

Key EPA Power Sector Rulemakings

Julia Miller

U.S. EPA, Office of Air and Radiation

miller.julia@epa.gov

(202) 564-3277

August 19, 2011

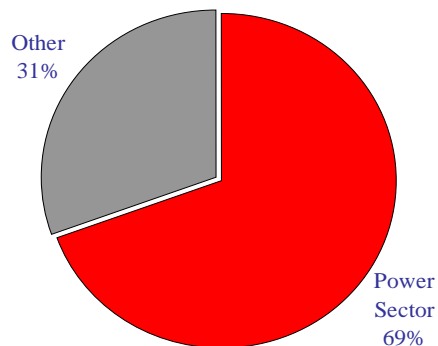
Why Reduce Power Plant Emissions?

- Deep emission reductions from power plants are needed over the next few years to address impacts on human health and the environment:
 - Reduce PM and ozone levels to meet air quality standards through cutting interstate transport and in-state emissions
 - Reduce emissions of mercury and other toxic pollutants
 - Reduce SO₂ and NO_x to clear regional haze and improve visibility in national parks, etc.
 - Protect ecosystems, such as by reducing acid deposition and nitrogen loadings to waterways

EPA plans to ensure that each individual power plant rule achieves its purpose and is legally defensible -- and that the rules, taken together, are achievable and advance the Clean Air Act's policy goals

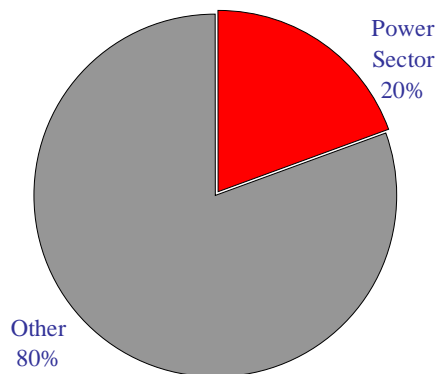
Power Sector Responsible for a Major Share of Air Emissions

SO₂ Emissions, 2007



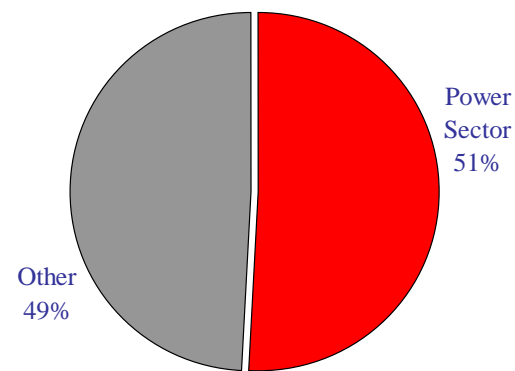
Total: 12.9 Million Tons

NO_x Emissions, 2007



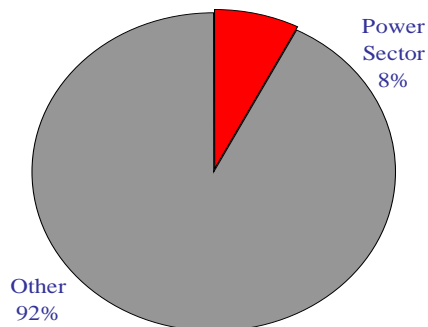
Total: 17.0 Million Tons

Hg Emissions, 2005



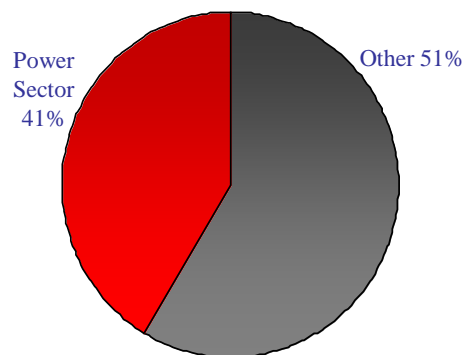
Total: 102.7 Tons

PM₁₀ Emissions, 2007



Total: 2.2 Million Tons

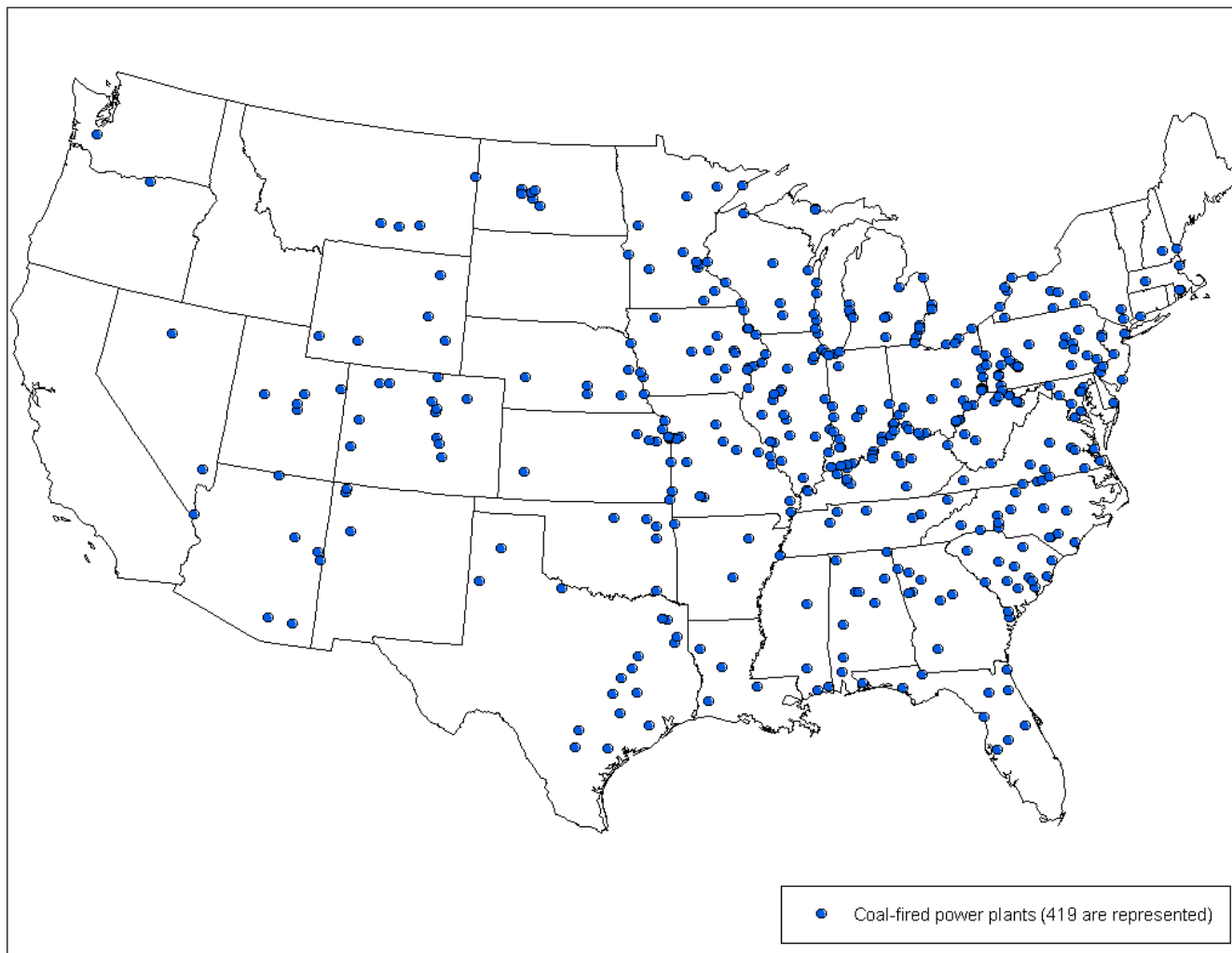
Carbon Dioxide, 2005



Total: 5.8 Billion Tons

Sources: SO₂, NO_x, PM₁₀, and Hg are from NEI trends data; PM₁₀ excludes condensibles and fugitive dust; CO₂ is from EPA's U.S. Greenhouse Gas Emissions and Sinks: 1990-2005 "Other" sources include transportation, other mobile sources, and industrial sources

U.S. Coal-Fired Power Plants Produce Most of the Power Sector Air Emissions

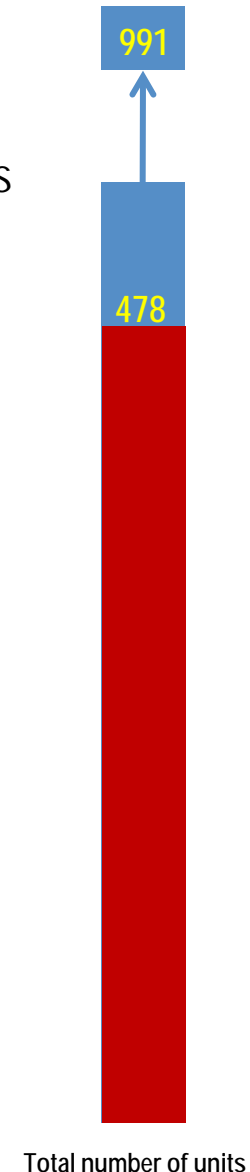
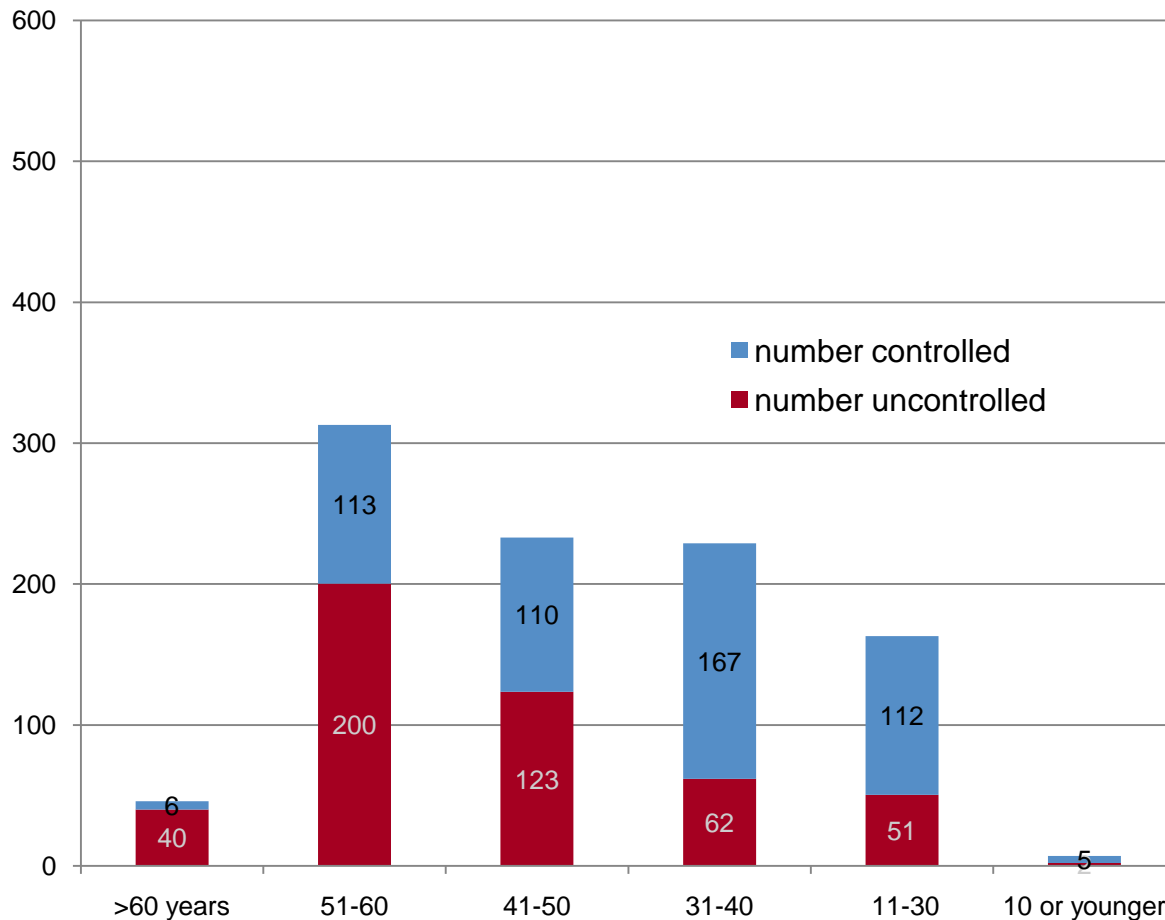


Coal-fired power plants (>300 GW) generate the vast majority of power sector air emissions:

- 92% of Hg
- 98% of SO₂
- 93% of NO_x
- 83% of CO₂

Many Plants Lack Controls

- 60% of the uncontrolled units are 31 years or older
- These units lack advanced controls for SO₂ and NO_x
- ~100 GW out of total of 300+ GW of coal are without SO₂ scrubbers



The Health Benefits are Huge

The benefits of the 1990 Clean Air Act Amendments include real improvements in the health of people right now.

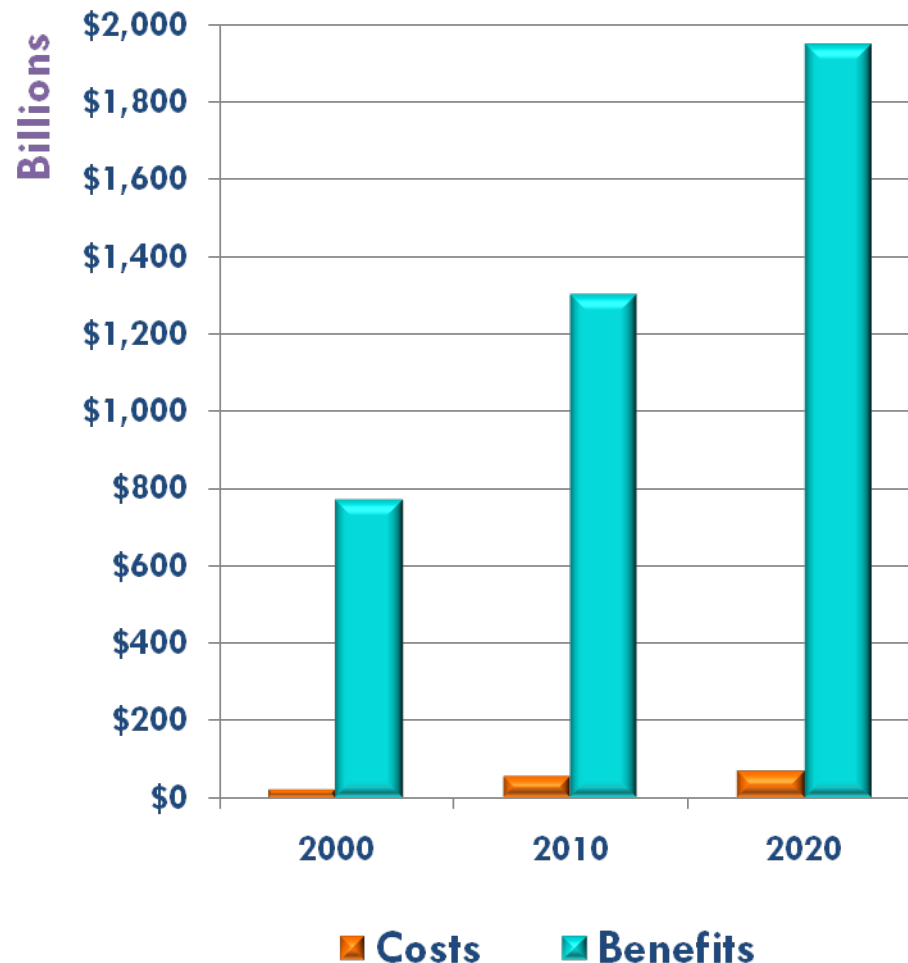
Health Effect Reductions (PM2.5 & Ozone Only)	Pollutant(s)	Year 2010	C A S E S A V O I D E D
PM2.5 Adult Mortality	PM	160,000	
PM2.5 Infant Mortality	PM	230	
Ozone Mortality	Ozone	4,300	
Chronic Bronchitis	PM	54,000	
Acute Bronchitis	PM	130,000	
Acute Myocardial Infarction	PM	130,000	
Asthma Exacerbation	PM	1,700,000	
Hospital Admissions	PM, Ozone	86,000	
Emergency Room Visits	PM, Ozone	86,000	
Restricted Activity Days	PM, Ozone	84,000,000	
School Loss Days	Ozone	3,200,000	
Lost Work Days	PM	13,000,000	

Toxic Pollutants and Greenhouse Gases also Raise Health and Environmental Concerns

- Hazardous air pollutants emitted by power plants include mercury, non-mercury metallic HAPS, acid gases, dioxin/furans, non-dioxin organics, and radionuclides.
- Mercury risks include:
 - Main exposure to people in U.S. comes from eating fish and other marine species containing methyl mercury. This form of mercury can impair neurological development in fetuses, infants and children and may cause heart disease in adults.
 - Methylmercury accumulates in fish at levels that may harm the fish and other animals that eat them, including birds and mammals and their predators.
- Other HAPs are human carcinogens (arsenic) and probable human carcinogens (lead, cadmium, nickel and dioxin/furans). HAPs also have other health and environmental effects.
- EPA has determined, based on numerous current and anticipated impacts, that CO₂ and other greenhouse gases endanger public health and welfare.

Clean Air Act Benefits Outweigh the Costs

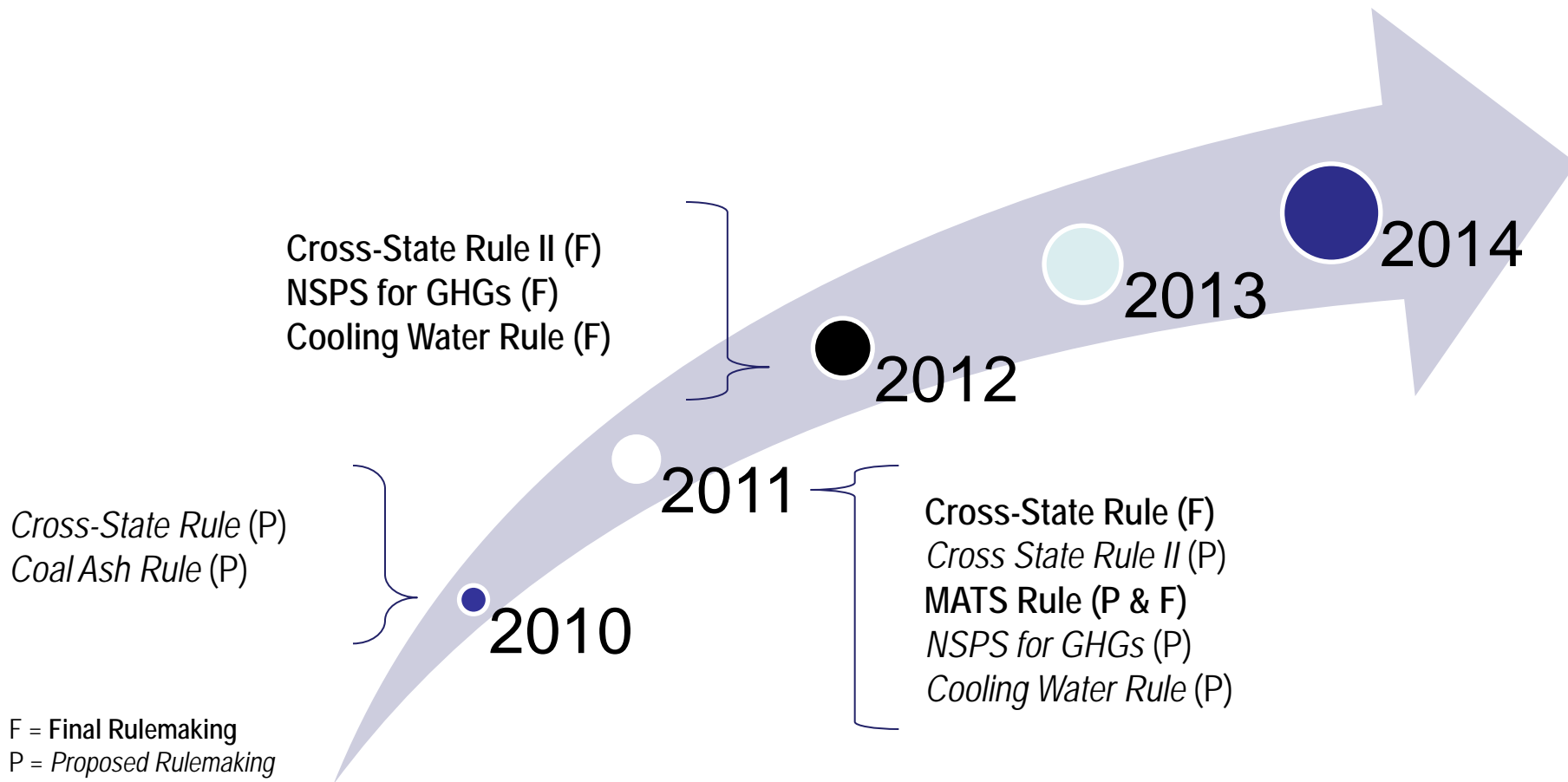
Primary central estimates of direct benefits and direct costs for 2000, 2010, and 2020 of 1990 Clean Air Act Programs
(In billions of 2006 dollars)



Rulemaking Schedule

Cross-State Air Pollution Rules:
MATS Rule & NSPS for GHGs:
Cooling Water Rule:

driven by statutory deadline
driven by court ordered deadlines
driven by court ordered deadline



F = Final Rulemaking
P = Proposed Rulemaking
GHG= Greenhouse gases
NSPS= New Source Performance Standard

Cross-State Air Pollution Rule

(aka: Transport Rule)

- Authority
 - The Clean Air Act required states to adopt rules to control interstate pollution by 2000.
 - NOx SIP Call Rule (1998) partially addressed ozone transport, but did not address fine particles.
 - Previous administration finalized Clean Air Interstate Rule (CAIR) in 2005 but the court found legal flaws and ordered EPA to replace it. CAIR remained in place until the Cross-State Air Pollution Rule was finalized in July 2011.
- Schedule – per statutory deadline
 - Phase I
 - Finalized in July 2011.
 - Compliance begins in January 2012.
 - Minnesota will be required to reduce annual emissions of SO₂ and NO_x to meet the 2006 24-hour PM_{2.5} standard.
 - Phase II
 - This rule includes a procedure to determine each upwind state's control responsibility that EPA can apply to any revised air quality standard. Each time air pollution standards (NAAQS) are changed, if interstate pollution transport contributes to the air quality problem, EPA will evaluate whether new emission reductions will be required from upwind states.
 - We're assessing the transport of air pollution across state boundaries that would affect meeting the upcoming ozone standard.
 - Final in summer 2012.
 - Compliance begins in 2014.

Cross-State Air Pollution Rule (aka: Transport Rule)

- **Key Points**

- Air pollution can travel hundreds of miles and cause multiple health and environmental problems on regional or national scales. This rule reduces emissions contributing to fine particle (PM_{2.5}) and ozone nonattainment that often travel across state lines:
 - Sulfur dioxide (SO₂) and nitrogen oxides (NO_x) contribute to PM_{2.5} transport, and
 - NO_x contributes to ozone transport.
- Coverage: Fossil-fuel fired units > 25 MW in the Eastern half of the U.S.
- 2012 Compliance builds largely off controls already in place and under construction.

- **Flexibility**

- This rule allows trading of emissions allowances.
- To meet this rule, EPA anticipates power plants will:
 - Operate already installed control equipment more frequently,
 - Use lower sulfur coal, or
 - Install pollution control equipment such as low NO_x burners, Selective Catalytic Reduction, or scrubbers (Flue Gas Desulfurization).

- **State Responsibilities**

- EPA is finalizing federal implementation plans (FIPs) that include allowance allocations, but states can replace the FIPs with State Implementation Plans (SIPs) at any time, and can choose to allocate allowances through SIPs starting in 2013.

Mercury and Air Toxics Standards

(aka Utility MACT or Toxics Rule)

- Authority
 - The Clean Air Act (section 112) requires the control of hazardous air pollutants (HAPs) from power plants.
 - 180+ HAPs are listed in the Clean Air Act. Those from fossil fuel combustion include mercury, dioxin/furans, and acid gases.
 - Previous Administration issued Clean Air Mercury Rule for power plants in 2005 but the court found the rule legally flawed and vacated it. Also, the rule failed to address all air toxics.
- Schedule – per court order
 - Proposed in March 2011.
 - Finalized in November 2011.
 - Compliance:
 - Existing sources: 3 years from final rule + 1 year allowable extension by state air permitting authority.
 - New sources: upon final rule.

Mercury and Air Toxics Standards (aka Utility MACT or Toxics Rule)

- Key Points

- Major Sources are defined as emitting 10 tons/yr for any one HAP or 25 tons/yr for all HAPs.
- General standard: maximum reduction achievable for sources, taking into consideration costs, energy requirements and non-air quality health and environmental impacts.
 - Existing sources: at least as stringent as the average of the top performing 12 percent of sources within the category.
 - New sources: at least as stringent as the single best performing source within the category.
- EPA is also proposing a new source performance standard (NSPS) for particulate, sulfur dioxide (SO₂), and nitrogen oxide (NO_x) emissions from new sources.

- Flexibility

- This is a technology-based standard.

- State Responsibilities

- States implement the rule by:
 - Incorporating into permits,
 - Conducting inspections, and
 - Taking enforcement actions, if necessary.

Utility New Source Performance Standards for GHGs

- Authority

- In April 2007, the U.S. Supreme Court ruled that greenhouse gases are air pollutants under the Clean Air Act.
- In December 2009, EPA issued a final determination that atmospheric concentrations of greenhouse gases endanger public health and welfare.
- Clean Air Act, Section 111, New Source Performance Standards (NSPS)
 - EPA authority to set emissions performance standard for new and modified sources (directly), and existing sources (through the states).
 - Standards must reflect “the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.”
 - While standards are based on demonstrated performance, EPA generally may not require use of any particular technology.

- Schedule – per court ordered deadline

- Proposed by September 30, 2011
- Finalized in May 2012

Coal Combustion Residuals

- Authority
 - Resource Conservation and Recovery Act (RCRA)
- Schedule
 - On June 21, 2010, EPA proposed 2 approaches for regulating disposal of CCRs from power plants.
- Key Points
 - Coal Combustion Residuals (CCRs) are byproducts from the combustion of coal – fly ash, bottom ash, boiler slag, and flue gas desulfurization materials.
 - In 2008, more than 136 million tons were generated
 - 34 % (46 million tons) landfilled
 - 22% (29.4 million tons) disposed of in surface impoundments
 - 37% (50.1 million tons) beneficially used
 - 8% (10.5 million tons) placed in mines
 - 75 % of impoundments are greater than 25 years old; 10% greater than 50 years old
 - ~300 CCR landfills and ~584 surface impoundments in use at ~ 495 coal-fired power plants

Coal Combustion Residuals

- Key Points (continued)
 - EPA has proposed two regulatory approaches:
 - 1st Approach: Regulates coal combustion residuals under Subtitle C of Resource Conservation and Recovery Act (RCRA) as a "special [hazardous] waste."
 - 2nd Approach: Regulates coal ash under Subtitle D of RCRA as a non-hazardous waste.
 - Under either approach, the beneficial use of coal ash would not be subject to regulation under RCRA.
- Flexibility
 - TBD
- State Responsibilities
 - 1st approach: This option would regulate the disposal of coal ash in landfills and surface impoundments, including permits to be issued by states or the EPA, and would require compliance within several years.
 - 2nd approach: This option would also regulate the disposal of coal ash in landfills and surface impoundments, but implementation would be by the states, as well as through citizen suits. Compliance with the rules would be within six months.

Cooling Water Rule

- Authority
 - Clean Water Act, Section 316(b)
- Schedule
 - Proposed in March 2011
 - Finalized in July 2012
- Key Points
 - This proposal covers 670 power plants that withdraw at least 2 million gallons per day of cooling water.
 - There are three components:
 - Existing facilities that withdraw at least 25 percent of their water exclusively for cooling purposes and have a design intake flow of > 2 million gallons per day would be subject to a limit on how many fish can be killed. The facility would determine which technology would be best suited to meeting this limit. Alternately, the facility could reduce their intake velocity to 0.5 feet per second.
 - Existing facilities that withdraw large amounts of water (> 125 MGD) would be required to conduct studies to help their permitting authority determine whether and what site-specific controls, if any, would be required to reduce the number of aquatic organisms that are killed.
 - New units that add capacity at an existing facility would be required to add technology that is equivalent to closed-cycle cooling.

Cooling Water Rule

- Flexibility
 - For existing facilities, state permitting authorities would decide what approach is best-suited to the facility.
- State Responsibilities
 - Regular permitting authority.

Other Upcoming Regulations

<i>Action</i>	<i>Schedule</i>
Ozone NAAQS Reconsideration	Final - August 2011
PM NAAQS	Proposal - August 2011

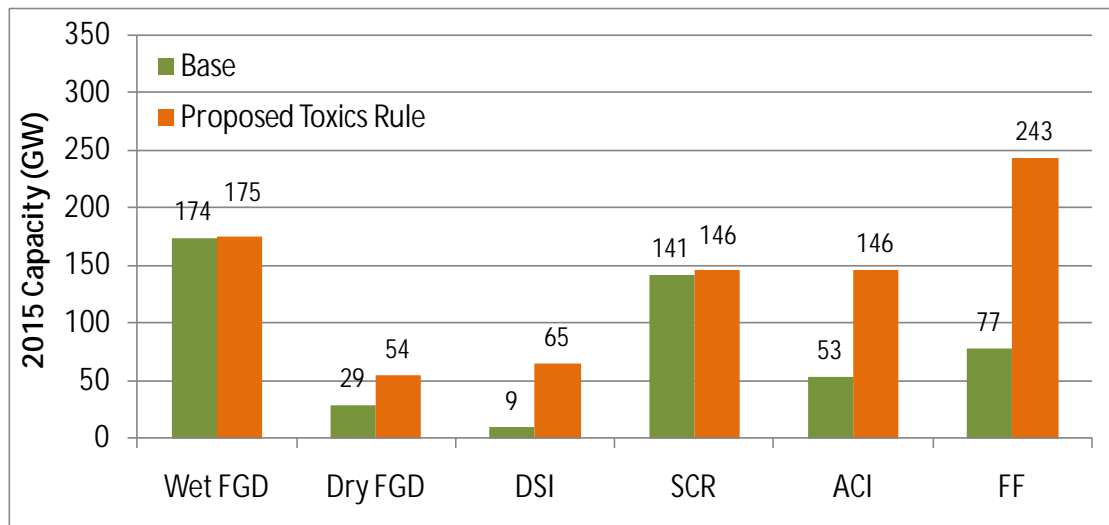
Tool Box of Pollution Control Technologies Satisfies Multiple Clean Act Requirements

- Pollution reduction controls at utilities are well-understood and available now
- SO₂ reduction technologies
 - Reduce HAPs to meet requirements of upcoming Toxics Rule
 - Help in-state areas attain the existing and upcoming PM_{2.5} NAAQS and 2010 SO₂ NAAQS
 - Help downwind states attain PM_{2.5} NAAQS
 - Address visibility (regional haze) improvement goals
- NO_x reduction technologies
 - Help in-state areas attain the existing and new ozone NAAQS
 - Help downwind states attain the existing and new ozone NAAQS
 - Address visibility (regional haze) improvement goals
- Mercury reduction technologies
 - Reduce mercury emissions to meet requirements of upcoming Toxics Rule
- Direct PM reduction technologies:
 - Help attain PM_{2.5} NAAQS and visibility program requirements
 - Reduce HAP emissions to meet requirements of upcoming Toxics Rule



Sources Can Achieve These Standards

- Proven control technologies to reduce these emissions such as scrubbers, fabric filters, and activated carbon injection are widely available
- Many units already use one or more of these technologies
- As a result of this standard, some power plants will upgrade existing controls (especially particulate matter controls like electrostatic precipitators)
- Power plants may also install new controls (such as fabric filters, dry sorbent injection, or activated carbon injection)



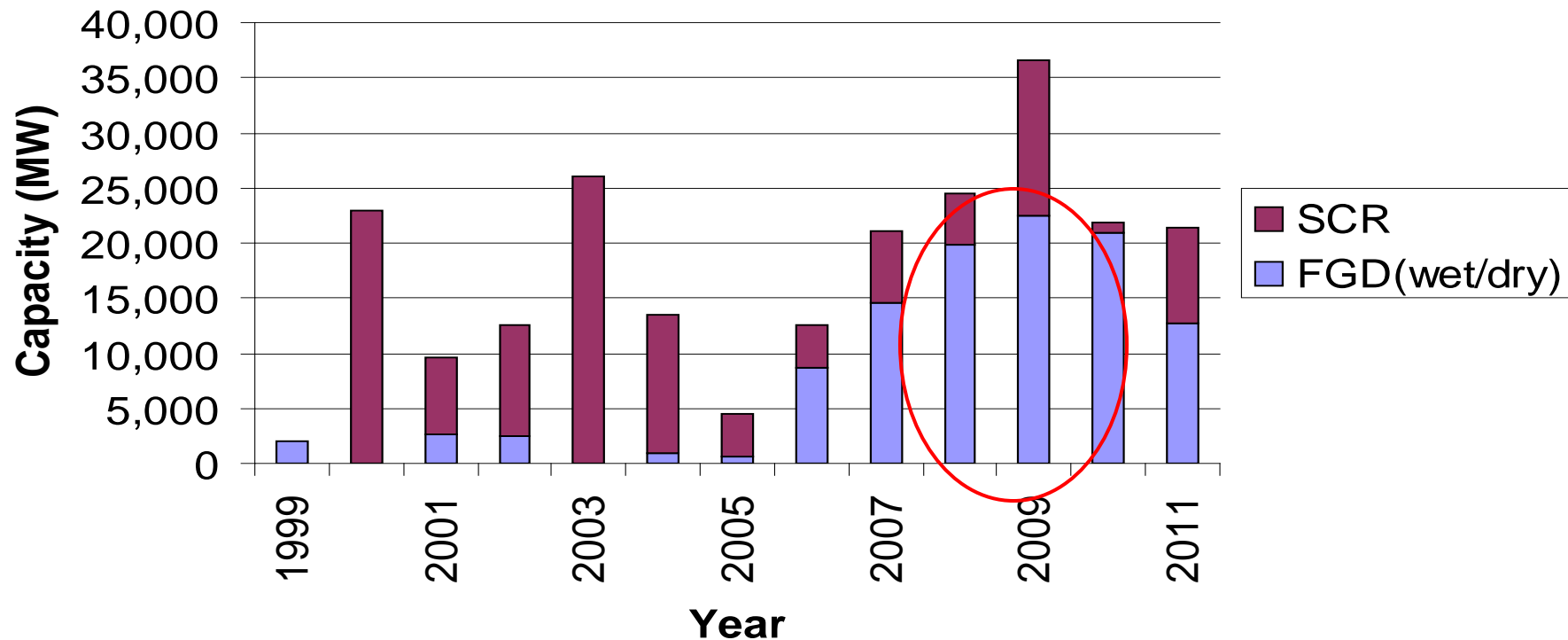
Retrofit pollution control installations on coal-fired capacity (by technology) with the base case and with the proposed Toxics Rule, 2015 (measured in GW capacity). Source: Integrated Planning Model run by EPA, 2011

FGD: flu gas desulfurization (scrubber)
DSI: dry sorbent injection
SCR: selective catalytic reduction
ACI: activated carbon injection
FF: fabric filter

Industry Capacity to Add New Emissions Controls

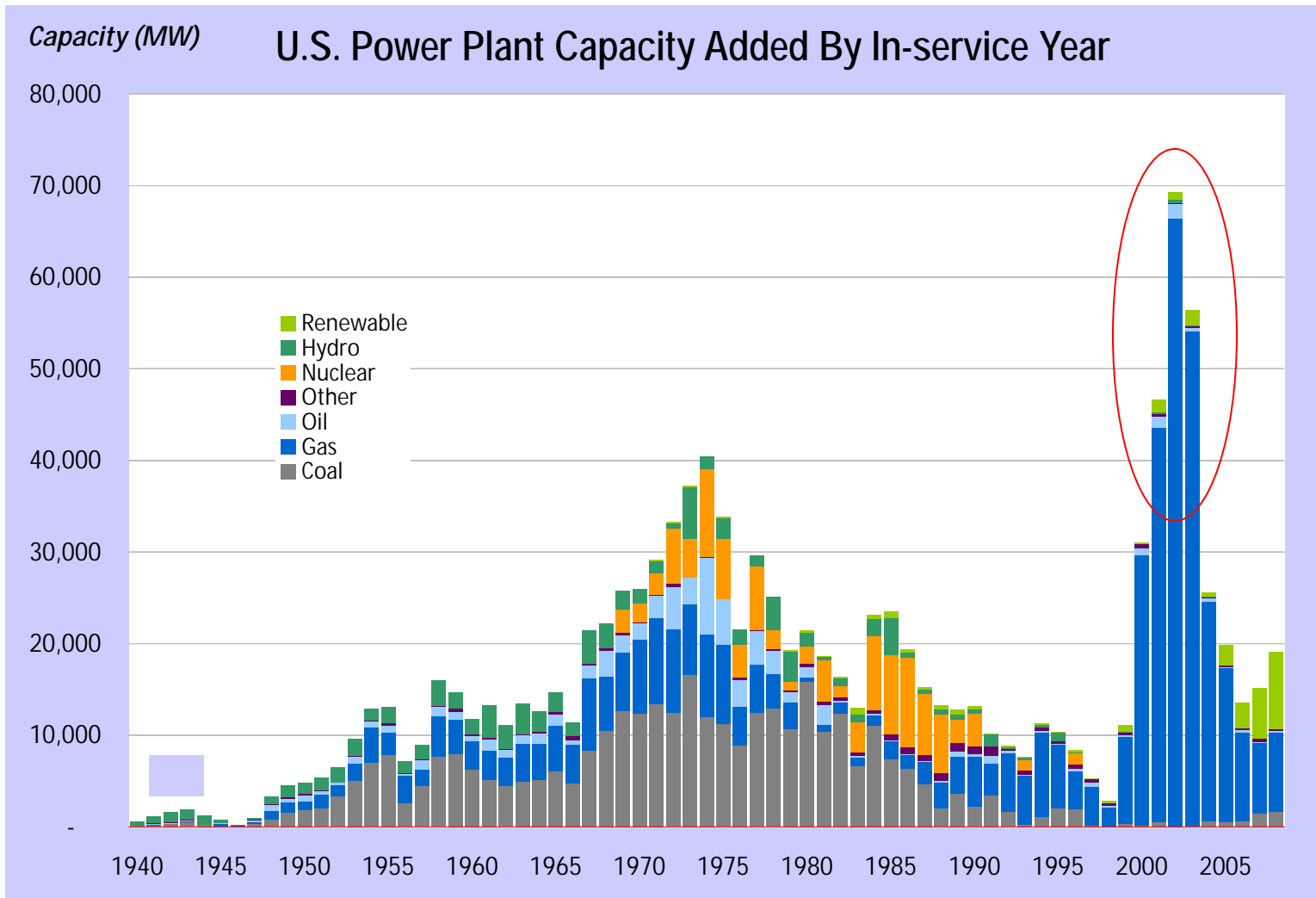
Added 20+ GW of SO₂ scrubbers per year 2008 - 2010

Cumulative SCR and FGD Installations by Year



Industry Capacity to Add New Generation

Between 2001-2003 the electric industry built over 160 GW of new generation



Source: Ceres, et al., Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States, June 2010.

For More Information

- **Clean Air Act (CAA)**

- Cross-State Air Pollution Rule

<http://www.epa.gov/crossstaterule/>

- Mercury and Air Toxics Standards

<http://www.epa.gov/airquality/powerplanttoxics/>

- Utility NSPS

<http://www.epa.gov/ttn/atw/nsps/boilernsps/boilernsps.html>

- **Resource Conservation and Recovery Act (RCRA)**

- Coal Combustion Residuals (CCR)

<http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/ccr-rule/index.htm>

- **Clean Water Act (CWA)**

- Cooling Water Intake Structures (CWIS)

<http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/index.cfm>