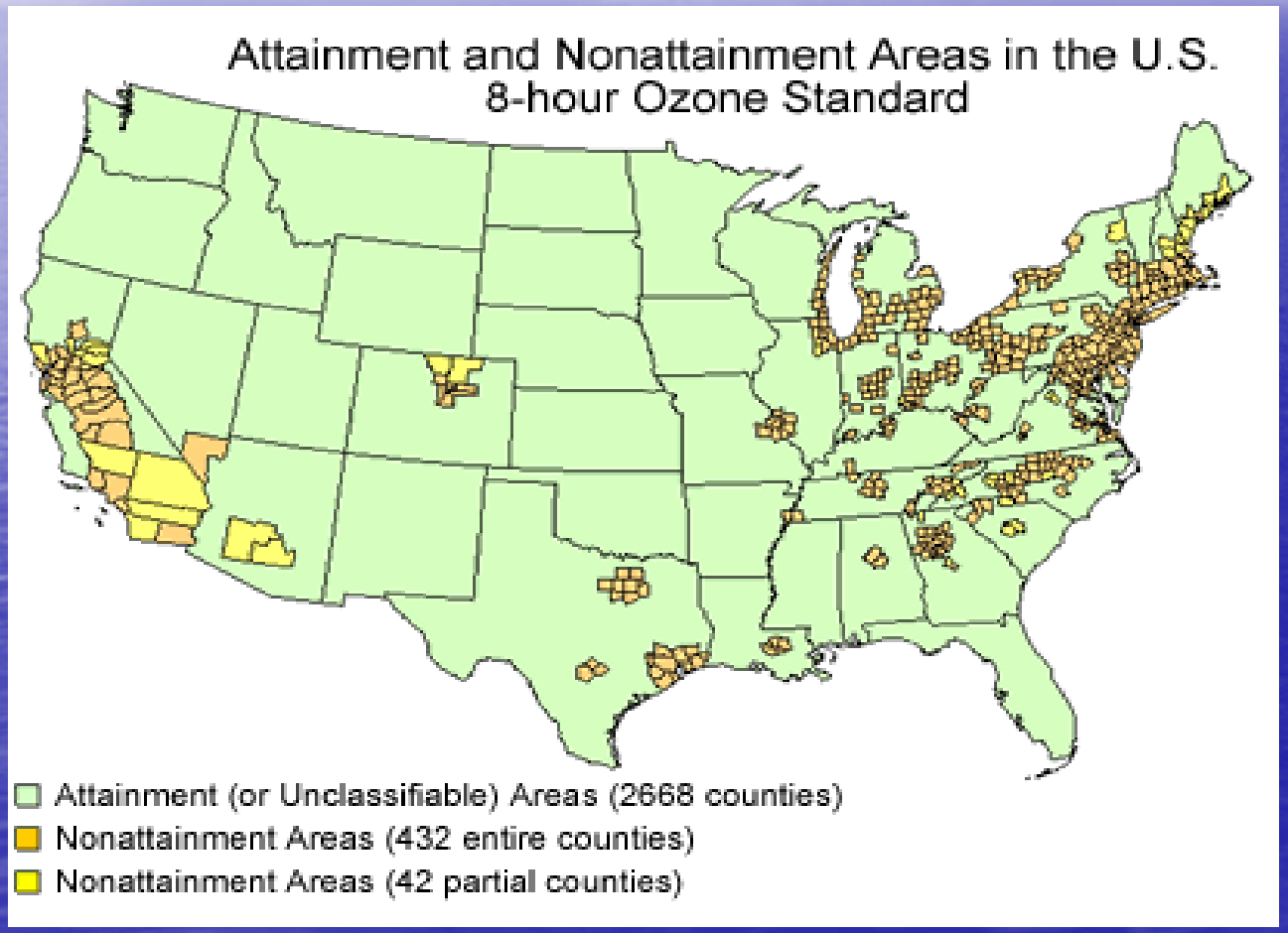
# Ozone Attainment, OTC's Multi-Pollutant Approach

## OTC Annual Meeting
## June 9, 2004
## Red Bank, New Jersey

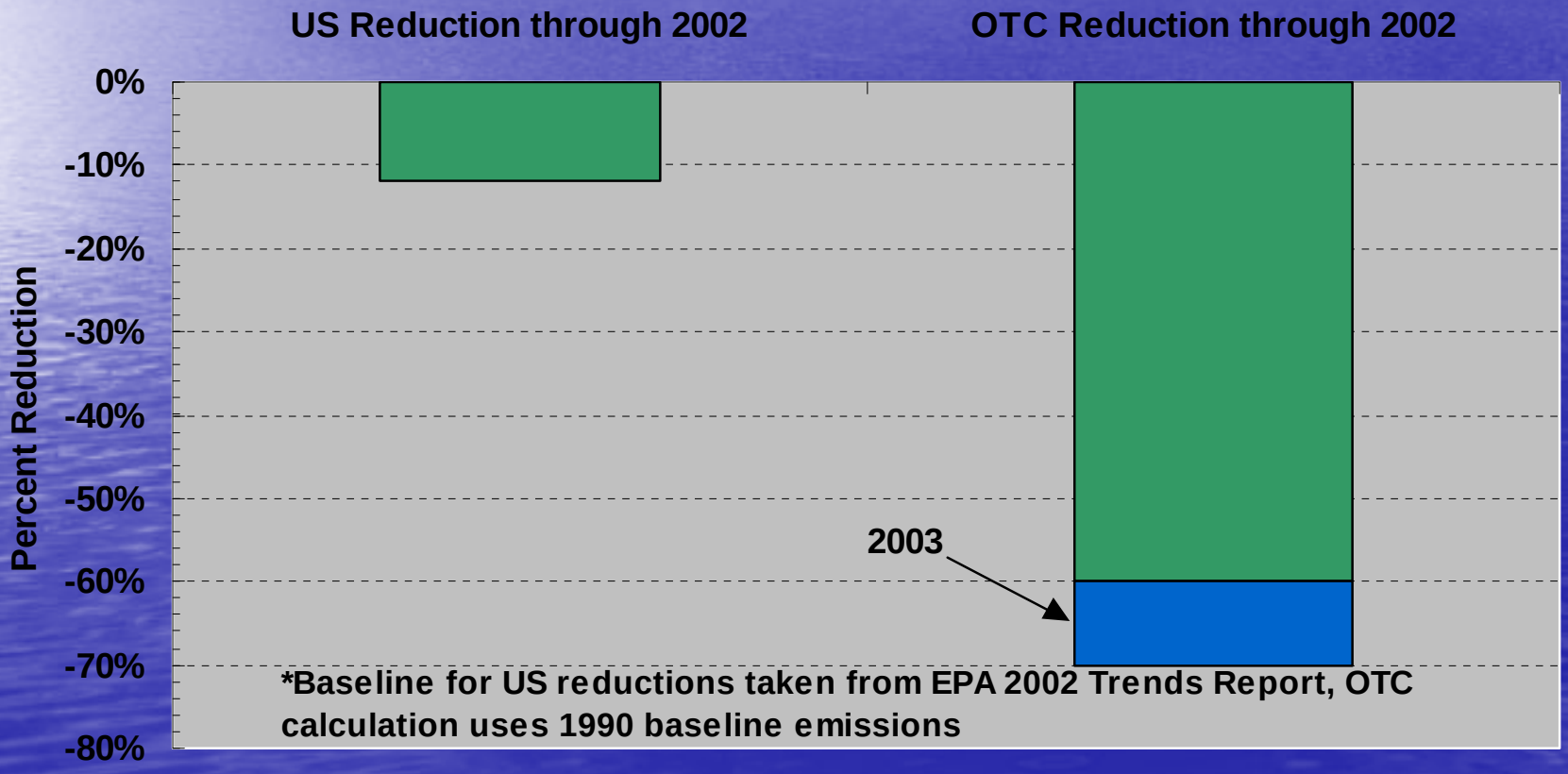
Christopher Recchia
Ozone Transport Commission
Washington, D.C.

OZONE TRANSPORT COMMISSION

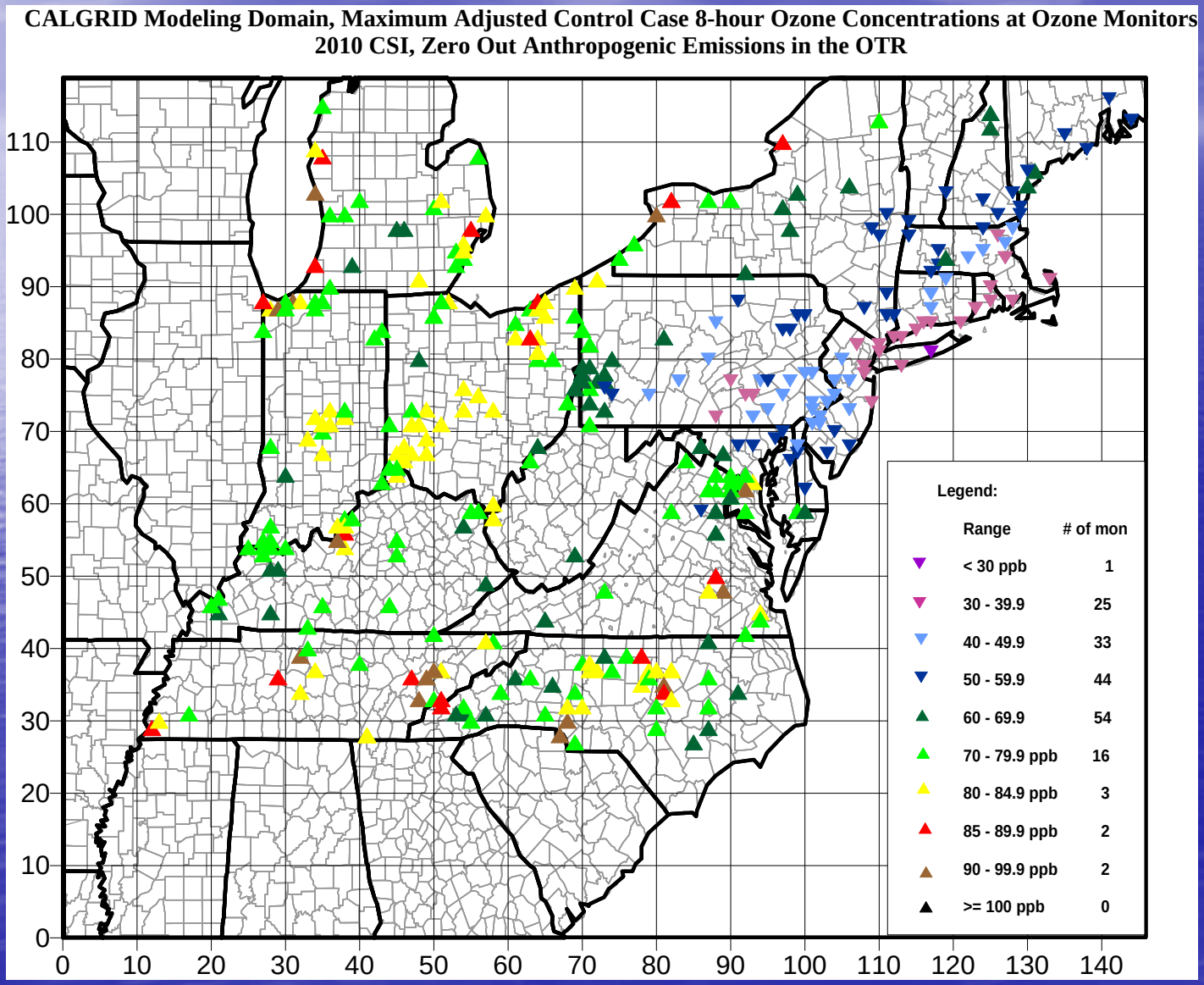
# EPA 8 Hour Non-Attainment Areas



# Electric Sector NOx Reductions Nationally vs. OTR



# Ramifications – Zero Anthropogenic OTR



# Ramifications

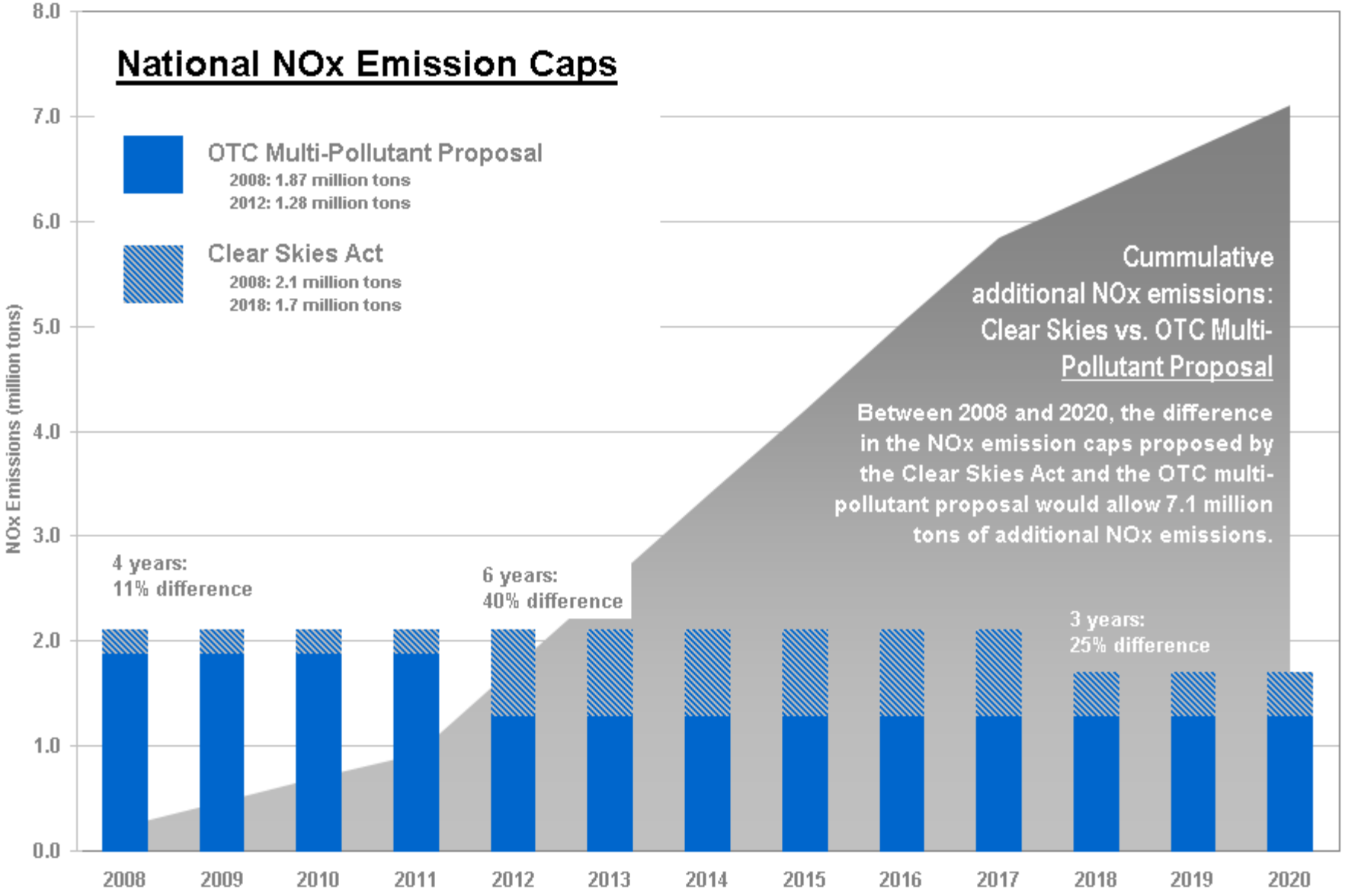
| Transported Ozone (ppb) | # Monitors | % of Standard |
|---|---|---|
| < 30 ppb | 1 | 25 % |
| 30-39.9 ppb | 25 | 44 % |
| 40-49.9 ppb | 44 | 56 % |
| 60-69.9 ppb | 54 | 81 % |
| 70-79.9 ppb | 16 | 94 % |
| 80-84.9 ppb | 3 | 106 % |
| 85-89.9 ppb | 2 | 113 % |
| 90-99.9 ppb | 2 | 119 % |

# OTC's Multi-Pollutant Proposal

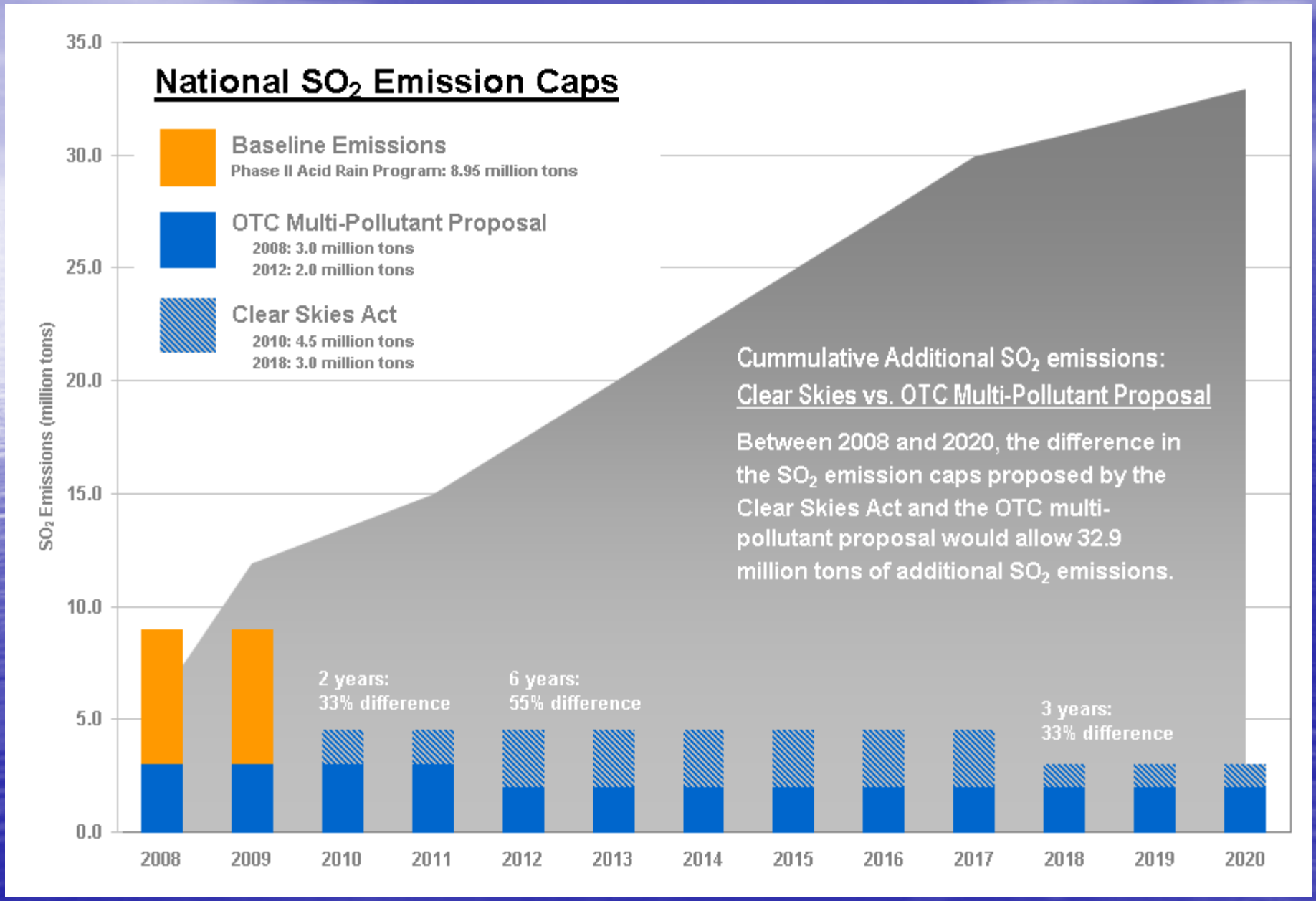
| Pollutant* | Historical Baseline | Emission Reduction Targets |
|---|---|---|
| NOx | 3.65 million tons (EPA projected emissions 2005) | **2008** – 1.87 million tons<br>**2012** – 1.28 million tons |
| $SO_2$ | 8.95 million tons (Phase II Acid Rain Cap) | **2008** – 3.0 million tons<br>**2012** – 2.0 million tons |
| Mercury | 48 tons (1999 emissions) | **2008** – 15 tons<br>**2012** – 10 tons<br>**2015** – roughly 5 tons |

*The OTC encourages Congress to act on a national program or programs promoting efficiencies that address emissions such as carbon dioxide and other greenhouse gases in a cost-effective, coordinated, and streamlined manner.

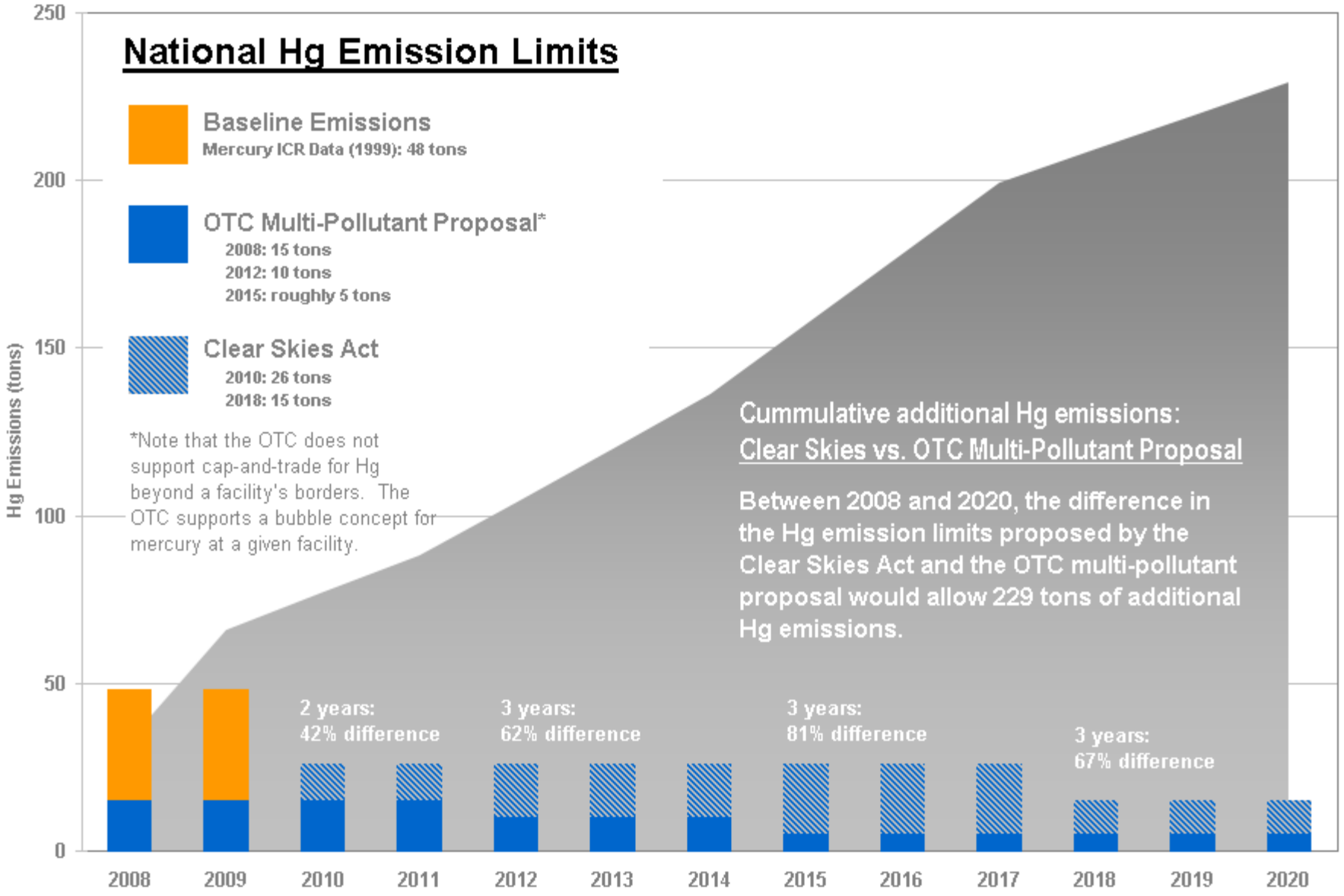
# Clear Skies: NOx Comparison



# Clear Skies: $SO_2$ Comparison



# Clear Skies: Mercury Comparison



# OTC Modeling Work and Results

- A series of modeling runs were performed to evaluate the OTC multi-pollutant proposal.
- Modeling was performed with ICF's Integrated Planning Model (IPM) using EPA's modeling assumptions version 2.1.6. Detailed assumptions can be found at: http://www.epa.gov/airmarkets/epa-ipm.
- Scenario 1 relies on EPA demand growth and natural gas price assumptions.
- Scenarios 2 and 3 rely on Energy Information Administration (EIA) demand growth and natural gas price assumptions.

# OTC Modeling Scenarios

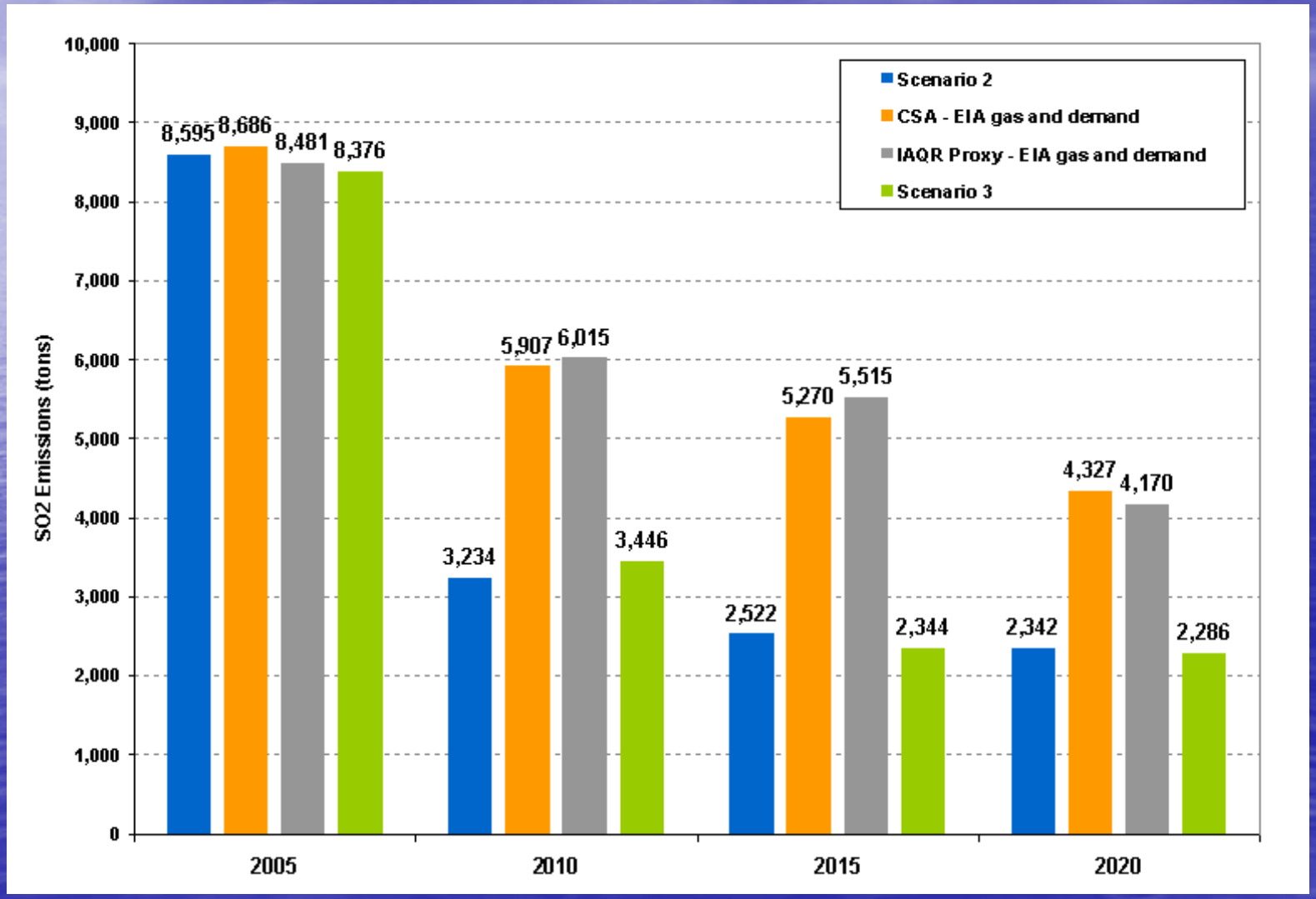
| Scenario | $NO_X$ | $SO_2$ | Hg |
|---|---|---|---|
| Scenario 1[EPA]<br><br>**EPA demand growth assumptions and gas prices** | NOx SIP Call in 2004<br>1.87 million ton cap in 2008<br>1.28 million ton cap in 2012<br><br>National annual cap and trade | Title IV $SO_2$<br>3 million ton cap in 2008<br>2 million ton cap in 2012<br><br>National annual cap and trade | none |
| Scenario 2[EIA]<br><br>**EIA demand growth assumptions and gas prices** | NOx SIP Call in 2004<br>1.87 million ton cap in 2008<br>1.28 million ton cap in 2012<br><br>National annual cap and trade | Title IV $SO_2$<br>3 million ton cap in 2008<br>2 million ton cap in 2012,<br><br>National annual cap and trade<br><br>Transfer of allowance bank allowed subject to Progressive Flow Control beginning in 2008 based on 10% trigger and 2:1 surrender ratio | none |
| Scenario 3[EIA]<br><br>**EIA demand growth assumptions and gas prices** | NOx SIP Call in 2004<br>1.87 million ton cap in 2008<br>1.28 million ton cap in 2012<br><br>National annual cap and trade | Title IV $SO_2$<br>3 million ton cap in 2008<br>2 million ton cap in 2012<br><br>National annual cap and trade<br><br>Transfer of allowance bank allowed subject to Progressive Flow Control beginning in 2008 based on 10% trigger and 2:1 surrender ratio | 5 ton cap in 2015<br><br>National annual cap and trade |

# Comparative Scenarios

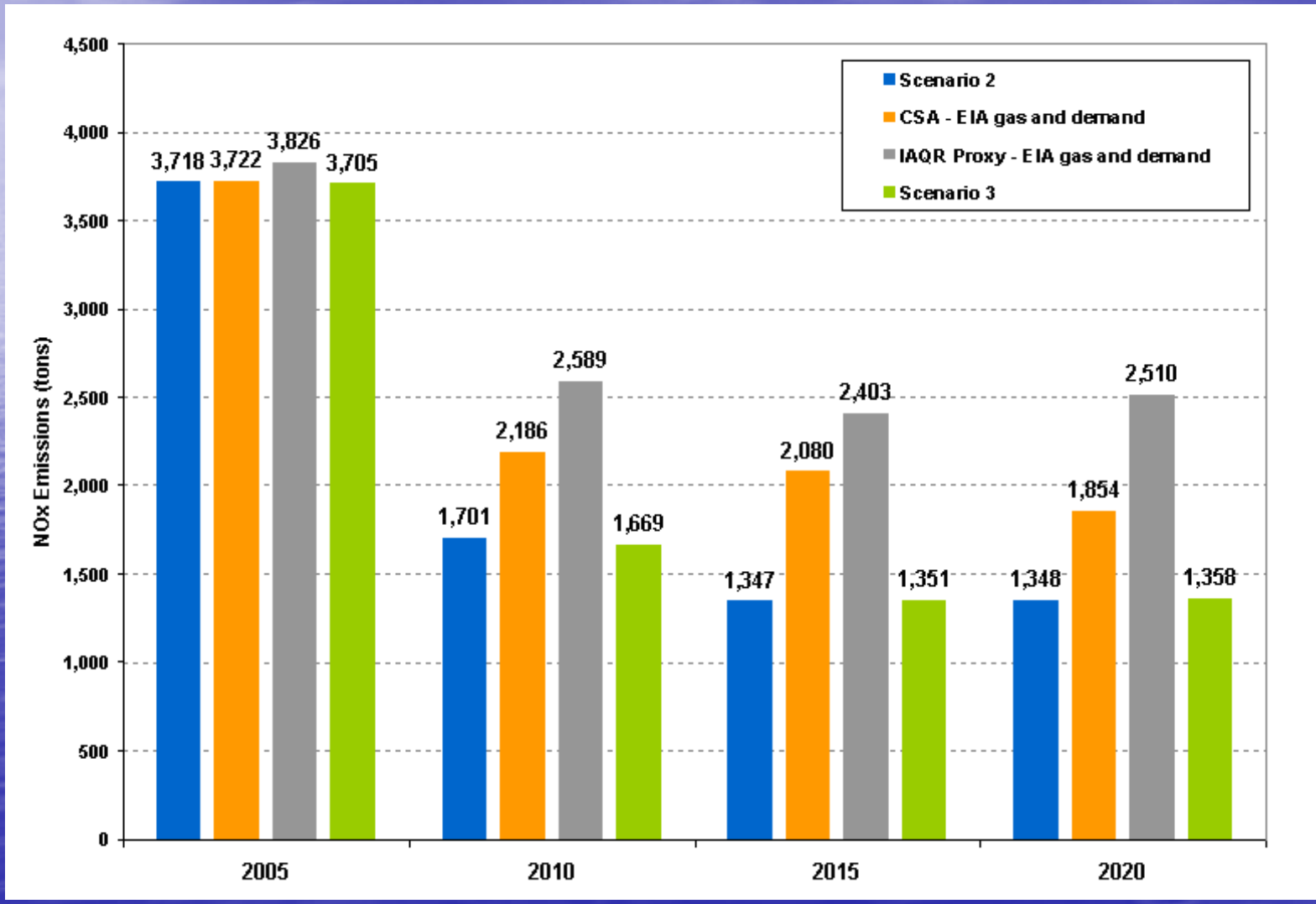
- EPA has used the same modeling assumptions used by the OTC to evaluate a hypothetical Base Case (i.e., business-as-usual scenario), the Clear Skies Act, and a proxy for the Interstate Air Quality Rule (IAQR).

- We compare their results with the OTC modeling results to understand the economic impacts of the various policies.

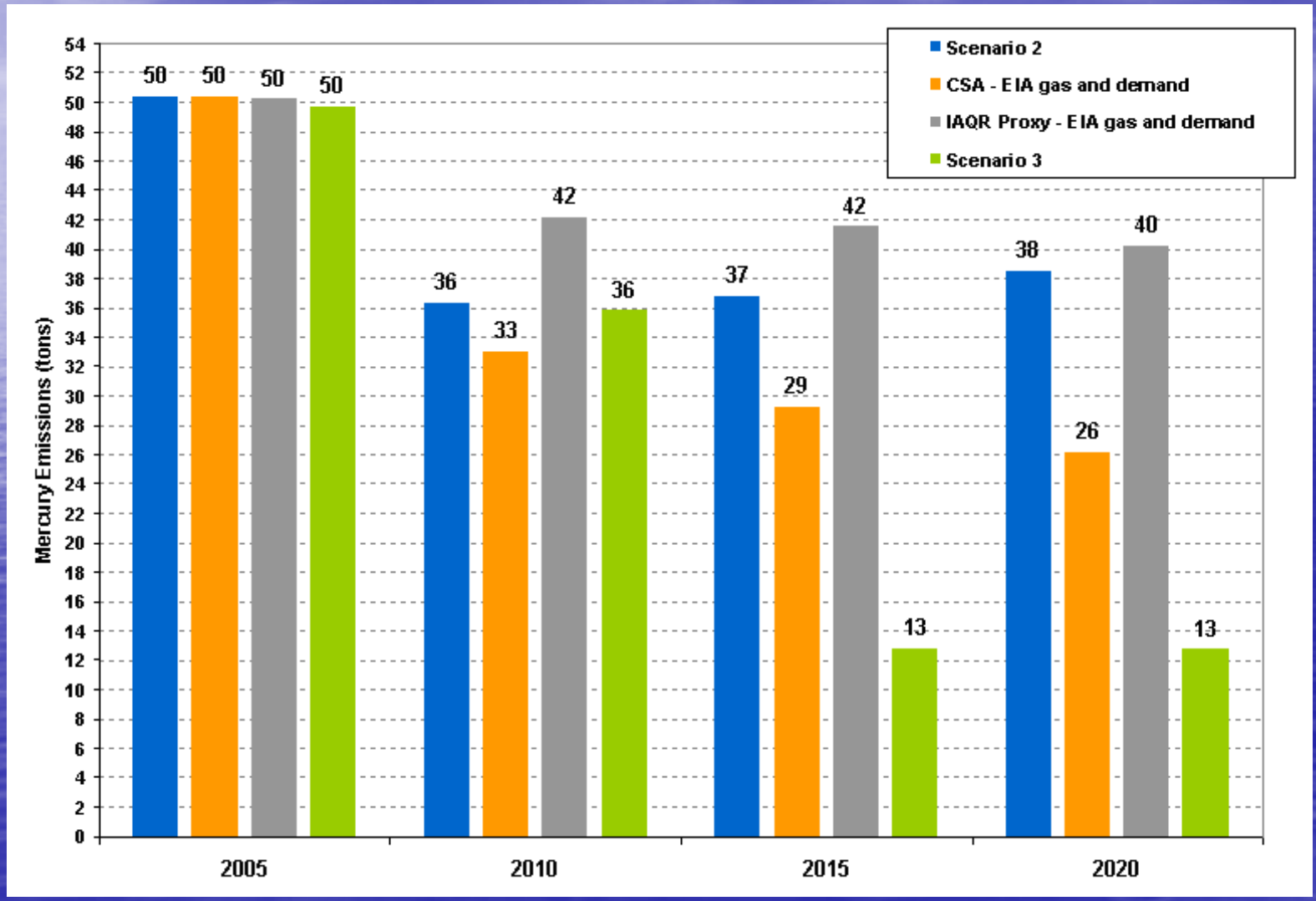
# $SO_2$ Emissions Comparison



# NOx Emissions Comparison



# Mercury Emissions Comparison

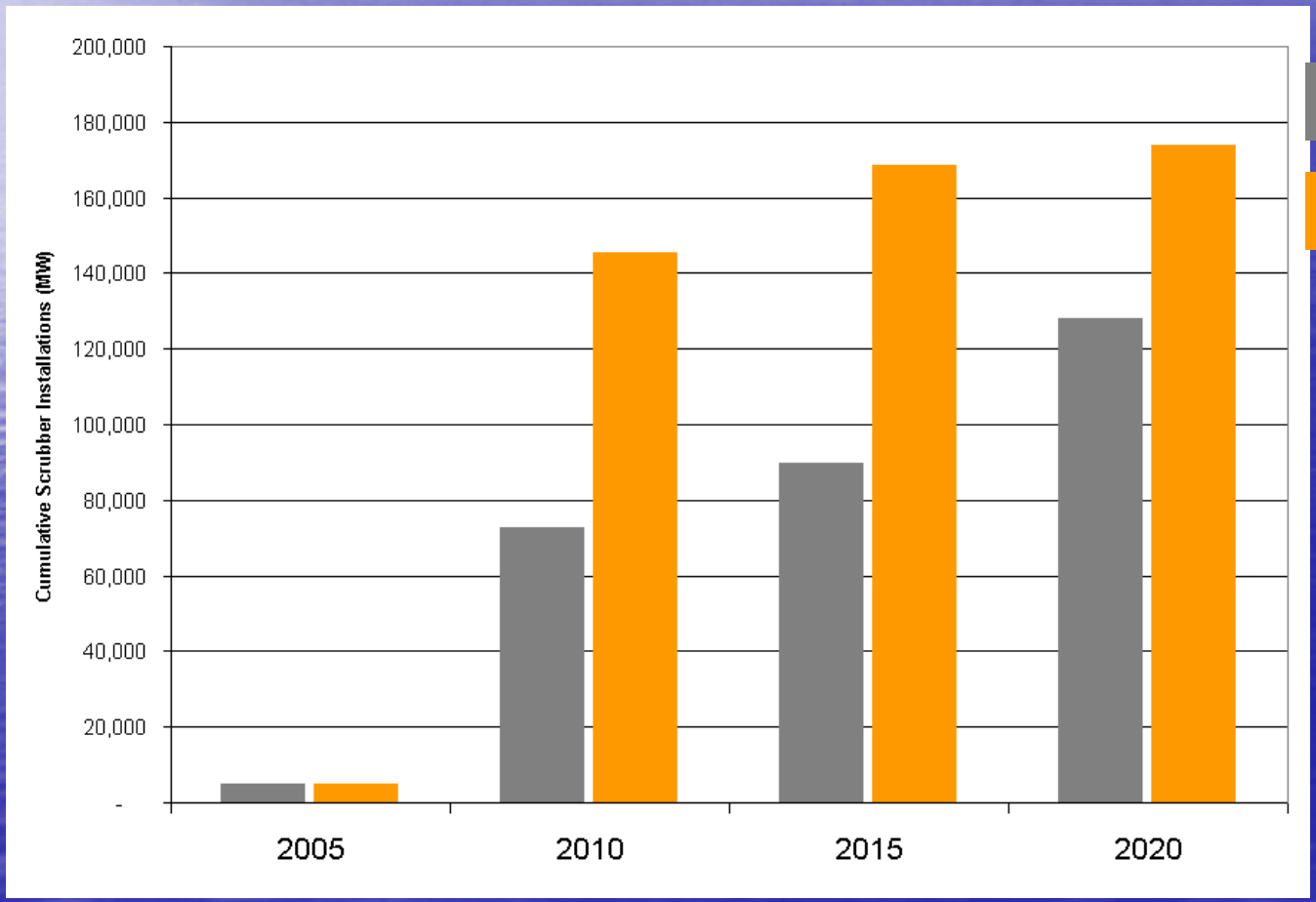


# Scrubbers Installed

| Scenario | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| **OTC Scenarios** | | | | |
| Scenario 1[EPA] | 5,066 (+35%) | 103,164 (+87%) | 138,286 (+87%) | 163,819 (+87%) |
| Scenario 2[EIA] | 5,066 (+3%) | 145,540 (+90%) | 168,507 (+88%) | 174,018 (+87%) |
| Scenario 3[EIA] | 5,066 (+3%) | 132,976 (+89%) | 135,607 (+85%) | 135,607 (+84%) |
| **EPA Scenarios** | | | | |
| Base Case[EPA] | 3,301 (NA) | 13,818 (NA) | 18,511 (NA) | 21,820 (NA) |
| Base Case[EIA] | 4,926 (NA) | 15,146 (NA) | 20,281 (NA) | 21,906 (NA) |
| Clear Skies[EPA] | 5,066 (+35%) | 60,770 (+77%) | 81,617 (+77%) | 109,295 (+80%) |
| Clear Skies[EIA] | 5,066 (+3%) | 77,595 (+80%) | 98,706 (+79%) | 126,770 (+83%) |
| IAQR Proxy[EPA] | 5,066 (+35%) | 62,549 (+78%) | 81,619 (+77%) | 112,263 (+81%) |
| IAQR Proxy[EIA] | 5,066 (+3%) | 72,771 (+79%) | 89,615 (+77%) | 127,849 (+83%) |

# Scrubber Installations

**Figure 1. Cumulative Scrubber Installations**

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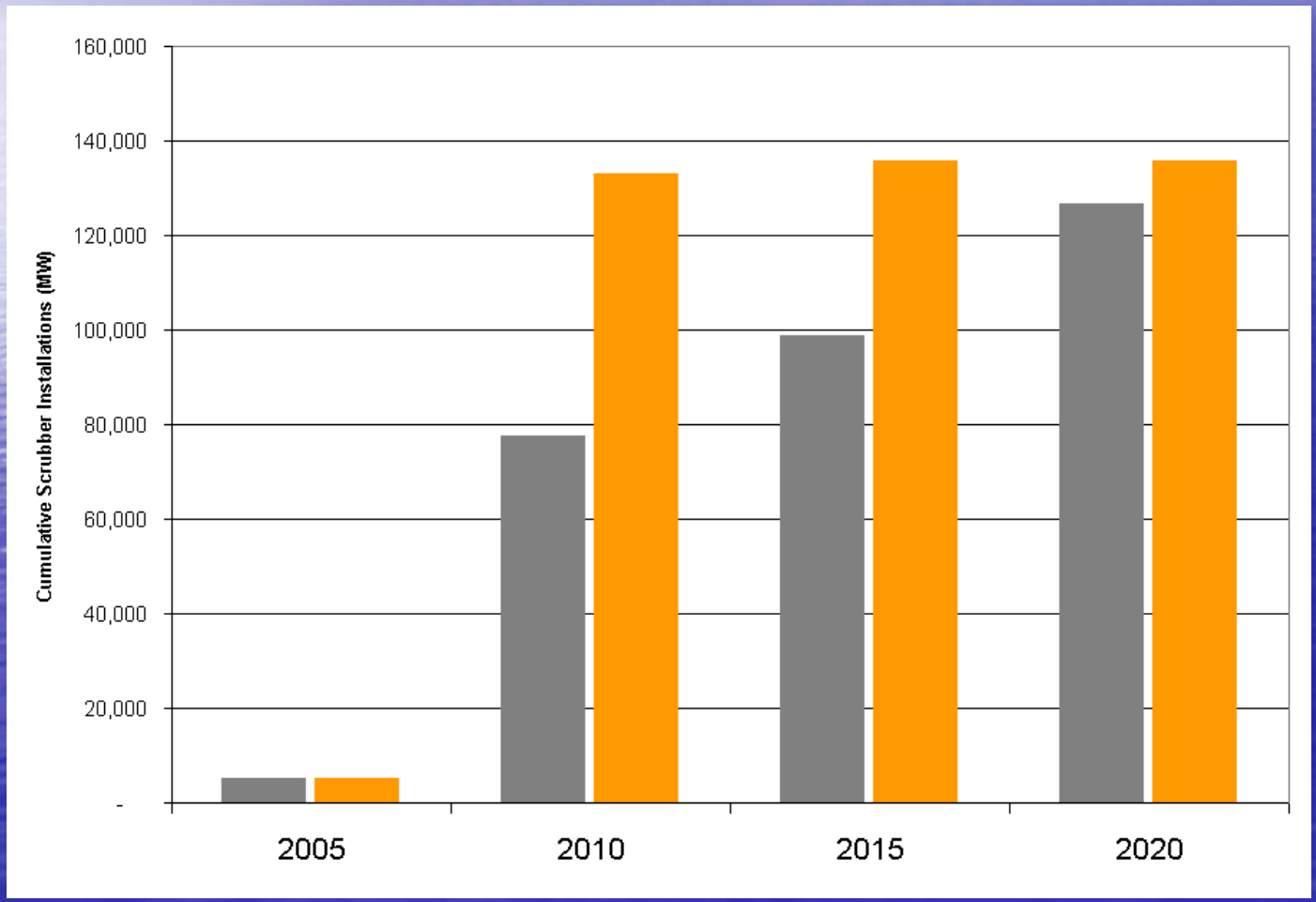
# Scrubber Installations, continued

**Figure 1. Cumulative Scrubber Installations**



# SNCR Installed

| Scenario | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| **OTC Scenarios** | | | | |
| Scenario 1[EPA] | 176 (+100%) | 7,344 (+68%) | 7,884 (+53%) | 7,884 (+38%) |
| Scenario 2[EIA] | 266 (-3%) | 7,608 (+41%) | 8,670 (+36%) | 8,735 (+23%) |
| Scenario 3[EIA] | 84 (-225%) | 7,407 (+39%) | 7,407 (+26%) | 7,407 (+9%) |
| **EPA Scenarios** | | | | |
| Base Case[EPA] | 0 (NA) | 2,347 (NA) | 3,717 (NA) | 4,851 (NA) |
| Base Case[EIA] | 273 (NA) | 4,499 (NA) | 5,507 (NA) | 6,769 (NA) |
| Clear Skies[EPA] | 38 (+100%) | 1,269 (-85%) | 1,549 (-140%) | 2,750 (-76%) |
| Clear Skies[EIA] | - | 6,211 (+28%) | 6,683 (+18%) | 7,915 (+14%) |
| IAQR Proxy[EPA] | 322 (+100%) | 402 (-484%) | 1,546 (-140%) | 1,775 (-173%) |
| IAQR Proxy[EIA] | - | 5,220 (+14%) | 6,061 (+9%) | 6,061 (-12%) |

# SCR Installed

| Scenario | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| **OTC Scenarios** | | | | |
| Scenario 1[EPA] | 22,350 (-54%) | 114,147 (+56%) | 161,019 (+63%) | 161,819 (+61%) |
| Scenario 2[EIA] | 36,259 (-18%) | 139,875 (+57%) | 176,562 (+61%) | 182,752 (+60%) |
| Scenario 3[EIA] | 34,808 (-23%) | 135,558 (+55%) | 137,286 (+50%) | 137,286 (+47%) |
| **EPA Scenarios** | | | | |
| Base Case[EPA] | 34,428 (NA) | 49,668 (NA) | 58,923 (NA) | 62,959 (NA) |
| Base Case[EIA] | 42,664 (NA) | 60,425 (NA) | 68,469 (NA) | 72,837 (NA) |
| Clear Skies[EPA] | 29,942 (-15%) | 91,684 (46%) | 101,844 (42%) | 133,558 (53%) |
| Clear Skies[EIA] | 37,010 (-15%) | 106,747 (+43%) | 130,574 (+48%) | 162,910 (+55%) |
| IAQR Proxy[EPA] | 28,245 (-22%) | 73,588 (+33%) | 105,309 (+44%) | 106,882 (+41%) |
| IAQR Proxy[EIA] | 35,601 (-20%) | 86,150 (+30%) | 117,710 (+42%) | 117,898 (+38%) |

# Changes in Coal Production

| Scenario | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| **OTC Scenarios** | | | | |
| Scenario 1[EPA] | | | | |
| Bit | 12,951 | 15,214 | 15,989 | 16,210 |
| Lig | 683 | 876 | 777 | 681 |
| Sub | 6,142 | 4,855 | 4,335 | 4,163 |
| Total | **19,776 (-4%)** | **20,945 (-3%)** | **21,100 (-4%)** | **21,053 (-9%)** |
| Scenario 2[EIA] | | | | |
| Bit | 13,639 | 16,172 | 19,083 | 20,528 |
| Lig | 953 | 1,032 | 999 | 964 |
| Sub | 6,240 | 4,870 | 5,691 | 6,558 |
| Total | **20,832 (-2%)** | **22,074 (-2%)** | **25,773 (-3%)** | **28,050 (-5%)** |
| Scenario 3[EIA] | | | | |
| Bit | 13,530 | 16,231 | 17,402 | 17,818 |
| Lig | 935 | 929 | 95 | 66 |
| Sub | 6,207 | 4,387 | 3,087 | 3,090 |
| Total | **20,672 (-2%)** | **21,546 (-4%)** | **20,585 (-22%)** | **20,973 (-29%)** |

# Changes in Coal Production - Continued

| EPA Scenarios | | | | |
|---|---|---|---|---|
| Base Case[EPA] OTC Scenario 1 | 20,557 (NA) | 21,542 (NA) | 21,988 (NA) | 23,244 (NA) |
| Base Case[EIA] OTC Scenarios 2& 3 | 21,152 (NA) | 22,459 (NA) | 26,467 (NA) | 29,547 (NA) |
| Clear Skies[EPA] OTC Scenario 1 | 20,270 (-1%) | 21,084 (-2%) | 21,453 (-2%) | 21,427 (-8%) |
| Clear Skies[EIA] OTC Scenarios 2& 3 | 20,879 (-1%) | 22,189 (-1%) | 26,152 (-1%) | 29,207 (-1%) |
| IAQR Proxy[EPA] OTC Scenarios 1 | 20,247 (-2%) | 21,322 (-1%) | 21,696 (-1%) | 21,738 (-6%) |
| IAQR Proxy[EIA] OTC Scenarios 2& 3 | 20,823 (-2%) | 22,357 (-0.5%) | 26,308 (-1%) | 28,983 (-2%) |

# Generation Fuel Mix

**Figure 1. Generation Fuel Mix OTC Scenario 2[EIA] (2020)**

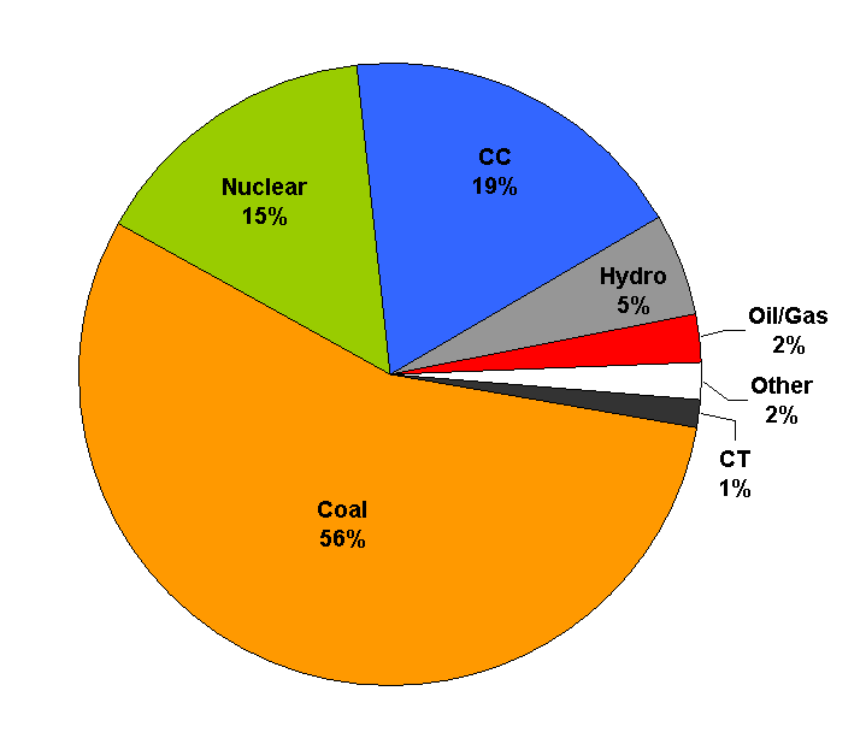
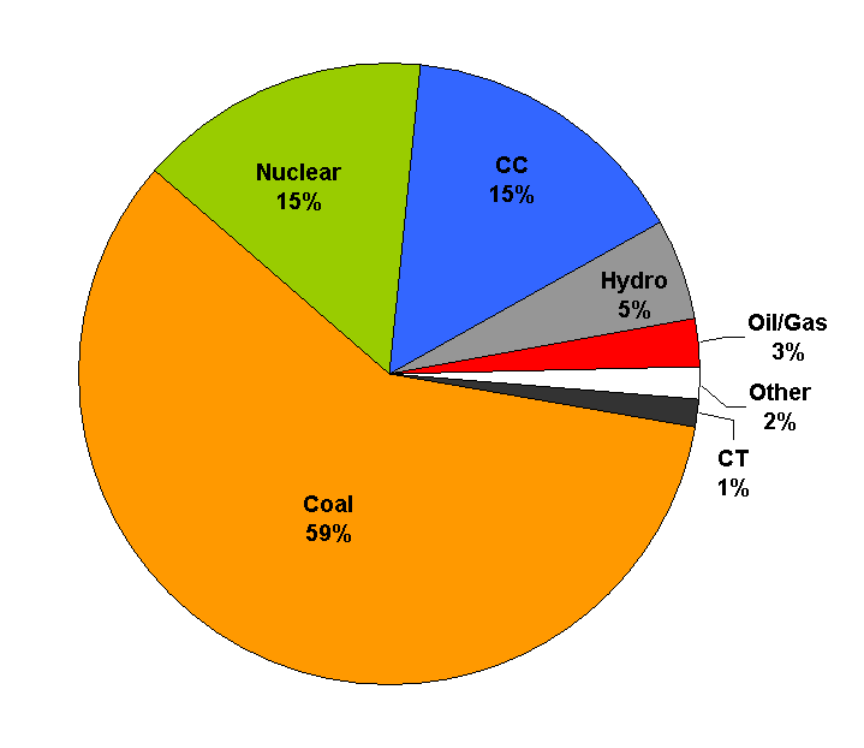



**Figure 2. Generation Fuel Mix IAQR[EIA] (2020)**

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# Generation Fuel Mix, continued

**Figure 1. Generation Fuel Mix OTC Scenario 3[EIA] (2020)**

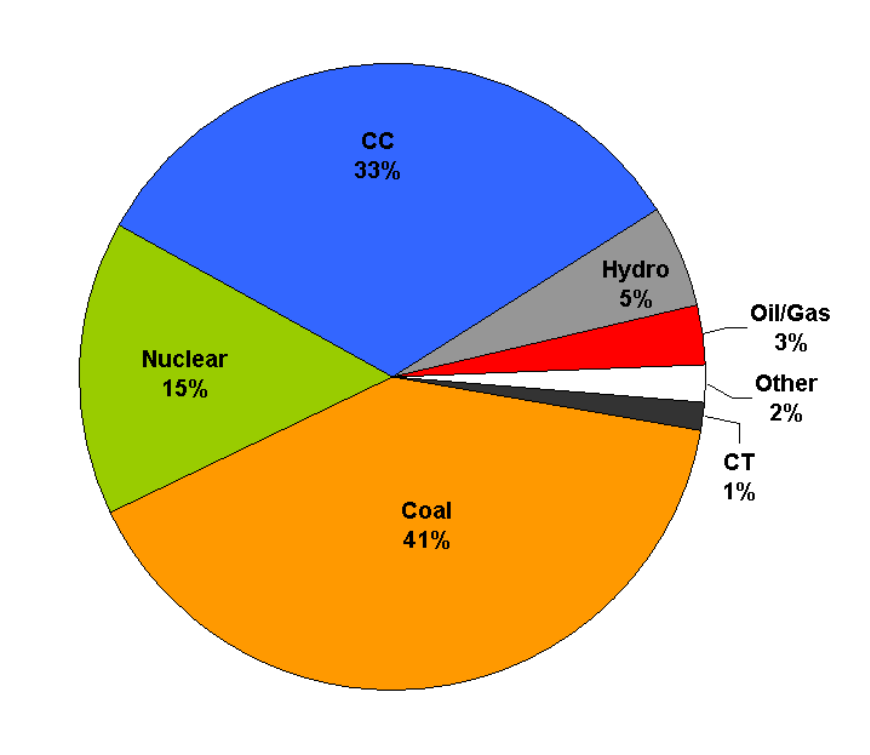
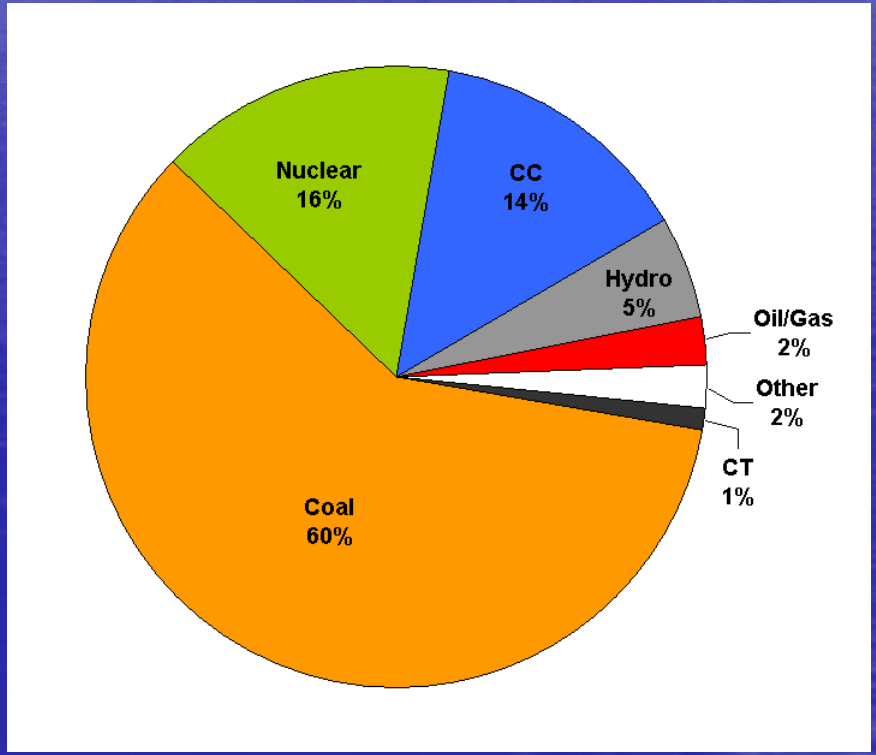



**Figure 2. Generation Fuel Mix CSA[EIA] (2020)**



# Major Capacity Changes

**Figure 1. Capacity Additions and Retirements OTC Scenario 2[EIA]**

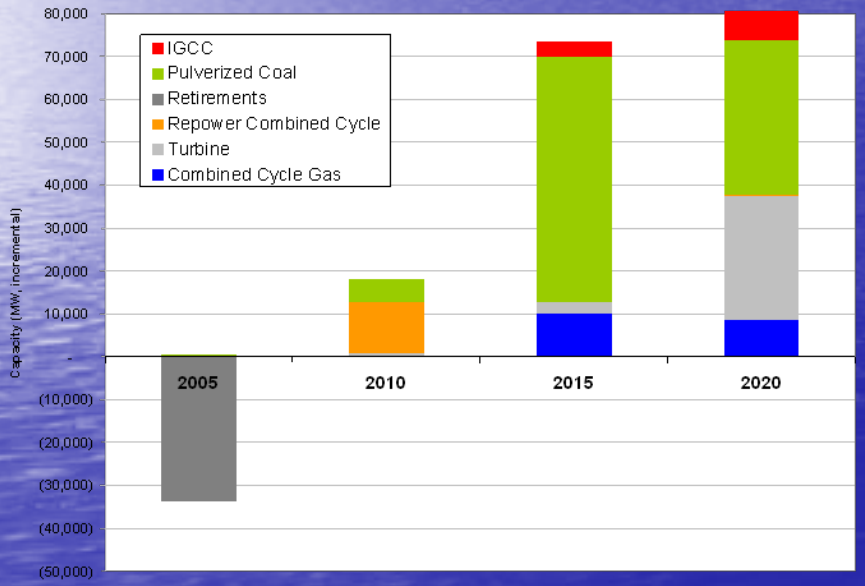
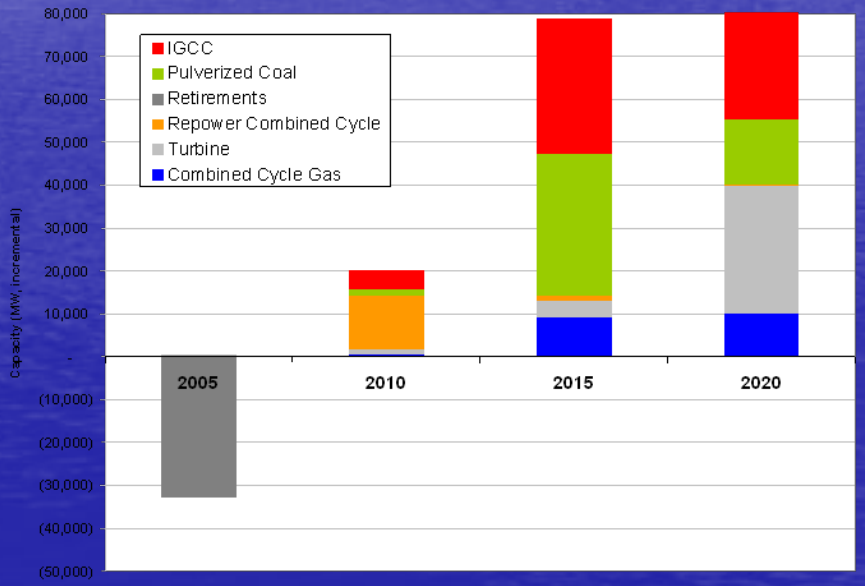



**Figure 2. Capacity Additions and Retirements IAQR[EIA]**

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# Major Capacity Changes, continued

**Figure 1. Capacity Additions and Retirements OTC Scenario 3[EIA]**

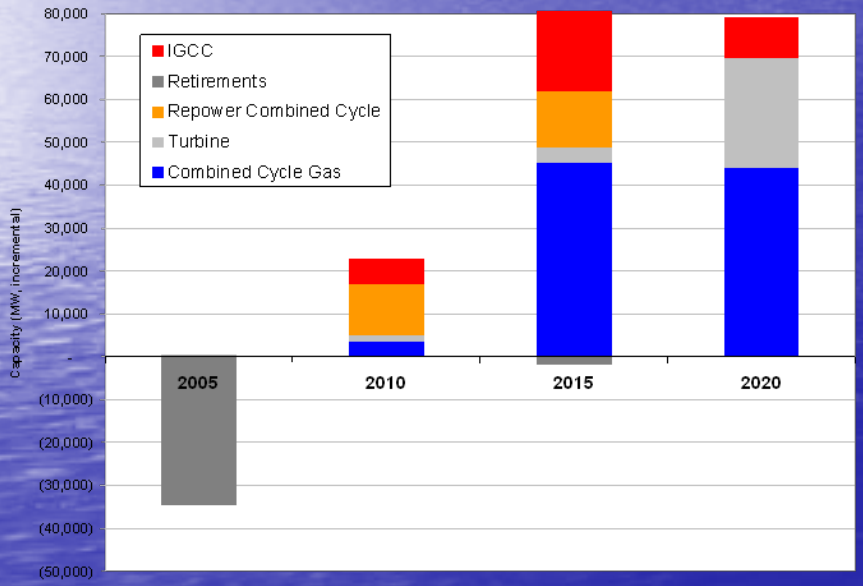
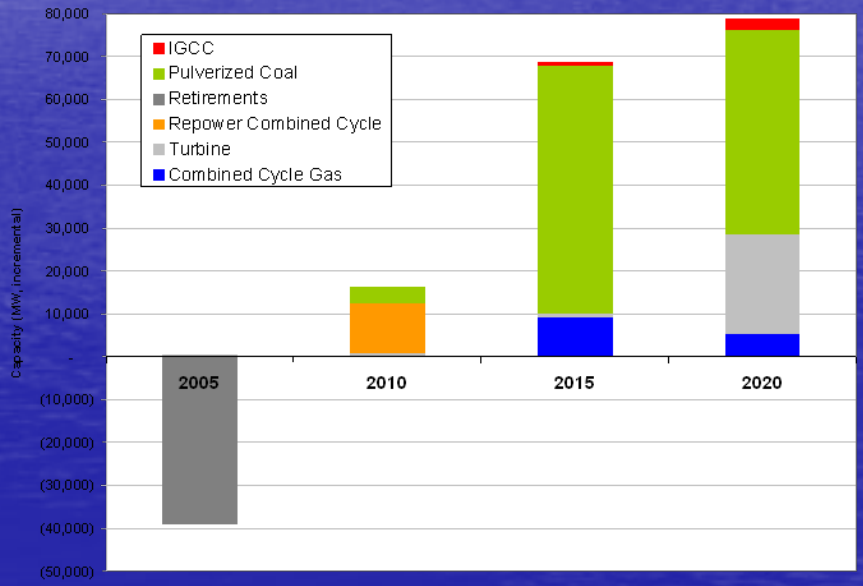
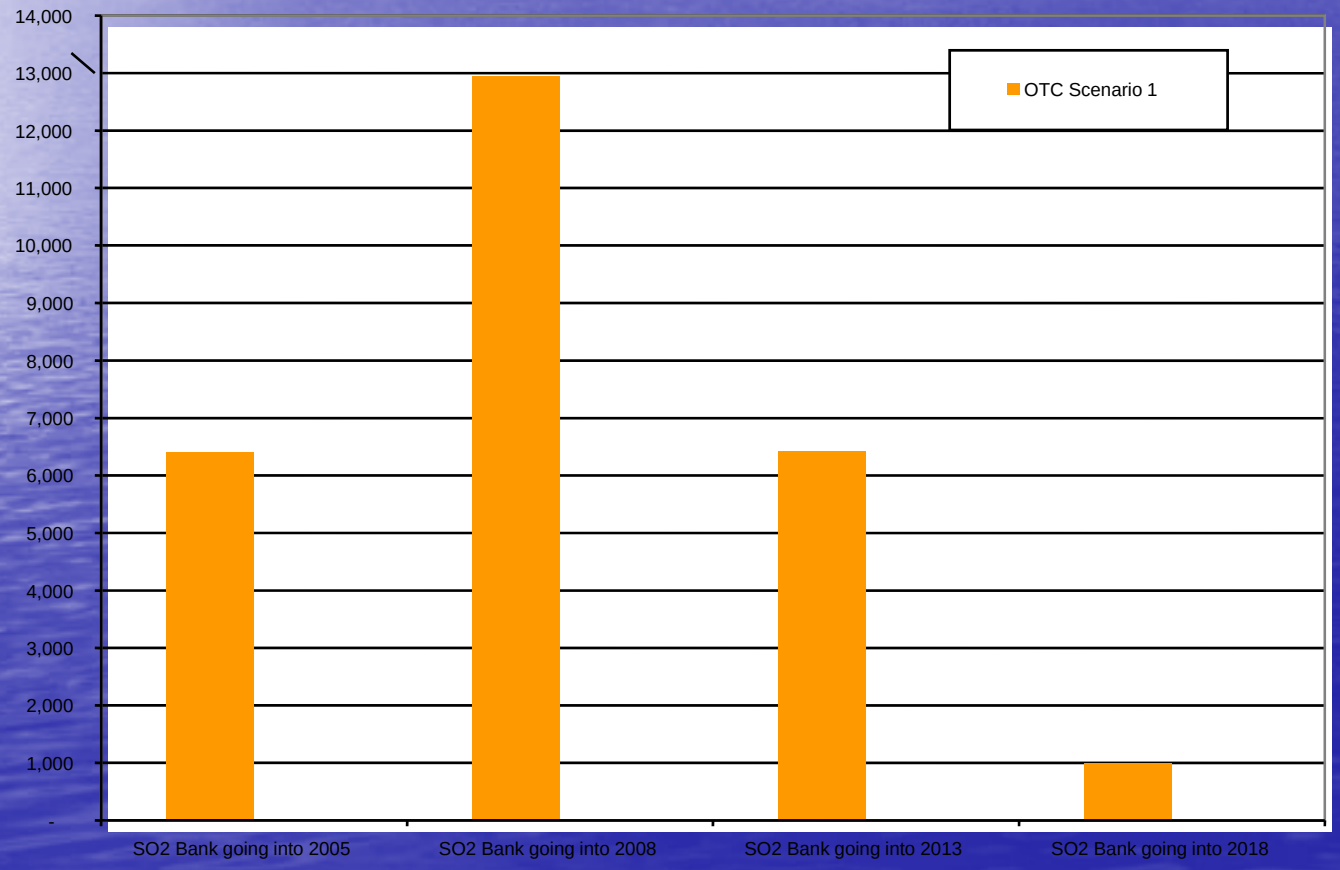



**Figure 2. Capacity Additions and Retirements CSA[EIA]**



# Banked $SO_2$ Allowances



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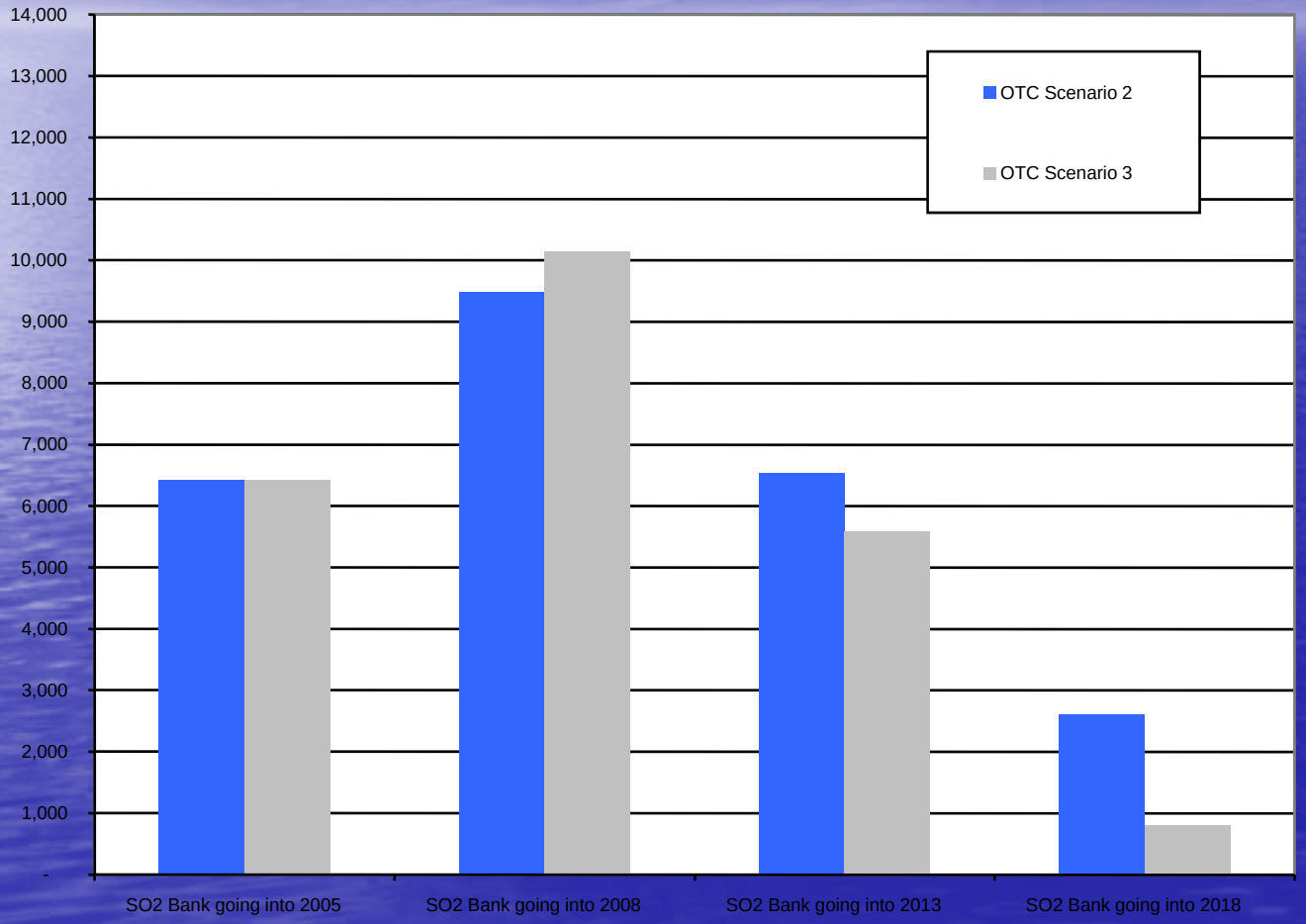


# Annual Compliance Costs

**Figure 1. Annual Compliance Costs as a % of Total System Costs**

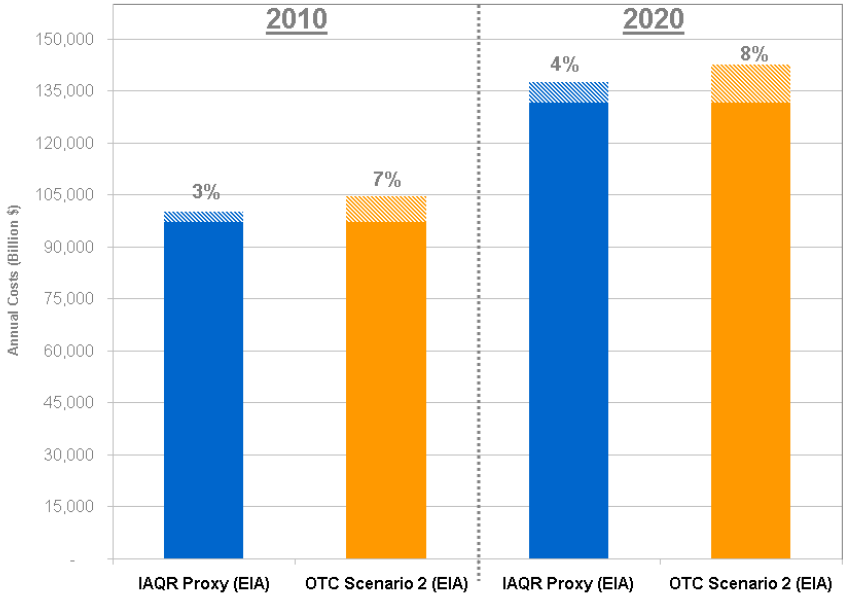
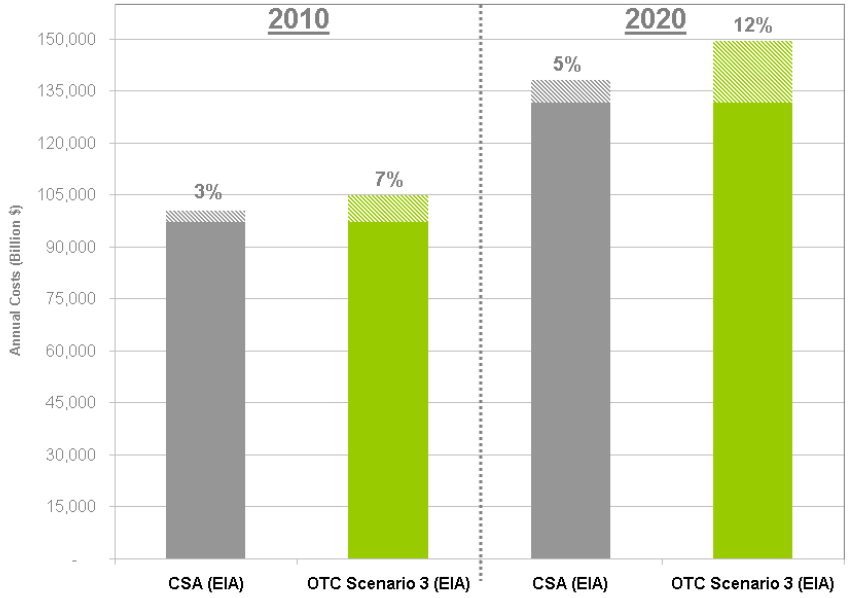



**Figure 2. Annual Compliance Costs as a % of Total System Costs**




Each bar (light and dark portions) represents the total costs required to operate the electric generating system. The lighter portions of the bars show the incremental costs attributable to the multi-pollutant proposals. The darker portions show EPA's Base Case projections of total system costs.

# Electricity Price Impacts

- OTC Scenario $2^{EIA}$ is projected to result in a national average wholesale electricity price 4% higher than the IAQR Proxy$^{EIA}$ in 2020.
- Scenario $3^{EIA}$ is projected to result in a national average wholesale electricity price 8% higher than CSA$^{EIA}$ in 2020.
- Retail price impacts will be lower (on a percentage basis) in all cases because retail prices reflect both the electricity costs as well as the cost of delivering the electricity, which remains constant.

# Benefits Analysis

- EPA has prepared an analysis of the health benefits attributable to the Clear Skies Act. It has also analyzed the Clean Air Planning Act and the Clean Power Act in response to requests from the Senate Environment and Public Works Committee. These analyses include an estimate of the monetized benefits of the three proposals as well as estimates of the number of premature deaths avoided. The vast majority of the monetized benefits result from reduced concentrations in fine particle concentrations (e.g., EPA does not estimate benefits attributable to reduced mercury exposure.) These estimates are presented on the following slide.

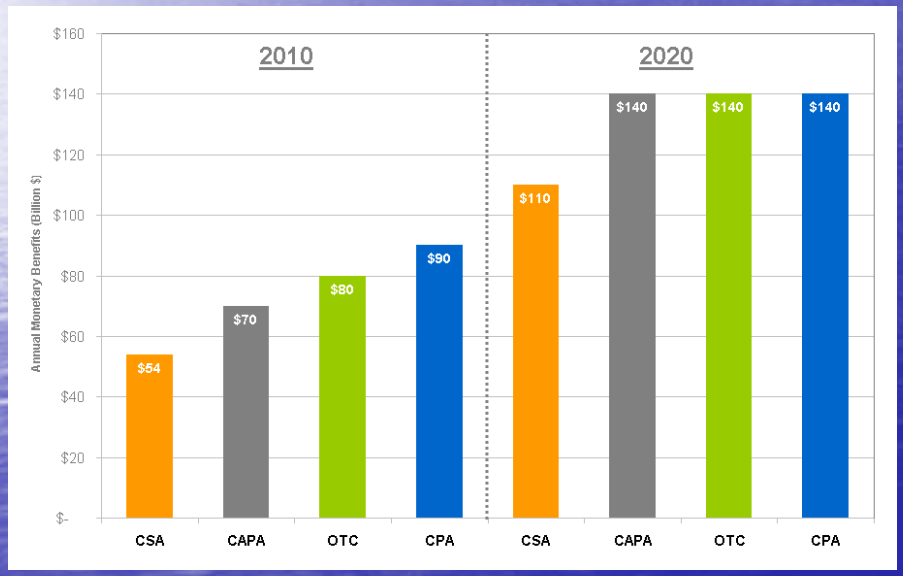
- EPA's benefits estimates (for CAPA and CPA) are based entirely on the $SO_2$ reductions achieved by the bills.

- In the near term (2009-2011), the OTC $SO_2$ emission cap lies between those proposed by CAPA and the CPA; therefore, we estimate that the OTC proposal would generate $80 billion in monetized health benefits in 2010.

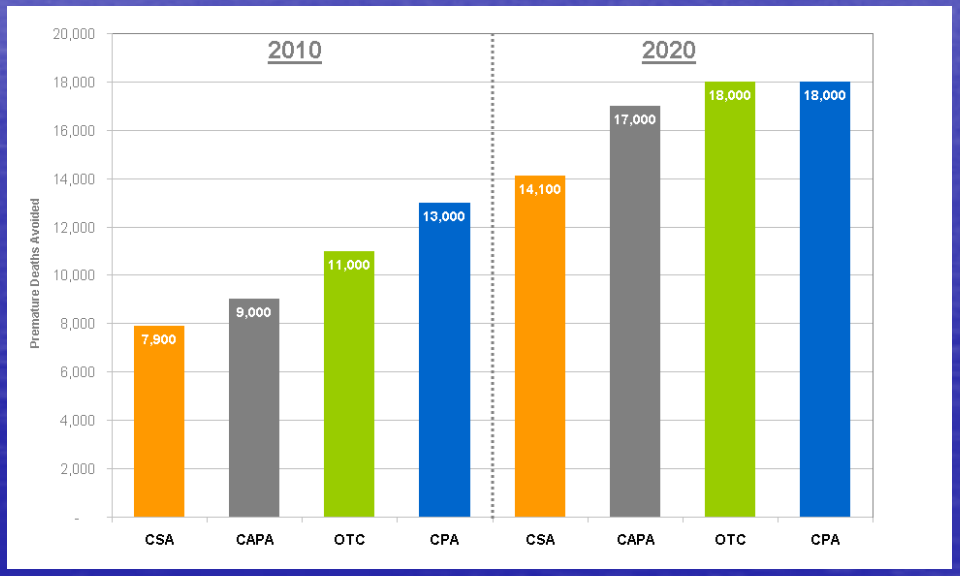
- By 2020, the OTC $SO_2$ cap is below both the CAPA proposal as well as the CPA; therefore, we estimate that the OTC proposal would generate in excess of $140 billion in monetized health benefits in 2020.

# Benefits Comparisons

## Figure 1. Annual Monetized Benefits



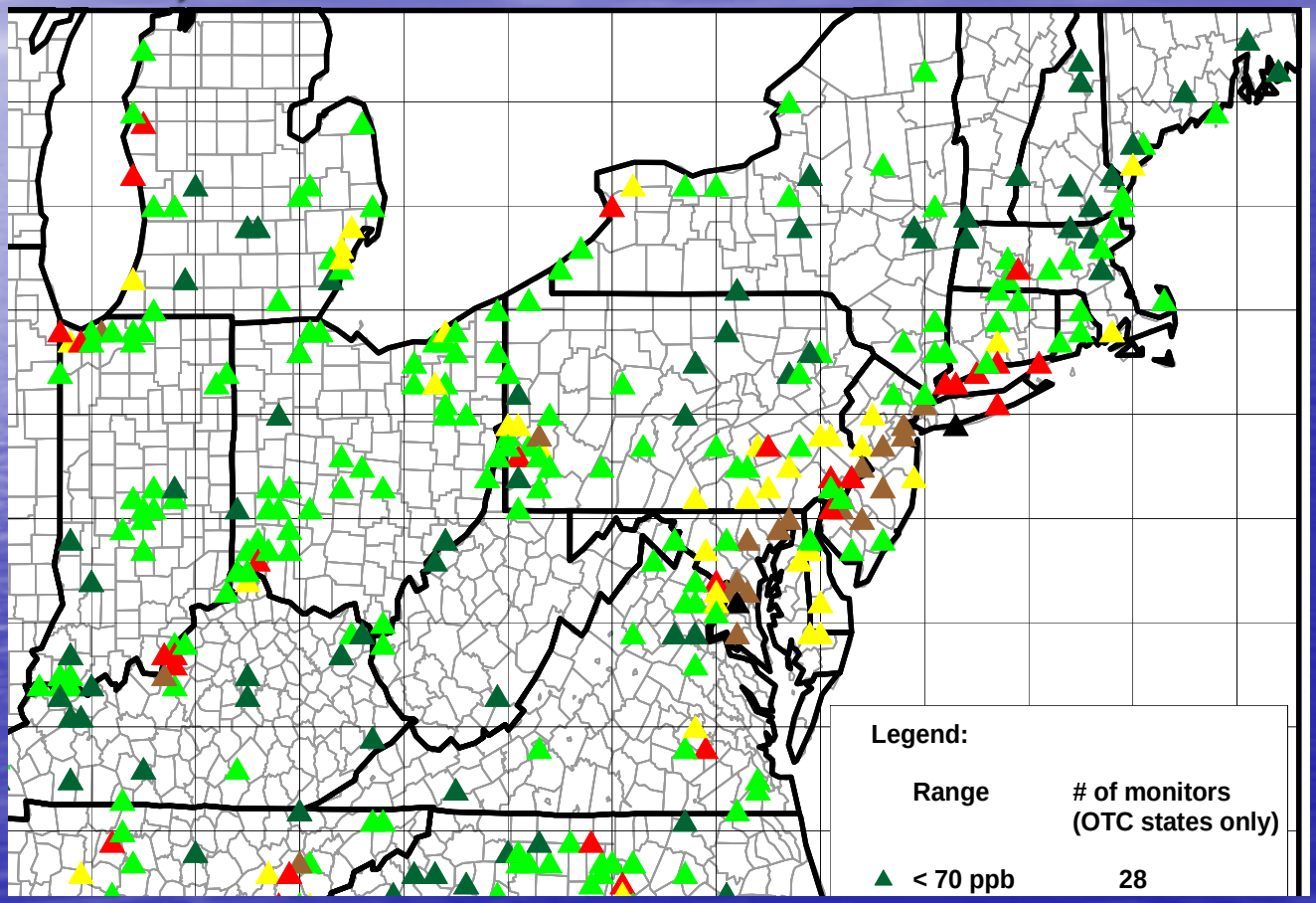

## Figure 2. Annual Estimates of Premature Deaths Avoided




The OTC multi-pollutant proposal is likely to generate roughly $80 billion in monetized benefits in 2010, and an excess of $140 billion in monetized health benefits in 2020.

Based on EPA's benefits assessments, the OTC multi-pollutant proposal is estimated to avoid 11,000 premature deaths in 2010, and an excess of 18,000 premature deaths in 2020.

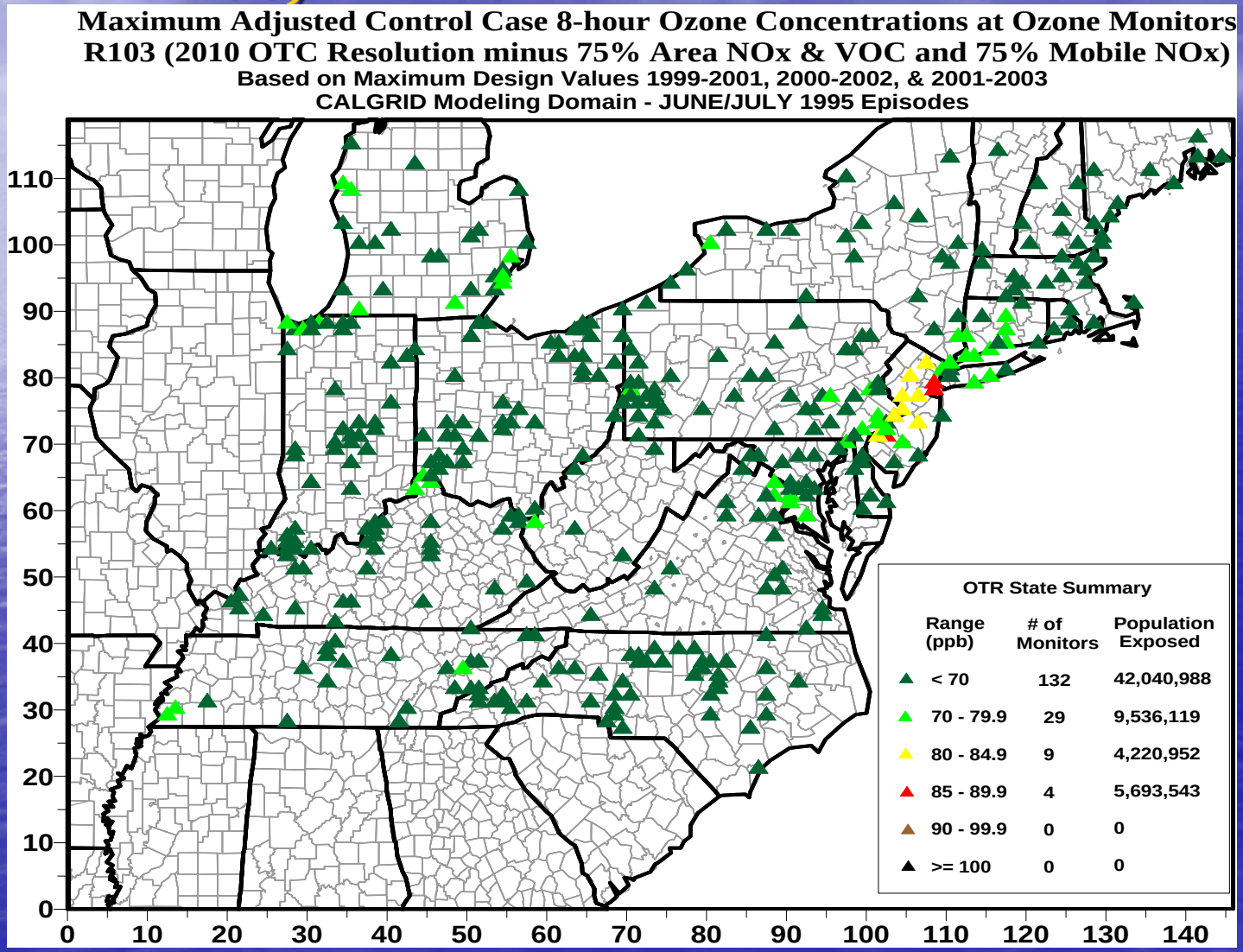
# OTC Proposal
# CSI - 25%, - 25% Area & Mobile 2010




▲ <70, ▲ 70-80, ▲ 80-85, ▲ 85-90, ▲90-100, ▲ >100 (ppb)

Preliminary: Based on June 1995 Episode

# OTC Proposal
# CSI - 25%, - 75% Area & Mobile 2010



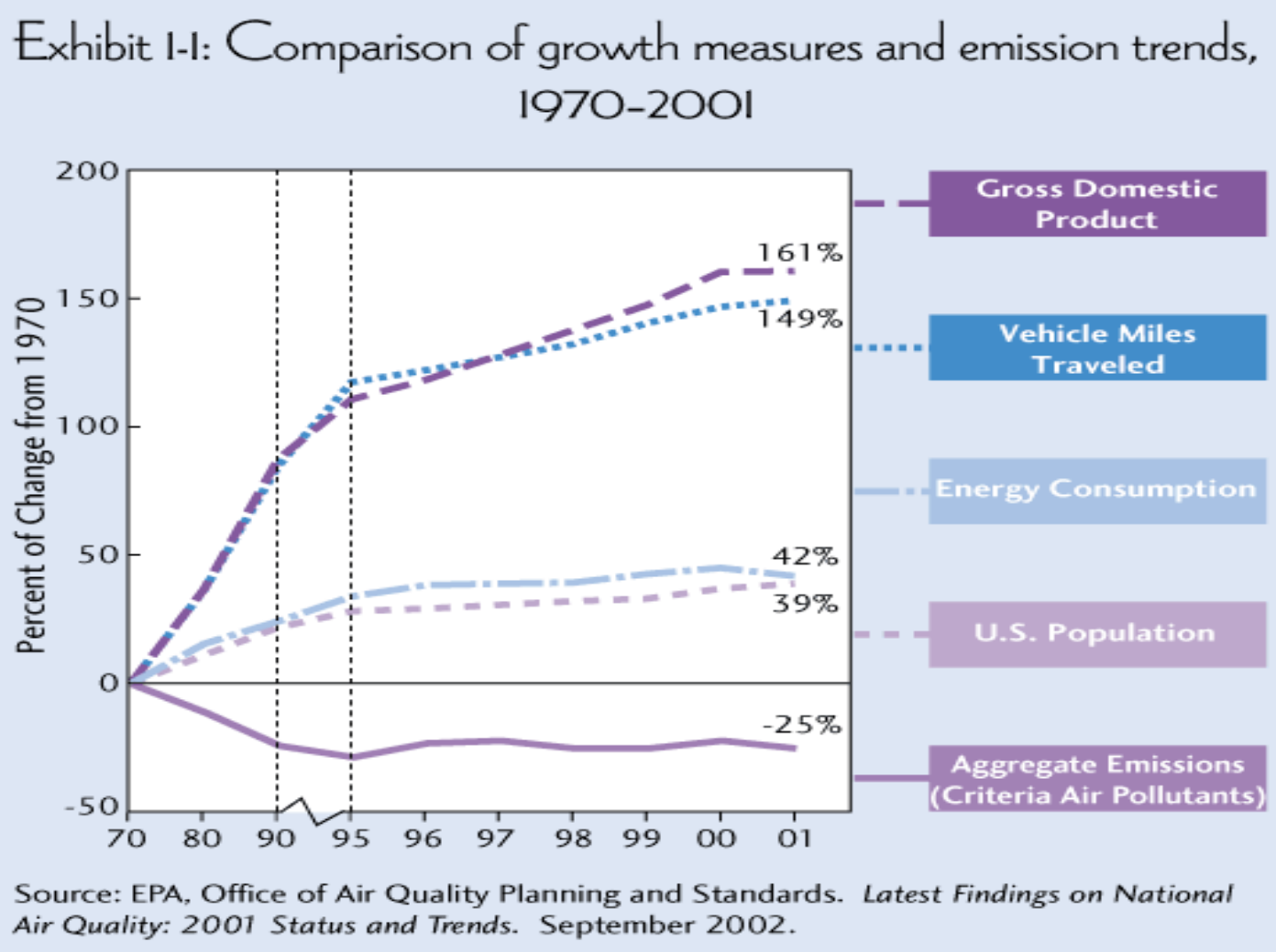
# Regional Haze
# BART Requirements

- Emissions limits representing BART or Trading Program
- Listing of all BART-Eligible sources
  - 25 others besides EGU's
- BART determinations for each source
- Emissions limits must consider statutory factors and degree of visibility improvement

# Other Sources - Actions

- Other Stationary
  - Industrial Boilers
- Mobile – NOx and VOC's
  - On-Road Diesel
  - Off-Road Diesel
  - Locomotive and Marine
  - Regional Fuels
  - VMT's?
- Area – VOC's and Ammonia

# "What About Jobs ...and the Economy!"




OZONE
TRANSPORT
COMMISSION