An Overview of Air Quality Issues

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- Clean Air Act History
- National Ambient Air Quality Standards
- Ozone and PM Control Efforts
- Transportation Planning Impacts
- Motor Vehicle Emissions Budgets
- Other Programs

Clean Air Act History

- 1948 - Donora PA
  - 20 people killed, 6,000 sickened during 5 day inversion
  - Emissions from coal burning, coke ovens, zinc plant, and iron and steel industries trapped in river valley
- London Fog 1952-53
  - Dense fog containing coal burning emissions enveloped area for a week in December
  - Estimated 12,000 excess deaths from Dec ’52 through Feb ’53

1950's Los Angeles

1955 Air Pollution Control Act

- *An Act to provide research and technical assistance relating to air pollution control*
  - Did little to prevent air pollution
  - Granted $5 Million/year for research by the Public Health Service
  - Acknowledgement that the problem existed on a national level
  - Reserved for Congress the right to control the problem

1963 Clean Air Act

- *An Act to improve, strengthen, and accelerate programs for the prevention and abatement of air pollution*
  - Granted funding to state/local air pollution agencies to conduct research and create control programs
  - Recognized dangers of motor vehicle exhaust and from emissions from use of high sulfur coal and oil
  - Encouraged development of controls for motor vehicle and stationary source controls

1963 Clean Air Act, Amendments

- 1965, established standards for automobile emissions
- 1966, expanded local air pollution control programs
- 1967, Air Quality Act
  - Established national standards for stationary sources
  - Established fixed timetable for State Implementation Plans
  - Recommended control technologies
- 1969, extended research on low emissions fuels and automobiles

1970 Clean Air Act

- *An Act to provide for a more effective program to improve the quality of the nation's air*

- Entirely rewrote the CAA of 1963
  - Set National Ambient Air Quality Standards
  - Set New Source Performance Standards
  - Set standards for hazardous air emissions and motor vehicle emissions
  - Granted citizens the right to take legal action against anyone in violation of emission standards

1970 Clean Air Act

- Established National Air Quality Standards for six criteria pollutants:
  - Carbon Monoxide
  - Ozone
  - Lead
  - Nitrogen Dioxide
  - Particulate Matter
  - Sulfur Dioxide
- Primary standards to protect public health
- Secondary standard to protect public welfare (e.g., damage to farm crops and vegetation)

1970 Clean Air Act

- Leaded gasoline phase-down
  - Tetraethyl Lead had been used as a gasoline additive since the 1920s
  - Required the use of lead in gasoline to be phased out by the mid 1980s
  - Considered one of the single most important and successful environmental health initiatives of the 20th century
  - By 1995, the percentage of U.S. children with elevated blood-lead levels dropped from 88.2% in the 1970s to 4.4%

1990 Clean Air Act Amendments

- *An Act to provide for attainment and maintenance of health protective national ambient air quality standards, and other purposes*
  - Establishes NAA classification scheme and timeframes
  - Requires constant emissions reductions (RFP)
  - Requires USEPA to adopt more stringent motor vehicle and fuels standards as well as reduce emissions from consumer products and off-road equipment
- Targets Acid Rain
  - Required two phases of control on largest sources of SO_2 and NO_x

1990 Clean Air Act Amendments

- Required phase out of ozone depleting chemicals (e.g., freon, CFCs, …)
- Establishes Title V permit program
- Begins to Address Air Toxics
  - Identifies 189 toxic air pollutants
  - EPA required to issue Maximum Achievable Control Technology (MACT) standards for air toxic sources

NAAQS Process

- CAA requires EPA to review standards every 5 years
- Clean Air Scientific Advisory Committee (CASAC) reviews pertinent health studies, recommends range for NAAQS standard
- EPA reviews CASAC recommendations and proposes level of standard
- EPA adopts level of standard after public comment period
- EPA gets sued

NAAQS Standards

Pollutant	Primary Standard	Averaging Times
Carbon Monoxide	9 ppm 35 ppm	8-hour 1-hour
Ozone	0.08 ppm	8-hour
Lead	1.5 ug/m^3	Quarterly Ave
Nitrogen Dioxide	100 ug/m^3	Annual Mean
Particulate Matter (PM10)	150 ug/m^3	24-hour
Particulate Matter (PM2.5)	15.0 ug/m^3 35 ug/m^3	Annual 24-hour
Sulfur Dioxide	0.03 ppm 0.14 ppm	Annual Mean 24-hour

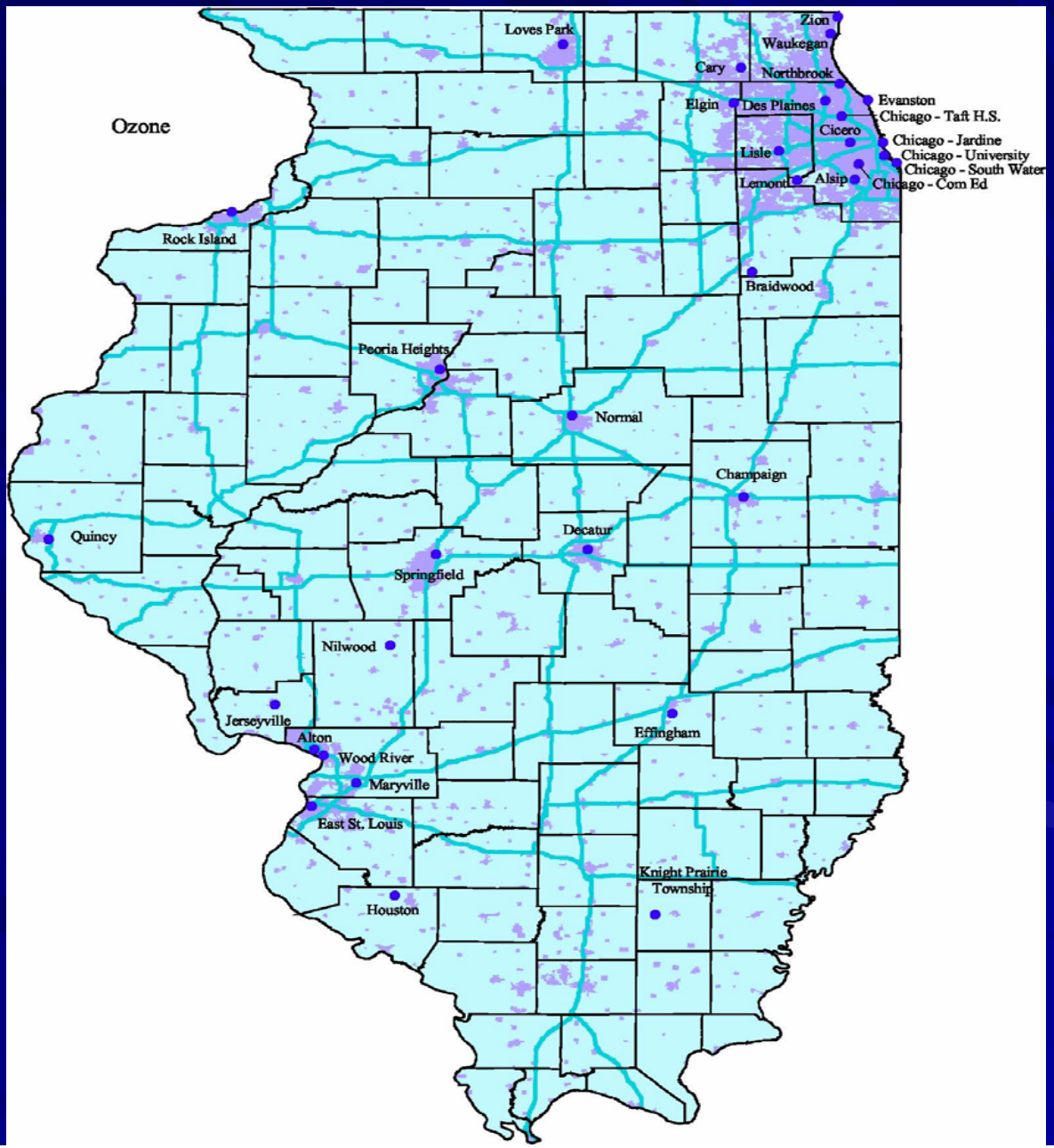
Attainment Status

- Illinois is in attainment of the NAAQS for

  Carbon Monoxide
  Lead
  Nitrogen Dioxide
  Sulfur Dioxide
  Particulate Matter (PM10)

- The Chicago and Metro-East St. Louis areas do not meet the 8-hour ozone and PM2.5 NAAQS

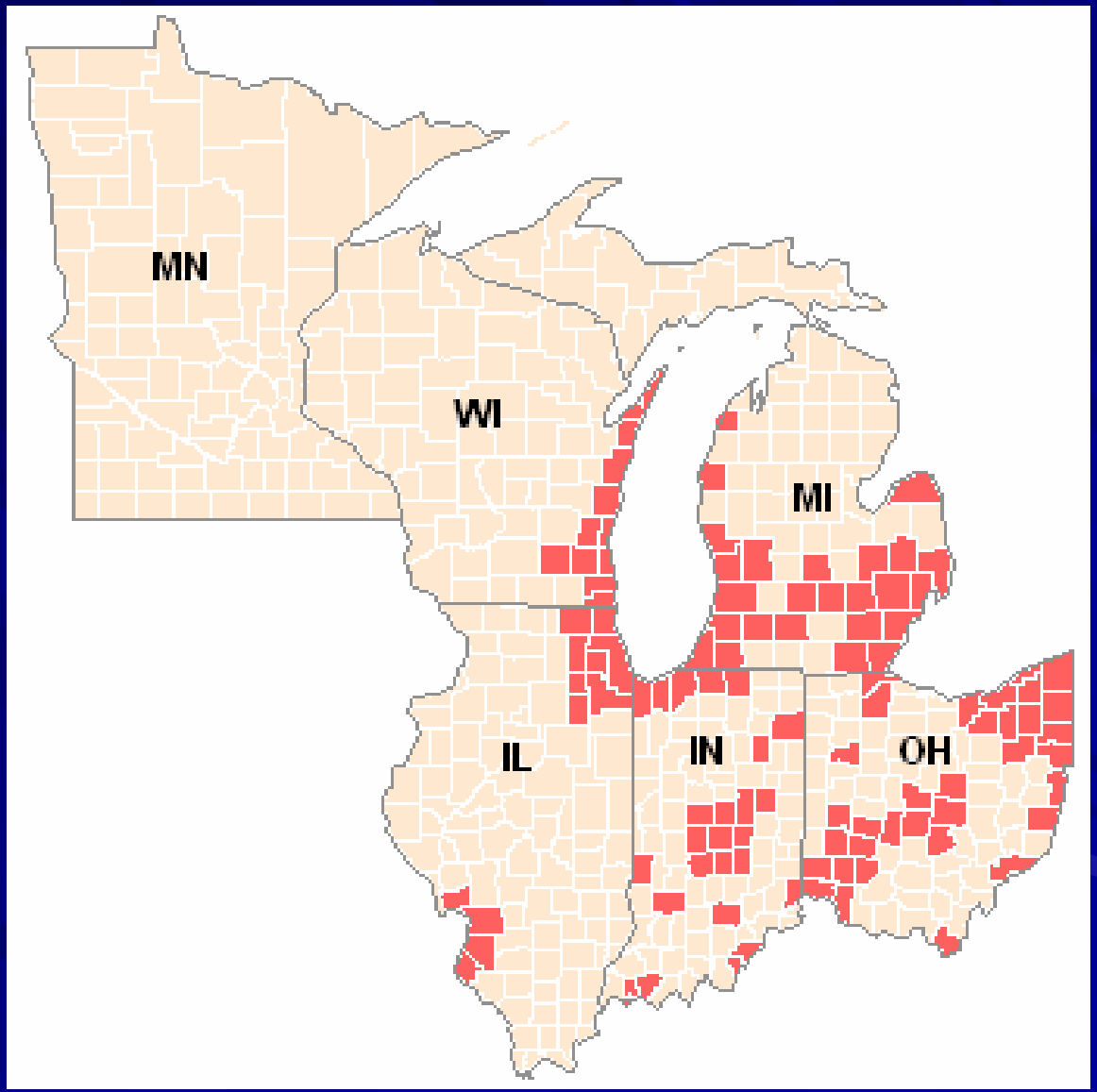
Ozone Monitor Locations



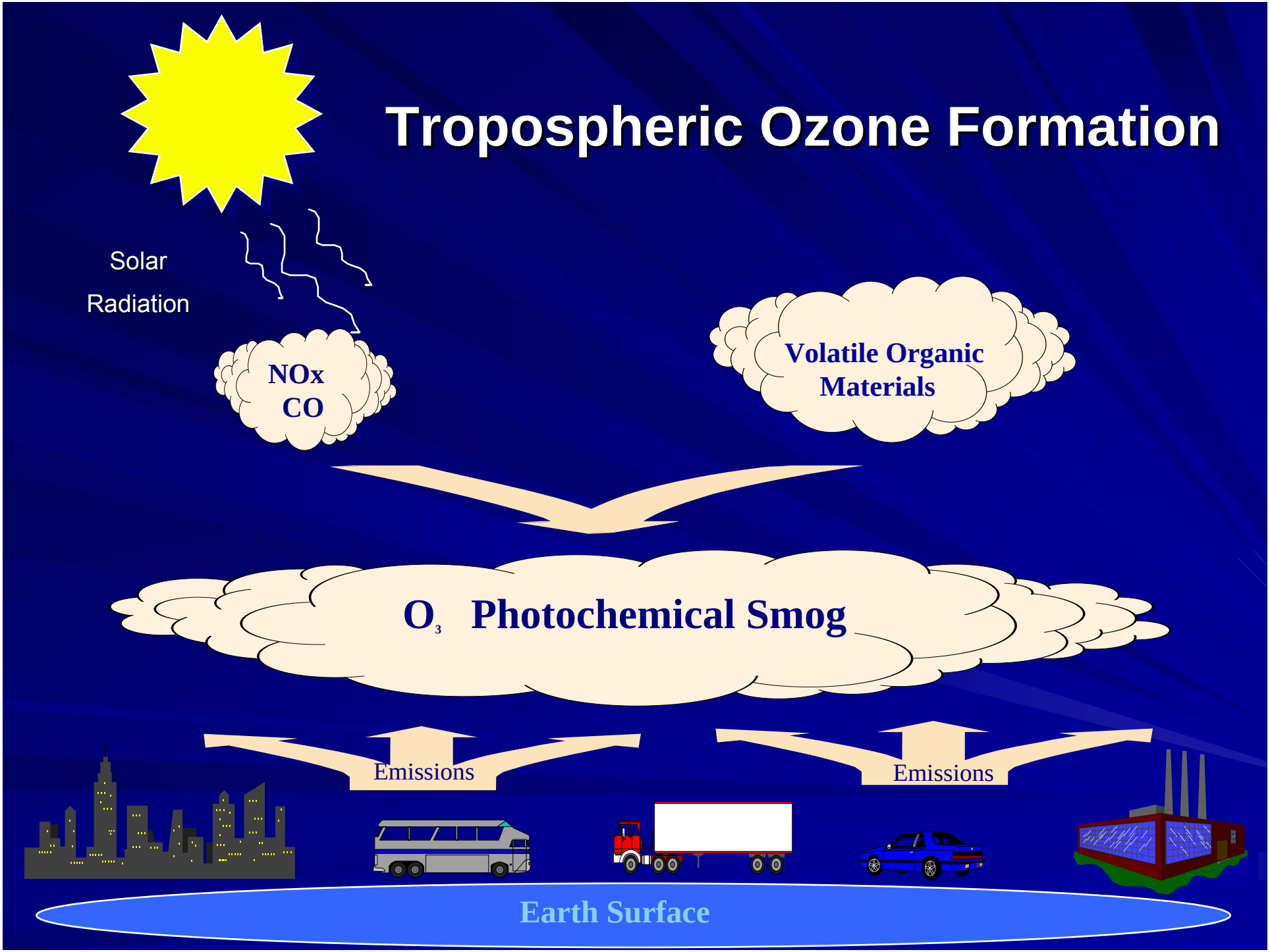
8-Hour Ozone Nonattainment Areas (Region V)

Illinois NAA Counties:
Chicago: Cook, DuPage, Kane Lake, McHenry, Will, Grundy (partial), Kendall (partial)

Metro-East St. Louis: Jersey, Madison, Monroe, St. Clair



Tropospheric Ozone Formation



Ozone Control Measures

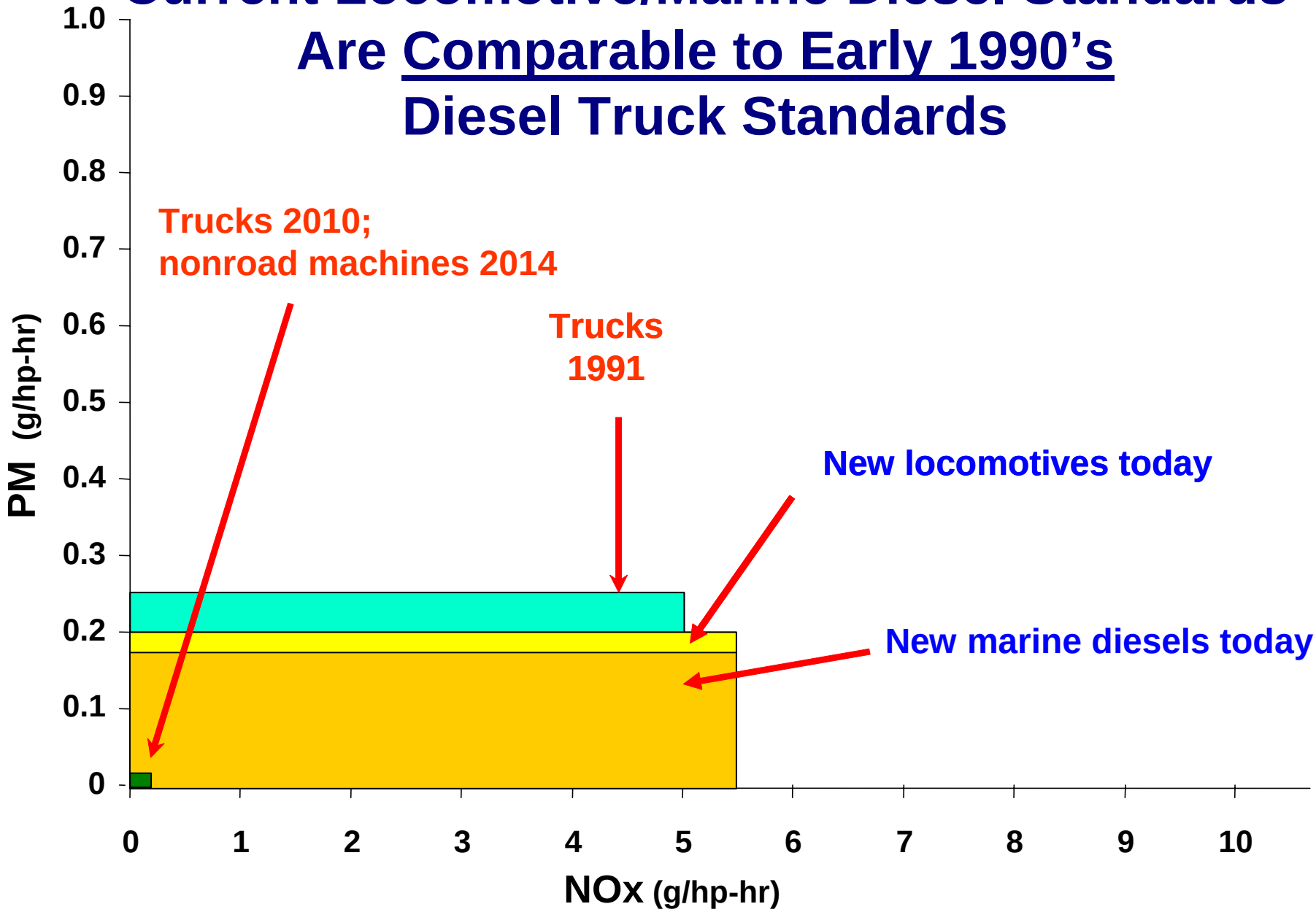
- Reduce local VOM emissions and regional NOx
- Recent VOM local controls (1990+)
  - Implementation of tighter vehicle emission standards (tier 1 in 1994, tier 2 in 2004)
  - Use of reformulated gasoline (1995, 2000)
  - Vehicle refueling controls (Stage II & ORVR)
  - Controls on surface coatings, printing
  - MACT controls on toxic emissions sources (e.g., coke ovens)
  - Illinois Emission Reduction Market System (ERMS)
  - Federal off-road engine controls

    (lawn & garden, pleasure craft, recreational equipment)

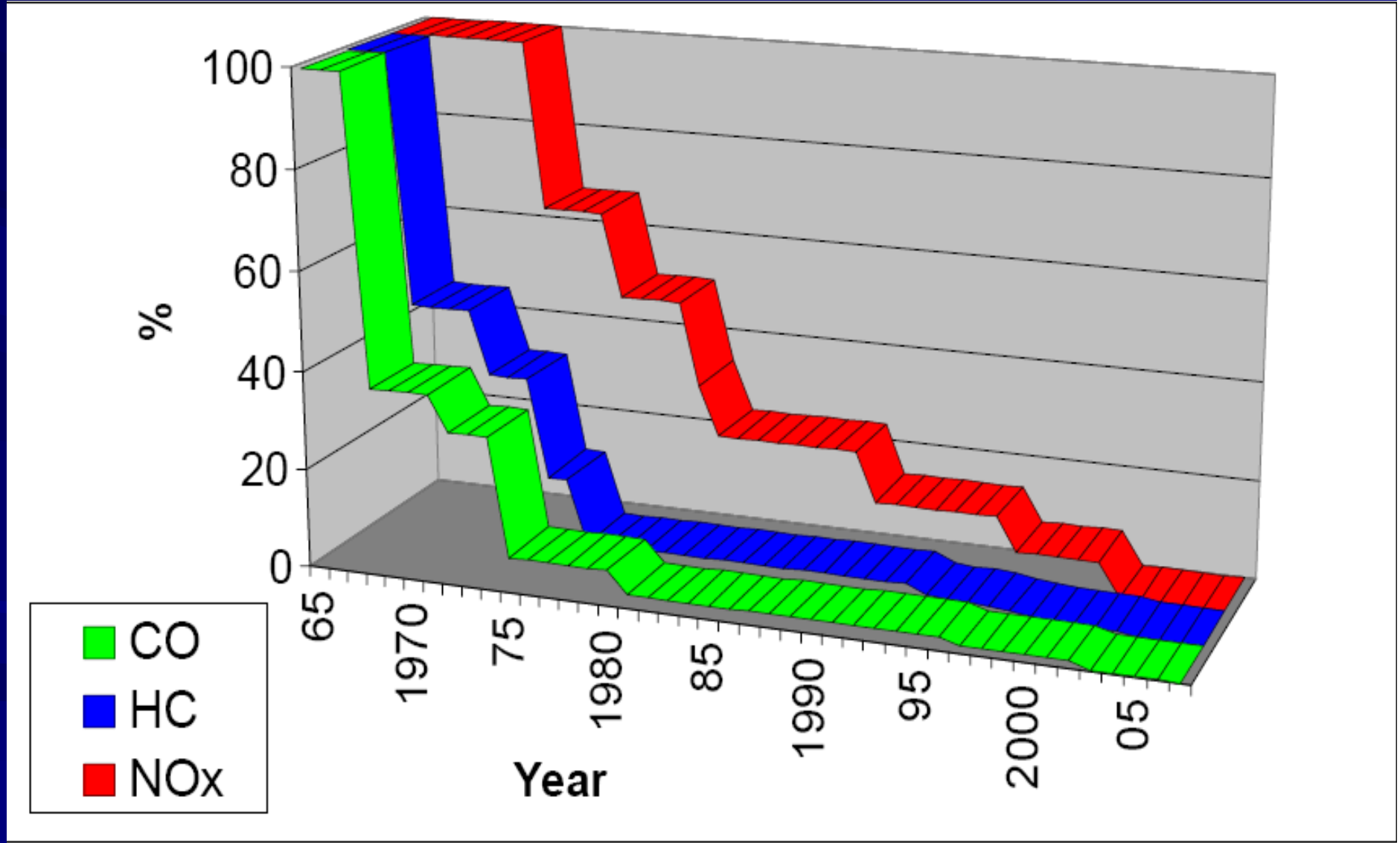
Ozone Control Measures

- NOx Reduction Measures
  - NOx SIP Call (2004) and CAIR (2006) (affected electric generating utilities)
  - Tier 2 Motor Vehicle and fuel standards
    - Restricts sulfur levels in gasoline to 30 ppm
    - Enables the use of advanced NOx control catalysts
    - Achieves a 77% reduction in NOx from cars, 95% reduction from trucks, vans, SUVs
  - USEPA Non-Road Engine Regulations

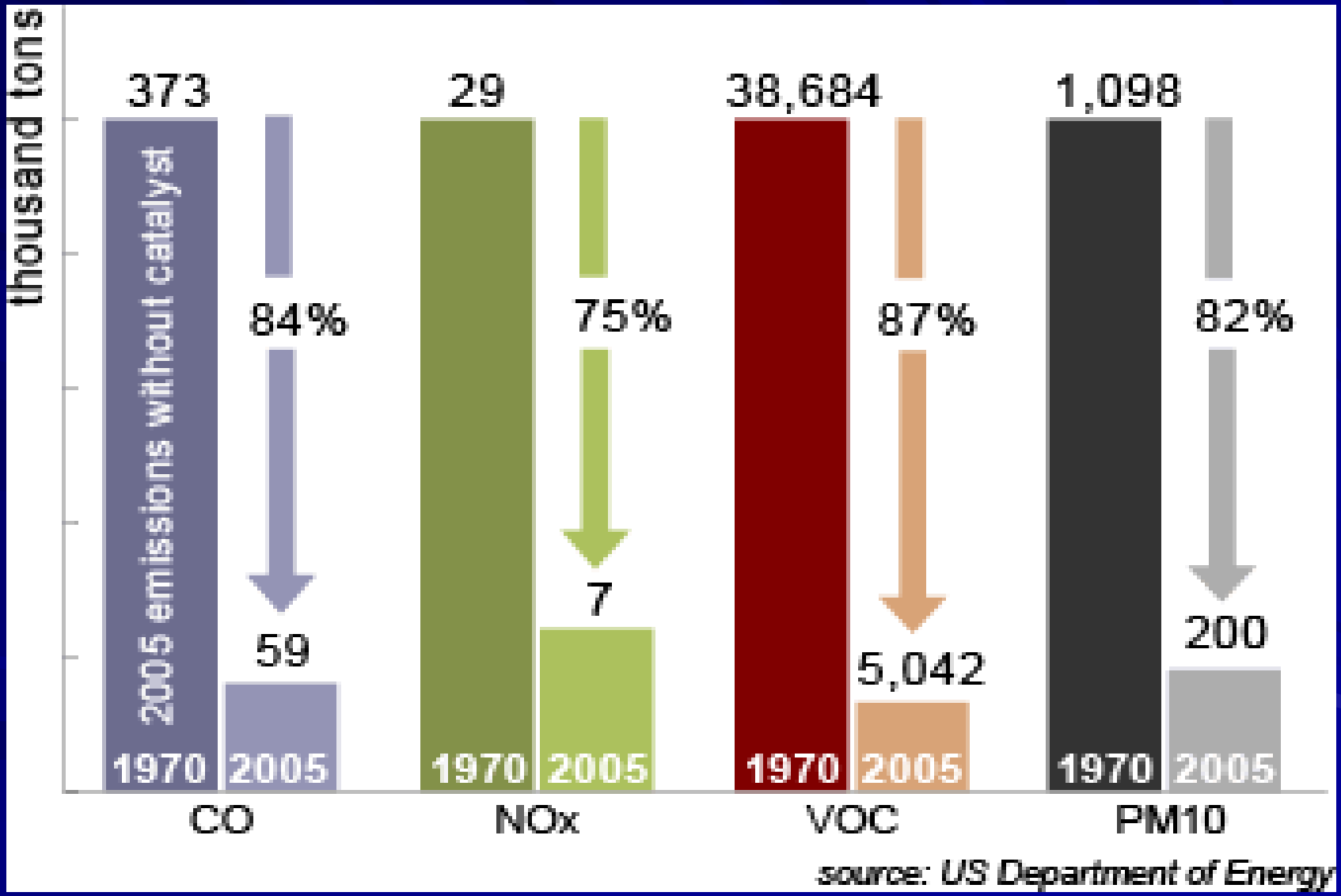
Current Locomotive/Marine Diesel Standards Are Comparable to Early 1990's Diesel Truck Standards



New Car Emission Standards



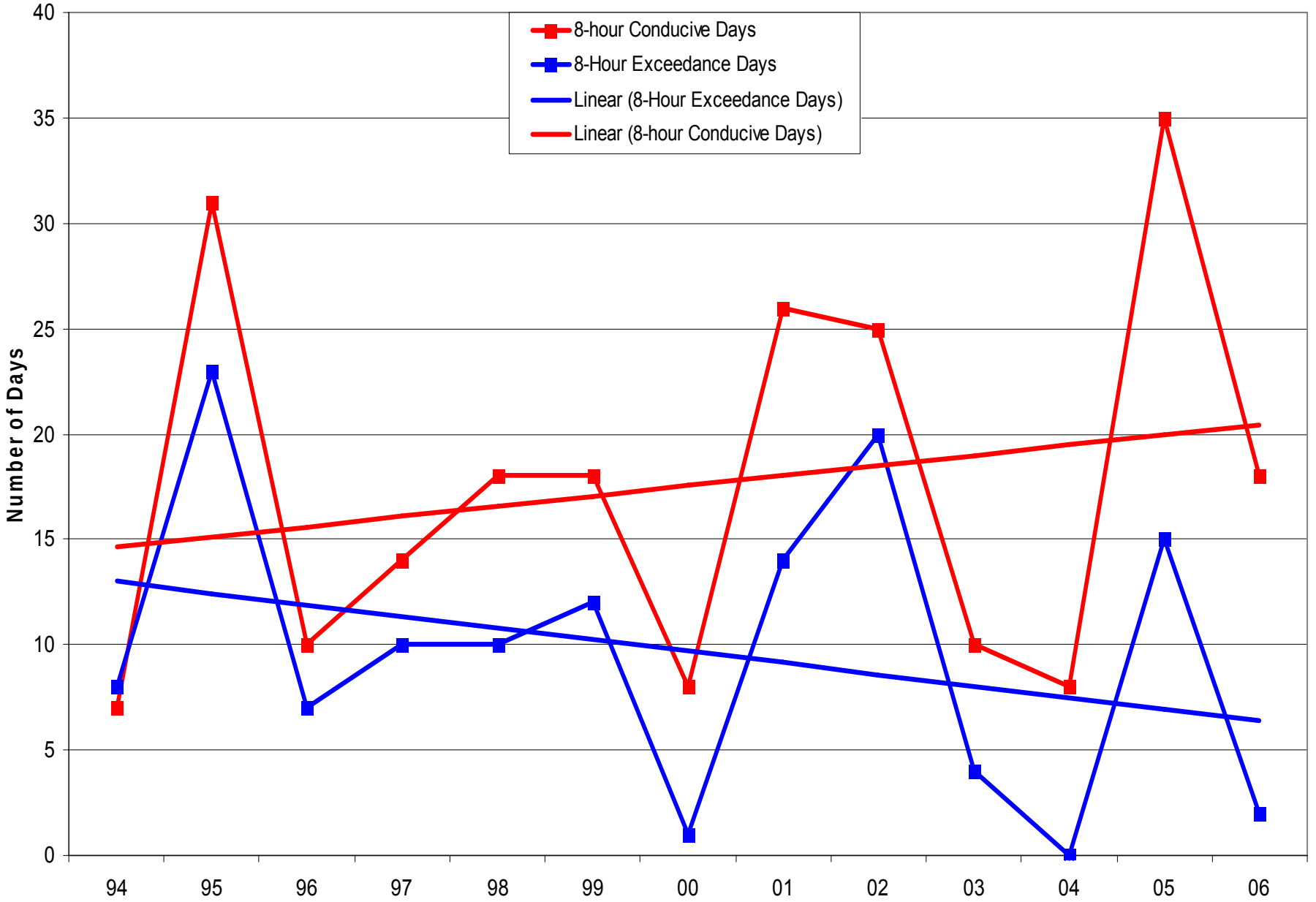
Motor Vehicle Emissions



CHICAGO NAA EMISSIONS OF VOM (TONS/DAY)

EMISSION CATEGORY	1970	1990	1996	2007	% Reduction from 1970	% Reduction from 1990
POINT	340	313	206	227	33.3	27.5
AREA	549	268	216	175	68.2	34.7
ON-HIGHWAY	992	491	257	127	87.2	74.2
OFF-HIGHWAY	109	144	145	106	2.8	26.4
TOTALS	1,990	1,216	824	663	66.7	45.5

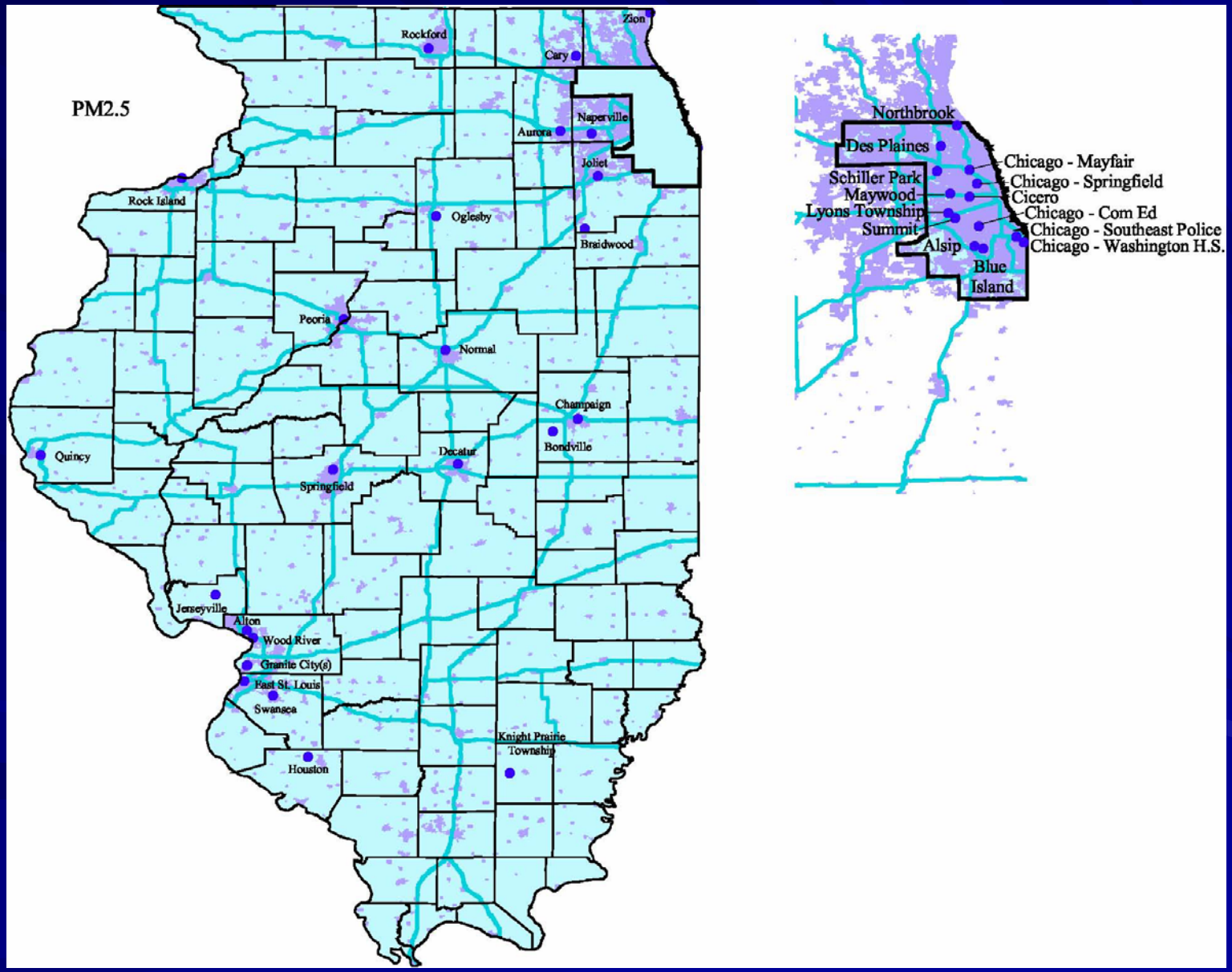
Chicago Area 8-hour Ozone Trend



Ozone status

- Ozone attainment demonstration modeling is currently being conducted by LADCO
- State regulations such as tighter consumer product standards are being adopted
- Attainment of the 8-hour ozone standard is required by April 2010.

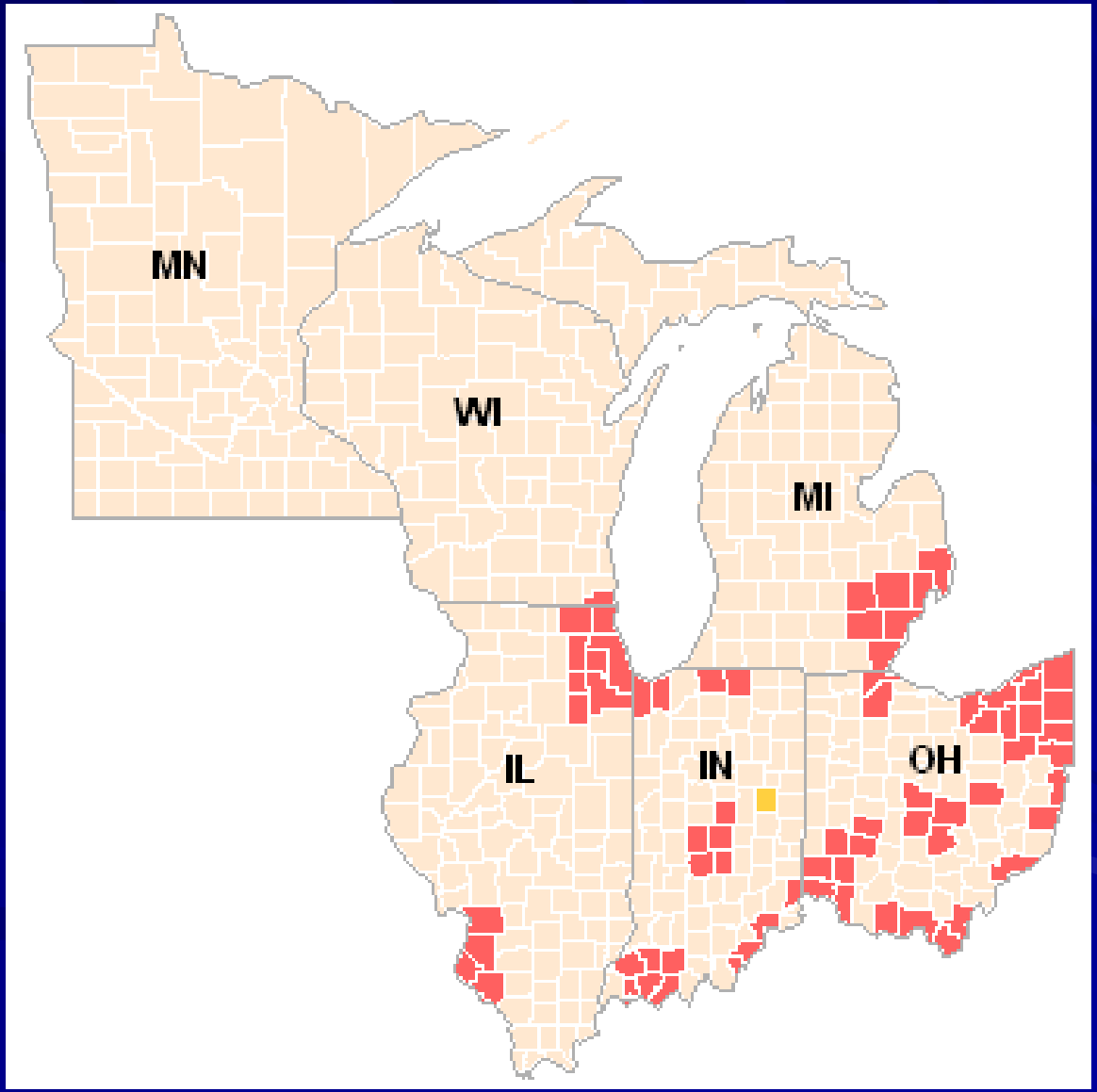
PM2.5 Monitor Locations



$PM_{2.5}$ Nonattainment Areas (Region V)

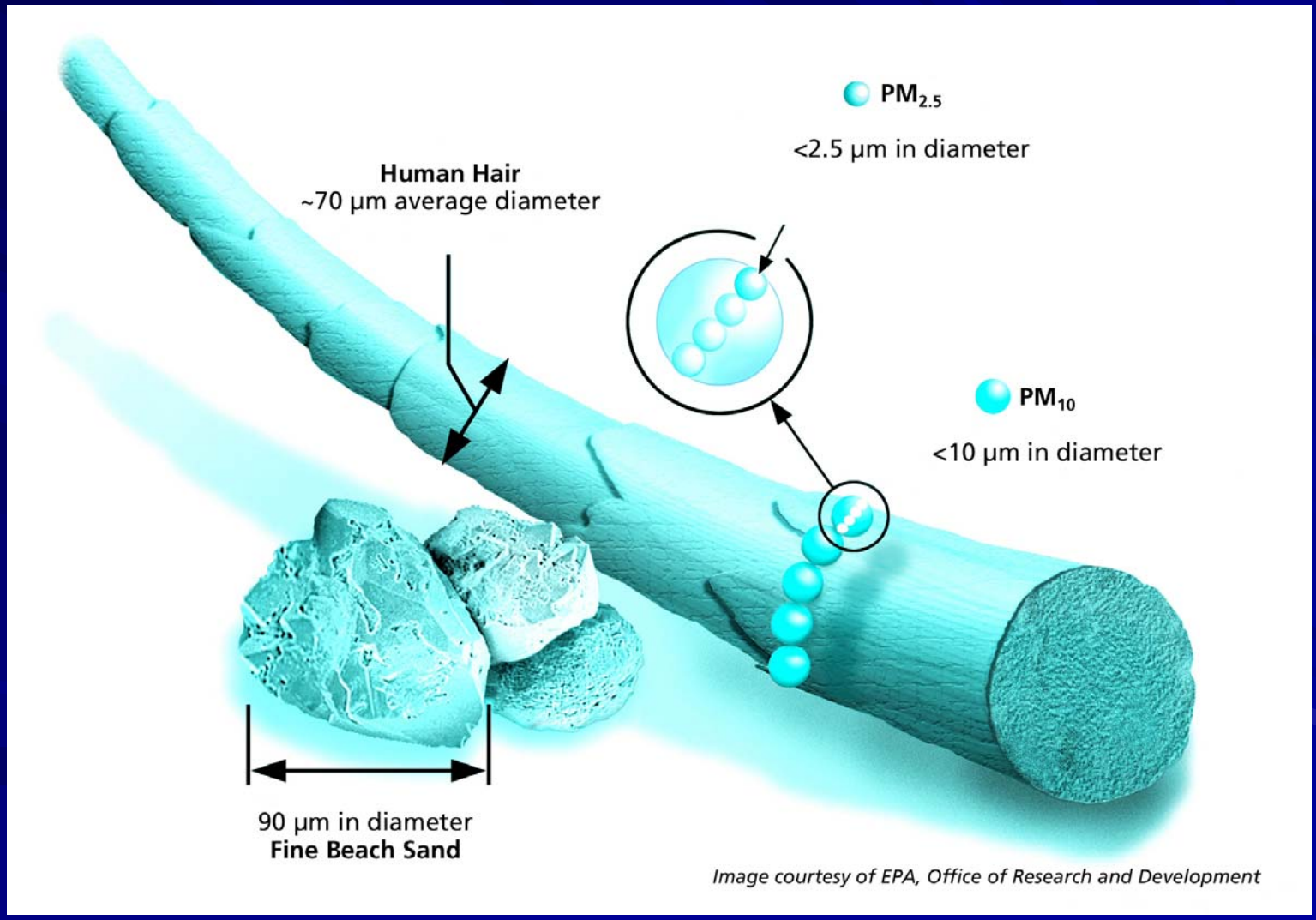
Illinois NAA Counties:
Chicago: Cook, DuPage, Kane, Lake, McHenry, Will, Grundy (partial), Kendall (partial)

Metro-East St. Louis: Madison, Monroe, St. Clair, Randolph (partial)



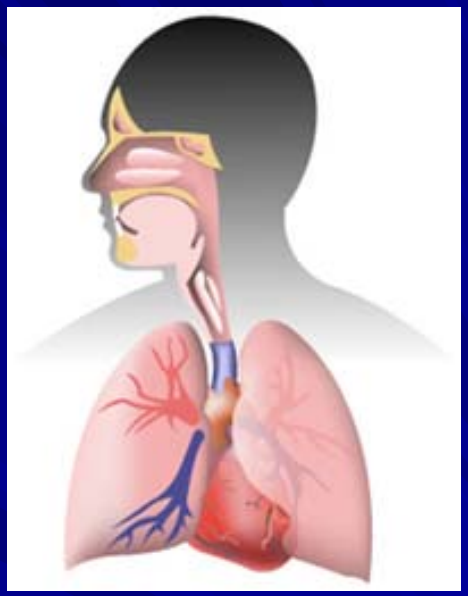
Particulate Matter: What is It?

A complex mixture of extremely small particles and liquid droplets



Particulate Matter

- Larger particles (> PM_{10}) deposit in the upper respiratory tract



- Smaller, inhalable particles (≤ PM_{10}) penetrate deep into the lungs

- Both coarse particulate matter and fine particulate matter can penetrate to lower regions of the lung
- Deposited particles may accumulate, react, be cleared or absorbed

PM Components: fine and coarse

Fine Particles

Combustion, gases to particles

Sulfates/acids
Nitrate
Ammonium
Organics
Carbon
Metals
Water

Sources:

Coal, oil, gasoline, diesel, wood combustion
Transformation of SOx, NOx, organic gases including biogenics
High temperature industrial processes (smelters, steel mills)
Forest fires

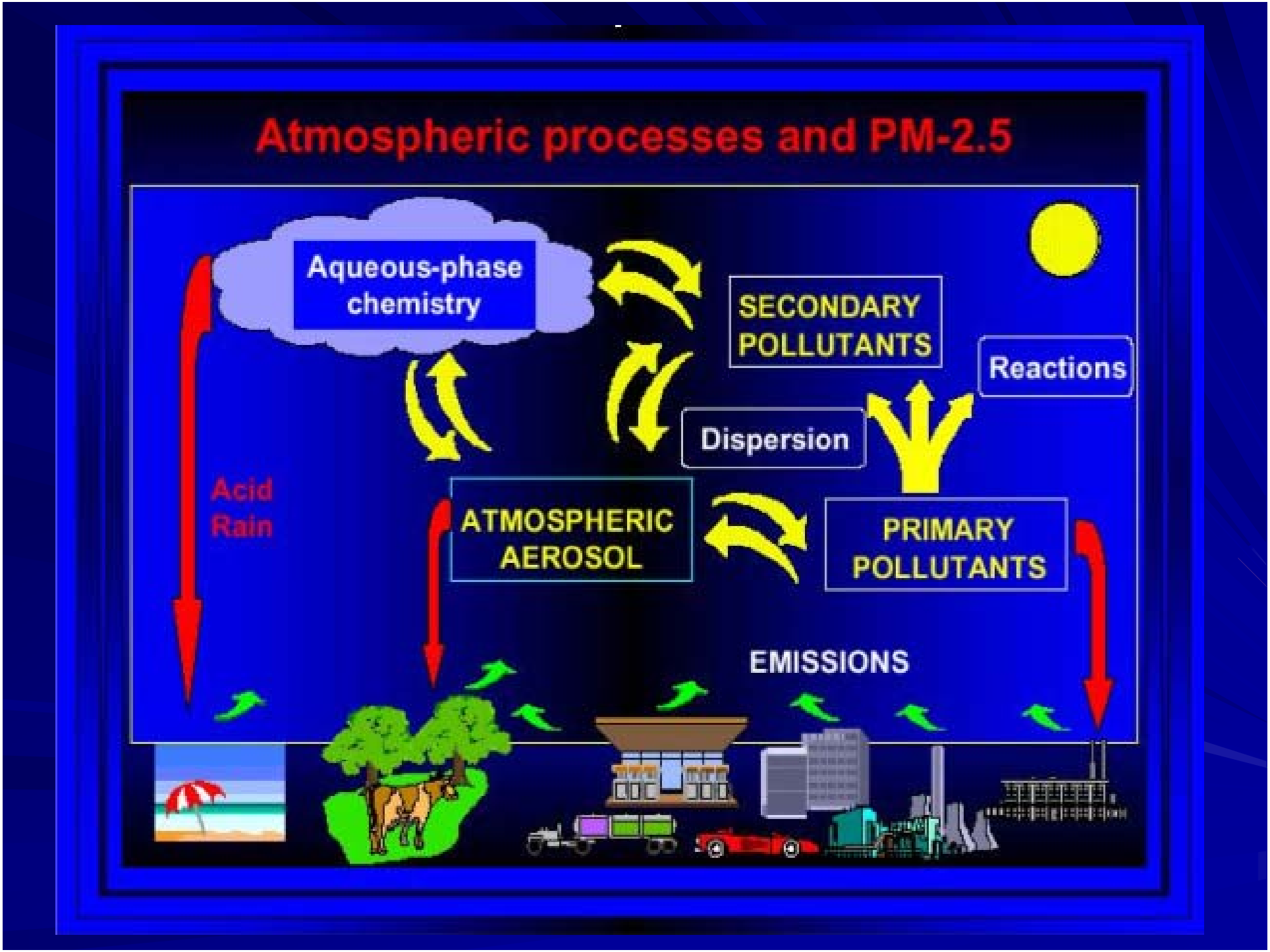
Inhalable Coarse Particles

Crushing, grinding, dust

Resuspended dusts (soil, street dust)
Coal/oil fly ash
Aluminum, silica, iron-oxides
Tire and brake wear
Inhalable Biological Materials (e.g., from soils, plant fragments)

Sources:

Resuspension of dust tracked onto roads
Suspension from disturbed soil (farms, mines, unpaved roads)
Construction/demolition
Industrial fugitives
Biological sources


Atmospheric processes and PM-2.5
Aqueous-phase chemistry
SECONDARY POLLUTANTS
Reactions
Dispersion
Acid Rain
ATMOSPHERIC AEROSOL
PRIMARY POLLUTANTS
EMISSIONS

PM2.5 Control Measures

- Targets reducing NOx and SO_2
  - NOx and SO_2 Reasonably Available Control Technology (RACT) on 100TPY fuel combustion sources
    - Initially in nonattainment area, expand to statewide if air quality modeling demonstrates need
- Tighter power plant controls statewide
  - More stringent than federal Clean Air Interstate Regulation (CAIR)

PM2.5 Control Measures

- Federal Heavy Duty Diesel Engine and Fuels Rule (2006)
  - Restrict sulfur levels in diesel to 15 ppm average (97 percent reduction)
  - New trucks and buses will be 90 cleaner
- Off-Road Diesel Engine Rule
  - Locomotives: reduce NOx by 2/3, HC and PM by 1/2
  - Affects agricultural, construction, industrial equipment >50 HP

Additional Controls/Programs

- Diesel Engine Retrofits
  - Diesel Oxidation Catalysts
  - Particulate Filters
- Clean Construction
  - O'Hare Modernization Program
  - Dan Ryan
  - IDOT Construction Dust Control Measures
- CMAQ

PM2.5 Requirements

- SIP Attainment Demonstration due in April 2008
- Attainment of PM standard required by 2010
- CAA allows extension of 5 years with continued emissions reductions

Transportation Planning Impacts

- The CAA requires that transportation planning work in concert with to air quality planning (transportation conformity)
- The SIP establishes specific pollutant emissions limits from the transportation sector for specific years
- On-road motor vehicle emissions estimated from the Transportation Improvement Program (TIP) must be at or less than the SIP budget in order for the TIP to be approved and projects funded

Other Controls

- Mercury Rule
  - Adopted in 2006
  - Requires electric utilities to reduce mercury emissions by 90% by 2009
  - Multi-pollutant strategy
    - Allows more time to meet mercury standard in exchange for additional reductions in NOx and SO2
    - Ameren, Dynegy, and Midwest Generation

Climate Change

- In October 2006, Governor Blagojevich issued an Executive Order creating the Illinois Climate Change Advisory Group
- Goal to reduce GHG emissions to 1990 levels by 2020 and to 60% below 1990 levels by 2050
- Committed the State of IL to joining the Chicago Climate Exchange (CCX)
  - Reduce GHG emissions from government activities by 6% by 2010

Illinois Climate Change Advisory Group

- Five Subgroups formed:
  - Power & Energy
  - Transportation
  - Commercial, Industrial & Agricultural
  - Cap and Trade
  - Modeling
- Have developed 24 policies for economic and emissions modeling, 20 adopted unanimously:
  - Energy efficiency standards, increased use of renewable energy, Smart Growth Initiatives, expanded use of transit, …
- Present final policy recommendations to Governor after September 6, 2007 meeting

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