

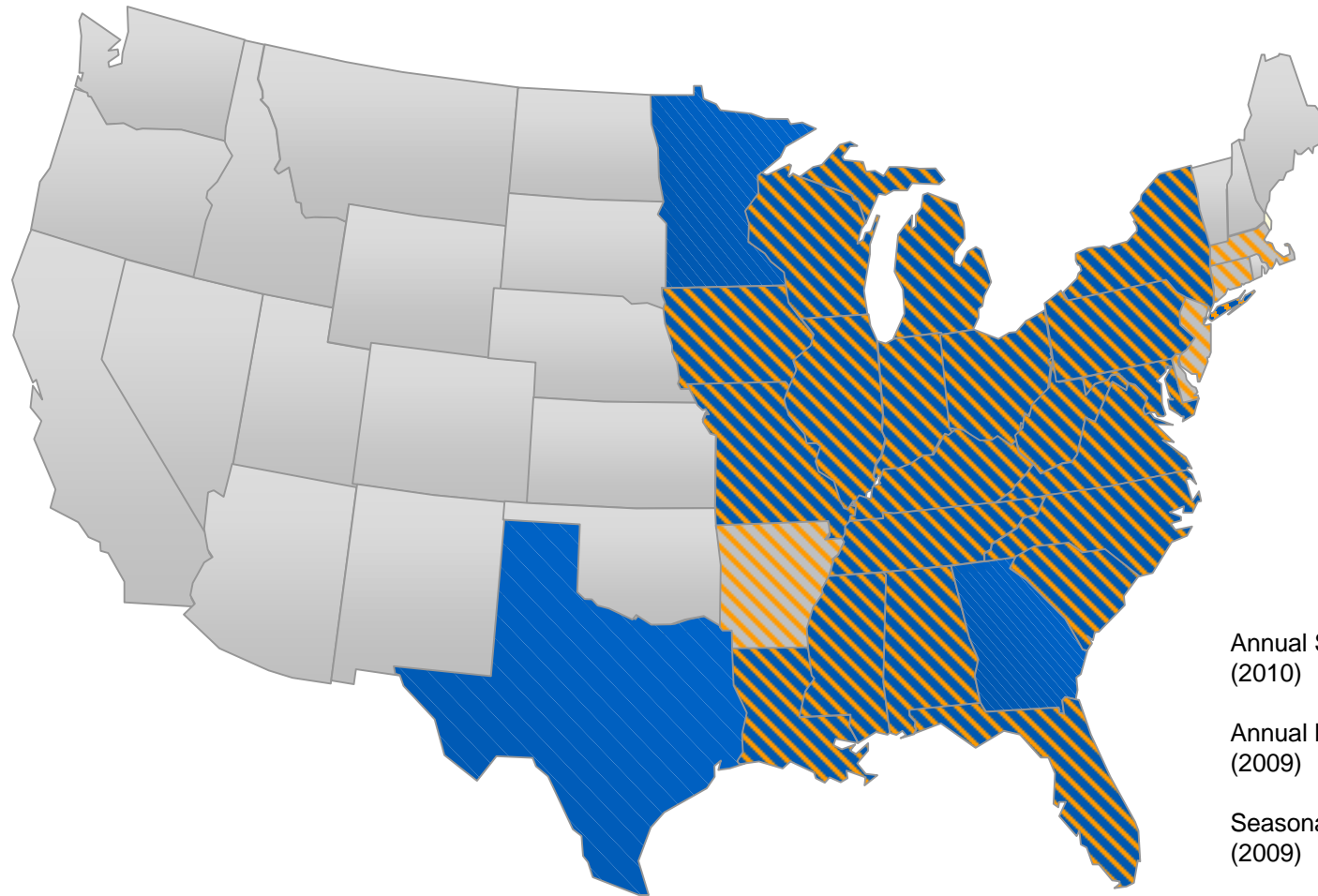
Mercury Co-benefits of the Clean Air Interstate Rule



Sam Napolitano
Office of Air and Radiation
U.S. Environmental Protection Agency
November 18, 2005



CAIR: Affected Region and Emission Caps



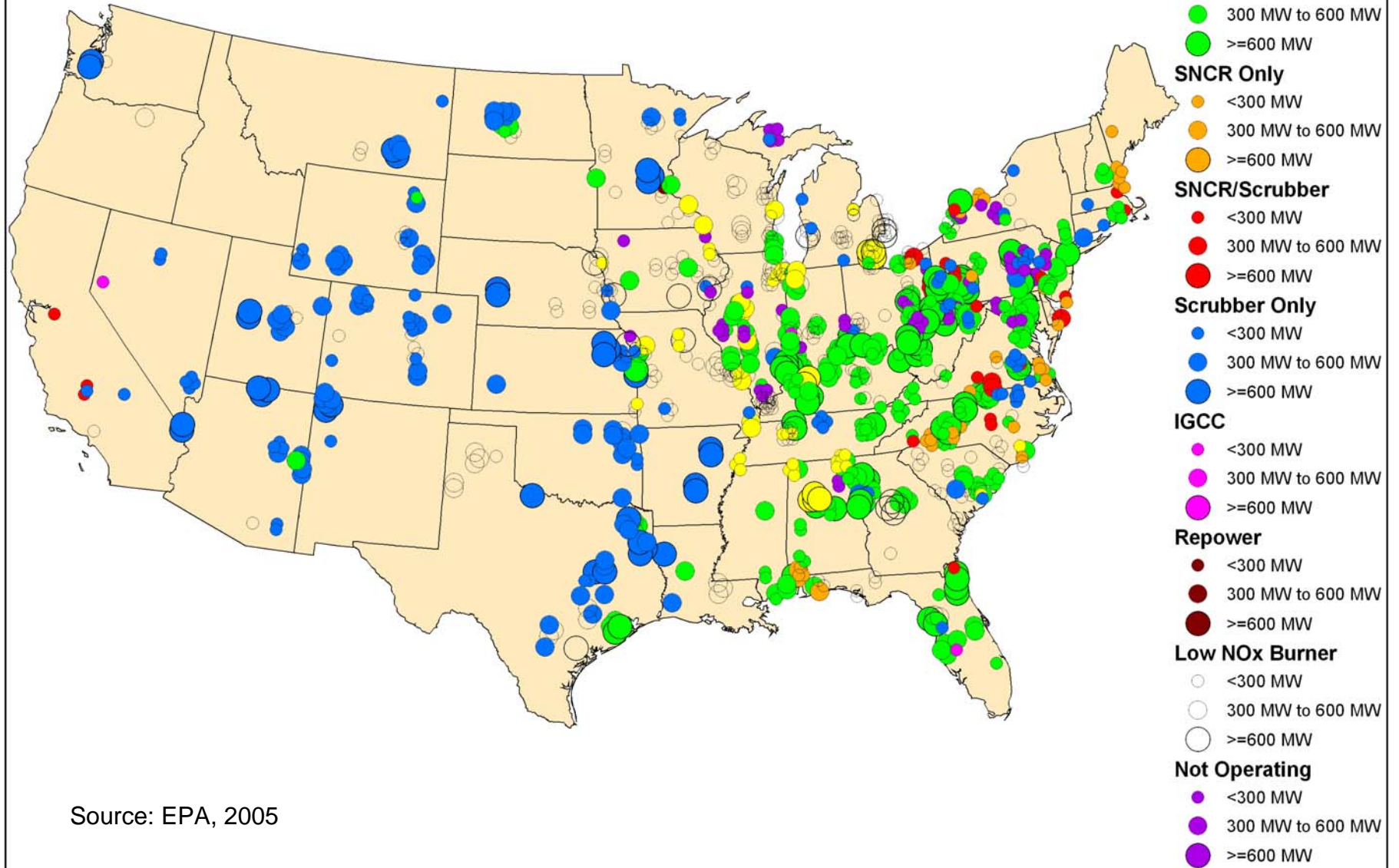
- States controlled for fine particles (annual SO₂ and NO_x)
- States controlled for ozone (ozone season NO_x)
- States controlled for both fine particles (annual SO₂ and NO_x) and ozone (ozone season NO_x)
- States not covered by CAIR

Emission Caps* (million tons)

	<u>2009/2010</u>	<u>2015</u>
Annual SO ₂ (2010)	3.6	2.5
Annual NO _x (2009)	1.5	1.3
Seasonal NO _x (2009)	.58	.48

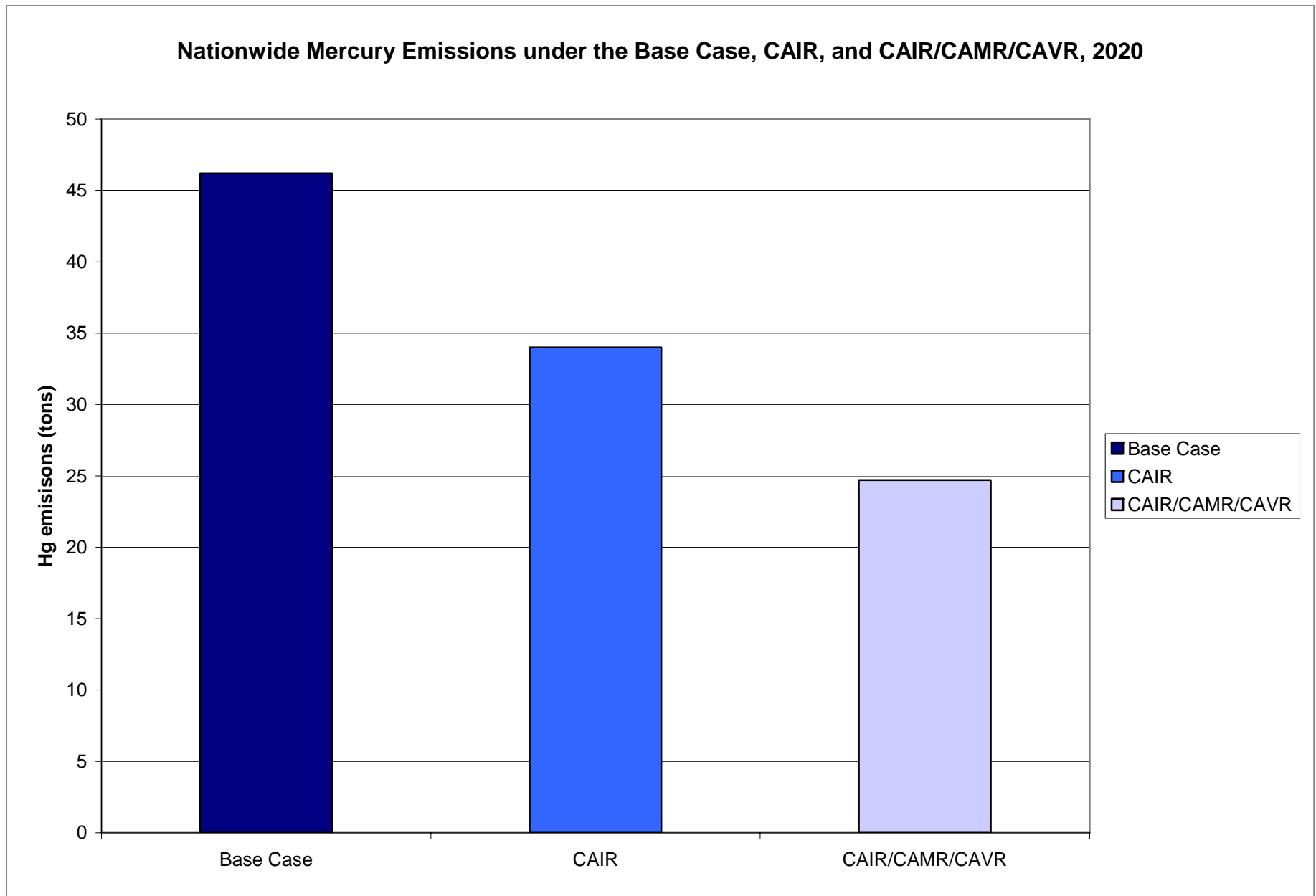
*For the affected region.

Projected Retrofits at Coal Fired Units After CAIR, CAMR, and CAVR in 2020

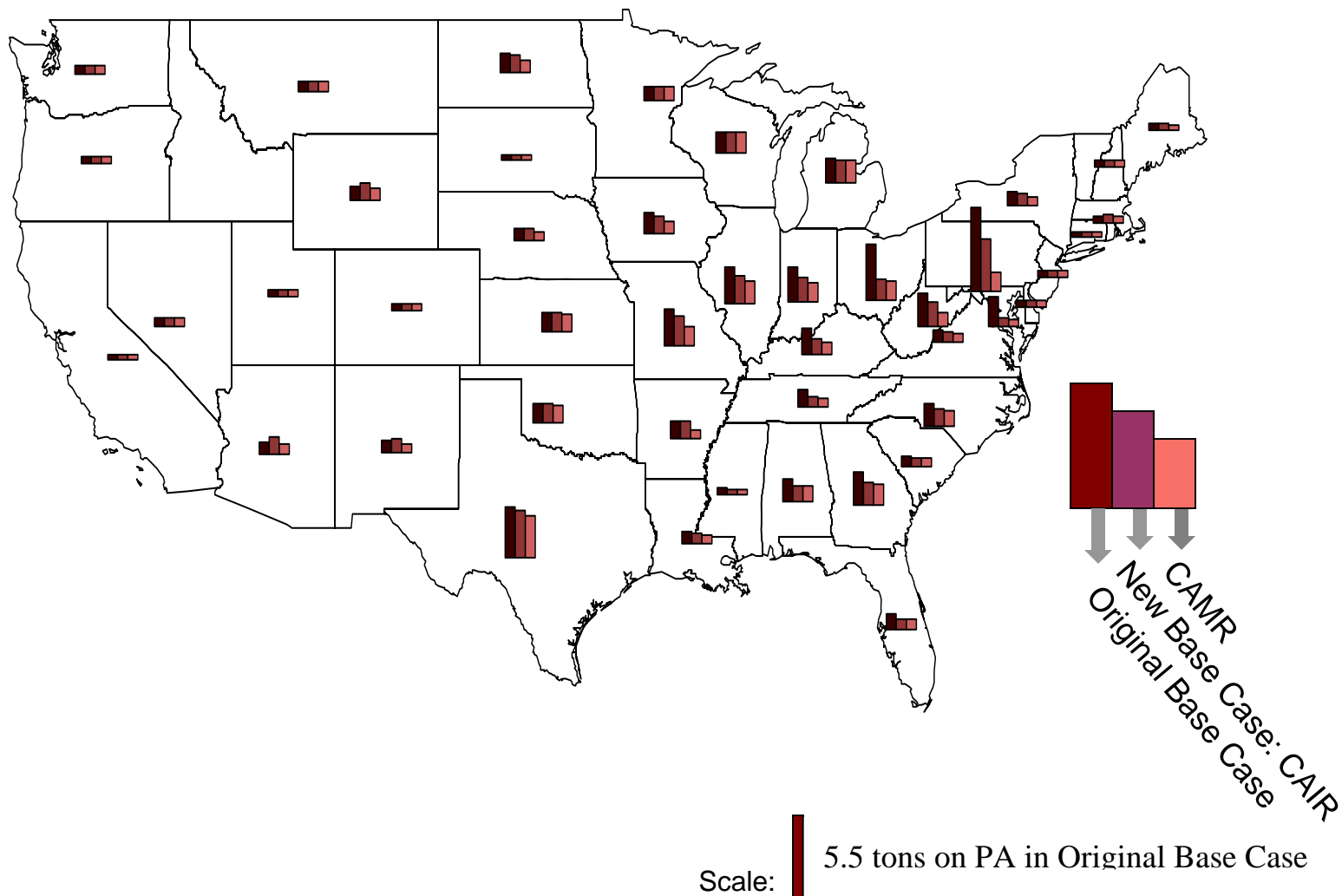


Source: EPA, 2005

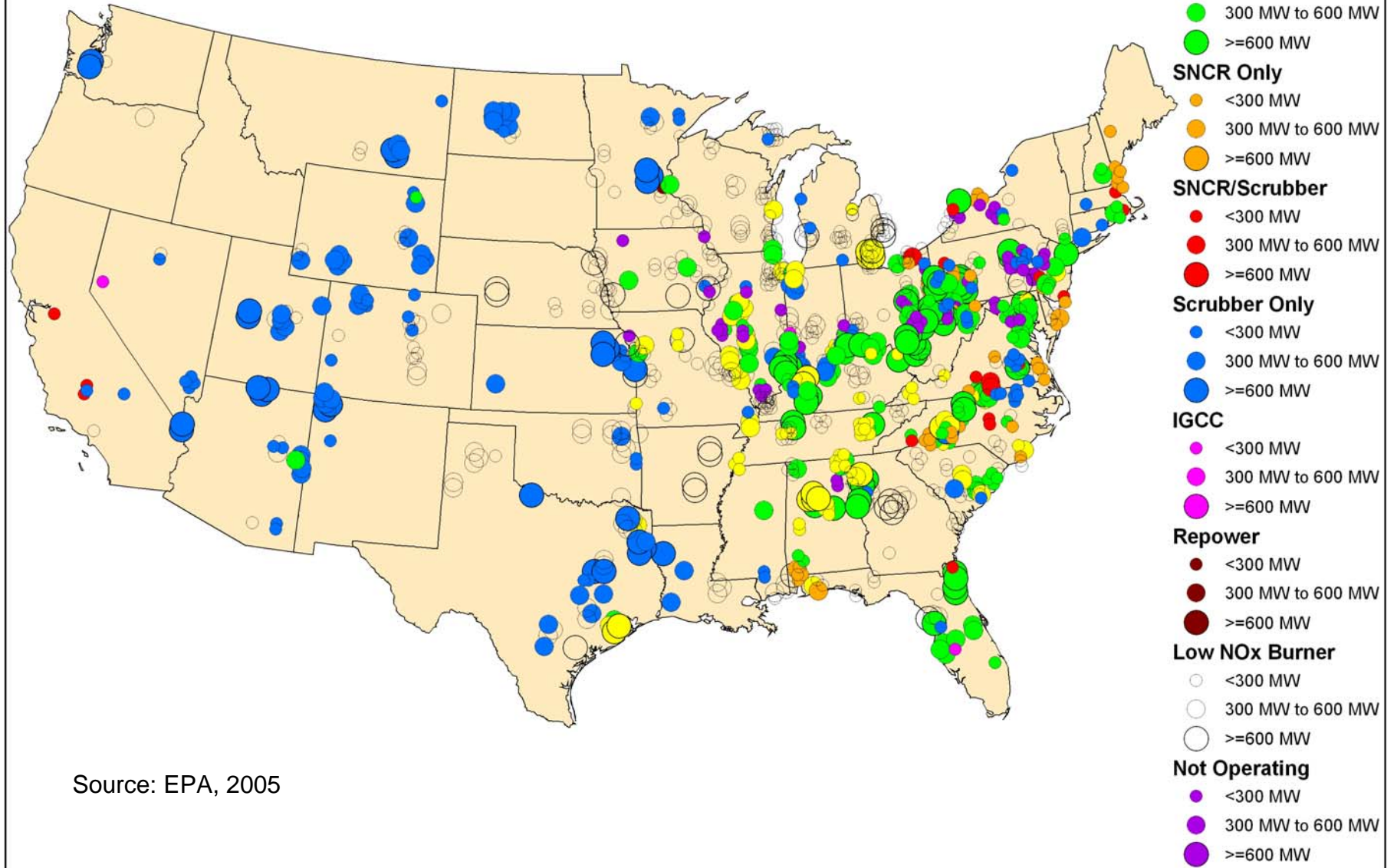
CAMR Builds Off of CAIR's Mercury Co-benefits



Projected 2020 Hg Emissions for Power Plants w CAMR



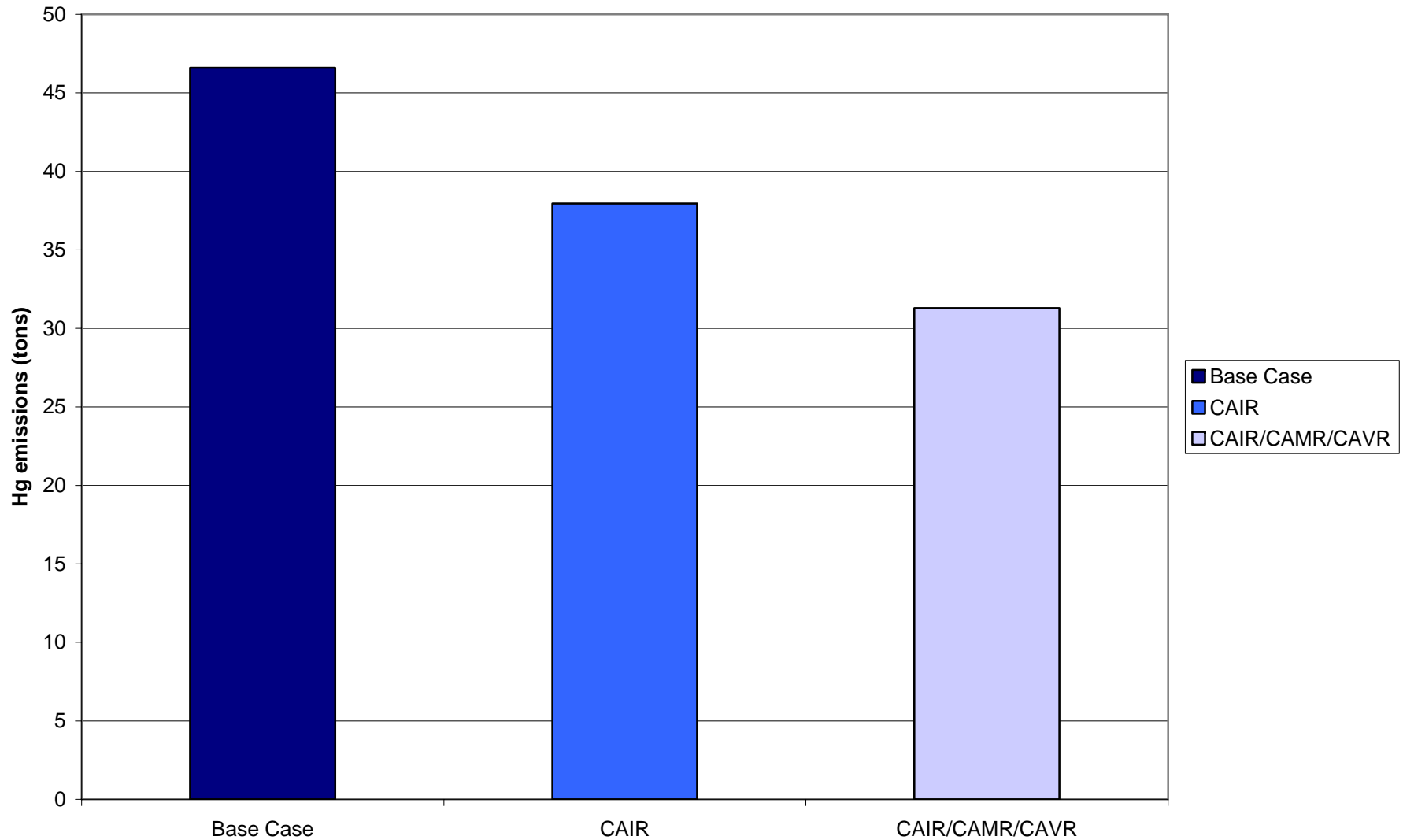
Projected Retrofits at Coal Fired Units After CAIR, CAMR, and CAVR in 2010



Source: EPA, 2005

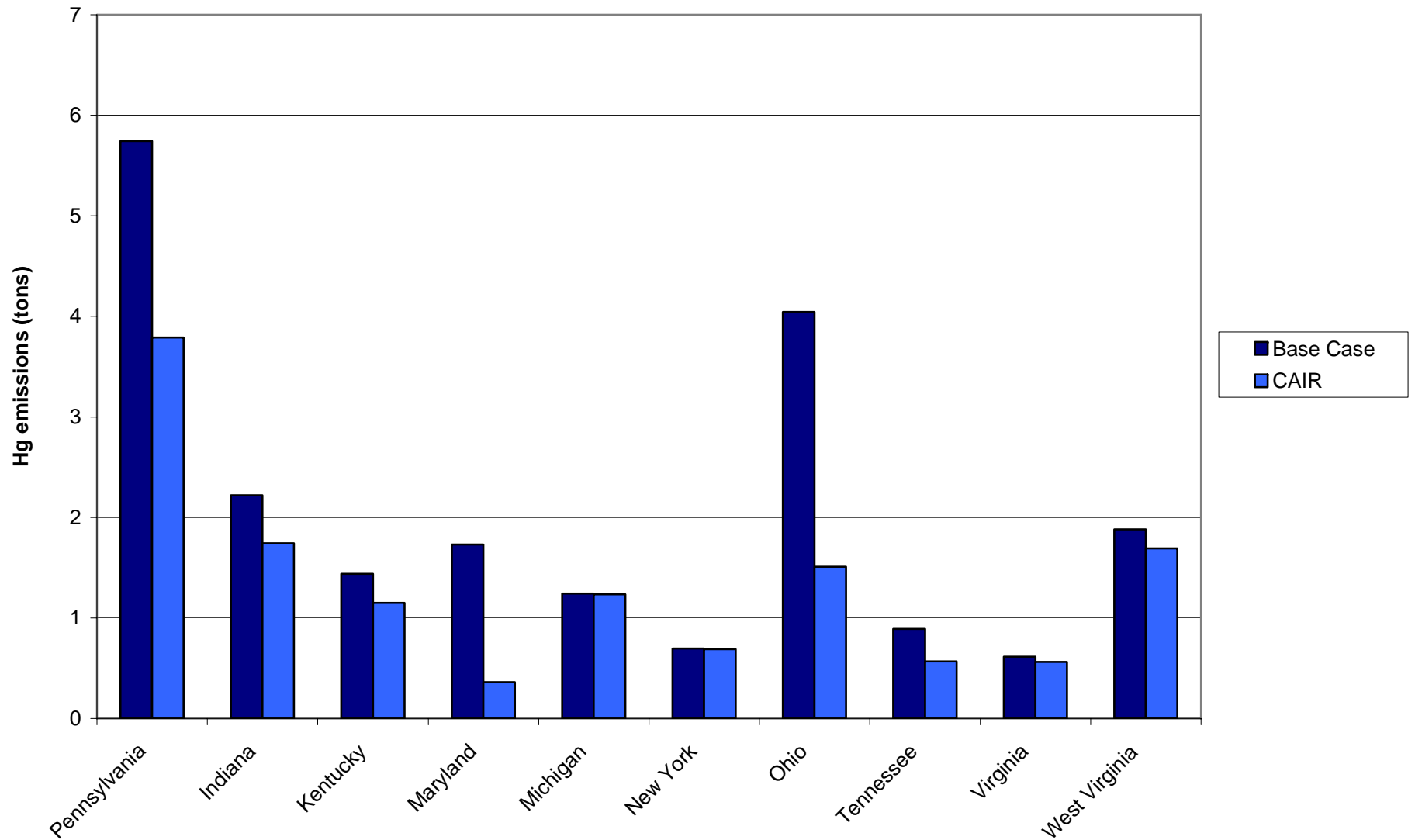
CAMR Starts with CAIR in Mind

Nationwide Mercury Emissions under the Base Case, CAIR, and CAIR/CAMR/CAVR, 2010



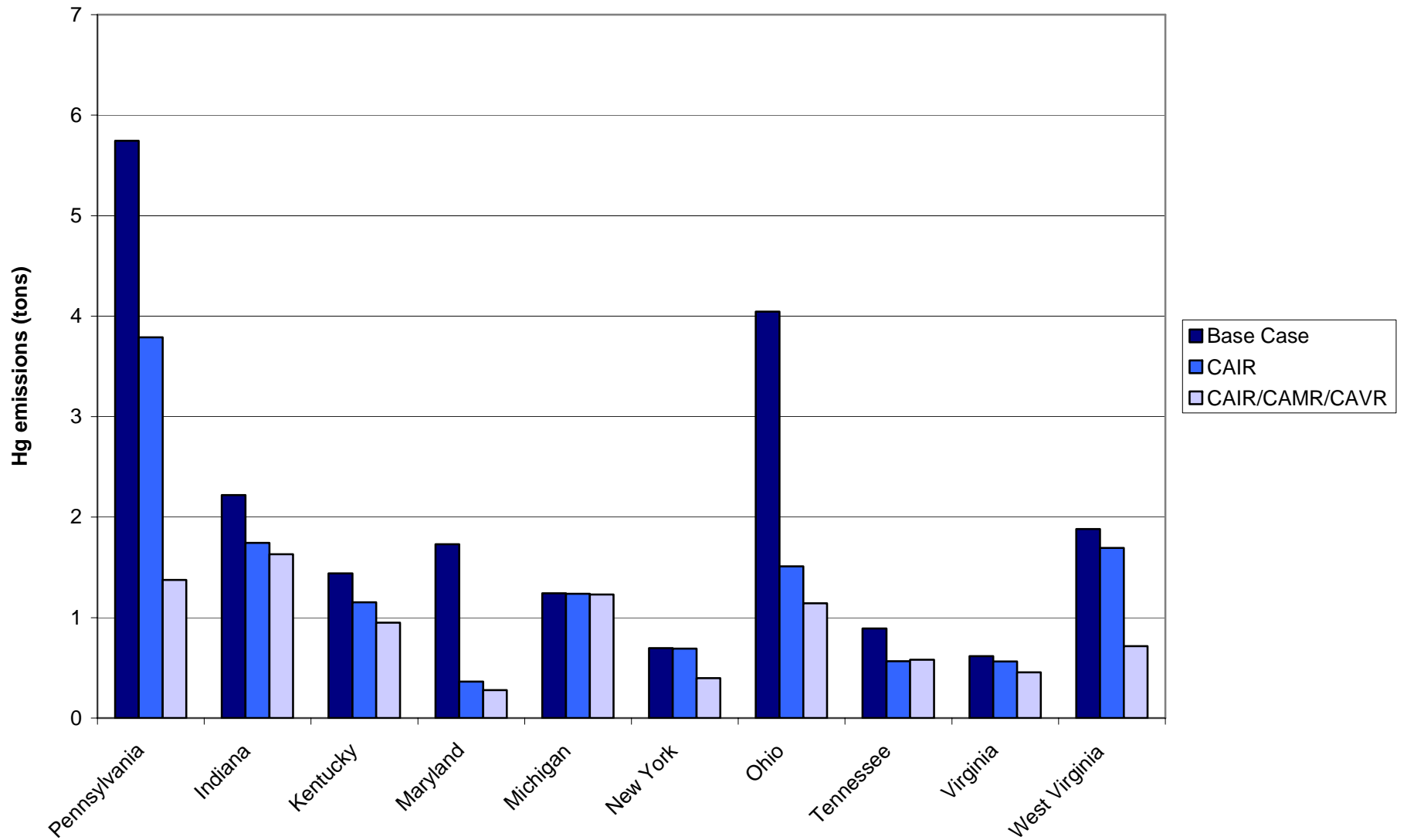
CAIR Lowers Hg Emissions in PA and Upwind States

Hg Emissions in Selected States in 2010 -- Base Case and CAIR

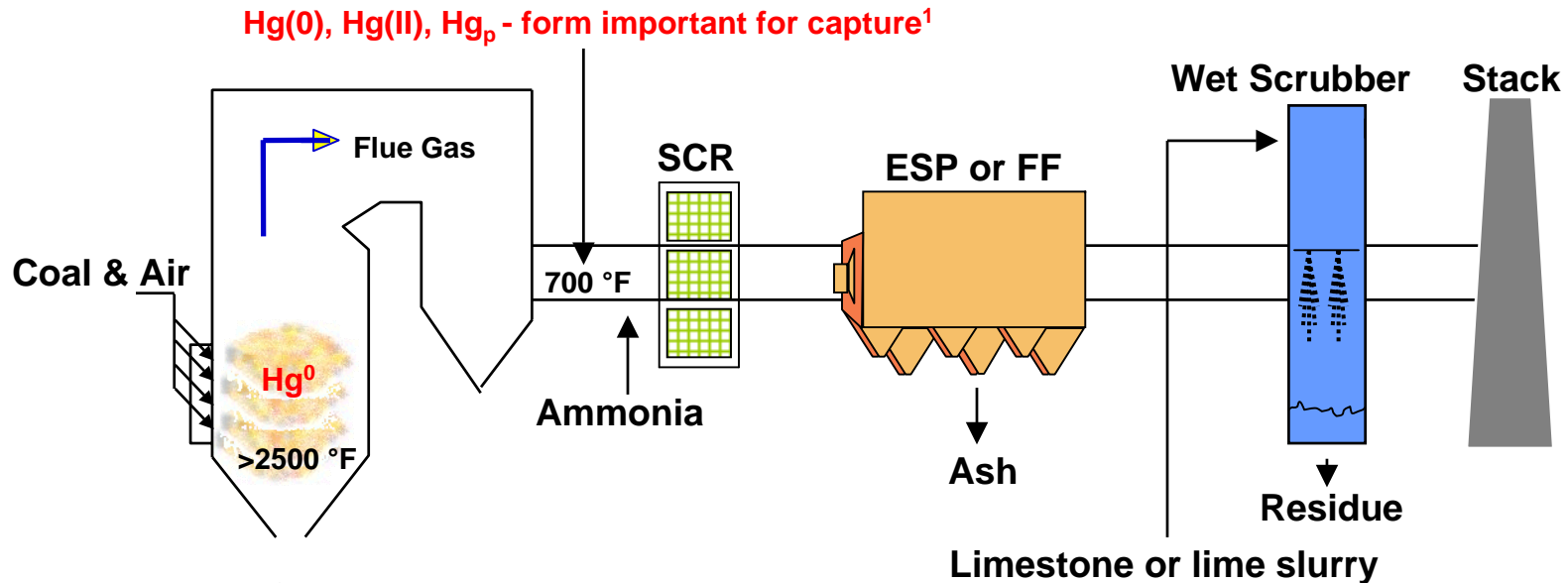


CAMR Further Lowers Hg Emissions

Hg Emissions in Selected States in 2010 -- Base Case, CAIR, and CAIR/CAMR/CAVR



Coal-fired Generation Unit Operations and Mercury



Factors that influence mercury control:

- Coal type
- Time/temperature profile
- Flue gas composition (chlorine) and fly ash characteristics (carbon, calcium, iron, porosity)
- Air pollution controls already in place

¹ Hg(0) = elemental Hg; Hg(II) = oxidized Hg; Hg_p = particulate Hg

Estimated Mercury Emissions Speciation by Coal Type, EPA Base Case, 2010

Coal Grade	Mercury Species		
	Elemental	Oxidized	Particulate
Bituminous	52.8%	37.2%	10.0%
Subbituminous	76.5%	23.2%	0.3%
Lignite	85.9%	13.4%	0.7%

Source: EPA Analysis using the Integrated Planning Model, 2005.

Mercury Emissions Factors for Coals Used in EPA Analysis

Pounds per trillion Btus

Coal Sulfur, Region, Grade	Low	Medium	High
Low Sulfur Eastern Bituminous	3.69	5.17	-
Low Sulfur Western Bituminous	3.41	4.1	7.85
Low-Medium Sulfur Bituminous	5.07	12.54	21.95
Medium Sulfur Bituminous	6.08	10.45	18.42
Medium High Sulfur Bituminous	6.83	11.09	18.69
High Sulfur Bituminous	8.04	17.43	28.73
Low Sulfur Subbituminous	4.55	5.88	7.06
Low-Medium Sulfur Subbituminous	4.4	6.01	7.39
Medium Sulfur Subbituminous	4.61	6.45	10.71
Low Medium Sulfur Lignite	8.45	-	-
Medium High Sulfur Lignite	5.88	9.79	-

Source: EPA IPM Modeling Documentation, 2005.

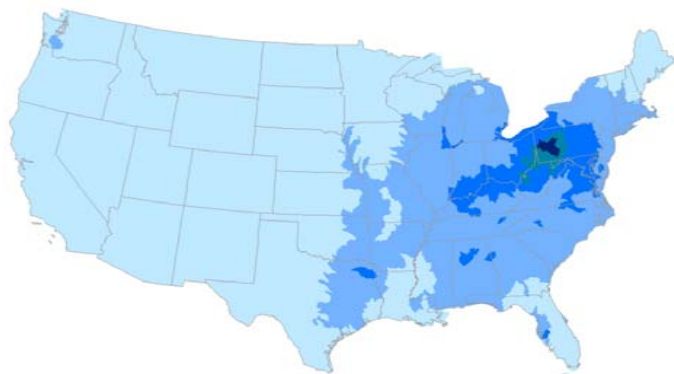
Mercury Reductions from “Other” Air Pollution Controls

<i>Control Configuration - Pulverized Coal Units</i>	<i>Coal Type</i>		
	Bituminous	Subbituminous	Lignite
Cold Side - ESP	36 %	3 %	0 %
Cold Side - ESP/FGD	66 %	16 %	44 %
Cold Side - ESP/FGD-dry	36 %	35 %	0 %
Cold Side - ESP/SCR/FGD	90 %	16 %	44 %
FF	89 %	73 %	0 %
FF/FGD	90 %	73 %	0 %
FF/FGD-dry	95 %	25 %	0 %
FF/SCR/FGD	90 %	73 %	44 %
Hot Side - ESP	10 %	6 %	0 %
Hot Side - ESP/FGD	42 %	20 %	0 %
Hot Side - ESP/FGD - Dry	40 %	15 %	0 %
Hot Side – ESP/SCR/FGD	90 %	20 %	0 %

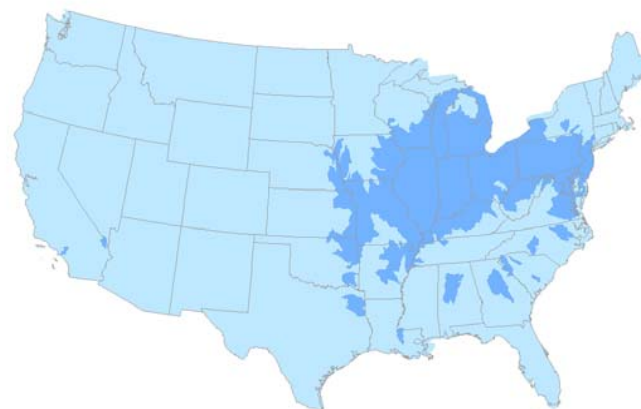
Key: ESP = Electrostatic Precipitator, FGD = Flue Gas Desulfurization, SCR = Selective Catalytic Reduction, FF = Fabric Filter.

Source: EPA Analysis using the Integrated Planning Model, 2005.

Mercury Co-benefits from CAIR in Perspective

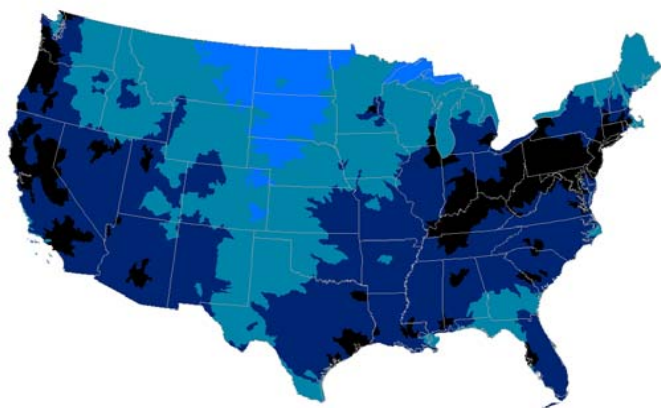
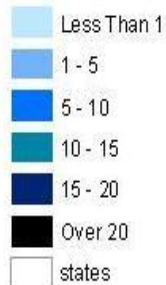


Mercury Deposition from US Power Plants in 2001

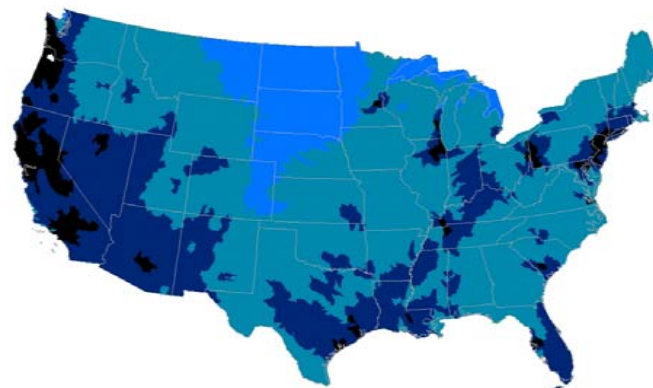


Mercury Deposition from US Power Plants in 2020 with CAIR

Deposition in Micrograms / Sq. Meter



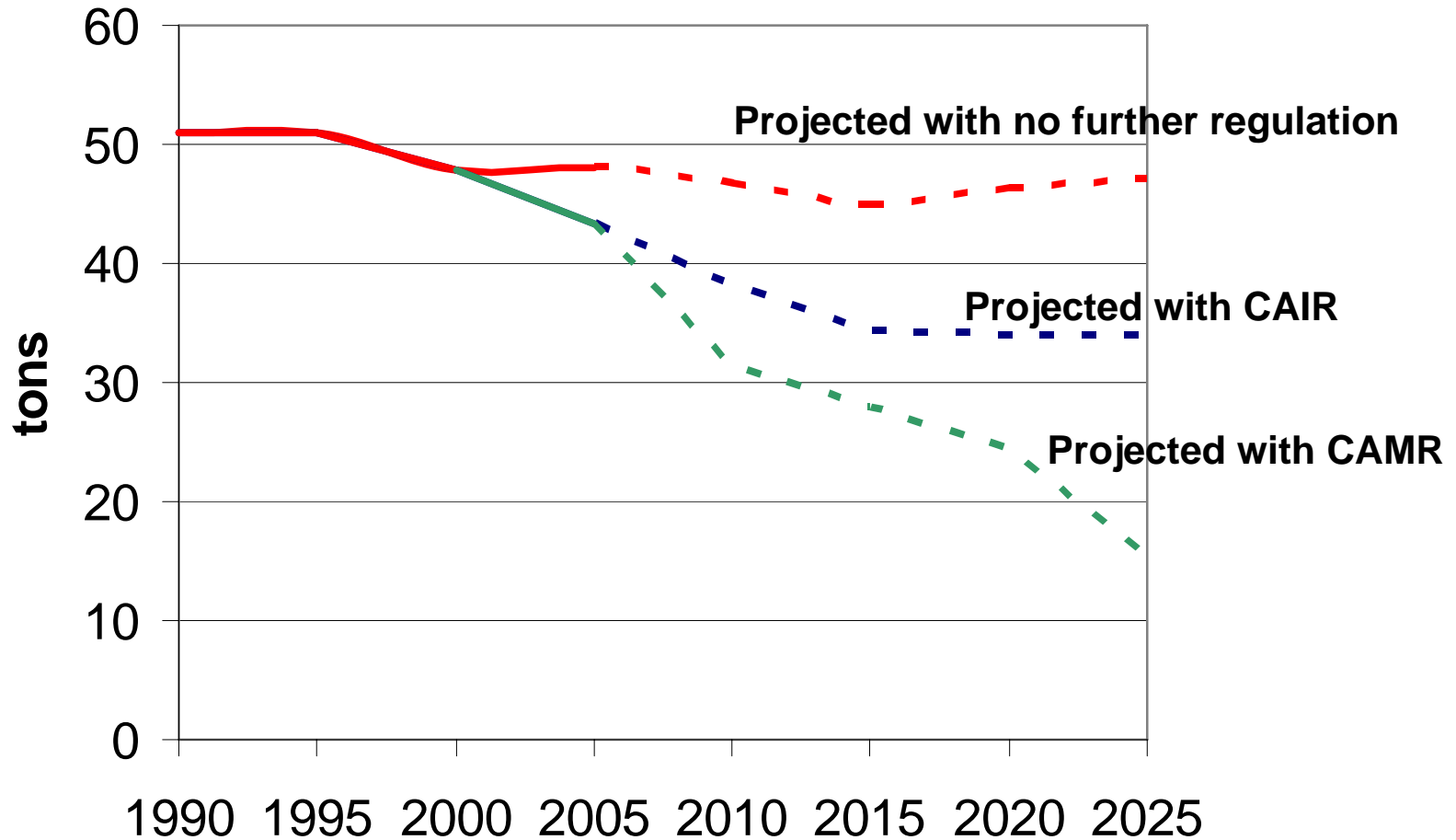
Mercury Deposition From All Sources in 2001



Non-Power Plant Sources in 2020

Source: EPA Technical Support for CAMR, 2005

National Hg Power Plant Emissions: Historic and Projected with CAMR



Source: EPA

Note: 1999 emission estimate for utility coal boilers is based on 1999 Information Collection Request (ICR); 1990 and 1996 are based on different methodology.

To Learn More ...

Clean Air Mercury Rule

www.epa.gov/mercury

