Contributions of CAIR/CAMR/CAVR to NAAQS Attainment: Focus on Control Technologies and Emission Reductions in the Electric Power Sector

Office of Air and Radiation
U.S. Environmental Protection Agency
April 18, 2006

Introduction

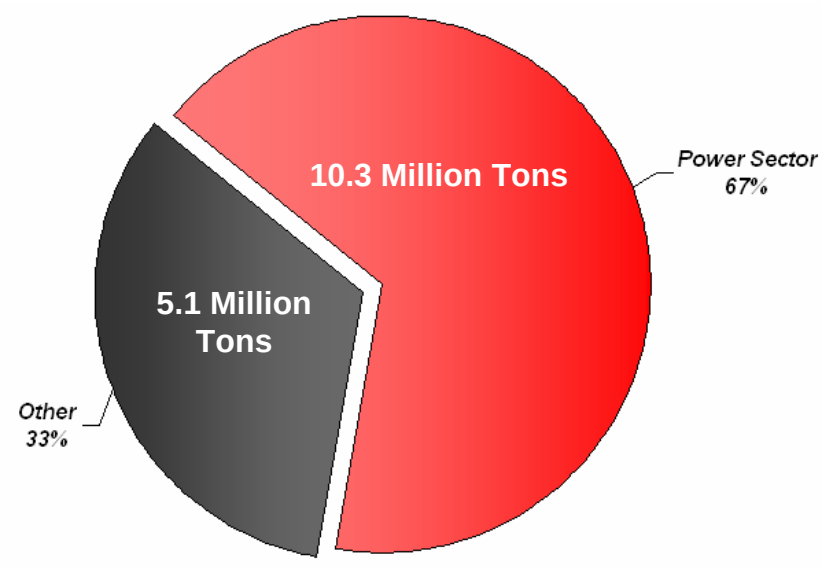
- Recent analyses of multipollutant legislative proposals that EPA released in October 2005, show that, under the Clean Air Interstate, Mercury, and Visibility Rules (CAIR/CAMR/CAVR), the power industry —especially coal-fired generation—will provide much cleaner electric power in the future. The installation of advanced pollution controls, use of cleaner coal, and changes in operation all lead to very substantial reductions in SO_2 and NO_x emissions throughout the region. This report focuses in detail on these findings by addressing the following questions:
  - What is CAIR designed to do?
  - Why does CAIR offer states an emissions cap and trade approach?
  - Will CAIR result in new advanced pollution controls on power generating sources?
  - How and where will emission reductions occur under CAIR/CAMR/CAVR in 2010, 2015, and 2020?
  - What happens to coal-fired sources without advanced controls for SO_2 and NO_x in 2010, 2015, and 2020?

I. What Is CAIR Designed to Do?

CAIR Is Designed to Reduce Interstate Transport of Fine Particles and Ozone

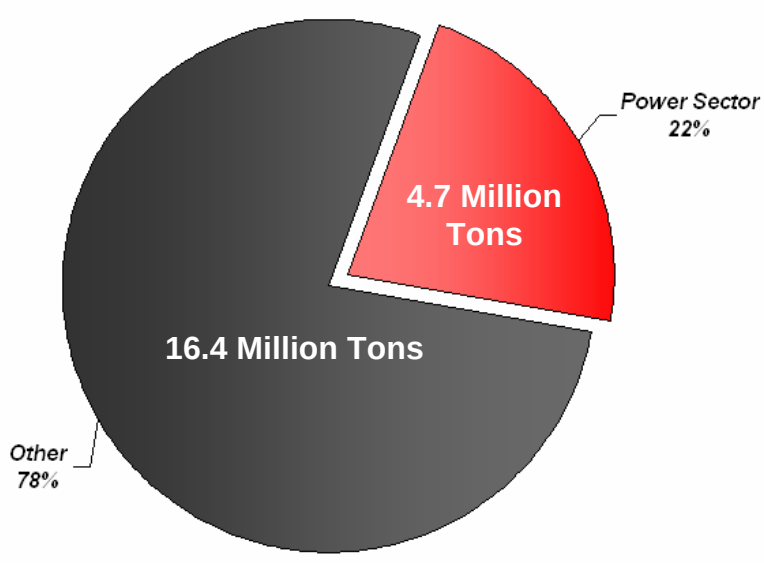
Electric power generation is a major source of air emissions

SO_2 Emissions



Total: 15.4 Million Tons

NOx Emissions



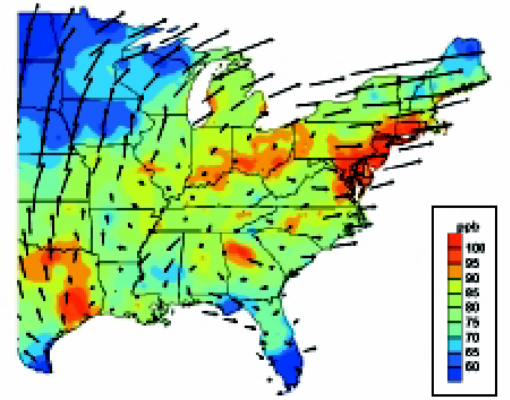
Total: 21.1 Million Tons

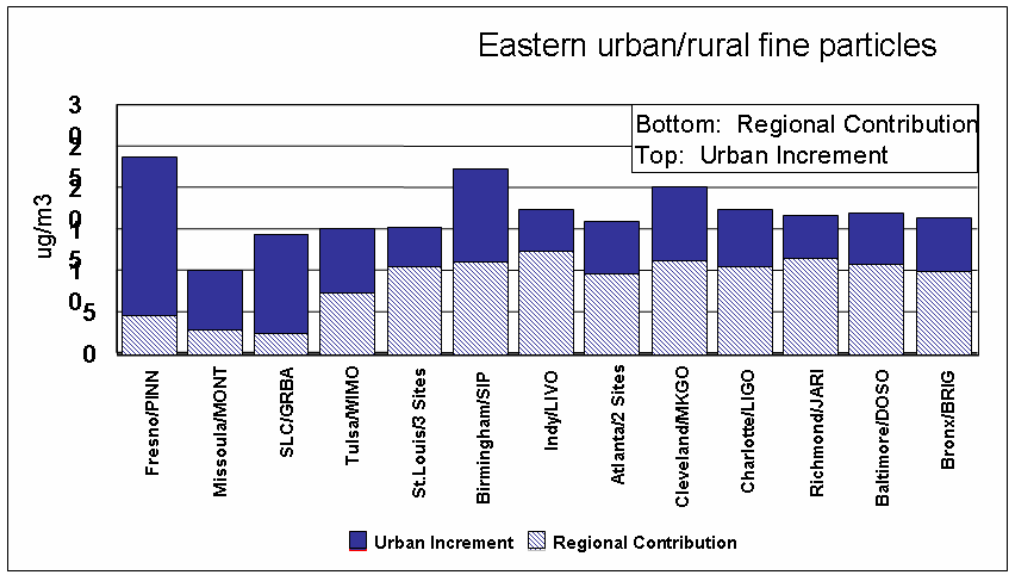
Note: Emissions data is for 2002 and is taken from EPA's 2003 National Emissions Inventory. "Other" sources of pollutants include transportation and other mobile sources and industrial sources.

CAIR Is Designed to Reduce Interstate Transport of Fine Particles and Ozone

- Air pollution can travel hundreds of miles and cause multiple health and environmental problems on regional or national scales.
- Attaining national ambient air quality standards will require some combination of emission reductions from:
  - Sources located in or near nonattainment areas (such as mobile sources) and
  - Sources, such as power plants, located further from the nonattainment area.

Transport Winds and Ozone Patterns on High Ozone Days





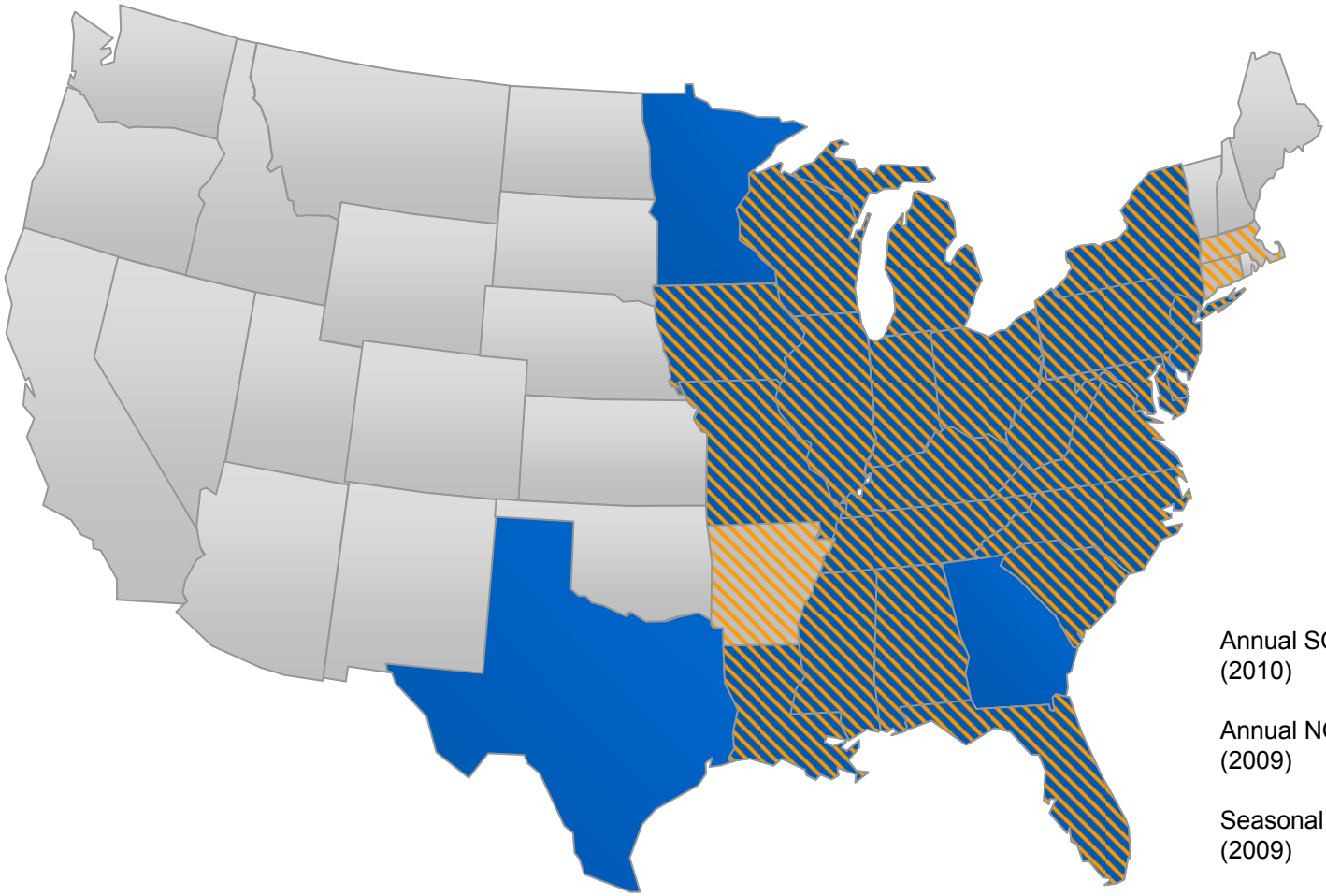
CAIR Is Designed to Reduce Interstate Transport of Fine Particles and Ozone

- National Ambient Air Quality Standards (NAAQS) set limits on air pollutants of concern to public health, such as SO_2, ozone, and particulate matter.
- Over the years, power plants have installed pollution control technology for particulates, almost universally.
- In order to address Acid Rain and regional ozone, programs have been designed and implemented, resulting in substantial SO_2 and NO_x emission reductions.
- Because of the interest and need to reduce SO_2 and NO_x more from power plants, CAIR/CAMR/CAVR were promulgated.
- Note that data presented here represent implementation of the CAIR, CAMR, and CAVR rules, although the analyses only focus on SO_2 and NO_x.

What Is CAIR?

- CAIR: In March 2005, EPA found that 28 states and the District of Columbia contribute significantly to nonattainment of the national ambient air quality standards (NAAQS) for fine particles and/or 8-hour ozone in downwind states.
- EPA is requiring these states to revise their State Implementation Plans (SIPs) to include control measures to reduce emissions of SO_2 and NO_x.
- The required emission reductions are based on controls that are known to be highly cost-effective for electric generation units (EGUs). EPA also considered in detail what was reasonable to require for pollution control installation by 2009 for NO_x and 2010 for SO_2 in setting the respective caps.
- EPA provided a model rule for multi-state cap and trade programs for annual SO_2 and NO_x emissions for $PM_{2.5}$ and seasonal NO_x emissions for ozone that states can choose to adopt to meet the required emission reductions in a flexible and cost-effective manner.
- Based on discussions with states to date, EPA expects all states in the CAIR region to participate in the trading programs.
- CAIR will reduce emissions of SO_2 and NO_x from power plants by more than 70% and 60% from 2003 levels, respectively, assisting more than 450 counties in the eastern U.S. to meet EPA's protective air quality standards for ozone and fine particles.

CAIR: Affected Region and Emission Caps



States not covered by CAIR

States controlled for fine particles (annual SO_2 and NOx)

States controlled for both fine particles (annual SO_2 and NOx) and ozone (ozone season NOx)

States controlled for ozone (ozone season NOx)

Emission Caps*

(million tons)

	2009/2010	2015
Annual SO_2 (2010)	3.7	2.6
Annual NOx (2009)	1.5	1.3
Seasonal NOx (2009)	.58	.48

**For the affected region.*

What Are CAMR and CAVR?

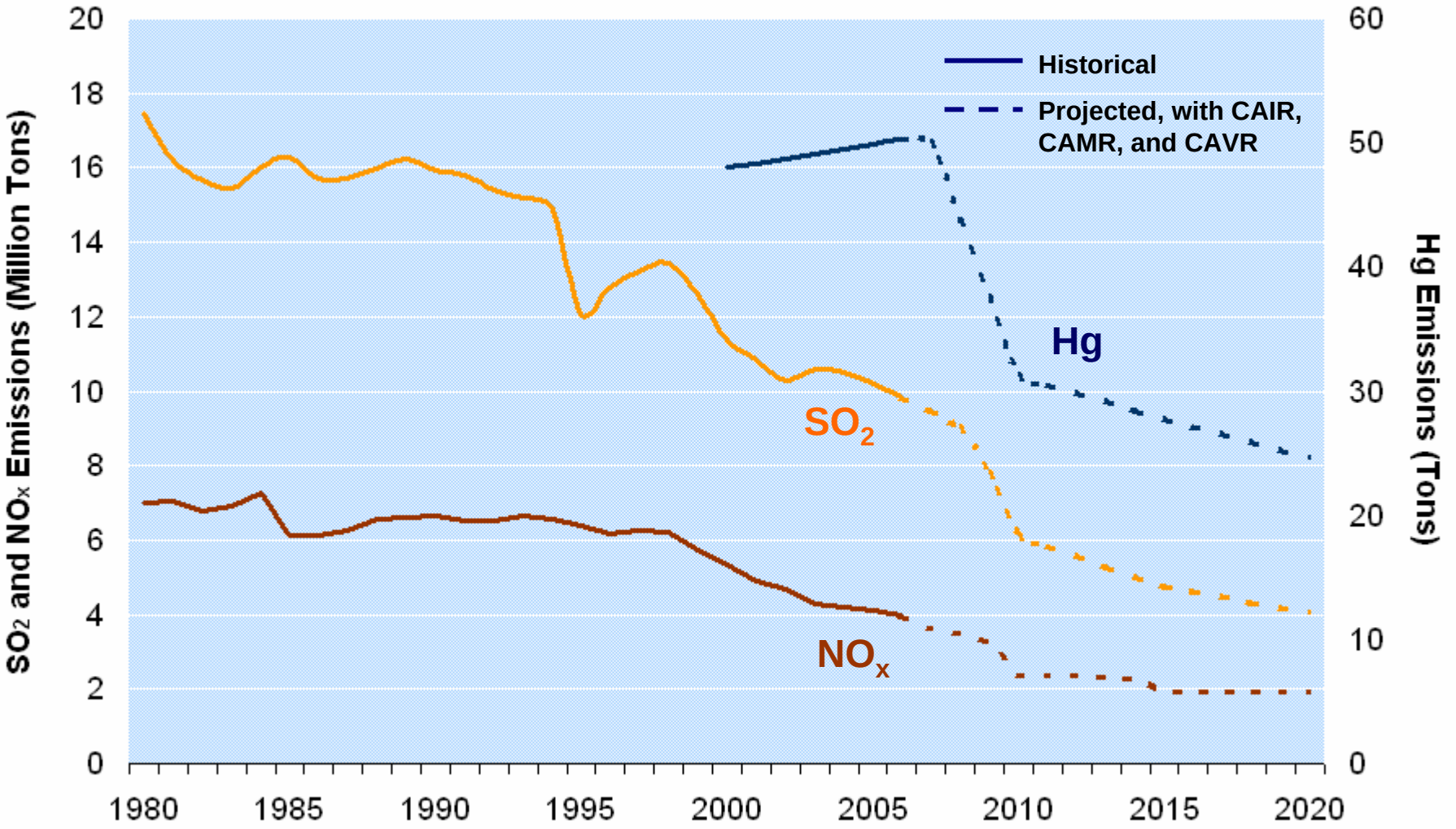
- The Clean Air Mercury Rule, CAMR, establishes performance standards for Hg for new and existing coal-fired electric generating units under a mandatory declining emissions cap of 38 tons starting in 2010 and 15 tons in 2018.

- The Clean Air Visibility Rule, CAVR, requires emission controls known as best available retrofit technology, or BART, for industrial facilities emitting air pollutants that cause or contribute to regional haze. The pollutants that reduce visibility include fine particles ($PM_{2.5}$) and compounds which contribute to $PM_{2.5}$ formation, such as NO_x and SO_2.

- These rules, together with CAIR, provide a nationwide multi-pollutant strategy to reduce $SO_2$and Hg by more than 70% and NO_x by more than 60%.

- Note that data presented here represent implementation of the CAIR, CAMR, and CAVR rules to capture the interactive effects of these programs.

Nationwide Emissions from Electric Generating Units: Historical and Projected under CAIR/CAMR/CAVR

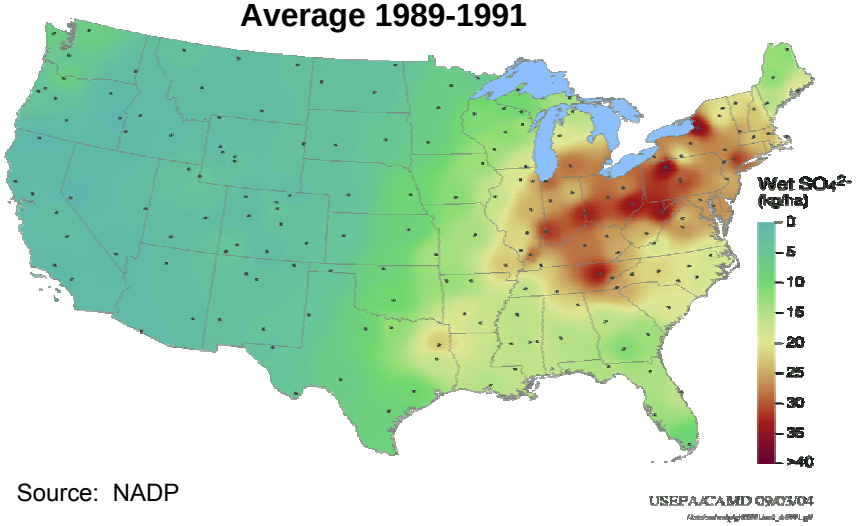


Note: The CAIR regional SO_2 caps are 3.6 million tons in 2010 and 2.5 million tons in 2015, and the annual regional NO_x caps are 1.5 million tons in 2009 and 1.3 million tons in 2015. The CAMR caps for Hg are 38 tons in 2010 and 15 tons in 2018.

II. Why Does CAIR Offer States an Emissions Cap and Trade Approach?

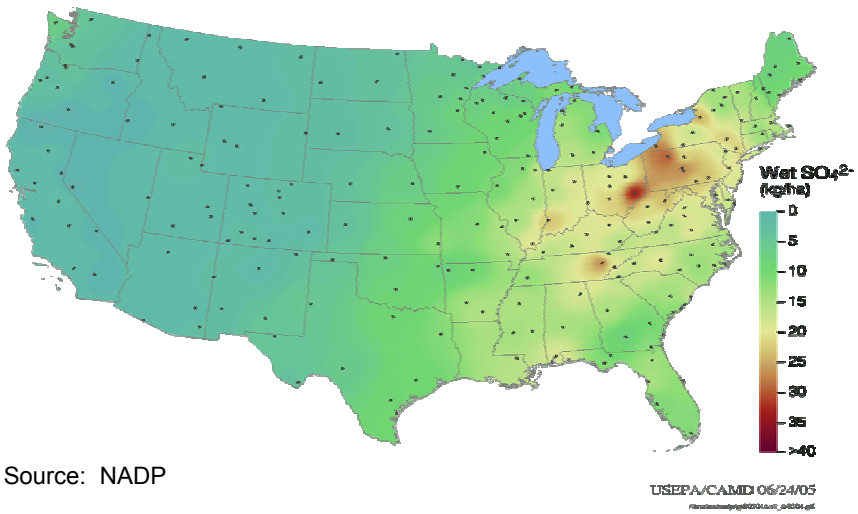
Previous Effectiveness of Approach Seen in Acid Rain Program and NOx SIP Call

Wet Sulfate Deposition
Average 1989-1991



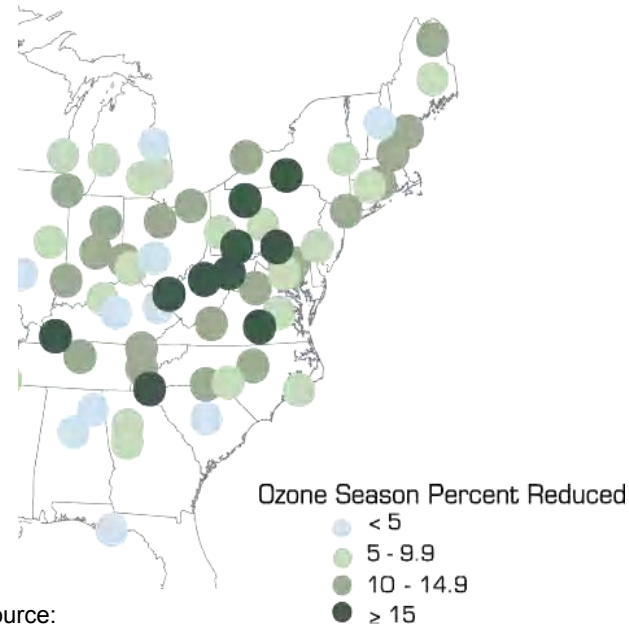
Source: NADP

Wet Sulfate Deposition
Average 2002-2004



Source: NADP

Regional Reductions in Seasonal 8-Hour Ozone, 2002 vs. 2004



Source:

www.gpv/airtrends

A study* in 2005 shows that the estimated human health and environmental benefits of the Acid Rain Program in 2010 are $122 billion annually—a 40-to-1 benefit to cost ratio—including $6.4 billion in annual health benefits gained by Canadians.

*A fresh look at the benefits and costs of the US acid rain program, Journal of Environmental Management Vol. 77 (2005) pp. 252-266

How Emissions Cap and Trade Works

- An air emissions cap is set
  - Level and timing of cap determine cost of program
- Emissions “allowances” equal to the cap are distributed
  - Each allowance authorizes an amount (e.g, one ton) of emissions
- Sources choose compliance approach
  - Controls, fuel switching, buying/selling/banking allowances
- Sources continuously measure and report emissions
- Sources must surrender allowances to cover regulated emissions
  - Automatic penalties for non-compliance
- Through their implementation of national health-based standards, States and local governments retain authority to address local impacts

Why Emissions Cap and Trade Works

- Full sector coverage – all sources of sector included
  - Minimizes shifting of production (and emissions) to uncapped sources ("leakage")
  - Assures achievement of emission reduction goal without case-by-case review
- The cap – government issues fixed quantity of allowances
  - Limits emissions to achieve/maintain environmental goal
  - Limits creation of "paper credits" and "anyway tons"
  - Provides certainty to allowance market
- Monitoring – accurate measurement and reporting of all emissions
  - Assures accountability and results
  - Establishes integrity of allowances and confidence in the market
- Trading – unrestricted trading and banking (emissions constraints allowed to protect local air quality)
  - Allows facilities to choose/change compliance options
  - Minimizes compliance cost
  - Ensures that trading will not cause "hotspots"

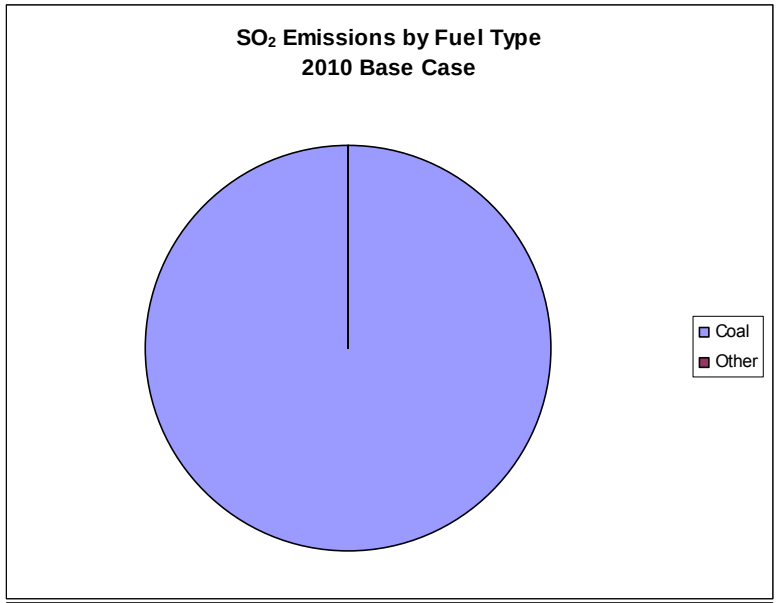
Cap and Trade Provides Flexibility and Certainty

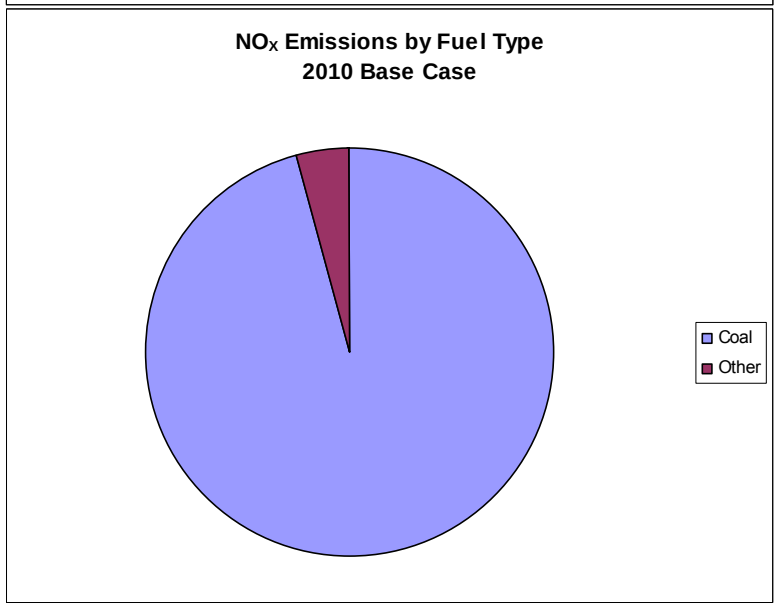
- Cap and trade programs do not specify *how* a source complies with the cap, yet it must comply.
- This flexibility in how sources comply includes installing pollution control technology or acquiring emission allowances to account for emissions.
- Market forces and the circumstances specific to each source determine the appropriate choice of control technology, or purchase and trade of allowances, or a combination for complying with the rule.
- In any case, sources must monitor and account for all their emissions. Compliance with emission cap and trade programs has been nearly 100% each year.

III. Will CAIR Result in New Advanced Pollution Controls on Power Generating Sources?

Changes to Coal-Fired Generation Are Key to CAIR Compliance

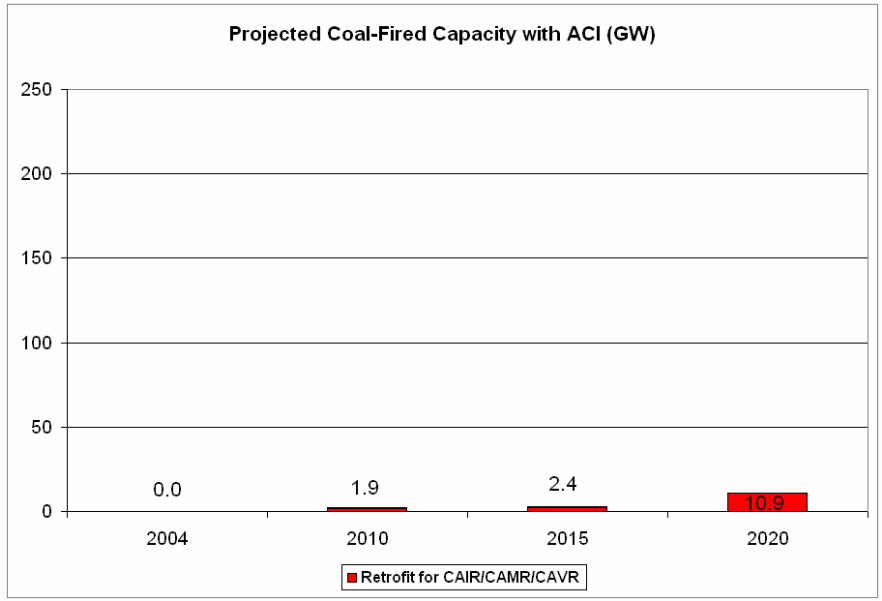
- Focusing on SO_2 and NO_x contribution to fine particle and ozone nonattainment, there are several types of power generation that produce these air emissions.
- Because coal-fired generation is the dominant source, and analysis shows that these coal-fired units also install the majority of pollution controls, EPA primarily looks at these sources and emissions in this report.

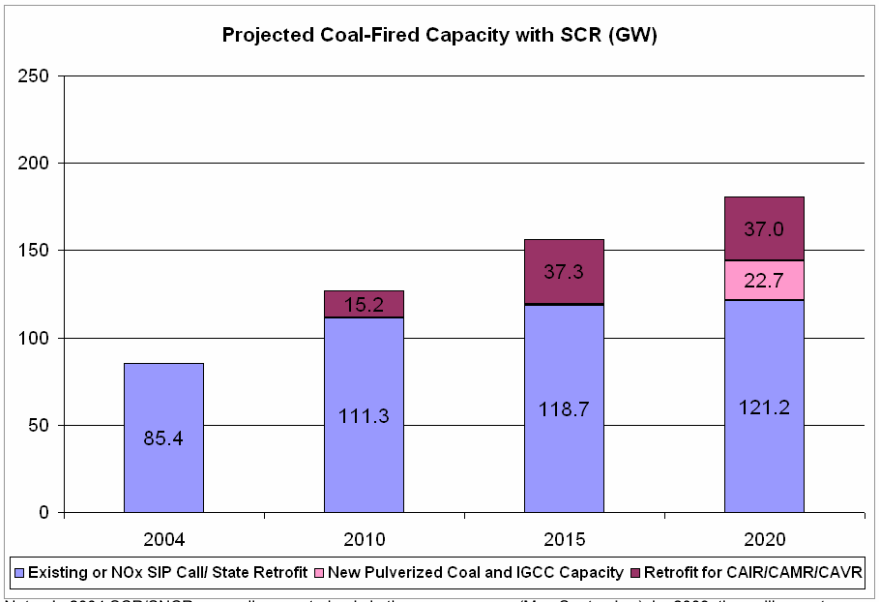


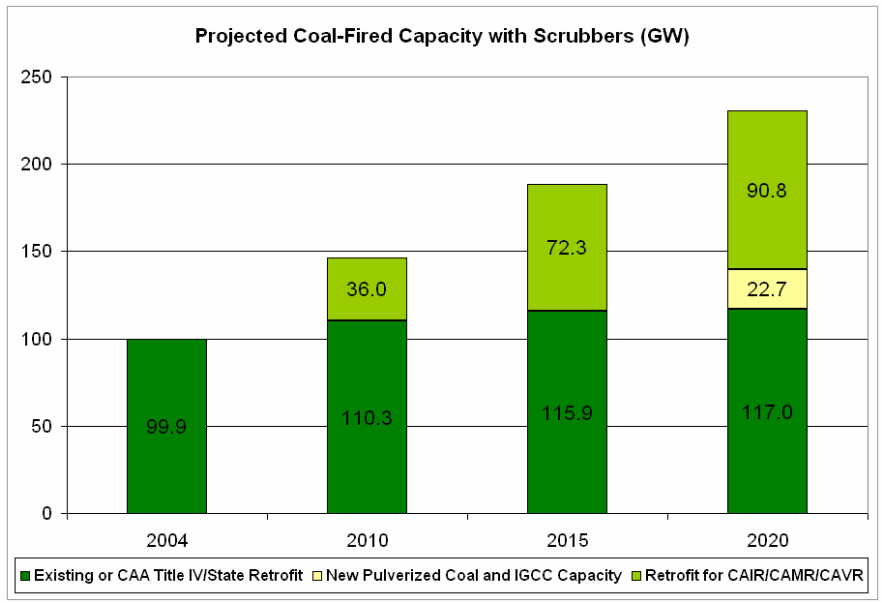


Projected Coal Capacity with Advanced Pollution Controls

- There are currently around 305 GW of coal-fired capacity in the U.S. That number is projected to increase to about 321 GW* of coal-fired capacity by 2020 with CAIR/CAMR/CAVR.
- By 2020, about 79% of CAIR-affected coal-fired capacity is projected to have one or more of the following installed: selective catalytic and non-catalytic reduction (SCR/SNCR) for NO_x, flue gas desulfurization (scrubbers) for SO_2, and/or activated carbon injection (ACI)** for mercury. The existing and/or NO_x SIP Call SCR/SNCR will go from seasonal to year-round operation beginning in 2009 (see note).
- The graphics show cumulative capacity with existing controls; controls projected to be retrofitted under the NO_x SIP Call, NSR settlements, State-enacted programs, and CAA Title IV; and controls projected to be retrofitted with CAIR/CAMR/CAVR.





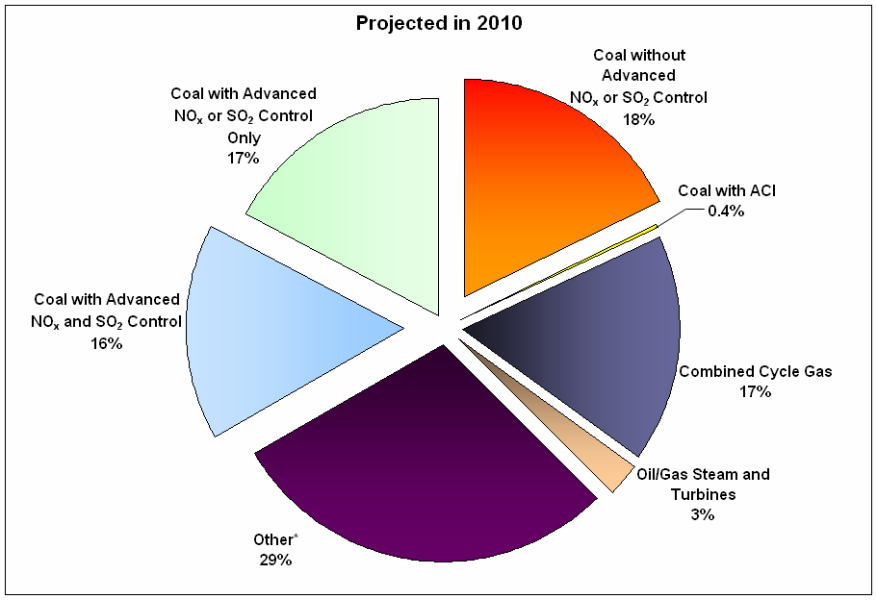


Note: In 2004 SCR/SNCR generally operated only in the ozone season (May-September); by 2009, they will operate year-round.

*This data includes capacity from all coal units nationwide, including units ≤ 25 MW. These smaller units, which number about 165 units and represent about 2.2 GW of capacity in 2010 and which number about 204 units and represent about 2.4 GW of capacity in 2020, are not regulated under CAIR, CAMR, or CAVR. For purposes of this analysis, Delaware and New Jersey were not included as part of the CAIR region because the modeling was done prior to EPA's recent final rule to include them in the CAIR annual programs for SO_2 and NO_x. Adding these two States would not alter the results presented here in any significant way.

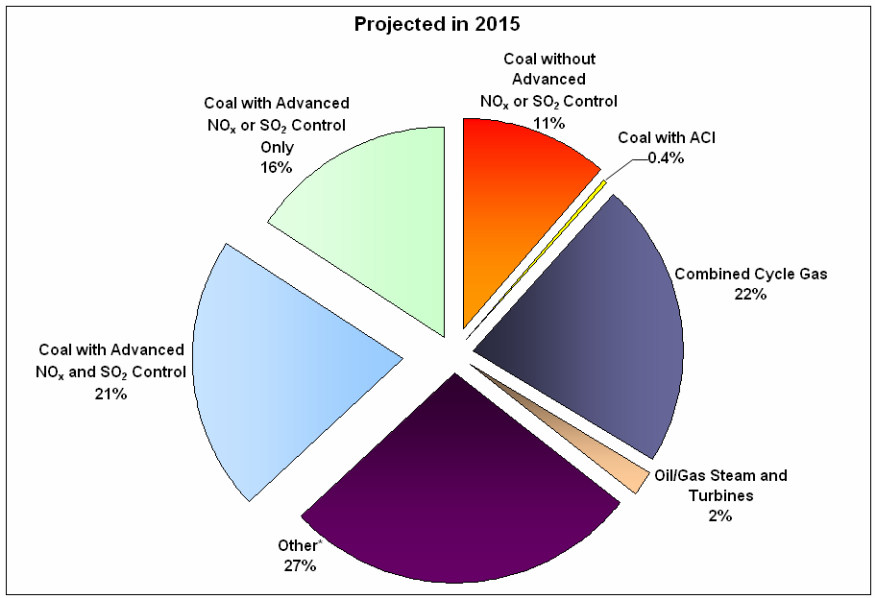
**There are no constraints on the feasibility of ACI for mercury control in IPM and results need to be reviewed with this in mind.

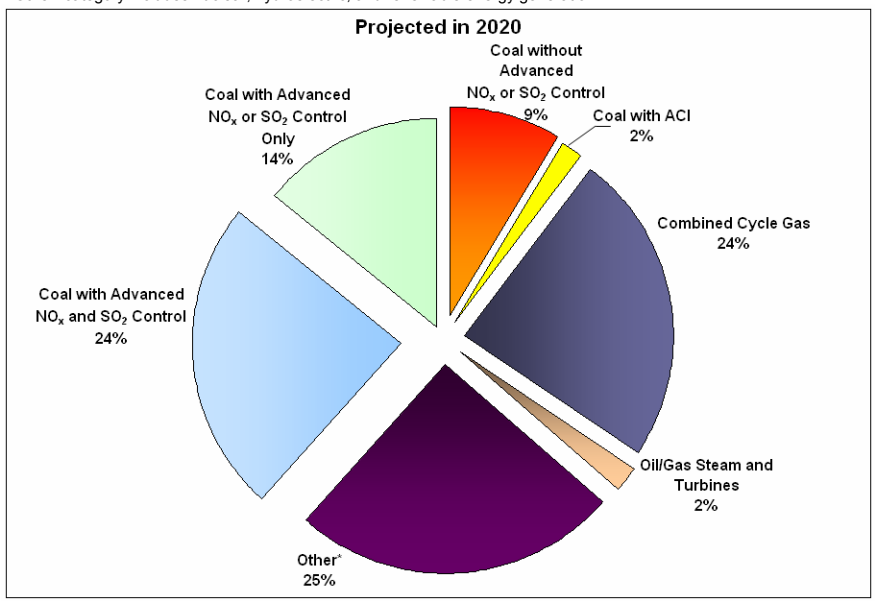
Percent of Electricity Generated from Fossil Fuel Units (by Fuel Type and Emission Control Type)



- These charts show percent of U.S. electricity generated from coal-fired capacity, with various types of pollution controls installed (e.g., in 2010, 16% of U.S. electricity comes from coal-fired units with both scrubbers and SCR/SNCR), and other types of power generation.
- In 2003, coal-fired generation totaled 2.0 trillion kWhs, compared to total generation of 3.8 trillion kWhs. That number is projected to increase to 2.4 trillion kWhs by 2020 under CAIR/CAMR/CAVR, compared to total generation of 4.8 trillion kWhs.
- Graphics show an increasing percentage of coal-fired generation with advanced pollution controls.

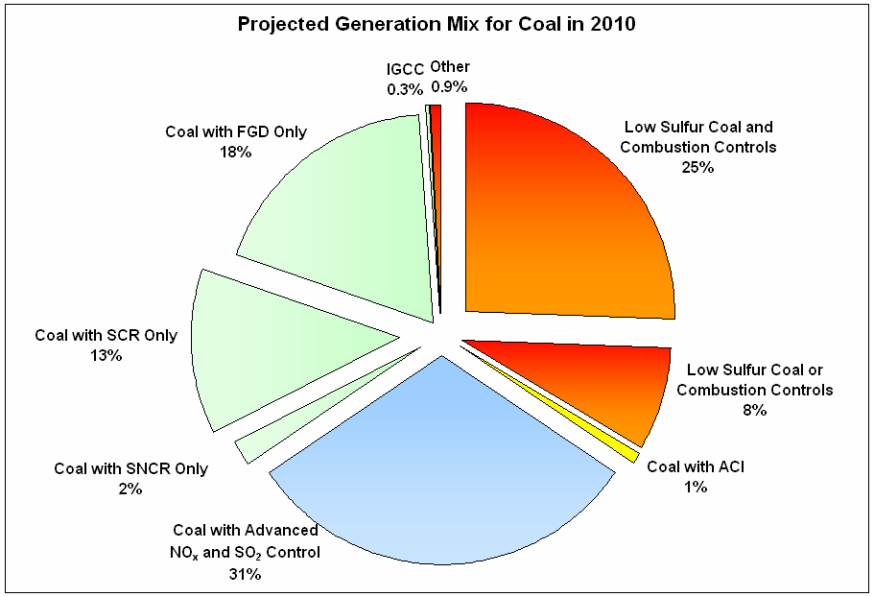
*"Other" category includes nuclear, hydroelectric, and renewable energy generation.



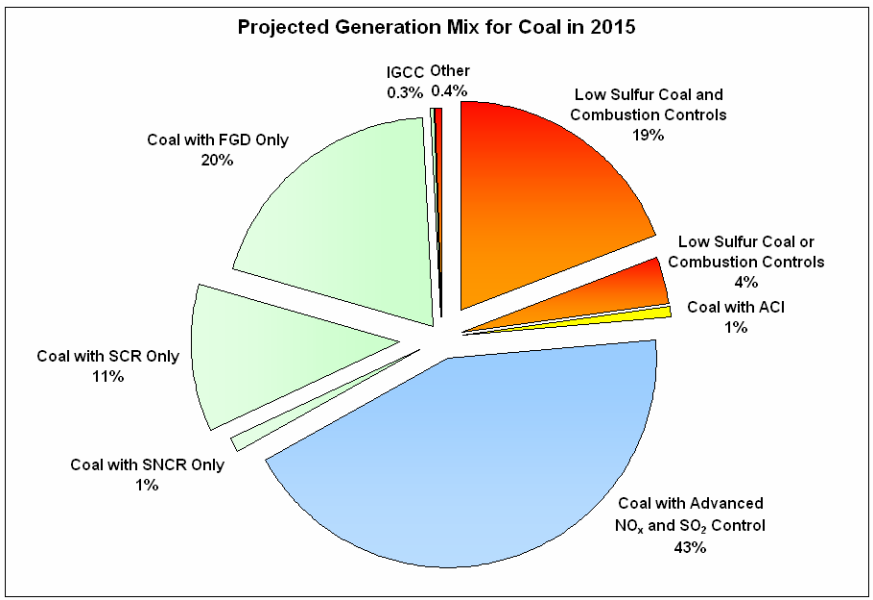


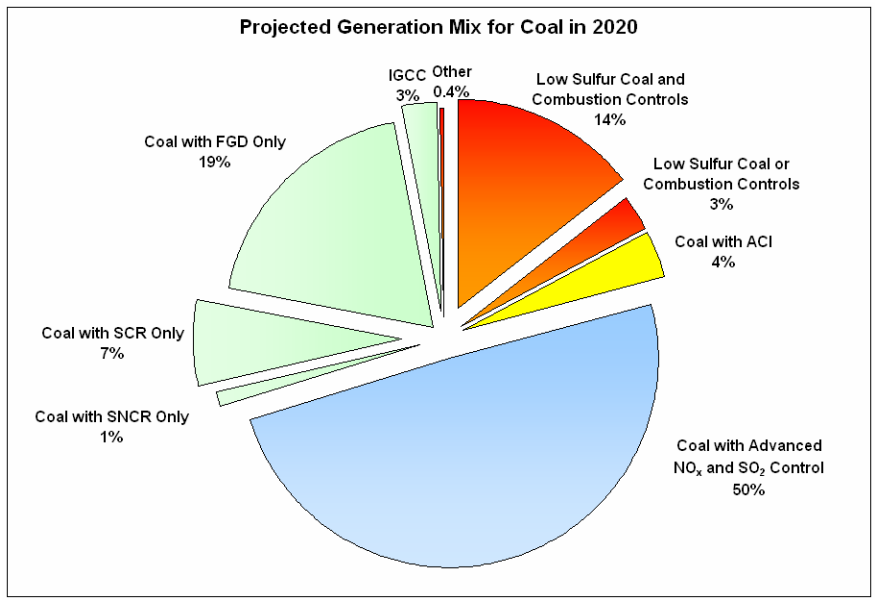
Note: Numbers may not add up due to rounding. This data includes generation from all EGUs nationwide, including fossil units ≤ 25 MW. These smaller units are not regulated under CAIR, CAMR, or CAVR. Coal units without advanced pollution controls for SO_2 and NO_x removal (either scrubbers, SCR, or SNCR) will typically have combustion controls for NO_x control, burn low-sulfur coal (from 0.45 to 1.2 lbs/mmBtu), and/or be utilized less frequently.

Percent Coal Generation and Controls in 2010, 2015, and 2020



- The graphics show the percent of electricity generated from coal, by pollution control type.
- Over 99% of coal generation in all modeled years (2010, 2015, and 2020) comes from units with some NO_x or SO_2 control measures in place.
- There is a clear shift over time toward advanced SO_2, NO_x, and mercury controls, such as SCR/SNCR for NO_x, scrubbers for SO_2, and/or Activated Carbon Injection (ACI) for mercury control.





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Average Emission Rates Decrease Significantly in CAIR States

Historical Average Emission Rates in lbs/MMBtu				
	All Fossil Generation		Pulverized Coal	
	SO_2 CAIR States	NO_x CAIR States	SO_2 CAIR States	NO_x CAIR States
2000	1.01	0.42	1.17	0.46
2004	0.92	0.29	1.10	0.33

Average Projected Emission Rates in lbs/MMBtu under CAIR/CAMR/CAVR				
	All Fossil Generation		Pulverized Coal	
	SO_2 CAIR States	NO_x CAIR States	SO_2 CAIR States	NO_x CAIR States
2010	0.50	0.14	0.59	0.16
2015	0.36	0.11	0.46	0.13
2020	0.28	0.10	0.36	0.12

Note: For the emission rates presented here, States categorized here as part of CAIR are the States covered by the annual CAIR requirements and include New Jersey and Delaware, but not ozone-season only States. Historical data is from EPA's Acid Rain Program, projected data is from EPA's Integrated Planning Model.

Average Emission Rates Decrease Significantly in Non-CAIR States

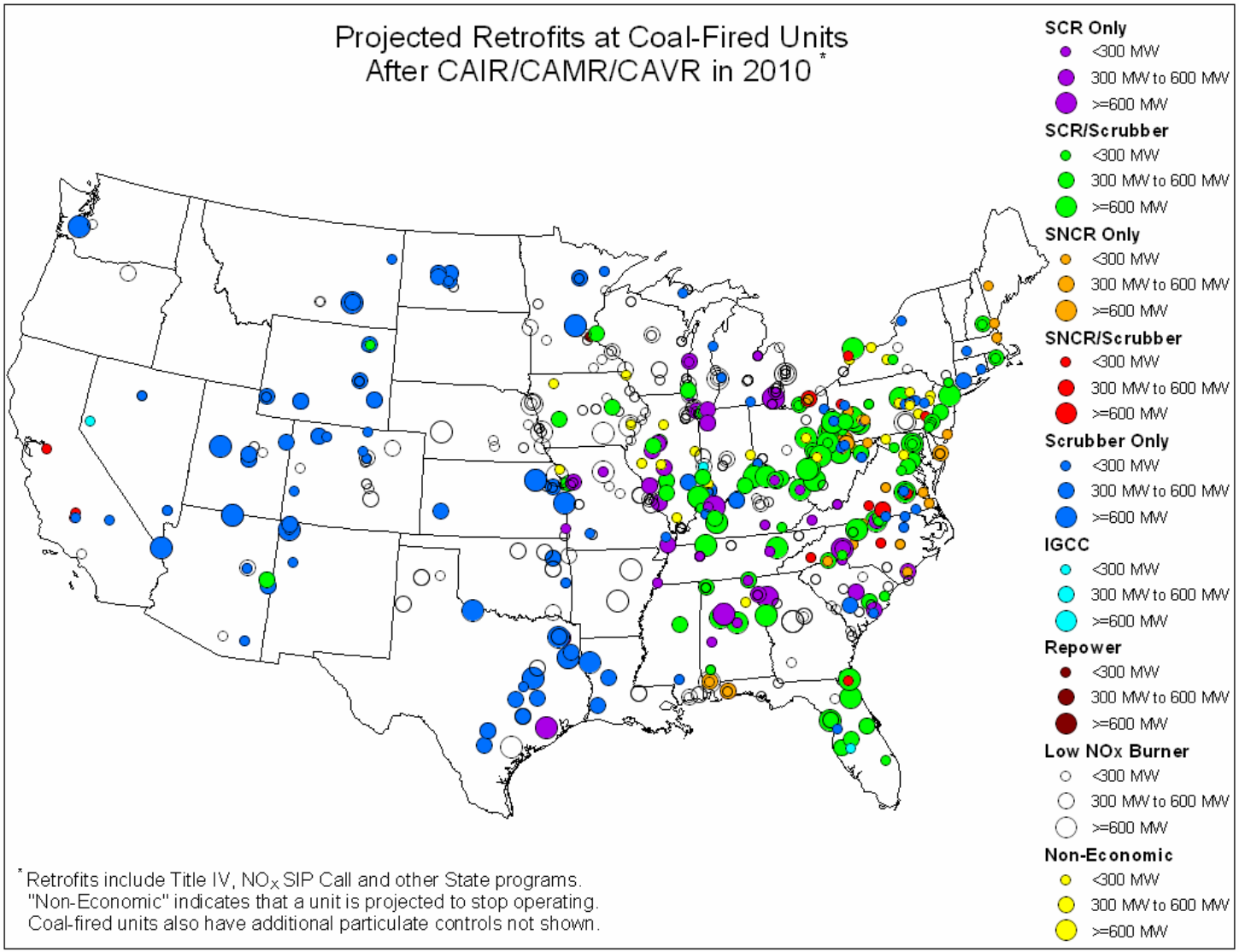
Historical Average Emission Rates in lbs/MMBtu				
	All Fossil Generation		Pulverized Coal	
	SO_2 Non-CAIR	NO_x Non-CAIR	SO_2 Non-CAIR	NO_x Non-CAIR
2000	0.42	0.33	0.52	0.40
2004	0.34	0.28	0.45	0.38

Average Projected Emission Rates in lbs/MMBtu under CAIR/CAMR/CAVR				
	All Fossil Generation		Pulverized Coal	
	SO_2 Non-CAIR	NO_x Non-CAIR	SO_2 Non-CAIR	NO_x Non-CAIR
2010	0.29	0.24	0.45	0.36
2015	0.22	0.18	0.36	0.27
2020	0.19	0.16	0.34	0.27

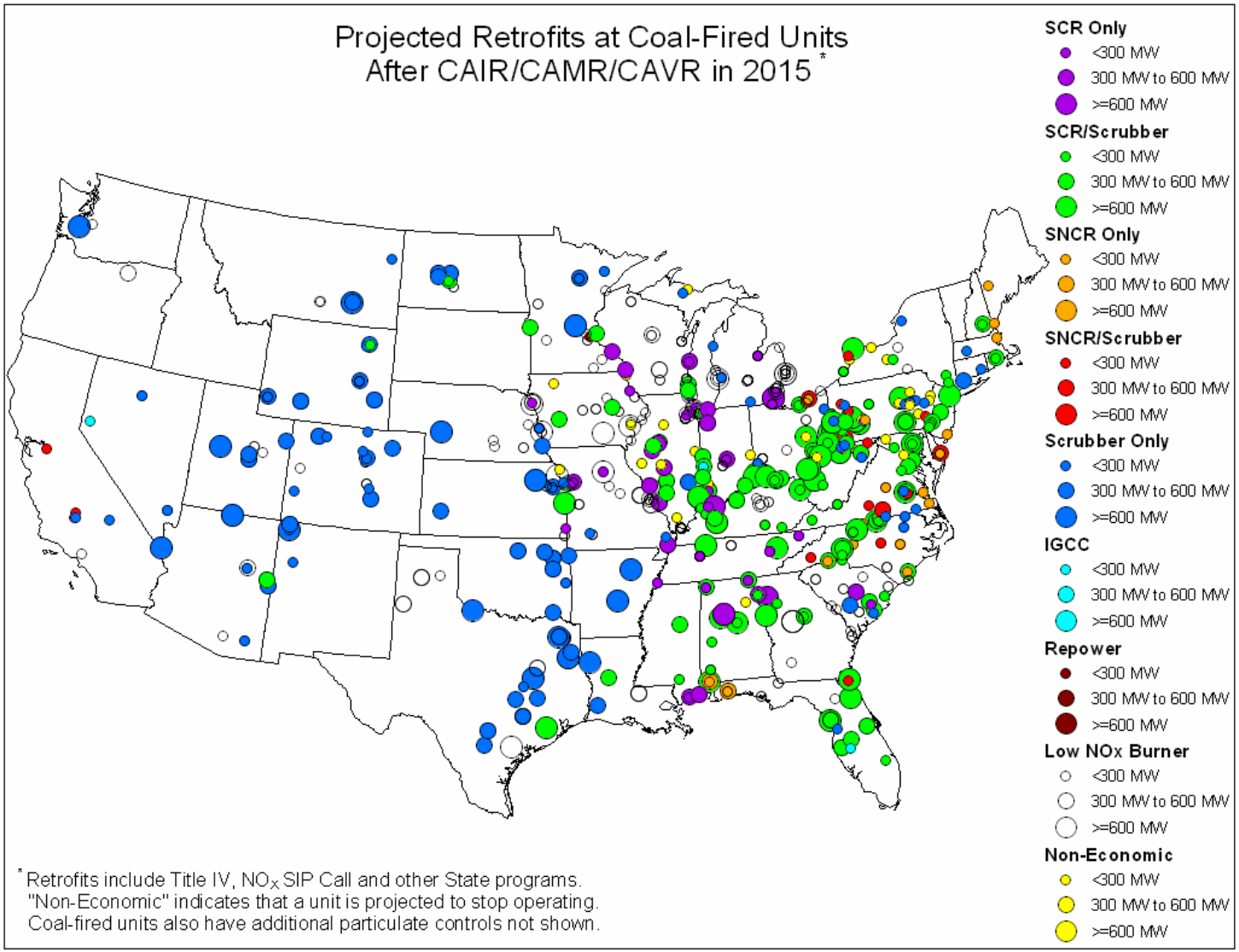
Note: For the emission rates presented here, States categorized here as part of non-CAIR are the States not covered by the annual CAIR requirements. Historical data is from EPA's Acid Rain Program, projected data is from EPA's Integrated Planning Model.

IV. How and Where Will Emission Reductions Occur under CAIR/CAMR/CAVR in 2010, 2015, and 2020?

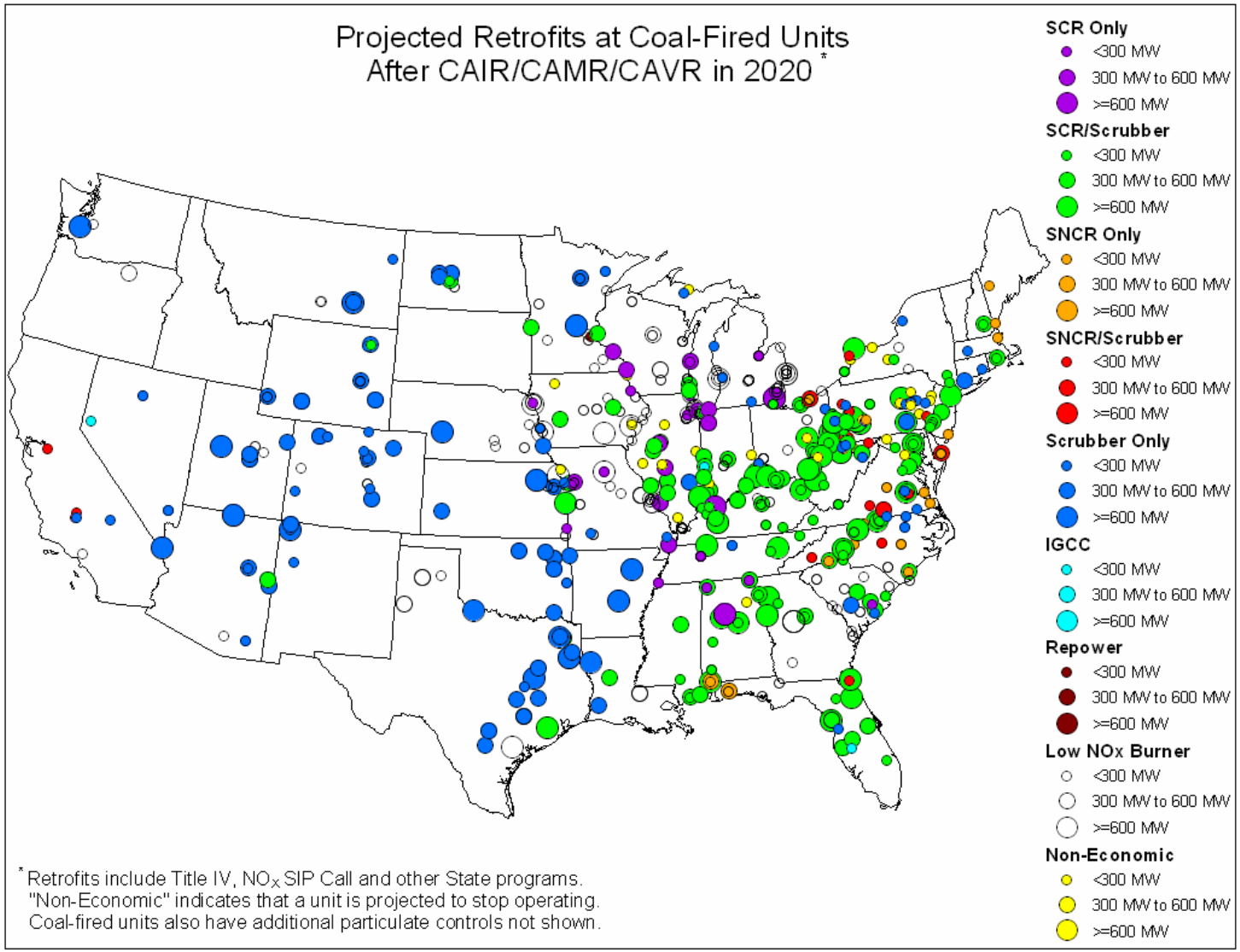
Emission Reductions Occur through Projected Installation of Advanced Air Pollution Control Technology in 2010…



Emission Reductions Occur through Projected Installation of Advanced Air Pollution Control Technology in 2015…

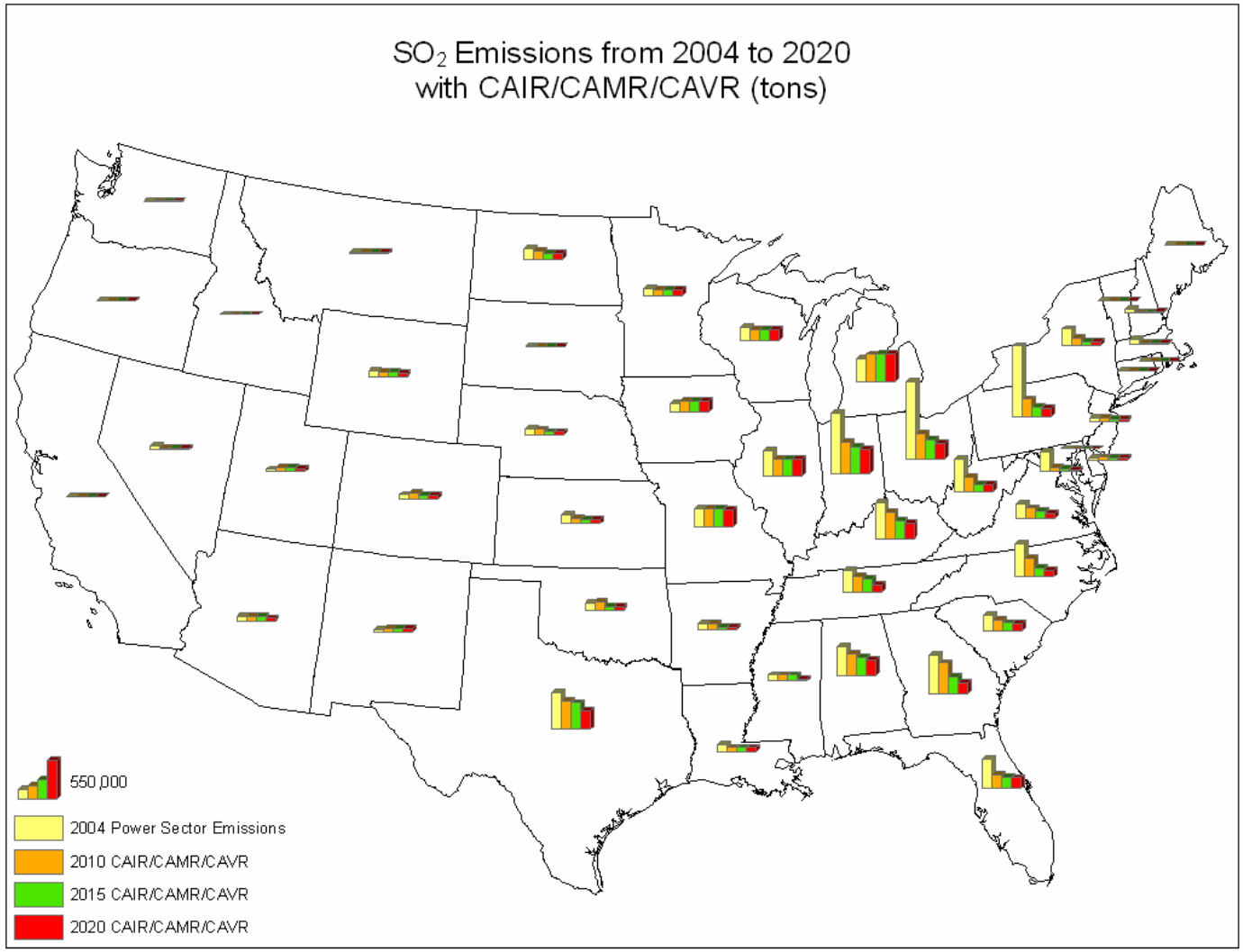


Emission Reductions Occur through Projected Installation of Advanced Air Pollution Control Technology in 2020



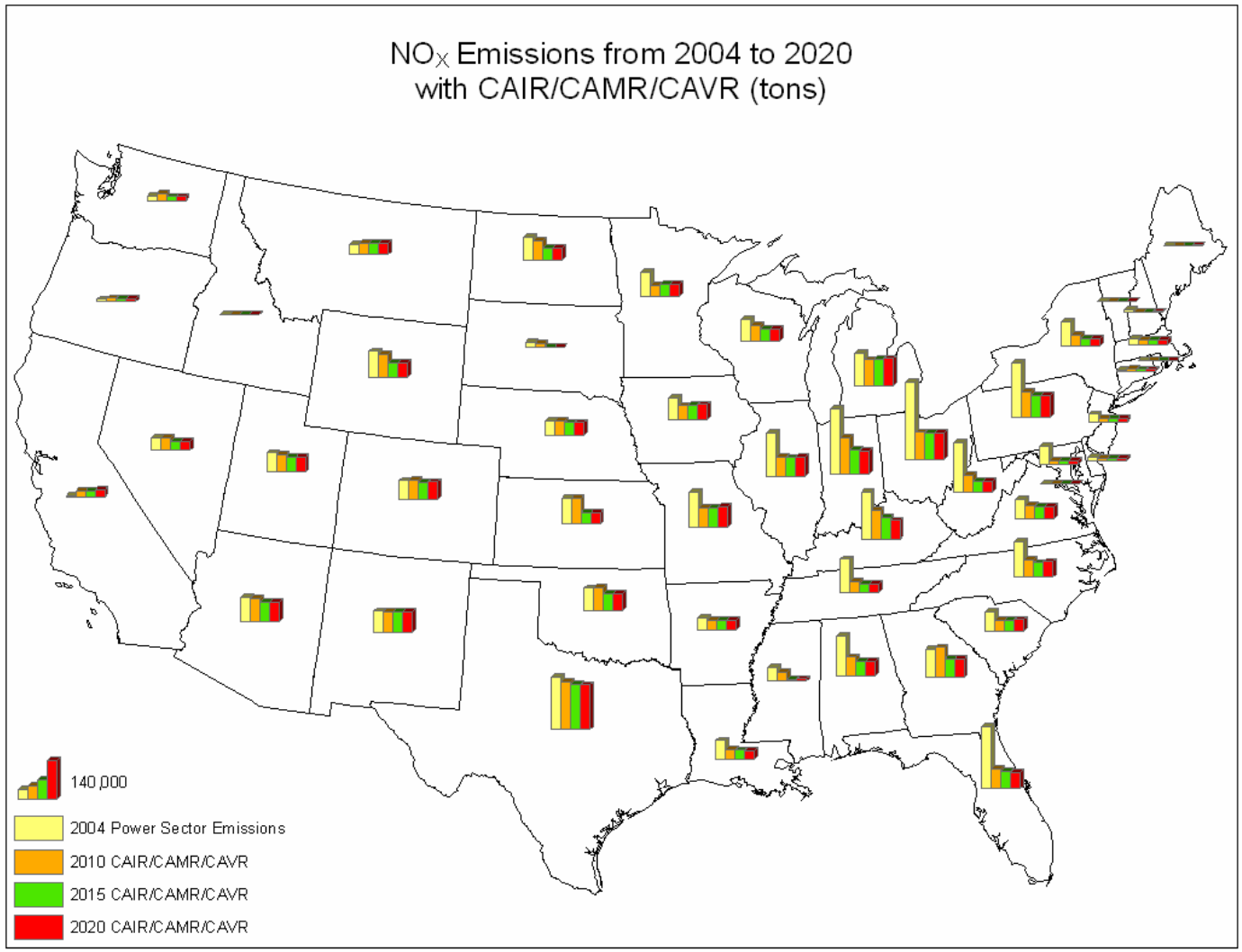
Where: State-by-State SO_2 Emissions

- Largest SO_2 emitting states reduce the most.



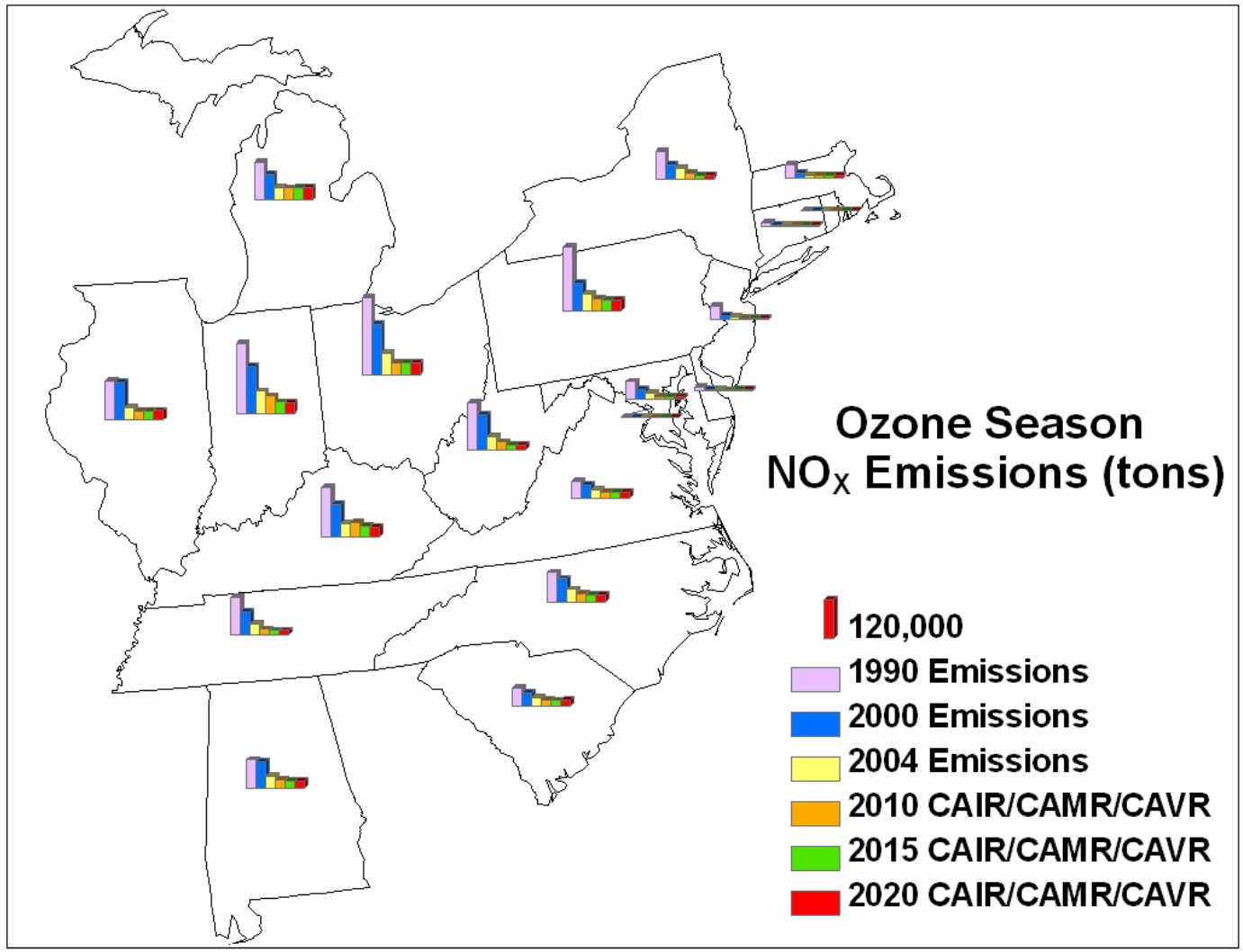
Where: State-by-State NO_x Emissions

- CAIR will build on the ozone season emission reductions from the NO_x SIP Call.
- The largest NO_x emission reductions will continue to occur in the central portion of the eastern United States.



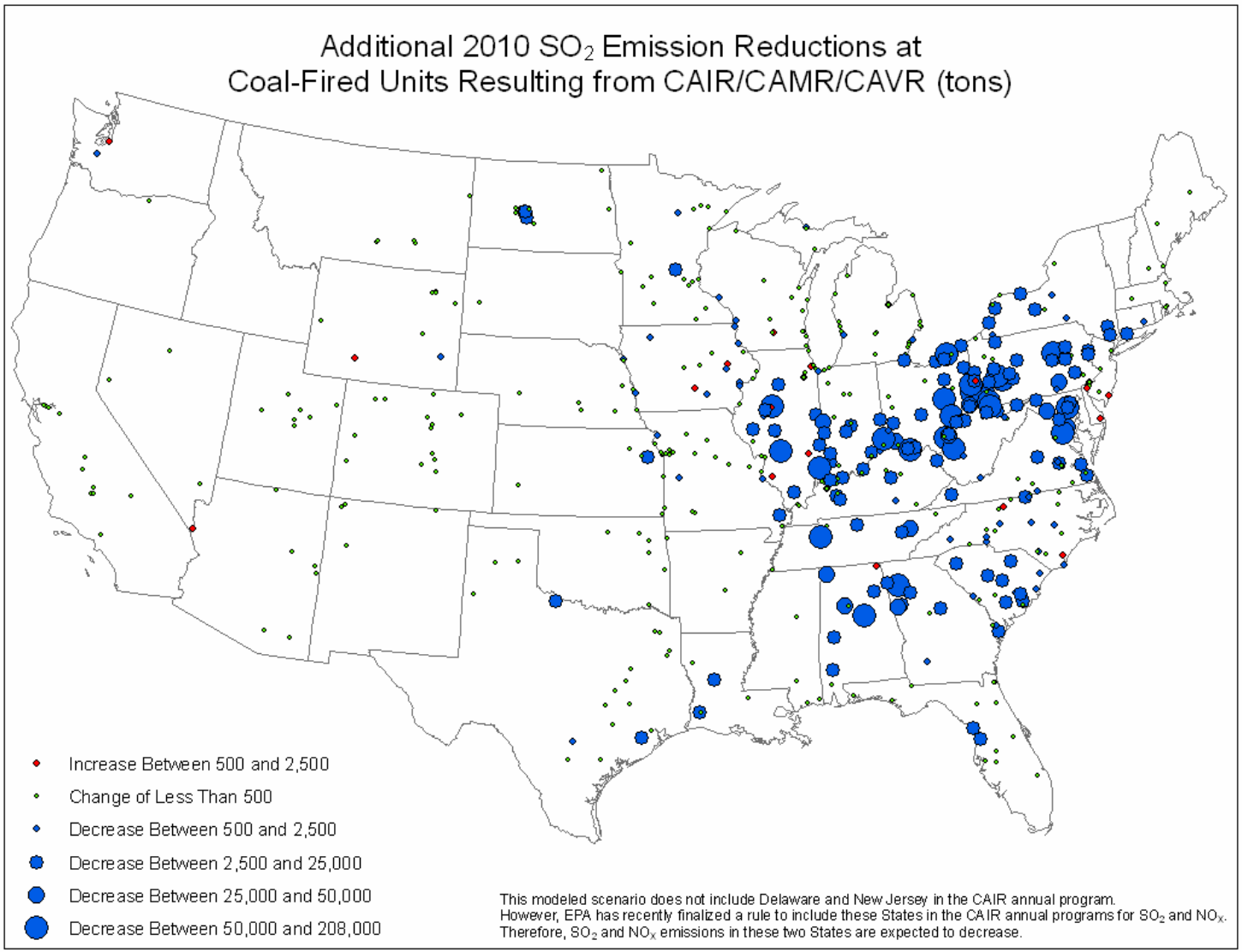
Where: State-by-State Ozone Season NO_x Emissions

- Ozone season emissions in the NO_x Trading Program region decreased nearly 70% from 1990 through 2004.
- Summertime NO emissions in the SIP Call region with CAIR will continue to significantly decrease due to additional SCR/SNCR/low-NOx burner retrofits by 2020.



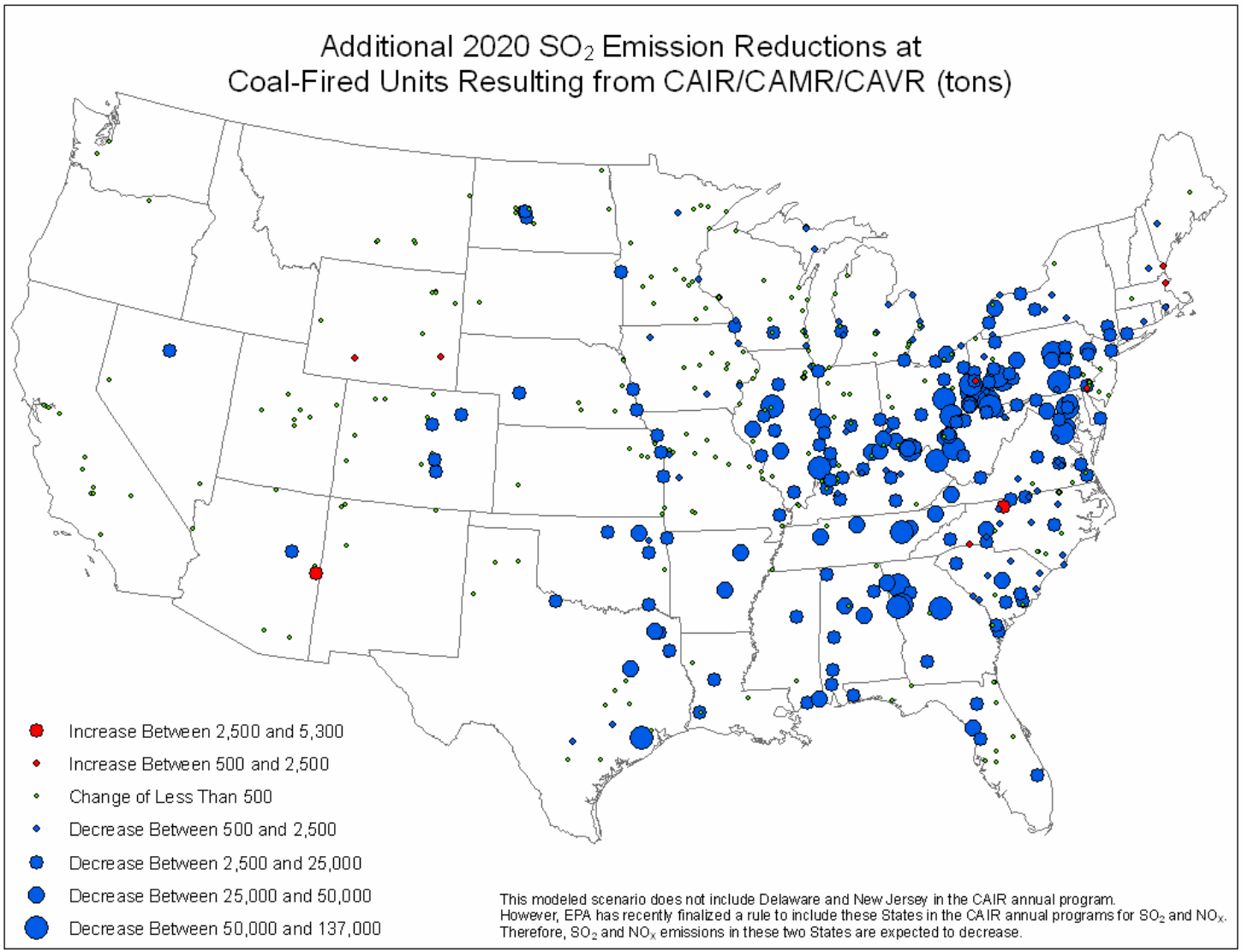
Where Plant-Level Emission Reductions Occur

This and the next slide compare plant-level SO_2 emission reductions in 2010 and 2020



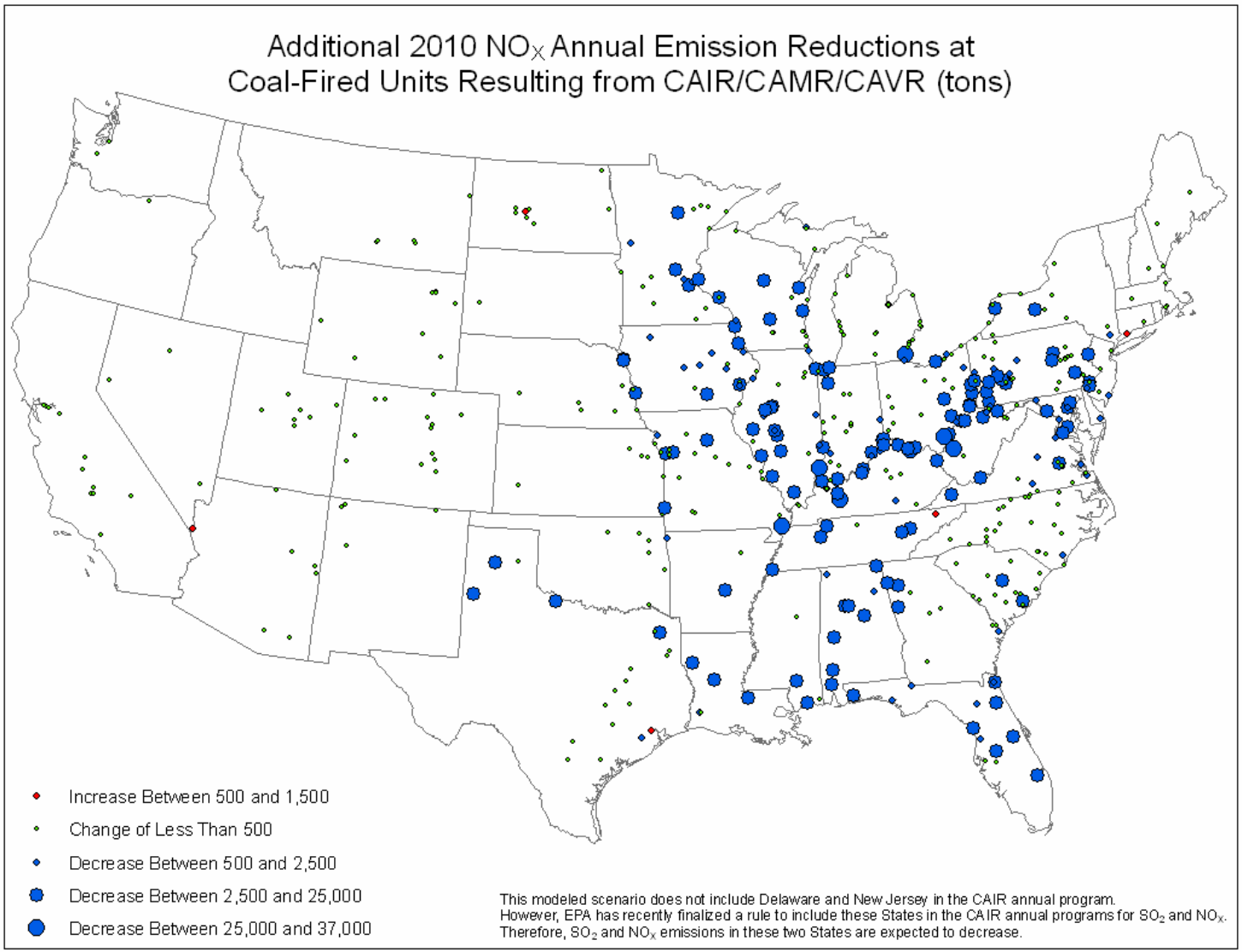
Where Plant-Level Emission Reductions Occur

Plant-level SO_2 Emission Reductions in 2020



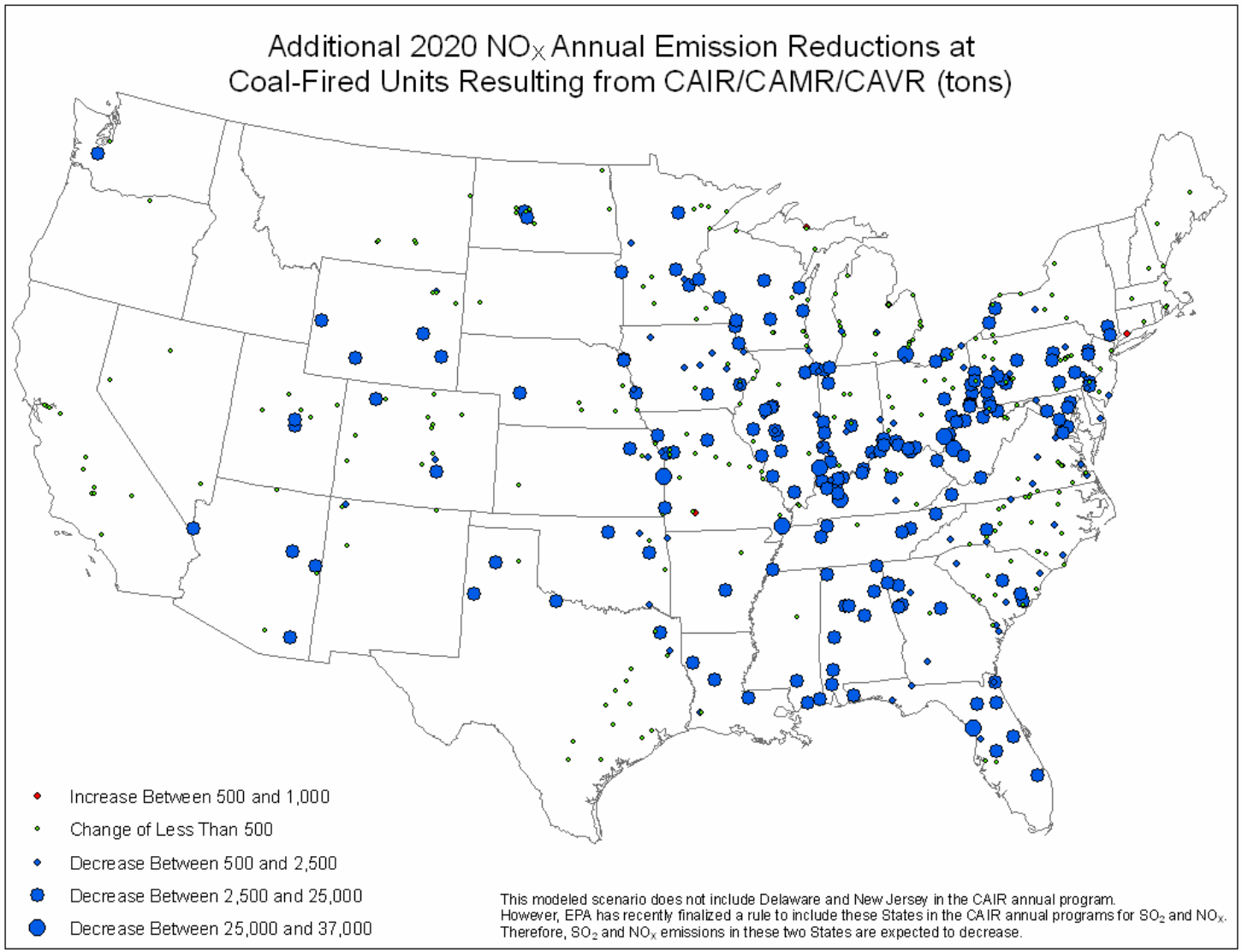
Where Plant-Level Emission Reductions Occur

This and the next slide compare plant-level NO_x annual emission reductions in 2010 and 2020



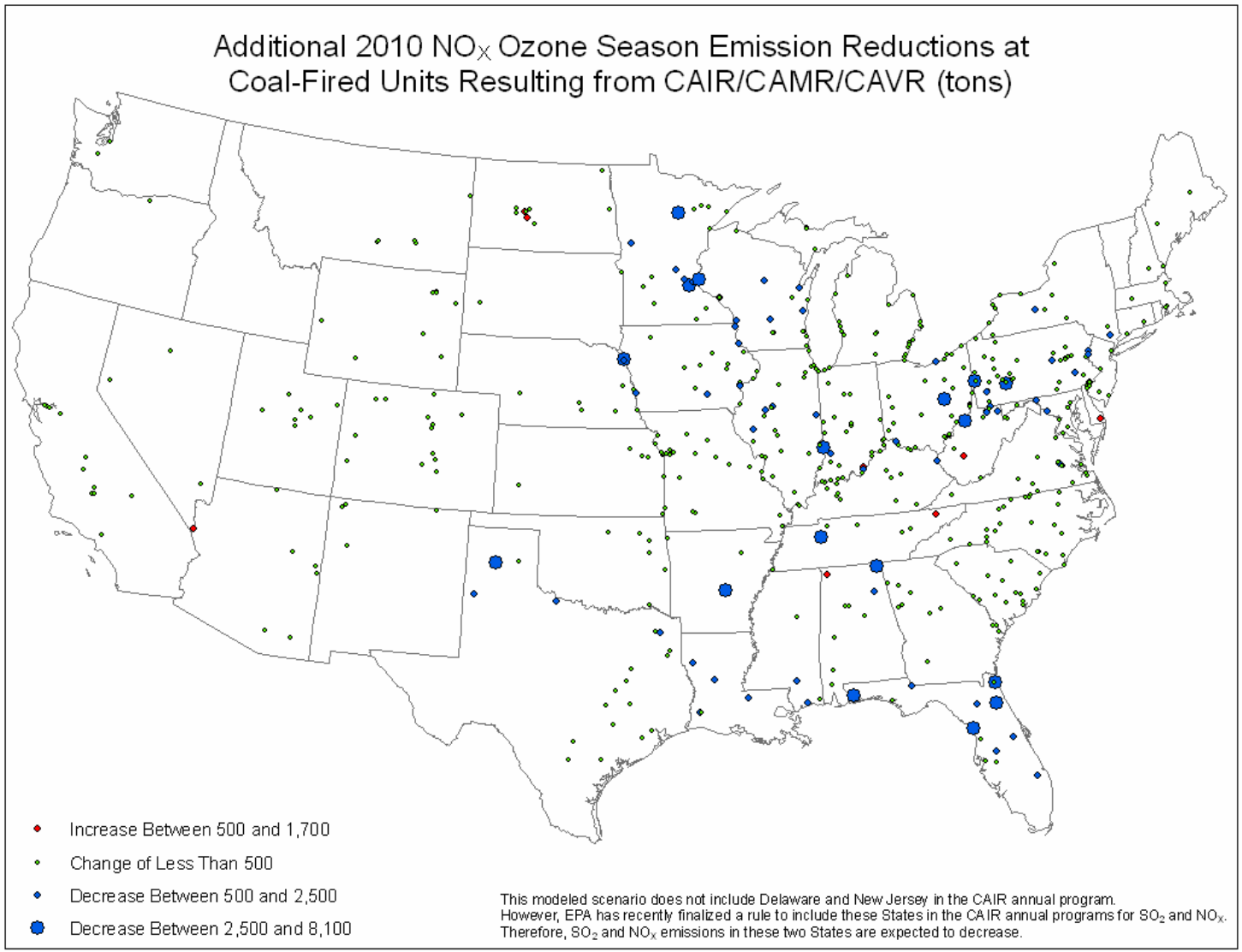
Where Plant-Level Emission Reductions Occur

Plant-level NO_x Annual Emission Reductions in 2020



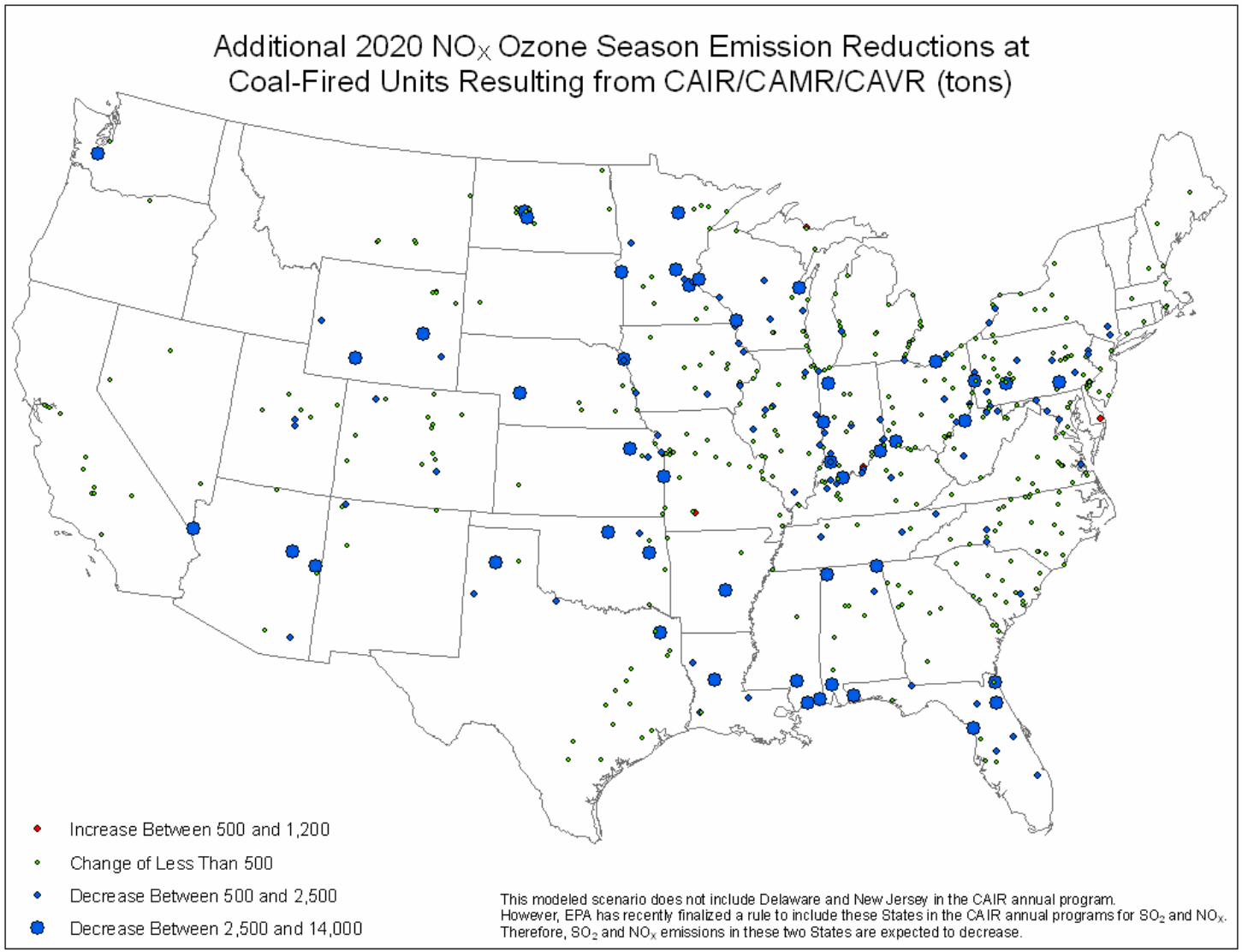
Where Plant-Level Emission Reductions Occur

This and the next slide compare plant-level NO_x ozone season emission reductions in 2010 and 2020



Where Plant-Level Emission Reductions Occur

Plant-level NO_x Ozone Season Emission Reductions in 2020



CAIR States and Projected Installation of Advanced Air Pollution Control Technology—2010, 2015, and 2020

- In 2010, AL, CT, DE, FL, MA, MD, NC, NJ, OH, PA, and WV will have more than 75% of their coal-fired capacity retrofitted with advanced air pollution controls for SO_2 and NO_X
  - In 2010, CT, MA, MD, NC, and NJ will have more than 95% of their coal-fired capacity retrofitted with advanced air pollution controls for SO_2 and NO_X
- In 2015, AL, AR, CT, DE, FL, IN, MA, MD, MS, NC, NJ, NY, OH, PA, TN, VA, and WV will have more than 75% of their coal-fired capacity retrofitted with advanced air pollution controls for SO_2 and NO_X
  - In 2015, AL, AR, CT, MA, MD, MS, NC, NJ, and WV will have more than 95% of their coal-fired capacity retrofitted with advanced air pollution controls for SO_2 and NO_X
- In 2020, AL, AR, CT, DE, FL, IN, KY, MA, MD, MS, NC, NJ, NY, OH, PA, TN, VA, and WV will have more than 75% of their coal-fired capacity retrofitted with advanced air pollution controls for SO_2 and NO_X
  - In 2020, AL, AR, CT, MA, MD, MS, NC, NJ, PA, and WV will have more than 95% of their coal-fired capacity retrofitted with advanced air pollution controls for SO_2 and NO_X
- Advanced air pollution controls include SCR, SNCR, Scrubbers, IGCC, or repowering to gas.
- CAIR's SO_2 and NO_x emission caps are based on EPA's initial assessment of how much pollution control the power sector could reasonably install without creating a boilermaker labor shortage that could potentially drive costs up.

V. What Happens to Coal-Fired Sources without Advanced Controls for SO_2 and NO_x in 2010, 2015, and 2020?

A Primer on Units vs. Generation and Capacity

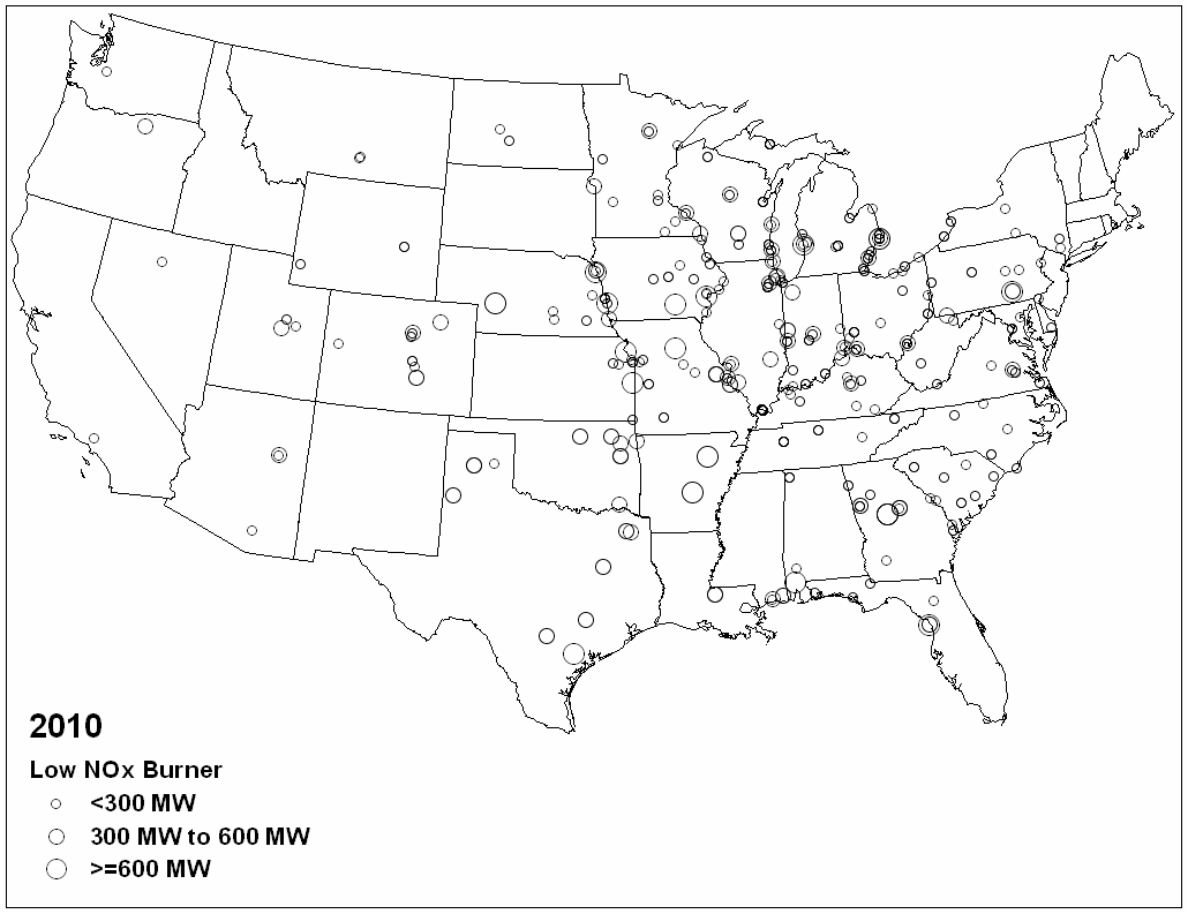
- A unit is an electrical energy generator. There may be one or more units comprising a power plant. (For instance, a plant with a capacity of 1,000 MW may have two 500 MW units, or a 500 MW unit plus two 250 MW units, etc.)
- Capacity (MW) is the maximum electric power output that can be produced by a unit or combination of units (e.g., in the above example, 1,000 MW).
- Power output (MW) is the rate (how fast) at which a unit generates electrical energy. (A 500 MW unit can operate—generate electrical energy—at any power output between zero and 500 MW.)
- Generation is the total amount of electrical energy produced (generated) over a period of time (MWh). Generation is the cumulative product of power output and time (MW x hours). (A 100 MW unit operated at an average power output of 50 MW generates 500 MWh in 10 hours.)

A Primer on Units vs. Generation and Capacity

- In discussing emission controls under CAIR, we show the total coal-fired capacity that will install controls, as well as the emissions associated with the generation from that capacity. In addition we describe units that will not have controls, their capacity, and the emissions associated with their projected generation.
- It should be understood that the emissions from an unscrubbed coal-fired unit that operates at 10% of its capacity for a year are roughly equivalent to the emissions from a scrubbed coal-fired unit of the same size that runs at 100% of its capacity for that year.
- The more an owner operates an unscrubbed unit, the higher the costs associated with the unit's emissions, and the more incentive there will be to add advanced pollution controls or operate less (or shut down).
- Notably, units that have advanced controls tend to run more than those that do not, as it is more economical to dispatch cleaner units that have relatively lower costs. Lower costs result from having lower residual pollution per MWh to offset with emission allowances.

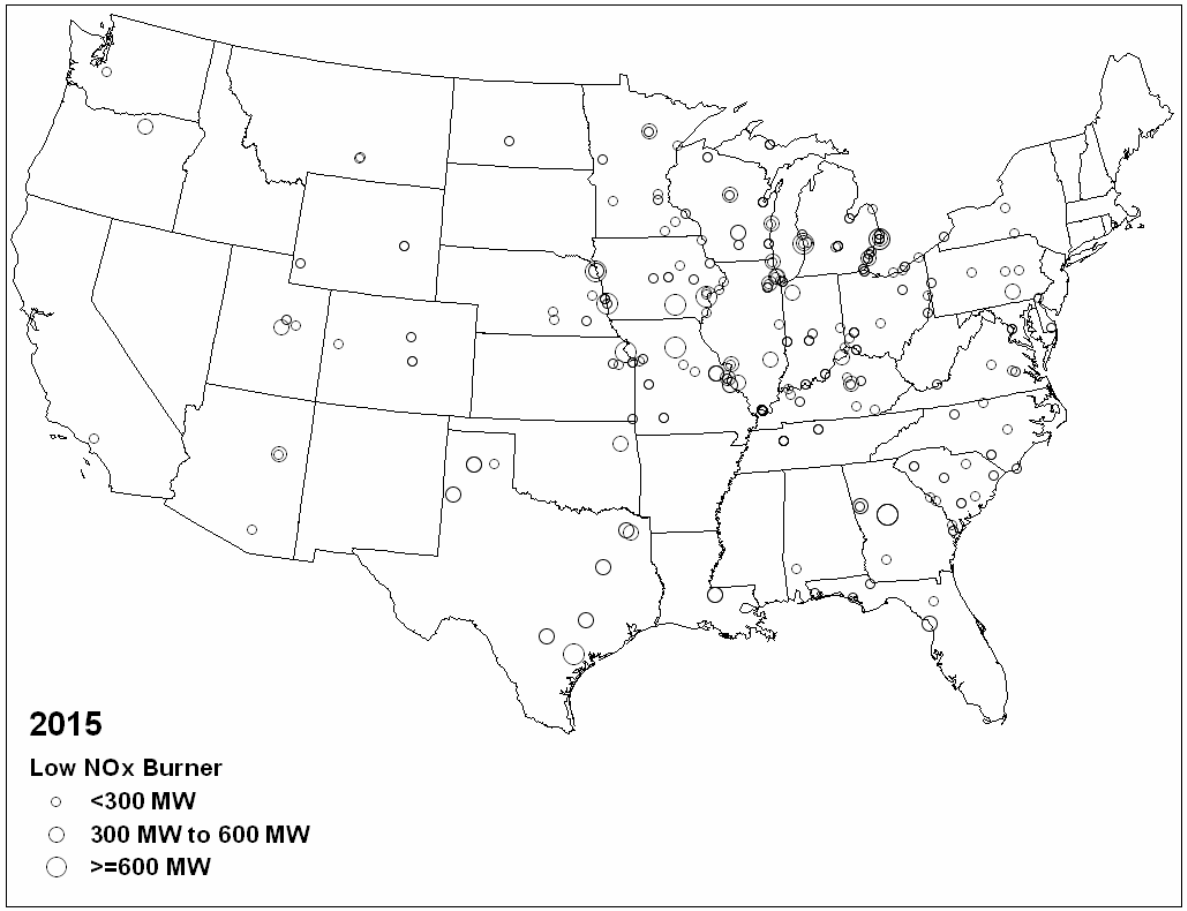
Coal-Fired Units Operating without Advanced Controls– 2010, 2015, 2020

Most coal-fired units operating without advanced pollution controls for SO_2 and NO_x (such as scrubbers or SCRs) have installed precombustion controls (low-NO_x burners) that provide for very low NO_x rates, and many may also burn low-sulfur coal and/or run at lower levels of operation. This slide (2010) and the next 2 slides show the decreasing number of units without advanced controls as CAIR is implemented.



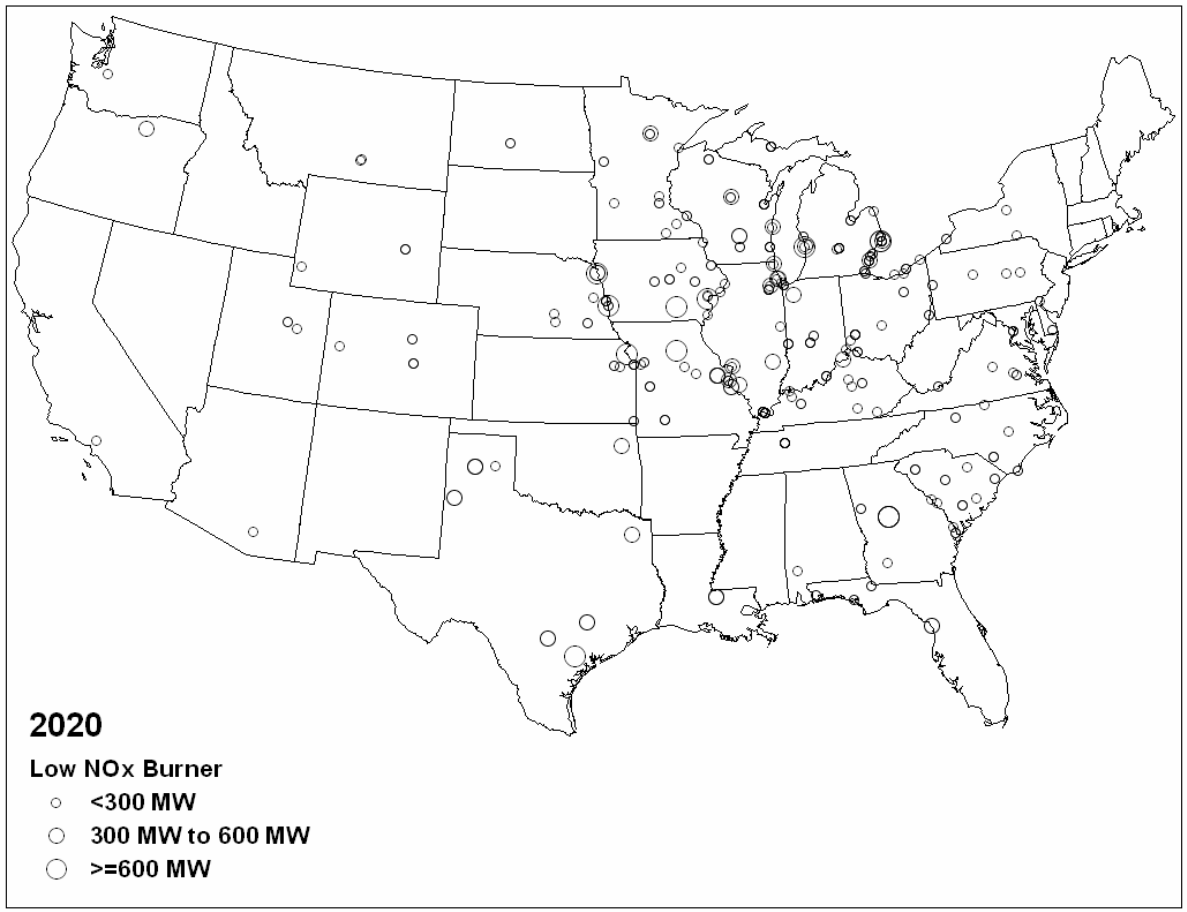
Coal-Fired Units Operating without Advanced Controls in 2015

This slide shows the decreasing number of units without advanced controls as CAIR is implemented, as of 2015.

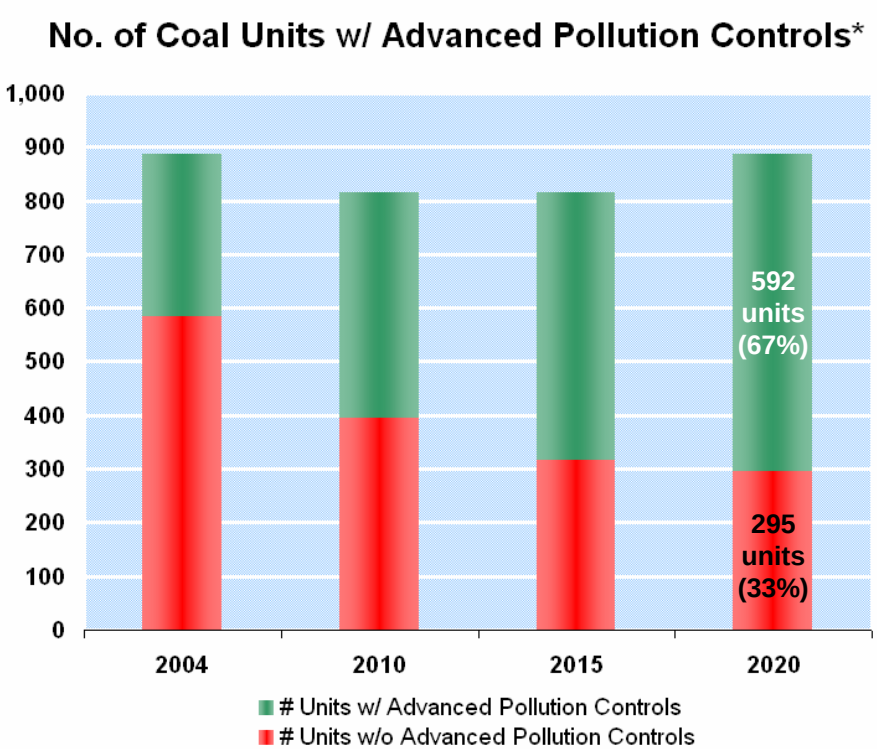


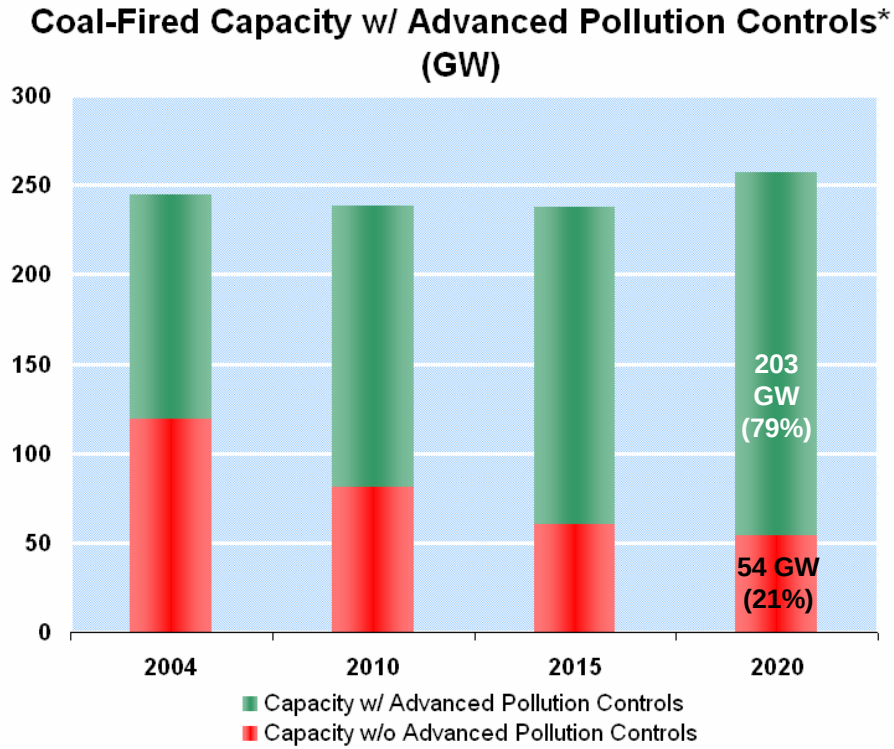
Coal-Fired Units Operating without Advanced Controls in 2020

This slide shows the decreasing number of units without advanced controls as CAIR is implemented, as of 2020.



Providing Context: Number of Regulated Units vs. Capacity





- Looking at the number of units without advanced pollution controls provides no information regarding the composition of those units (i.e., size). The largest and highest emitting units are typically the ones that install controls, as demonstrated by the graphics above.
- Units without advanced pollution controls for SO_2 and NO_x removal (either scrubbers, SCR, or SNCR) will typically have baghouses or electrostatic precipitators for particulate control, have combustion controls for NO_x control, and burn low-sulfur coal (from 0.45 to 1.2 lbs/mmBtu). In addition, these units will often be utilized less frequently.

* The existing coal fleet has already installed advanced controls for direct particulate control on almost every unit. Advanced pollution controls include scrubbers for SO_2 control and either SCR and SNCR technologies for NO_x control. All new pulverized coal-fired units will have both SCR and scrubbers. New IGCC is included as having advanced controls (IGCC is less-emitting than new coal with SCR and scrubbers). Data is for CAIR annual States only and includes affected sources with non-zero generation only (units ≤ 25 MW are not regulated by CAIR). Units from Delaware and New Jersey were not included as part of the CAIR region because the modeling was done prior to EPA's recent final rule to include them in the CAIR annual programs for SO_2 and NO_x. Adding these two States would not alter the results presented here in any significant way. Historical data is from EPA's National Electric Energy System database; projected data is from EPA's Integrated Planning Model.

Historical and Projected Pollution Controls in CAIR States

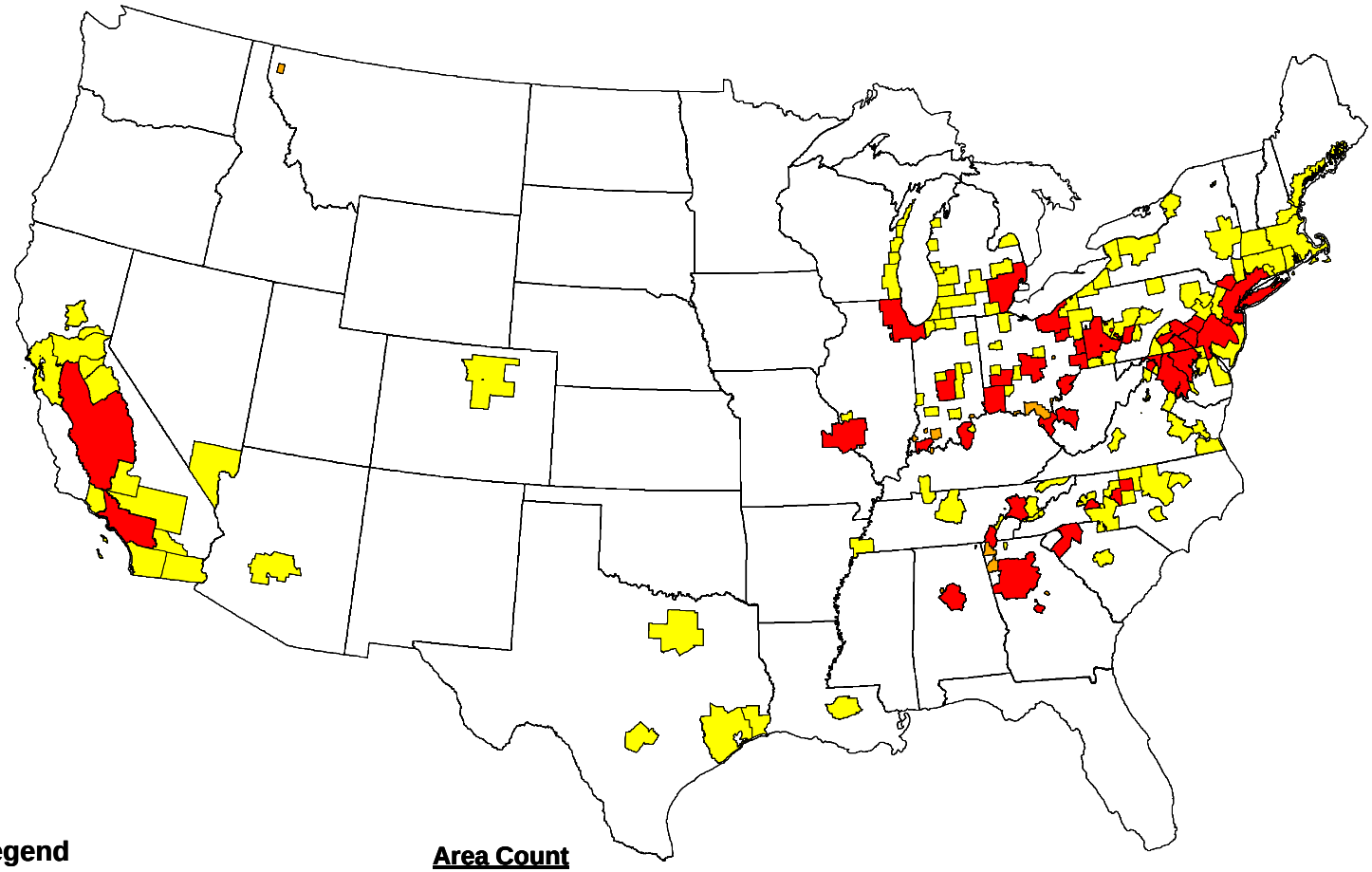
- There are many ways to analyze pollution control data; isolating one statistic (e.g., uncontrolled units) could provide an incomplete picture.
- **Although 295 regulated coal units* (33% of the total number of units) in CAIR States are projected to be without any scrubbers, SCR, or SNCR in 2020, those units represent only 21% of coal capacity and only 20% of CAIR-affected coal-fired generation.**

Historical and Projected Pollution Controls in the CAIR Region for Regulated Coal-Fired Units			
		Units w/o Advanced Pollution Controls	Units w/ Advanced Pollution Controls
2004	# of Units	576	305
	% of Total	65%	35%
	Capacity (GW)	118	125
	% of Total	48%	52%
2010	# of Units	394	421
	% of Total	48%	52%
	Capacity (GW)	81	158
	% of Total	34%	66%
2015	# of Units	316	499
	% of Total	39%	61%
	Capacity (GW)	61	177
	% of Total	25%	75%
2020	# of Units	295	592
	% of Total	33%	67%
	Capacity (GW)	54	203
	% of Total	21%	79%

* The existing coal fleet has already installed advanced controls for direct particulate control on almost every unit. Advanced pollution controls include scrubbers for SO_2 control and either SCR and SNCR technologies for NO_x control. All new pulverized coal-fired units will have both SCR and scrubbers. New IGCC is included as having advanced controls (IGCC is less-emitting than new coal with SCR and scrubbers). Data is for CAIR annual States only and includes affected sources with non-zero generation only (units ≤ 25 MW are not regulated by CAIR). Units from Delaware and New Jersey were not included as part of the CAIR region because the modeling was done prior to EPA's recent final rule to include them in the CAIR annual programs for SO_2 and NO_x. Adding these two States would not alter the results presented here in any significant way. Historical data is from EPA's National Electric Energy System database; projected data is from EPA's Integrated Planning Model.

VI. Getting Back to the Goal of Protecting Public Health and the Environment

Ozone and Particle Pollution: CAIR, together with other Air Programs, Will Bring Cleaner Air to Areas in the East

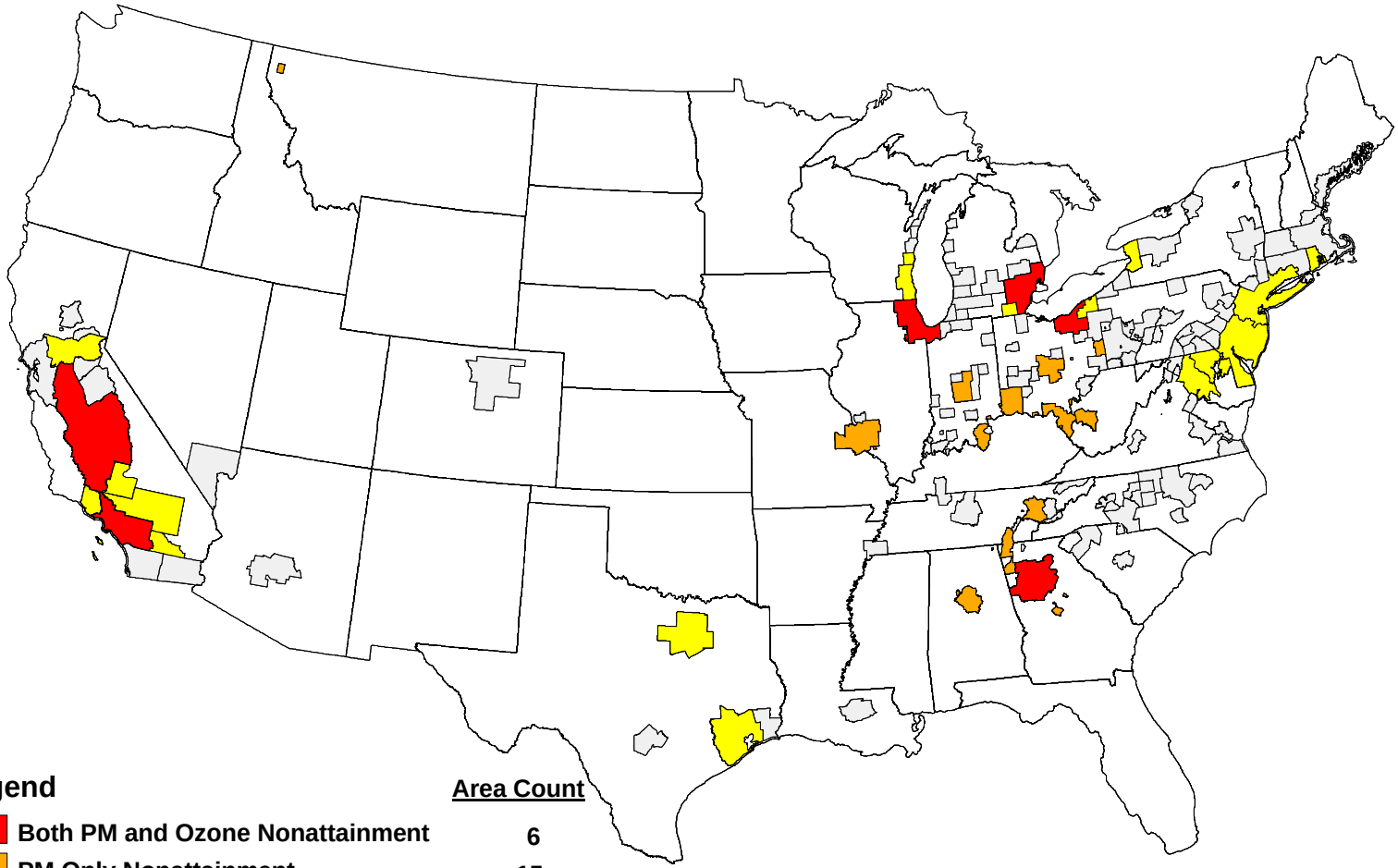


Legend	Area Count
Both PM and Ozone Nonattainment	36
PM Only Nonattainment	3
Ozone Only Nonattainment	90

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

92 Areas Are Projected to Meet the $PM_{2.5}$ and 8-Hour Ozone Standards in 2010

with CAIR/CAMR/CAVR and Some Current Rules* Absent Additional Local Controls



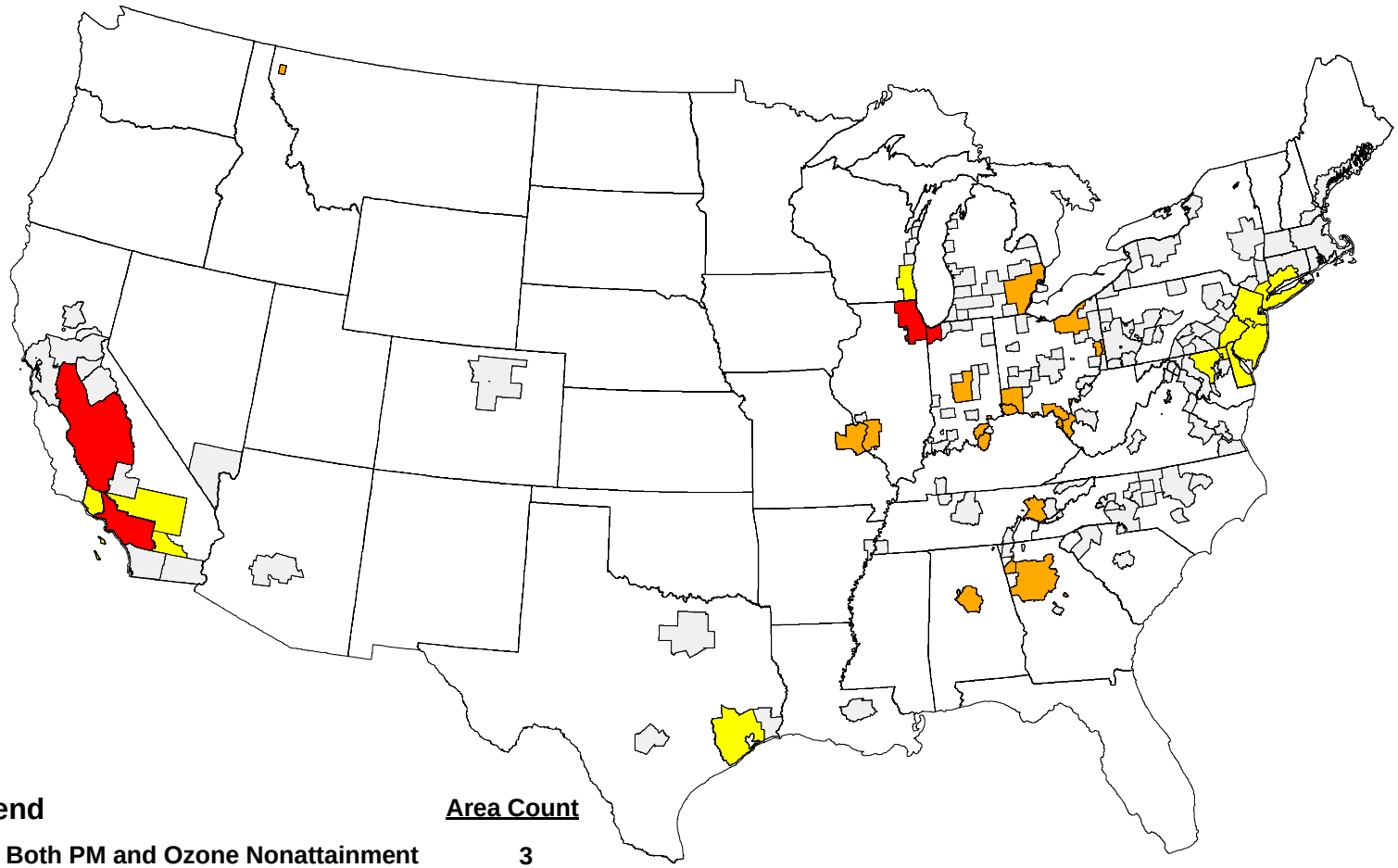
Legend	Area Count
Both PM and Ozone Nonattainment	6
PM Only Nonattainment	15
Ozone Only Nonattainment	16
Nonattainment areas projected to attain	92

**Areas forecast to remain in nonattainment may need to adopt additional local or regional controls to attain the standards by dates set pursuant to the Clean Air Act. These additional local or regional measures are not forecast here, and therefore this figure overstates the extent of expected nonattainment.

*Current rules include Title IV of CAA, NO_x SIP Call, and some existing State rules.

104 Areas Projected to Meet the $PM_{2.5}$ and 8-Hour Ozone Standards in 2015

with CAIR/CAMR/CAVR and Some Current Rules* Absent Additional Local Controls



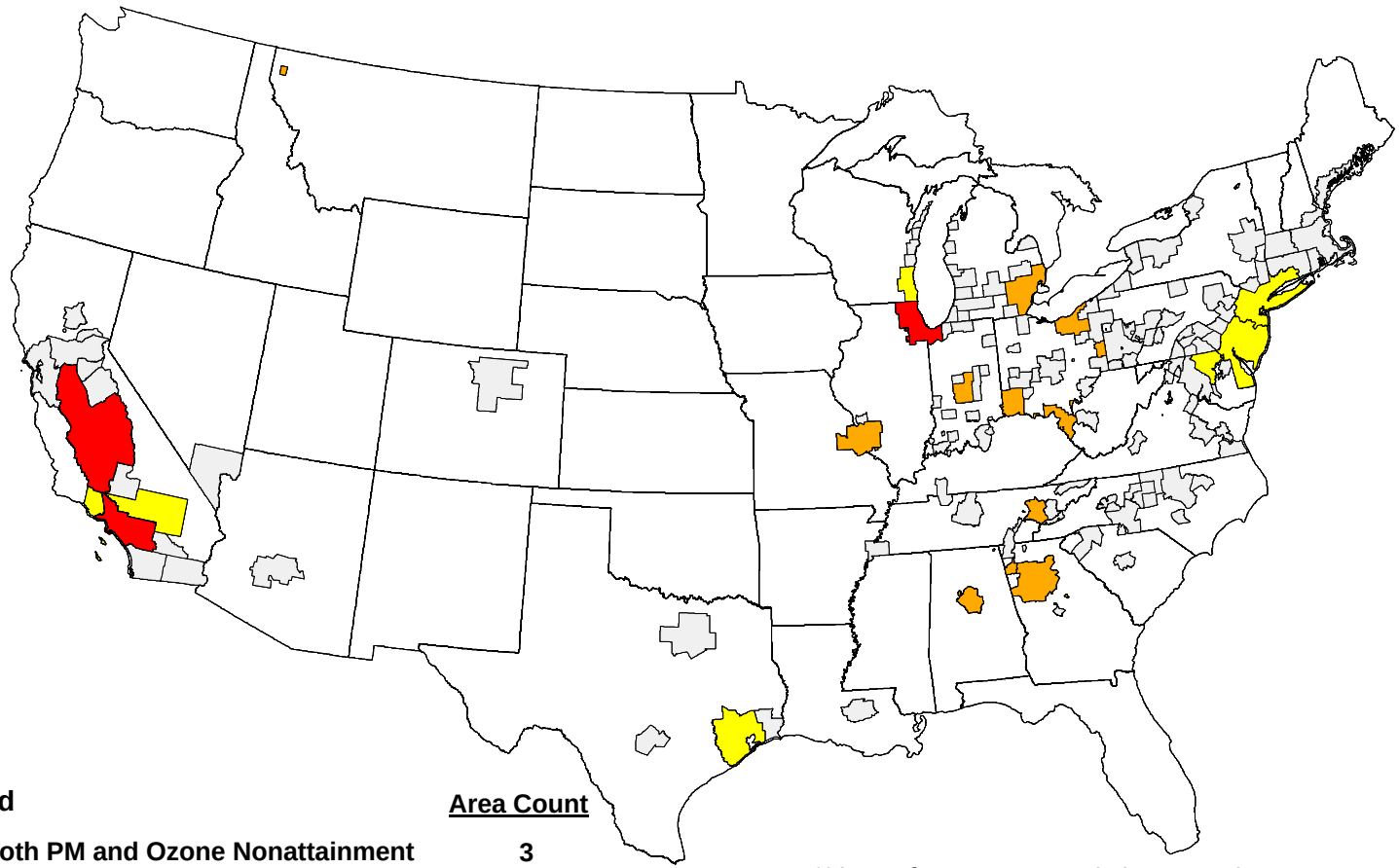
Legend	Area Count
Both PM and Ozone Nonattainment	3
PM Only Nonattainment	14
Ozone Only Nonattainment	8
Nonattainment areas projected to attain	104

**Areas forecast to remain in nonattainment may need to adopt additional local or regional controls to attain the standards by dates set pursuant to the Clean Air Act. These additional local or regional measures are not forecast here, and therefore this figure overstates the extent of expected nonattainment.

*Current rules include Title IV of CAA, NO_x SIP Call, and some existing State rules.

106 Areas Projected to Meet the $PM_{2.5}$ 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	3
PM Only Nonattainment	13
Ozone Only Nonattainment	7
Nonattainment areas projected to attain	106

**Areas forecast to remain in nonattainment may need to adopt additional local or regional controls to attain the standards by dates set pursuant to the Clean Air Act. These additional local or regional measures are not forecast here, and therefore this figure overstates the extent of expected nonattainment.

*Current rules include Title IV of CAA, NO_x SIP Call, and some existing State rules.

Summary

- What is CAIR designed to do?
  - Reduce interstate transport of fine particles and ozone
- Why does CAIR offer states an emissions cap and trade approach?
  - Most cost-effective way to reduce regional pollution from power plants
- Will CAIR/CAMR/CAVR result in new advanced pollution controls for SO_2 and NO_x on power generating sources?
  - Results in advanced SO_2 and NO_x controls on over 80% of coal-fired generation. Already have widespread major controls on particulates.
- How and where will emission reductions occur under CAIR/CAMR/CAVR in 2010, 2015, and 2020?
  - Largest emitting states make the largest reductions
- What happens to coal-fired sources without advanced SO_2 and NO_x controls in 2010, 2015, and 2020?
  - Many of these units contribute to reductions through highly effective low-NOx burners, lower sulfur coals, and reduced operation—they are primarily the smallest units.
  - State and local governments remain empowered to control these units further, where warranted.
  - Air quality will still improve due to reductions from other coal-fired sources in the area that will run more.

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/