Update: Clean Air Mercury Rule (CAMR)

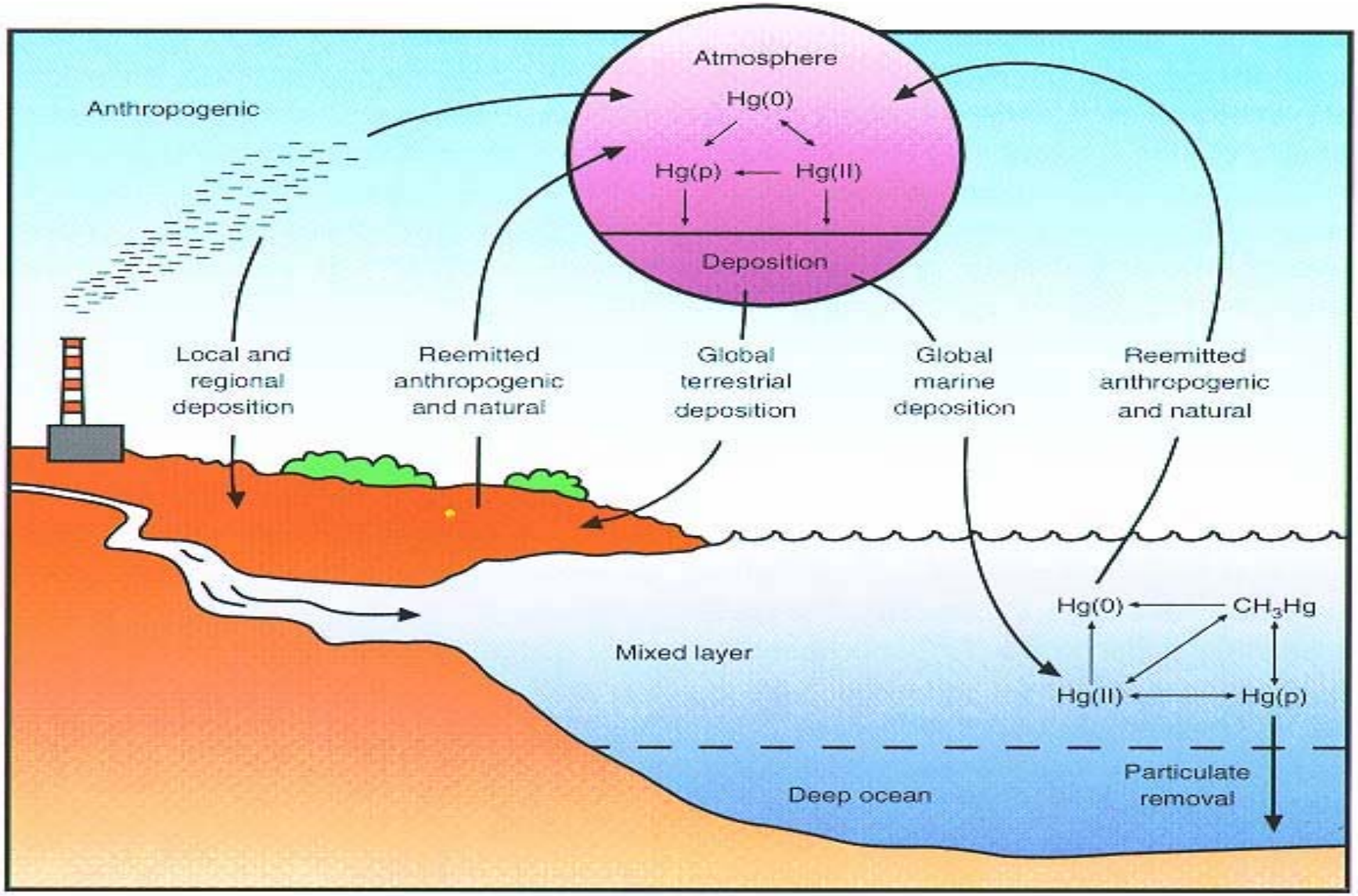


Presentation to Clean Air Act Advisory Committee

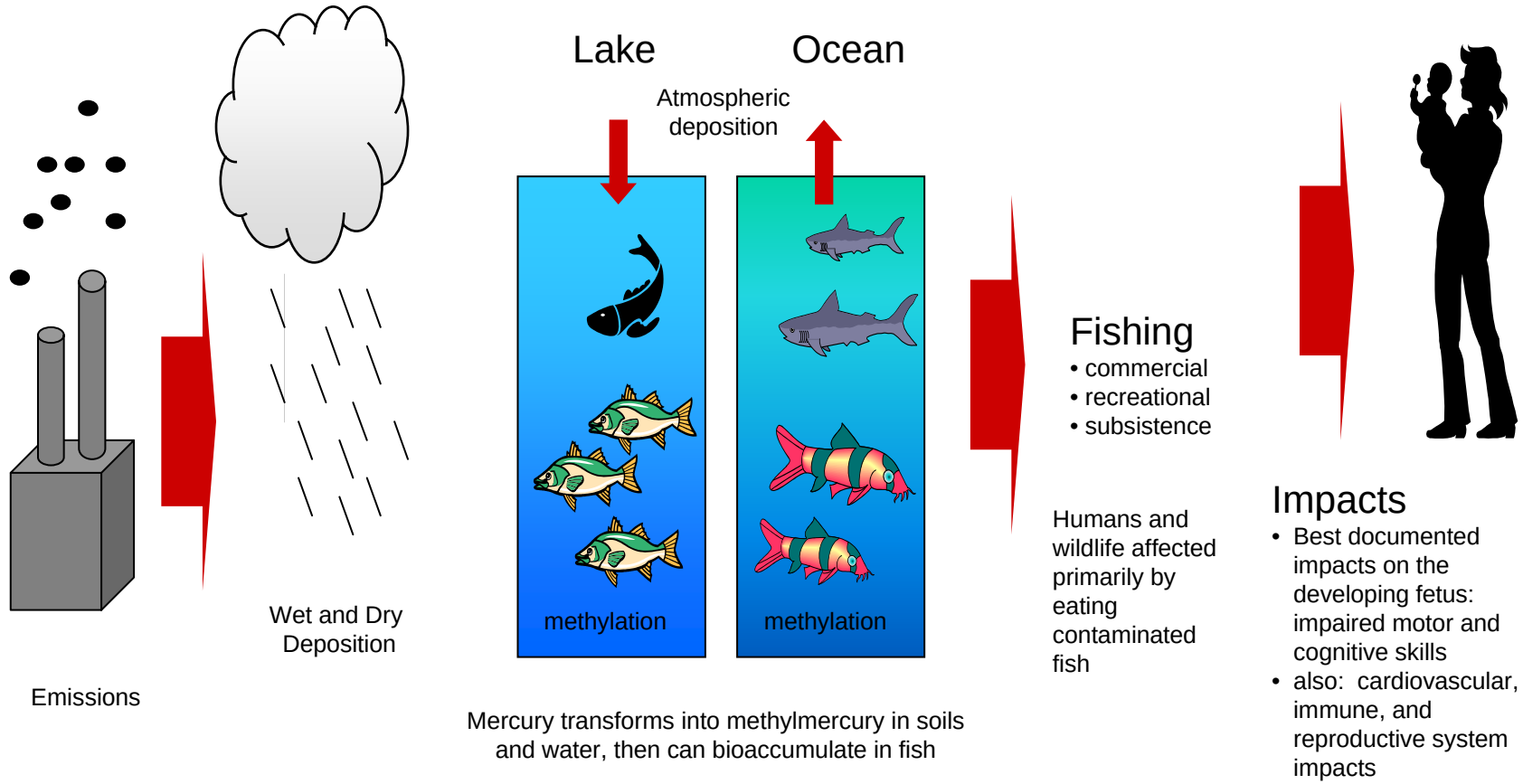
Sally L. Shaver, Director
Emission Standards Division
Office of Air and Radiation

June 24, 2004

Mercury Cycling Pathways



Mercury Emissions Contribute to Human Exposure to Mercury

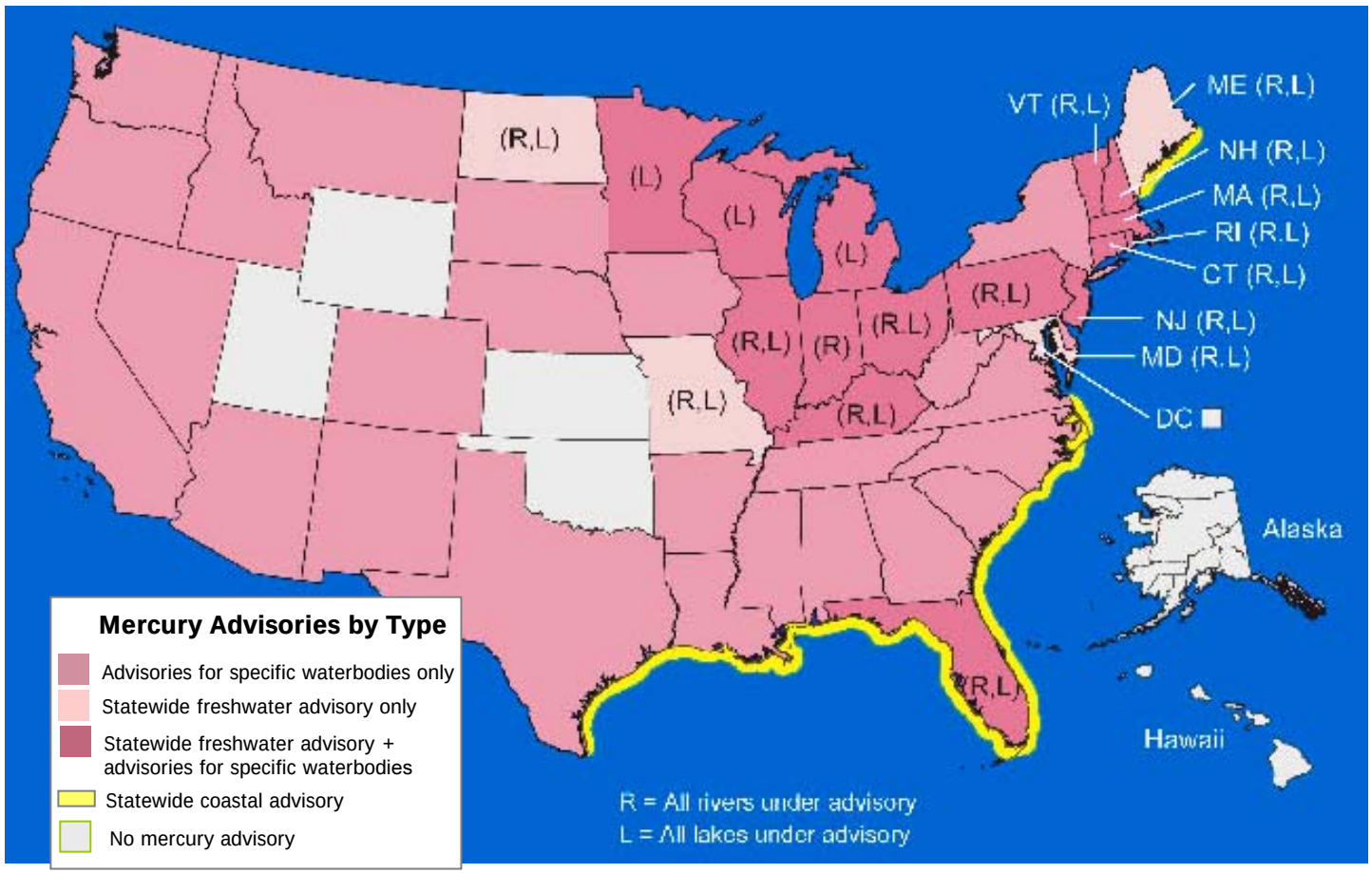


Emissions → **Atmospheric Transport and Deposition** → **Ecosystem Transport and Methylation** → **Human and Wildlife Exposure** → **Health Impacts**

Mercury Contamination in Fish

- **Currently 44 states have issue fish consumption advisories for some or all of their waters due to contamination from mercury.***

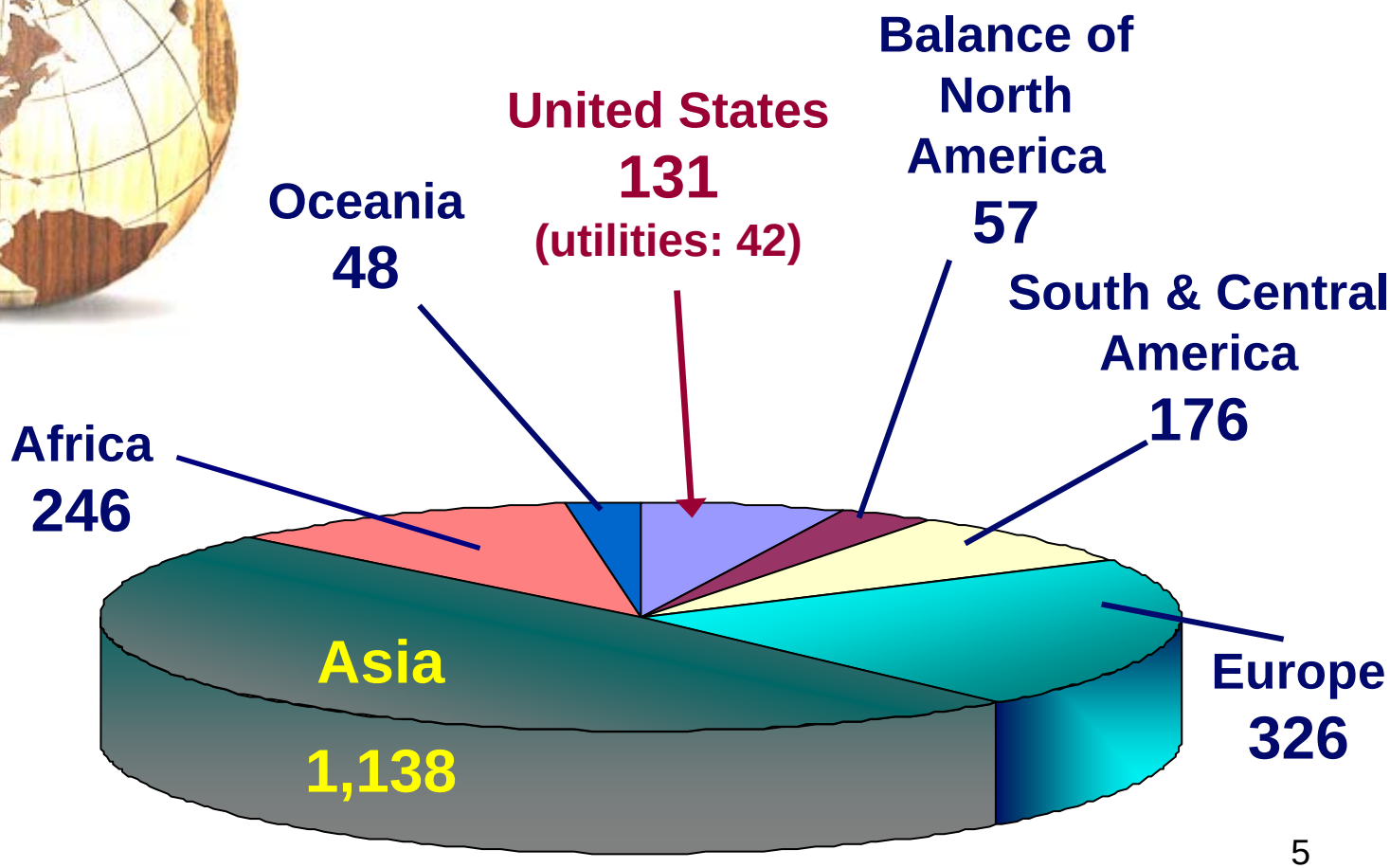
States with Fish Advisories Due to Mercury



*Note: For more information about the relationship between fish advisories and human exposure to mercury, see the EPA Report "America's Children and the Environment: Measures of Contaminants, Body Burdens, and Illnesses" available at *http://yosemite.epa.gov/ochp/ochpweb.nsf/content/publications.htm*

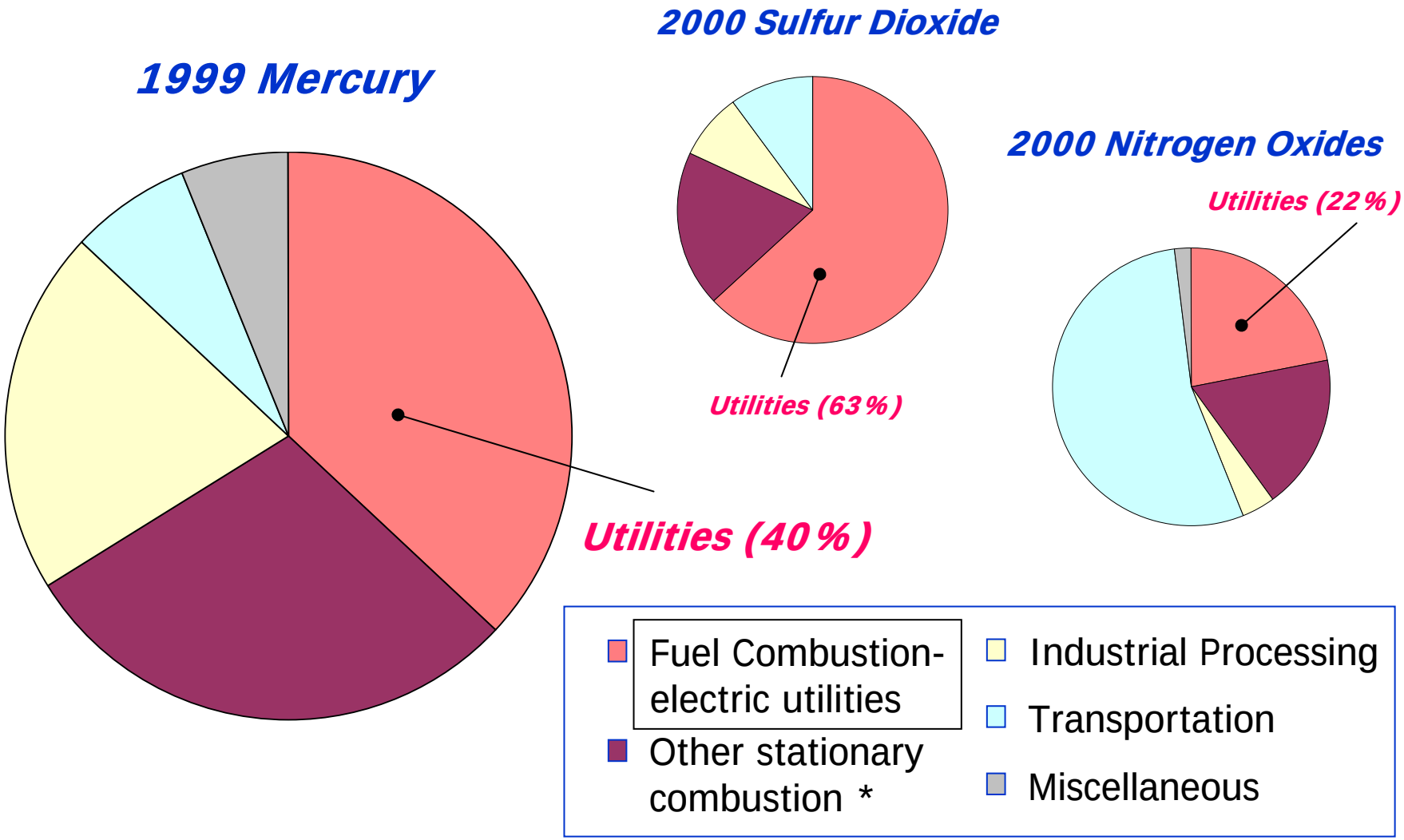
Mercury Global Emissions - Anthropogenic Emissions by Continent

Global total: 2,122 Mg/y



(Adapted from EPRI, 2004)

Power Generation Is a Major Source of Emissions



* Other stationary combustion includes residential and commercial sources.

Pollutant Reduction for Coal-fired Utilities

- Emissions reductions possible through:
  - End-of-pipe control technologies
  - Advanced power generation technologies
  - Power plant efficiency improvements
  - Fuel switching
- Focus on emissions control technologies that provide emission reduction co-benefits
  - Potential for increased emission control at overall reduced cost
  - Potential for increased flexibility

NO_x Control Technologies and Co-benefits

- Low NO_x burners (LNBs)
  - Impact on mercury reduction not well quantified.
- Selective non-catalytic reduction (SNCR)
  - Limited impact on mercury reduction.
- Selective catalytic reduction (SCR)
  - SCR converts $Hg^{(0)}$ – $Hg^{(++)}$
  - Some reduction could improve for bituminous coals with wet scrubber.

SO_2 Control Technologies and Co-benefits

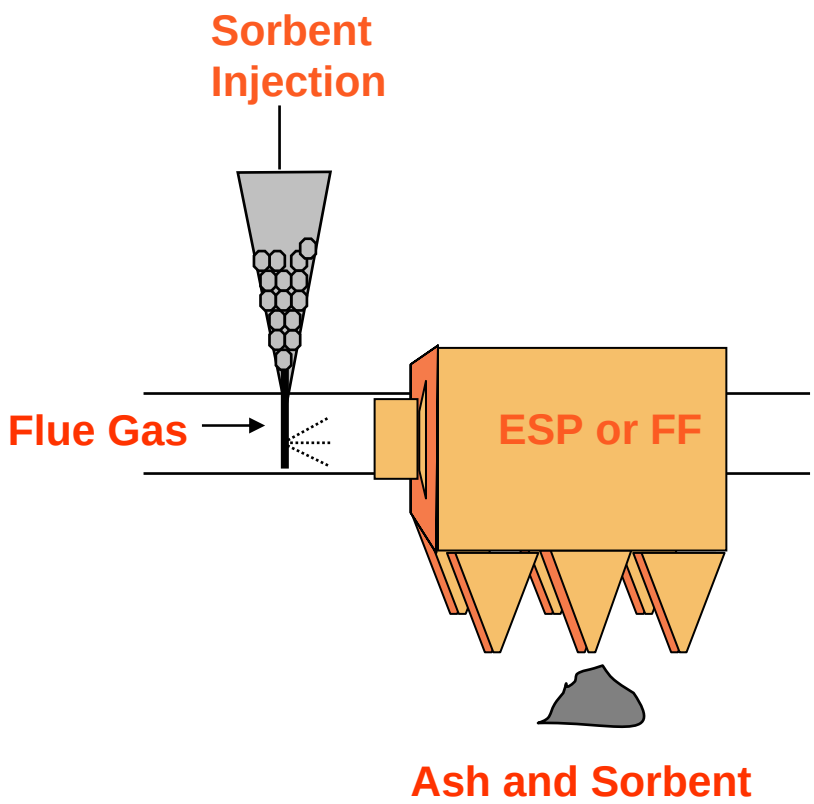
- Wet scrubbers
  - Good mercury removal of the water-soluble forms (e.g., $Hg^{(++)}$, etc.).
- Dry scrubbers
  - Data more variable depending on the PM removal technology used.

PM Control Technologies and Co-benefits

- High variability of mercury test data results.
- Mercury removal enhanced when PM controls are used with NO_x and SO_2 controls.
- Electrostatic precipitators (ESPs)
  - Installed on 72% of U.S. coal-fired boilers
- Baghouses (fabric filters)
  - Installed on 14% of U.S. coal-fired boilers

Beyond Co-benefits -- Sorbent Injection

- The extent of capture depends on:
  - Sorbent characteristics (particle size distribution, porosity, capacity at different gas temperatures)
  - Residence time in the flue gas
  - Type of PM control (FF vs. ESP)
  - Concentrations of SO_3 and other contaminants



Activated Carbon Injection (ACI)

- ACI successfully used to reduce mercury emissions from waste-to-energy facilities. Effort underway to transfer to coal-fired power plants.

- Not currently installed at any power plant, but short-term testing suggests it may eventually be able to achieve up to 90% control for all coal types.

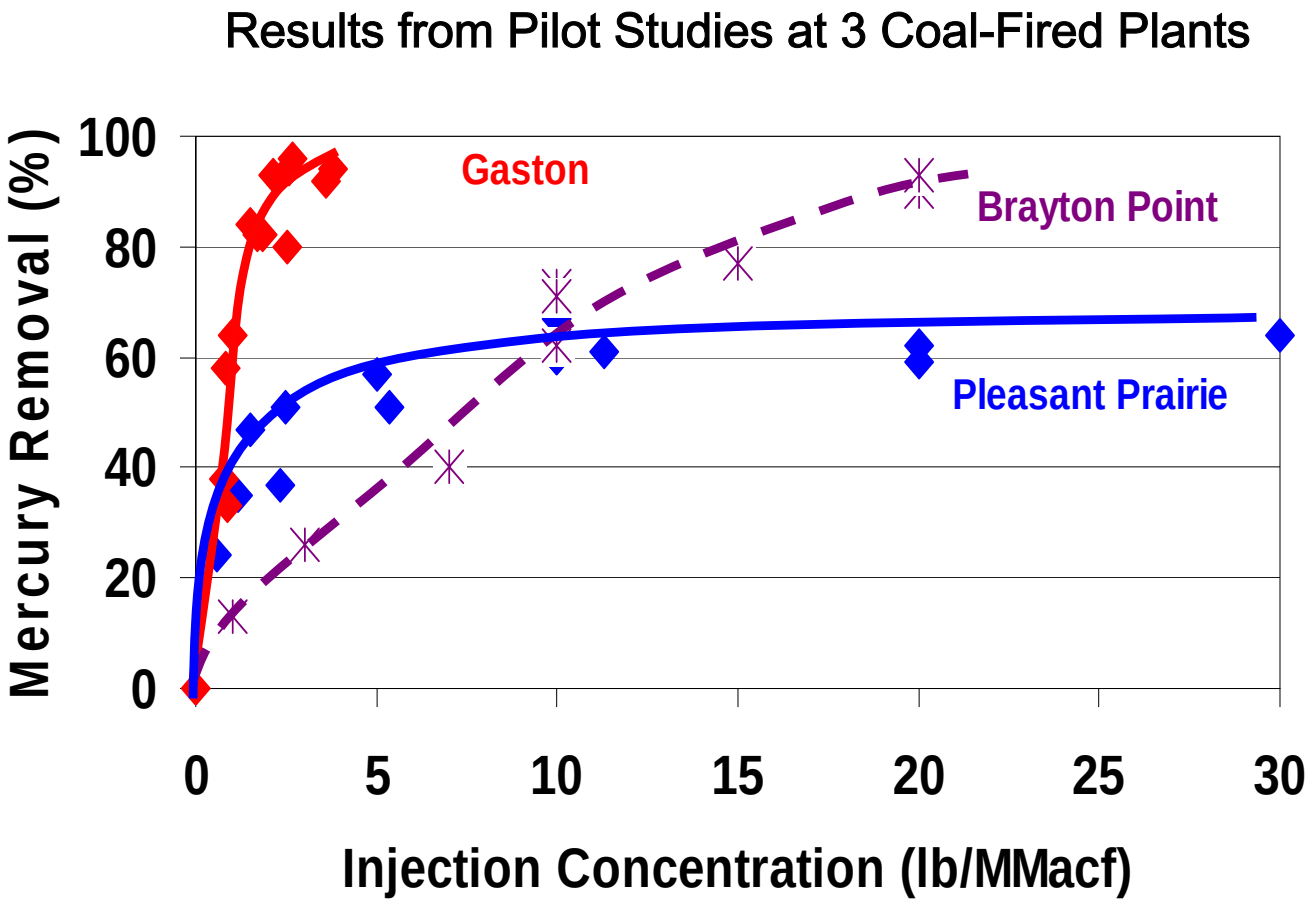
Activated carbon storage and feed system

Recent Power Plant Activated Carbon Injection Demonstration Projects

- **Alabama Power E.C. Gaston: unit 3, 135-MW equivalent, low-sulfur eastern bituminous coals**
  - Longest continuous short-term test run – 9 days
  - Long-term test (~1 year) underway
- **WEPCO Pleasant Prairie: unit 2, 150-MW equivalent, Powder River Basin, subituminous coal**
  - Longest continuous short-term test run – 5 days
- **PG&E Brayton Point: unit 1, 245-MW, low-sulfur bituminous coal**
- **PG&E Salem Harbor: 85-MW, low-sulfur bituminous coal**

Alabama Power E.C. Gaston Plant

Mercury Removal Trends with ACI



Source: ADA Environmental Solutions (2003)

So…

- We need more NO_x, SO_2, and PM reductions for fine particulate ($PM_{2.5}$) and 8-hr ozone attainment
- Current control technologies for NO_x, SO_2, and PM are capable of significantly reducing power plant mercury emissions
- Mercury-specific control technologies are not ready for full-scale commercial deployment
- And...settlement agreement says we must propose mercury rule by 12/15/2003 and promulgate by 12/15/04...now 03/15/05

EPA Proposes to Reduce Utility Emissions through Current CAA Authorities…

- **Clean Air Interstate Rule (CAIR)** to address the contribution of transported SO_2/NO_x emissions to ozone (smog) and fine particle ($PM_{2.5}$) nonattainment problems in the Eastern U.S.
- **Clean Air Mercury Rule (CAMR)** to address emissions of mercury

Clean Air Mercury Rule – Options for Controlling Mercury from Coal-Fired Power Plants

Proposed Alternatives to Reduce Mercury Emissions from the Power Sector

- Proposed section 112 MACT requirements for coal-fired generation units
  - Reduces mercury emissions from 48 to approximately 34 tons by 2008 with controls based on coal type.
- Proposed cap-and-trade approach to address mercury from coal-fired generation units under section 111
  - Revises December 2000 determination to use section 112 MACT requirements.
  - Commits to phased-in caps: first cap at co-benefits level in 2010; second cap at 15 tons in 2018.
  - Caps annual mercury emissions at 15 tons in 2018 and after.
- Also, discusses cap-and-trade approach under section 112(n)(1)(A)

Proposed Section 112 MACT

- Existing sources
  - Six subcategories
  - Limits are based on the average of the top 12% of sources in each subcategory
  - Accounted for variability
  - Emission standards applicable to each source
  - No trading
- New sources
  - Six subcategories
  - Limits are based on the best performing similar source in each subcategory
  - Accounted for variability
  - Emission standards applicable to each source
  - No trading

Proposed Existing Source MACT Limits

Subcategory	Hg (lb/TBtu)[1]	Hg (10^{-6} lb/MWh)[1]
Bituminous-fired	2.0	21
Subbituminous-fired	5.8	61
Lignite-fired	9.2	98
IGCC	19.0	200
Coal refuse-fired	0.38	4.1

[1] – Based on a 12-month rolling average

Subcategory	Ni (lb/TBtu)[2]	Ni (lb/MWh)[2]
Oil-fired	210	0.002

[2] – Based on a not-to-exceed annual limit

NOTE: Output-based standards are referenced to a baseline efficiency (32% for existing units).

Proposed New Source MACT Limits

Subcategory	Hg (10^{-6} lb/MWh)[1]
Bituminous-fired	6.0
Subbituminous-fired	20
Lignite-fired	62
IGCC	20[3]
Coal refuse-fired	1.1

[1] – Based on a 12-month rolling average
[3] – Based on a 90% reduction for beyond-the-floor control

Subcategory	Ni (lb/MWh)[2]
Oil-Fired	0.0008

[2] – Based on a not-to-exceed annual limit

NOTE: Output-based standards are referenced to a baseline efficiency (35% for new units).

Proposed Section 112 Monitoring and Compliance Requirements

- Mercury testing and monitoring requirements
  - Three options for mercury monitoring
    - Continuous Emission Monitors (CEM)
    - Carbon Absorption Tube
    - Manual Stack Test
- Allows for emissions averaging across facility for mercury

Proposed Section 111 Alternative

- January 2004 proposal:
  - New sources
    - Federal rule – 111(b)
    - Includes emission limits for mercury (coal-fired) and nickel (oil-fired)
      - Limits same as new-source MACT
  - Existing sources
    - Federal Guidelines for State Implementation Plans – 111(d)
      - Sets mercury emission rates for coal-fired utility units under a cap-and-trade program administered by States
        - » Phase 1: 2010 (solicit comment on co-benefits-based cap level)
        - » Phase 2: 2018 Capped at 15 tons
      - Sets a limit for nickel emissions from oil-fired units

Proposed Section 111 Alternative – cont.

- March 2004 supplemental proposal:
  - Establishes model trading program
  - Provides model mercury trading rule
  - Allocates State budget allocations
  - State requirements
    - Each State must submit a plan that demonstrates it will meet its assigned statewide mercury emissions budget
      - States may join the trading program by adopting or referencing the model trading rule in State regulations; or, adopting regulations that mirror the necessary components of the model trading rule
      - States can choose not to join the Federal trading program and meet their budget through intra-state trading or no trading
      - States can also choose to implement more stringent mercury emissions requirements
  - Monitoring requirements

Proposed Section 111 Hg Monitoring Requirements

- Requires continuous monitoring of mercury sufficient to support the trading program
- A comprehensive QA/QC program ensures the adequacy and completeness of emissions data
- Regulated sources would have the flexibility of using alternative monitoring approaches as long as such approaches meet the performance requirements in the rule

Benefits of Section 111 Alternative

- Would reduce nationwide mercury emissions by 33 tons (69 percent) from today's levels when fully implemented after 2018.
- Potential for earlier and greater reductions than proposed MACT alternative.
- Complements the CAIR, creating an integrated multipollutant approach to controlling emissions from power plants.

Proposed Section 112 Trading Alternative

- EPA has taken comment on a proposal to promulgate, under section 112(n)(1)(A), a cap-and-trade program for mercury from coal-fired utility units
  - Trading program would be Federally implemented with the EPA, instead of States, serving as the permitting authority

Perspective on Approach

- Administration prefers Clear Skies
  - Provides substantial health and environmental benefits with certainty, less complexity, and reasonable economic impacts.
- However, the Clean Air Interstate and Mercury Rules will:
  - Help cities and States in the East meet new, more stringent national ambient air quality standards for ozone and fine particles.
  - Provide substantial health, welfare, and environmental benefits.
  - Will maintain both fuel diversity and low electricity prices.
  - Provide benefits at a very reasonable cost.
  - Address major power sector emissions in an integrated manner.


Further Information:
www.epa.gov/interstateairquality
www.epa.gov/mercury