



**MINNESOTA**  
Climate Change  
Advisory Group



# Minnesota Climate Change Advisory Group

Transportation and Land Use Technical  
Work Group Meeting #2

June 6, 2007

Minnesota Department of Commerce

Minnesota Pollution Control Agency

The Center for Climate Strategies

# Agenda

- Introductions
- Review of Minnesota Emissions Inventory & Forecast
- Discussion of Catalog
- 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
- Used MN inventory for 1990-2004/2005
  - Prepared by Peter Ciborowski, MN PCA
- Consumption and production-based emissions from electricity generation
  - Very simplified approach used for initial analysis

# Projection Approach

- Reference case assumes no major changes from business-as-usual (BAU)
  - Includes assessment of approved policies and actions to the extent possible (e.g., Renewable Energy Standards)
- 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 (CO<sub>2</sub>), Methane (CH<sub>4</sub>), Nitrous Oxide (N<sub>2</sub>O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF<sub>6</sub>)
- All major emitting sectors
  - Electricity Supply & Demand (Consumption Based)
  - Residential, Commercial, Industrial (RCI) Fuel Use and Non-fuel Use Processes
  - Transportation (onroad and nonroad)
  - Natural gas pipeline transmission & distribution
  - Agriculture, Forestry, and Waste
- Emissions expressed as CO<sub>2</sub> equivalent
  - 100-year global warming potentials
    - CO<sub>2</sub> = 1; CH<sub>4</sub> = 22; N<sub>2</sub>O = 310; halogenated gases, up to 25,000

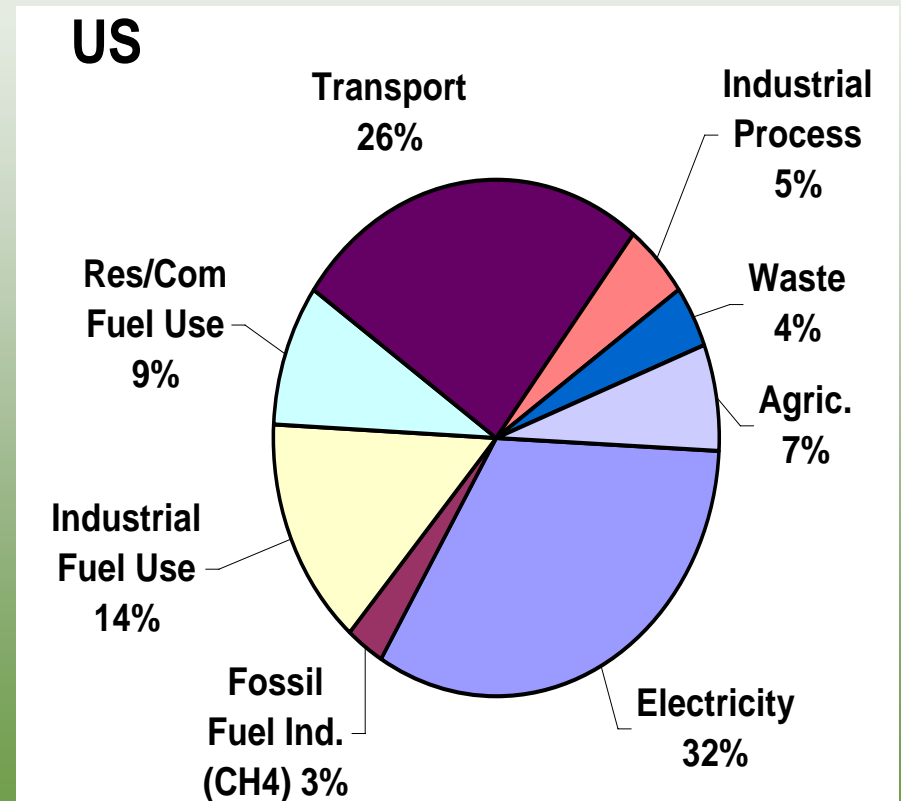
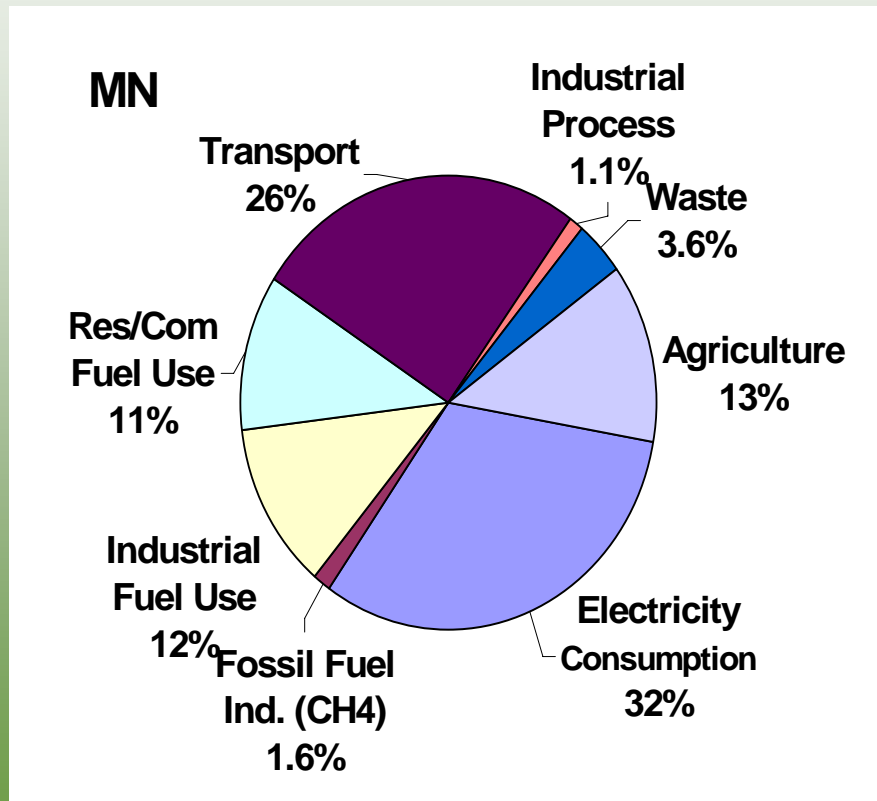
# Key Points

- Preliminary draft for MCCAG 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

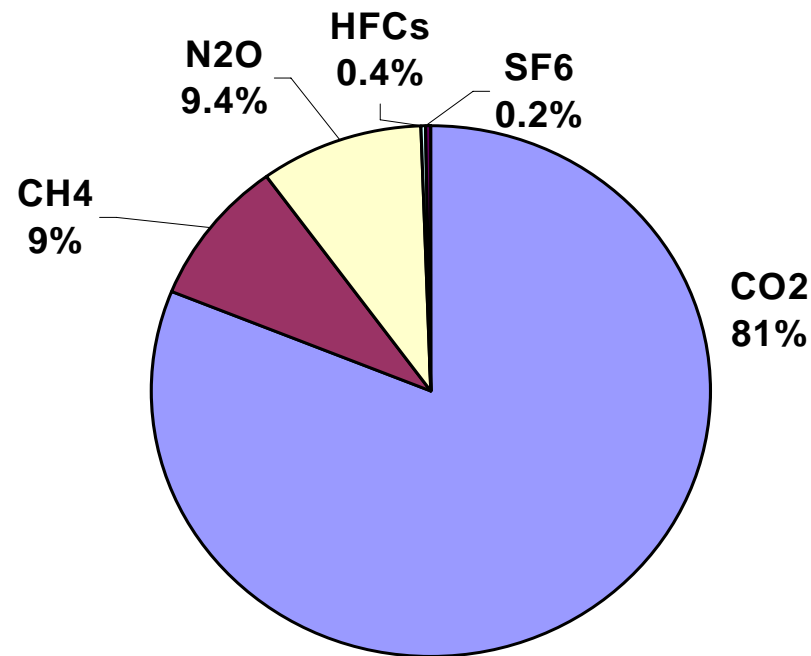
# Key Points

- Other Pollutants
  - MN PCA Inventory includes:
    - Carbon monoxide (CO) from combustion processes
    - CO<sub>2</sub> from biomass combustion
  - IPCC Guidelines –
    - Report CO and biomass CO<sub>2</sub> separately from six GHG pollutants
    - Good to track for multi-pollutant assessment of GHG options
  - CO and biomass CO<sub>2</sub> not included in I&F totals presented today

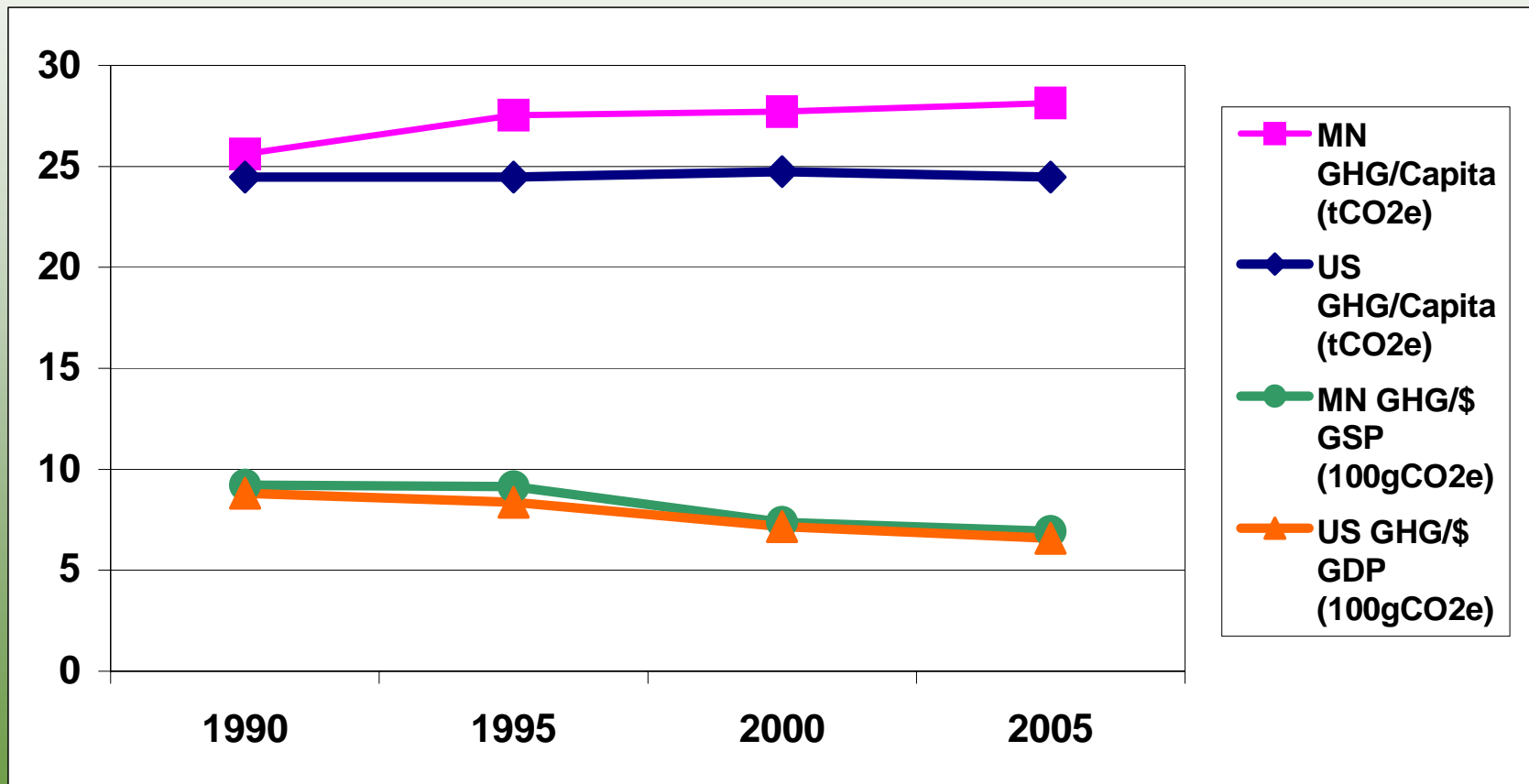
# MN & US Emissions By Sector, Year 2000



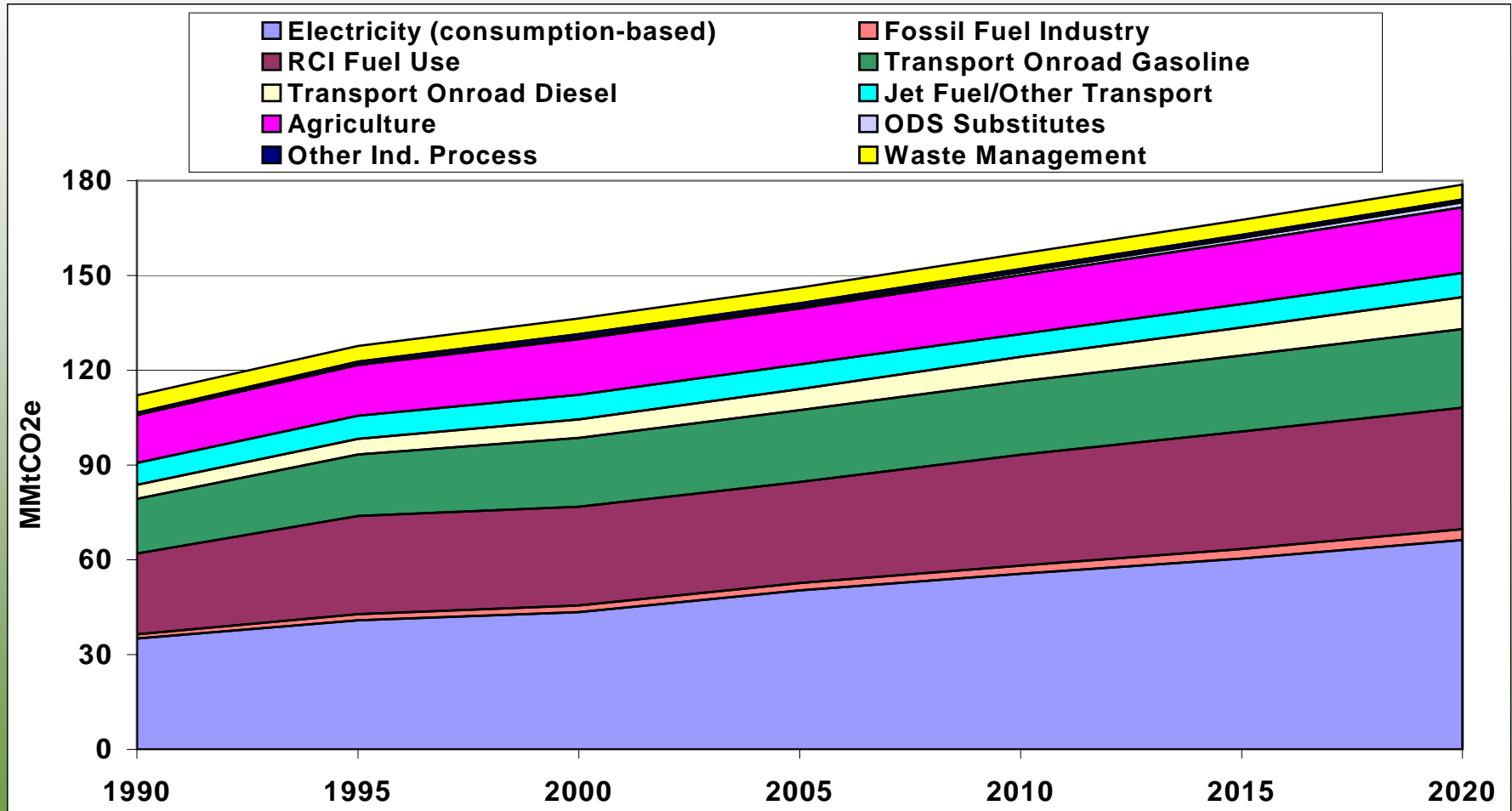
# MN Emissions By GHG, Year 2000 (MMtCO<sub>2</sub>e Based)



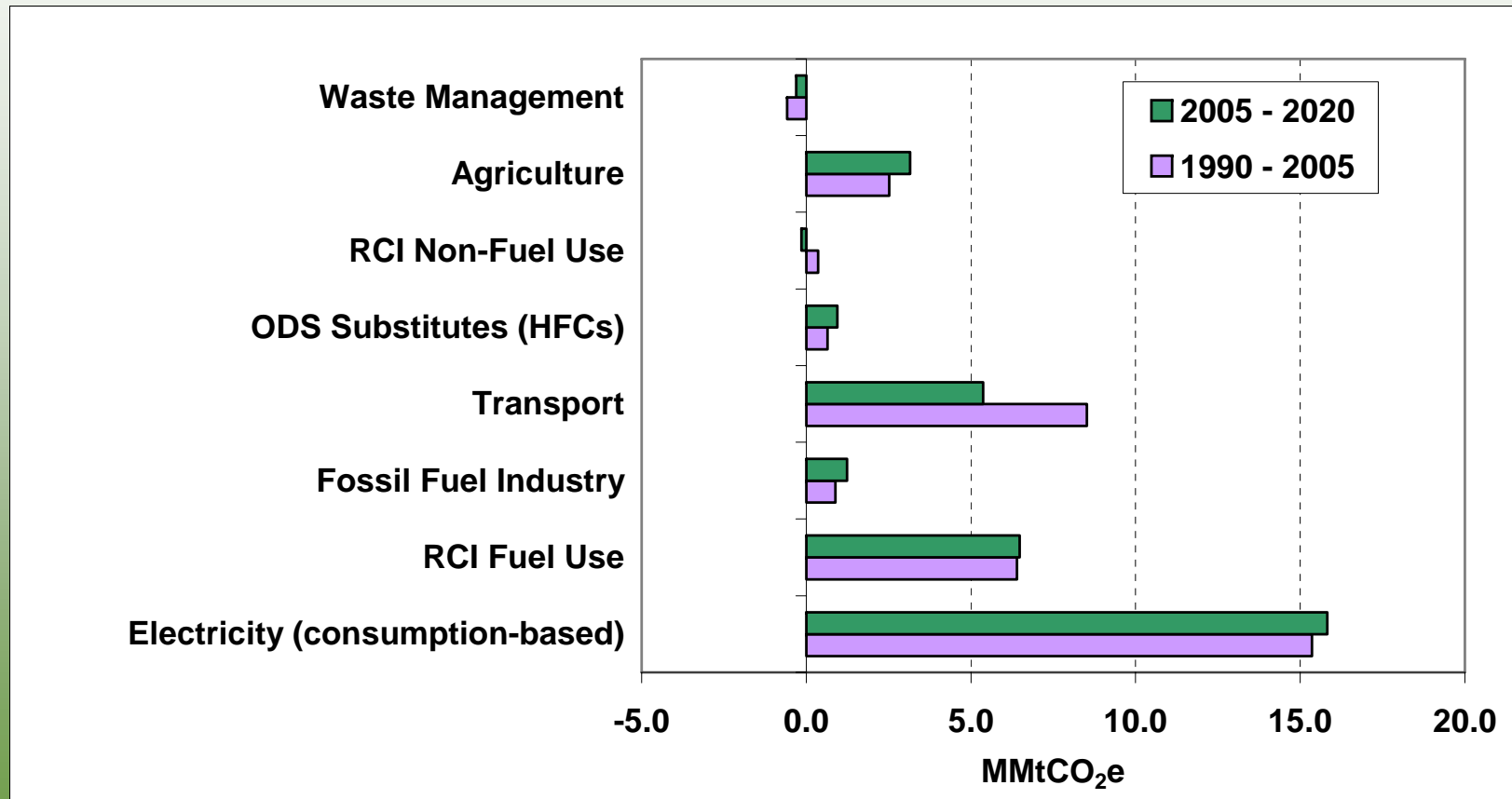
# Per Capita and GSP/GDP GHG Emissions, 1990-2005



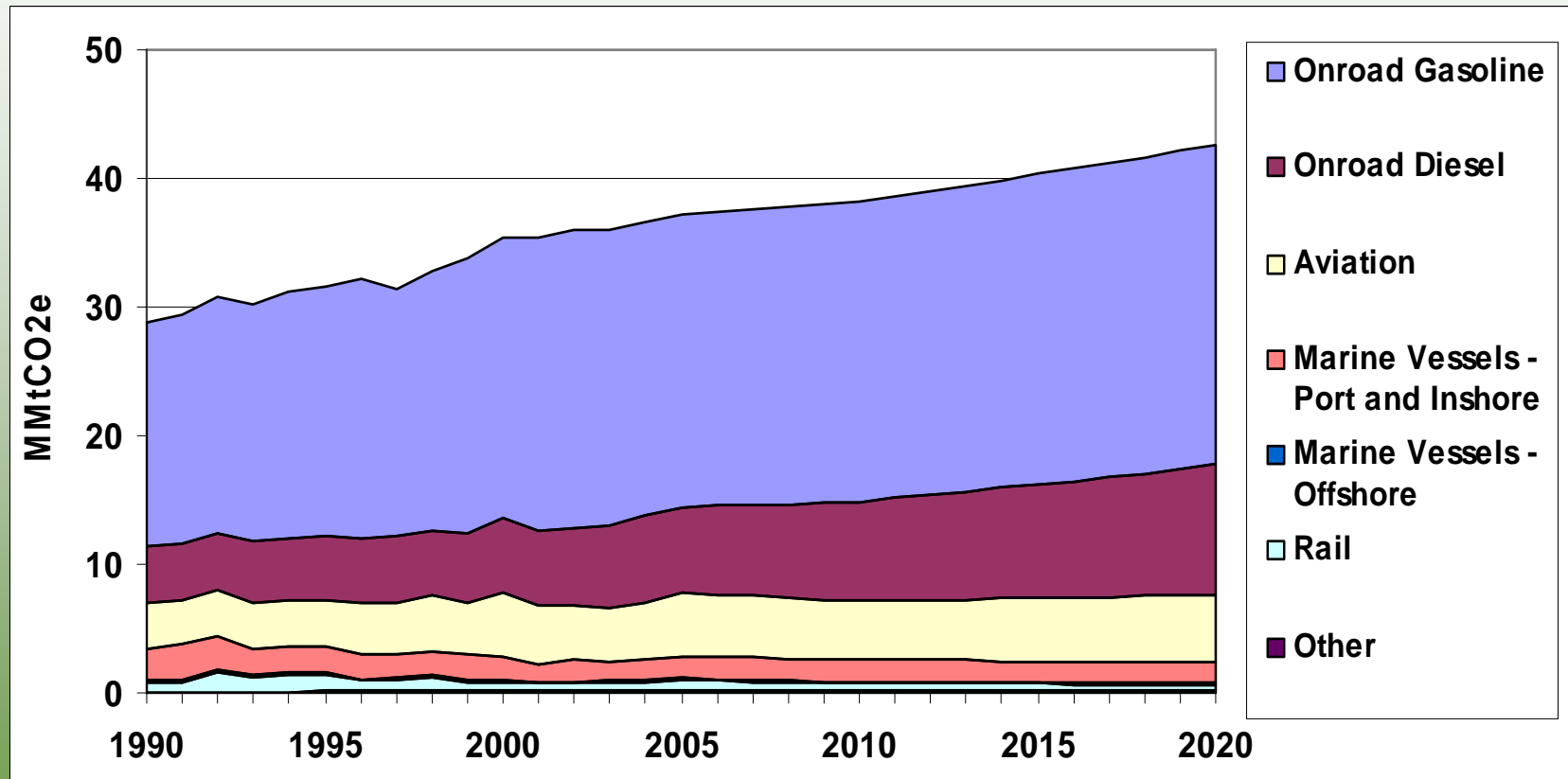
# Gross MN GHG Emissions By Sector, 1990-2020



# MN Emissions Growth (MMtCO<sub>2</sub>e Basis)



# Transportation



# Transportation

- Data Sources: Fuel Consumption
  - Gasoline (onroad, marine, aviation) – FHWA's *Highway Statistics*
  - Diesel (onroad, rail) – EIA's *Fuel Oil and Kerosene Sales*
  - Jet Fuel – Minnesota Petroleum Tax Division
  - LPG - Calculated from Vehicle Inventory and Use Survey (VIUS) vehicles, VMT/vehicle, and approximate fuel economy
  - Natural Gas – EIA's *Natural Gas Annual*
  - Waste Oil - Calculated at a rate of 1 quart of motor oil/2000 miles traveled
  - Marine Diesel and Residual Fuel – Estimated by allocating national sales based on national-state waterborne freight tonnage (Waterborne Commerce Statistics Center)

# Transportation

- Other Data Sources
  - VMT – Minnesota Department of Transportation
  - Vehicle Vintage - Vehicle Inventory and Use Survey (US Census Bureau) and the National Household Travel Survey (FHWA)
  - Vehicle fuel breakdown - MOVES2004, National Transit Database

# Transportation

- Methods
  - Inventory (1990-2005)
    - CO<sub>2</sub>
      - Fuel Consumption and EPA Emission Factors
    - Onroad CH<sub>4</sub> and N<sub>2</sub>O
      - VMT and EPA Emission Factors
    - Nonroad CH<sub>4</sub> and N<sub>2</sub>O
      - Fuel Consumption and EPA Emission Factors

# Transportation

- Methods for Projections (2005-2030)
  - Onroad Gasoline and Diesel CO<sub>2</sub>
    - VMT forecasts from MNDOT
    - VMT allocated to vehicle type using 2006 EIA Annual Energy Outlook data
    - VMT forecasts adjusted to account for projected fuel efficiency improvements from 2006 EIA Annual Energy Outlook.
  - Onroad CH<sub>4</sub> and N<sub>2</sub>O
    - VMT forecasts from MNDOT allocated to vehicle type using 2006 EIA Annual Energy Outlook data
  - Aviation
    - FAA aircraft operations projections for commercial aircraft (applied to jet fuel) and general aviation (applied to aviation gasoline)
    - Jet fuel projections adjusted to account for projected fuel efficiency improvements from 2006 EIA Annual Energy Outlook
  - Rail and Marine
    - Historical growth rates
  - Natural Gas, LPG, Lubricants
    - Regional fuel consumption projections from 2006 EIA Annual Energy Outlook

# Transportation

- Key Assumptions
  - Available VMT projections are accurate (statewide 2004-2030 = 1.7%/yr)
- Key Uncertainties
  - Future vehicle mix – based on national estimates
  - Aircraft fuel consumption includes state-to-state and international flights
  - Assumption that the state's fraction of national marine fuel consumption is proportional to the fraction of national freight tonnage moving through Minnesota ports

# Next Steps

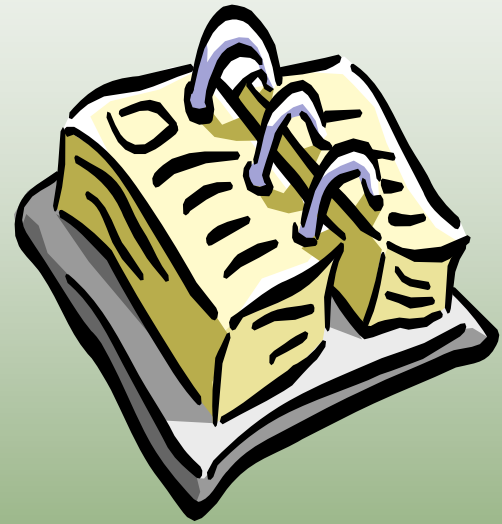
- Discussion of State Catalog of Options
- Prioritization of Options

# Discussion of Catalog

- See Catalog of State Actions document

# Next TWG Meeting

- Time and Date TBD



# Public Input, Announcements