

US EPA ARCHIVE DOCUMENT

The information presented here reflects EPA's modeling of the Clear Skies Act of 2002. The Agency is in the process of updating this information to reflect modifications included in the Clear Skies Act of 2003. The revised information will be posted on the Agency's Clear Skies Web site (www.epa.gov/clearskies) as soon as possible.

Clear Skies Details: Mechanism and Impacts

Clear Skies Workshop
June 19, 2002

Clear Skies

Regulatory mechanism

- Clear Skies proposes the use of a market based, cap-and-trade approach:
 - *Emission caps*
 - ensure environmental benefit
 - accommodates growth of regulated community without compromising environmental goals
 - *Emission trading*
 - allows sources to find the least cost compliance strategy

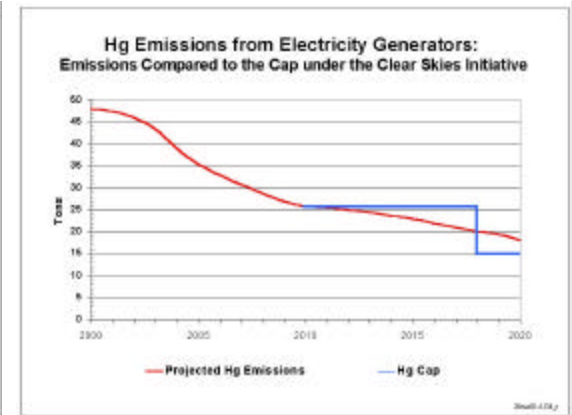
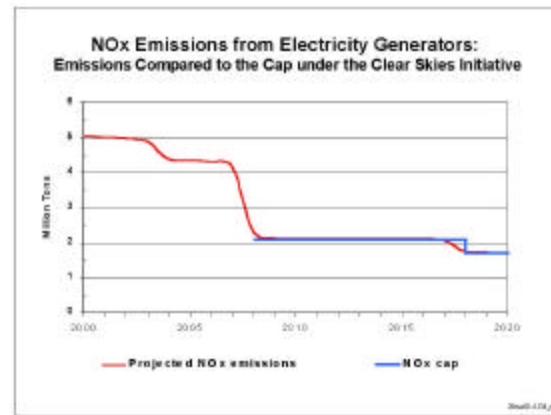
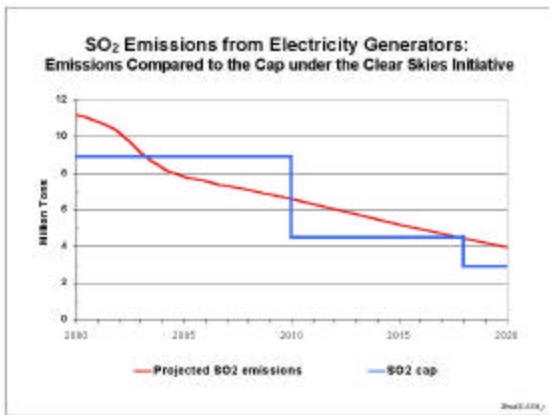
Regulatory mechanism

- The Clear Skies Initiative builds on the specific elements of successful cap-and-trade programs:
 - Unrestricted banking
 - Large source universe with a range of control costs
 - Verified emissions through use of continuous emissions monitoring systems (CEMS)
 - Automatic penalties for non-compliance

Trading

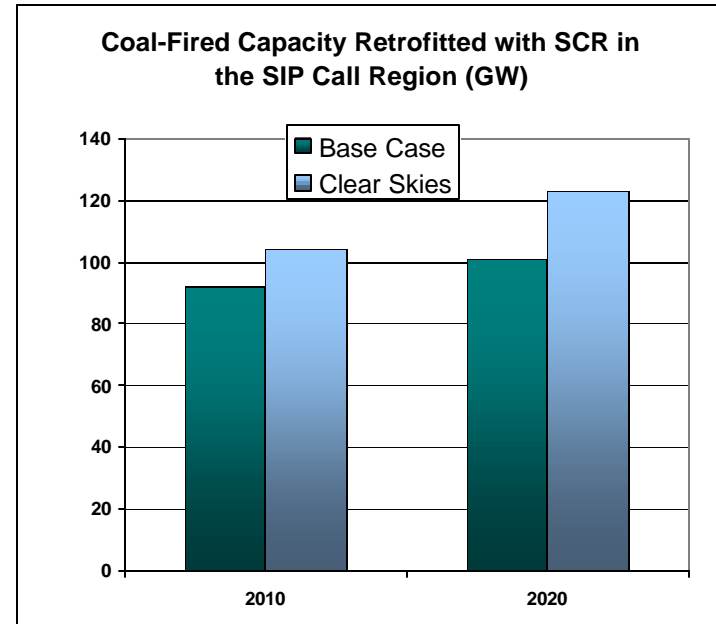
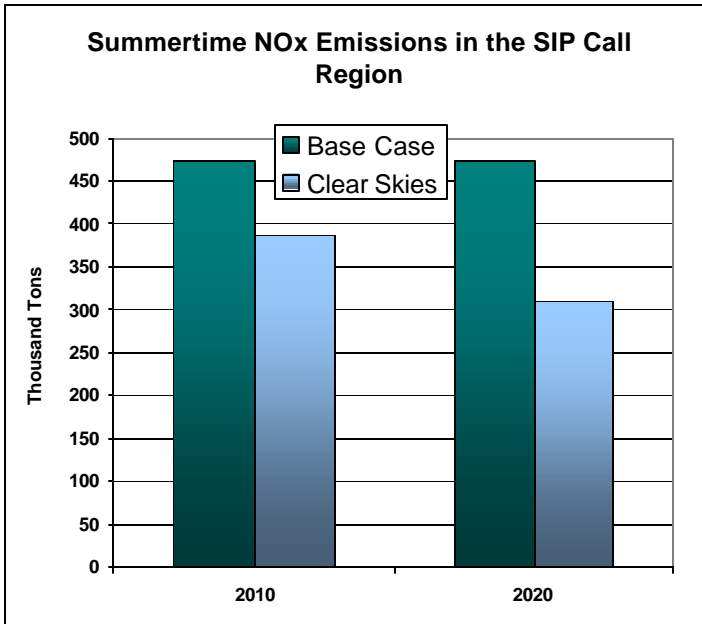
- Emission allowance trading proposed for SO₂, NO_x, and mercury
 - SO₂ trading will build upon existing Title IV infrastructure
 - NO_x trading will be expanded from the current seasonal program in the northeast to a national annual program with two trading zones
 - Mercury emissions will be capped for the first time and significantly reduced through a national cap and trade program

Projected Emissions from Electric Generating Units

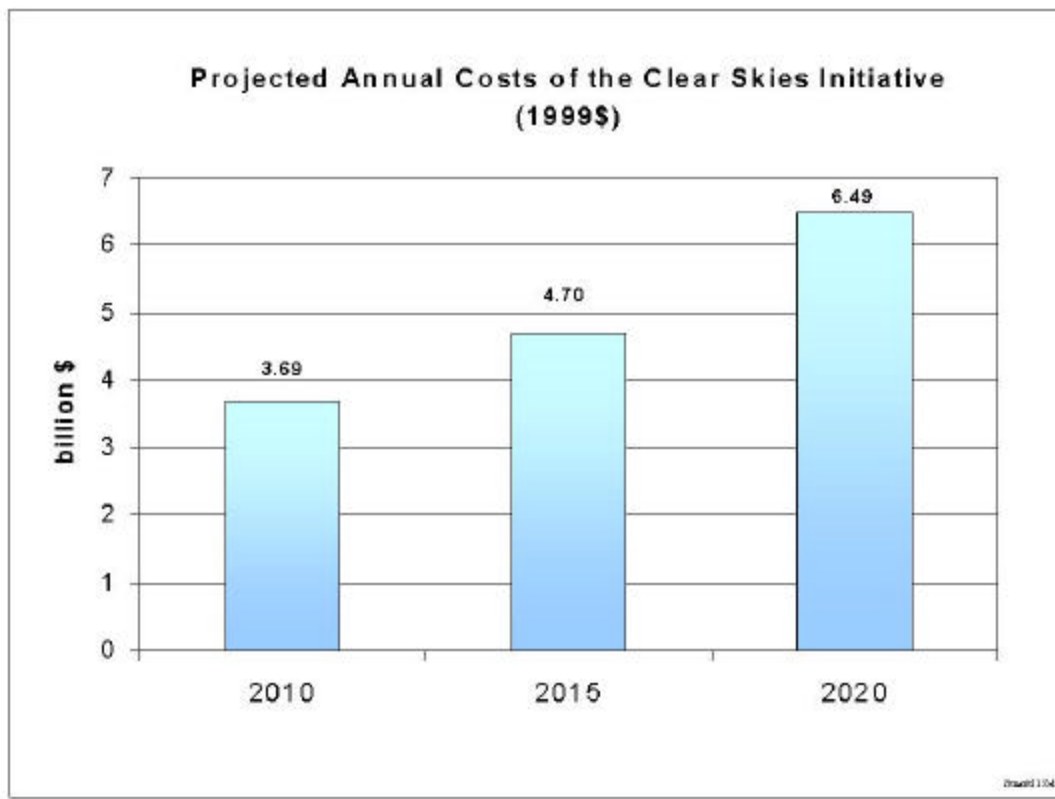


- The Clear Skies Initiative will result in significant over-compliance in the early years because sources are allowed to bank excess emissions reductions and use them later. The use of these banked allowances for compliance in the later years of the program (e.g., 2020) results in SO₂ and mercury emissions initially above the second phase cap, gradually declining to the cap level.

Clear Skies Impact on the SIP Call Region



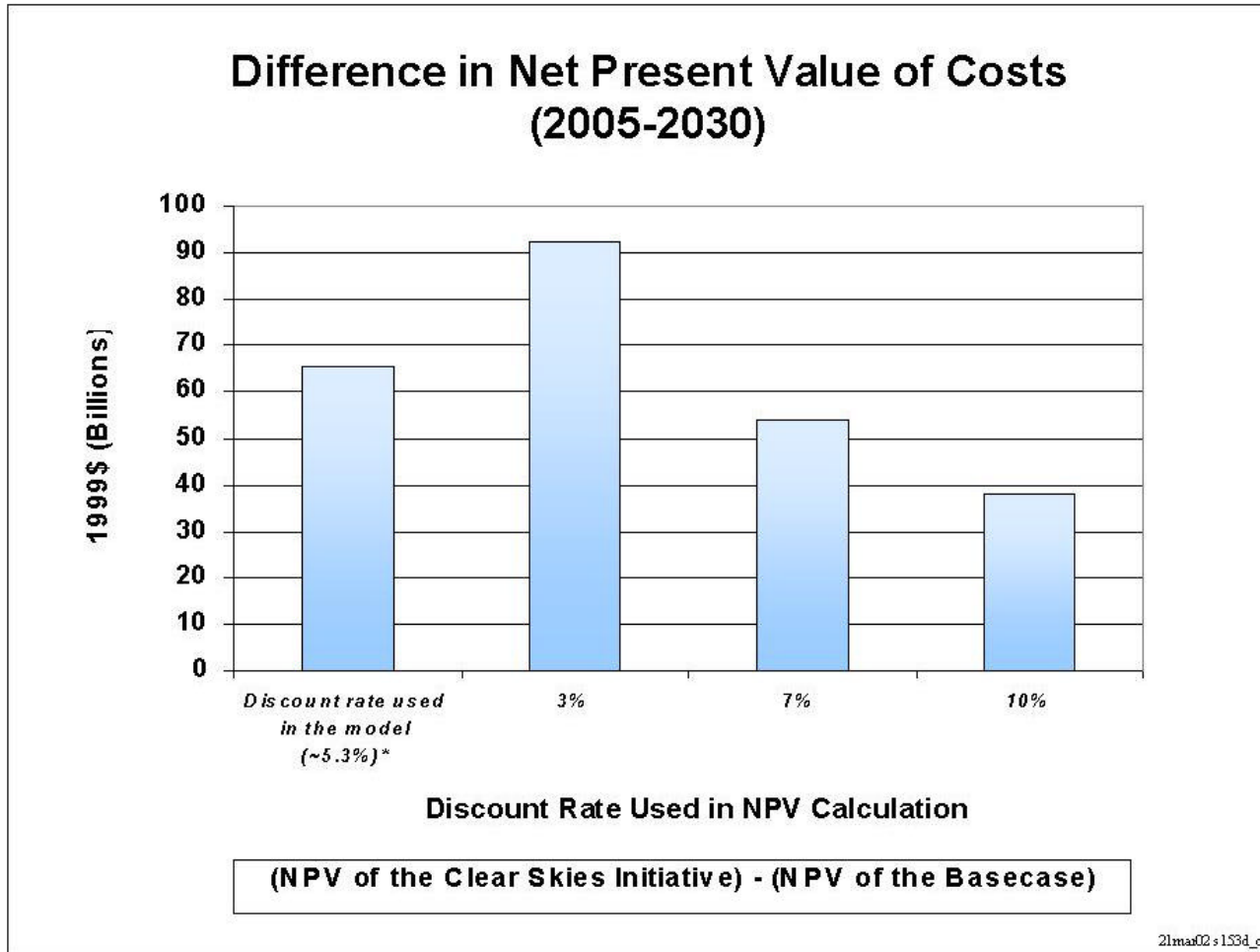
Projected Annual Costs of the Clear Skies Initiative



- Cost projections assume the Phase II caps.
- Cost projections are EPA's estimates; EIA's modeling would likely show different costs.

NOTE: These projections show the costs to power generators over and above the costs they have already incurred to meet statutory and regulatory requirements that are already in effect. In the absence of Clear Skies legislation, there are existing statutory provisions that will, in the future, require EPA and states to impose additional requirements (and thus additional costs) on power generators between now and 2020. Because Clear Skies would use a highly-efficient cap-and-trade approach, it may be less costly in the future than continued implementation of existing law, even though it could achieve greater emissions reductions.

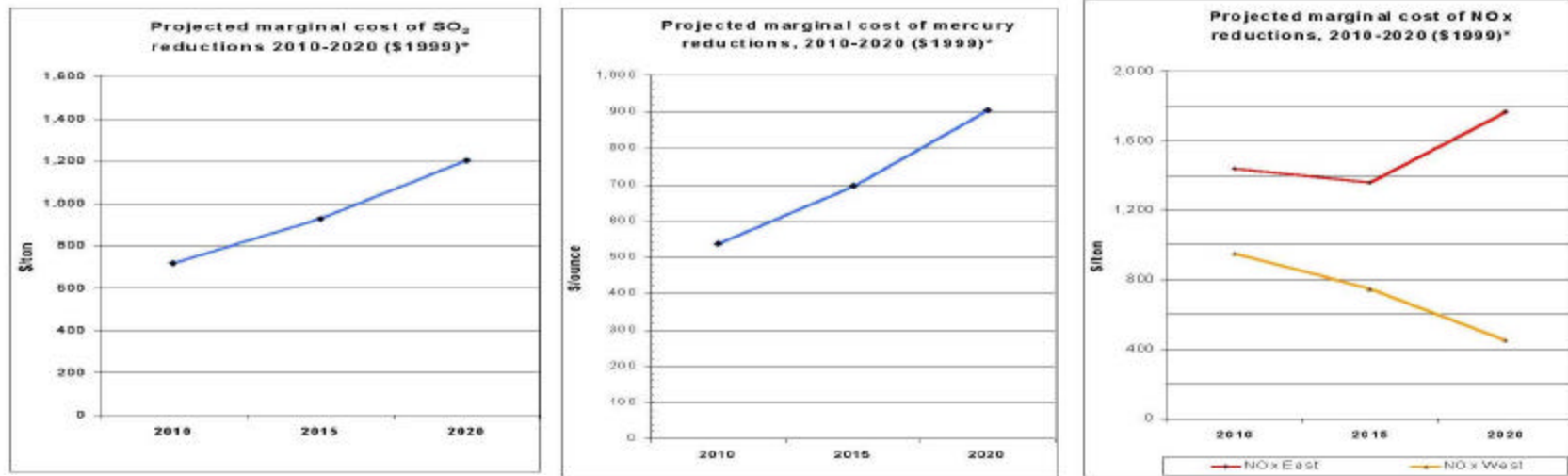
Net Present Value of Costs



- NPV calculations are based on EPA's cost projections; EIA's modeling would likely show different costs and estimates of NPV.

* The model generally assumes a 5.3% discount rate. See chapter 7, table 7.1 of the IPM documentation (<http://www.epa.gov/airmarkets/epa-ipm/index.html#documentation>) for more information.

Projected Allowance Prices for SO₂, NO_x and Hg



* Marginal cost projections are EPA's estimates, EIA's modeling would likely show different marginal costs.

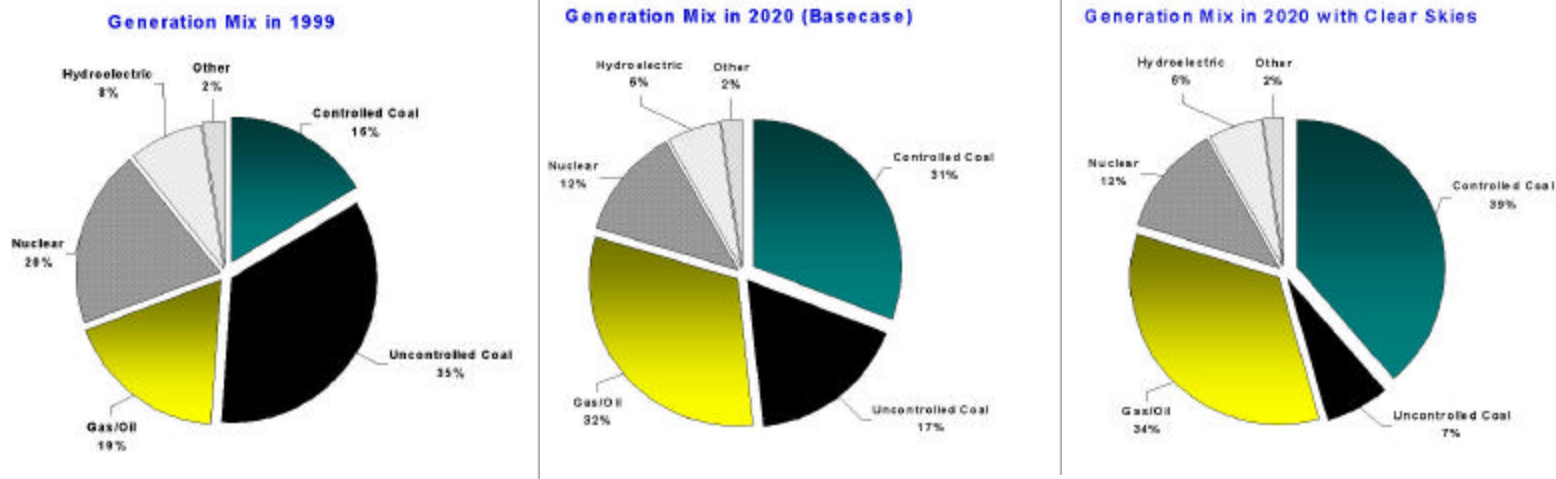
- Overall, when compared to existing Clean Air Act requirements, the Clear Skies Initiative will likely result in cost savings because a “cap-and-trade” approach is much more efficient than existing regulatory programs. When the Acid Rain Program was implemented using a cap-and-trade program, compliance costs were significantly lower than predicted as sources took advantage of the flexibility provided by a cap and trade program.
- Under the Clear Skies Initiative, the marginal costs of SO₂ and NO_x reductions are well below \$2,000/ton and the marginal cost of mercury reductions are below \$1,000/ounce.

Cost Comparison to other Sectors

	NOx Reductions	SO ₂ Reductions
Clear Skies Initiative	Marginal cost in 2020: ➤ \$1,750 per ton for NOx reductions	Marginal cost in 2020: ➤ \$1,200 per ton for SO ₂ reductions
Other Sectors	<u>Average costs</u> of reductions : ➤ Process heaters - \$6,800 per ton ➤ Glass manufacturing - \$2,600 per ton ➤ Chemical manufacturing - \$2,000 per ton ➤ Petroleum refining - \$8,300 per ton	➤ Inorganic chemical manufacture, process heaters, petroleum industry, and residual oil boilers would likely require scrubbers. ➤ Due to economies of scale, scrubbers on smaller units in these industries results in average costs that are much higher than the larger, coal-fired, boilers used for electric generation.
Tier 2 and Heavy-Duty Diesel Rules	<u>Average</u> cost per ton of emissions reduced about \$2,000 per ton, more than twice the average cost per ton of reductions under EPA's multi-emission proposal.	

The marginal cost of reducing SO₂ and NOx emissions from power generators under Clear Skies is significantly less than the *average cost* of reducing emissions from other sectors. For example, under the Tier II and heavy-duty diesel rules, the average cost of removing a ton of NOx is estimated at about \$2,000/ton.

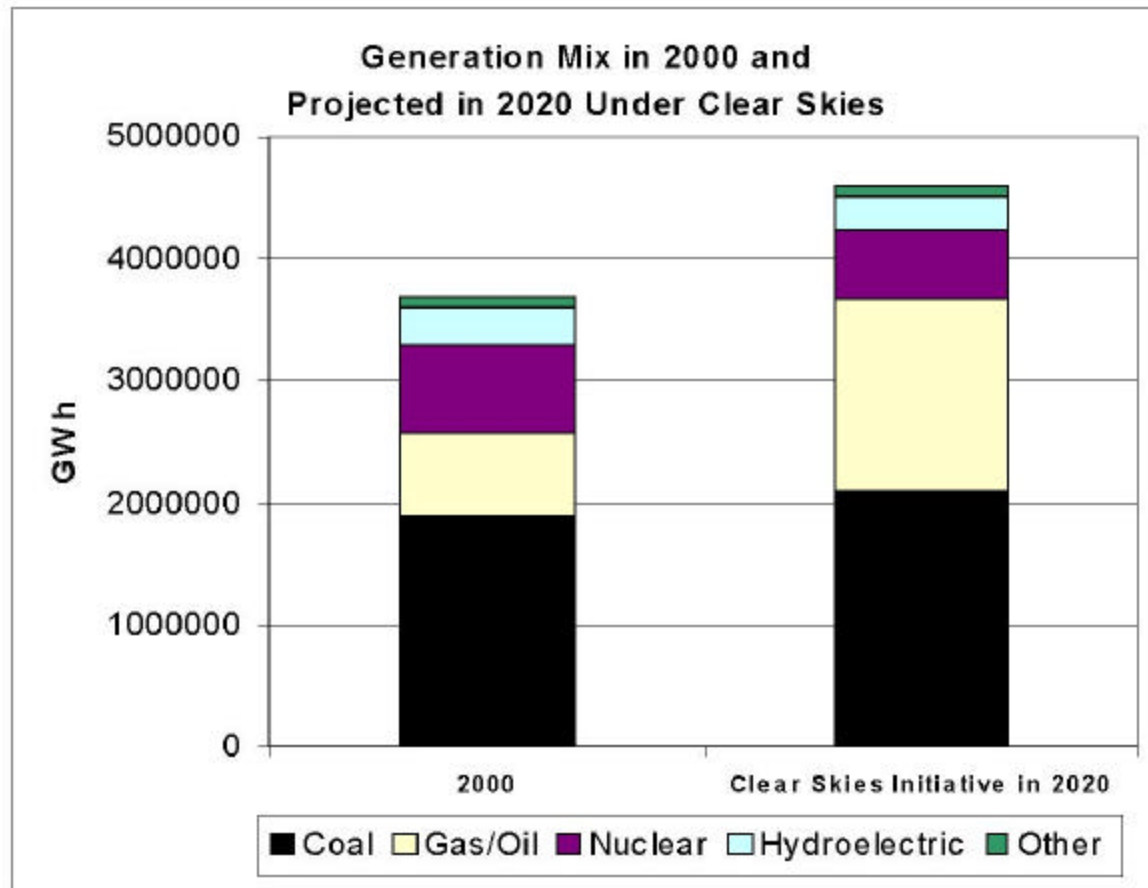
Generation Mix Under Clear Skies



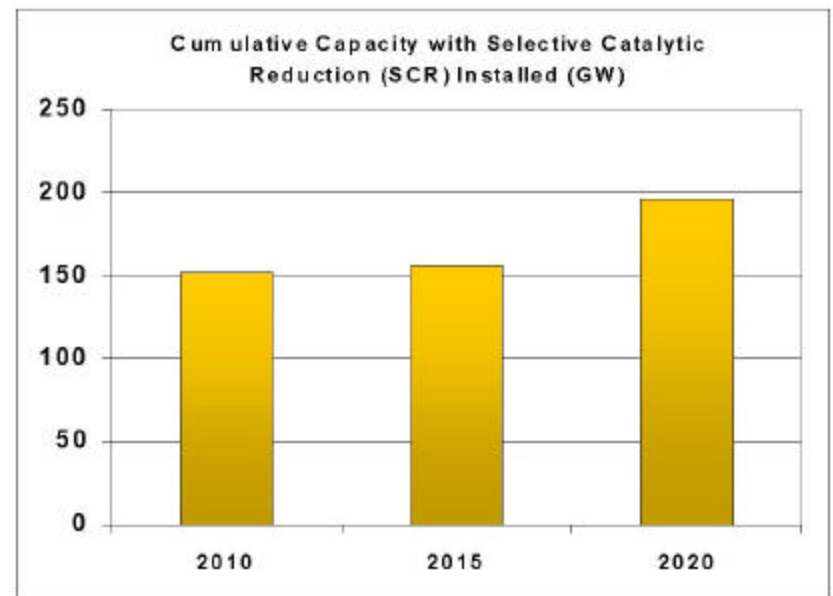
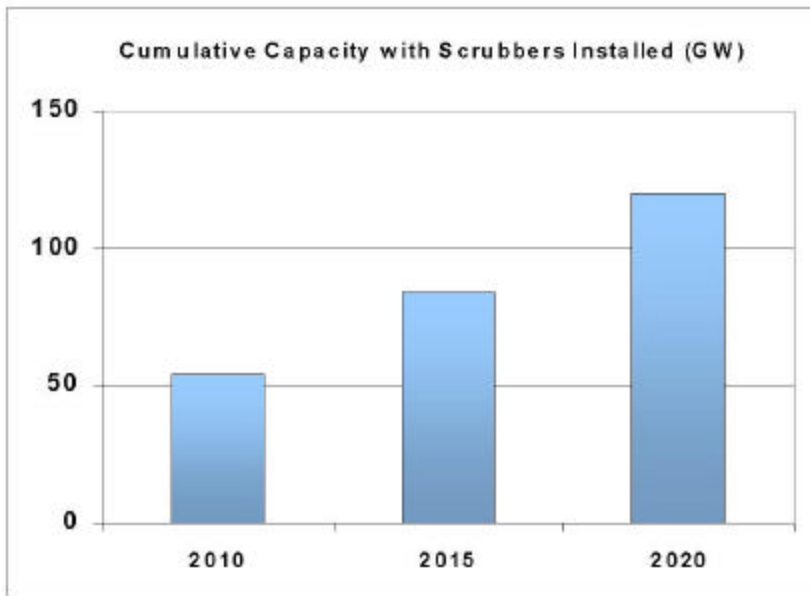
Notes:

Source of 1999 data is the NEEDS 2000 database. For more information on NEEDS see the IPM documentation, chapter 4. The 2020 projections are EPA estimates; EIA's modeling would likely show different impacts. "Controlled Coal" includes units with post-combustion SO₂ and/or NO_x controls. "Uncontrolled Coal" could include PM and/or NO_x combustion controls.

Electricity Generation Under the Clear Skies Initiative



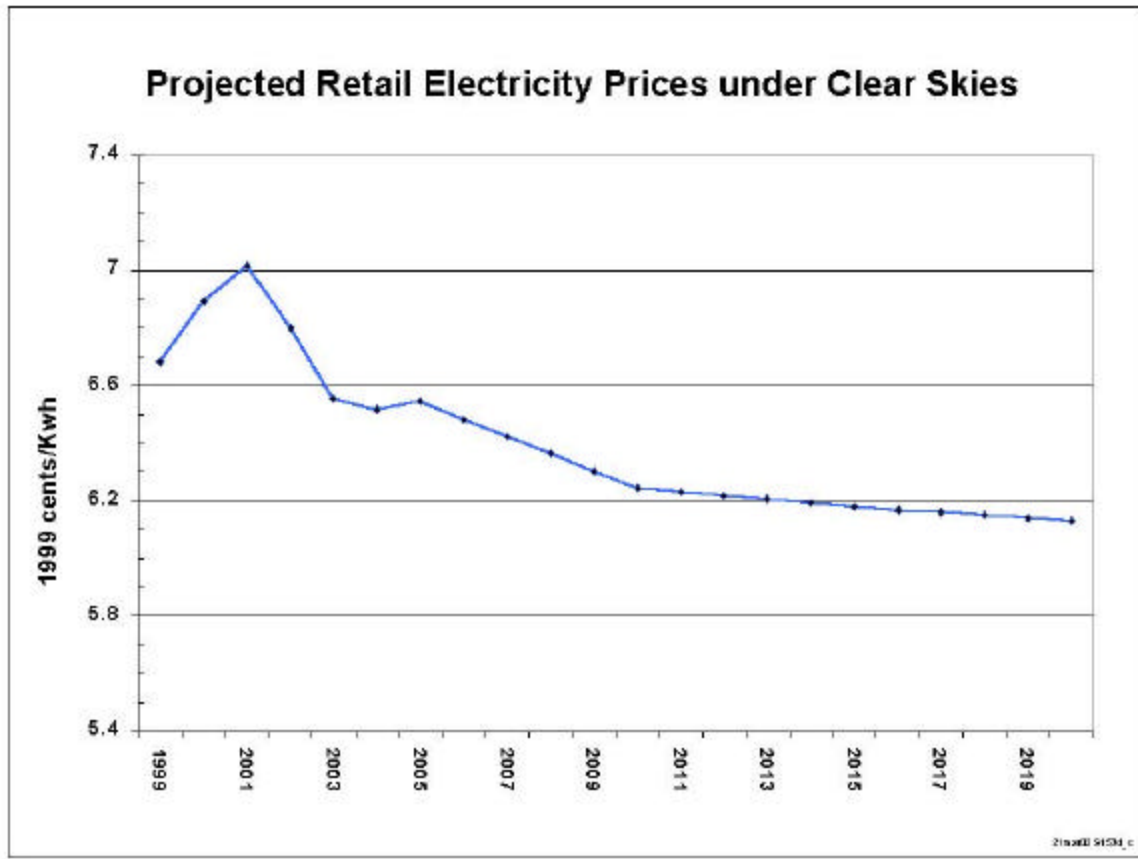
Coal-Fired Capacity with Post-Combustion SO₂ and/or NO_x Control Technologies Installed under Clear Skies*



Note: The 2010 projected SCR retrofits include about 72 GW of SCR needed to meet the NO_x SIP call. Retrofit projections are EPA estimates. EIA's modeling would likely show different impacts.

- The 2010 projected SCR retrofits include about 72 GW of SCR needed to meet the NO_x SIP call.
- In 2020 under Clear Skies, 85% of all coal-fired generation comes from units with post-combustion SO₂, NO_x and/or mercury controls installed (SCR, scrubbers, Activated Carbon Injection, gas re-burn and Selective Non-catalytic Reduction).

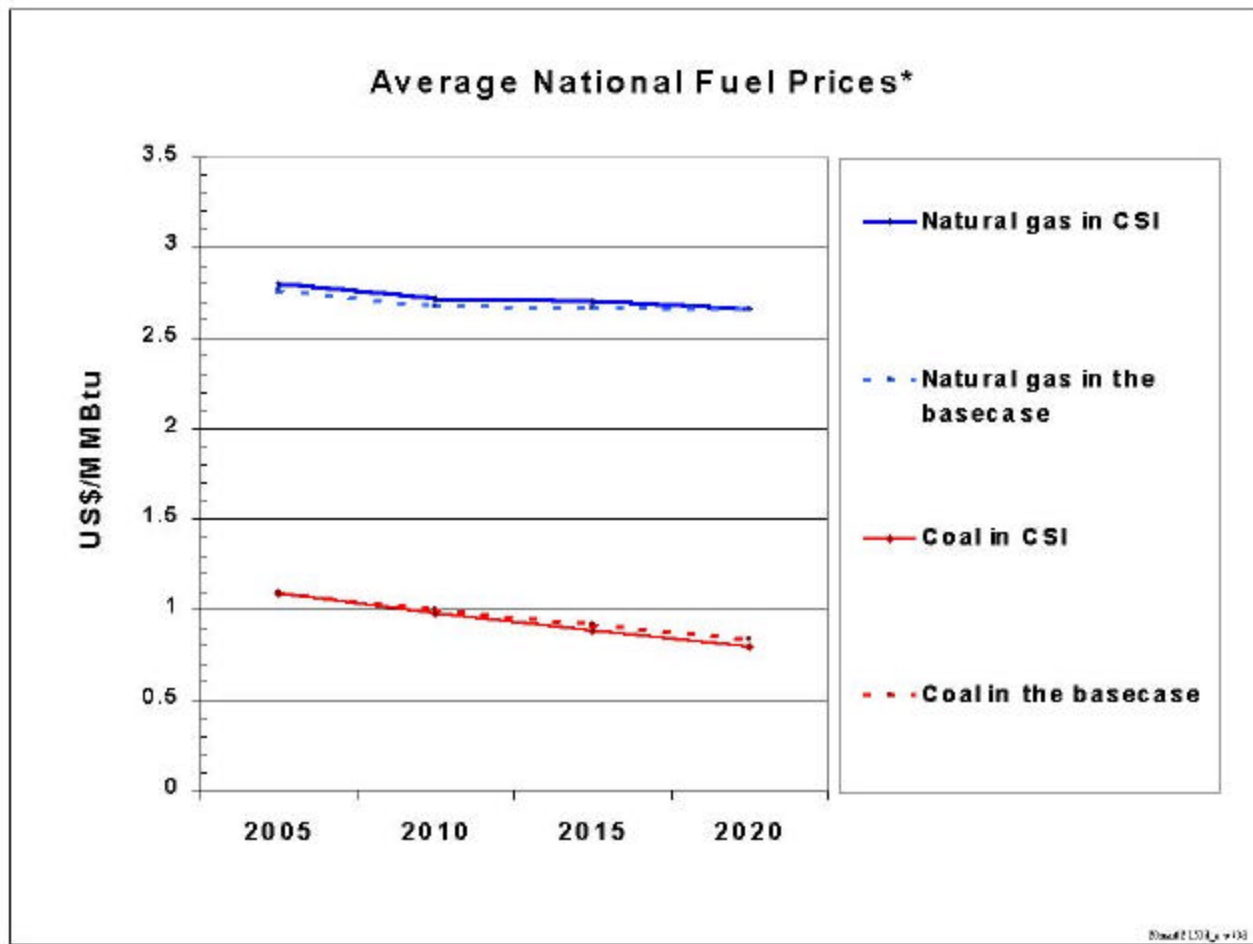
Impact on Electricity Prices



Retail electricity prices are expected to decline with or without Clear Skies because of ongoing deregulation in the electric generating sector.

Note: Retail prices through 2003 are from AEO2000. Prices for Clear Skies were calculated using an offline spreadsheet model. Retail electricity price projections are EPA estimates, EIA projections would likely show different impacts.

Impact on Fuel Prices

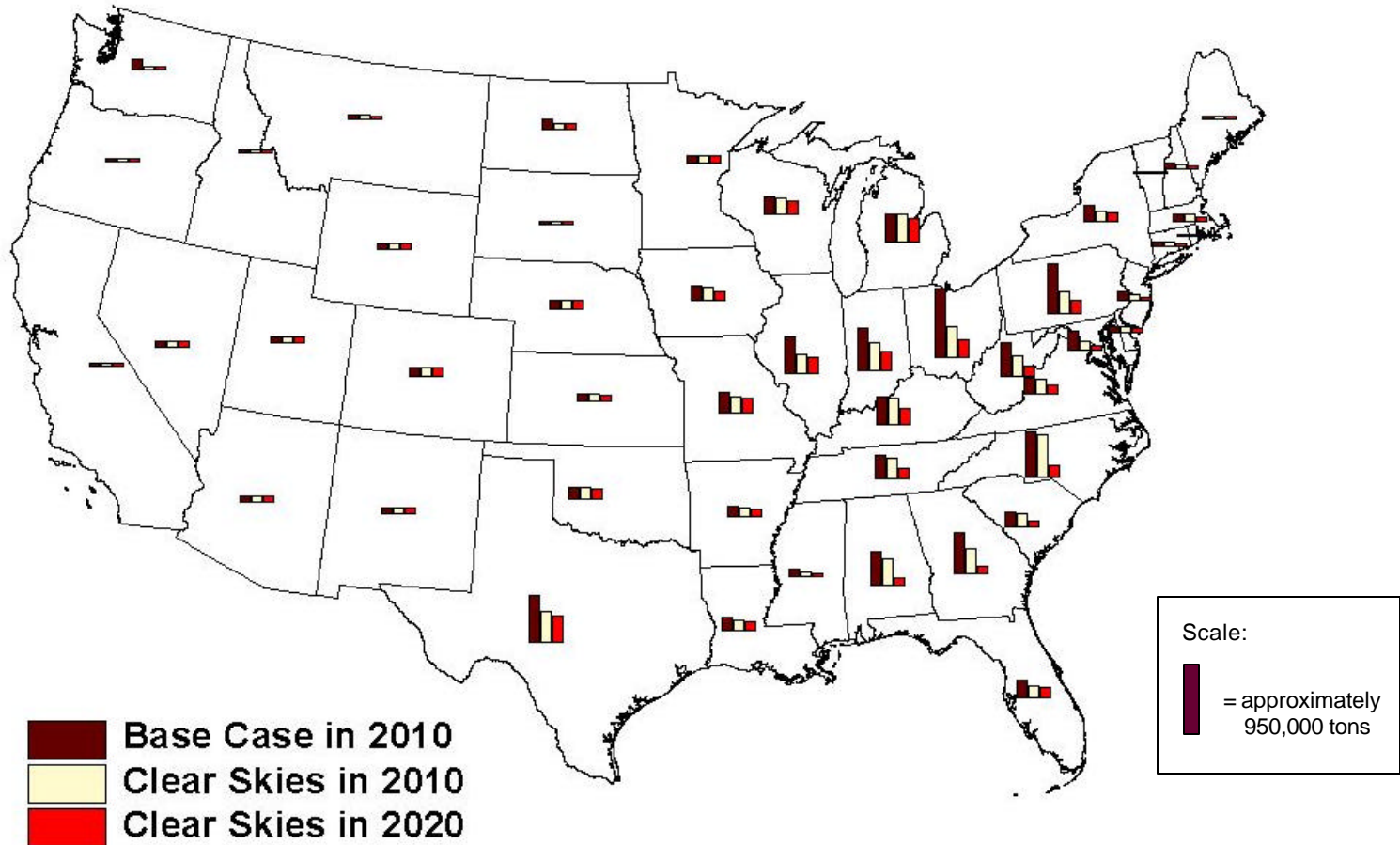


Note: the coal price represents an average across all twelve grades of coal in the model. The natural gas price is the Henry hub price, the coal price is the minemouth price. Average national fuel prices are EPA's estimates, EIA's modeling would likely show different fuel prices. Base case includes Title IV, the NOx SIP call, and state specific caps in CT, TX and MO. It does not include any potential future regulations to implement the current CAA.

Regional-level analysis of the Impacts of Clear Skies

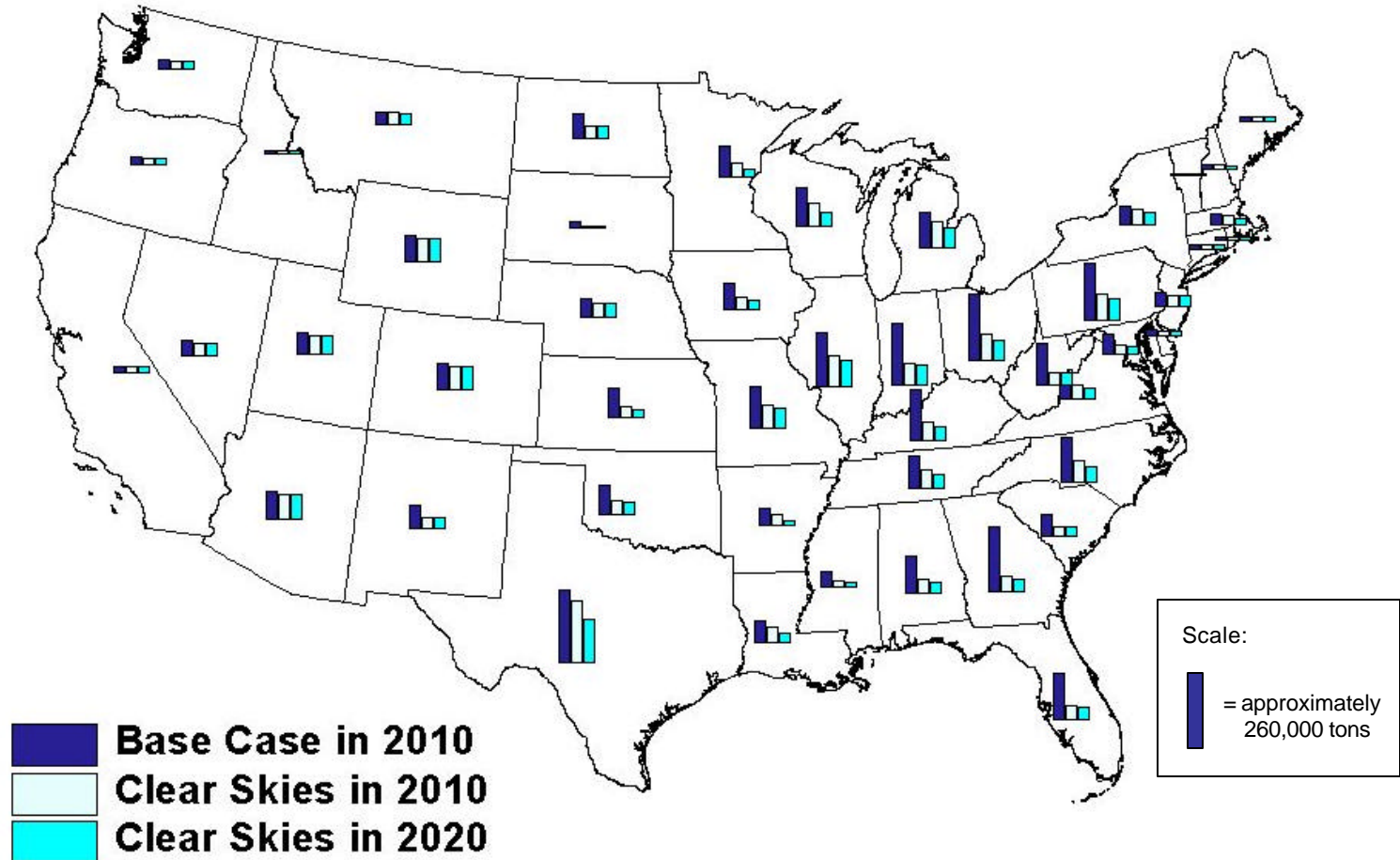
- The following categories of regional analysis are included in the packets:
 - Mass emissions
 - Emissions rates by primary fuels
 - Electricity prices
 - Changes in generation
 - Changes in fuel production
 - Environmental benefits
 - Health benefits

Emissions of Sulfur Dioxide



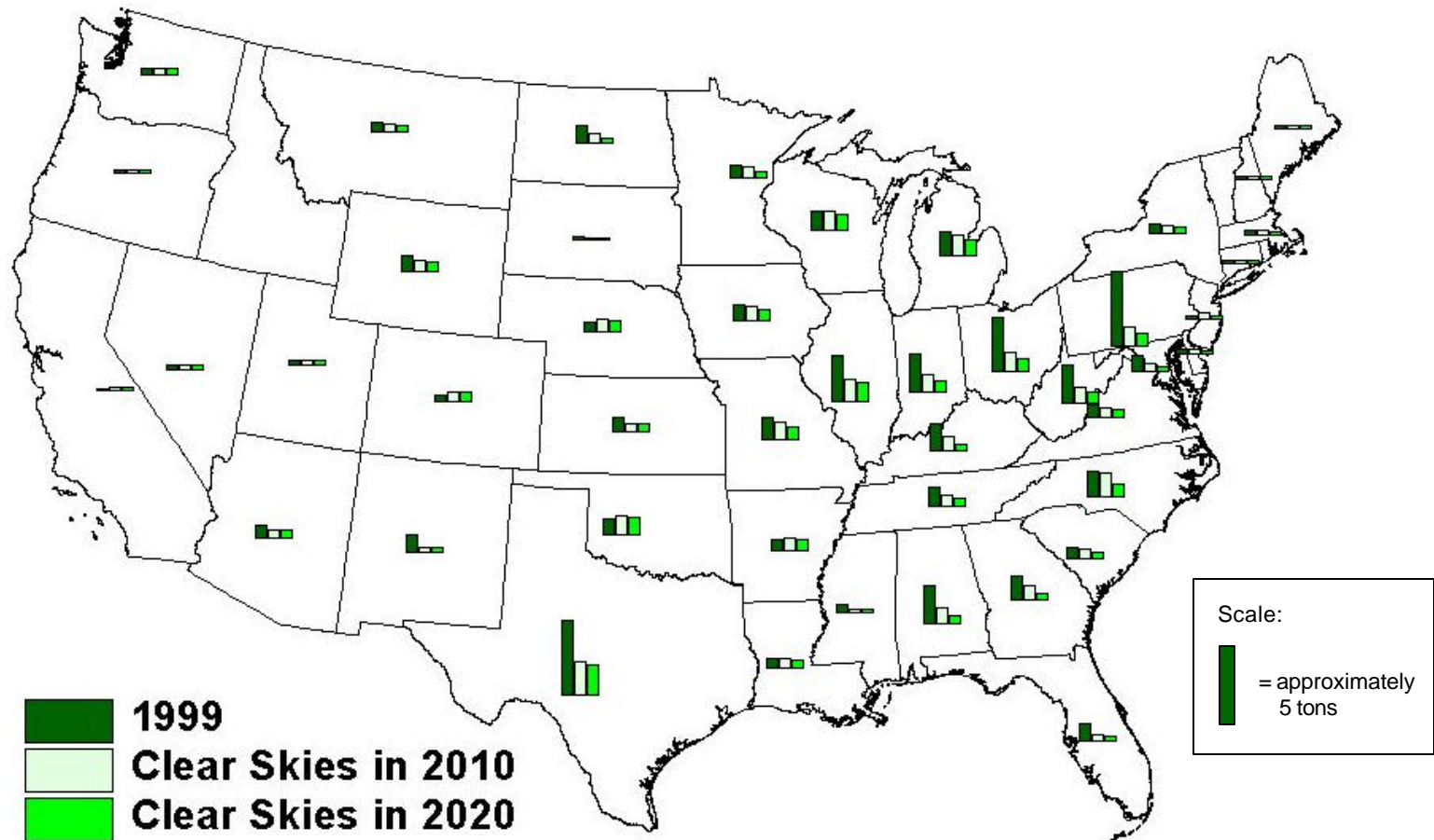
Total emissions under the Base Case in 2010 would be 9.6 million tons; total emissions under Clear Skies in 2010 would be 6.6 million tons; total emissions under Clear Skies in 2020 would be 3.9 million tons. (Note: Emissions are from electric generating facilities greater than 25MW.)

Emissions of Nitrogen Oxide



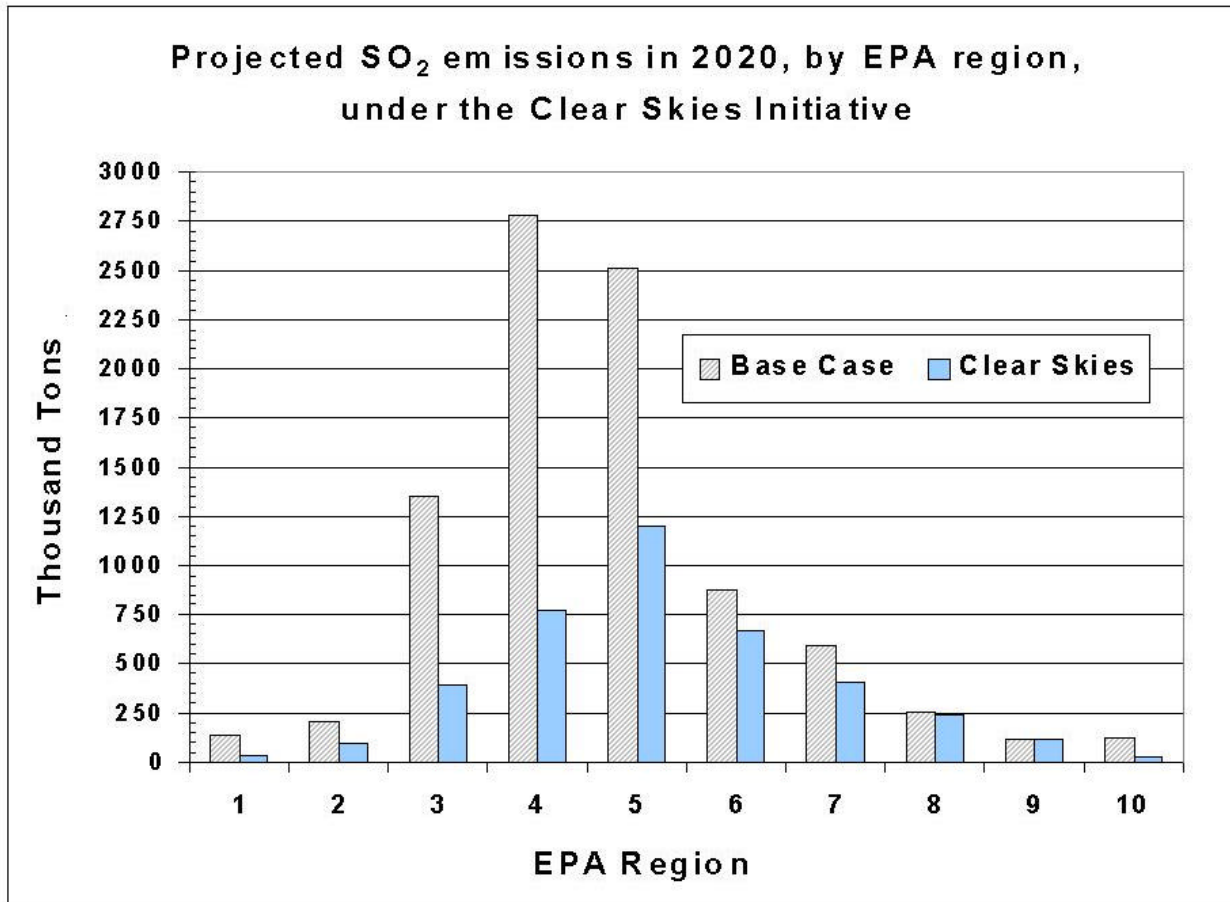
Total emissions under the Base Case in 2010 would be 4.2 million tons; total emissions under Clear Skies in 2010 would be 2.1 million tons; total emissions under Clear Skies in 2020 would be 1.7 million tons. (Note: Emissions are from electric generating facilities greater than 25MW.)

Emissions of Mercury



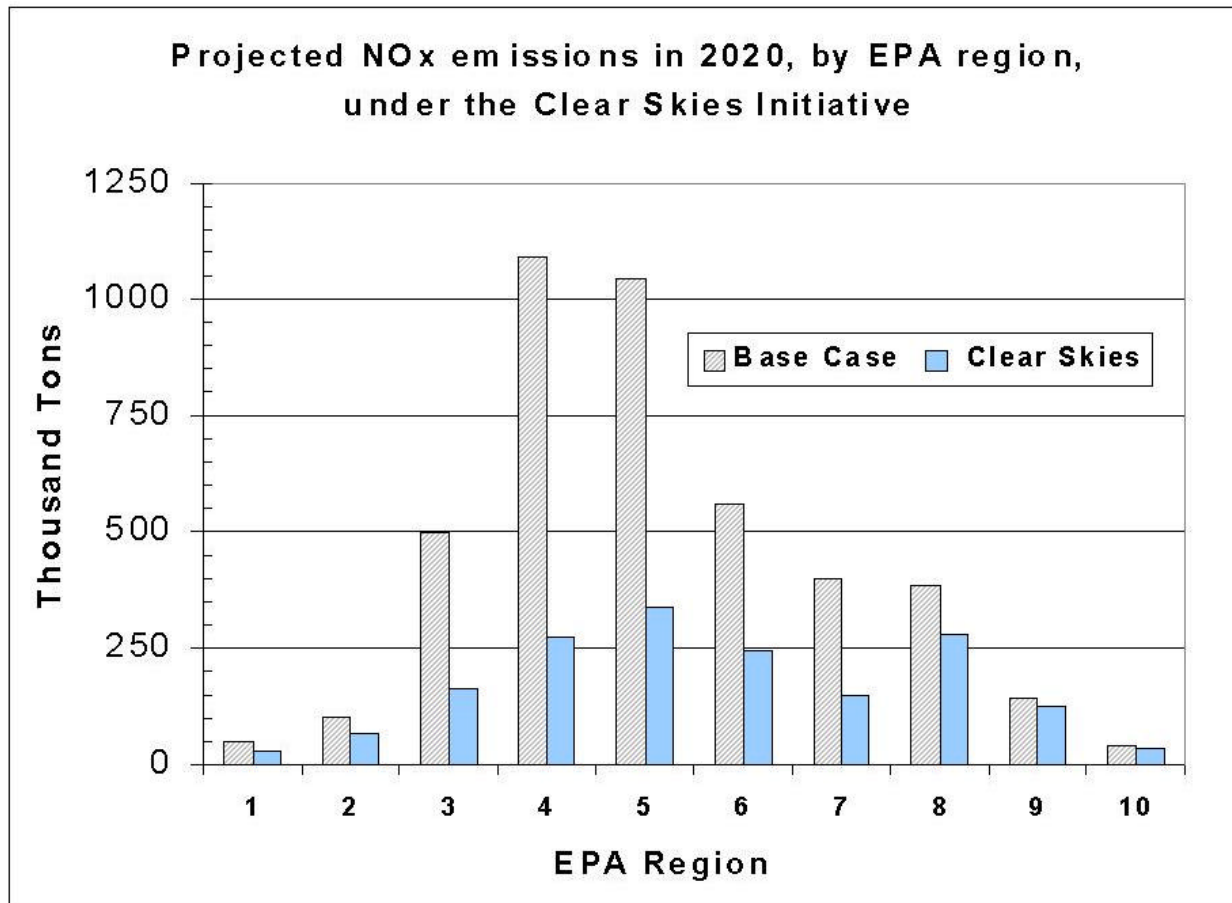
Total emissions in 1999 were 48 tons; total emissions under Clear Skies in 2010 would be 26 tons; total emissions under Clear Skies in 2020 would be 18 tons. (Note: Emissions are from coal-fired electric generating facilities greater than 25MW.)

Projected SO₂ Emissions from Power Plants



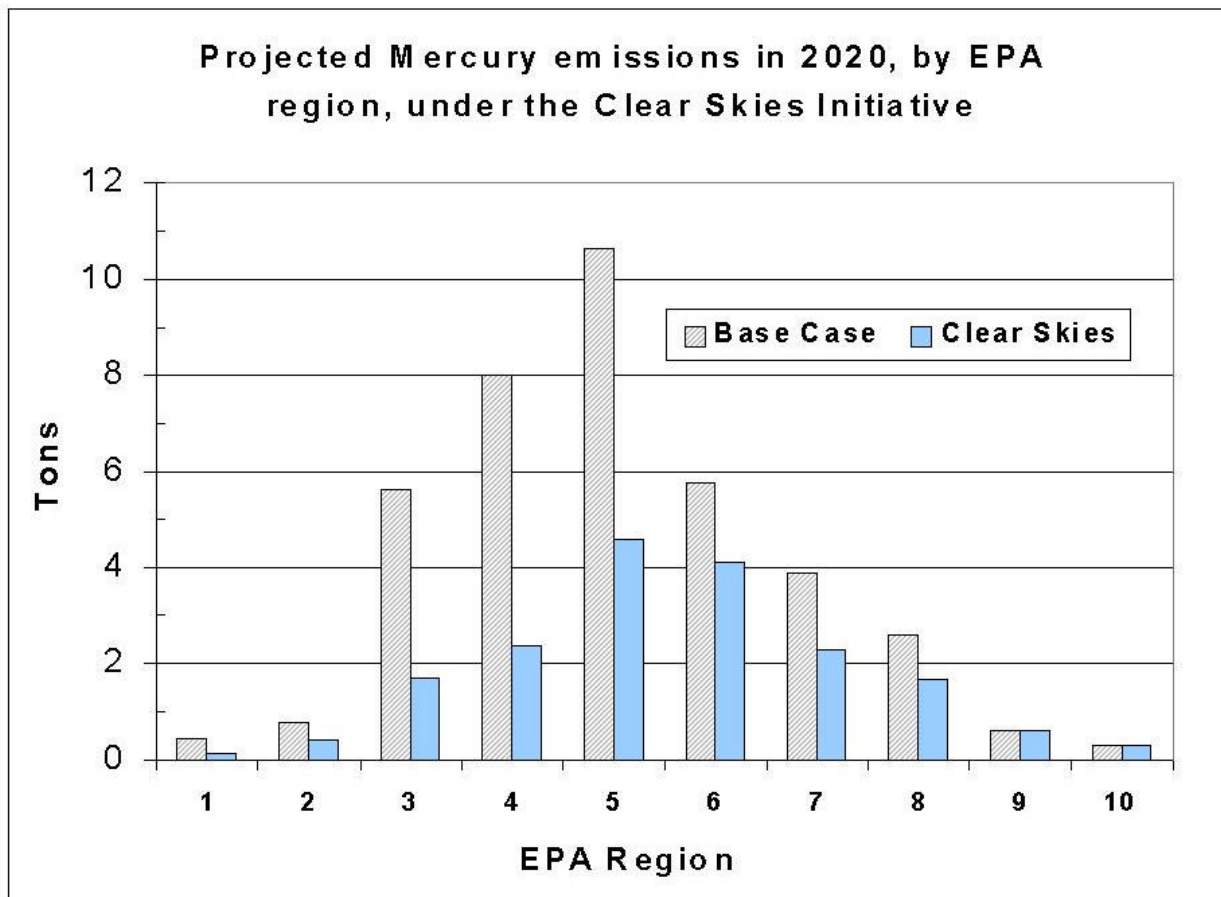
- Reductions are relative to projected base case emissions projected in 2020.
- The base case includes Title IV, the NO_x SIP call and state-specific caps. It does not include any potential future regulations to implement the current CAA.

Projected NOx Emissions from Power Plants



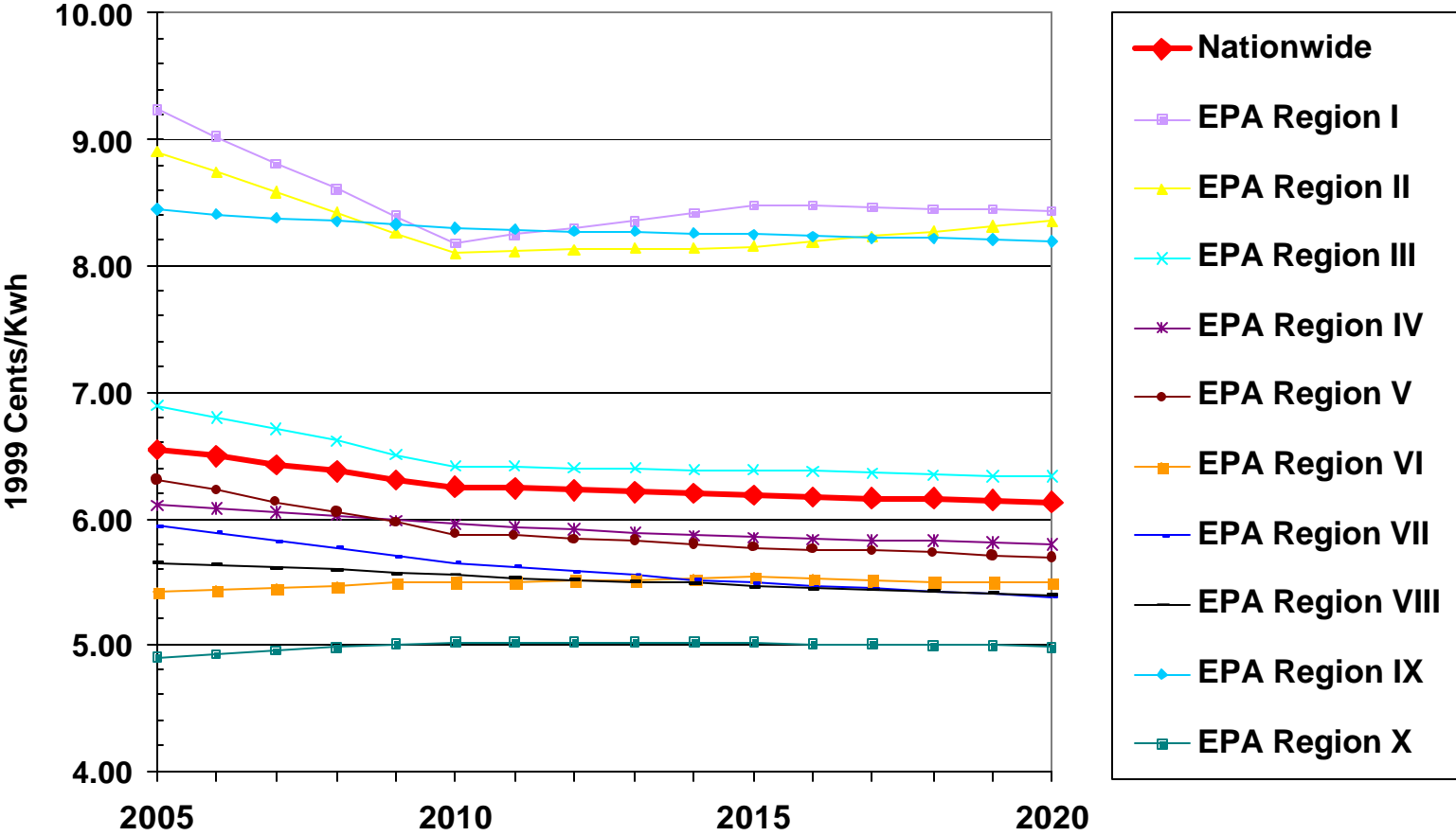
- Reductions are relative to projected base case emissions projected in 2020.
- The base case includes Title IV, the NOx SIP call and state-specific caps. It does not include any potential future regulations to implement the current CAA.

Projected Mercury Emissions from Power Plants



- Reductions are relative to projected base case emissions projected in 2020.
- The base case includes Title IV, the NO_x SIP call and state-specific caps. It does not include any potential future regulations to implement the current CAA.

Projected Electricity Retail Prices Under Clear Skies by EPA Region



- In 1999, the national average electricity price was \$6.66/Kwh