



Colorado Climate Action Panel Meeting #2 February 15, 2007



Agenda

- Introductions and review of day's agenda
- Approval of draft summary of Climate Action Panel (CAP) Call #1
- Review and discussion of the Colorado GHG Inventory and Forecast
- Review and additions to the Catalog of States Actions
- Discussion of water and climate vulnerability issues
- Next Steps of PWGs and CAP
- Agenda, Time and Date for Next Meeting
- Public Input and Announcements

Inventory Approach

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

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Projection Approach

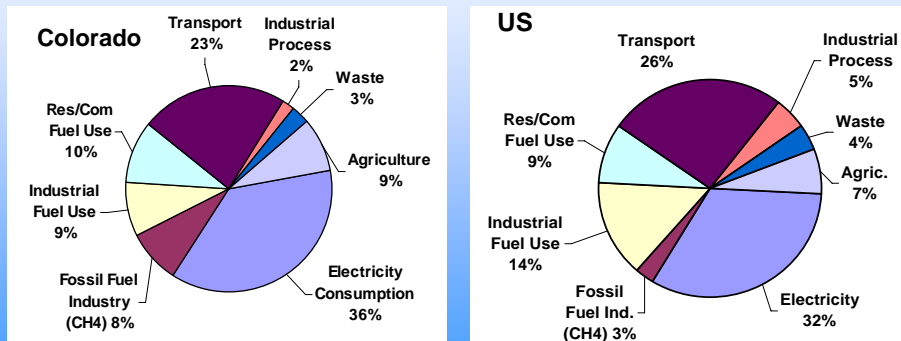
- Reference case assumes no major changes from business-as-usual (BAU)
 - Includes approved policies and actions to the extent possible (e.g., Energy Efficiency, Renewable Energy)
- Growth assumptions from existing sources
 - US Census and Bureau of Labor & Statistics
 - US Energy Information Administration

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Colorado & US Emissions By Sector, Year 2000

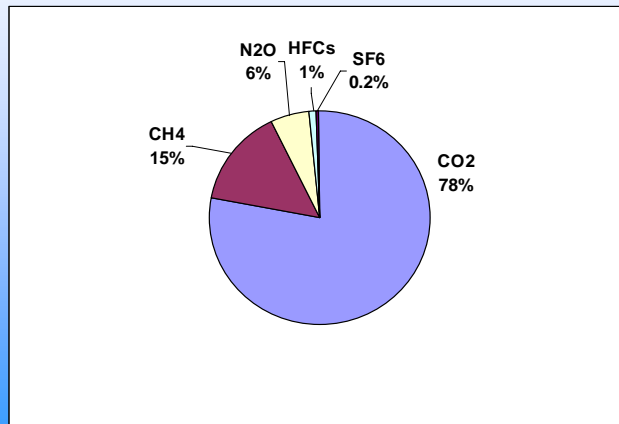


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Colorado Emissions By GHG, Year 2000 (MMtCO₂e Based)

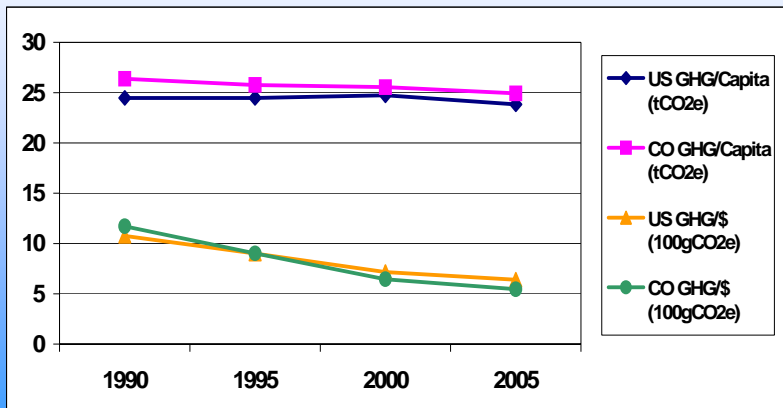


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Per Capita and GSP/GDP GHG Emissions, 1990-2002

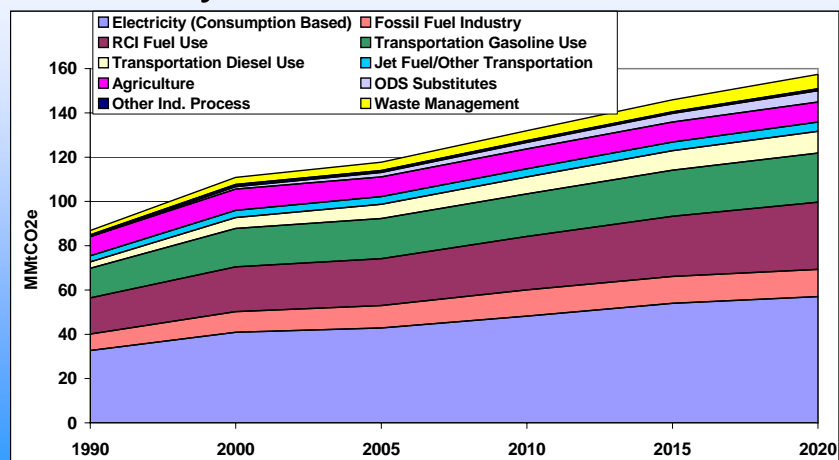


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Gross Colorado GHG Emissions By Sector, 1990-2020

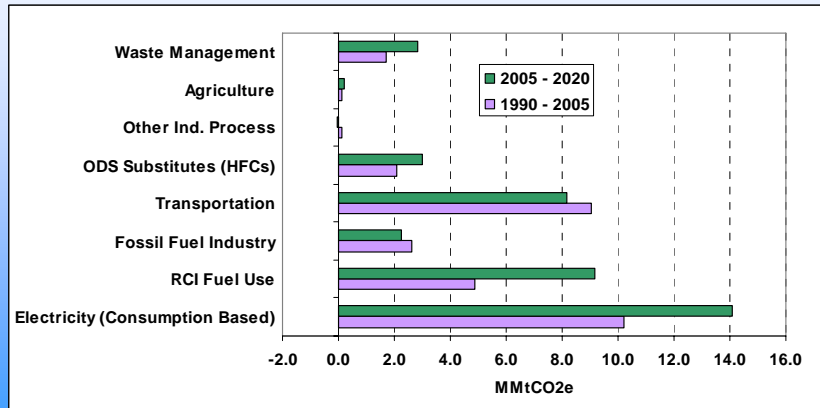


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Colorado Emissions Growth (MMtCO₂e Basis)



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Key Points

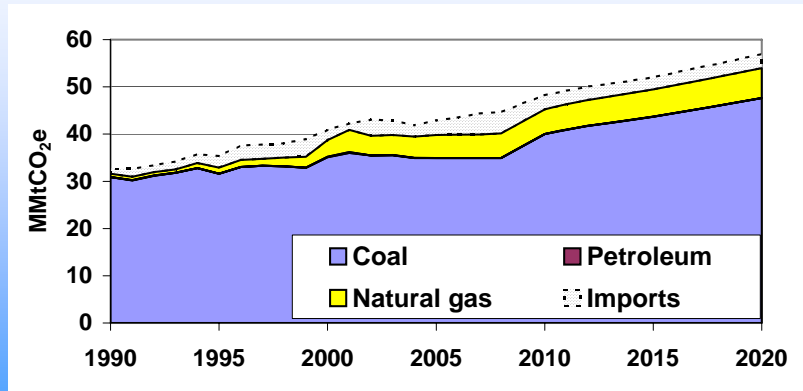
- Preliminary draft prepared by CDPHE and CCS under WRAP project
- Preliminary draft for PWG and CAP review and revision, as needed
- Helpful for diagnosis of GHG emissions, but not a baseline for modeling or compliance for individual options
- Consumption and Production methods
- Net and Gross methods

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Electricity



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Electricity

- Data Sources
 - US DOE, EIA State Energy Data
 - Historic energy consumption and electricity sales
 - Colorado's Electricity Future, Xcel/PSCo website
 - Projected electricity sales
 - Proposed plants and generation through 2010
 - US DOE, Annual Energy Outlook
 - Projected generation, amount and type, 2010-2020
- Methods
 - Historic – use energy consumption and emission factors
 - Projections for energy based on growth and mix of new generation, emissions based on energy X emission factors

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Electricity

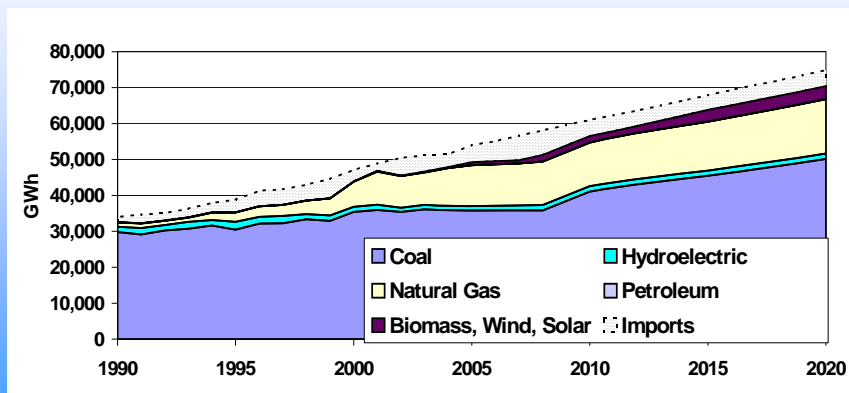
- Key Assumptions
 - Electricity sales grow at 2.9% to 2010, 2.1% to 2020
 - Generation grows at 2.8% to 2010, 2.2% to 2020
 - RPS met by IOUs and 4 public utilities (65% of sales), 10% of sales by 2015, wind and solar
 - New non-renewables plants
 - 90% coal / 10% natural gas for 2007 to 2010
 - 75% coal / 25% natural gas for 2011 to 2020
- Key Uncertainties
 - Amount of new generation / mix of non-renewables
 - Source of electricity imports and exports

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Electricity



Source: Colorado Energy Plan, 2005

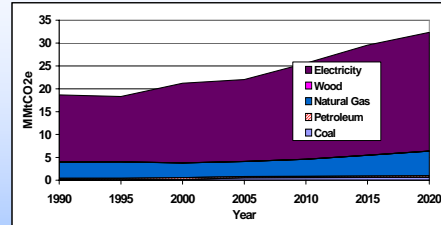
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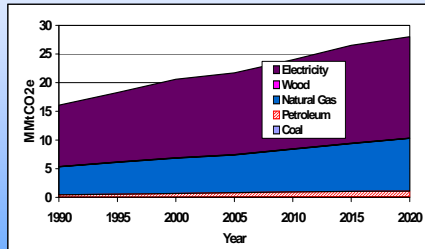
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RCI

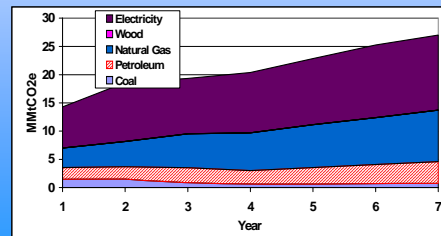
Commercial Sector



Residential Sector



Industrial Sector



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RCI

- Data Sources
 - EIA State Energy Data (SED)
 - Historic energy consumption for natural gas, oil, wood, coal
 - EIA Annual Energy Outlook 2006 (AEO2006)
 - Projected consumption, amount and type
- Methods
 - Energy consumption multiplied by emission factors

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RCI

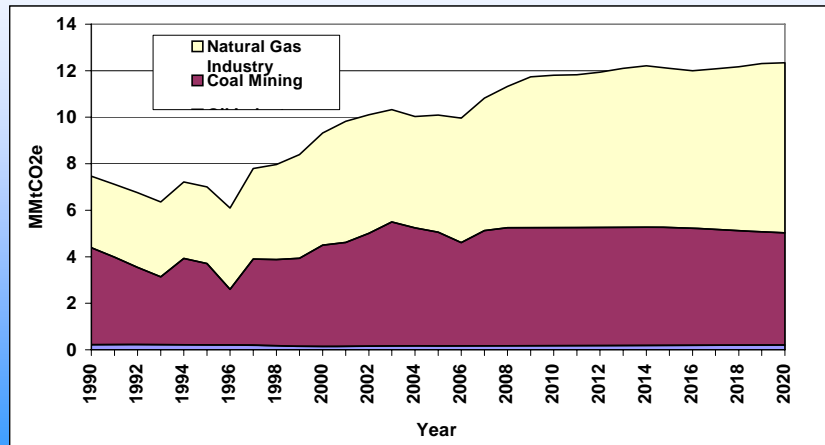
- Key Assumptions
 - Projections based on regional projections scaled for Colorado population and employment growth projections
- Key Uncertainties
 - Regional projections
 - Industrial sector growth and mix
 - EIA regional forecast for coal-to-liquids plants

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Fossil Fuel Production



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Fossil Fuel Production

- Data sources
 - Natural Gas – Gas Facts, US DOE (wells, pipelines, processing)
 - Oil Industry – US DOE (oil produced and refined)
 - Coal Mining – US EPA National GHG Inventory
- Methods
 - Based on US State GHG Inventory Tool
 - Activity x emission factors

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Fossil Fuel Production

- Key Assumptions
 - Growth Rates
 - Oil and NG production
 - follow 2000-2005 growth rate through 2009
 - 2010-2020 based on US DOE, Annual Energy Outlook
 - Coal
 - Emissions follow Colorado Geological Survey coal production projections (intensity held at 2004 level)
- Key Uncertainties
 - Future production of fossil fuels
 - Production from Oil Shale
 - Coal bed methane – entrained CO₂

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Break

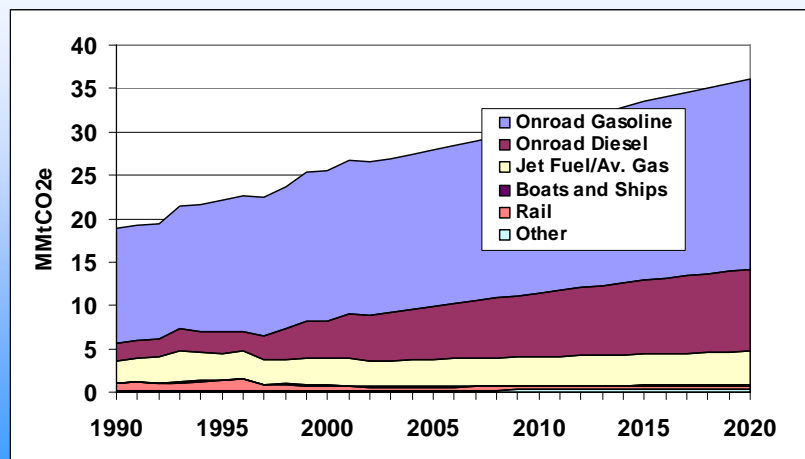


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Transportation



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Transportation

- Data Sources: Onroad Vehicles
 - US DOE EIA State Energy Data fuel consumption thru 2002
 - State-level vehicle miles traveled (VMT) from CDOT
 - VMT allocated to vehicle type with fleet mix data from CDPHE
 - VMT projections from local planning organizations (DRCOG, NFRTAQPC, PPACG)
 - VMT forecast for rest of state from CO SIP growth rate

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Transportation

- Data Sources: Other Transport Sectors
 - Aircraft – EIA SED fuel consumption
 - Aircraft Projection – CDOT operations forecasts
 - Rail and Marine – EIA SED
 - Rail/Marine Projection – based on historical growth

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Transportation

- Methods
 - Inventory (1990-2002)
 - CO2
 - SGIT and Fuel Consumption
 - Onroad CH4 and N2O
 - SGIT and VMT
 - Nonroad CH4 and N2O
 - SGIT and Fuel Consumption

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Transportation

- Methods for Projections (2003-2020)
 - Onroad Gasoline and Diesel CO2
 - VMT forecasts from local planning organizations and CO SIP
 - VMT forecasts adjusted to account for projected fuel efficiency improvements from 2006 EIA Annual Energy Outlook
 - Onroad CH4 and N2O
 - VMT projections, as above
 - VMT allocated to vehicle type using 2006 EIA Annual Energy Outlook data
 - Aviation
 - 2002-2005: Jet fuel – Denver International operations; general aviation – EIA aviation gasoline sales for CO
 - Post-2005: CDOT Aircraft Operations Forecasts
 - Rail/Marine
 - Historical growth rates

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Transportation

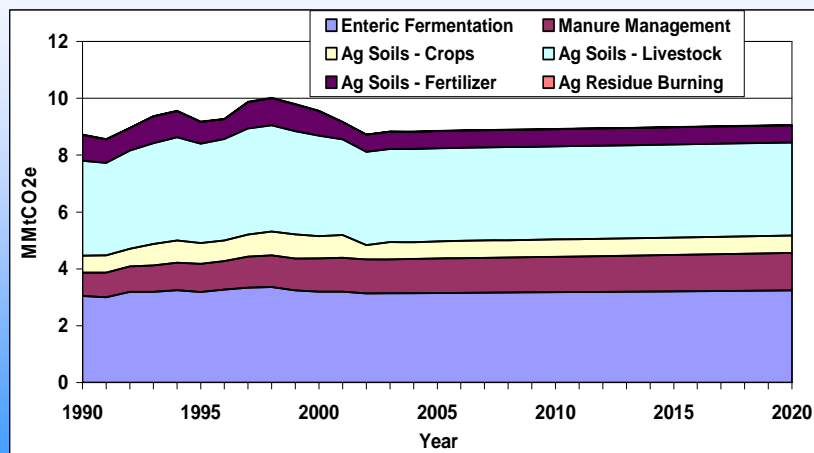
- Key Assumptions
 - Available VMT projections are accurate (statewide 2002-2020 = 2.1%/yr)
- Key Uncertainties
 - Future vehicle mix – based on national estimates
 - No data on future consumption of biofuels
 - Consumption of international bunker fuels in the aircraft sector

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Agriculture



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Agriculture

- Data Sources
 - Crop Acreage: USDA/NASS
 - Livestock: USDA/NASS
 - Fertilizer: Fertilizer Institute
- Methods
 - Crops: SGIT emission factors and crop acreage
 - Livestock: SGIT emission factors and livestock populations
 - Fertilizer: SGIT fertilizer consumption
 - No growth assumed for Ag Soils and Ag Residue Burning emissions

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Agriculture

- Key Assumptions
 - No growth or significant change in crop production for the future
 - Dairy cattle population growth (1.8%/year); no growth for other livestock categories
 - Based on Colorado Agricultural Statistics Service data
- Key Uncertainties
 - Projection data

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Forestry

Carbon Pool	MMtCO ₂ e/yr
Live Trees	-15.3
Standing Dead Trees	-1.5
Live Understory	-0.9
Down and Dead Trees	-1.0
Forest Floor	-5.2
Soils	-7.1
Harvested Wood Products	-0.8
Total	-31.8

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Forestry

- Data Sources
 - USFS carbon stock for 2 inventories (1983/1984-2005) based on FORCARB2 model
 - USFS also provides modeled estimates for harvested wood products
- Methods
 - Forestry: USFS FORCARB2 carbon stock change model provides carbon pools for each inventory cycle
 - Flux calculated for each pool based on difference in time between inventory cycles
 - Carbon pool data for the 1983/1984-2005 time-period used to quantify flux.

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Forestry

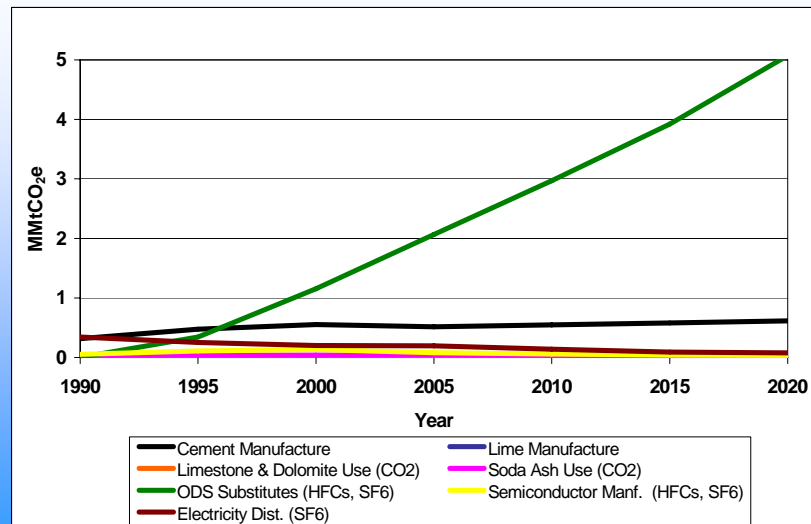
- Key Assumptions
 - 1983-2005 carbon stock change representative of current conditions
 - No significant change in sequestration from 2006-2020
- Key Uncertainties
 - Effects of future development on forested acreage
 - Effects of near-term climate change on forest sequestration levels
 - Effects of increasing wildfire activity on sequestration levels

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Industrial Process



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Industrial Process

- Data sources
 - US EPA National GHG Inventory for national emissions from ODS substitutes, electric distribution, and semiconductor manufacturing
 - State CDPHE - lime production
 - USGS data
 - Cement manufacture (clinker and masonry cement)
 - Soda ash use
 - Limestone and dolomite use
- Methods
 - Based on US EPA's State GHG Inventory Tool (SGIT)
 - Scale national to state (ODS subs, Electricity Tans./Dist.)
 - Activity X emission factors (all other)

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Industrial Process

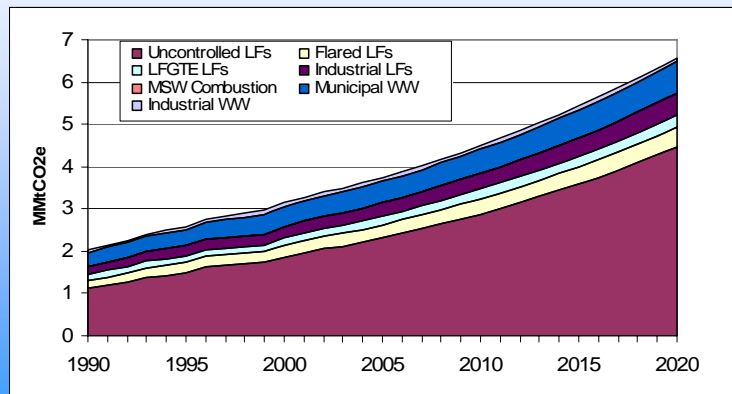
- Key Assumptions
 - Growth Rates
 - ODS subs and Elec. Dist. –
 - National growth rate (US State Dept and US EPA)
 - Cement and lime manufacture, limestone/dolomite use –
 - State employment forecasts for non-metallic minerals
 - Soda ash use – USGS national forecast
- Key Uncertainties
 - Industry activities to reduce GHG emissions
 - Clinker and masonry cement & soda ash production
 - SGIT default production - replace with plant-specific data, when available

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Waste Management



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Waste Management

- Data sources
 - EPA LMOP Database
 - CDPHE Survey on landfills
 - CDPHE data on WW flows for meat/poultry processors
 - State population and SGIT default data for municipal WW treatment
- Methods
 - SGIT with data sources above
 - CCS post-processing to account for controls and growth

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Waste Management

- Key Assumptions
 - Growth Rates
 - Landfills – based on historic emissions growth
 - Industrial WW – held constant at 2005 levels
 - Municipal WW – CO population projections
- Key Uncertainties
 - Future controls applied to uncontrolled landfills
 - Industrial landfills – SGIT default of 7% of municipal landfills
 - Industrial WW – growth for meat/poultry; lack of data for pulp/paper and food/vegetable processing

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Black Carbon

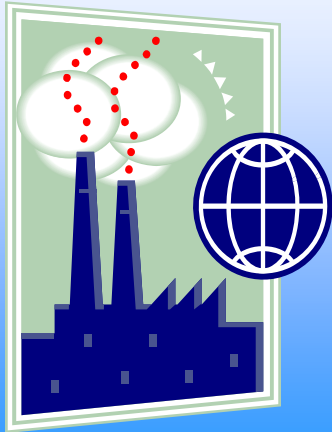
- One of two carbonaceous aerosol species – BC and Organic Carbon (OC)
- Also known as light absorbing carbon (LAC) and elemental carbon (EC)
- Absorbs solar energy and warms the troposphere (like GHG's)

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Sources of Black Carbon



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

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Black Carbon Emissions

- 2002
 - 6.8 MMtCO₂e
 - Primary Contributors:
 - nonroad diesel (54%)
 - onroad diesel (26%)
 - rail (7%)
 - nonroad gasoline engines (5%)
- 2018
 - Nonroad diesel drops from 3.7 to 1.1 MMtCO₂e
 - Onroad diesel drops from 1.7 to 0.4 MMtCO₂e

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Break



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Catalog of States Actions

- Refer to updated handout
 - Updates from PWG review:
 - Draft preliminary rankings of GHG potential, cost/cost savings for review and revision
 - Notation of actions from AZ, NM and MT
 - Supplemental descriptions of catalog actions
 - CAP addition of new potential actions?

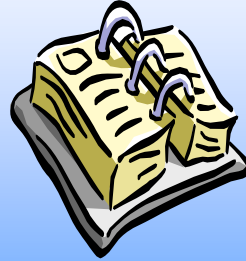
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Next CAP Meeting

- Agenda:
 - Review TWG suggested priorities for analysis of policy options
 - Review PWG suggested updates to the Colorado emissions inventory and projection
 - Discuss policy design issues and next steps for policy options
- Date and Location TBD



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Public Input, Announcements

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