



Air Emissions Cap and Trade Programs *An Update*

Presentation for
National Association of Regulatory Utility Commissioners

U.S. Environmental Protection Agency
Office of Air and Radiation
February 18, 2007



Overview

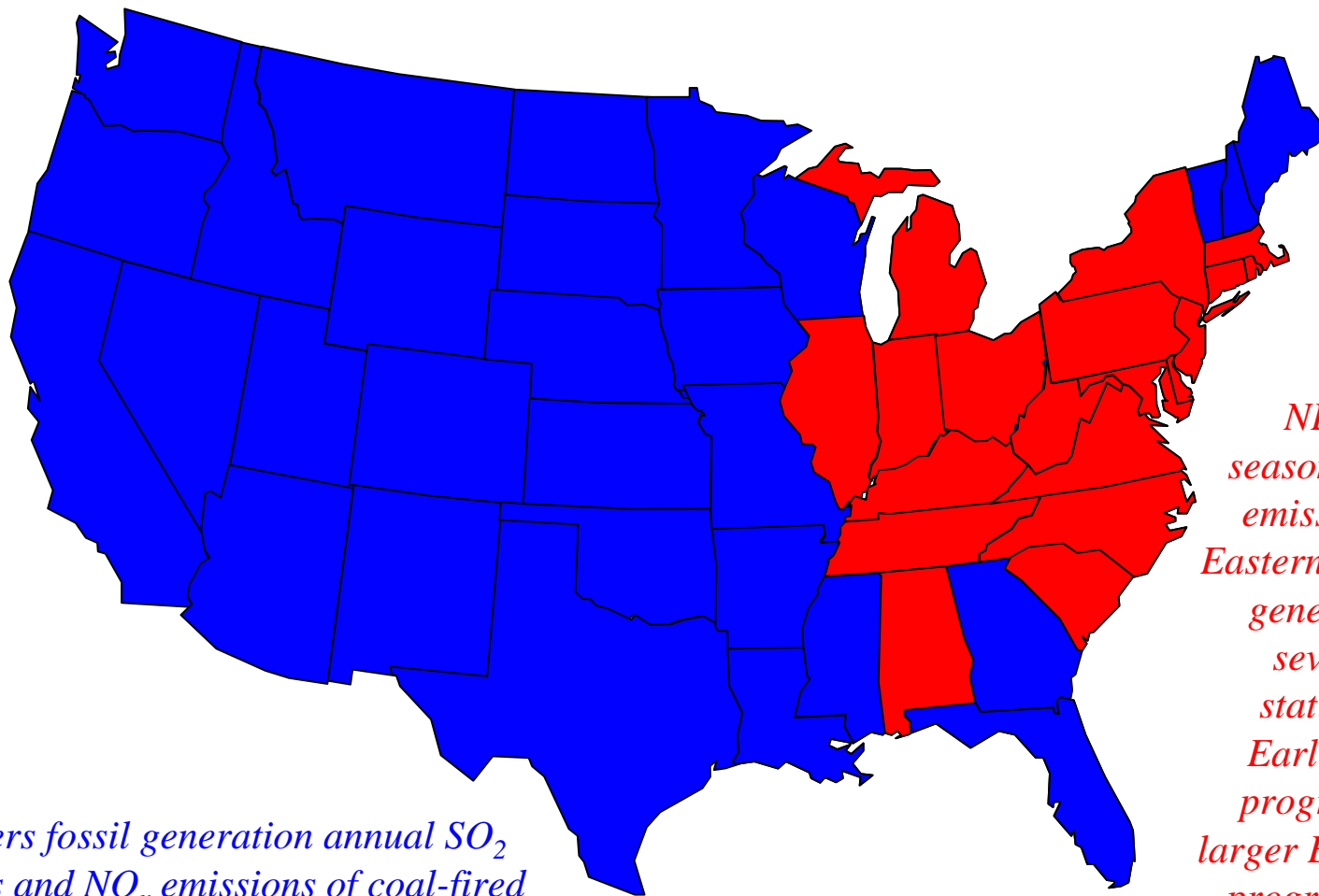
Status of:

- **Acid Rain Program (ARP)**
- **NO_x Budget Trading Program (NBP)**
- **Clean Air:**
 - **Interstate Rule (CAIR)**
 - **Mercury Rule (CAMR)**
 - **Visibility Rule (CAVR)**

Power Sector Reductions of SO₂ NO_x and Hg



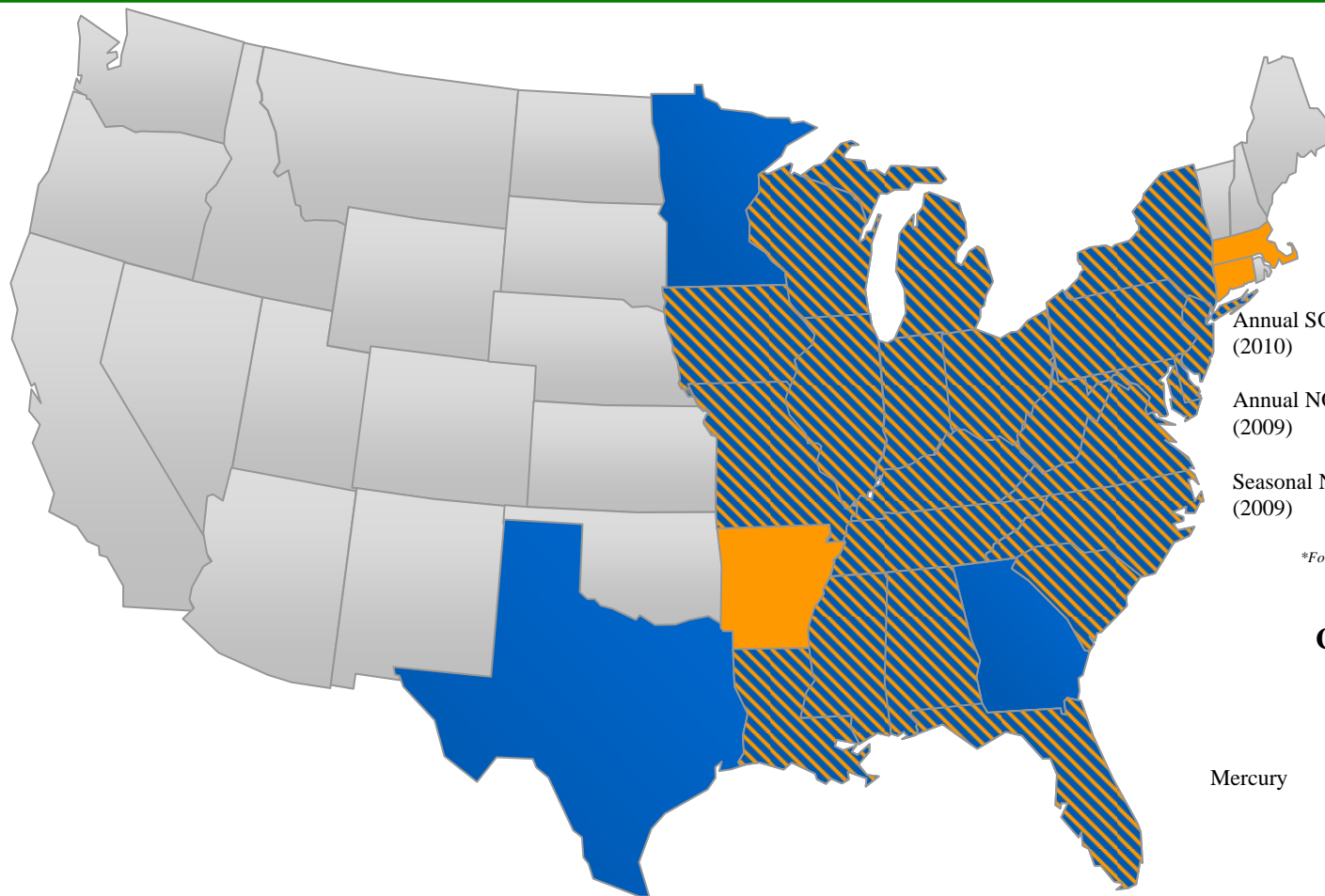
Coverage of ARP and NBP







ARP covers fossil generation annual SO₂ emissions and NO_x emissions of coal-fired generators in contiguous U.S.. Largest SO₂ and NO_x emitters faced control in 1995 and 1996, respectively, all others in program in 2000.

NBP covers ozone season (summer) NO_x emissions in selected Eastern states for fossil generator units (and several other large stationary sources). Earlier northeastern program replaced by larger Eastern regional program beginning in 2004.

CAIR Sets Stage for CAMR and CAVR



-  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

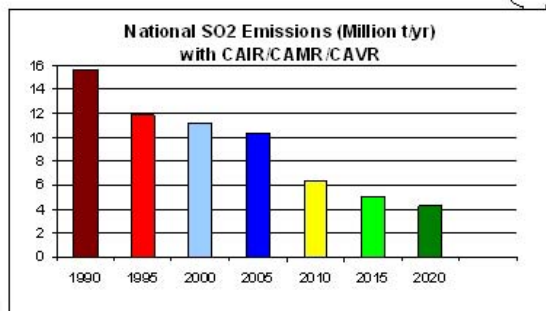
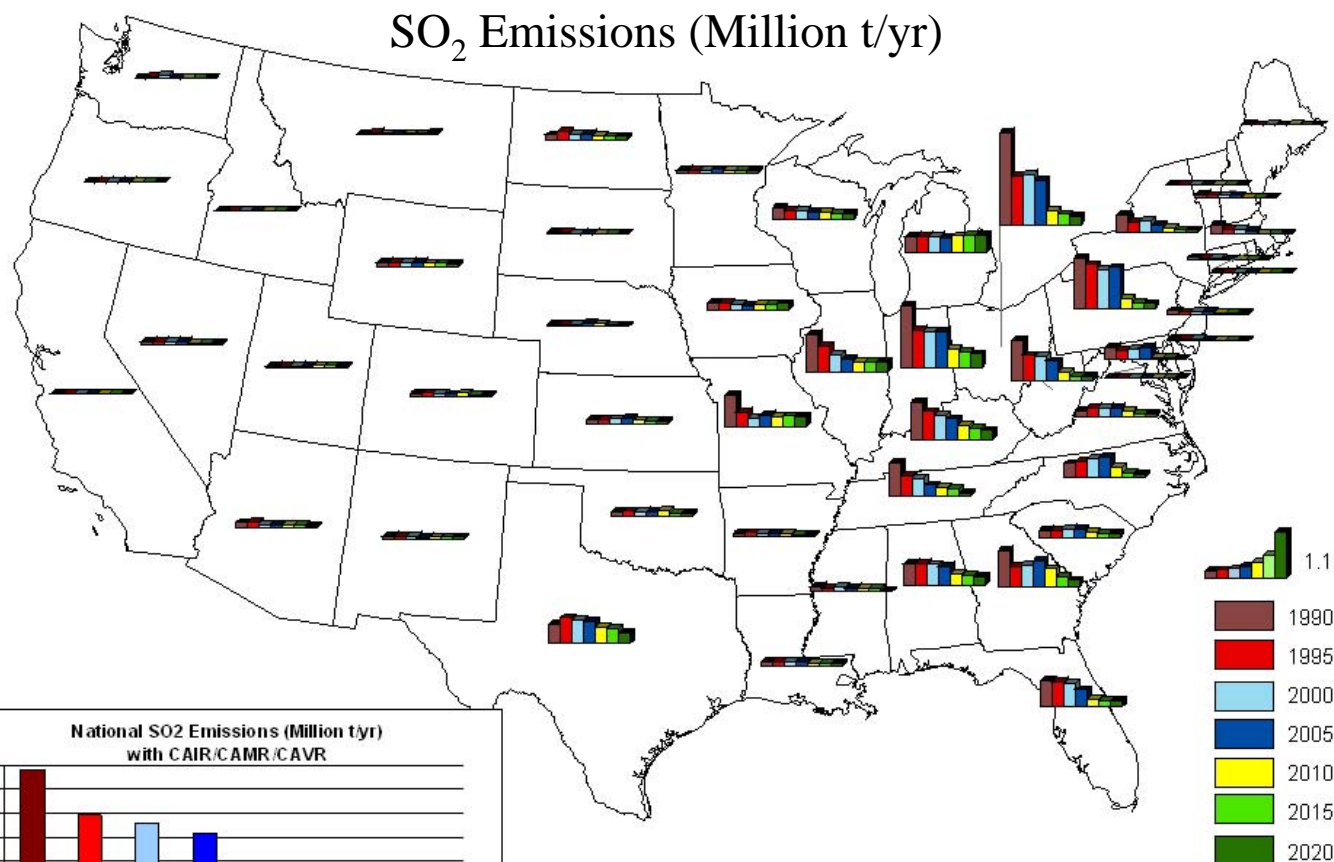
(tons)

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

CAVR

**Outside of CAIR Region –
BART (best available retrofit
technology)**

SO₂ Emissions with ARP and CAIR/CAMR/CAVR



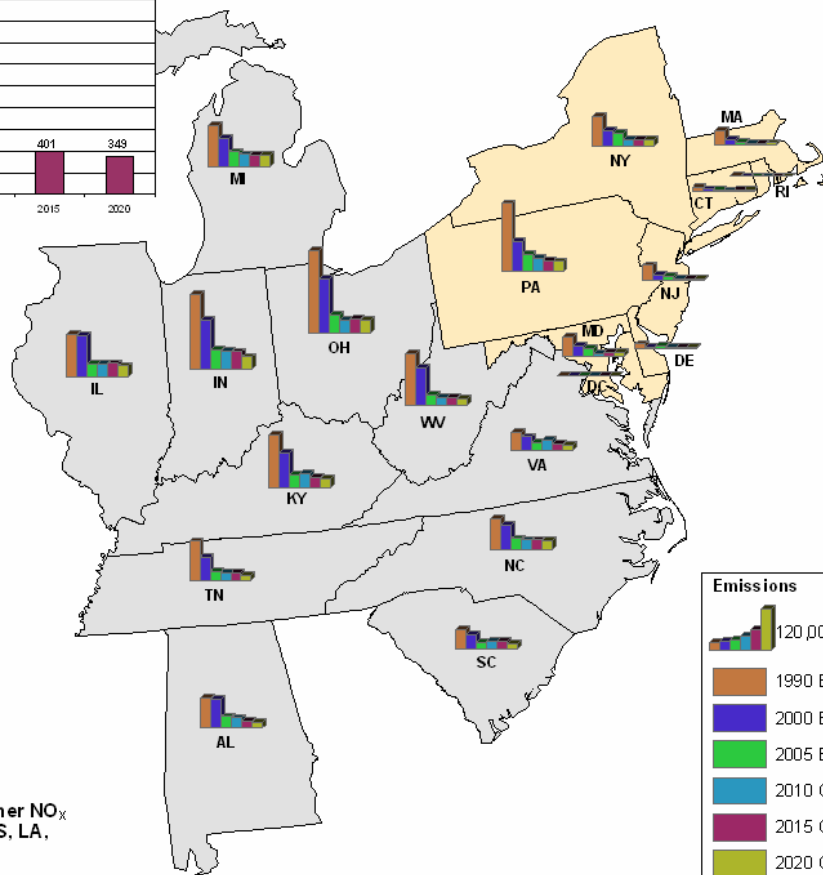
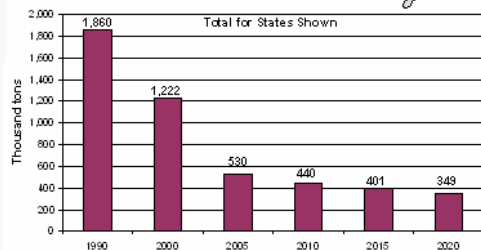
* Pre 2010 data is based on Title IV emissions.
2010, 2015, and 2020 is based on IPM projections with CAIR/CAMR/CAVR.

Source: EPA, 2006.

NO_x Emissions with NBP and CAIR/CAMR/CAVR



NO_x Budget Trading Program Ozone Season NO_x Emissions from 1990, 2000, and 2005, and 2010, 2015, and 2020 CAIR/CAMR/CAVR Projected Emissions

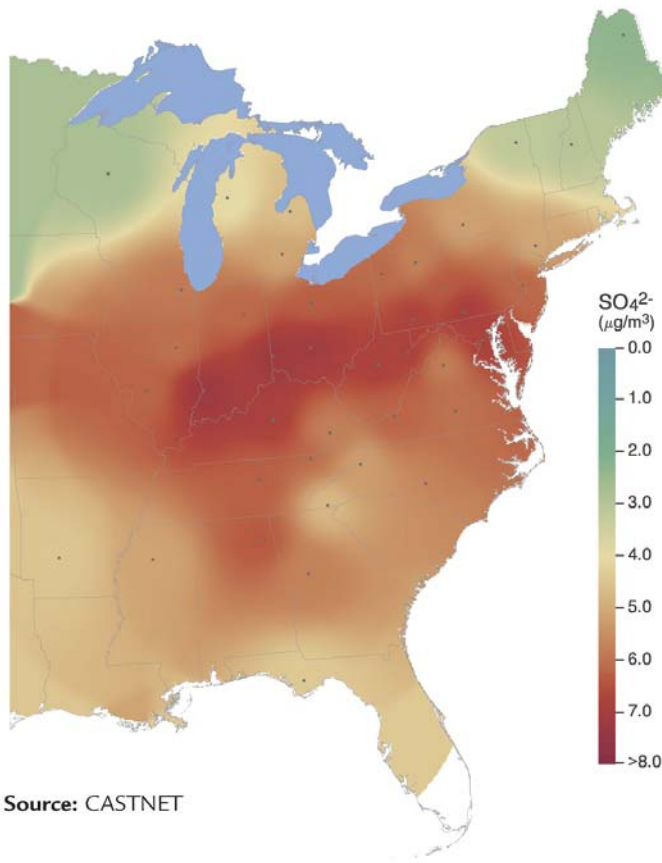


Note: CAIR will also lead to summer NO_x reductions over AR, FL, GA, IA, KS, LA, MN, MO, MS, TX, and WI.

Acid Rain Environmental Progress: Sulfate

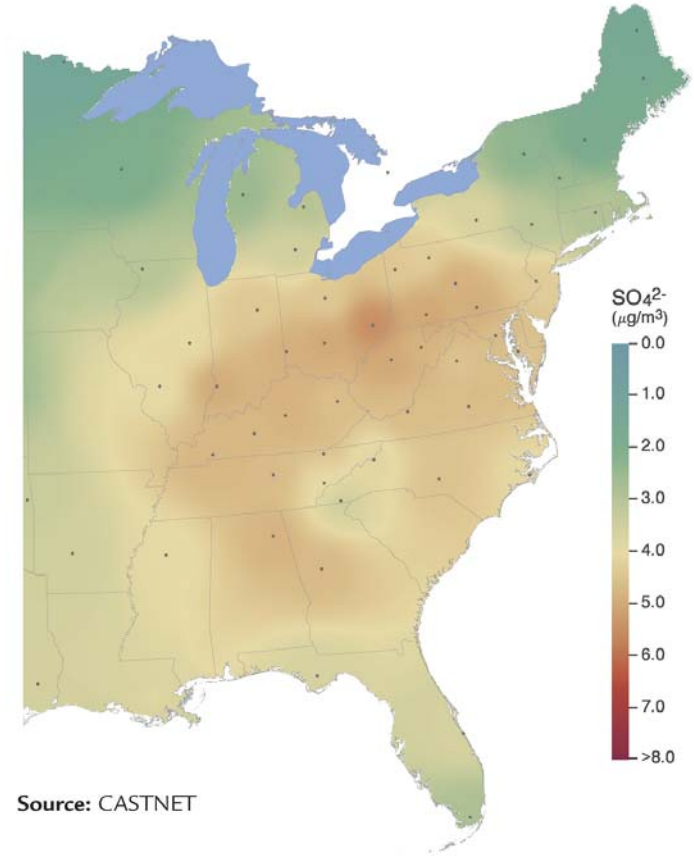


Annual Mean Ambient Sulfate Concentration,
1989–1991



Source: CASTNET

Annual Mean Ambient Sulfate Concentration,
2003–2005



Source: CASTNET

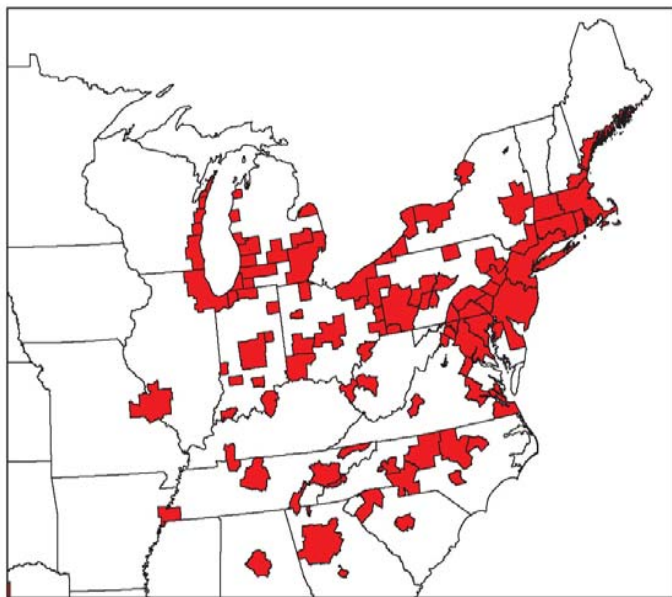
*Dots on all maps represent monitoring sites. Lack of shading for southern Florida indicates lack of monitoring coverage.

Ozone Air Quality Improvements from the NBP



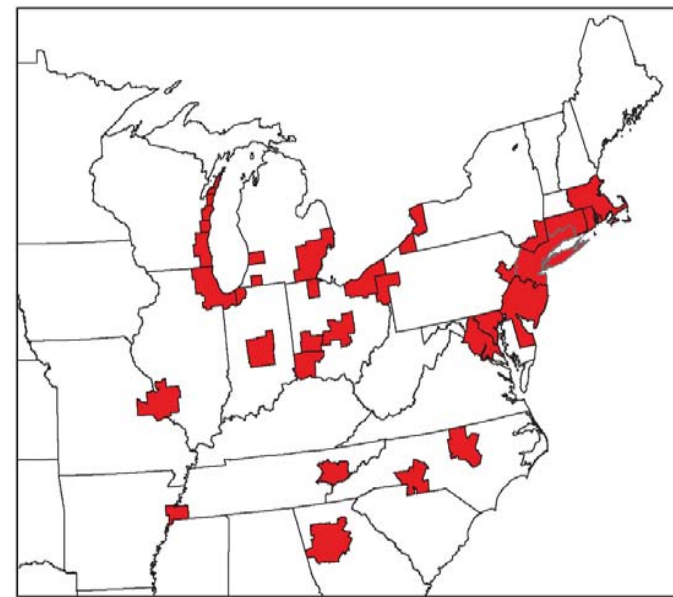
2003

8-Hour Ozone Nonattainment Areas,
April 2004 (2001-2003 Air Quality Data)



2005

Areas Remaining Above Standard
(2003-2005 Air Quality Data)



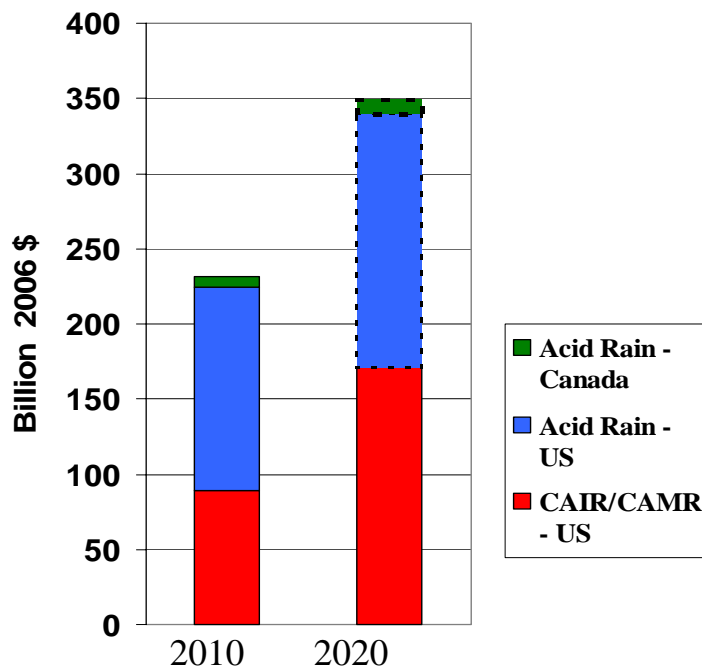
Note: Included in the maps, but excluded from the analysis, are four areas with incomplete data for 2003 to 2005 (Cass Co, MI; Dayton-Springfield, OH; Essex Co (Whiteface Mtn), NY; LaPorte, IN).

Nearly 70 percent of the areas out of attainment in 2003 are now below the ozone standard in 2005. Power plant NO_x reductions is the major contributor to this improvement.

Benefits of Acid Rain and CAIR Programs

Annual Benefits

-Qualified Assessment-



Note: All estimates used a 3% discount rate. Use of 7% discount rate would lower estimates about 15 percent. CPI-U used to convert 1999\$ and 2000\$ to 2006\$. Sources: Used Chestnut & Mills Analysis, "A fresh look at the benefits and costs of the US acid rain program" (Oct. 1, 2004) for 2010 Acid Rain Benefits and EPA's Multi-pollutant Regulatory Analysis: CAIR, CAVR, CAMR (Oct. 2005) for 2010 and 2020 estimates for these programs. Acid Rain 2020 benefits extrapolated from 2010 estimates.

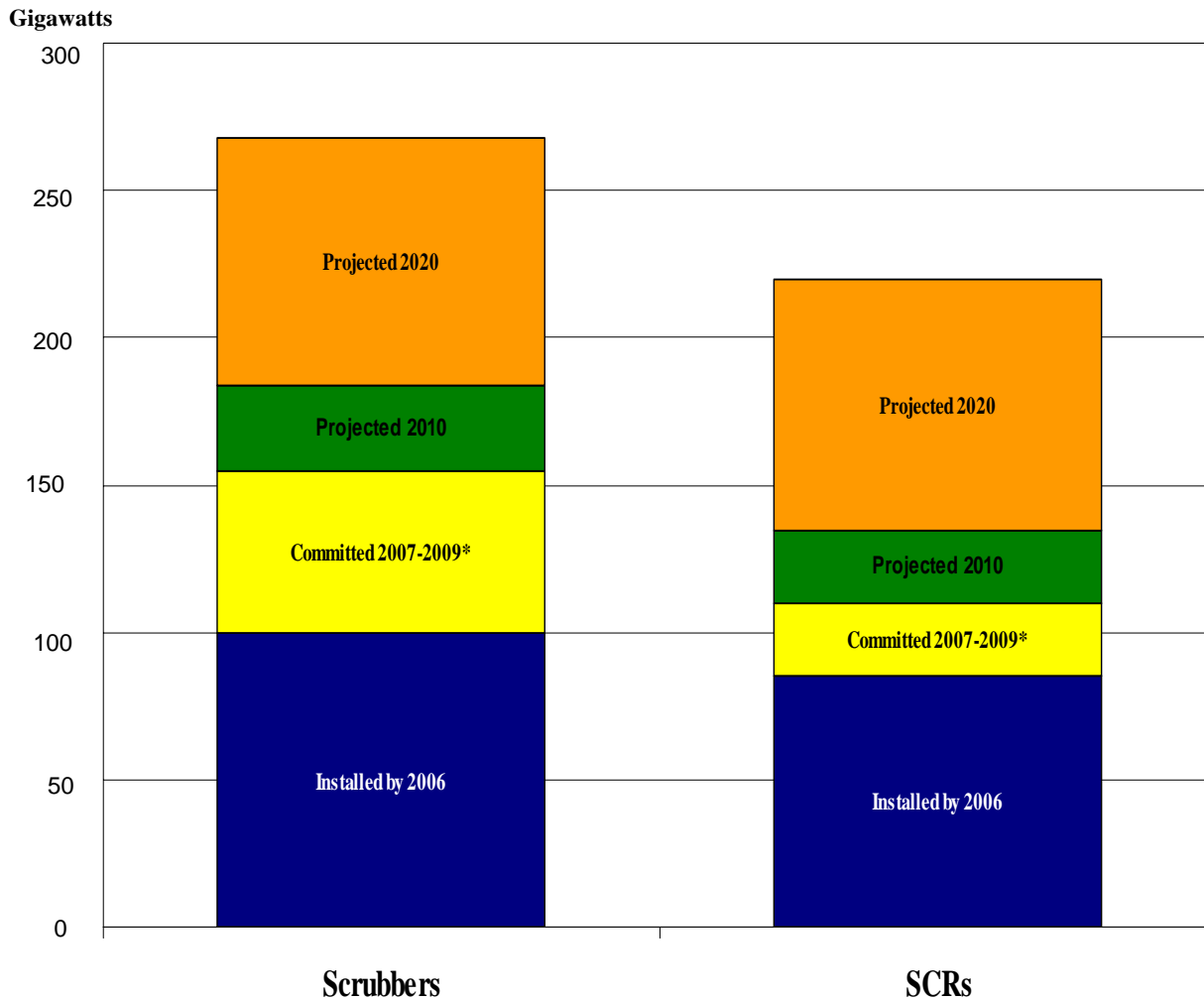
- Benefits are driven by:
 - Reduced premature deaths
 - Lowering aggravation and incidence of heart and lung ailments
 - There also some benefits estimated for increased worker productivity, reduced absences from school and work, and visibility improvement in some parks
- Many benefits are not included in estimates:
 - CAIR's Canadian Health Benefits
 - Acid rain environmental benefits
 - Mercury benefits
 - Remaining visibility benefits from parks and urban areas
 - Others
- Found that the benefits are far outweighing the costs for these programs:
 - ARP has a benefit to cost ratio of 40 to 1
 - CAIR has B/C ratio of more than 25 to 1
- For context, from the Energy Information Administration's latest forecast (AEO 2007) you can estimate electricity sales of about \$320 billion and \$360 billion in 2010 and 2020, respectively (\$2005).

CAIR, CAMR, and CAVR Implementation



- Main rules are done – programs are moving into place.
- State plan development is advancing.
- EPA is providing Federal backstop programs.
 - CAIR Federal Implementation Plan in effect
 - CAMR Federal plan proposed
- Litigation is in progress, there was a favorable CAVR decision recently.
- Power industry is actively installing pollution controls and making other compliance preparations.

Advanced Pollution Controls for SO₂ and NO_x that Are Installed, Committed to, and Projected for Coal-fired Generation



- EPA has estimated the “Committed 2007-2009” upfront capital costs for pollution controls on existing plants to be over \$12 billion.
- EPA has estimated the upfront capital costs for forecasted additional pollution control retrofits to be about \$8 billion in 2010, \$6 billion in 2015, and more than \$3 billion by 2020. (Pollution control expenditures for new coal-fired units that EPA projects to be built are close to \$4 billion in 2015 and over \$9 billion in 2020.)
- Roughly two-thirds of existing coal-fired capacity is located in a cost-of-service area.
- Many units will have both SCR and FGD installed (by 2020, about 320 existing coal-fired units and an additional 100 new coal-fired units that are projected to be built).

Note: All dollar figures are \$2005.

Source: EPA's use of the Integrated Planning Model in 2006..

Source: EPA 2006 Base Case for CAIR, CAMR, and CAVR results from IPM and 2004 and 2006 NEEDS data sets for IPM.

*Committed 2007-2009 based on reports from selected major companies. It is an understatement of controls going into place now.

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