



# Current Activities Related to NYSERDA Science Programs

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# Overview

- Efforts to reduce SO<sub>2</sub> and NO<sub>x</sub> emissions
- Recent SO<sub>2</sub> and NO<sub>x</sub> emissions from the power sector
- Environmental improvements in relation to SO<sub>2</sub> and NO<sub>x</sub> emissions reductions
- Current status of the Mercury and Air Toxics Standards
- U.S. Greenhouse Gas Emissions

# Regulatory Efforts to Address SO<sub>2</sub> and NO<sub>x</sub> Emissions

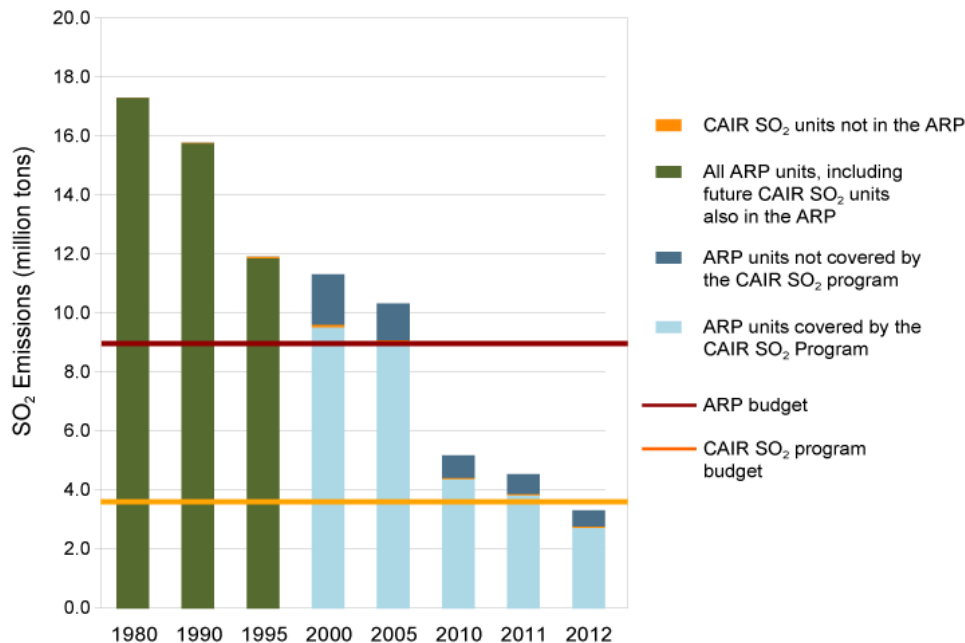
- Acid Rain Program (ARP)
  - ARP SO<sub>2</sub> program sets a permanent cap on the total amount of SO<sub>2</sub> that may be emitted by electric generating units (EGUs) in the contiguous United States
  - The program is phased in, with the final 2010 SO<sub>2</sub> cap set at 8.95 million tons
  - NO<sub>x</sub> reductions under the ARP are achieved through a program that applies to a subset of coal-fired EGUs and is closer to a traditional, rate-based regulatory system
- Clean Air Interstate Rule (CAIR)
  - CAIR requires certain eastern states to limit emissions of NO<sub>x</sub> and SO<sub>2</sub> to address regional interstate transport of ozone and PM<sub>2.5</sub> pollution
  - CAIR includes three separate cap and trade programs to achieve the required reductions:
    - NO<sub>x</sub> ozone season trading program (began 2009)
    - NO<sub>x</sub> annual trading program (began 2009)
    - SO<sub>2</sub> annual trading program (began 2010)
- Cross State Air Pollution Rule (CSAPR)
  - Scheduled to replace CAIR starting on January 1, 2012, but the U.S. Court of Appeals for the District of Columbia Circuit stayed CSAPR pending judicial review and on August 21, 2012 the court issued a decision vacating the rule.
  - The U.S. Supreme Court granted petitions to review the decision, and we anticipate the Supreme Court will issue its opinion in the first half of 2014.
  - CAIR remains in place and EPA continues to implement CAIR programs.

# Regulatory Efforts to Address SO<sub>2</sub> and NO<sub>x</sub> Emissions

- EPA is working with stakeholders to address the continued and shared problem of air pollution transport.
  - From an air quality and health perspective, the most pressing transport challenge appears to be ozone in the eastern half of the U.S. Specifically, transported emissions may pose significant challenges for areas with respect to the 2008 ozone standard.
  - EPA's efforts will focus on defining state obligations, while states should have flexibility on implementation, including the option of cost-effective regional programs.
- A number of additional efforts focus on reducing emissions that contribute to regional ozone and fine particle pollution levels:
  - Implementing rules that are already in place: MATS, boiler MACT, vehicle rules;
  - Completing other national rulemakings: Tier 3, wood stoves, refineries;
  - Innovative approaches to reduce pollution: Energy Efficiency/Renewable Energy programs, Ozone and PM Advance;
  - SO<sub>2</sub> NAAQS designations and implementation.

# Acid Rain Program and CAIR SO<sub>2</sub> Annual Program Emission Reductions

SO<sub>2</sub> Emissions from CAIR SO<sub>2</sub> Annual Program and ARP Sources, 1980–2012



Note: For CAIR units not in the ARP, the 2009 annual SO<sub>2</sub> emissions were applied retroactively for each pre-CAIR year following the year in which the unit began operating.

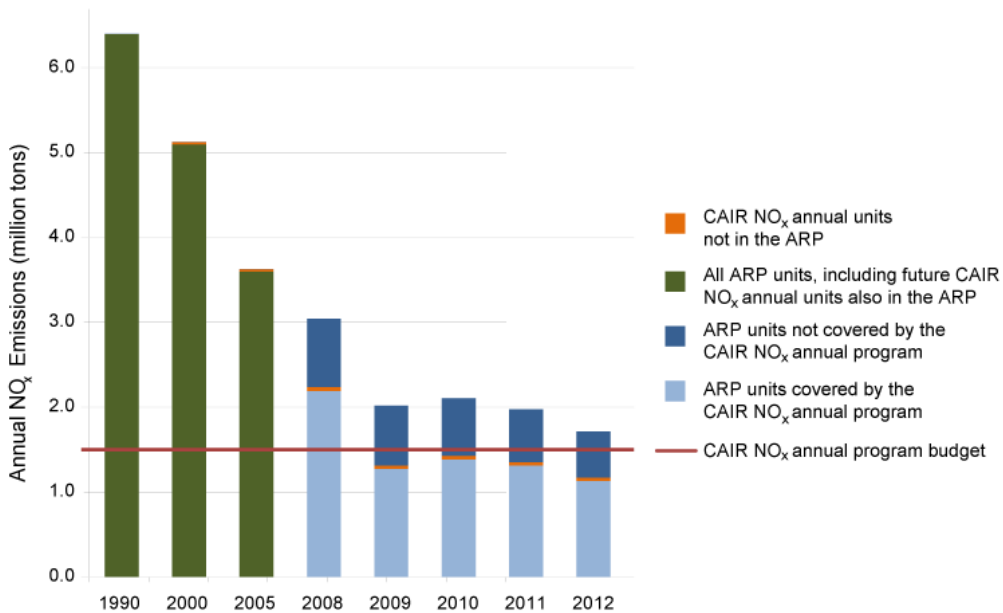
Source: EPA, 2013

All ARP and CAIR sources together emitted a total of 3.3 million tons of SO<sub>2</sub> in 2012

- SO<sub>2</sub> emissions from ARP sources decreased to 3.3 million tons — 81% below 1980 levels, 79% below 1990 levels, and more than 5 million tons below the 2010 goal
- Annual SO<sub>2</sub> emissions from sources in the CAIR SO<sub>2</sub> program alone fell from 9 million tons in 2005 to 2.8 million tons in 2012, a 69 percent reduction
- Seven CAIR states exceeded their 2012 budgets, indicating that, on an aggregate basis, sources within those states covered a portion of their emissions with banked or purchased allowances

# Acid Rain Program and CAIR NO<sub>x</sub> Annual Program Emission Reductions

Annual NO<sub>x</sub> Emissions from CAIR and ARP Sources, 1990–2012



Note: For CAIR units not in the ARP in 1990, 2000 and 2005, the emissions were applied retroactively for each pre-CAIR year following the year in which the unit began operating.

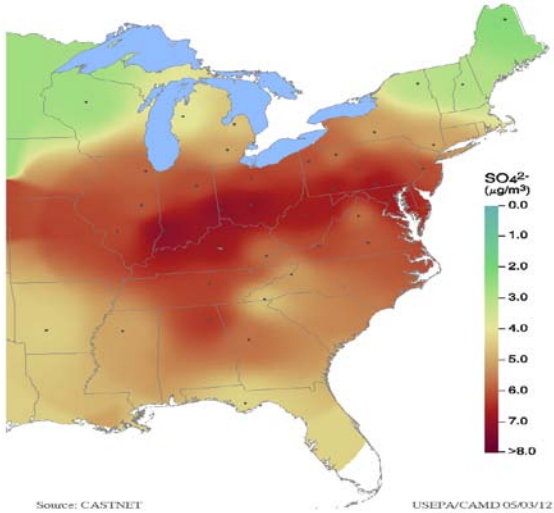
Source: EPA, 2013

- ARP sources emitted 1.7 million tons of NO<sub>x</sub> in 2012
- Emissions from CAIR NO<sub>x</sub> annual program sources alone were 1.17 million tons in 2012, 22 percent below the 2012 CAIR NO<sub>x</sub> annual program's regional budget of 1.5 million tons
- ARP and CAIR annual NO<sub>x</sub> emissions were 1.9 million tons lower (53 percent) than in 2005 and 3.4 million tons lower (67 percent) than in 2000

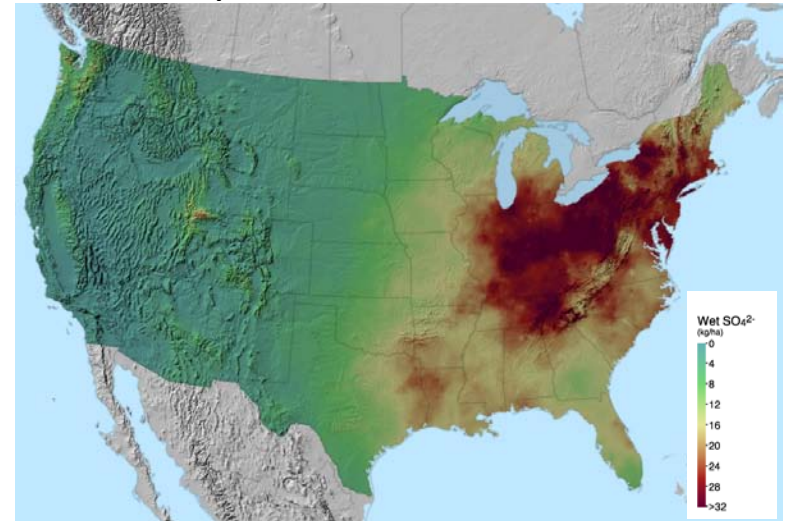
All ARP and CAIR sources together emitted a total of 1.7 million tons of NO<sub>x</sub> in 2012

# Environmental Results of SO<sub>2</sub> Emissions Reductions

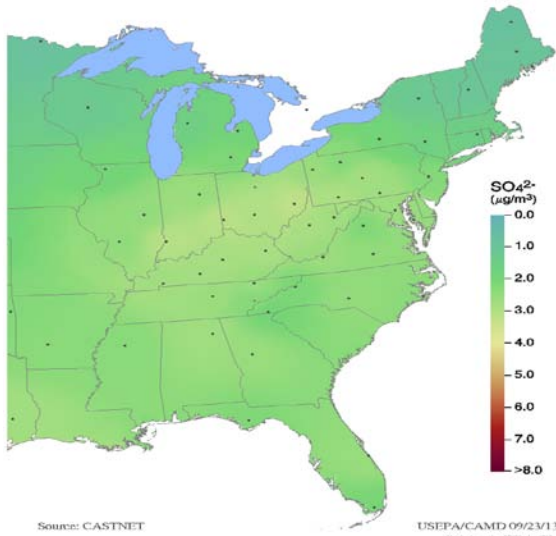
Ambient Sulfate Concentrations, 1989-91



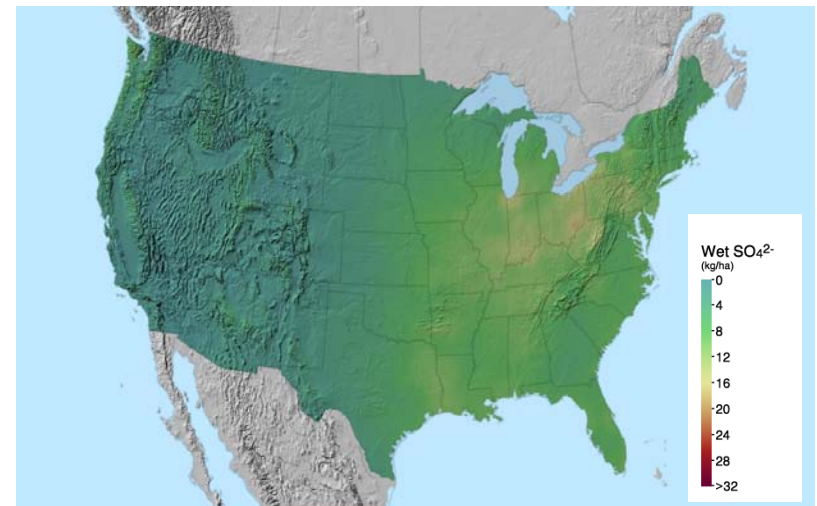
Wet Sulfate Deposition, 1989-1991



Ambient Sulfate Concentrations, 2010-2012

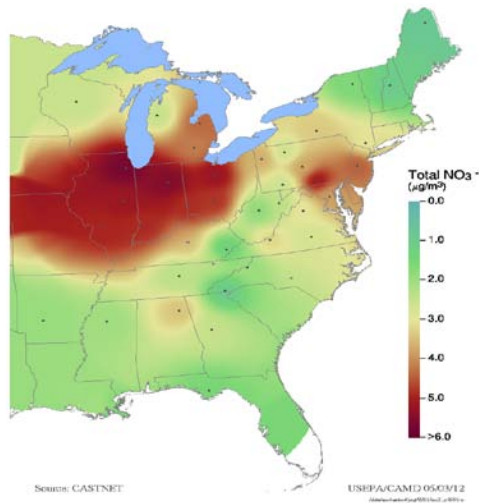


Wet Sulfate Deposition, 2010-2012

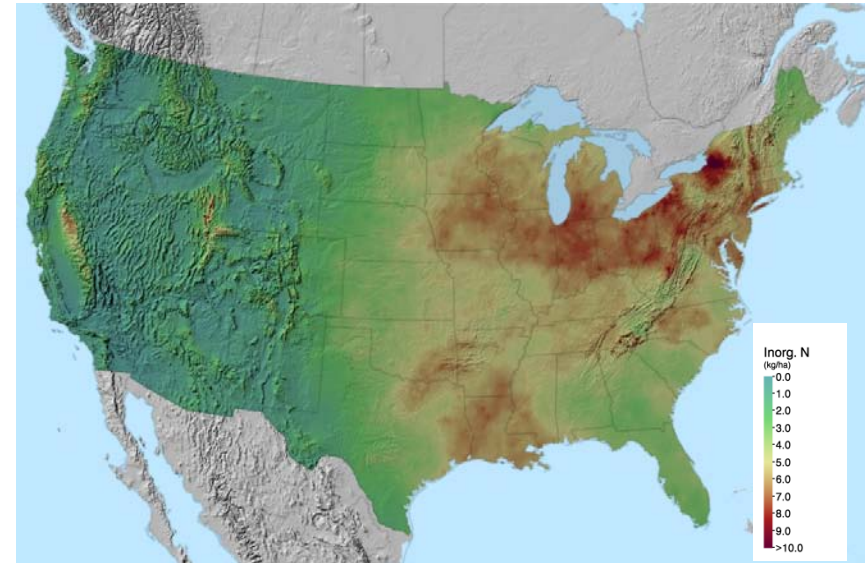


# Environmental Results of NO<sub>x</sub> Emissions Reductions

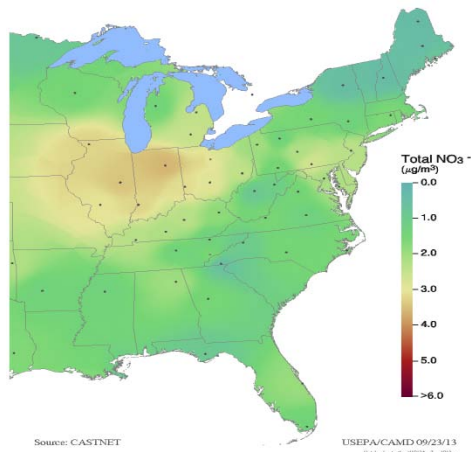
Three-Year Mean Ambient Nitrate Concentrations, 1989-1991



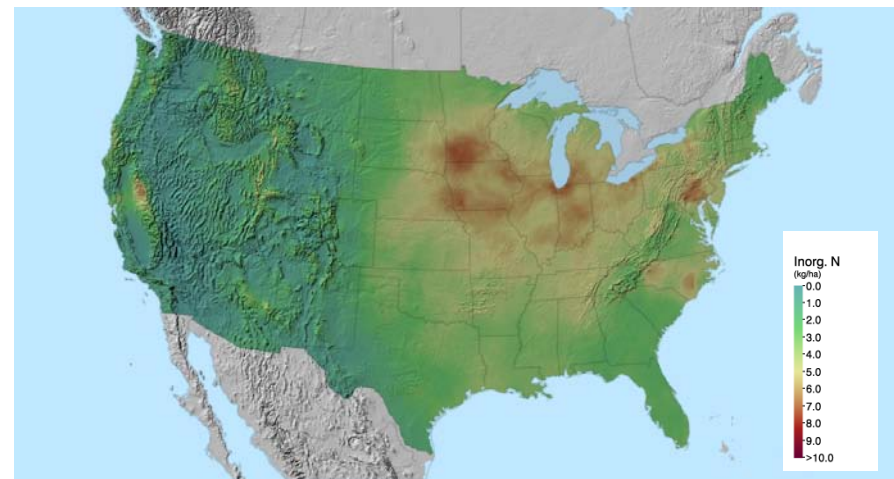
Three-Year Mean Wet Inorganic Nitrogen Deposition, 1989-1991



Three-Year Mean Ambient Nitrate Concentrations, 2010-2012



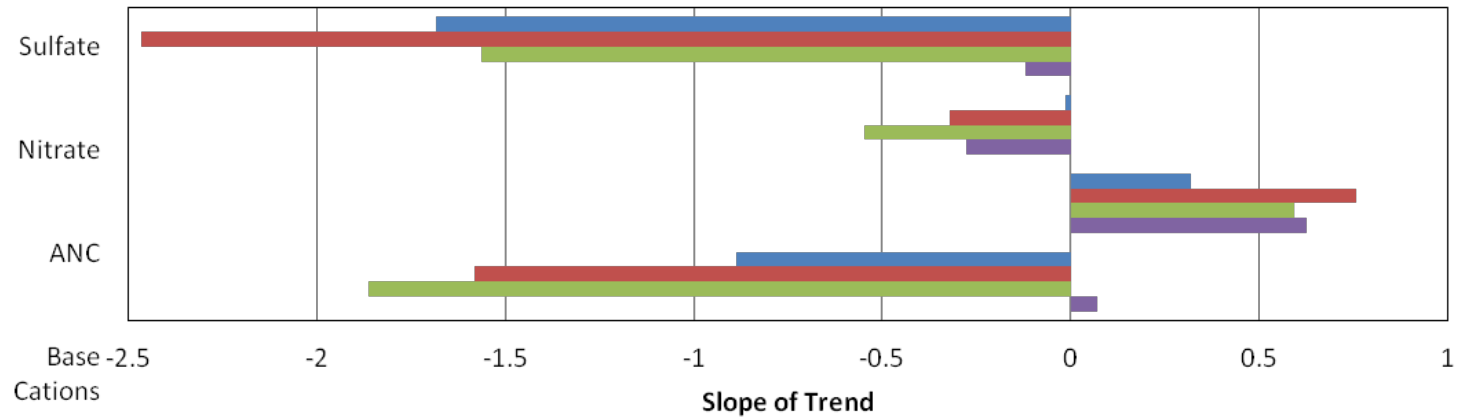
Three-Year Mean Wet Inorganic Nitrogen Deposition, 2010-2012



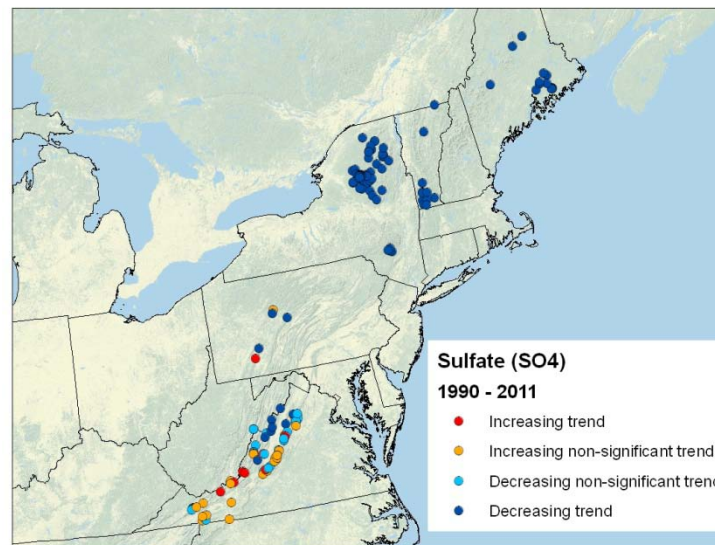


# Lake and Stream Response to Emissions Reductions

## Trends in Acidification of LTM Lakes and Streams, 1990-2011



■ New England lakes ■ Adirondack lakes ■ N. Appalachian Plateau streams ■ Ridge and Blue Ridge streams



# Mercury and Air Toxics Standards

## ***MATS Basics:***

- EPA issued the MATS rule on February 16, 2012 (signed 12/21/11), establishing national emission standards for mercury and other hazardous air pollutants for new and existing coal- and oil-fired electric power plants.
  - Requires significant reductions in emissions of mercury, and other metals such as chromium and nickel, and of arsenic and acid gases, including hydrochloric acid and hydrofluoric acid.
- Existing units generally have to comply by either April 2015 or April 2016.
- For more information on MATS - <http://www.epa.gov/airquality/powerplanttoxics/>

## ***MATS Implementation:***

- Utilities are making substantial progress in complying with MATS.
- MATS has put in motion planning and investment leading to the installation of pollution control technologies and adoption of emissions reduction measures across the existing fleet of power plants.

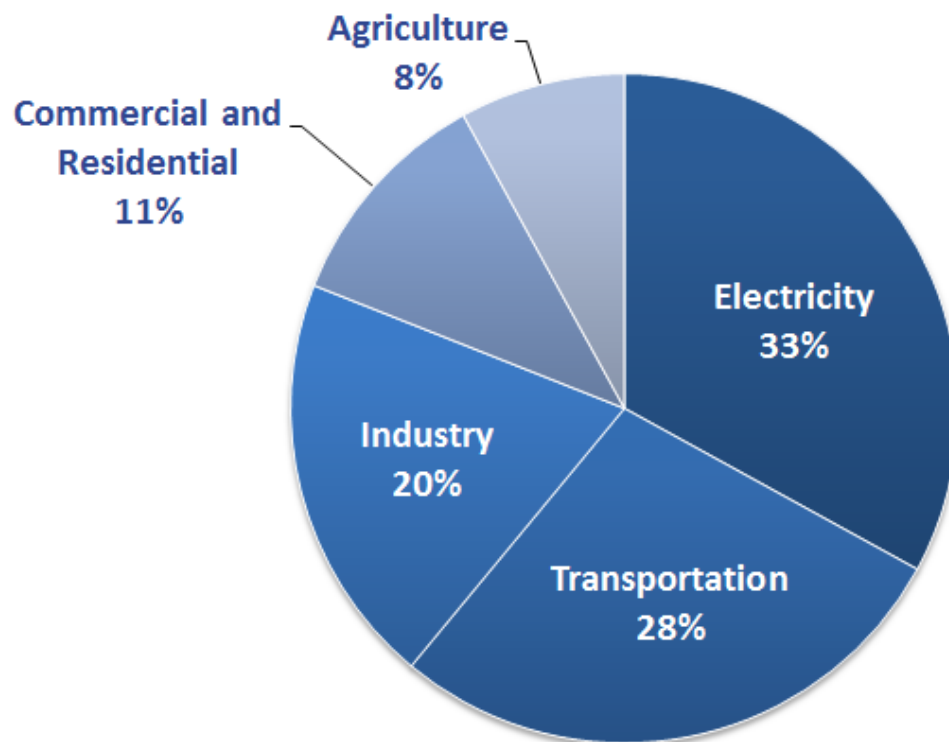
# Mercury and Air Toxics Standards

## ***Litigation and reconsideration:***

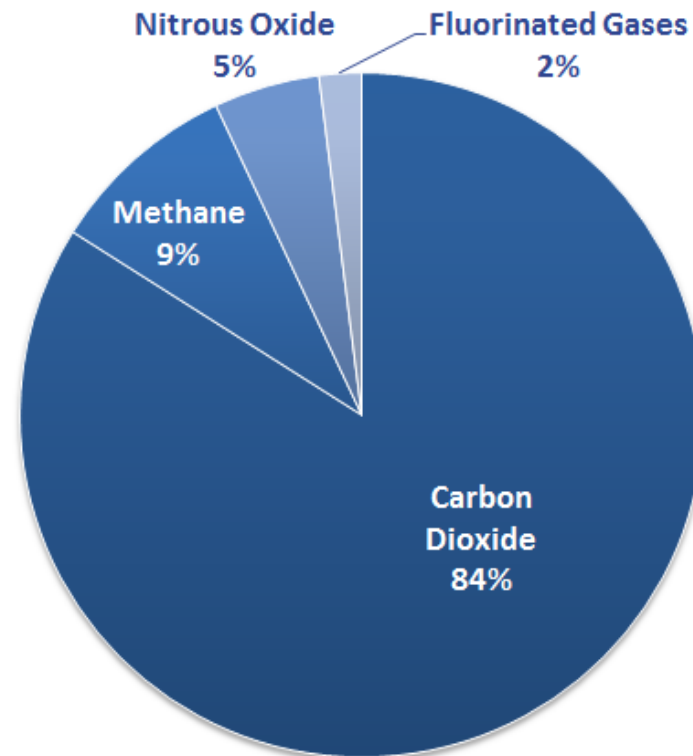
- Numerous groups filed suit against the final MATS, the reconsidered new source limits, and the New Source Performance Standard portion of the rule.
  - The litigation has been split into several proceedings.
  - On December 10th, the DC Circuit Court will hear oral arguments on the final MATS and the New Source Performance Standards finalized in February 2012.
- EPA received 20 petitions for reconsideration. On April 24, 2013, EPA finalized amendments to certain emission limits for new power plants.
  - They result in no significant change in MATS costs, emission reductions, or health benefits.
- EPA reopened the public comment period on startup and shutdown provisions from June 25, 2013 to August 26, 2013 (60 days).
  - The purpose was to solicit comment on specific issues raised during the original public comment period.
  - EPA is currently evaluating those comments prior to issuing a final rule addressing the startup and shutdown provisions.

# U.S. Greenhouse Gas Emissions

US GHG Emissions by Source Sector - 2011



US GHG Emissions by Gas - 2011



Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011 (April 2013)

# Further Information on GHG Emissions

- For more information on GHG emissions:
  - <http://www.epa.gov/climatechange/ghgemissions/>
- For more information on efforts to reduce GHG emissions:
  - <http://www.whitehouse.gov/share/climate-action-plan>
  - <http://www2.epa.gov/carbon-pollution-standards>