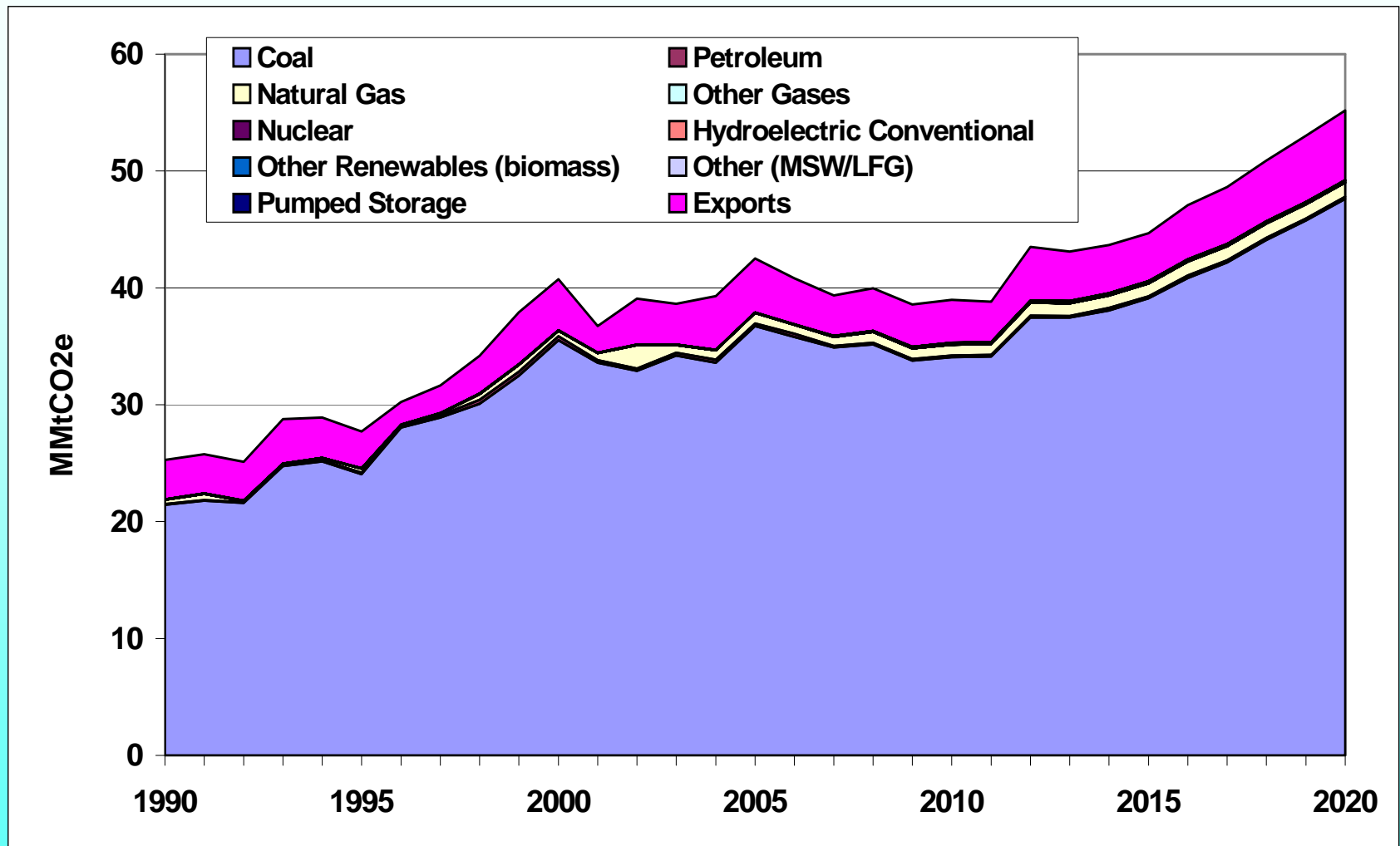
Preliminary Results: South Carolina Gross Emissions Growth (MMtCO₂e Basis)



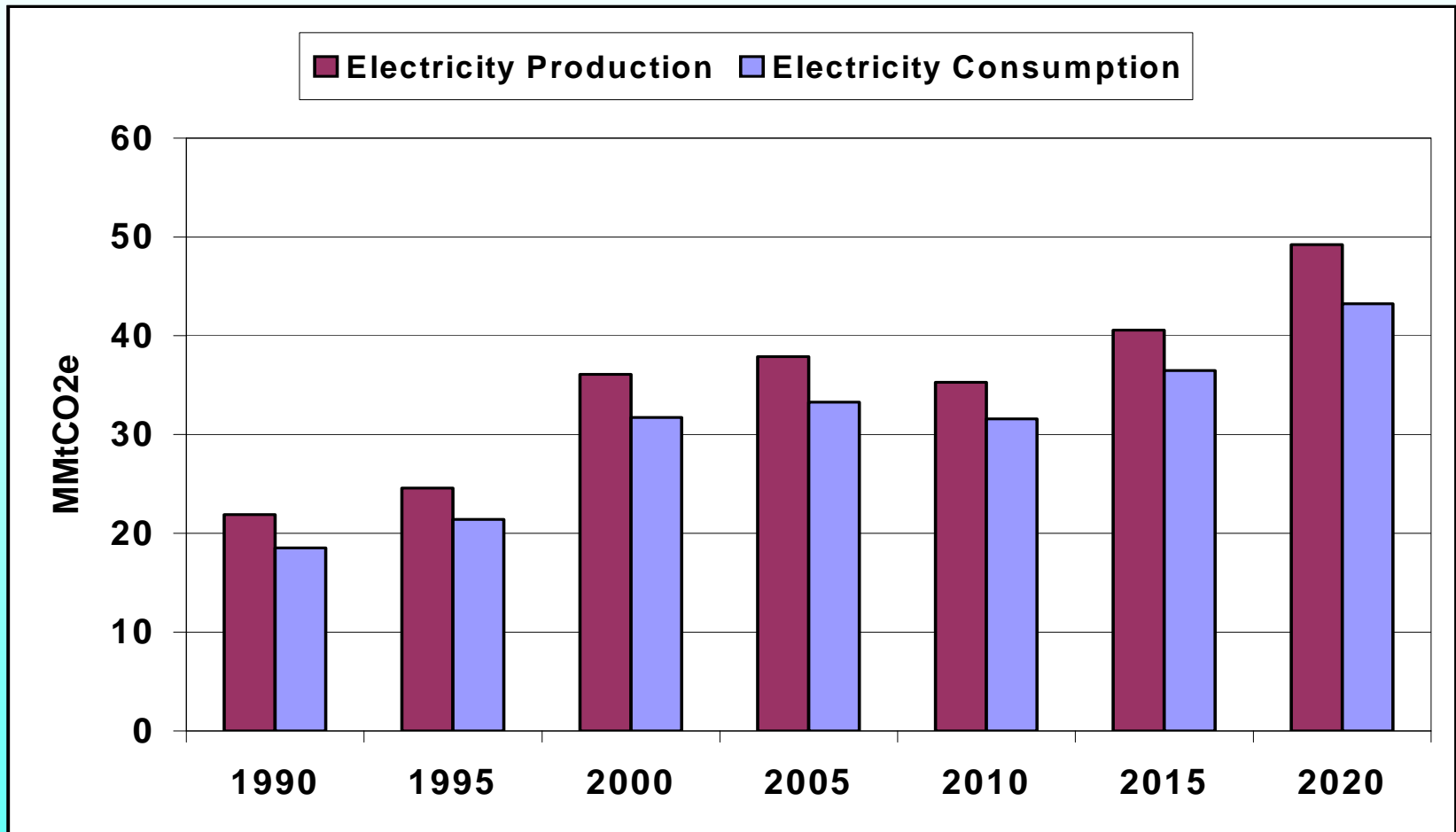
Preliminary Results: Electricity – Gross Generation



Preliminary Results: Electricity - Emissions



Preliminary Results: Electricity - Emissions



Current Methodology: Electricity

- Data Sources

- Historical –

- Generation and fuel consumption for 1990-2003

- 906/920 Monthly Time Series data (EIA)

- Monthly Cost and Quality of Fuels for Electric Plants (EIA) – coal-type data

- Forecast –

- South Carolina Energy Office modeling

- Projected electricity sales

- Annual Energy Outlook 2007 for Southeastern Electric Reliability Council (SERC) region (EIA)

- Projected trends in combustion efficiency improvement and transmission & distribution losses for 2004-2020

Current Methodology: Electricity

- Methodology
 - Key Inputs:
 - Coal quality used in SC power stations
 - Gross annual primary energy consumption by SC power stations by fuel type
 - Gross annual generation to meet SC demand
 - Multiply gross annual primary energy consumption by SC power stations by CO₂e emission factors
 - Assign the portion of CO₂e emissions not associated with SC demand to exports

Current Methodology: Electricity – Key Assumptions

Key Assumptions	2003	2020	Average Annual Growth / Change (%)
SC electricity demand (GWh)	77,054	102,200	1.68%
SC Gross generation (GWh)	94,125	122,843	1.58%
SC utility sales to meet SC demand (GWh)	84,927	107,961	1.42%
Gross generation exports to SERC (GWh)	9,198	14,882	2.87%
Power plant heat rate (btu/kWh)			
Coal	9,789	9,650	-0.08%
Petroleum	7,205	7,224	0.01%
Natural Gas	7,619	6,776	-0.69%
Other Gases	0	0	0.00%
Nuclear	10,392	10,392	0.00%
Hydroelectric Conventional	10,320	10,320	0.00%
Other Renewables (biomass)	10,500	10,500	0.00%
Other (MSW/LFG)	10,500	10,500	0.00%
Pumped Storage	10,320	10,320	0.00%
Losses (%)			
From on-site usage	0.35%	0.79%	5.48%
From T&D and on-site usage	9.27%	5.34%	-3.62%

Current Methodology: Electricity

- Key Uncertainties
 - Top-down approach
 - Assumes SC electric systems evolve consistently with the surrounding Southeastern Electric Reliability Council (SERC) region
 - Does not capture all state-specific system characteristics
 - Source of electricity imports and exports
 - Coal quality over time
 - Coal quality for 2003 assumed for forecast period

Potential Revision to Methodology: Electricity

- Data Sources
 - Historical – generation and fuel use data provided by utilities
 - Forecast –
 - Projected electricity sales data provided by utilities to calculate growth rates
 - Projected trends in combustion efficiency improvement and transmission & distribution losses for 2004-2020 – same approach as current

Potential Revision to Methodology: Electricity – Table A2 Data

Resource	Net Gen (GWh)	Fuel Use (E9 btu)	Heat Rate (btu/kWh)	E6 tons of CO2	
Coal	37,553	402,897	10,729	38.66	
Petroleum	188	2,950	15,661	0.39	
Natural Gas	6,577	13,424	2,041	0.56	% of total GWh
Other Gases	22	232	10,545	0.01	Duke: 4.2%
Nuclear	50,418	515,448	10,224	0	Santee: 50.6%
Hydroelectric Con	2,723	0		0	Progress: 2.8%
Other Renewable	0	0		0	SCANA: 42.4%
Other	0	0		0	Total: 100.0%
Pumped Storage	-1,207	0		0	
Total	96,275	934,951		39.62	

*Reporting companies include Duke, Santee Cooper, Progress Energy, and SCANA. 12.5% = increase over I&F

From I&F:

**Table A2. Summary of South Carolina Electric Generator Characteristics
2003 Base Year**

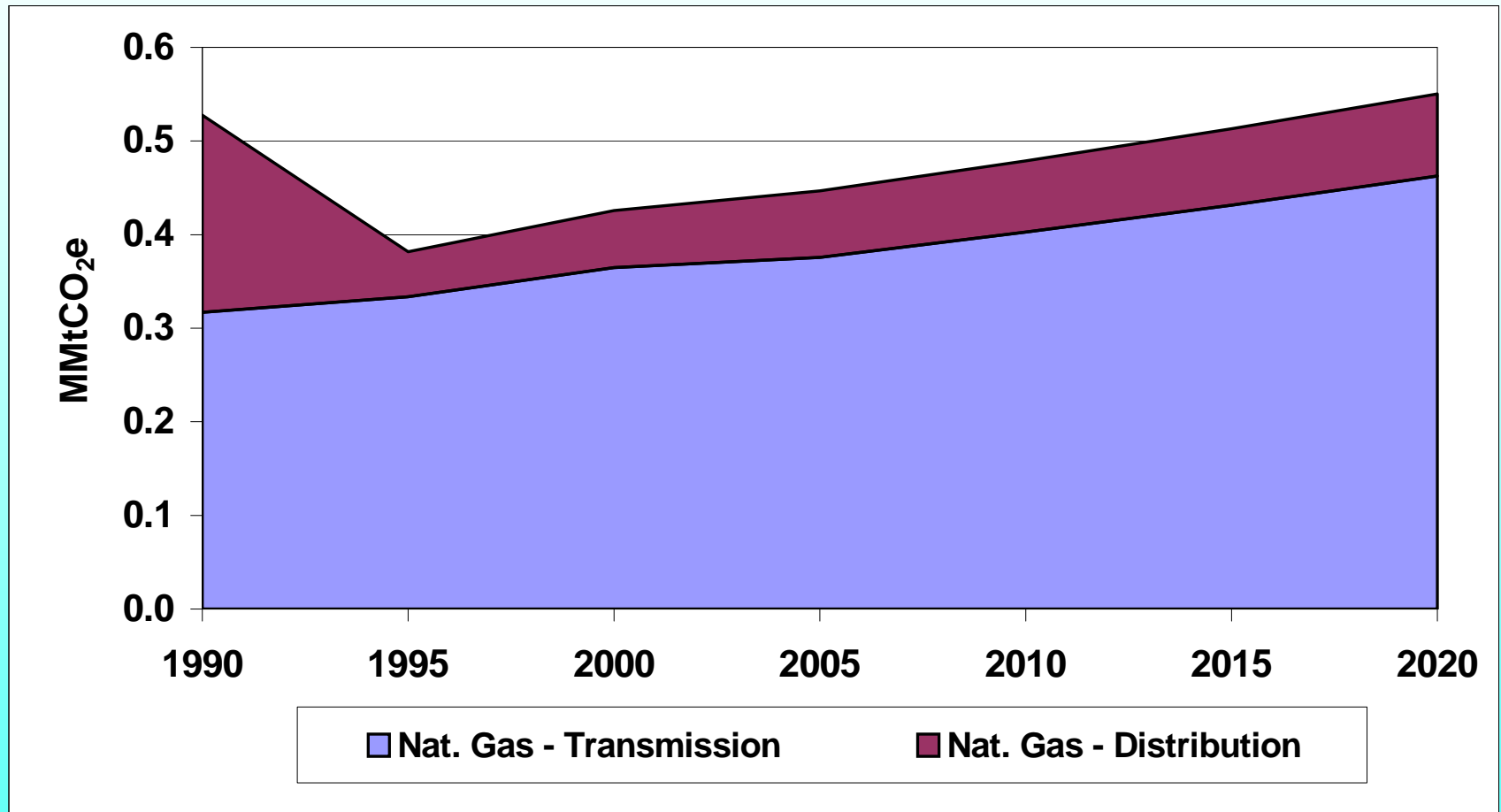
Resource	Gross Generation (GWh)	Fuel Use (Million BTU)	Heat rate (BTU/kWh)	Million tonnes CO2e
Coal	37,565	367,719	9,789	34.20
Petroleum	458	3,312	7,223	0.24
Natural Gas	1,669	13,856	8,304	0.74
Other Gases	0	0	0	0.00
Nuclear	50,596	525,403	10,384	0.00
Hydroelectric Conventional	3,678	37,961	10,320	0.00
Other Renewables	1,349	14,169	10,500	0.02
Other	15	161	10,500	0.01
Pumped Storage	-1,207	-12,454	10,320	0.00
Total	94,125	950,126		35.21

Potential Revision to Methodology: Electricity - Demand Forecast Data

Year	Average 2008-2020:		1.74%	1.72%
	Annual Energy (I&F)	Annual Energy Reported	Annual Growth I&F	Annual Growth Reported
2003	94,125	75,873		
2004	97,564	78,492	3.7%	3.5%
2005	98,417	80,090	0.9%	2.0%
2006	97,528	79,851	-0.9%	-0.3%
2007	98,173	82,102	0.7%	2.8%
2008	100,807	83,691	2.7%	1.9%
2009	102,499	85,389	1.7%	2.0%
2010	104,257	86,952	1.7%	1.8%
2011	105,018	88,375	0.7%	1.6%
2012	109,178	89,800	4.0%	1.6%
2013	109,723	91,289	0.5%	1.7%
2014	110,773	92,832	1.0%	1.7%
2015	112,051	94,419	1.2%	1.7%
2016	114,793	95,978	2.4%	1.7%
2017	116,524	97,579	1.5%	1.7%
2018	118,286	99,201	1.5%	1.7%
2019	120,768	100,849	2.1%	1.7%
2020	122,843	102,523	1.7%	1.7%

Companies Reporting:
 SCANA
 Central Elec. Power Coops
 Duke
 Progress Energy
 Santee Cooper

Natural Gas Transmission and Distribution



Natural Gas Transmission and Distribution

- Data sources
 - Historic (2000-2005)
 - Miles of transmission and distribution pipeline
 - Pipeline and Hazardous Materials Safety Administration / Office of Pipeline Safety
 - Compressor stations – EPA defaults
 - Forecast
 - Annual growth rates from total NG consumption in SC
 - EIA Natural Gas Navigator
- Methods
 - Based on EPA SGIT
 - Activity x emission factors

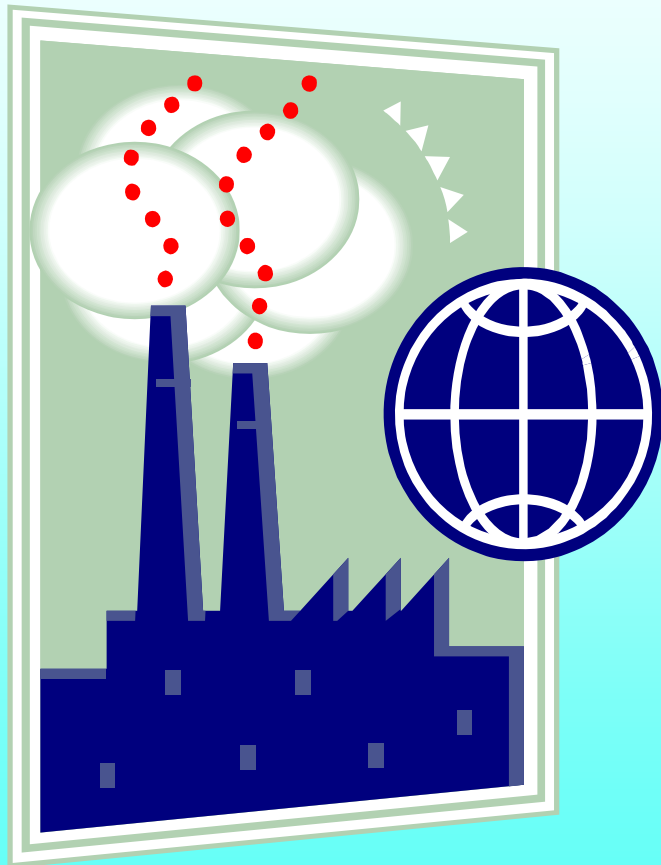
Natural Gas Transmission and Distribution

- Key Assumptions
 - Growth Rates for Transmission & Distribution
 - 1.4% annual for 2006-2020
 - EPA defaults for compressor stations?
- Key Uncertainties
 - Growth in emissions from transmission and distribution pipelines and compressor stations

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

Black Carbon Emissions

- 2002
 - 7.0 MMtCO₂e
 - Primary Contributors:
 - nonroad diesel (35%)
 - onroad diesel (28%)
 - electricity generated using coal (17%)
 - aircraft (5%)
 - rail (4%)
- 2018
 - Nonroad diesel drops from 2.5 to 0.8 MMtCO₂e
 - Onroad diesel drops from 2.0 to 0.3 MMtCO₂e

Potential Adjustments to Inventory and Forecast for Recent Actions

- Bills Enacted in 2007-2008 Legislative Session
 - S.431
 - Amends law to enhance certainty of investments for electric utilities
 - Fuel cost recovery to allow inclusion of certain environmental costs and emission allowance costs
 - S.312
 - Revises definitions in the joint municipal electric power and energy act

Potential Adjustments to Inventory and Forecast for Recent Actions (cont.)

- Bills Enacted in 2007-2008 Legislative Session
 - H.3828
 - Creates a study committee to examine the feasibility of natural gas exploration in Atlantic Ocean
 - H.3749
 - Establishes a Renewable Energy Grants and Loans program
 - Overlap with AFW TWG?

Potential Adjustments to Inventory and Forecast for Recent Actions (cont.)

- Other Bills Introduced in 2007-2008
Legislative Session
 - H.3533 – study on wind energy production farms (last activity 2/15/07)
 - H.3395 & S.684 – process & procedures for establishing net metering programs (potential overlap with RCI TWG) (last activity 4/19/07)
 - H.3545 – volume limits for low level radioactive waste

Public Input, Announcements