

# The NO<sub>x</sub> Budget Trading Program: 2008 Emission, Compliance, and Market Data



The NO<sub>x</sub> Budget Trading Program (NBP) was a market-based cap and trade program created to reduce the regional transport of emissions of nitrogen oxides (NO<sub>x</sub>) from power plants and other large combustion sources that contribute to ozone nonattainment in the eastern United States. NO<sub>x</sub> is a major precursor to the formation of ground-level ozone, a pervasive air pollution problem in many areas in the East. The NBP was designed to reduce NO<sub>x</sub> emissions during the warm summer months, referred to as the ozone season, when ground-level ozone concentrations are highest.

Over the next several months, EPA will release a series of reports summarizing progress under the NBP. This first report presents 2008 data on emission reductions, compliance results, and NO<sub>x</sub> allowance prices. Future reports will evaluate progress under the NBP in 2008 by analyzing emission reductions, reviewing compliance results and market activity, and comparing changes in emissions to changes in ozone concentrations. For more information on the NBP, please visit: [www.epa.gov/airmarkets/progsregs/nox/sip.html](http://www.epa.gov/airmarkets/progsregs/nox/sip.html).

## Emission Reductions

### Ozone Season NO<sub>x</sub> Reductions under the NBP

In 2008, NBP sources emitted 481,420 tons of NO<sub>x</sub> during the summer ozone season, an overall decrease of 24,880 tons from 2007. Emissions in 2008 were 62 percent below 2000 levels, 75 percent below 1990 levels, and 9 percent below the 2008 cap. Figure 1 shows the total ozone season NO<sub>x</sub> emissions for all affected sources in the NBP region in 2008 compared to pre-NBP baseline years (1990 and 2000) and prior NBP compliance years (2003 through 2007). It also presents the allowances allocated for 2008, which comprised the cap (the sum of the state budgets) for the program (528,453 tons).

Due to litigation, sources in states affected by the NBP had three different compliance dates: May 1, 2003 for Ozone Transport Commission (OTC) states; May 31, 2004 for non-OTC states; and May 1, 2007 for Missouri. To compare emissions year-to-year, the data presented in this report generally include full ozone season emissions for all

### At a Glance: NBP Results in 2008

**Ozone Season Emissions:** 481,420 tons

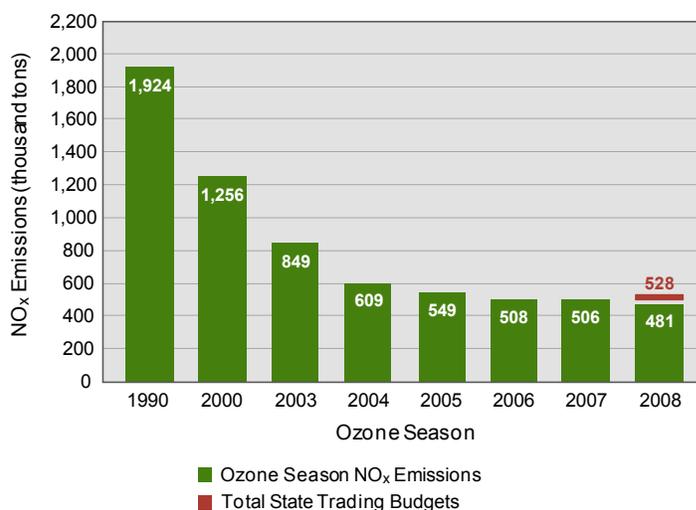
- 9% below 2008 cap
- 62% lower than in 2000 (before implementation of the NBP)
- 75% lower than in 1990 (before implementation of the 1990 Clean Air Act Amendments)

**Compliance:** Nearly 100%—only 2 units out of compliance (out of a total 2,568 units)

**Allowances:** 275,367 unused NBP allowances transferred for future use under the Clean Air Interstate Rule (CAIR)

**Allowance Prices:** 28% decline in 2008, from \$825/ton to \$592/ton

Figure 1: Ozone Season NO<sub>x</sub> Emissions from All NBP Sources



Notes:

- Data reflect full ozone season emissions in all years for all states. The year 2000 baseline value has been adjusted to correct a misprint in Figure 5 of the 2007 NBP report.
- The 2008 total state trading budgets include opt-in allowances, where applicable (New York, Ohio, and West Virginia).

Source: EPA, 2009

states, rather than “compliance only” emissions based on these various compliance deadlines. This approach allows for a consistent comparison across all states and all years. All data for 2003–2008 in this report were gathered from EPA’s data systems as of April 1, 2009.

## Affected Units

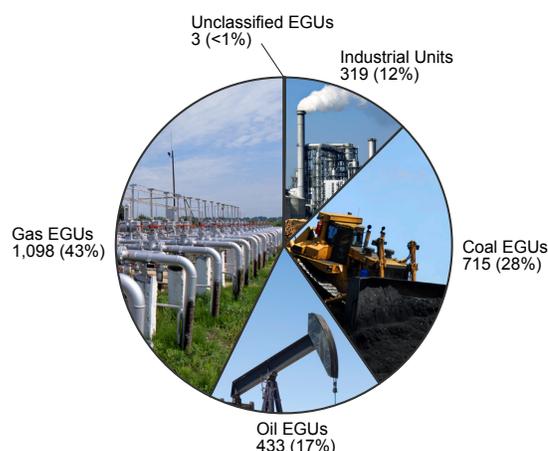
There were 2,568 affected units under the NBP in 2008, including some units that may not have operated nor had emissions during the 2008 ozone season. For example, some units provide electricity only on peak demand days, and may not operate every year.

Most of the units in the NBP were electric generating units (EGUs)—large boilers, turbines, and combined cycle units used to generate electricity for sale. Figure 2 shows that EGUs constituted 88 percent of all regulated NBP units. The program also applied to large industrial units that produced electricity or steam primarily for internal use. Examples of these units are boilers and turbines at heavy manufacturing facilities, such as paper mills, petroleum refineries, and iron and steel production facilities. These units also included steam plants at institutional settings, such as large universities or hospitals. Some states included other types of units, such as petroleum refinery process heaters and cement kilns.

Ozone season NO<sub>x</sub> emissions decreased substantially, by 43 percent, between 2003 and 2008, even while energy

demand (as measured by heat input) remained essentially flat during the same period. Table 1 shows that emission reductions have occurred because the overall average ozone season NO<sub>x</sub> emission rate has declined significantly, by about 45 percent, since the NBP began in 2003.

**Figure 2: Number of Units in the NBP by Type in 2008**



Notes:

- The three “unclassified” units represent units in long-term shut-down or other non-operating status that remained identified as affected units under the NBP and that had not retired prior to the 2008 ozone season.
- Percentages add up to more than 100 due to rounding.

Source: EPA, 2009

**Table 1: Comparison of Ozone Season NO<sub>x</sub> Emissions, Heat Input, and NO<sub>x</sub> Emission Rates for All NBP Sources, 2003–2008**

Units by Fuel Type	Ozone Season NO <sub>x</sub> Mass Emissions (thousand tons)						Ozone Season Heat Input (billion mmBtu)						Ozone Season NO <sub>x</sub> Emission Rate (lb/mmBtu)					
	2003	2004	2005	2006	2007	2008	2003	2004	2005	2006	2007	2008	2003	2004	2005	2006	2007	2008
Coal	800	564	494	475	475	456	4.91	4.91	5.10	5.06	5.15	4.93	0.32	0.23	0.19	0.19	0.18	0.18
Oil	26	25	32	14	13	9	0.27	0.25	0.31	0.17	0.17	0.13	0.19	0.20	0.20	0.16	0.15	0.14
Gas	24	20	23	19	19	16	0.59	0.70	0.85	0.87	0.99	0.85	0.08	0.06	0.05	0.04	0.04	0.04
Total	849	609	549	508	506	481	5.77	5.86	6.27	6.10	6.30	5.91	0.29	0.21	0.18	0.17	0.16	0.16

Notes:

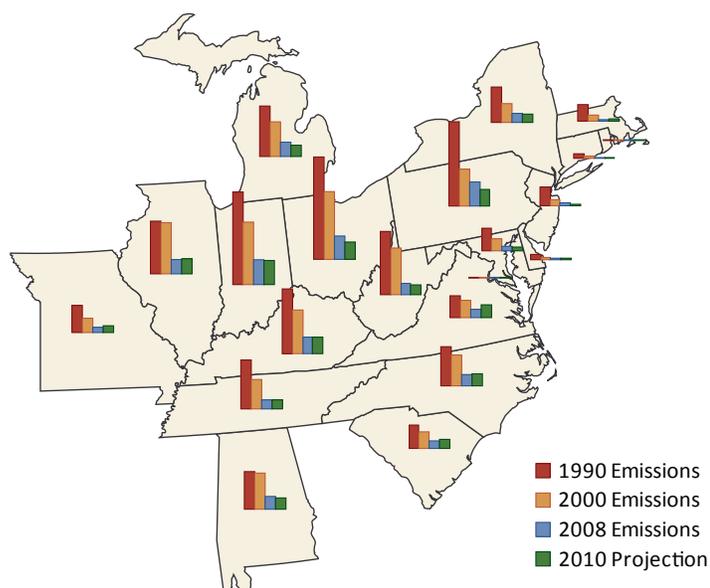
- Tons are rounded to the nearest 1,000, and the heat input values are rounded to the nearest 10 million mmBtus. Totals in final row may not equal the sum of individual rows due to rounding.
- The average emission rate is based on dividing total reported ozone season NO<sub>x</sub> emissions for each fuel category by the total ozone season heat input reported for that category, and then rounding the emission rate to the nearest 0.01 lb/mmBtu. The average emission rate expressed for the total uses total NO<sub>x</sub> mass divided by total heat input to represent the heat input-weighted average for the three fuel categories.
- Fuel type, as shown here, is based on the monitoring plan primary fuel designation submitted to EPA; however, many units burn multiple fuels. Also, one primary wood-fired boiler is classified with the coal-fired units based on its secondary fuel.

Source: EPA, 2009

## State-by-State NO<sub>x</sub> Reductions

Ozone season NO<sub>x</sub> emissions have decreased from levels in baseline years in all states participating in the NBP. EPA projects that the Clean Air Interstate Rule (CAIR) NO<sub>x</sub> ozone season program, which started this year, will bring a continued decline in emissions across the region (as shown in Figure 3).

**Figure 3: State-level Ozone Season NO<sub>x</sub> Emissions from NBP to CAIR, 1990–2010**



Scale: Largest bar equals 241,000 tons of NO<sub>x</sub> emissions in Ohio, 1990.

Note: Projected emissions in 2010 represent estimated reductions due to the implementation of CAIR.

Source: EPA, 2009

In the 2008 ozone season, the total emissions from NBP sources were 47,033 tons (9 percent) below the regional emission cap. Fourteen states and the District of Columbia had emissions below their allowance budgets, collectively by 70,960 tons. Another six states (Alabama, Indiana, Kentucky, Michigan, Ohio, and Pennsylvania) exceeded their 2008 budgets by a total of 23,927 allowances, indicating that some sources within those states covered a portion of their emissions with allowances banked from earlier years or purchased from the market.

In any given year, emission control programs experience variation in emissions from individual units due to a wide range of conditions, including weather, grid demand, transmission constraints, fuel costs, and compliance

strategy. See Appendix A at the end of this document for individual state emission and budget data. Subsequent 2008 reports will analyze these state-specific results in further detail. In addition, detailed unit-level data are available in Appendix 1, online at [www.epa.gov/airmarkets/progress/progress-reports.html](http://www.epa.gov/airmarkets/progress/progress-reports.html). To view emission data in an interactive file format using Google Earth or a similar three-dimensional platform, go to [www.epa.gov/airmarkets/progress/interactivemapping.html](http://www.epa.gov/airmarkets/progress/interactivemapping.html).

## Compliance

### 2008 Compliance Results

There were 2,568 units affected under the NBP in 2008. Of those units, only two units at separate facilities did not hold sufficient allowances to cover their emissions (63 tons total). Because 2008 was the last official year of the NBP, affected facilities have transitioned to the CAIR NO<sub>x</sub> ozone season program, which began on May 1st for the 2009 ozone season. Accordingly, the two units out of compliance automatically surrendered first year (2009) CAIR NO<sub>x</sub> ozone season program allowances on a 3:1 basis, or 189 allowances total. Table 2 summarizes the allowance reconciliation process for 2008.

**Table 2: NO<sub>x</sub> Allowance Reconciliation Summary for the NO<sub>x</sub> Budget Trading Program in 2008**

<b>Total Allowances Held for Reconciliation (2003 through 2008 Vintages)</b>	<b>755,684</b>
Allowances Held in Compliance or Overdraft Accounts	673,336
Allowances Held in Other Accounts*	82,348
<b>Allowances Deducted in 2008</b>	<b>482,476</b>
Allowances Deducted for Actual Emissions	481,147
Additional Allowances Deducted under Progressive Flow Control (PFC)	1,329
<b>Banked Allowances (Carried into 2009 CAIR NO<sub>x</sub> Ozone Season Program)</b>	<b>273,208</b>
Allowances Held in Compliance or Overdraft Accounts	188,003
Allowances Held in Other Accounts**	85,205
Penalty Allowances Deducted*** (from 2009 CAIR NO <sub>x</sub> Ozone Season Program Allocations)	189

Notes:

\* "Other Accounts" refers to general accounts in the NO<sub>x</sub> Allowance Tracking System (NATS) that can be held by any source, individual, or other organization, as well as state accounts.

\*\* Total includes 2,857 unused new unit allowances returned to state holding accounts.

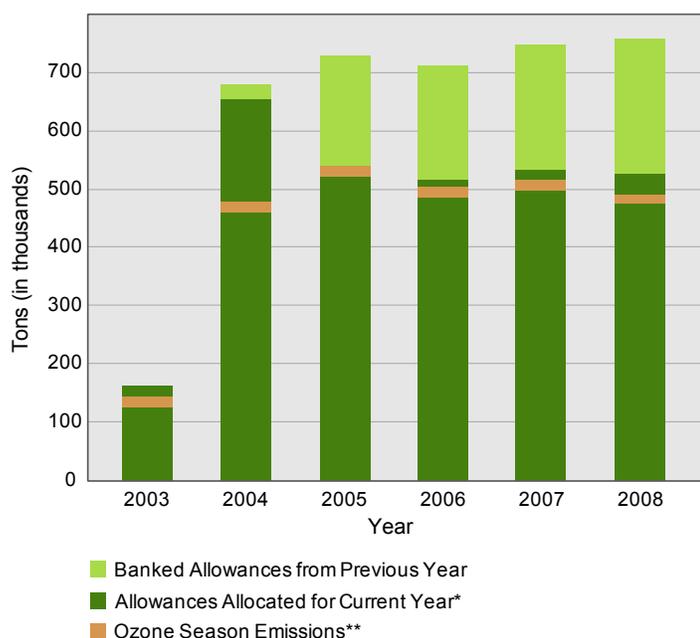
\*\*\* These penalty deductions are made from 2009 vintage year CAIR NO<sub>x</sub> ozone season allowances, not 2008 allowances.

Source: EPA, 2009

## Banking in 2008

Figure 4 shows the allowances allocated each year, the allowances banked from the previous year, and the total ozone season emissions subject to allowance holding requirements for NBP sources from 2003 to 2008. The bank has grown each year since the program began in 2003, with this trend continuing through the NBP's final ozone season. After completion of the 2008 reconciliation process, the bank increased to 273,208 NBP allowances, as shown in Table 2. Additionally, 2008 marked the fifth of six compliance years in which sources achieved more reductions

**Figure 4: NO<sub>x</sub> Allowance Allocations and the Allowance Bank, 2003–2008**



### Notes:

\* Allowances allocated may include those issued by states from base budget, compliance supplement pool (CSP) (available only for the first two years of compliance), and opt-in allowances. Not all budgeted allowances were necessarily issued by the states each year.

\*\* This graph represents only those emissions from states who were subject to compliance each year. Thus, the 2003 total ozone season emissions includes emissions only from OTC states. The 2004 total represents emissions from non-OTC states in the NBP (except Missouri) during a shortened control period (May 31 to September 30) and OTC states during the full control period (May 1 to September 30). The 2005 and 2006 emissions represent the full ozone season for all participating NBP states, except Missouri. The 2007 data is the first year in which the ozone season emissions represent all NBP states, including Missouri.

Source: EPA, 2009

than required under the NBP and were able to bank allowances for use in future years.

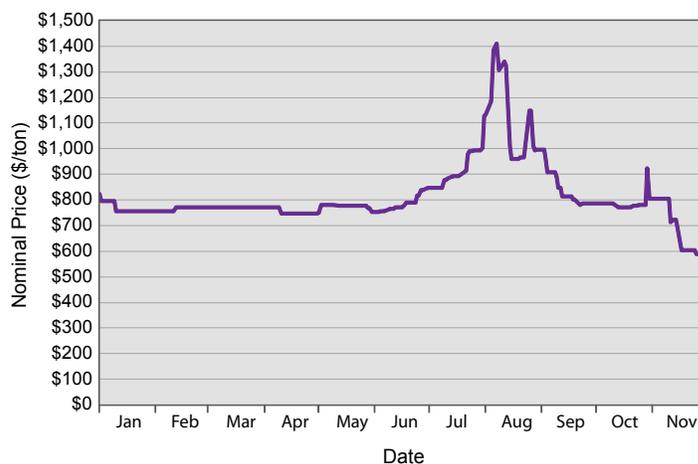
In 2009, the NBP transitioned to the CAIR NO<sub>x</sub> ozone season program. As part of this process, EPA transferred NBP banked allowances and some previously unallocated allowances held by states to corresponding CAIR accounts. In total, 275,367 allowances were transferred from the NBP to the CAIR NO<sub>x</sub> ozone season program. In addition, while the NBP flow control provisions resulted in 1,329 additional allowances being deducted from the allowance bank as part of the 2008 reconciliation process (see Table 2), flow control no longer applies 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.

## Market Activity

### NO<sub>x</sub> Allowance Trading in 2008

The 2008 NO<sub>x</sub> allowance market experienced a 28 percent price decline – beginning the year at \$825 per ton in January and climbing as high as \$1,400 during the middle of the year before falling to a period-end closing price in November of \$592 per ton (see Figure 5). NBP reports released in the next few months will investigate allowance market activity for 2008 in more detail.

**Figure 5: NO<sub>x</sub> Allowance Spot Price (Prompt Vintage), January 2008–November 2008**



**Note:** Prompt vintage is the vintage for the “current” compliance year. For example, 2008 vintage allowances were considered the prompt vintage until the true-up period closed at the end of November 2008.

Source: CantorCO2e's Market Price Indicator (MPI), 2009; see <[www.emissionstrading.com](http://www.emissionstrading.com)>

## Appendix A: Ozone Season NO<sub>x</sub> Emissions (Tons) from NBP Sources, 1990–2008, and 2008 State Trading Budgets

State	1990	2000	2003	2004	2005	2006	2007	2008	2008 Budget
AL	89,758	84,560	50,895	40,564	33,632	27,812	28,744	30,221	25,497
CT	11,203	4,697	2,070	2,191	3,022	2,514	2,152	1,721	4,477
DC	576	134	72	35	279	115	76	133	233
DE	13,180	5,256	5,414	5,068	6,538	4,763	5,454	4,285	5,227
IL	124,006	119,460	48,917	40,976	37,843	36,343	35,630	34,126	35,557
IN	218,333	145,722	100,772	68,375	57,249	55,510	56,374	57,838	55,729
KY	153,179	101,601	63,057	40,394	36,730	37,461	40,210	39,386	36,109
MA	40,367	14,324	9,265	7,481	8,269	5,464	3,666	3,230	12,861
MD	54,375	28,954	19,257	19,944	20,989	18,480	16,521	10,667	15,466
MI	120,132	80,425	45,614	39,848	42,157	40,353	34,354	34,358	31,247
MO	64,272	34,058	29,407	16,190	18,809	15,917	12,961	12,777	13,459
NC	92,059	73,082	51,943	39,821	32,888	30,387	28,390	27,105	34,703
NJ	44,359	14,630	11,003	10,807	11,277	8,692	7,773	7,139	13,022
NY	84,485	43,583	34,815	34,157	36,633	26,339	24,728	20,934	41,385
OH	240,768	159,578	133,043	67,304	54,335	52,817	57,862	54,644	49,842
PA	199,137	87,329	51,530	52,140	51,125	52,806	57,615	56,747	50,843
RI	1,099	288	209	177	253	181	187	161	936
SC	56,153	39,674	34,624	25,377	18,193	18,376	18,418	17,552	19,678
TN	115,348	69,641	55,376	31,399	25,718	23,930	23,261	21,711	31,480
VA	51,866	40,043	32,766	25,448	22,309	20,491	22,957	19,596	21,195
WV	149,176	109,198	69,171	41,333	30,401	28,852	28,967	27,089	29,507
All NBP States	1,923,831	1,256,237	849,220	609,029	548,649	507,603	506,300	481,420	528,453

Notes:

- Emissions for Alabama, Michigan, and Missouri are for units in the portion of the state that became subject to the NBP in 2004 (Alabama and Michigan) and 2007 (Missouri).
- The 2008 state budget values include opt-in allowances, where applicable (New York, Ohio, and West Virginia).
- Emissions for prior years reflect emission resubmissions as of April 1, 2009, and may differ slightly from numbers that appear in previous progress reports.

Source: EPA, 2009