



A Four-Pollutant Approach to Power Plant Emissions

An Overview of the Clean Air Planning Act

March 2003



Introduction

The Clean Air Planning Act provides business certainty, relies on cost-effective regulatory systems, and delivers significant improvements in our Nation's air quality.

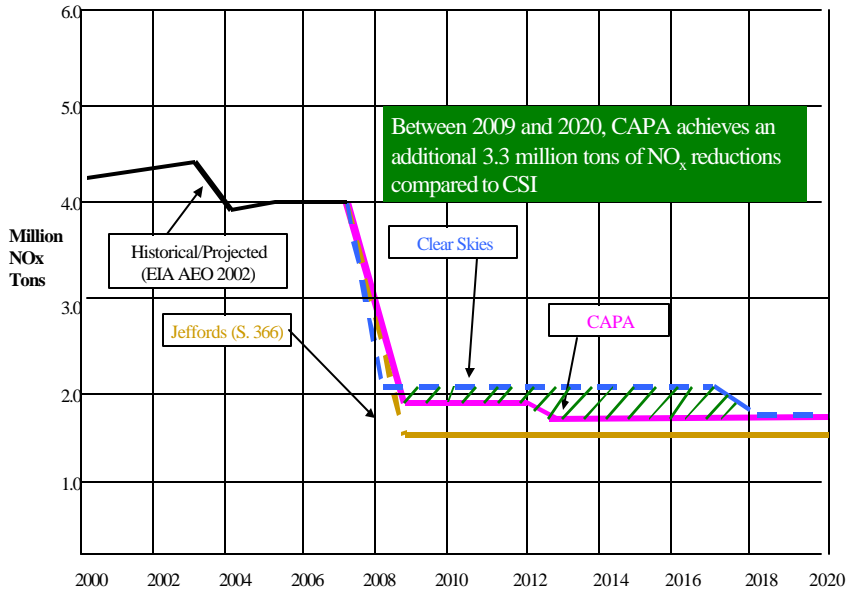
- The Clean Air Planning Act (the Act) establishes national tonnage caps for nitrogen oxides, sulfur dioxide, mercury, and carbon dioxide, with reasonable compliance timelines.
- The Act relies on cap-and-trade based regulation and output-based allocations, creating a powerful incentive for technological innovation and cost-effective compliance.
- In light of the caps proposed by the Act, it proposes to streamline the federal New Source Review (NSR) permitting program.

Emission Reduction Targets and Schedule

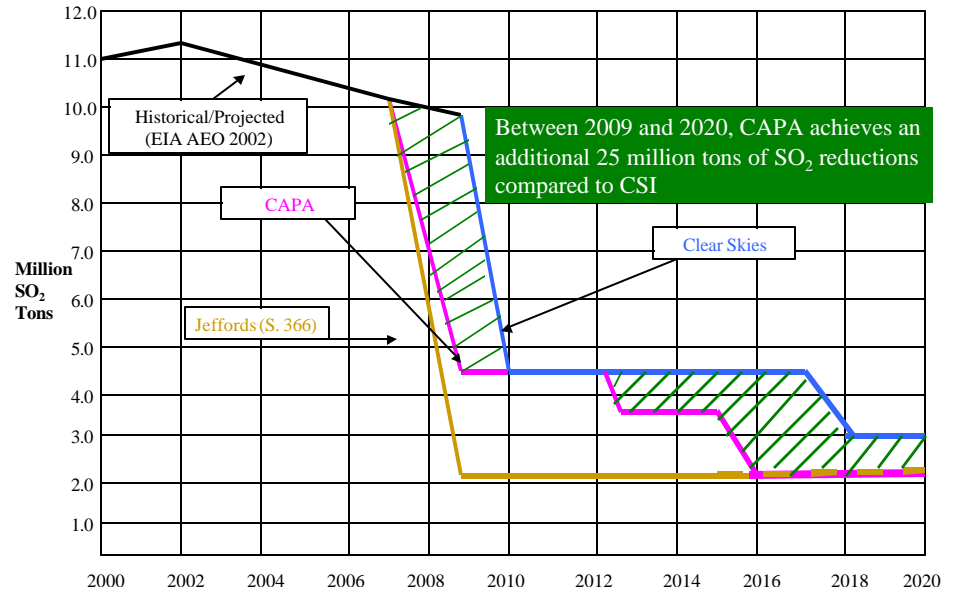
Pollutant	Proposed Target	Current Emissions	% Change*
Sulfur Dioxide	<ul style="list-style-type: none"> 4.5 million tons in 2009 3.5 million tons in 2013 2.25 million tons in 2016 	11 million tons	<ul style="list-style-type: none"> -60 percent -68 percent -80 percent
Nitrogen Oxide	<ul style="list-style-type: none"> 1.87 million tons in 2009 1.7 million tons in 2013 	5 million tons	<ul style="list-style-type: none"> -63 percent -66 percent
Mercury	<ul style="list-style-type: none"> 24 tons in 2009 10 tons in 2013 	48 tons	<ul style="list-style-type: none"> -50 percent -80 percent
Carbon Dioxide	<ul style="list-style-type: none"> Stabilize at 2005 levels (~ 2.6 billion tons) plus flexibility measures in 2009 Stabilize at 2001 levels (~ 2.4 billion tons) plus flexibility measures in 2013 	2.4 billion tons	<ul style="list-style-type: none"> +8 percent 0 percent

*Please note that these are % reductions from current levels of emissions, not reductions from future projected emissions. State and federal law will require reductions in emissions of SO₂, NOx and mercury, even in the absence of the adoption of federal multi-pollutant legislation.

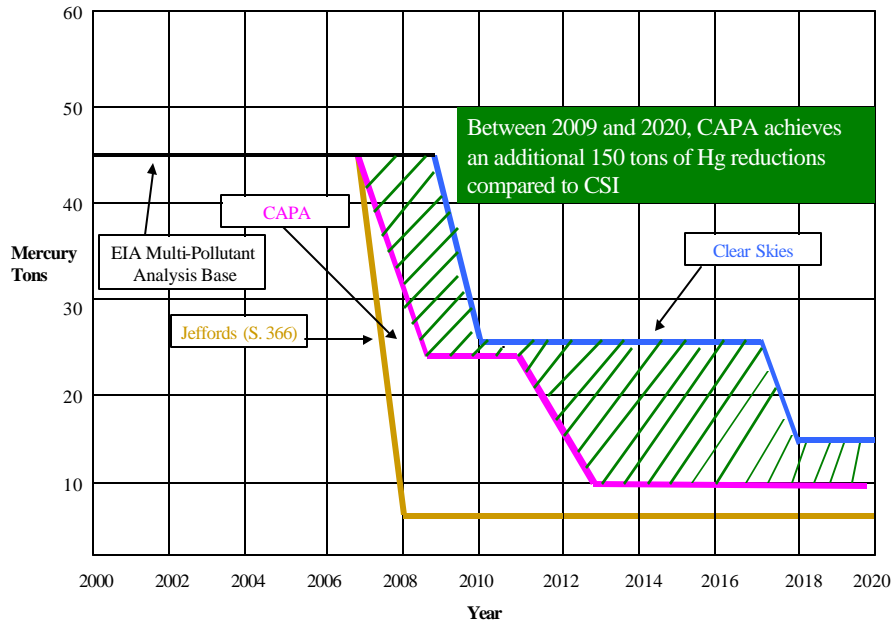
Comparison of Multi-Pollutant Proposal **NO_x** Emissions Caps



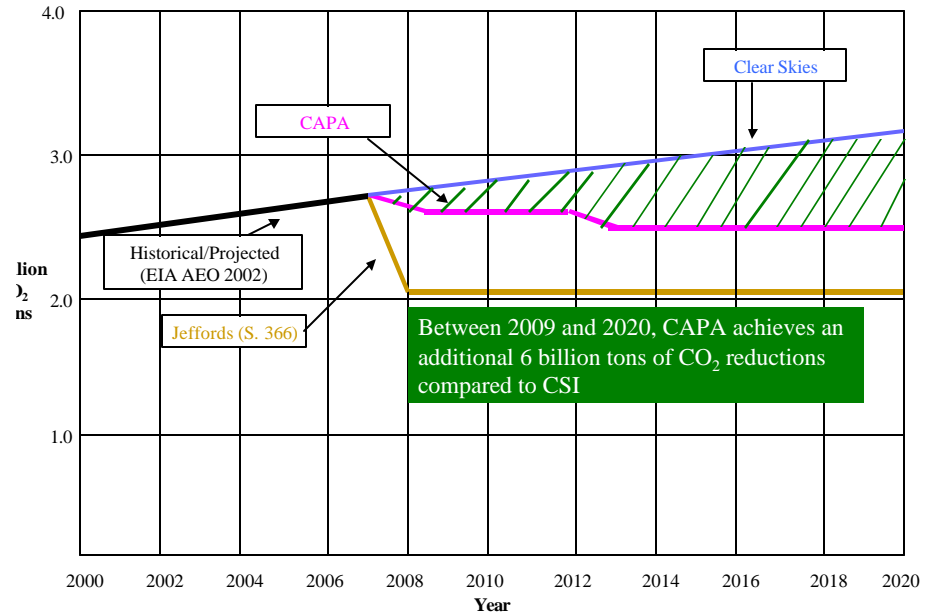
Comparison of Multi-Pollutant Proposal **SO₂** Emissions Caps



Comparison of Multi-Pollutant Proposal **Hg** Emissions Caps



Comparison of Multi-Pollutant Proposal **CO₂** Emissions Caps*



* This chart does not reflect the flexibility measures in the Carper and Jeffords proposals.

Comparison of Reduction Targets

The emission reduction targets and timelines proposed by the Clean Air Planning Act are earlier and in some cases more stringent than those proposed by the Clear Skies Act. The major differences are as follows:

- With respect to SO₂, the Clean Air Planning Act proposes greater reductions in emissions, and sooner, than proposed by the Clear Skies Act.
- As a result, between 2009 and 2020, the Clean Air Planning Act achieves an additional 25 million tons of SO₂ reductions compared to the Clear Skies Act.
- Both Acts propose a second phase NO_x cap of 1.7 million tons. However, the implementation schedules vary significantly. The Clean Air Planning Act proposes a 2013 start date, while the Clear Skies Act proposes a 2018 start date.
- As a result, between 2009 and 2020, the Clean Air Planning Act achieves an additional 3.3 million tons of NO_x reductions compared to the Clear Skies Act.

Comparison of Reduction Targets, *cont'd*

- With respect to mercury, the Clean Air Planning Act proposes a reduction of 10 tons in 2013. The Clear Skies Act proposes a target of 15 tons in 2018.
- As a result, between 2009 and 2020, the Clean Air Planning Act achieves an additional 105 tons of mercury reductions compared to the Clear Skies Act.
- The Clean Air Planning Act would establish a cap-and-trade program for CO₂, while the Clear Skies Act focuses exclusively on SO₂, NO_x, and mercury.
- As a result, between 2009 and 2020, the Clean Air Planning Act achieves an additional 6 billion tons of CO₂ reductions when compared to projections of emissions under the Clear Skies Act.

New Source Review

Clear Skies Act	Clean Air Planning Act	Clean Power Act
<p>Largely eliminates NSR for new sources</p> <ul style="list-style-type: none"> - Compliance with minimal control requirements exempts sources from NSR <p>Largely eliminates NSR for existing sources</p> <ul style="list-style-type: none"> - Compliance with minimal control requirements exempts sources from NSR <p>Reduces state authority to address local air quality concerns</p>	<p>Simplifies NSR for new sources:</p> <ul style="list-style-type: none"> - Eliminates offset requirement - Allows consideration of costs in determining required controls <p>Clarifies when NSR applies to existing sources:</p> <ul style="list-style-type: none"> - Any activity that increases a source's emission rate triggers NSR - Repowering a facility triggers NSR <p>Adds control requirement for all sources built before 1971</p> <p>Increases state authority to address local air quality impacts</p>	<p>Retains NSR for new sources</p> <p>Retains NSR for existing sources and adds control requirement for all sources in 40th year of operation</p> <p>Retains state authority to adopt more stringent requirements</p>

Sulfur Dioxide Background

- The electric generating sector has made great strides in reducing SO₂ emissions over the past decade as a result of the innovative cap-and-trade program established by the Clean Air Act.
- However, further reductions are required to address serious human health and environmental concerns. Sulfur dioxide is an important contributor to fine particulate concentrations, particularly in the Eastern U.S., and is the primary focus of EPA's "transport rule".
- Of the four pollutants addressed by the Clean Air Planning Act, sulfur dioxide is considered to pose the greatest risk to human health and therefore represents an important opportunity for improving air quality in the U.S.
- SO₂ control technologies have been demonstrated to significantly reduce emissions of mercury. Knowing the future reduction targets for both of these pollutants will allow companies to implement cost-effective control strategies, while avoiding wasted investments.

Sulfur Dioxide

Human Health and Environmental Concerns

- Respiratory illness (e.g., asthma, chronic bronchitis) and other serious health impacts attributable to elevated concentrations of fine particulate matter.
- Acidification of surface water, reducing biodiversity and impacting fish populations.
- Damage to forests through direct impacts on leaves and needles, and by soil acidification and depletion of soil nutrients.
- Decreased visibility (regional haze) in natural parks and other natural areas.
- Weathering of monuments, buildings, and other stone and metal structures.

Sulfur Dioxide Emission Control Strategies

As with NO_x, the strategies for controlling emissions of SO₂ from power plants are well developed. Power plant operators can achieve cost-effective reductions in excess 95% control efficiency with the application of existing control technologies.

- Wet scrubber
- Dry Scrubber
- Low-sulfur coal
- Fuel switching
- SO₂ Allowance Trading

Nitrogen Oxides Background

- NO_x is one of the primary contributors to the formation of ground-level ozone, a persistent air quality concern particularly in the Eastern U.S.
- The NO_x SIP call, which was designed to address the interstate transport of ozone, will be fully implemented in 2004, capping summer-time NO_x emissions in states throughout the Eastern U.S.
- EPA will likely be requiring further reductions in NO_x from power plants as part of its “transport rule” to assist the states in achieving compliance with the 8-hour ozone and fine particulate standards.
- Also, individual states are proceeding with the adoption of annual, power plant NO_x control programs (e.g., New Hampshire, Massachusetts, New York, North Carolina).

Nitrogen Oxides

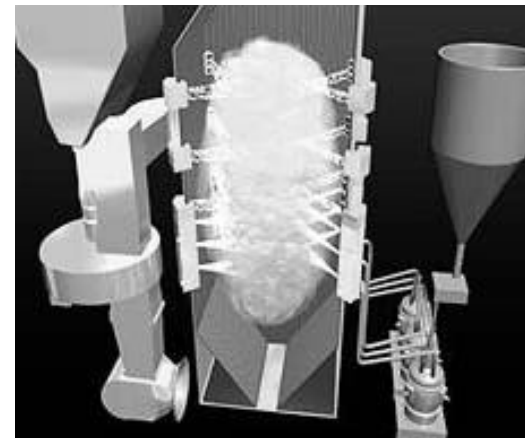
Human Health and Environmental Concerns

- Respiratory illness (e.g., asthma, chronic bronchitis) and other serious health impacts attributable to elevated concentrations of fine particulate matter and ground-level ozone.
- Acidification of surface waters, reducing biodiversity and impacting fish populations.
- Damage to forests through direct impacts on leaves and needles, and by soil acidification and depletion of soil nutrients.
- Damage to forest ecosystems, trees, ornamental plants, and crops as a result of elevated concentrations of ground-level ozone.
- Eutrophication of coastal waters, impacting fish and shellfish.
- Decreased visibility (regional haze) in natural parks and other natural areas.
- “Brown clouds” in some major western cities.
- Weathering of monuments, buildings, and other stone and metal structures.

Nitrogen Oxides Emission Control Strategies

The strategies for controlling emissions of NO_x from power plants are well developed based on the experience accumulated from having to comply or prepare for compliance with the Acid Rain program, OTC NO_x budget program, New Source Review, NO_x RACT, and the NO_x SIP call.

- Selective Catalytic Reduction (SCR)
- Selective Noncatalytic Reduction (SNCR)
- Low-NO_x Burners / Overfire Air
- Fuel Lean Gas Reburn
- NO_x Allowance Trading



Low NO_x control System

Efforts are also underway to develop “ultra-low” NO_x control technologies. For additional information see the National Energy Technology Laboratory’s website at <http://www.netl.doe.gov/coalpower/environment/nox>

Mercury

Background

- Coal-fired power plants are the largest source of mercury air emissions in the U.S., representing about one-third of total emissions from man-made sources.
- After extensive study, EPA concluded in December 2000 that regulation of hazardous air pollutants (HAPs) from coal- and oil-fired electric utility steam generating units is necessary, and that mercury is the air toxic of most serious concern.
- EPA appears to be on track to propose by December 2003 mercury emission standards (known as MACT) for coal-fired power plants, to promulgate a final rule by December 2004, and to require compliance by January 2008.
- Testing continues of alternative mercury control technologies and significant progress has been achieved. The Connecticut legislature has adopted mercury emissions standards for power plants requiring a 90% control efficiency and the Massachusetts Department of Environmental Protection has concluded that removal of 85-90+% of mercury in flue gas is demonstrated to be technologically and economically feasible.

Mercury

Human Health and Environmental Concerns

- Impaired cognitive and motor skills development in children of women who consume significant amounts of fish during pregnancy.
- Increased risk of cardiovascular effects (blood pressure regulation, heart rate variability and coronary heart disease) in children and adults.
- Impaired reproductive, immune and endocrine systems.
- Reproductive and neurological effects, in loons, mink, otter, and other fish-eating animals.

In May 2002, EPA reported that 44 states have issued mercury fish advisories and a recent study by EPA suggests that 8 percent of women of childbearing age have levels of mercury in their blood beyond what the Agency considers safe.

Mercury

Emission Control Strategies

The strategies for controlling emissions of mercury are less developed than those available for the control of NO_x and SO₂.

Currently available technologies include:

- Particulate control devices (ESPs and fabric filters)
- COHPAC (ESP followed by fabric filter)
- Wet and dry SO₂ scrubbers
- Also, SCR controls for NO_x have been shown to enhance mercury capture

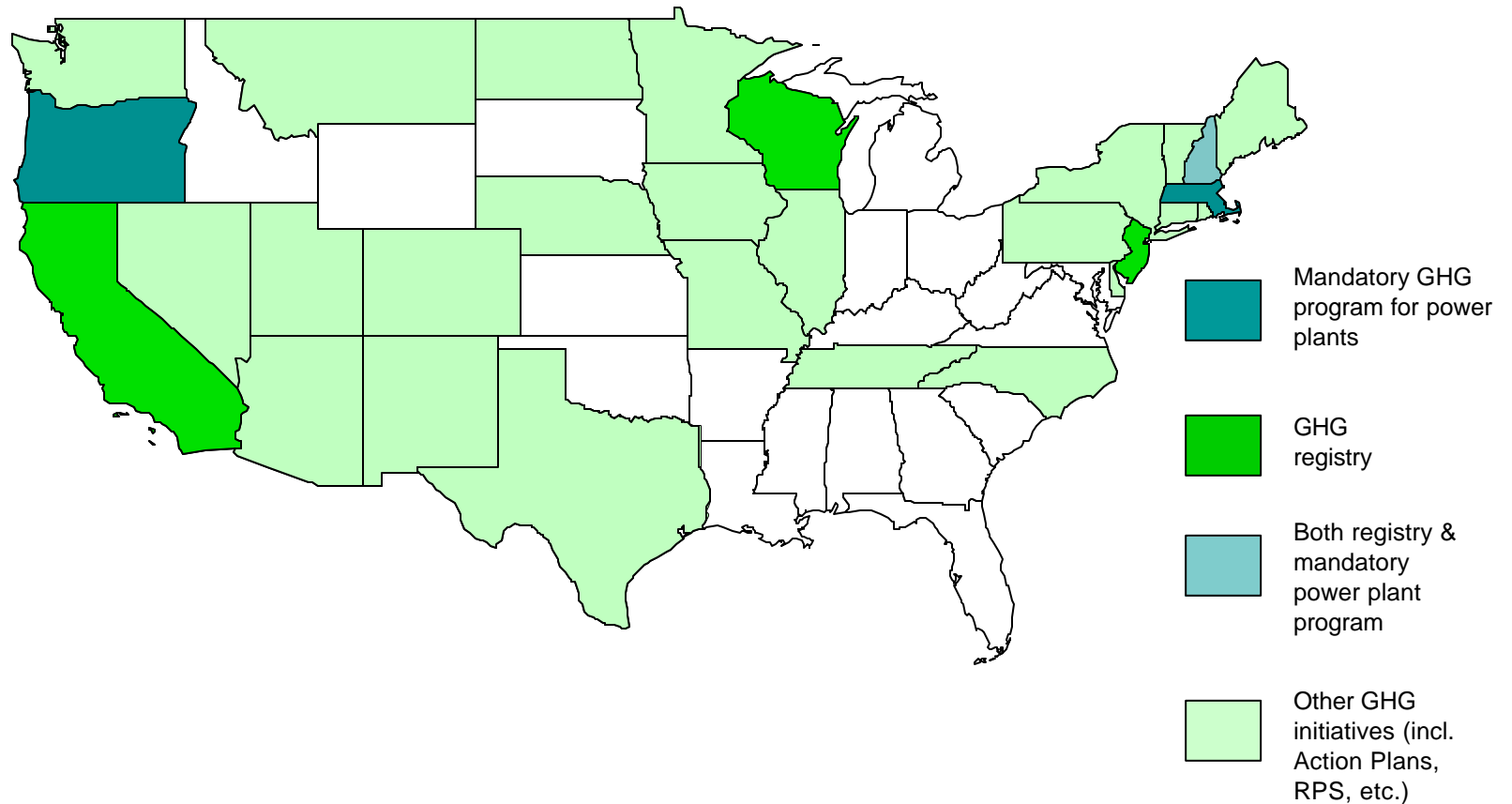
Emerging technologies include:

- Activated carbon injection
- Injection of other sorbents
- Catalytic oxidation

Carbon Dioxide Background

- The Bush Administration has opted for a voluntary approach to reducing greenhouse gas emissions. The Clear Skies Act is limited to three pollutants, excluding CO₂.
- The Clean Air Planning Act includes CO₂ to facilitate rational compliance planning. A multi-pollutant strategy with CO₂ creates a stable environment for capital investment and provides long-term certainty about the industry's future compliance obligations.
- In the absence of federal action, individual states are moving ahead with programs to regulate CO₂ from power plants (e.g., Massachusetts, Oregon, New Hampshire) and numerous states are developing greenhouse registries and other programs to encourage reductions. A patchwork of state regulations is much more burdensome for electric generators than a single unified program, particularly one that includes the flexibility of a trading program.

State Greenhouse Gas Initiatives



Carbon Dioxide

Human Health and Environmental Concerns

- The risk of global climate disruption as a result of the continued accumulation of greenhouse gases in the atmosphere
- Sea level rise
- Alterations in forests and other ecosystem impacts
- Alterations in crop yields and water supplies

Carbon Dioxide Emission Control Strategies

There is currently no cost-effective technology available for capturing CO₂ emissions as they exit the stack of a power plant. However, there are several cost-effective options available for reducing CO₂ emissions by adopting alternative energy technologies:

- Higher efficiency power generation technologies like combined-heat and power systems (CHP)
- Fuel switching to lower carbon fuels (primarily coal to gas)
- Renewable energy technologies and fuel cells
- Electricity production from biomass crops

Outside of the electric generating sector there are additional strategies available. We list only a sample of the options available:

- Carbon sequestration
- Landfill gas-to-energy projects
- End user efficiency and energy conservation

Comparing the Clean Air Planning Act and the Clear Skies Act

- The total cost of the Clean Air Planning Act to the electric generating sector will be slightly higher (4%) than the Clear Skies Act; however, the benefits are projected to be significantly greater (30%-40%).
- The Clean Air Planning Act and Clear Skies are projected to result in a similar generation fuel mix, with a 3% shift away from coal to natural gas under the Clean Air Planning Act when compared to Clear Skies in 2020.
- The Clean Air Planning Act would achieve significant reductions in mercury, NO_x, and SO₂ emissions in advance of the schedule proposed by the Clear Skies Act.
- The Clean Air Planning Act would establish a CO₂ allowance trading program. This increases the total costs of the legislation by 1.5%.
- The Clean Air Planning Act proposes an output-based allocation methodology to create an incentive for efficiency improvements. Clear Skies, with its grandfathering approach, represents a missed opportunity, foregoing the chance to create a on-going incentive for investment in clean and efficient energy technologies.

Conclusion

- The Clean Air Planning Act (the Act) will deliver substantial health and environmental benefits based on reasonable compliance timelines.
- The electric generating sector has been besieged with piecemeal pollutant-by-pollutant regulation and more requirements are on the horizon. The Act provides electric generating companies with a clear understanding of future environmental obligations allowing them to make the right investment decisions and ensuring that our nation's energy needs are satisfied.
- The Act achieves a balance between the need to improve our Nation's air quality, and the need for a reliable and cost-effective energy system.