I. NOx Budget Trading Program - Basic Information

The NOx Budget Trading Program (NBP) was a market-based cap and trade program created to reduce the regional transport of NOx emissions from power plants and other large combustion sources that contribute to ozone nonattainment in the eastern United States. The program was a central component of the NOx SIP Call, promulgated in 1998. All 20 states covered by the NOx SIP Call were in the NBP.

In 2009, CAIR's NOx ozone season program began, effectively replacing the NBP in the East and achieving further summertime NOx reductions from the power sector.

Cap and trade programs set a cap on overall regional emissions and allocate each affected source allowances authorizing a certain number of tons of emissions. This approach provides individual sources with flexibility in how they comply with emission limits. Sources may sell or bank (save) excess allowances if they reduce emissions and have more than they need, or purchase allowances if they are unable to keep emissions below their allocated budget. As a group, the participating sources cannot exceed the cap. The cap level is intended to protect public health and the environment and to sustain that protection into the future, regardless of growth in the affected sector. The cap also lends stability and predictability to the allowance trading market. Cap and trade programs have proven highly effective in reducing emissions from multiple sources, while achieving emission reductions, meeting environmental goals, and improving human health.

a. Ozone

Ozone in the Earth's upper atmosphere (the stratosphere) shields the planet from the sun's harmful ultraviolet rays. However, at ground level (the troposphere), ozone contributes to a number of serious health and ecological effects. The U.S. Environmental Protection Agency (EPA) has worked with state, local, and tribal representatives for more than three decades to reduce emissions that contribute to the formation of ozone.

In the 1970s, EPA established the National Ambient Air Quality Standard (NAAQS) for ozone. A 1-hour standard of 0.08 parts per million (ppm) was set in 1971 and revised to 0.12 in 1979. In 1997, a new, more stringent 8-hour ozone standard of 0.08 ppm was promulgated, revising the 1979 standard.

EPA responded by developing programs to reduce NOx emissions, including the NOx State Implementation Plan (SIP) Call rule in 1998. This rule was designed to reduce the regional transport of ozone and ozone-forming pollutants in the East. All 20 affected states and the District of Columbia (DC) chose to meet mandatory NOx SIP Call reductions, primarily through participation in the NOx Budget Trading Program (NBP), a market-based cap and trade program for electric generating units (EGUs) and large industrial units.

In March 2008, EPA again strengthened the 8-hour ozone standard to 0.075 ppm. The new standard will result in significant human health benefits in addition to protecting vegetation and ecosystems.

On May 1, 2009, the Clean Air Interstate Rule's NOx ozone season program began, replacing the NBP in affected states and requiring further NOx emission reductions from the power sector. In conjunction with local programs, the CAIR NOx ozone season program will help states move into attainment with the ozone NAAQS.

i. Ozone Formation

Ozone pollution forms when NOx and VOCs react in the presence of sunlight. Ozone itself is rarely emitted directly into the air. Major sources of NOx and VOC emissions include motor vehicles, solvents, industrial facilities, and electric power plants.

Meteorology plays a significant role in ozone formation. Dry, hot, sunny days are most favorable for ozone production. In general, ozone concentrations increase during the daylight hours, peak in the afternoon when the temperature and sunlight intensity are highest, and drop in the evening. Because ground-level ozone concentrations are highest when sunlight is most intense, the warm summer months (May 1 to September 30) are known as the ozone season.

Weather also affects ozone concentrations and how quickly ozone is transported or dispersed. Very light winds or no wind can allow ozone (and ozone precursors) to build up in an area, providing a favorable environment for the chemical reactions necessary to generate more ozone. Winds can also bring more pollution to an area, sometimes from hundreds of miles away. Ozone levels are typically higher in urban and suburban areas where there are concentrated local sources of NOx and VOCs. However, ozone levels can be elevated in some rural areas with few local emission sources due to transport of ozone and ozone precursors.

ii. Impacts on Human Health and Ecosystems

Exposure to ozone has been linked to a variety of health effects, the severity of which depends on concentration, length of exposure, and breathing rate. At levels found in many urban areas, ozone can aggravate respiratory diseases such as asthma, emphysema, and bronchitis, and can

increase susceptibility to respiratory infections. These health impacts result in increased medication use and emergency department visits. When developing the more stringent 8-hour ozone standards in 2008, EPA evaluated hundreds of new scientific studies and found increasingly convincing evidence of health impacts, including: school absenteeism, breathing difficulty, respiratory symptoms, increased medication use, and doctor visits for people with asthma. More serious effects include emergency department visits, hospital admissions, and premature mortality. At-risk groups include people with asthma or other lung diseases, older adults, and children and adults who are active outdoors.

Scientific evidence also continues to show that repeated exposure to ozone damages sensitive vegetation, including some tree, crop, and native plant species. Such effects can include reduced growth and productivity, damaged foliage, and increased susceptibility to disease, insect pests, and other stresses (e.g., harsh weather). Ozone-related damage can lead to ecosystem-level changes such as loss of diversity. Ozone damage can also reduce the aesthetic value of the landscape in city parks, national parks, forests, and recreation areas.

For more information on the health and environmental effects of ground-level ozone, visit EPA's Ground Level Ozone page.

iii. The 2008 Ozone NAAQS

On March 12, 2008, EPA strengthened its NAAQS for ground-level ozone, the primary component of smog. The new standard will improve public health and help protect sensitive trees and plants.

EPA revised both the primary ozone standard, designed to protect public health, and the secondary standard, designed to protect public welfare, from 0.08 to 0.075 ppm. In addition, EPA changed its Air Quality Index (AQI) to reflect the new primary standard. The AQI is a color-coded tool or health index that can be used by state and local authorities to inform the public about daily air pollution levels in their communities.

For more information on the Ozone NAAQS, visit EPA's National Ambient Air Quality Standards page.

iv. Overview of NOx and VOC Control Programs

The majority of NOx and VOC emissions in the eastern United States come from mobile sources, industrial processes, and the electric power industry.

The majority of ozone season NOx emissions in the East come from mobile sources (both on-road and nonroad) and EGUs and large industrial sources. VOC emissions come from a variety of sources, both biogenic (natural) and anthropogenic (manmade). While a significant portion of total VOC emissions come from biogenic sources (such as trees), especially during the ozone season, mobile and industrial sources make up a large portion of the anthropogenic sources of VOC emissions.

In addition to the NBP, which focuses on reducing NOx emissions from EGUs and large industrial sources, EPA has developed more than a dozen programs to reduce NOx and VOCs since 1990. Through these programs, improvements in ozone air quality are achieved by reducing emissions of NOx and VOCs from major mobile, industrial, and power sector sources. These programs complement state and local efforts to improve ozone air quality and meet national standards. Together, these programs have achieved significant emission reductions across the eastern United States. More information about trends in NOx and VOC emissions.

Moreover, several current and recently implemented air quality programs will further reduce NOx and VOC emissions in the coming years. The Clean Air Nonroad Diesel Rule, the 2007 Heavy Duty Highway Rule (also known as the Clean Air Diesel Trucks and Buses Rule), and the recently finalized Locomotive and Marine Diesel Standards are part of a suite of national programs designed to reduce pollution from diesel engines. These rules will reduce NOx emissions and particle pollution by more than 90 percent from affected diesel engines by 2030. Additional NOx reductions will be achieved from passenger vehicles including cars, light trucks and SUVs through the Tier 2 Vehicle and Gasoline Sulfur Program.

Reductions in VOCs will occur as part of these programs and, more dramatically, through the Control of Hazardous Air Pollutants from Mobile Sources (MSAT 2) program, which began in 2007. While EPA's Acid Rain Program (ARP) has achieved significant reductions from the power sector, beginning in 2009, ozone season and annual NOx reductions are required as part of CAIR.

Finally, additional reductions of NOx and VOCs will also result from the industrial sector. Industrial source hazardous air pollutants are regulated through the Maximum Achievable Control Technology (MACT) standards, while criteria pollutants are controlled by the New Source Performance Standards (NSPS) and Emission Guidelines. Regulations on the contents and use of consumer and commercial products will also result in additional reductions of both VOCs and NOx.

b. The NOx Budget Trading Program

i. History of National and Regional Power Sector NOx Control Programs

Acid Rain Program (ARP): Congress established the ARP through Title IV of the Clean Air Act Amendments of 1990. This annual program reduces sulfur dioxide (SO2) from EGUs through a cap and trade program across the lower 48 states. The ARP also reduces NOx emissions from some of these units, but, unlike the SO2 portion of the ARP, there is no cap on NOx emissions or allowance trading. Instead, the ARP NOx provisions apply boiler-specific NOx emission limits in pounds per million British thermal units (lb/mmBtu) on certain coal-fired boilers. Companies

can use "emission averaging" plans across their units to comply flexibly with rules. Beginning in 1996, NOx limits were applied on some of the largest boilers, while a second phase to reduce NOx emissions from additional coal-fired generating units began in 2000.

Ozone Transport Commission (OTC) NOx Reduction Programs: The OTC was established under the 1990 Clean Air Act Amendments. States in the Northeast and Mid-Atlantic collaborated to help reduce summertime ground-level ozone in the region by achieving ozone season NOx reductions in several phases. In 1995, Phase 1 required sources to reduce their annual NOx emission rates to meet Reasonably Available Control Technology (RACT) requirements. In Phase II (1999–2002), states achieved reductions in NOx from fossil fuel-fired EGUs and large industrial boilers and turbines through an ozone season cap and trade program known as the OTC NOx Budget Program. The third phase of the OTC NOx Budget Program was slated to begin on May 1, 2003, but was replaced by EPA's NOx SIP Call.

NOx State Implementation Plan (SIP) Call: In 1995, EPA and the Environmental Council of the States formed the Ozone Transport Assessment Group to begin addressing the problem of ozone transport across the entire eastern United States. Based on the group's findings and other technical analyses, EPA issued the NOx SIP Call in 1998 to reduce the regional transport of ground-level ozone. This rule requires states to reduce ozone season NOx emissions that contribute to ozone nonattainment in other states. The NOx SIP Call does not mandate which sources must reduce emissions; instead, it requires states to meet emission budgets and gives them flexibility to develop control strategies to meet those budgets.

NOx Budget Trading Program (NBP): Under the NOx SIP Call, EPA developed the NBP to allow states to meet their emission budgets in a cost-effective manner through participation in a region-wide cap and trade program for EGUs and large industrial boilers and turbines. As of the 2007 ozone season, all 20 affected states and the District of Columbia chose to meet most of their NOx SIP Call requirements through participation in the NBP. While EPA administered the trading program, states shared responsibility with EPA by allocating allowances, inspecting and auditing sources, and enforcing the program. The 2008 ozone season was the last year of the NBP as it was effectively replaced by the CAIR NOx ozone season program starting in 2009.

Clean Air Interstate Rule (CAIR): On March 10, 2005, EPA promulgated CAIR, a rule that was designed to achieve the largest reduction in air pollution in more than a decade. In addition to helping states address ozone nonattainment, CAIR assists states in attaining the particulate matter 2.5 (PM2.5) NAAQS by reducing transported precursors, SO2 and NOx. CAIR accomplishes this by creating three separate trading programs: an annual NOx program, an ozone season NOx program, and an annual SO2 program.

Each of these programs would use a two-phase approach, with declining emission caps based on cost-effective controls on power plants. Similar to the NOx SIP Call, CAIR gives states the flexibility to reduce emissions using a strategy that best suits their circumstances and provides an EPA-administered, regional cap and trade program as one option. On July 11, 2008, the U.S. Court of Appeals for the DC Circuit issued a ruling vacating CAIR in its entirety. EPA and other parties requested a rehearing, and on December 23, 2008, the Court granted a rehearing only to the extent that it remanded the rules to EPA without vacating them. This ruling leaves CAIR and

the CAIR Federal Implementation Rules (FIPs) -- including the CAIR trading programs -- in place until EPA issues a new rule to replace CAIR. EPA estimates that development and finalization of a replacement rule could take about two years.

ii. Key Components

The NBP was an ozone season (May 1 to September 30) cap and trade program for EGUs and large industrial combustion sources, primarily boilers and turbines. The program had several important features:

- The region-wide cap was the sum of the state emission budgets EPA established under the NO_x SIP Call to help states meet their air quality goals to protect human health and the environment.
- Authorizations to emit, known as allowances, were allocated to affected sources based on state trading budgets. The NOx allowance market enabled sources to trade (buy and sell) allowances throughout the year.
- Sources could choose among several options to reduce NOx emissions. Options included adding emission control technologies, replacing existing controls with more advanced technologies, optimizing existing controls, or switching fuels.
- At the end of every ozone season, each source surrendered sufficient allowances to cover its ozone season NOx emissions (each allowance represents one ton of NOx emissions). This process was called annual reconciliation.
- If a source did not have enough allowances to cover its emissions, EPA automatically deducted allowances from the following year's allocation at a 3:1 ratio.
- If a source had excess allowances because it reduced emissions beyond required levels, it could sell the unused allowances or bank (save) them for use in a future ozone season.
- To accurately monitor and report emissions, sources used continuous emission monitoring systems (CEMS) or other approved monitoring methods under EPA's stringent monitoring requirements (40 CFR, Part 75).

1. Allowances

As part of its responsibility to administer the NO_x Budget Trading Program under the SIP Call, EPA's Clean Air Markets Division recorded allowance allocations in the NO_x Allowance Management System (NAMS) according to the specifications of each state. In order to record allocations in NAMS, the state had to get EPA approval for its finalized SIP, including its trading rules, and submit an electronic file including account-specific allocation amounts.

To find specific information on allowance accounts, visit Data and Maps.

2. State Trading Budgets, Allowance Allocations, and Compliance Supplement Pool (CSP) Allowances

EPA provided broad discretion to states as to how they could allocate allowances from their trading budget to affected sources. One option was to allocate allowances based on each source's share of statewide ozone season heat input (i.e., fuel use). Another option was based on each

source's share of ozone season output (e.g., generation) to reward sources that generated more energy with less fuel input. States could also set aside allowances for new sources or as incentives for energy efficiency and renewable energy programs. In addition to their NOx budgets, states received additional allowances to distribute from the Compliance Supplement Pool (CSP). EPA created the CSP allowances to address concerns that initial efforts to comply with the NOx emissions cap could have too many primary electric generating units out of operation at the same time to install pollution control retrofits, which could have adversely affected electricity supply reliability. The CSP allowances helped states to phase-in compliance during the first two years of the trading program and allowed sources to limit units out of service at critical times during the year. States were allowed to distribute their CSP allowances based on early reductions in NOx emissions, on the basis of demonstrated need, or on some combination of the two methods. The CSP allocation was a one-time, up-front allocation. For the states that began to comply with the NOx SIP Call in 2003 (states that had been a part of the OTC trading program), all CSP allowances were distributed as vintage year 2003 allowances and replaced existing banked OTC allowances. The non-OTC states distributed CSP allowances as vintage year 2004 allowances. The vintage is the first year an allowance can be used for compliance (i.e., deducted to cover emissions). Sources could only use CSP allowances for the first two years of the NBP.

3. Flow Control

The NBP's progressive flow control provisions were designed to discourage extensive use of banked allowances in a particular ozone season. Flow control was triggered when the total number of allowances banked for all sources exceeded 10 percent of the total overall (regional) budget for the next year. When this occurred, EPA calculated the flow control ratio by dividing 10 percent of the total regional NOx trading budget by the number of banked allowances (a larger bank will result in a smaller flow control ratio). The resulting flow control ratio established the percentage of banked allowances that could be deducted from a source's account on a 1:1 ratio of one allowance per one ton of emissions. The remaining banked allowances, if used, were deducted at a 2:1 ratio of two allowances per one ton of emissions.

On January 1st, 2009, the NBP transitioned to the CAIR NOx ozone season program. As pat of this process, the EPA transferred these banked NBP allowances to CAIR NO_x ozone season accounts for use under CAIR in 2009 and beyond. In addition, EPA transferred to CAIR some allowances from the primary reserve accounts of two states. These allowances were not considered "banked" under the NBP because they had never been serialized or allocated. In total, EPA transferred 275,367 allowances from the NBP to the CAIR NO_x ozone season program. Flow control will no longer apply in 2009 and beyond with the transition to CAIR. Thus, the transferred allowances may be used under CAIR with no restrictions or time limits on a straight 1:1 basis.

4. Opt-ins

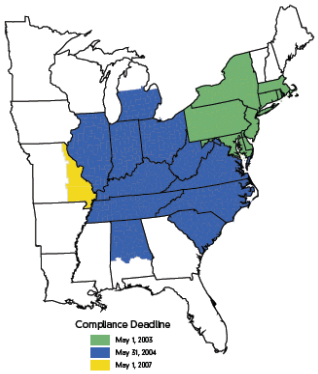
States could choose to allow sources that were not affected by the NBP to opt in to the trading program. Opt-ins were limited to fossil fuel-fired combustion devices that vented all emissions through a stack and were able to meet EPA's stringent Part 75 emission monitoring

requirements. Potential opt-in sources applied for a state NBP opt-in permit. If approved, these sources were issued opt-in allowances, which were in addition to the state's base budget.

iii. Affected States and Compliance Dates

Compliance with the NOx SIP Call was scheduled to begin on May 1, 2003, for the full ozone season. However, litigation delayed implementation until May 31, 2004, for 11 states. The states previously in the OTC NOx Budget Program adopted the original compliance date of May 1, 2003, in transitioning to the NOx SIP Call (see figure below). These eight states included Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, and Rhode Island, as well as the District of Columbia.

NOx SIP Call Program Implementation



Source: EPA, 2008.

The 11 states not previously in the OTC NOx Budget Program included Alabama, Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia. These states began compliance on May 31, 2004, one month into the normal ozone season. Missouri's compliance with the program began on May 1, 2007.

Only portions of Alabama, Michigan, and Missouri were affected by the program. In addition, Georgia was originally slated to begin compliance with the NBP in 2007 along with Missouri. However, on April 16, 2008, EPA finalized a rule to remove the requirements of the NOx SIP Call for Georgia in response to a petition. Georgia did not participate in the NBP in 2007 or 2008.

iv. Emissions Monitoring and Reporting

EPA's emissions monitoring requirements for the NBP ensured that the emissions data collected was of a known, consistent, and high quality, and that the mass emissions data from source to source were collected in an equitable manner.

More information on EPA's stringent Part 75 emission monitoring requirements, continuous emission monitoring systems (CEMS), audits, calibration and accuracy testing, as well as hourly data from NBP sources.