

An Update on EPA's Clean Air Rules and Future Directions



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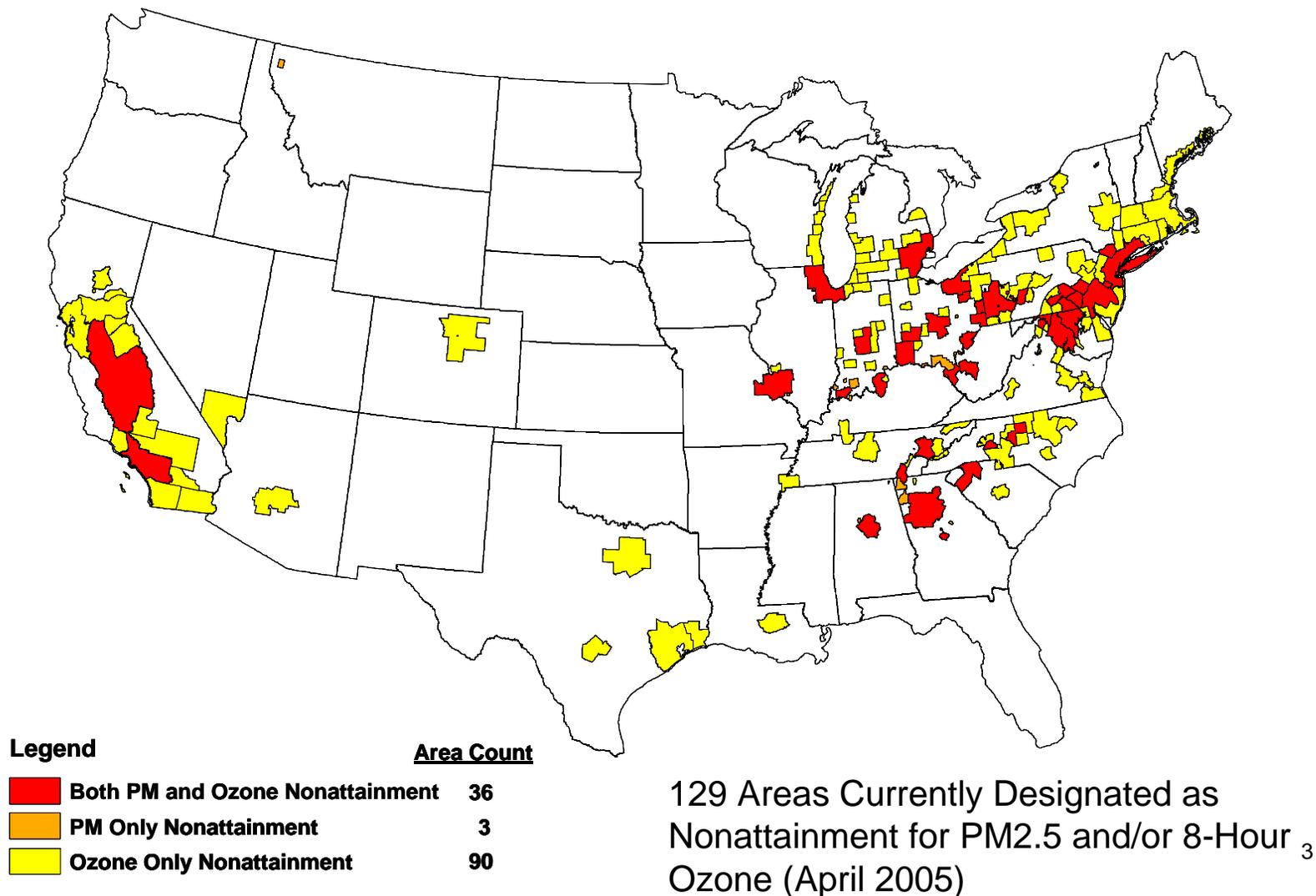
NETL Mercury Control Technology Conference
December 11-13, 2006



Outline

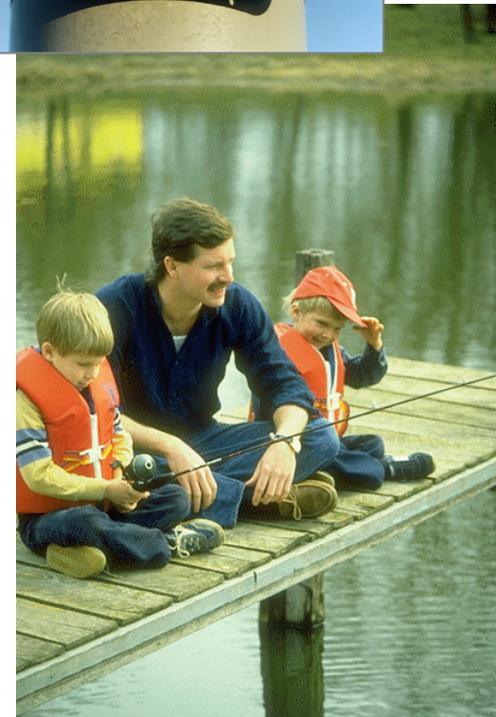
- Clean Air Rules
 - Environmental concerns
 - Overview of regulations
 - Implementation
- EPA's Clean Coal Technology Related efforts

Despite the Successes of Existing Air Regulations, There are Persistent Nonattainment Issues



Mercury Concerns

- Concentrations of mercury in the air are usually low. However, atmospheric mercury falls to Earth through rain, snow and dry deposition and enters lakes, rivers and estuaries. Once there, it can transform into, **methylmercury**, and **can build up in fish tissue**.
- **Americans are exposed to methylmercury primarily by eating contaminated fish.**
- Because the **developing fetus** is the **most sensitive to the toxic effects of methylmercury**, women of childbearing age are regarded as the population of greatest concern.
- Children who exposed to methylmercury before birth may be at **increased risk of poor performance on neurobehavioral tasks**, such as those measuring attention, fine motor function, language skills, visual-spatial abilities and verbal memory.
- Methylmercury exposure may **also** result in **cardiovascular and other health effects**.
- **Ecosystems may be affected by mercury deposition.**



CAIR/CAMR/CAVR – Overview

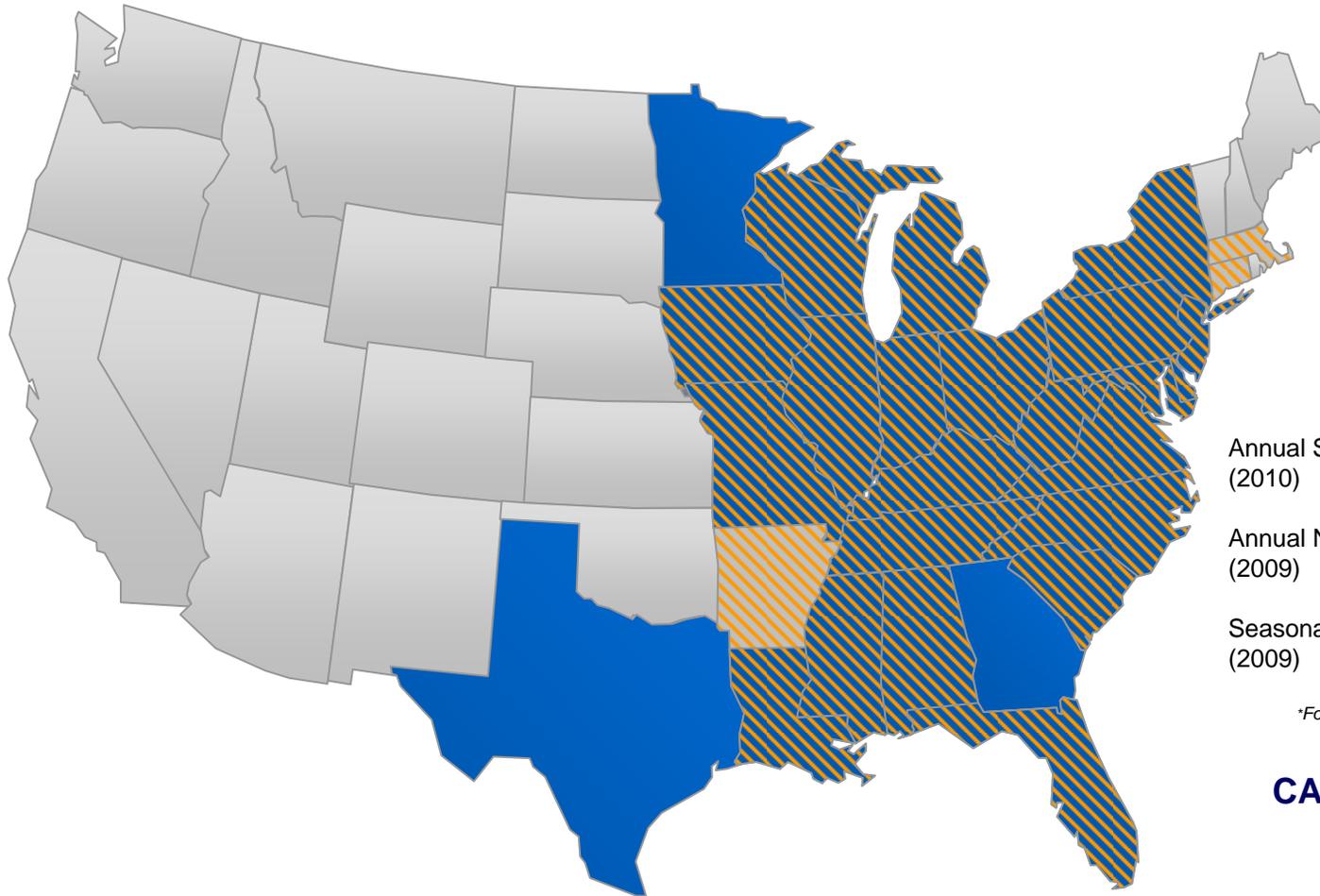
General:

- EPA finalized the Clean Air Interstate, Mercury, and Visibility Rules in 2005
- The annual costs to the power industry of these rules will be substantial: 2010: \$ 2.7 billion, 2015: \$ 4.4 billion, and 2020: \$ 6.1 billion
- The health benefits are much larger. EPA estimates that by 2020 the annual health benefits are between \$120 to \$143 billion – and there are more visibility and environmental benefits that EPA has not estimated.
- The rules provide extensive air emissions reductions while the public still has affordable, reliable electricity from a diverse generation mix.
- The rules help States comply with the National Ambient Air Quality Standards for ozone and fine particles and the Regional Haze Program.

Coverage: The CAIR annual programs cover 25 States and DC, the CAIR ozone season NO_x program covers 25 States and DC, and the CAMR mercury program covers 50 States and DC.

Emissions Trading: For CAIR and CAMR, creates EPA administered cap-and-trade programs for SO₂, NO_x (annual and seasonal), and Hg that States can opt to join to meet the requirements of the rules (States can choose to obtain reductions through different measures of their choosing).

CAIR Sets the Stage for CAMR



- States not covered by CAIR
- States controlled for fine particles (annual SO₂ and NO_x)
- States controlled for both fine particles (annual SO₂ and NO_x) and ozone (ozone season NO_x)
- States controlled for ozone (ozone season NO_x)

CAIR Emission Caps*

(million tons)

	<u>2009/2010</u>	<u>2015</u>
Annual SO ₂ (2010)	3.7	2.6
Annual NO _x (2009)	1.5	1.3
Seasonal NO _x (2009)	.58	.48

*For the affected region.

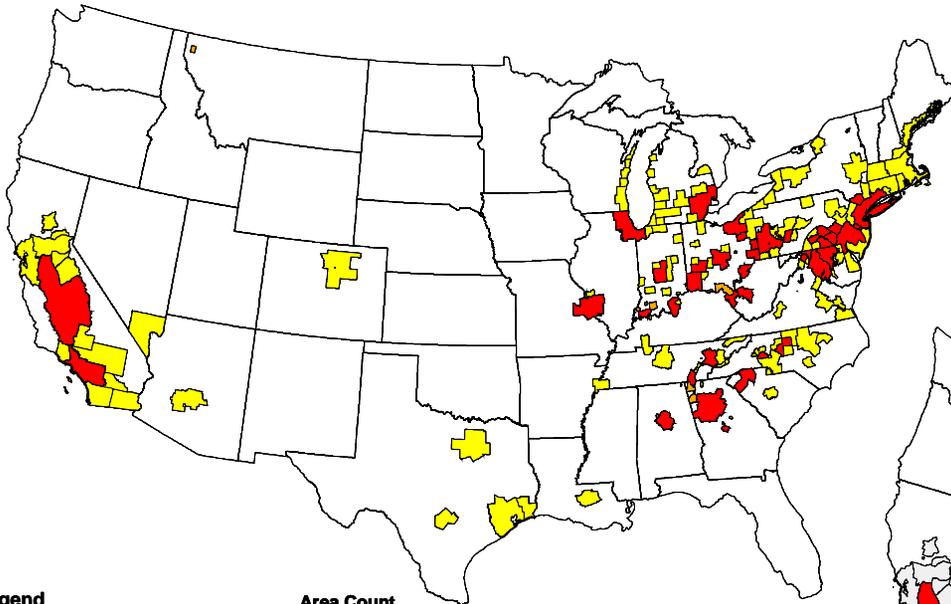
CAMR Emissions Caps

(tons)

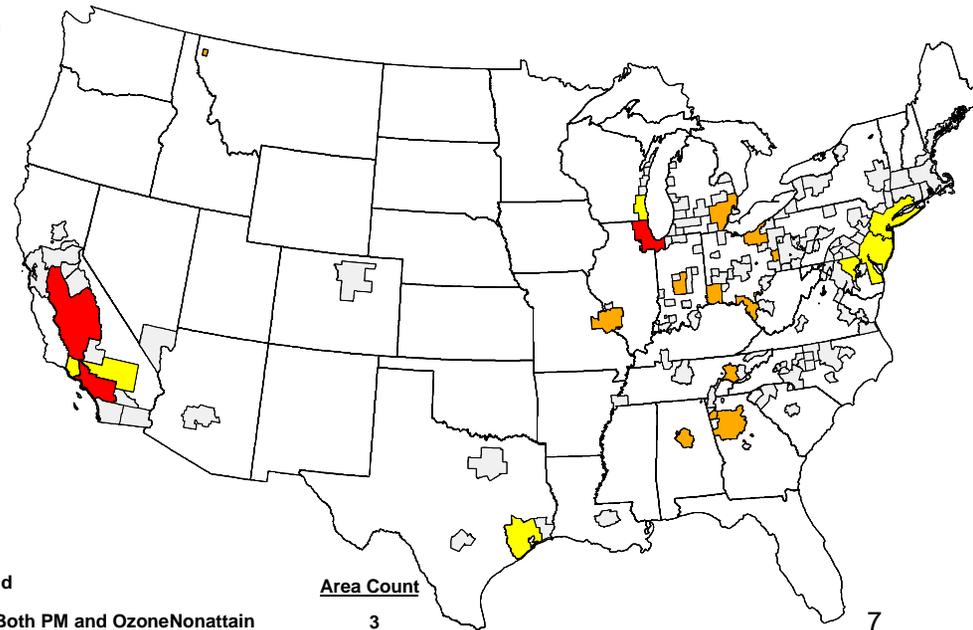
	<u>2010</u>	<u>2018</u>
Mercury	38	15

CAIR, CAMR, and CAVR's Addition to Existing Programs Should Lead to Much Cleaner Air

Areas Currently Designated as Nonattainment for PM2.5 and/or 8-Hour Ozone (April, 2005)



Areas Projected to Meet the PM2.5 and 8-Hour Ozone Standards in 2020 with CAIR/CAMR/CAVR and Some Current Rules, Absent Additional Local Controls

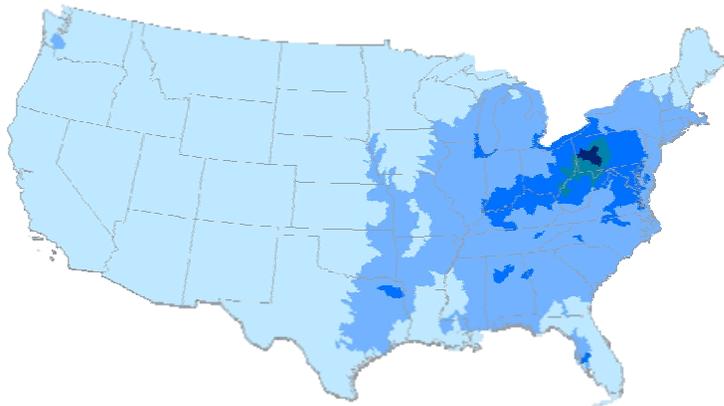


Legend	Area Count
Both PM and Ozone Nonattainment	36
PM Only Nonattainment	3
Ozone Only Nonattainment	90

Legend	Area Count
Both PM and Ozone Nonattainment	3
PM Only Nonattainment	13
Ozone Only Nonattainment	7
Nonattainment areas projected to attain	106

Reductions in Mercury Deposition

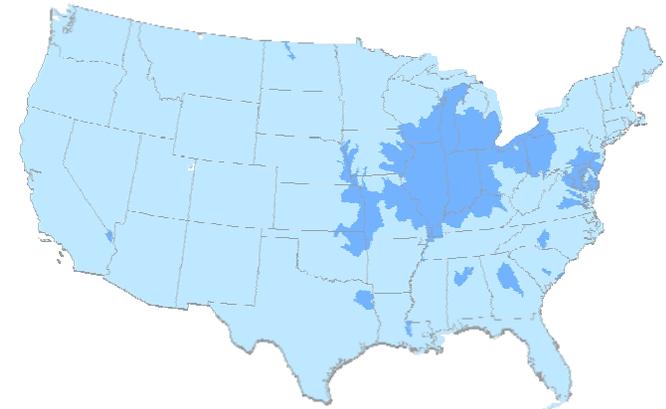
Mercury Deposition from US Power Plants in 2001



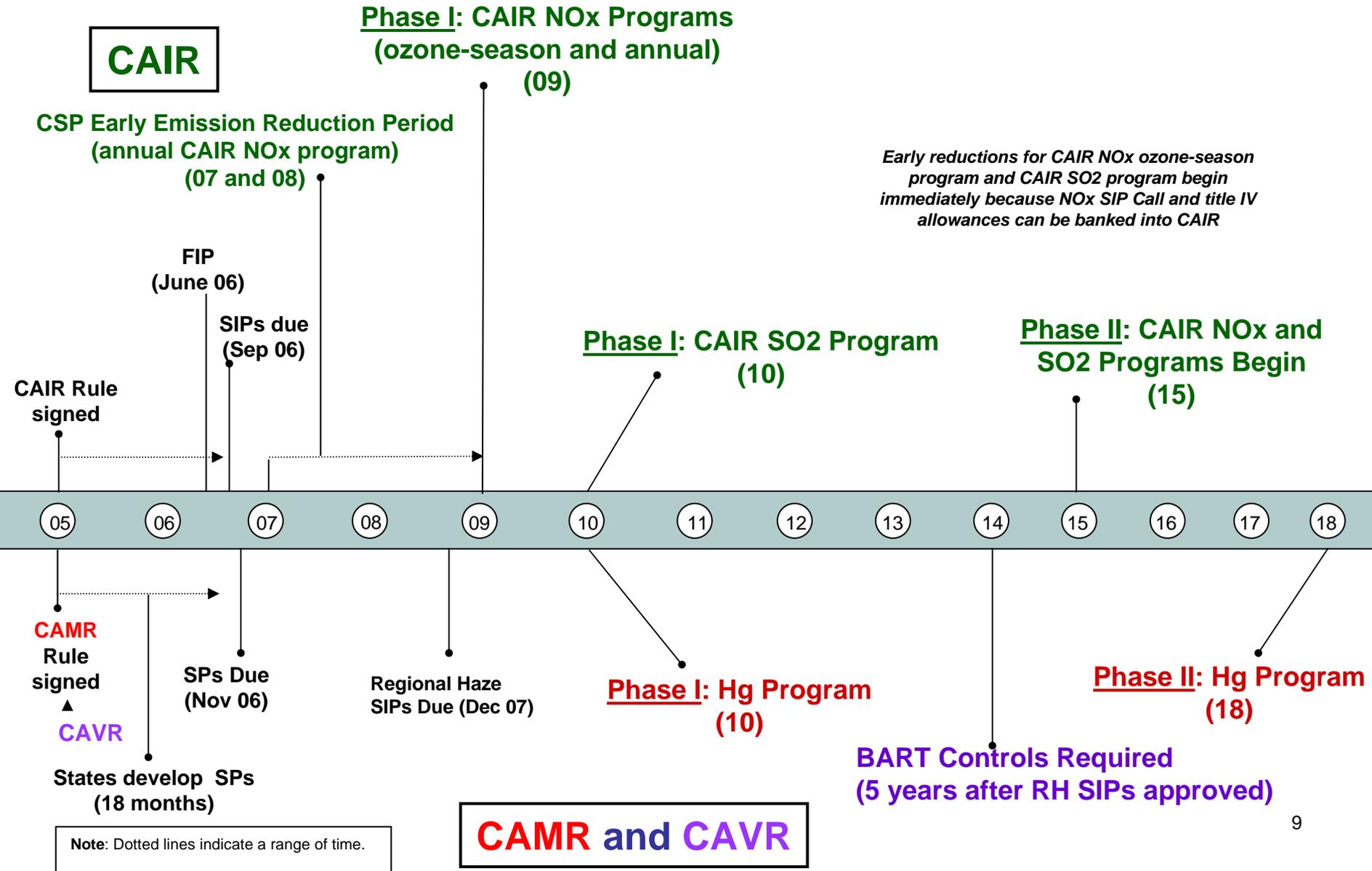
**Deposition in
Micrograms / Sq. Meter**



Mercury Deposition from US Power Plants in 2020 with CAIR and CAMR



CAIR, CAMR, CAVR Implementation Timeline



CAIR Implementation

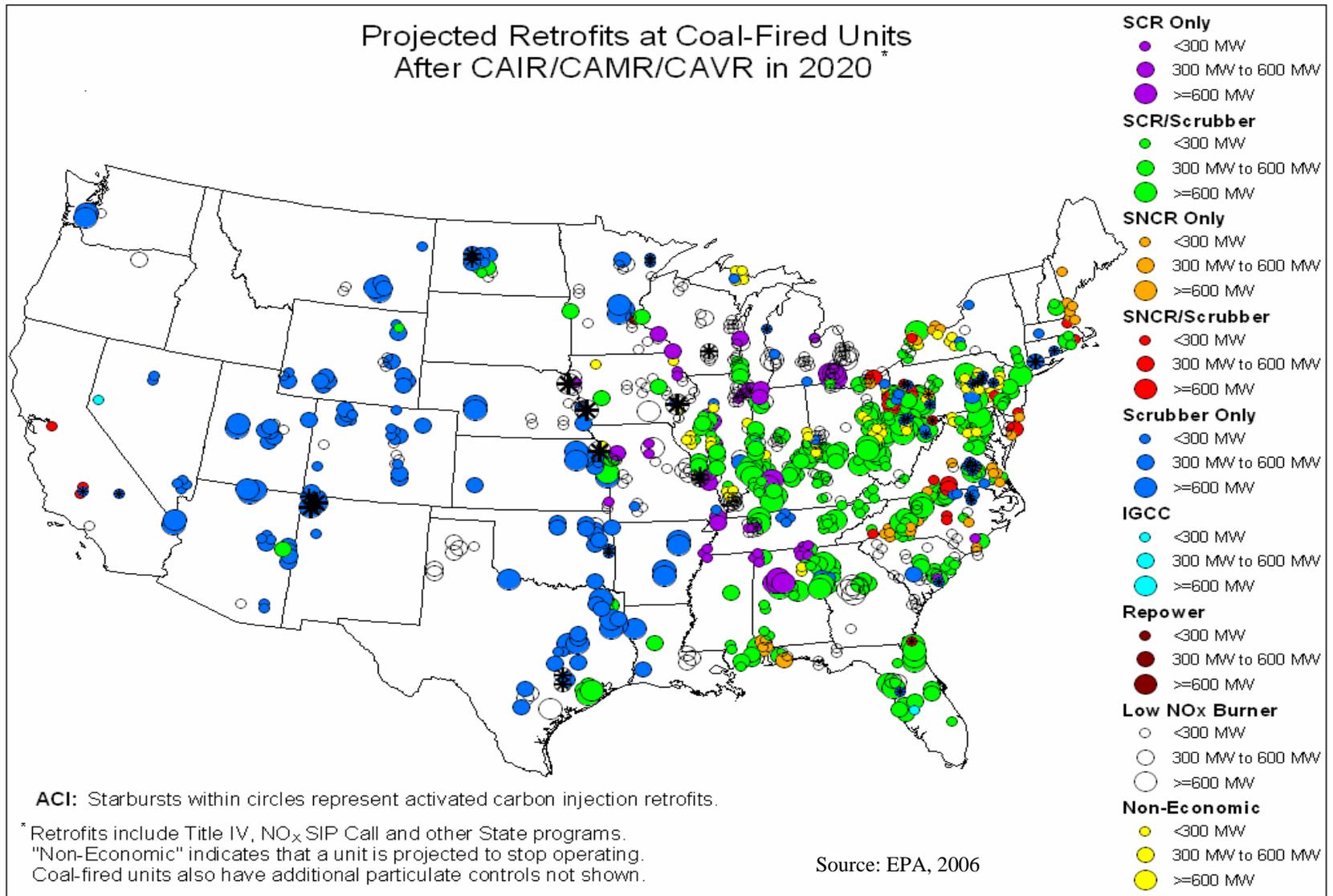
- EPA promulgated a Federal Implementation Plan (FIP) to serve as a backstop for CAIR States until State Implementation Plans (SIPs) are in place.
- Full CAIR FIP in effect since June 2006; states are working to submit full and/or abbreviated SIPs*
- 29 affected entities (28 states + DC)
- All are expected to be part of the trading program
- Full SIPs were due in September, 2006; EPA has received 7 full SIPs for review
- EPA expects viable trading markets
- Under litigation

*Abbreviated SIPs refer to a shortened form of a SIP and address only specific aspects of the FIP trading program.

CAMR Implementation

- State plans were due November 17, 2006
- EPA received 21 plans
- 53 affected entities (50 states + DC + 2 tribes)
- EPA expects viable trading market
- Under litigation

Existing and Projected Pollution Control Retrofits at Coal-Fired Units after CAIR/CAMR/CAVR in 2020



EPA's Clean Coal Technology (CCT) Efforts - IGCC

- The world needs to make electricity from coal in an environmentally and economically sustainable way
- IGCC has fundamental advantages from both environmental and efficiency perspectives relative to conventional coal-fired power generation technologies
 - Inherently lower emissions of NO_x, SO₂ and Hg
 - Requires less fresh water – special issue in the drier, water-limited Western regions of the U.S.
 - Considerably more commercially useful byproducts (and thus, less waste materials)
- High potential for reducing Greenhouse Gas (GHG) emissions by allowing for carbon capture and sequestration at costs significantly below conventional PC generation costs



Coal-Based IGCC Status

- **Limited experience:**
 - Two operating US plants
 - Two operating European plants
- **Capital cost concerns:**
 - Industry estimates - costs higher than PC plants
 - Uncertainties with costs associated with guaranties, warranties, availability, etc.
- **Availability concerns:**
 - 80% maximum availability at two existing single-train US plants
 - Availability expected to improve with higher equipment redundancy (spare gasifier)

EPA's Analysis: IGCC vs Pulverized Coal Generation



EPA is not trying to pick a technology winner for clean coal, but is trying to ensure that IGCC has a chance to prove itself commercially

Considers today's technology, not where we could be in the future. Had to work around data gaps with expert engineering judgments

Units (500 MW) compared:

- IGCC
- Sub-critical Pulverized Coal
- Supercritical Pulverized Coal
- Ultra-Supercritical Pulverized Coal

Coals – bituminous, subbituminous, and lignite

State-of-the art pollution controls

Looked at energy efficiency, air emissions, water use, carbon sequestration potential and costs

**Copy available at
<http://www.epa.gov/airmarkets/articles/control.html>**

Conclusions of the EPA Study

- **IGCC thermal performance significantly better than PC technologies applied in the US; ultra-supercritical PC thermal performance may match or exceed current IGCC performance**
- **Better environmental performance for IGCC**
- **Potential advantage for IGCC in capturing and sequestering CO₂ at lower costs**
- **Higher capital cost for IGCC than PC plants**
- **Limited information available for the study on low-rank coal applications for IGCC and on ultra-supercritical PC plants**

For More Information on Power Sector Air Programs

- Clean Air Interstate Rule:** <http://www.epa.gov/cair/>
- Clean Air Mercury Rule:** <http://www.epa.gov/camr/>
- Clean Air Visibility Rule:** <http://www.epa.gov/visibility/>
- Multi-Pollutant Analyses:** <http://www.epa.gov/airmarkets/mp/>
- Acid Rain Program:** <http://www.epa.gov/airmarkets/arp/>
- NO_x SIP Call:** <http://www.epa.gov/airmarkets/fednox/>