

Particulate Matter (PM) Nonattainment and Control Strategies

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EPA Region 4

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Today's presentation . . .

- Characteristics of PM_{2.5}
- Standards and implementation
- Louisville nonattainment area
- Federal measures
- State and local measures
- Other resources
- Success stories

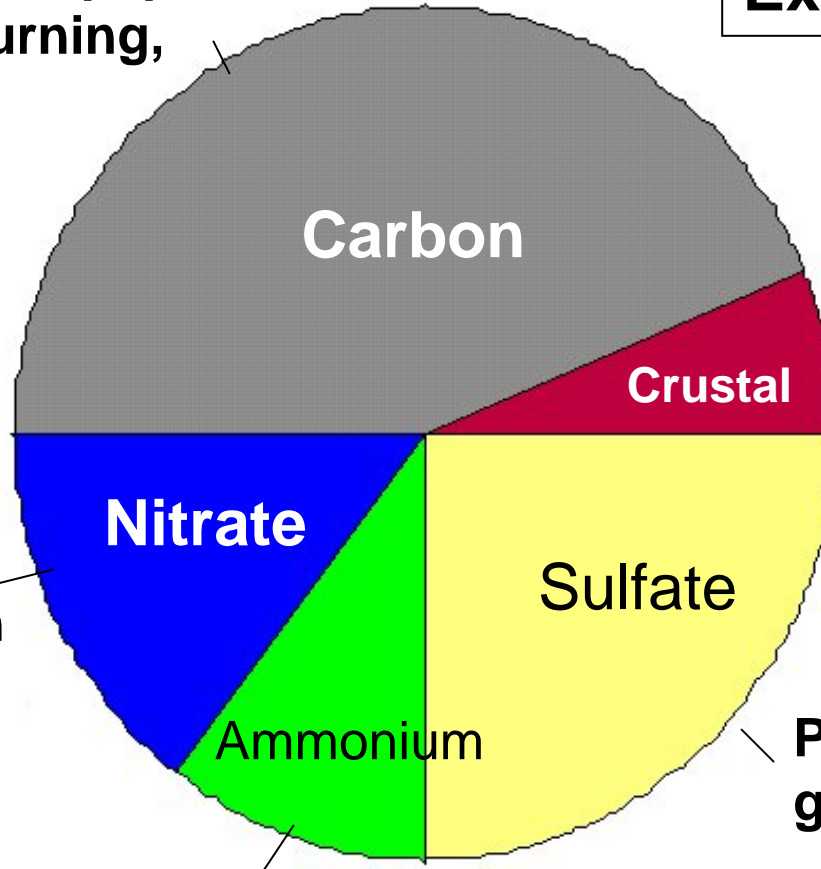
Characteristics of PM_{2.5}

- Sources of PM_{2.5} and PM_{2.5} precursor emissions include both natural and human-made origins
- Unlike ozone, elevated particle pollution levels occur year-round but do exhibit seasonal variability
- The key to reductions in individual areas understanding the nature of the problem so effective local control strategies may be developed and implemented

Automobiles, power generation, and other sources contribute to fine particle levels

Cars, trucks, heavy equipment, wild fires, waste burning, and biogenics

Example Area



Soil related chemical elements

Cars, trucks, and power generation

Power generation

Fertilizers and Animal Feed Operations (with SO₂ and NO_x, forms ammonium sulfate and ammonium nitrate)

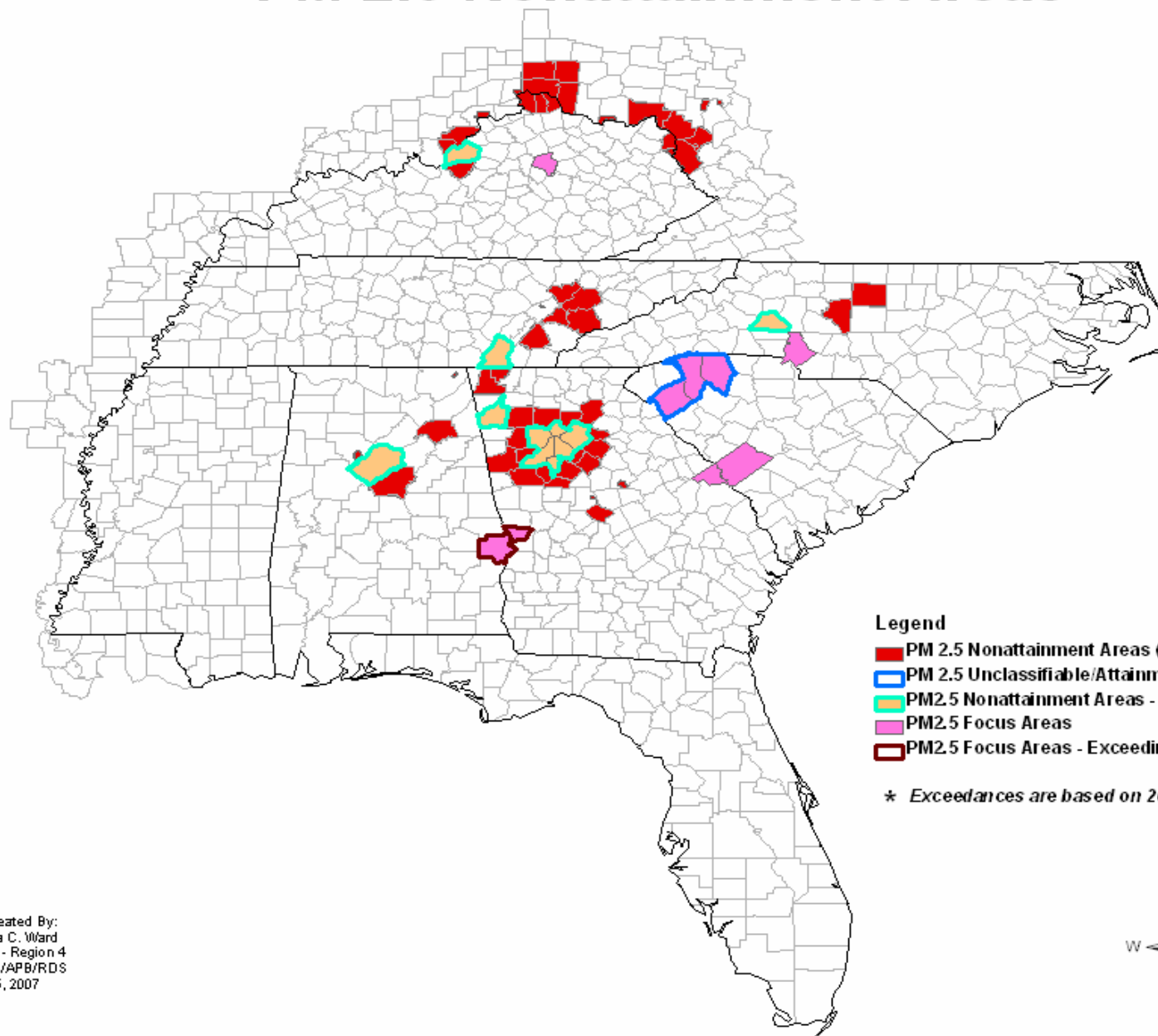
PM Standards

	1997 standards:	2006 standards:
PM_{2.5}	Annual: 15 $\mu\text{g}/\text{m}^3$ 24-hr: 65 $\mu\text{g}/\text{m}^3$	Annual: 15 $\mu\text{g}/\text{m}^3$ 24-hr: <u>35</u> $\mu\text{g}/\text{m}^3$
PM₁₀	Annual: 50 $\mu\text{g}/\text{m}^3$ 24-hr: 150 $\mu\text{g}/\text{m}^3$	Annual: revoked 24-hr: 150 $\mu\text{g}/\text{m}^3$

Timeline for PM_{2.5} NAAQS Implementation

April 2005	39 areas designated for 1997 standards
Dec. 2006	2006 revised PM NAAQS
Dec. 2007	States recommend designations for 2006 revised PM _{2.5} standards
April 2008	PM _{2.5} State plans due for 1997 standards
2008-9	Final designations for 2006 PM _{2.5} standards (effective date 60-90 days later; 2009-10)
Apr 2010-15	Attainment date for areas designated in 2005 for 1997 standards
April 2012-13	PM _{2.5} State plans due for 2006 standards
April 2014-20	Attainment date for areas designated in 2009-10

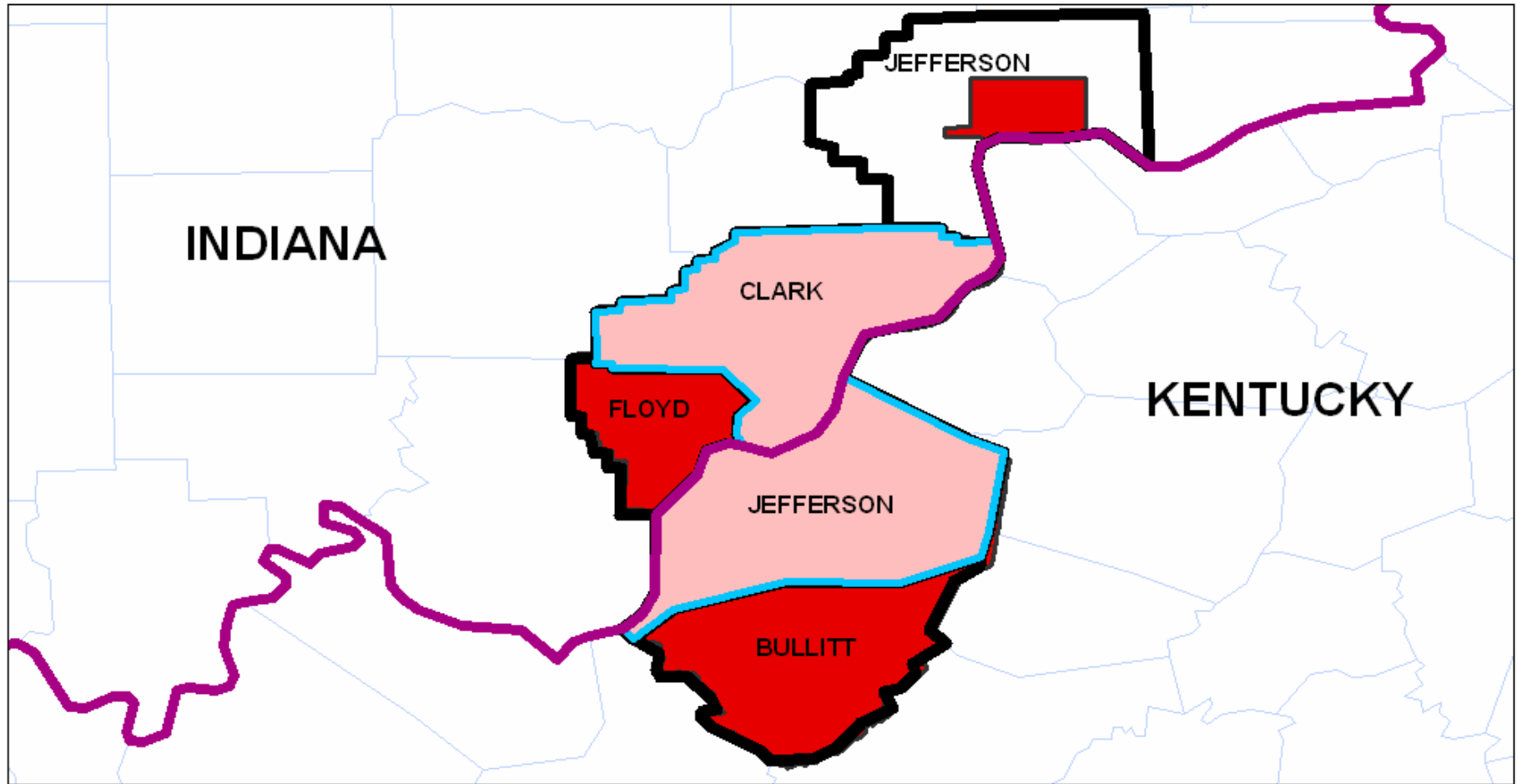
PM 2.5 Nonattainment Areas






Map Created By:
Nacosta C. Ward
USEPA - Region 4
APTMD/APB/RDS
June 15, 2007



Louisville, KY-IN PM 2.5 Nonattainment Area



Legend

-  IN/KY State Line
-  PM 2.5 Nonattainment Areas - Exceeding 2006 Daily Std.*
-  PM 2.5 Nonattainment Area - Louisville

**Exceedances are based on 2004-2006 monitoring data*

Louisville PM_{2.5} Nonattainment Area

KENTUCKY (EPA Region 4)

County	Monitor	Annual DV	Daily DV
Bullitt		14.7	34
Jefferson	Barret 21-111-0048	14.8	36
	Southwick 21-111-0043	15.4	35
	Wyandotte 21-111-0044	15.2	36

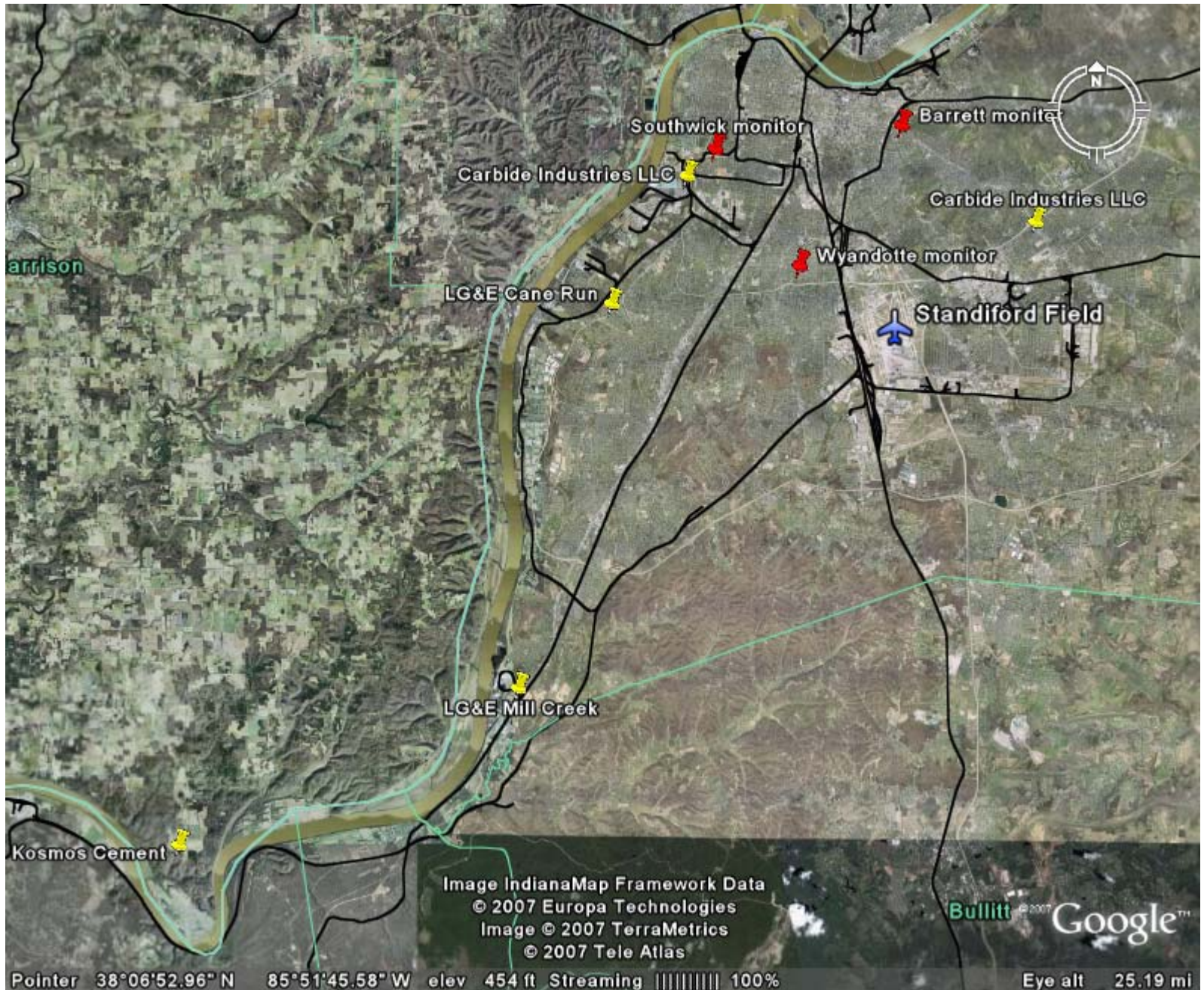
Based on 2004-2006 data

Louisville PM_{2.5} Nonattainment Area

INDIANA (EPA Region 5)

County	Monitor	Annual DV	Daily DV
Clark	Clark 18-019-0006	<u>16.2</u>	<u>37</u>
Floyd	Floyd 18-043-1004	14.6	32
Jefferson (partial)			
<i>Madison Township</i>			

Based on 2004-2006 data



Federal Measures and Programs

- Regulatory Measures
 - Power Plants and Industry
 - Mobile Sources
- Voluntary Programs
 - Clean diesel
 - Woodstove changeouts
 - List of resources

Power Plants and Industry

- **Clean Air Interstate Rule (CAIR)** - permanently caps SO₂ and NOx emissions in the East
(Final rule: 2005; Implementation: 2006 – 2015)
- **Clean Air Visibility Rule (CAVR)** - controls for facilities emitting visibility-reducing pollutants
(Final rule: 2005; Implementation: 2006 – 2015)
- **Acid Rain Program** - cap and trade program that reduces power plant emissions of SO₂ and NOx
(Final rule: 1993; Implementation: 1995 – 2000)
- **NOx SIP Call** - reduces fine particle formation by reducing emissions of NOx in the East
(Final rule: 1998; Implementation: 1999 – 2007)

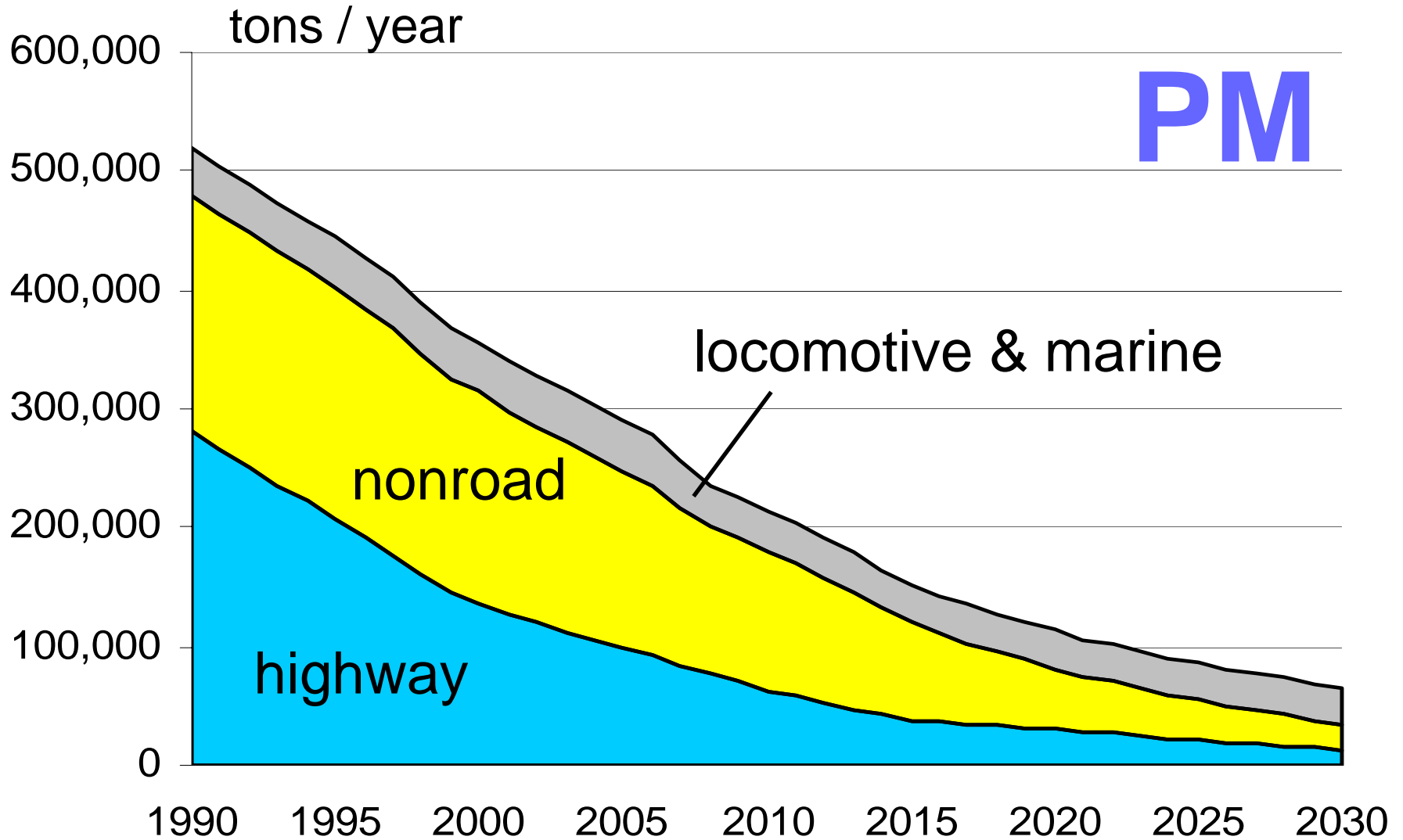
Projected Annual SO ₂ Emissions from Power Plants with the Final Clean Air Interstate Rule		Annual SO ₂ (Million Tons)				
		2003	2010	2015	2020	Full Implementation of CAIR
Emissions without CAIR	CAIR Region	9.4	8.7	7.9	7.7	N/A
	Nationwide	10.6	9.7	8.9	8.6	N/A
CAIR Caps	CAIR Region	N/A	3.6	2.5	2.5	2.5
Emissions with CAIR	CAIR Region	N/A	5.1	4.0	3.3	2.5
	Nationwide	N/A	6.1	5.0	4.3	3.5
Percent Reduction with CAIR (Relative to 2003)	CAIR Region	N/A	44%	56%	64%	73%
	Nationwide	N/A	42%	53%	60%	67%

Projected Annual NOx Emissions from Power Plants with the Final Clean Air Interstate Rule		Annual NOx (Million Tons)				
		2003	2009	2015	2020	Full Implementation of CAIR
Emissions without CAIR	CAIR Region	3.2	2.7	2.8	2.8	N/A
	Nationwide	4.2	3.6	3.7	3.7	N/A
CAIR Caps	CAIR Region	N/A	1.5	1.3	1.3	1.3
Emissions with CAIR	CAIR Region	N/A	1.5	1.3	1.3	1.3
	Nationwide	N/A	2.4	2.2	2.2	2.2
Percent Reduction with CAIR (Relative to 2003)	CAIR Region	N/A	52%	61%	61%	61%
	Nationwide	N/A	42%	48%	48%	48%

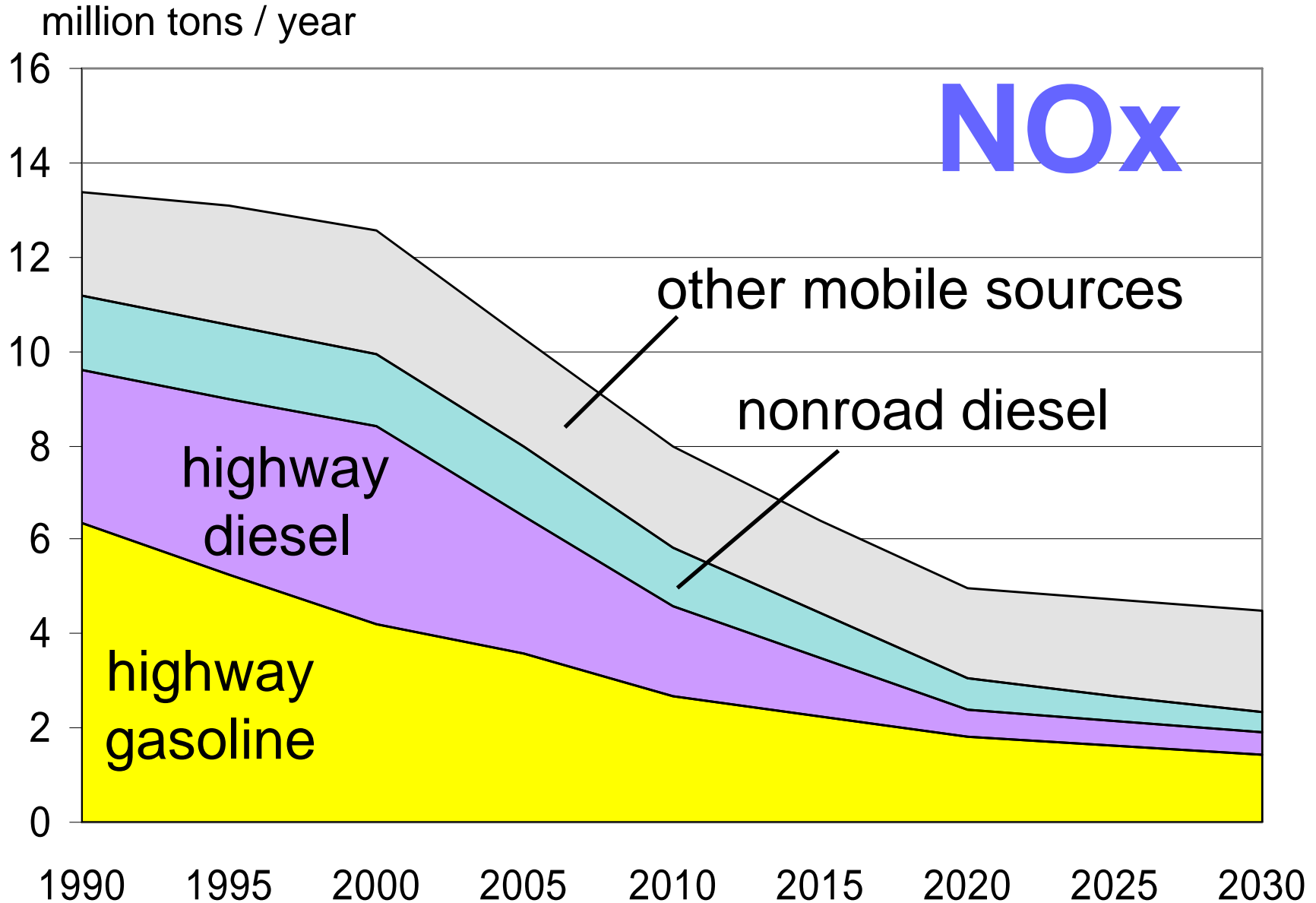
Mobile Sources

- 2004 Clean Air Nonroad Diesel Rule - set emission standards for engines; reduces sulfur in fuel
- 2007 Heavy Duty Highway Rule (the “2007 Highway Rule”) - building a fleet that will be 95% cleaner than today’s trucks and buses
- Tier 2 Vehicle Emission Standards and Gasoline Sulfur Program - setting tailpipe emissions standards for all passenger vehicles; requiring reduced sulfur in gasoline
- Motorcycle and other engine rules – setting emissions standards for highway motorcycles and other engines
- Locomotives and marine diesel engine rules - to propose more stringent standards for locomotives and marine diesel engines

Impact of Mobile Source Programs on Diesel PM_{2.5}



Impact of Mobile Source Programs on NOx Emissions



Voluntary Programs

National Clean Diesel Campaign

- Voluntary Diesel Retrofit Program
- Smartway Transport Partnership
- Clean School Buses USA
- Southeastern Diesel Collaborative



Voluntary Programs (cont.)

[The Great American Woodstove Changeout](#)

- Encourages replacement of older, more polluting stoves with EPA-certified stoves and fireplace inserts



Did you know?

Replacing 20 non-certified, older stoves with 20 EPA-certified stoves can prevent the emissions of **one ton** of fine particulate matter per year.

State and Local Measures

Examples of state and local level air quality improvement programs:

- **Control measures “White Papers” from the Lake Michigan Air Directors Consortium**
[\(\[www.ladco.org/Regional_Air_Quality.html\]\(http://www.ladco.org/Regional_Air_Quality.html\)\)](http://www.ladco.org/Regional_Air_Quality.html)
- **New Jersey’s “Reducing Air Pollution Together Initiative”** [\(\[www.nj.gov/dep/airworkgroups\]\(http://www.nj.gov/dep/airworkgroups\)\)](http://www.nj.gov/dep/airworkgroups)
- **California SB 656 Program to identify available PM measures**
[\(\[www.arb.ca.gov/pm/pmmeasures/pmmeasures.htm\]\(http://www.arb.ca.gov/pm/pmmeasures/pmmeasures.htm\)\)](http://www.arb.ca.gov/pm/pmmeasures/pmmeasures.htm)
- **South Coast (California) Air Quality Management Plan, (control technology info in Appendix A)**
[\(<http://www.aqmd.gov/aqmp/AQMPintro.htm>\)](http://www.aqmd.gov/aqmp/AQMPintro.htm)

Examples of Resources

- **Stationary Source Control Techniques Document for Fine Particulate Matter (EPA-452/R-97-001)**
www.epa.gov/ttn/catc/dir1/finepmttech.pdf
- **Control measures “White Papers” from the Lake Michigan Air Directors Consortium**
www.ladco.org/Regional_Air_Quality.html
- **New Jersey’s “Reducing Air Pollution Together Initiative”** **www.nj.gov/dep/airworkgroups**
- **California SB 656 Program identifies PM measures**
www.arb.ca.gov/pm/pmmeasures/pmmeasures.htm

Other Resources

EPA's Innovative Air Connections page
<http://www.epa.gov/ttn/airinnovations/>

Lists dozens of control measures, including some specifically for:

- **PM₁₀**
- **PM_{2.5}**
 - **VOCs**
 - **NO_x**
 - **SO₂**
 - **Ammonia**
 - **Direct PM_{2.5}**
- **TSP**
- **PM Coarse**
- **Visibility/Regional Haze**

Other Resources (cont.)

Controlling Fine Particulate Matter Under the Clean Air Act: *A Menu of Options*

State and Territorial Air Pollution Program Administrators and
Association of Local Air Pollution Control Officials (STAPPA/ALAPCO)
March 2006

- **Boiler Technologies**
- **Industrial and Commercial Boilers**
- **Electric Generating Units**
- **Pulp and Paper**
- **Cement Manufacturing**
- **Iron and Steel**
- **Petroleum Refineries**
- **Diesel Engine Technologies**
- **Diesel Trucks and Buses**
- **Nonroad Equipment**
- **Light-Duty Cars and Trucks**
- **Airports**
- **Marine Ports**
- **Residential Fuel Combustion and Electricity Use**
- **Commercial Cooking**
- **Fugitive Dust**

<http://www.4cleanair.org/PM25Menu-Final.pdf>

Other Resources (cont.)

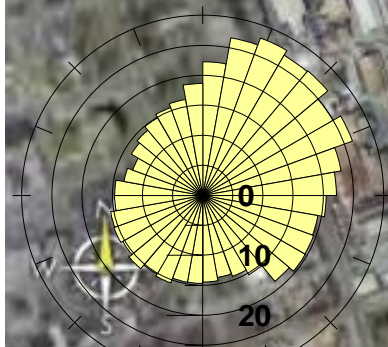
Presentations from June 2007 PM_{2.5} Implementation and Designations Workshop available at:

<http://projects.pechan.com/epa/pm25workshop/>

- Overview of PM_{2.5} Implementation Rule
- Current PM Monitoring Data for Speciation
- Policies for PM_{2.5} precursors
- Relationship to Transportation Conformity
- Determining Attainment Dates
- Identifying Reasonable Control Measures
- Emission Inventory Issues
- Air Quality Modeling
- RFP-Mid Course Review
- Control Measures-Stationary & Area
- Control Measures-Mobile
- Condensable PM Issues
- Enforceable Regulations
- Overview of Designations Guidance
- PM_{2.5} Designations Part 1-Overview
- PM_{2.5} Designations Part 2-Conceptual Model
- PM_{2.5} Designations Part 3-Analytical Tools
- PM_{2.5} Implementation Program New Jersey Perspective
- PM Controls in the San Joaquin Valley

Also, 2-hour web-based training to be available at:

<http://cte.ncsu.edu/cte/>



PM_{2.5} ($\mu\text{g m}^{-3}$)

Pointer 33° 33' 30.50" N 86° 48' 15.64" W elev 591 ft

Streaming ||||| 100%

Eye alt 7734 ft

© 2005 Google

Action Early Compact – Success Story

Triad Area, North Carolina

Measures	Projected Reductions VOC	Projected Reductions NOX
Open Burning Ban statewide	2.1 TPD	1.5 TPD
Expand vehicle I&M	1.7 TPD	4.0 TPD
Reduce Fleet Emissions	1.1 TPY	0.9 TPY
Add 20 Park and Ride lots	1.8 TPY	3.2 TPY
Truck Stop Electrification	1.8 TPY	35 TPY
Sidewalks/greenways/bike routes	279 TPY	229 TPY
School bus retrofits	17 TPY	23 TPY

PM_{2.5} Success Story

Lexington, Kentucky

- **KY DAQ and Lexington Fayette Urban County Government (LFUCG) convened stakeholders**
- **Memorandum of Intentions to increase use of biodiesel:**
 - **Local treatment plant and Univ. of KY using 10% mix of biodiesel in their diesel vehicles and equipment**
 - **Fayette County Public Schools began a biodiesel pilot program**
 - **Riley Oil Co. awarded CMAQ funds to purchase a biofuels storage tank**
- **University of Kentucky**
 - **Installed new large natural gas-fired boilers to replace use of coal-fired boilers**
 - **Using low-sulfur fuel as the back-up to natural gas**
- **Annual DV reduced**
 - **2003-2005: 15.1 $\mu\text{g}/\text{m}^3$**
 - **2004-2006: 14.7 $\mu\text{g}/\text{m}^3$**



Questions?

Break?

