$PM_{2.5}$ and Electric Power Generation: Recent Findings and Implications

April 9 - 10, 2002
Omni William Penn Hotel
Pittsburgh, PA

U. S. Department of Energy
Office of Fossil Energy
National Energy Technology Laboratory

Welcome to Pittsburgh!

Why is DOE Sponsoring This Conference ?

- **Goal 1 of Strategic Plan, DOE Office of Fossil Energy:**
  - ***"eliminate environmental issues as a barrier to fossil fuel production and use, while maintaining the availability and affordability of fossil fuels."***

- **Power plant emissions contribute to $PM_{2.5}$**
  - SO_2 and NO_x are important $PM_{2.5}$ precursors
  - Primary $PM_{2.5}$ and condensibles (SO_3) may cause plume opacity

Regulatory/Legislative Drivers

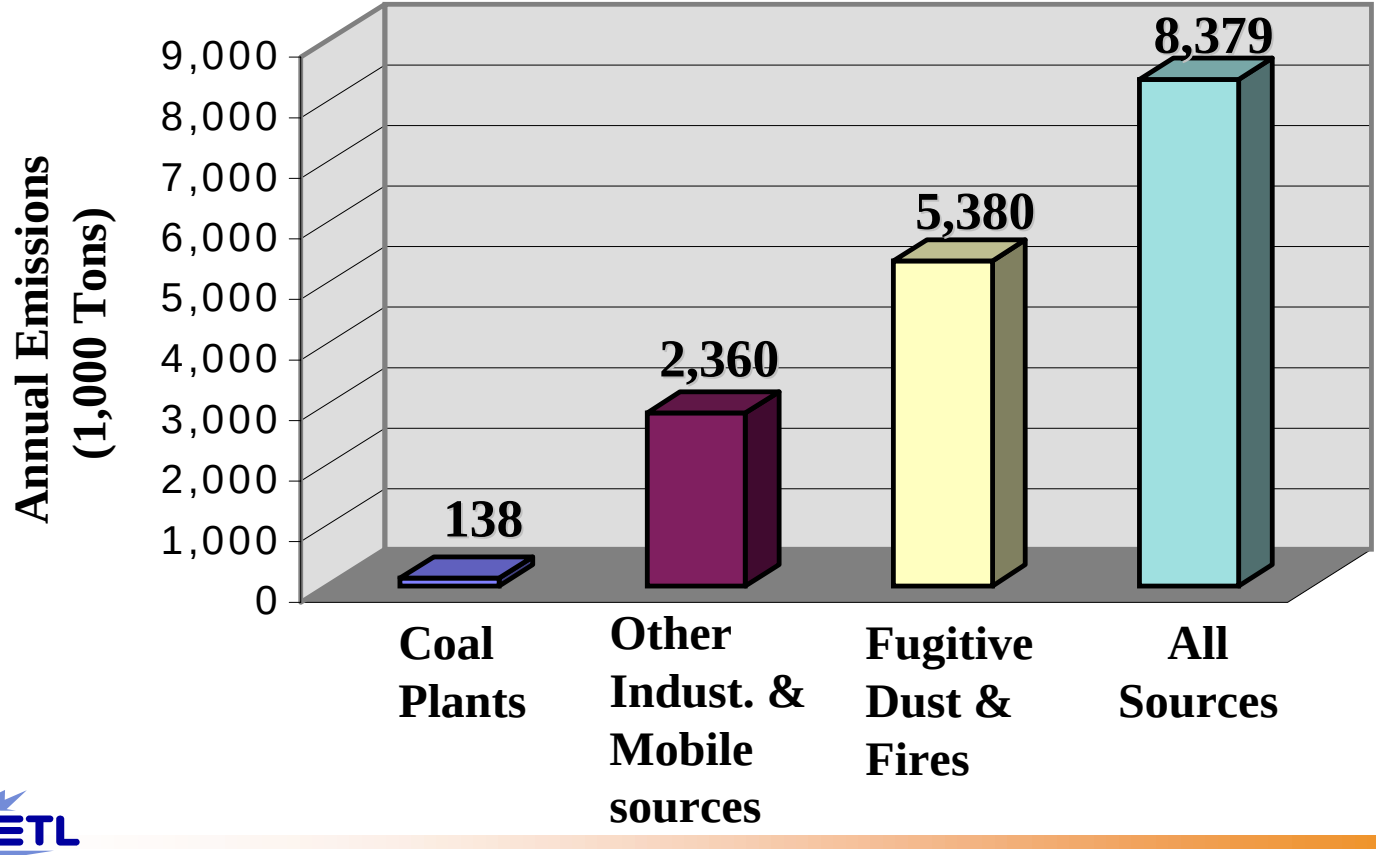
- **National Ambient Air Quality Standards (NAAQS)**
  - Based on $PM_{2.5}$ mass concentration (not composition)
    - Annual mean: 15 µg/m^3 ; Daily max: 65 µg/m^3
- **1999 Regional Haze Rule**
  - Long-range visibility related to $PM_{2.5}$ mass concentration
  - BART provisions for power plants
- **Multi-pollutant legislation: "Clear Skies Initiative"**
  - Mandatory reductions in SO_2 and NO_x emissions
- **Near-stack opacity**
  - Local regulations; community concerns

Why is $PM_{2.5}$ Research So Important?

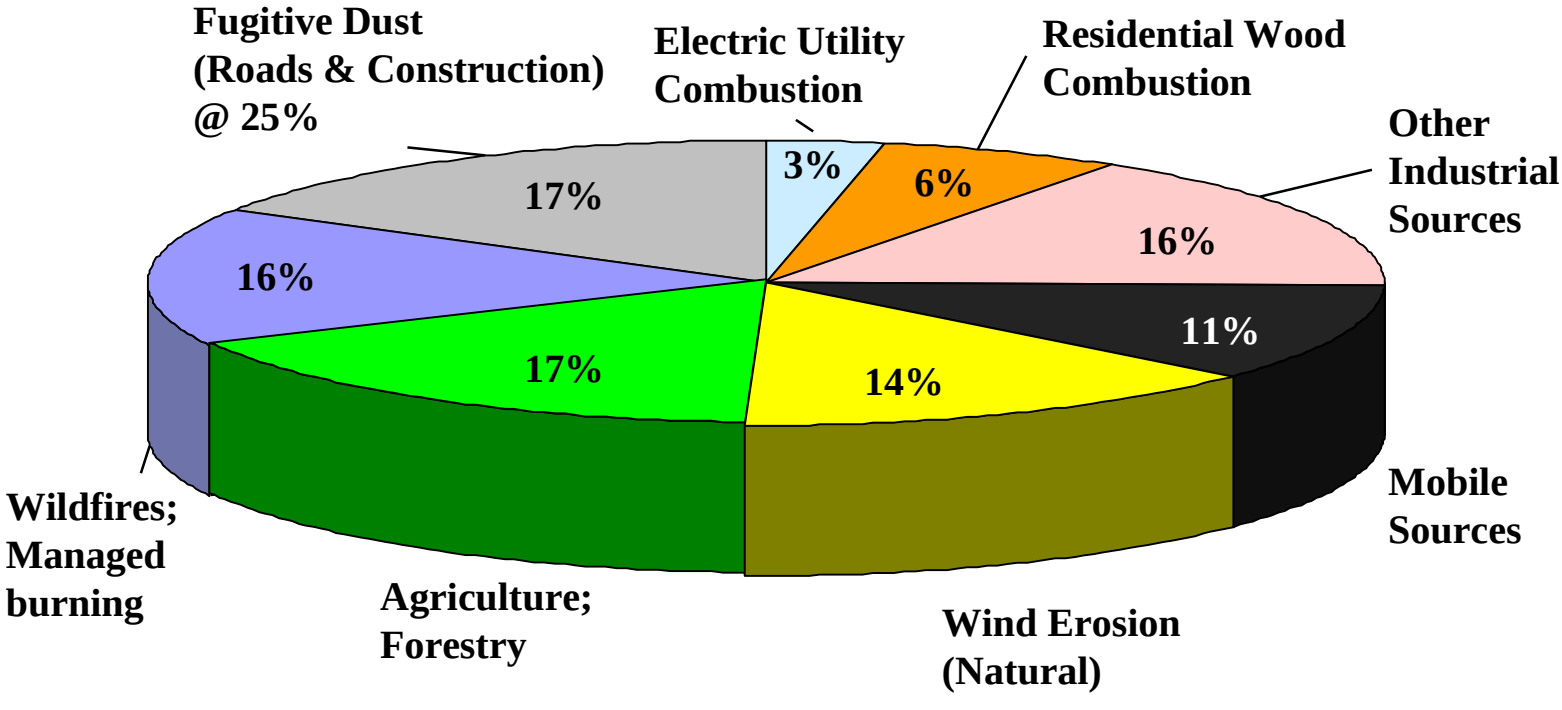
- **Complex scientific and technical issues**
  - Primary vs.secondary $PM_{2.5}$
  - Power plants vs. other sources
  - Health effects: mass vs. composition
- **High stakes for electric power generation**
  - Coal provides >50% of U.S. electricity

1998 U. S. Primary $PM_{2.5}$ Emissions

Source: National Air Pollution Emission Trends, 1990 – 1998 (EPA-454/R-00-02, March 2000)



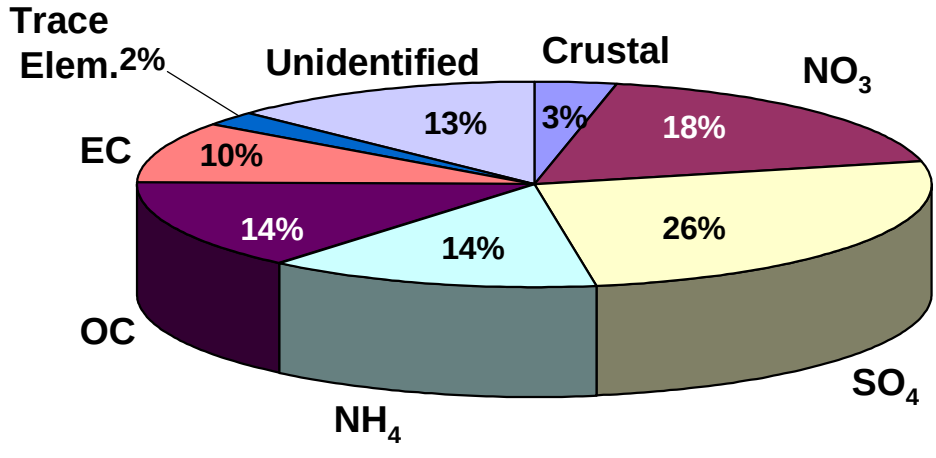
1998 U. S. Primary $PM_{2.5}$ Emissions

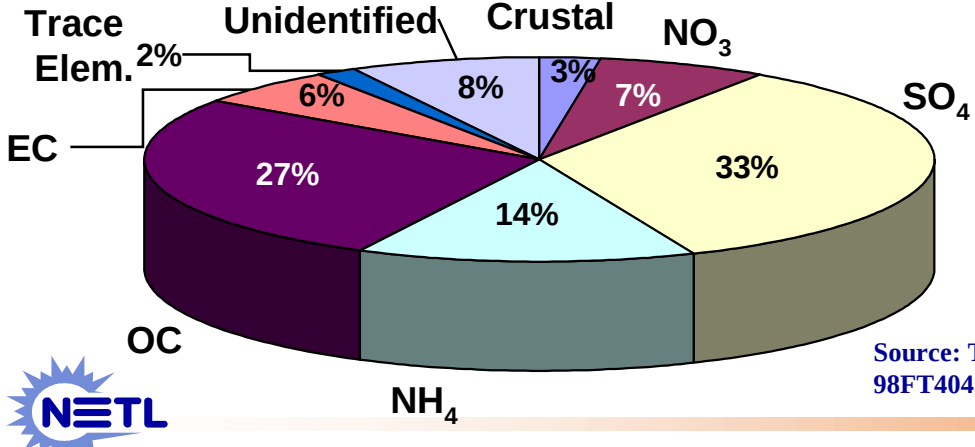


Source: National Air Pollution Emission Trends, 1990 – 1998 (EPA-454/R-00-02, March 2000)

$PM_{2.5}$ Composition in Western PA (*Winter 1999*)

Urban Site
Pittsburgh, PA
(avg. of 36 samples)

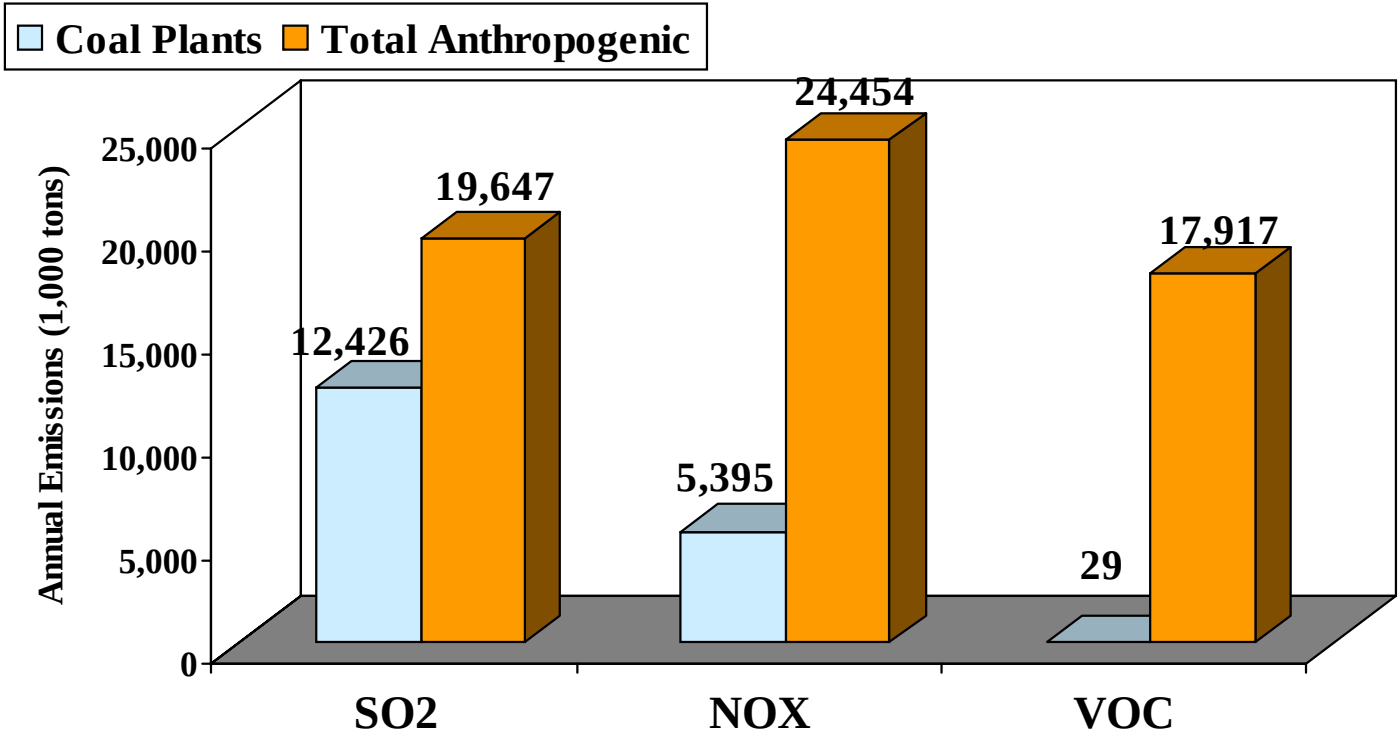




Rural Site
Greene County, PA
(avg. of 9 samples)

Source: Technical Progress Report, DOE Contract DE-AC26-98FT40456 (Advanced Technology Systems, Inc., October 2001)

1998 U.S. Secondary $PM_{2.5}$ Precursor Emissions



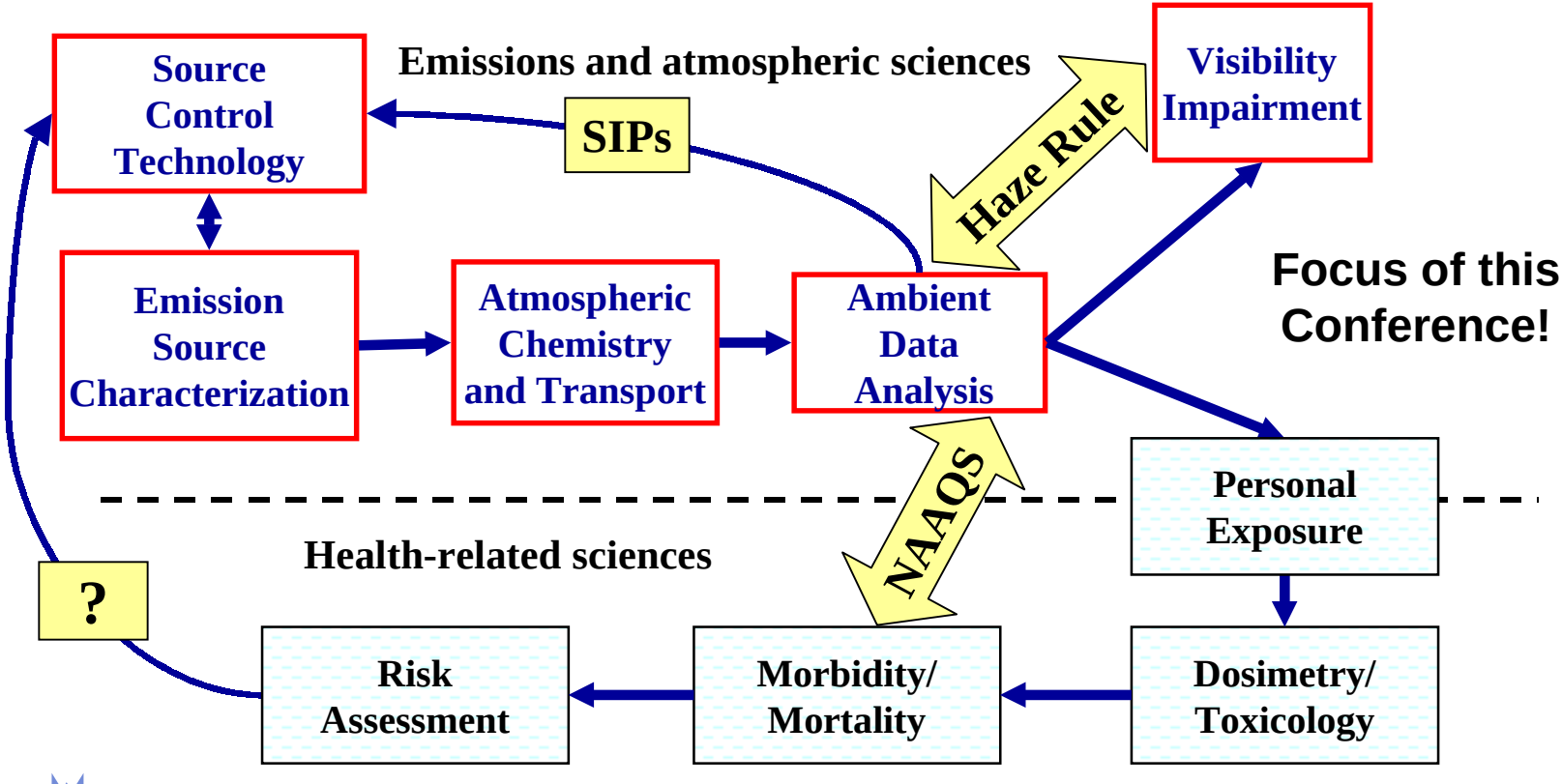
Source: National Air Pollution Emission Trends, 1990 – 1998 (EPA-454/R-00-02, March 2000)

$PM_{2.5}$ & Power Generation - Central Issues

- **Power plant emissions contribute significantly to secondary $PM_{2.5}$ mass**
- **Effects of power plant emission reductions on ambient $PM_{2.5}$ mass, composition, and regional haze are uncertain**
- **Effects of power plant emission reductions on human health are even less certain**

$PM_{2.5}$ Research Paradigm

as applied to Power Plant Emissions



Goals for This Conference

- Relate concentrations and composition of ambient $PM_{2.5}$ to emissions from energy production sources
- Better understanding of atmospheric processes governing $PM_{2.5}$ formation and deposition
- Information about energy management options for achieving $PM_{2.5}$ and related air quality standards