

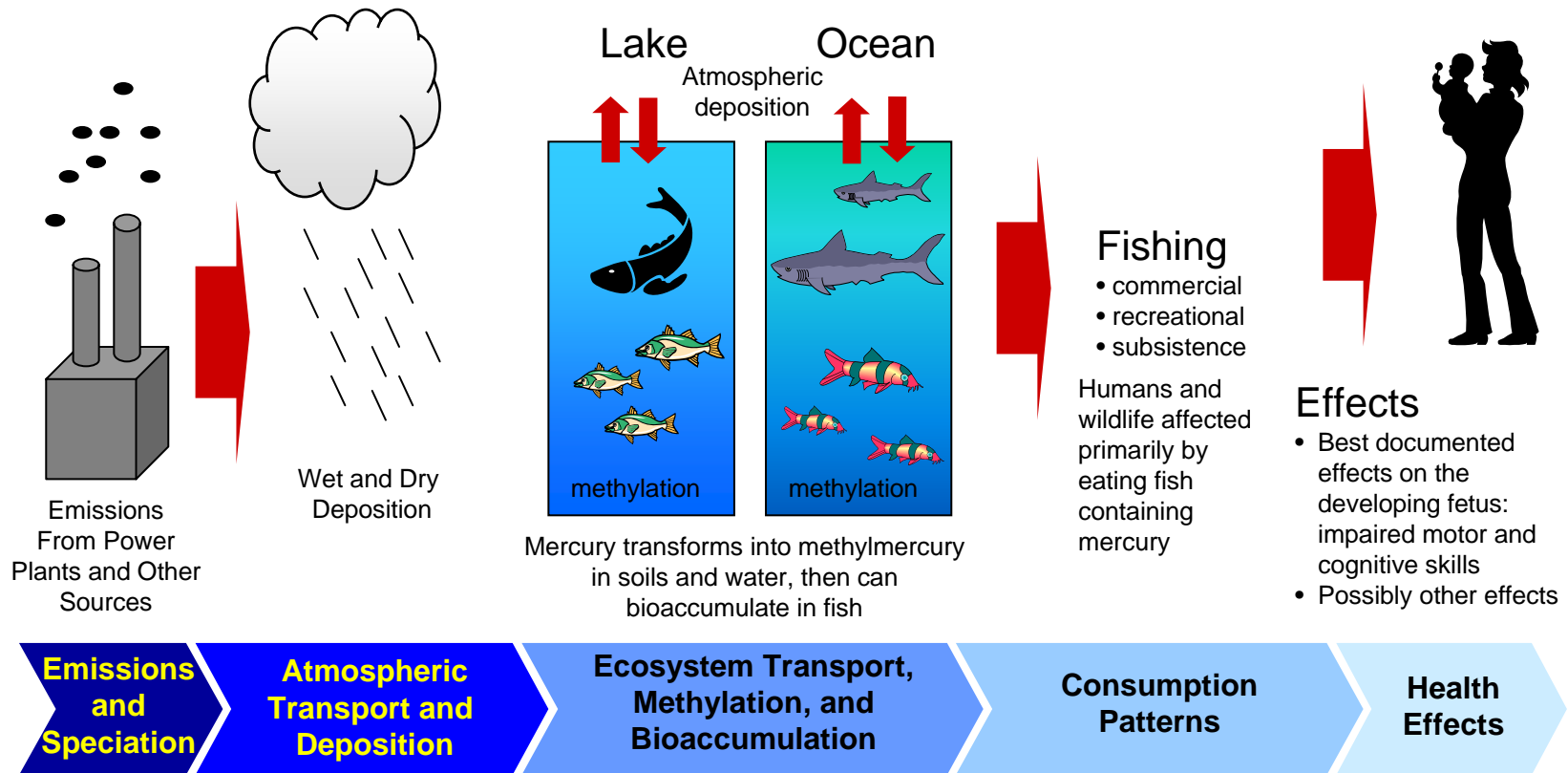
Mercury Cobenefits of the Clean Air Interstate Rule



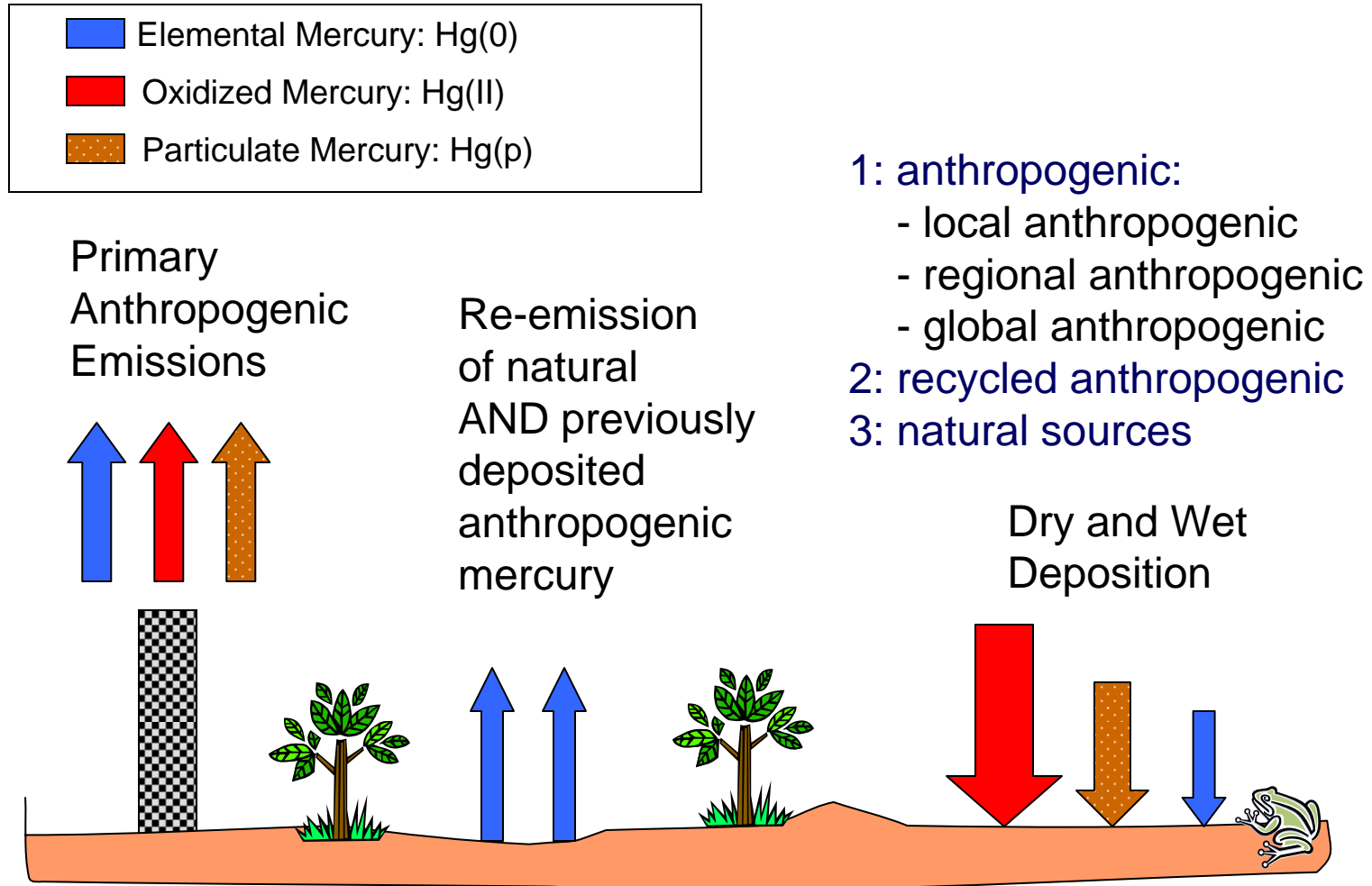
Office of Air and Radiation
U.S. Environmental Protection Agency
April 25, 2006



Mercury Exposure Pathway

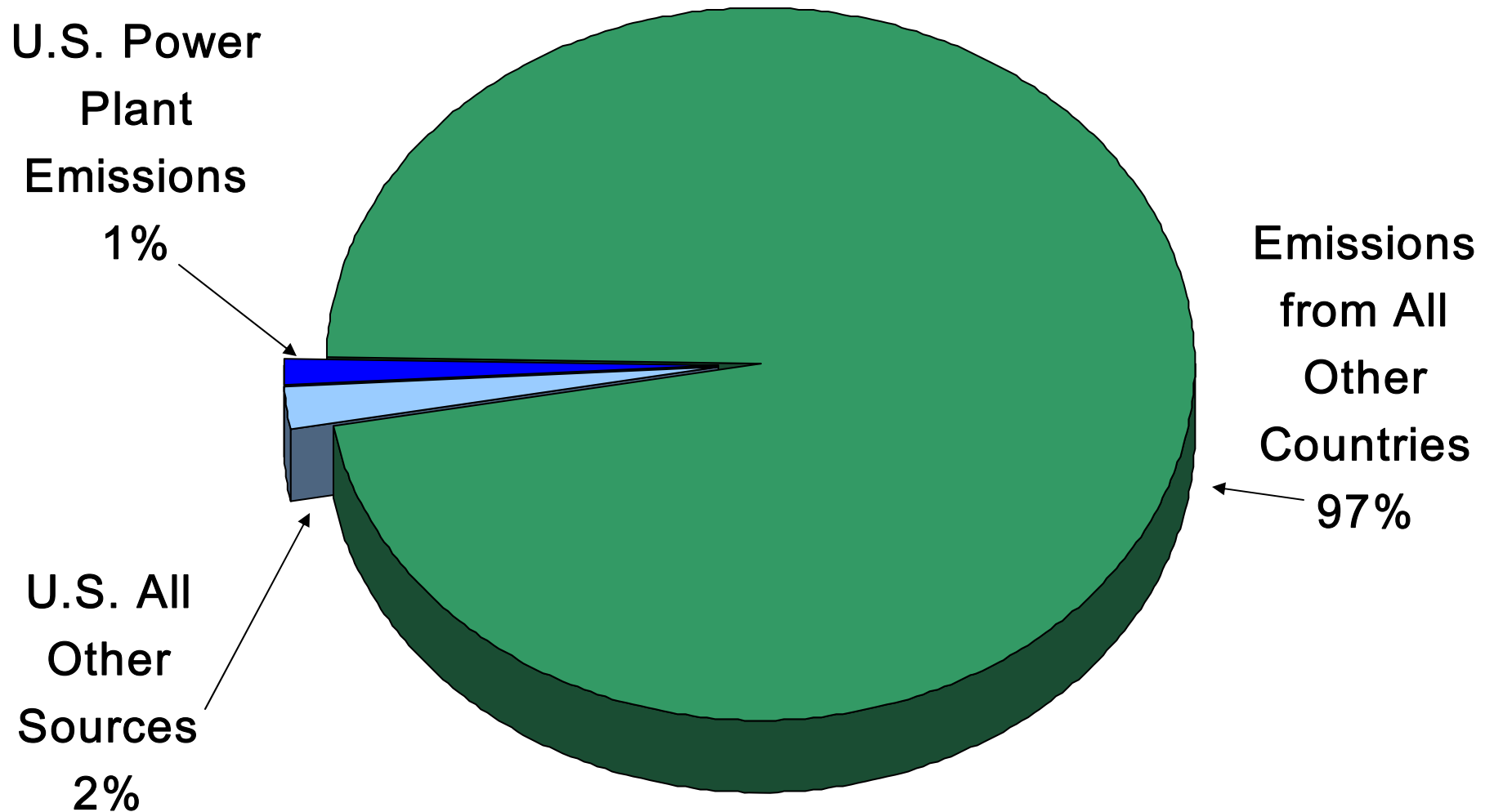


Atmospheric Transport & Fate Processes

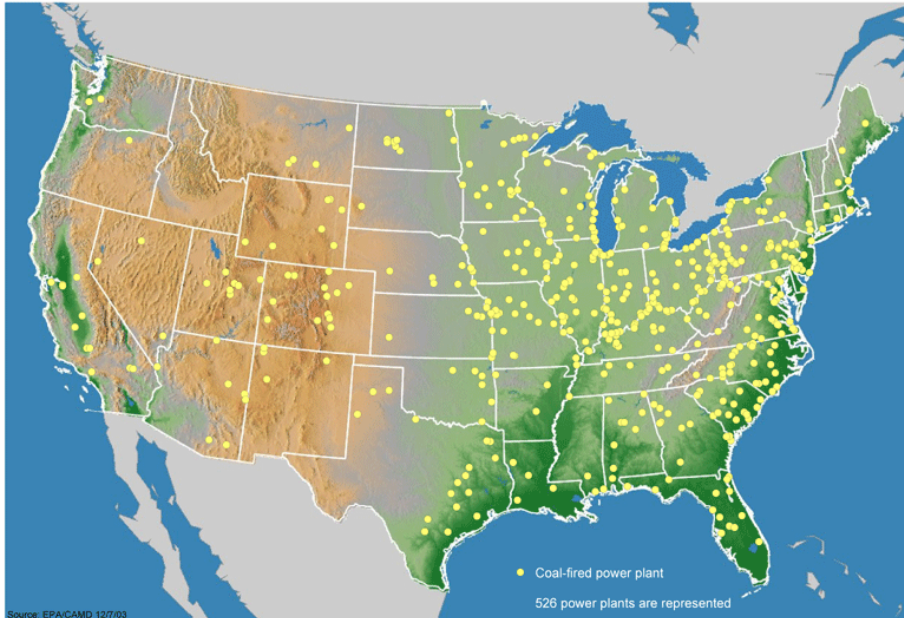


Mercury Emissions Are a Global Problem

1999 Global Mercury Emissions



Coal-Fired Power Plants in the U.S.



U.S. Coal-Fired Power Plants

- **Affected Facilities:**

- About 1,300 coal-fired generation units (~ 500 coal-fired power plants), representing about 305 GW of generation capacity

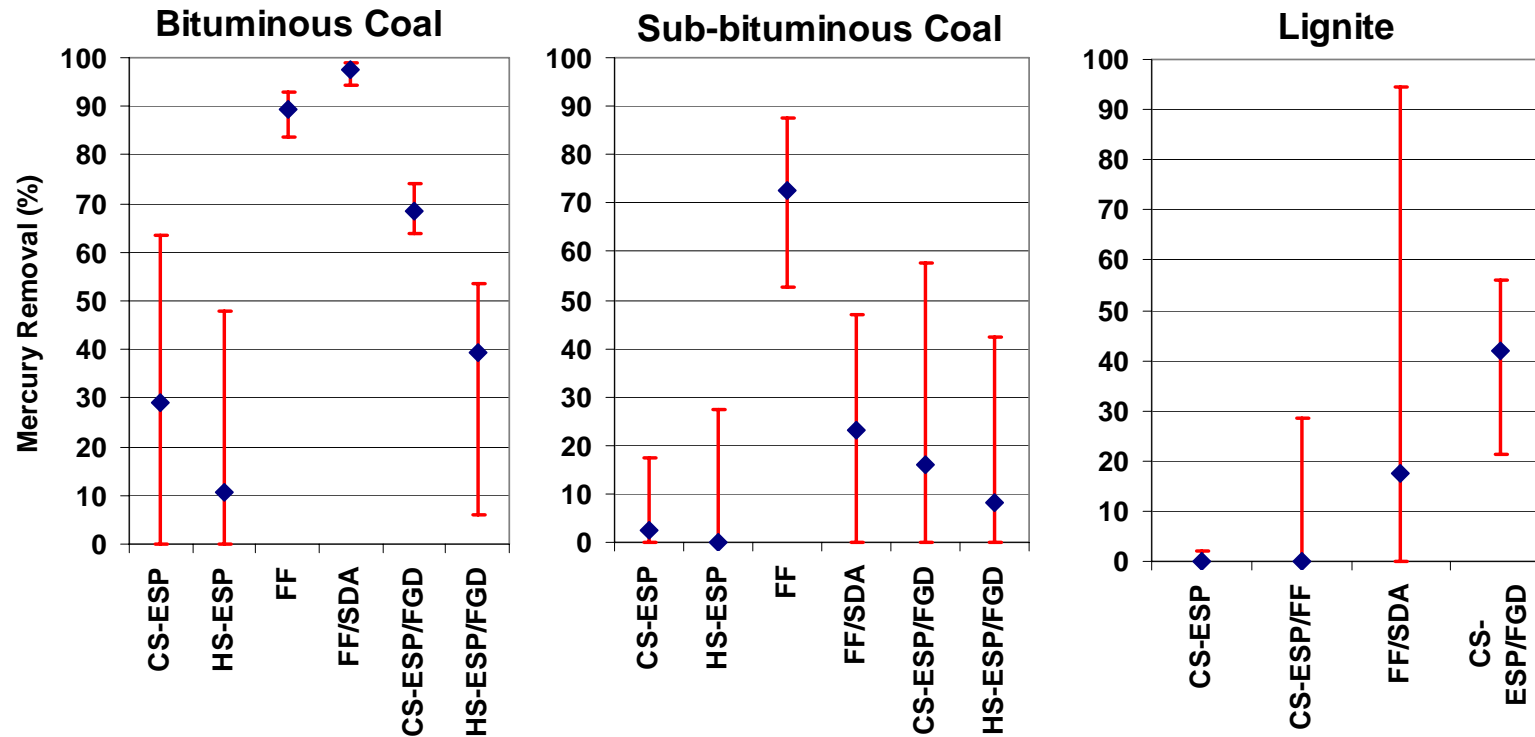
- **Existing Controls:**

- Almost all units have particulate matter (PM) control devices
- About one-third of capacity has sulfur dioxide (SO₂) scrubbers
- Most have initial nitrogen oxides (NO_x) controls (low-NO_x burners)
- About one-third of the capacity (primarily in the east) will have advanced NO_x control (SCR) when NO_x SIP-call is fully implemented

- **Future Controls:**

- About two-thirds of the capacity (primarily in the east) will have SO₂ scrubbers when CAIR is fully implemented
- About one-half of the capacity (primarily in the east) will have advanced NO_x control (SCR) when CAIR is fully implemented

ICR Data – Capture in Existing Equipment

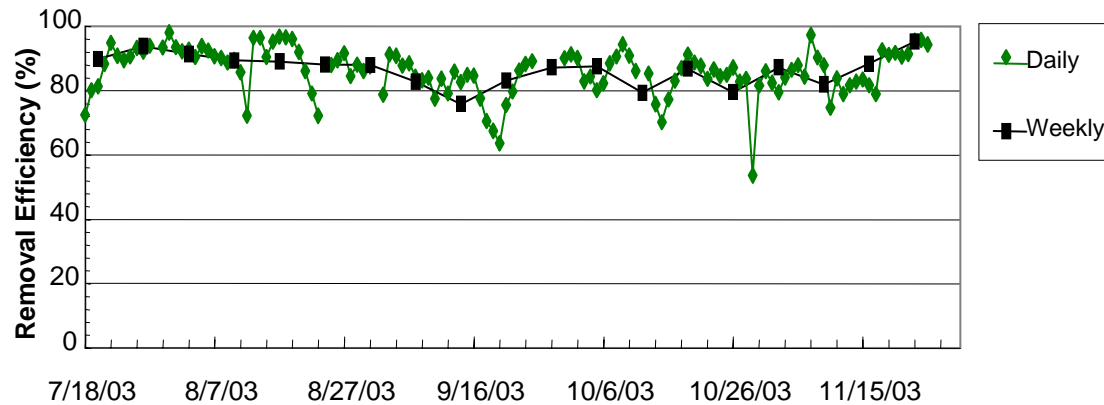


Through its 1999 mercury information collection request (ICR), EPA conducted a national survey to determine amount of Hg capture in coal-fired power plants. Major conclusions:

- Higher levels of Hg capture for bituminous coal-fired plants compared to low-rank coal-fired plants
- Large ranges of Hg capture observed
- Compared to ESPs, FFs capture higher levels of Hg
- Limited data suggested that scrubbers could potentially capture Hg(II) effectively. Existing data also indicates that some of the absorbed Hg may be reduced to Hg(0) and get re-emitted.

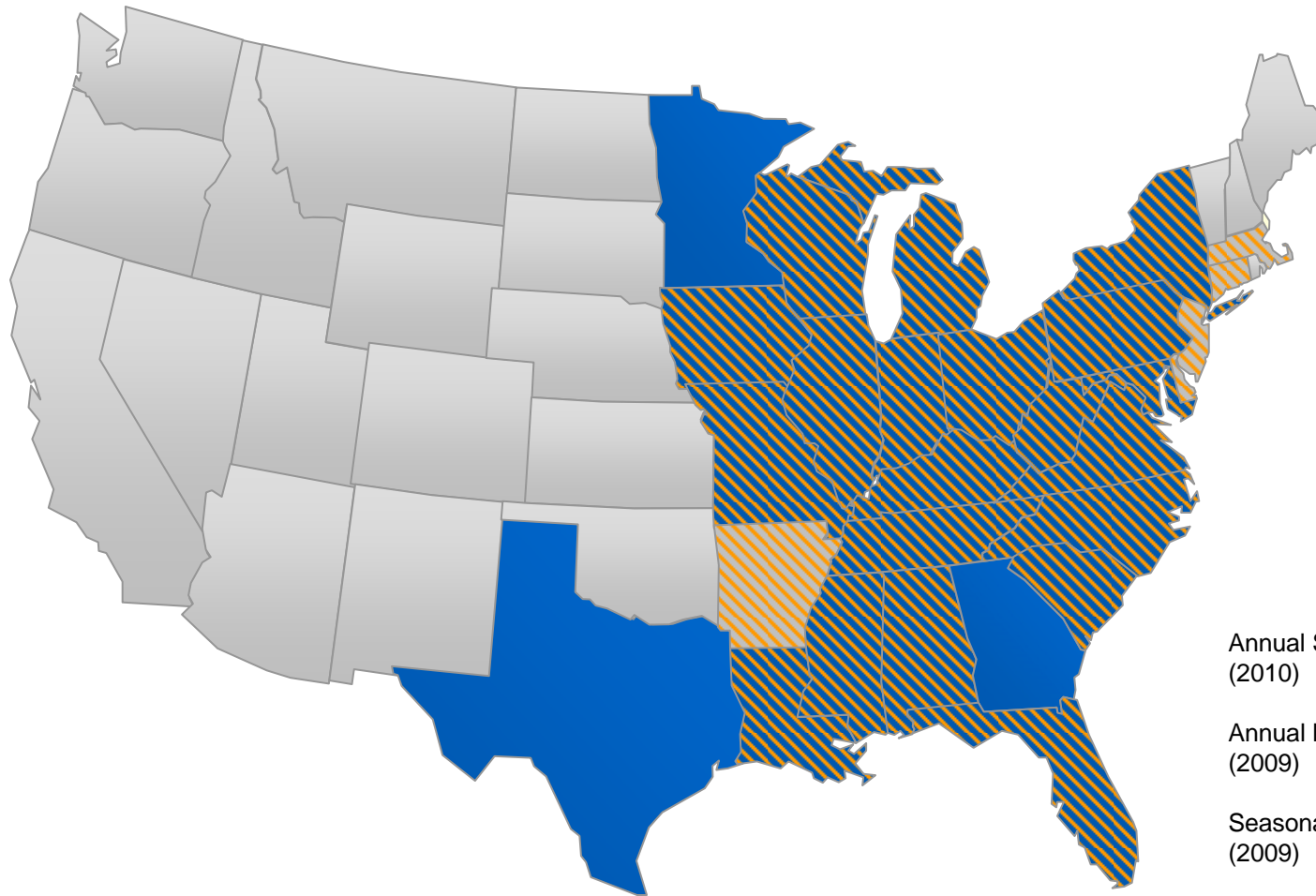
Continuation of TOXECON™ DOE Phase I Project Gaston, Low-sulfur Bituminous Coal

Testing Between June-November, 2003 (Longest ACI testing period thus far)



- ACI operated nearly continuously between June 26-November 25; rate < 0.7 lb/MMacf
- Weekly Hg removal between 80- 90%, average 86%
- Less variability in emissions over longer averaging period
- Need to change air-to-cloth ratio to get 90% removal
- TOXECON requires a FF after an ESP, a plant configuration limited to relatively few plants currently.

CAIR: Affected Region and Emission Caps



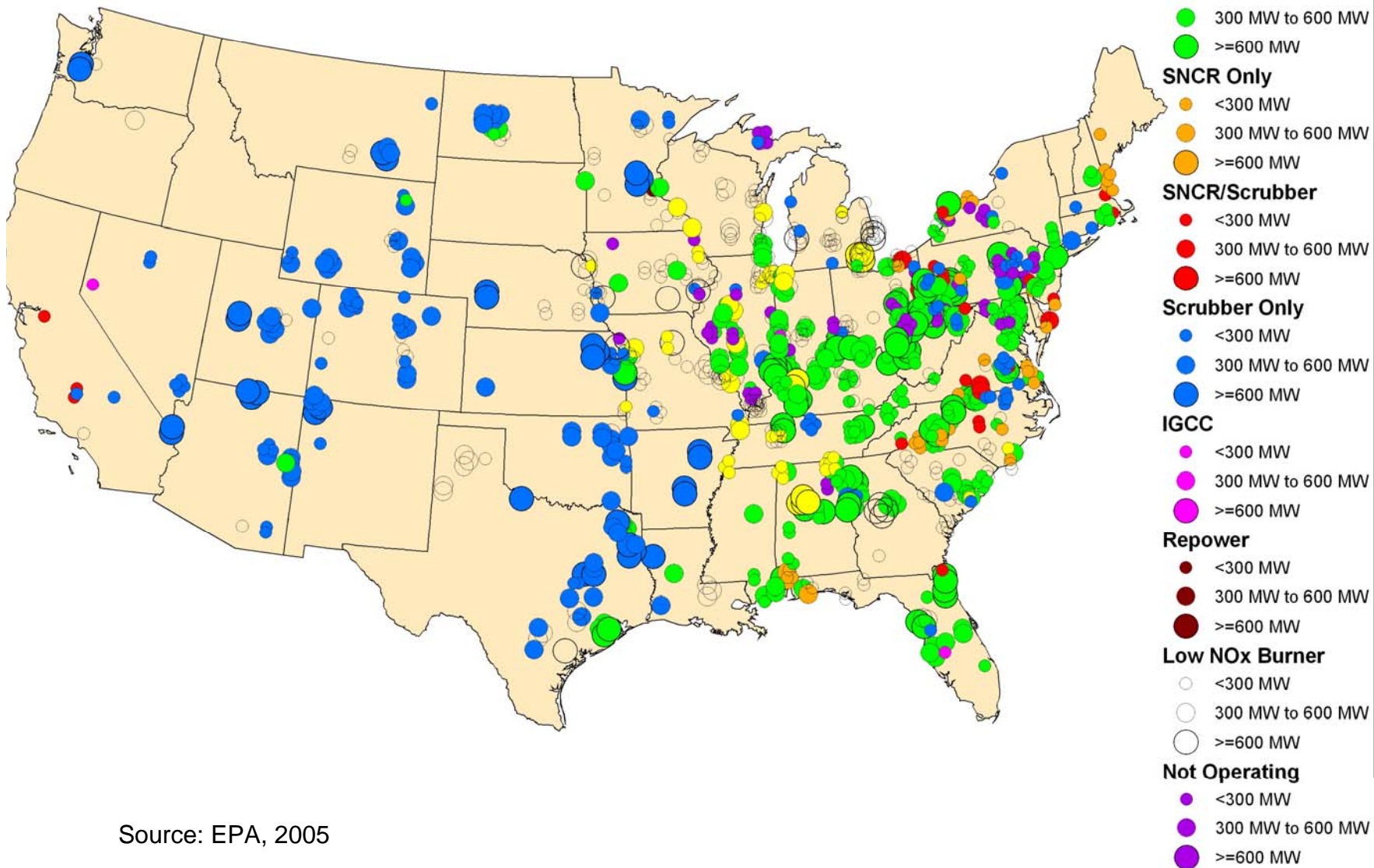
- States controlled for fine particles (annual SO₂ and NO_x)
- States controlled for ozone (ozone season NO_x)
- States controlled for both fine particles (annual SO₂ and NO_x) and ozone (ozone season NO_x)
- States not covered by CAIR

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

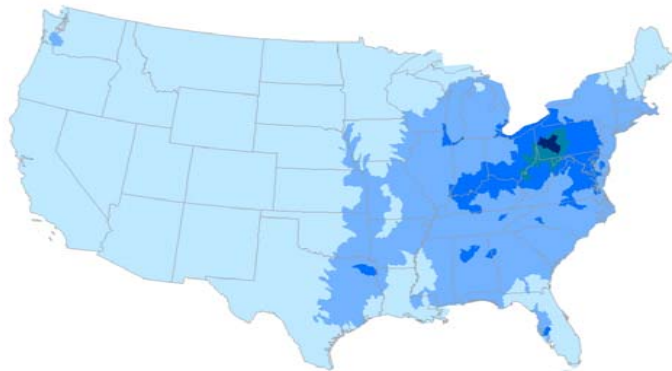
*For the affected region.

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

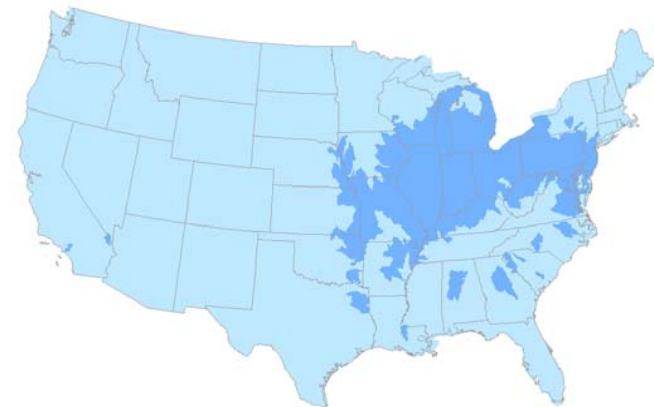


Source: EPA, 2005

Mercury Cobenefits from CAIR in Perspective

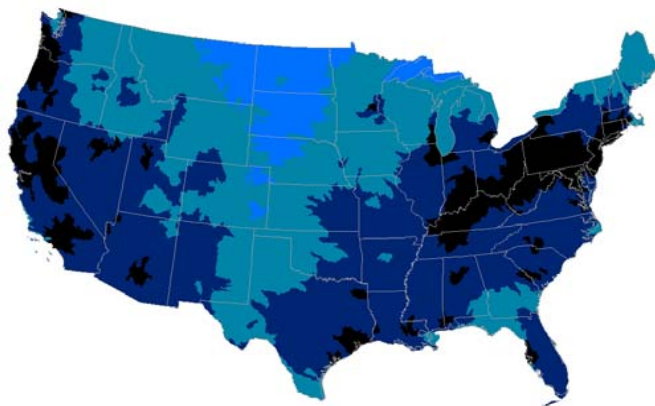


Mercury Deposition from US Power Plants in 2001

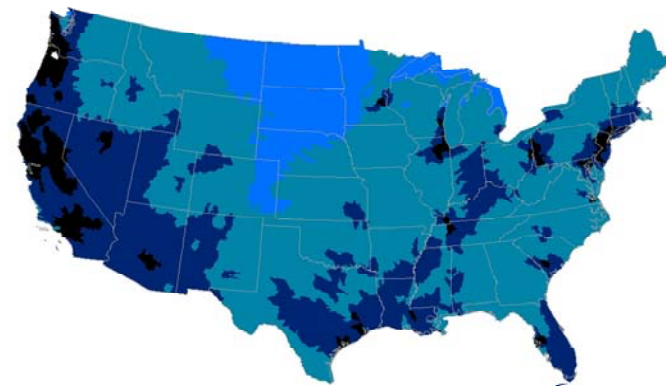


Mercury Deposition from US Power Plants in 2020 with CAIR

Deposition in Micrograms / Sq. Meter



Mercury Deposition From All Sources in 2001

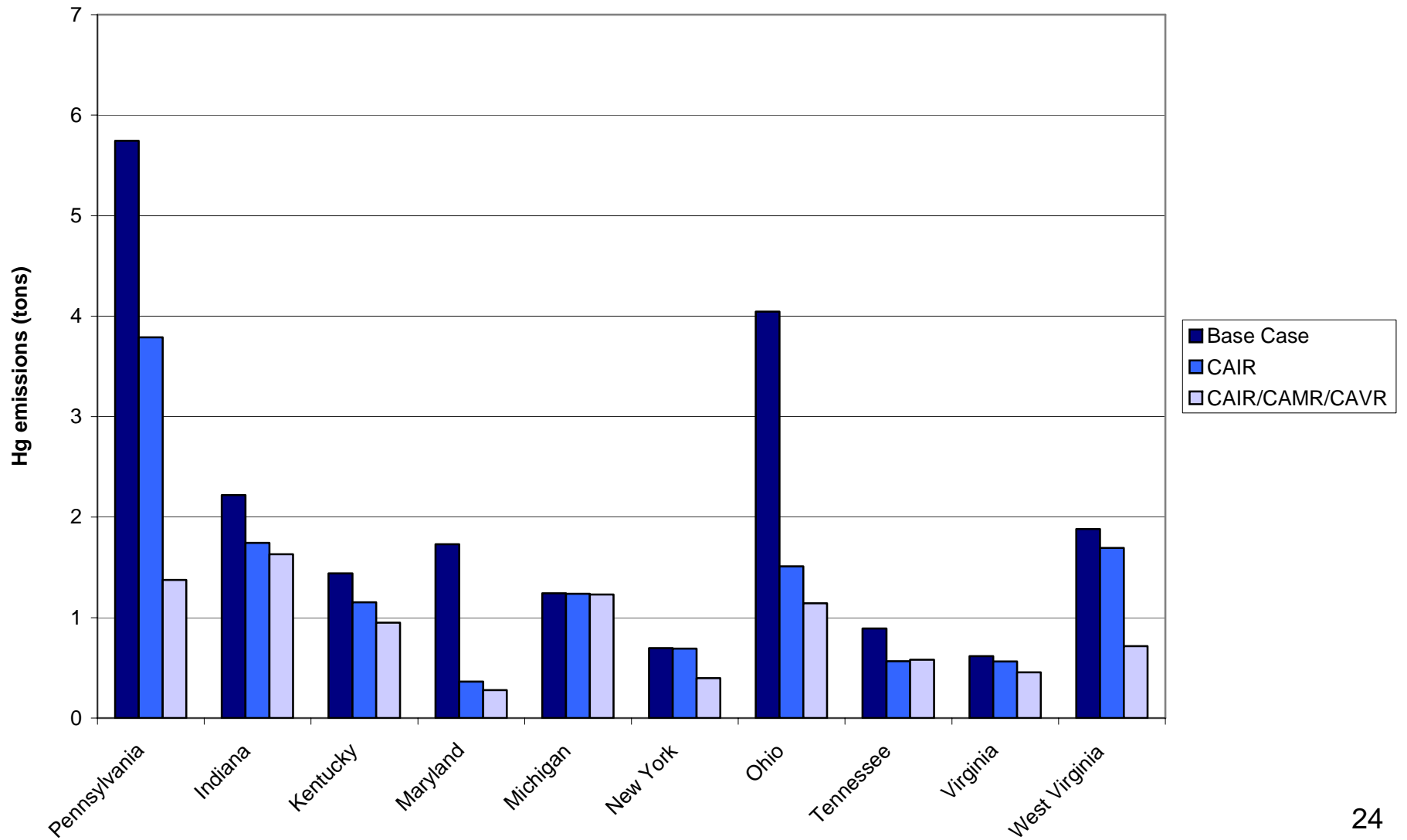


Non-Power Plant Sources in 2020

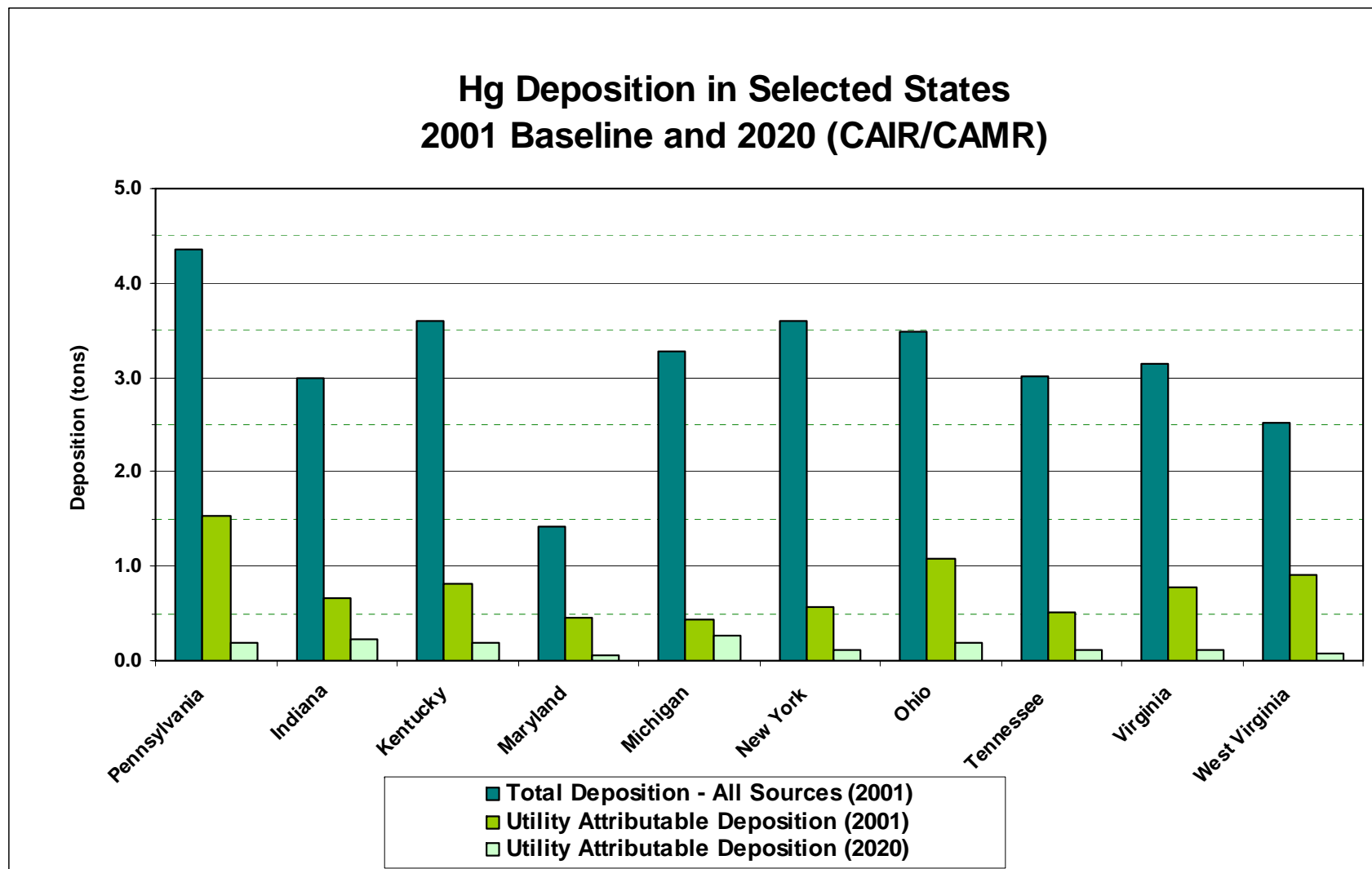
Source: EPA Technical Support for CAMR, 2005

CAMR Further Lowers Hg Emissions

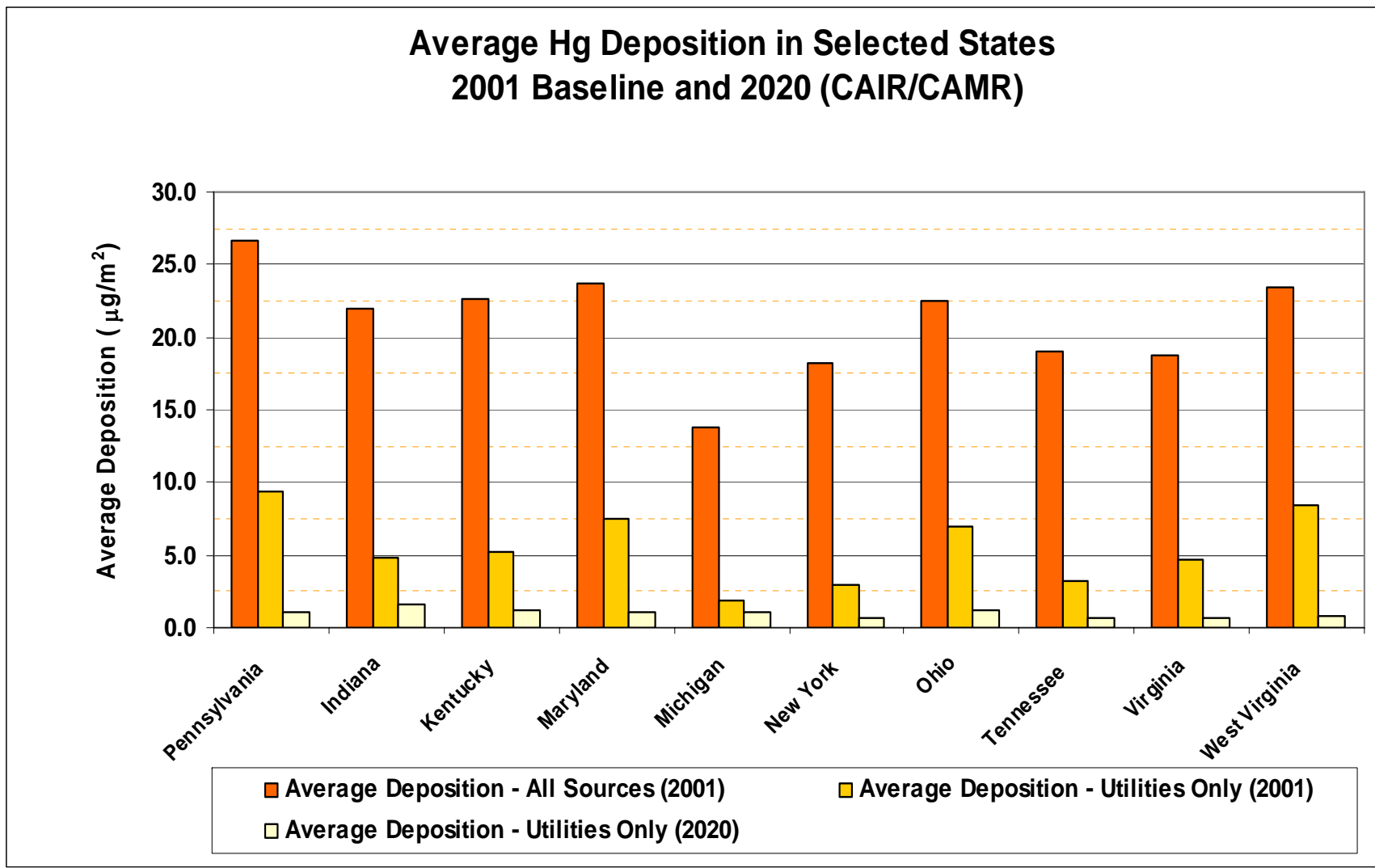
Hg Emissions in Selected States in 2010 -- Base Case, CAIR, and CAIR/CAMR/CAVR



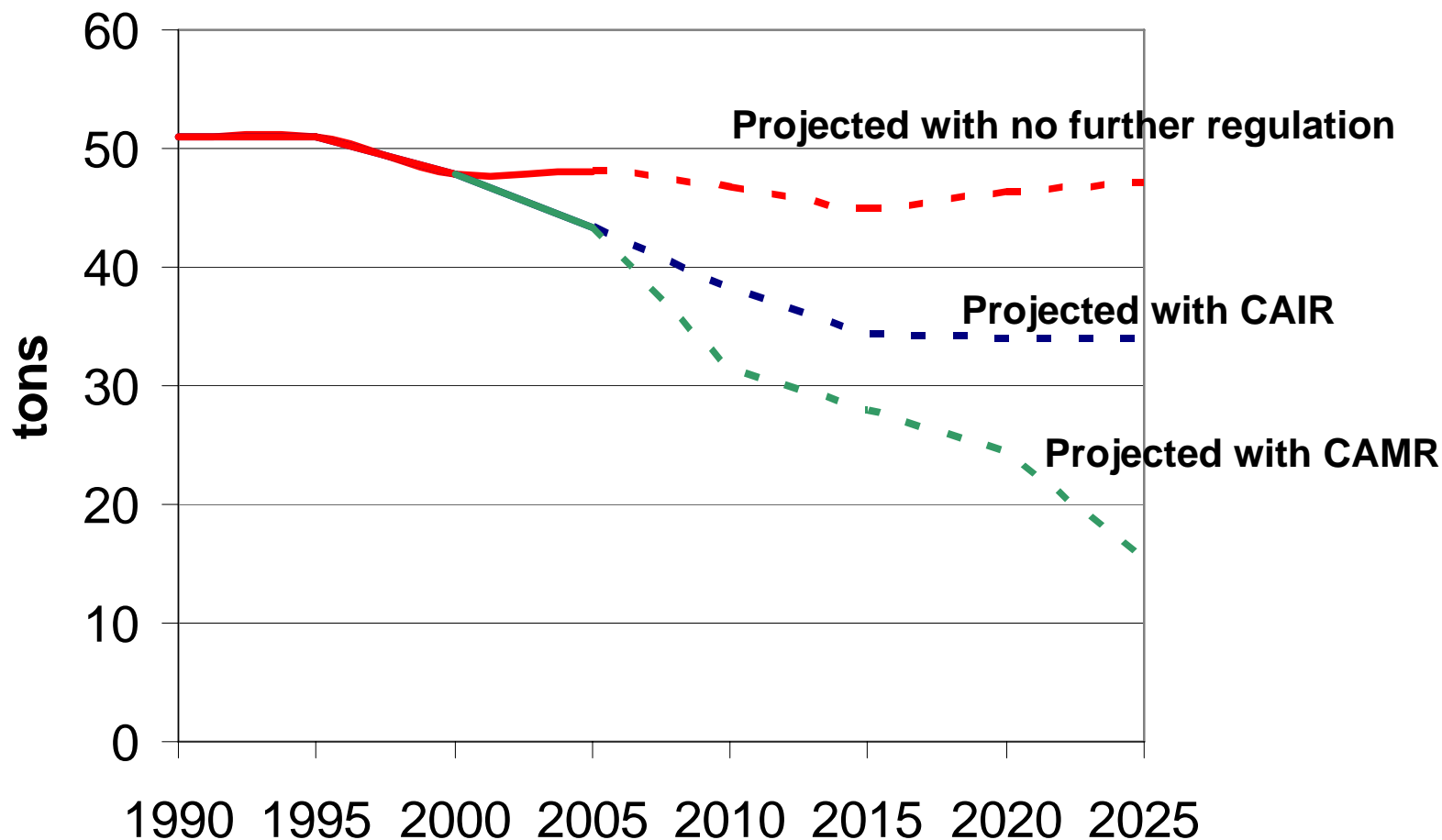
Changes in Total Hg Deposition with CAIR+CAMR



Changes in Average Hg Deposition with CAIR+CAMR



National Hg Power Plant Emissions: Historic and Projected with CAIR+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.

EPA's Reassessment of the Trasande et al., Manuscript:

*“Public Health and Economic Consequences of Methylmercury
Toxicity to the Developing Brain”*



Trasande et al., “Public Health and Economic Consequences of Methylmercury Toxicity to the Developing Brain”

- **Trasande initially claimed**
 - Cost of global anthropogenic emissions = \$2.2 - \$43.8 billion
(preferred estimate of \$8.7 billion)
 - Cost of U.S. anthropogenic Hg emissions = \$400 million - \$15.8 billion
 - Cost of U.S. power plant Hg emissions = \$100 million - \$6.5 billion
- **Trasande’s linear model used a dose-response relationship based on an error that overstated some results by a factor of 10**
- **Trasande’s corrected results now claim**
 - Cost of global anthropogenic emissions = \$0.5 - \$13.5 billion
(preferred estimate of \$7.0 billion)
 - Cost of U.S. anthropogenic Hg emissions = \$100 million - \$4.8 billion
 - Cost of U.S. power plant Hg emissions = \$37 million - \$2.0 billion

EPA's Response to the Trasande Estimates

- The Trasande estimates are not potential benefits from CAMR
- The preferred estimate is based on a model that the NRC cautions against
- The linear dose-response slope used is very high
- The estimate of lifetime earnings used is much higher than EPA's estimate
- The percent of consumption affected by domestic deposition is based on landings data rather than consumption data
- The percent of domestic deposition attributable to U.S. sources is substantially higher than indicated by EPA air deposition modeling
- The Trasande estimates do not account for the ecosystem response time

To Learn More ...

Clean Air Mercury Rule

www.epa.gov/mercury

