

# evolution markets

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## EXECUTIVE BRIEF

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## State of the World's Largest Smog Market (Redux)

The second phase of the start up of the new Federal NOx Budget Trading Program has begun. Standards are tighter, the program is broader, and **Peter Zaborowsky**, managing director of Evolution Markets, makes sense of it all.

*This year, the U.S. regional emissions trading program expanded to include 11 additional states and four-times the number of allowance allocations. Participants new to the program have had one year to sit back and watch the market progress under new standards. Now, they are faced with compliance, and trading has been robust.*

*In this Special Issue of Evolution Markets' Executive Brief, Peter Zaborowsky, the head of our domestic Environmental Markets group, revisits an Executive Brief published 12 months ago to explain how the market has reacted to new NOx regulations and how companies are using the market to manage their risk. Participants in environmental markets everywhere should take heed: the devil is in the details. The complex NOx allowance market presents plenty of opportunities.*

### Background

NOx Emission Allowances were originally created under regulations implemented by a coalition of northeastern state air regulators called the Ozone Transport Commission (OTC). The OTC's 1994 Memorandum of Understanding (MOU) controlled interstate transfer of Ozone pollution in nine northeastern states and the District of Columbia by establishing a budget or "cap" of summertime (May 1 - September 30) NOx emissions for all major sources. Regulated sources included utility and independent power producer (IPP) electricity generators 15 MW or larger and industrial boilers with a heat input of 250 MMBtus/hr. or greater. The program was in place until 2003, when it was superseded by the Federal NOx Budget Trading Program, also known as the 'NOx SIP Call' program.

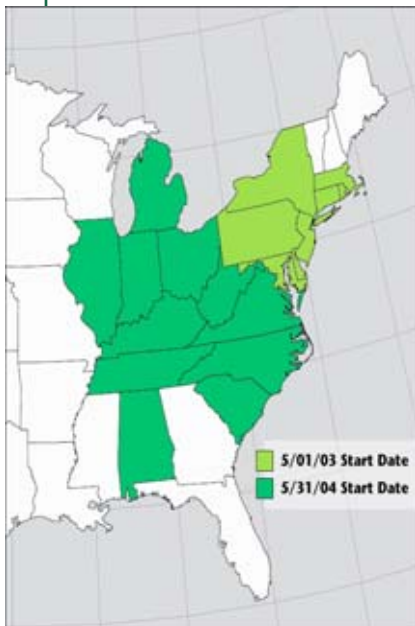
The NOx SIP Call program was created in response to the EPA's call for State Implementation Plans (SIPs) to reduce the transport of ozone pollution over broader geographic regions of the country and to address Section 126 petitions under the Clean Air Act Amendments filed by several northeastern States to achieve the same objective. Under the SIP Call program, NOx trading programs will expand considerably. The number of sources will increase from 300 under the OTC program to 1,500 under SIP Call rules. In addition, the number of allowances allocated expands from 135,000 to more than 500,000 per year.

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## Two Phase Implementation

On May 1, 2003, compliance under the NOx SIP Call market program began. In the first year of the program, facilities in eight northeastern states plus the District of Columbia that were previously regulated under the OTC NOx Budget trading program were required to make a 35-40% reduction from 2002 levels as the emissions standard was ratcheted down to 0.15 lbs NOx/MMBTU from a region-wide average 0.23 lbs NOx/MMBTU that existed under the OTC program cap.

Under the SIP Call program, all wholesale electric generators with a nameplate rating of 25MW or larger (EGUs) and large industrial facilities such as steel, chemical, pulp and paper, and refining that have boilers with heat inputs of 250 MMBTU per hour and larger (non-EGUs) are affected under the trading program. In some states, cement kilns are also regulated. The emissions reduction obligations are differentiated by industry sector, with electric generators making roughly 80-85% reductions from prevailing levels in the late 1990s. Heavy industrials and cement kilns are obligated to reduce NOx emissions 65% and 35%, respectively. The program controls NOx emissions from May through September (referred to as “the ozone season”) by allocating a finite number of allowances (the right to emit one ton of NOx in a specific or future year) to a defined population of sources.



This year, the SIP NOx program entered its second phase, in which it expands considerably. On May 31, 2004, sources in an additional 11 states were required to control NOx to the same levels as sources in the affected eight state region last year. (See graphic at left of the affected states.)

The two-stage implementation of the program is the direct result of lawsuits filed against the EPA by several Midwestern

states and sources, which sought to overturn the promulgation of the new program. While the EPA prevailed against these court challenges, the litigation forced a “stay” in rulemaking, which delayed implementation of the NOx SIP call until May 31, 2004 — instead of the initially scheduled May 1, 2003. Eight of the 19 affected states decided to move ahead with a May 1, 2003 implementation under the NOx SIP Call since similar cuts were already envisioned under a second phase of the OTC program, to which they were already subjected.

## A “State Implemented” Federal Program

Although the NOx program is federally mandated, it is implemented by the states. With so many states involved there is bound to be some differences in approach.

For example, all 19 states submitted final regulations that adopted the EPA’s “model rule” to implement a region-wide cap and trade program, but there are some differences in the allocations schedule and methodology. For instance, Massachusetts was the only state to allocate allowances to EGUs based on an emission rate per electric output basis (lbs.-NOx per MWhr), an approach that favors newer and more efficient plants, while the balance of the states are allocating based on the more conventional emission rate per heat input basis (lbs.-NOx per MMBtu).

Most states allocated three or five years’ worth of allowances up front to affected sources based on average historical operating levels in the late 1990s that have been inflated to a 2007 operating base using load growth factors. But, several states including New York, Massachusetts, and New Jersey are allocating allowances a year at a time, three years in advance, based on an average three-year “lookback” of operating levels. For example, New York sources will receive their 2008 vintage allowances by May of 2005, based on the emissions rate limit and their average utilization levels achieved in 2002-2004. Each state also has a compliance supplement pool (CSP), which is essentially a cache of early reduction credits that can be used for only the first two years of the SIP Call program. These credits are allocated to affected sources, which voluntarily reduced their emissions below the cap level in the two to three years prior to the start of the program.

The chart below summarizes the total number of allocations that have been distributed to sources in the affected states for vintage year 2004 as of May 1<sup>st</sup> and also the “cycle” of vintages already entered into the NOx Allowance Tracking System (NATS):

SIP NOx Allocation Schedule				
	Vintages	2004 Vintage Allowances in NATS	2003 Emissions (tons)	
2003 Start Date	Connecticut	2003-4	4,292	2,070
	Delaware	2003-6	5,227	5,491
	Maryland	2003-5	8,112	19,227
	Massachusetts	2003-7	9,936	9,168
	New Jersey	2003-7	5,884	11,182
	New York	2003-7	36,101	34,587
	Pennsylvania	2003-7	31,626	51,460
	Rhode Island	2003-7	590	209
	District of Columbia	2003	–	72
2004 Start Date	Alabama	2004-6	33,822	50,932
	Illinois	2004-6	42,518	47,230
	Indiana	2004-6	68,974	99,967
	Kentucky	2004-6	46,266	62,955
	Michigan	2004-6	40,624	42,976
	North Carolina	2004-8	33,864	2,982*
	Ohio	2004-7	65,242	132,797
	South Carolina	2004-6	19,209	34,577
	Tennessee	2004-18	40,545	55,079
	Virginia	2004-8	19,520	33,122
	West Virginia	2004-7	44,915	66,451
	General Accounts	n/a	59,385	n/a

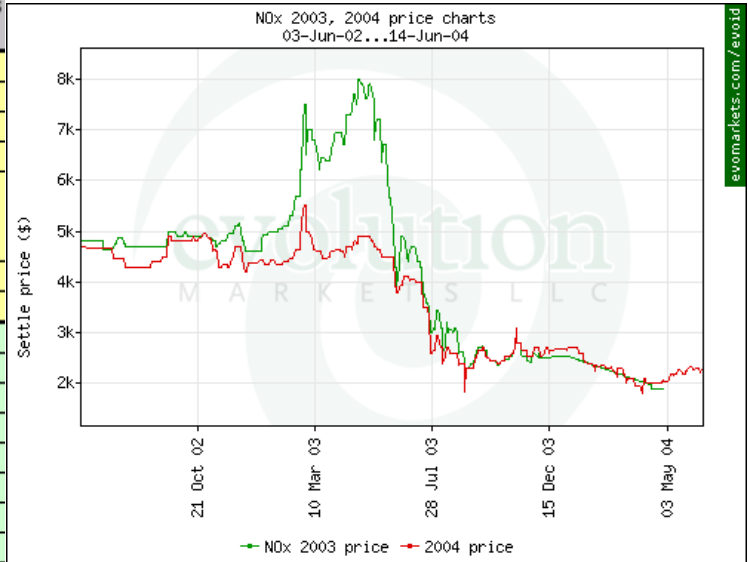
\*: NC sources not required to report until '04.

### From Boom to Bust in Six Months

The finalization of some of the OTC states’ regulations in the Spring of 2001 cleared the way for the first forward trades in SIP NOx allowances – even before there was an allocation of allowances to the EPA’s NATS. Evolution Markets structured the first NOx SIP Call trade on June 6, 2001 in which a steel company agreed to sell to an energy marketer more than 300 tons per year of 2003-2007 vintage allowances to be allocated to its Pennsylvania facility. The groundbreaking trade was “forward settling”, with allowances to be delivered immediately upon their initial allocation to the NATS. The average price per allowance was approximately \$3,700 per ton.

Trading in 2003 vintage allowances was brisk throughout 2002, and the price rose gradually. But at the beginning of 2003, the price skyrocketed – leading to a wild NOx market this past summer. Vintage 2003 and 2004 allowances were in a relatively tight

price range at the beginning of 2003, but the spread soon blew out as 2003 vintage prices skyrocketed from less than \$5000 to \$8000 at the beginning of the ozone season. The vintage 2003 over 2004 premium exceeded \$3000 at one point. (See chart below.)



The reasons point back to the staggered implementation of the program. The extra year before the implementation of tougher caps given to the sources in the additional 11 states entering the program afforded many of these sources time to install emissions control technology. Excess allowances for 2004 were anticipated as large compliance supplement pools and the shortened 2004 compliance period inflated the supply side of the 2004 market. Lastly, natural gas prices spiked at the beginning of 2003, and at one point commanded a huge premium to oil. The market speculated these conditions would lead to higher demand for 2003 allowances as northeastern utilities switched fuel sources from natural gas to oil.

Just as quickly as the price for 2003 allowances nearly doubled going into this summer’s ozone season, the bottom fell out of the market. By the end of the 2003 compliance period, the price for 2003 vintage NOx allowances had dipped below \$2000.

What was the cause? In a word, weather. The Northeast experienced the coolest May since 1967, and the heat never really kicked in during the early summer.

Without customers turning on their air conditioners, utilities in the Northeast had little use for their peaking units, which tend to have fewer pollution controls and can quickly consume allowances. Natural gas prices also dropped nearly 20% in June on weakened demand and news of elevated storage levels.

The dramatic drop in 2003 vintage allowance prices brought down the 2004 vintage, as well. In July alone the price dipped to \$2600 from \$4025. Companies were unloading credits they did not need because of a projected overhang of 2003 vintage allowances that would carry into the 2004 ozone season.

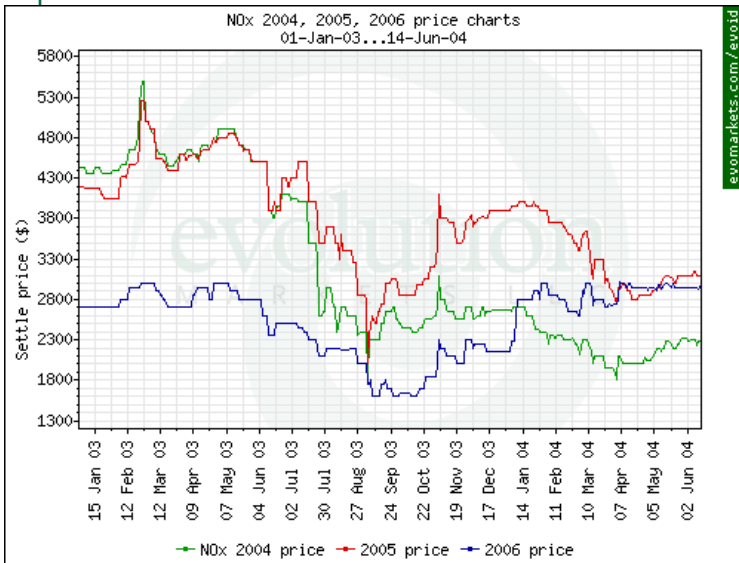
Furthermore, many of the sources that were not affected until 2004 received their allocations in the summer of 2003, leading to a surge of supply in the market. (States placed their allowances into the NATS at different times over the past couple of years.) This supply came mostly from distressed companies that were liquidating allowances to raise cash and sources that were looking to help finance the control equipment they had just installed.

### Complex Regs Flip Forward Curve

Another interesting price dynamic is the emergence of the 2006 vintage price from a sharp discount to a premium over 2004 and at times even 2005 vintage allowances. The chart below indicates that 2004 and 2005 vintage allowances had a peak premium of around \$2,200 per ton in February 2003. Within a year, 2006 vintage had flipped to a premium over 2004. By April 2004, vintage 2006 prices were oscillating between a slight premium over 2005 to a slight discount.

The cause is easy to pinpoint – but complex to explain. In order to prevent affected sources from hoarding allowances and using them in future years (which could lead to spikes in NOx levels in some locales), federal regulators instituted controls to limit banking of allowances. Known as “progressive flow control”, these regulations assess each year the surplus bank of allowances and potentially limit their use in meeting future NOx caps. The regulations can trigger the discounting of banked allowances if too many accumulate. This is exactly what the market anticipates will happen to both 2003 and 2004 vintage allowances at the end of this year.

2005 vintage allowances may also be falling prey to “flow control” speculation. A total of 23,664 vintage 2003 allowances were brought forward to 2004, increasing supply this Ozone Season. Perhaps more importantly, the sources entering the NOx program this year will begin compliance one month later than sources that participated last year. But, they will still receive their full compliment of allowances for this year. This means that these sources will receive five months of allowances for four months of compliance. Market participants anticipate a healthy supply of 2004 allowances will again be available for banking into 2005, which should contribute to a discount in price. Below we work through the flow control formula to anticipate how big the supply of surplus 2003 and 2004 allowances is projected to be.



Flow control is calculated by taking 10% of the '05 Budget divided by the combined bank of allowances from '03 and '04. We know the '05 budget is approx. 48,789. We don't yet know the '03-'04 bank or the flow control ratio.

$$\text{Flow Control} = \frac{0.1 * '05 \text{ Budget}}{'03 + '04 \text{ Bank}} \rightarrow \frac{48,789 \text{ allowances}}{X}$$

You can determine the market's estimation of the '03-'04 bank, by backing into the flow control ratio. To do this you can calculate the effective yield on banked allowances. The effective yield is equal to the flow control ratio plus half the flow control ratio (because you can submit banked allowances 1:1 up to the flow control ratio and then 2:1 beyond that ratio).

$$\text{Effective yield on Banked allowances} = \text{Flow control} + \frac{1 * \text{Flow control}}{2}$$

If the market is relatively efficient, the ratio in price between '04 and '05 vintages is a proxy for the effective yield on banked allowances.

$$\frac{'04 \text{ price } (\$2,225)}{'05 \text{ price } (\$3,150)} = \text{Effective yield on Banked allowances } (0.7063)$$

An effective yield of 0.7063 gives you a flow control ratio of 0.4126. Plugging this back into our original equation, we can surmise that the '03 and '04 bank is projected to be 118,248 allowances.

$$0.4126 = \frac{48,789 \text{ allowances}}{'03 + '04 \text{ bank}} \quad \boxed{'03 + '04 \text{ Bank} = 118,248}$$

Based on the current vintage 2005 over 2004 spread market participants are predicting a surplus of 118,248 vintage 2003 and 2004 allowances to be carried into 2005. The vintage 2005 and 2006 price relationship has been more difficult to nail down lately. In April, vintage 2006 went \$150 premium to vintage 2005, inferring a slight flow control hit on banked allowances carried into 2006 (i.e. indicates a 54,312 combined 2003-2005 vintage surplus). But in May, this premium disappeared, and we are now seeing a \$100 to \$200 premium for 2005 over 2006. So NOx market participants seem to feel that the bank of surplus allowances will be 50,000 or less going into 2006.

### Trading Volume

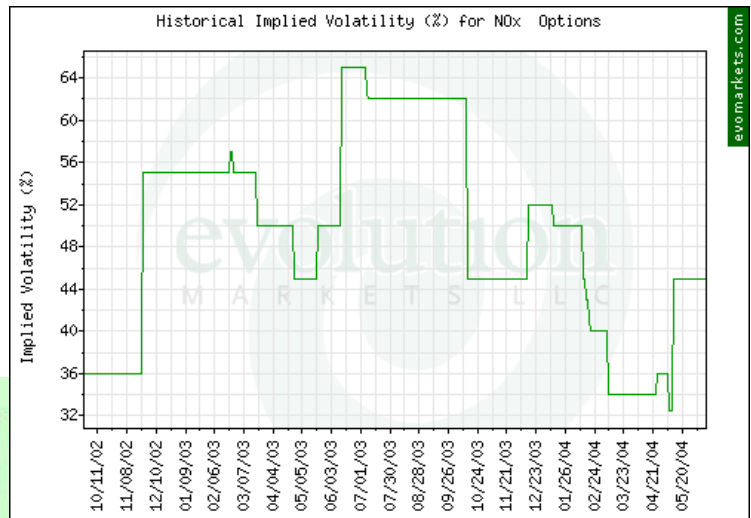
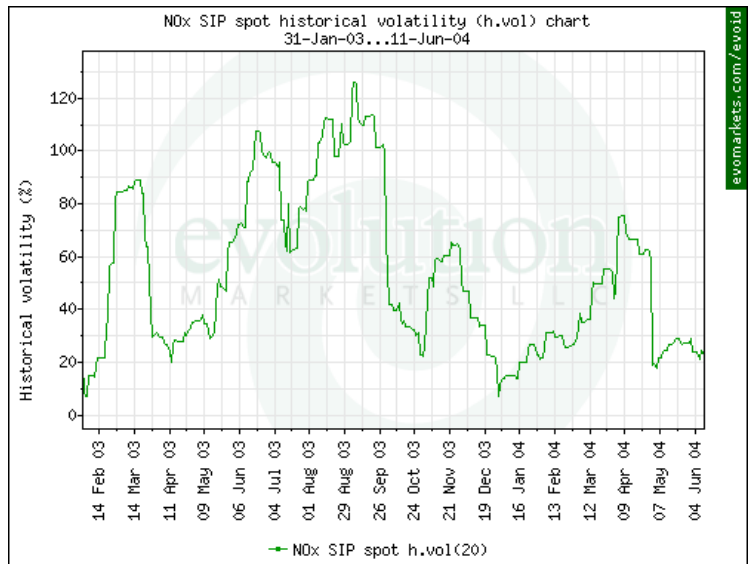
Such volatility in price and the collapse in spread in vintages has attracted considerable attention and correspondingly, trading activity. There was a steady improvement in market participation throughout 2003 and the beginning of 2004, and the Ozone Season has just now kicked off in earnest.

The SIP NOx allowance market has been consistently active for the last 16 months as new sources entering the program in 2004 began to manage their allowance inventories and take advantage of price volatility. Still, there are a number of new entrants to the SIP NOx program who have yet to actively engage the market. As external factors (i.e. weather, natural gas prices) begin to impact the market this summer, more and more counterparties are likely to contribute to trade volume. The volatility in price and relationship to electric production costs has also attracted new speculative entries such as hedge funds to the NOx market.



### Options Trading Expands

A baseline of measured NOx price volatility and increasing liquidity in the underlying market are the basic requirements for options trading. Options trading for NOx allowances under the previous OTC program was thin and sporadic, but the options market for SIP NOx allowances heated up as we entered the 2004 Ozone Season.



As the historical volatility chart shows, measured price volatility for the spot vintage over a one-month term has ranged from a low of 5% to a high of 130% on an annualized basis. The implied volatility chart shows actual traded one-month spot market volatility has ranged from a low of 32% to a high of 65%.

Because of the inherent seasonal nature of the NOx market and its proven ability to gap at times in response to supply or demand shocks, participants have been unwilling to write options with implied volatility much below 40%, even during times when the historic volatility has been fairly low. But given the comparatively low current price in vintage 2004 NOx, call options providing upside price protection have been more affordable for participants. Consider that a \$2500 Call option on vintage 2004 NOx, expiring Sept. 15, 2004, would likely trade in a \$125 to \$175 range.

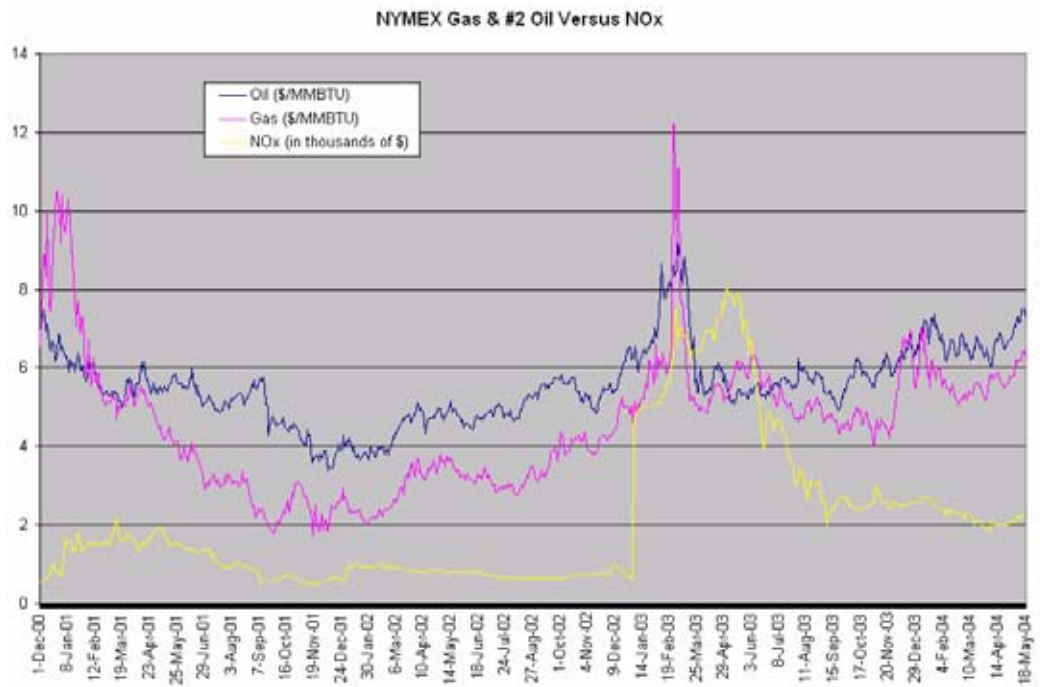
Market participants that are sensitive to paying option premiums can also look to options “collars” or “fences” to lock in price ranges for NOx and assist them in making other operating decisions based on fuel choice, internal control costs, or other issues. For example, consider that if the current vintage 2005 NOx market is settling at \$3050, one could probably enter into a May 15, 2005 expiring \$2750 Put and \$3750 Call option collar, without any premium payment. In this example, the options have equivalent market value and the Put option seller has given the counterparty the right, but not the obligation, to sell vintage 2005 allowances at \$2750 on the expiration date, but has also received the right to purchase them at \$3750 on the same date.

While the structures have been slow to emerge, weather-indexed NOx options offer participants an even lower cost alternative to hedge NOx price exposure, especially for volumes of NOx production that may be directly correlated to significant deviations from normal summertime weather patterns. A full description of weather indexed NOx option structures can be found at:

<http://www.evomarkets.com/assets/articles/takinweather.htm>

## Price outlook and market drivers

While weather is the largest driver of demand, the previous ozone season again demonstrated the sensitivity of NOx prices to the spread of fuel prices, particularly oil versus gas price spreads. The attached chart shows historical NYMEX Henry Hub gas prices and NYMEX NY Harbor and #2 oil fuel prices (on a \$/MMBTU basis) and their correlation to NOx prices.



The sharp spike in vintage 2003 NOx pricing, correlated directly with a sharp rise in natural gas prices, and in particular, a sharp increase in gas prices relative to oil. Bear in mind that delivered natural gas prices in the NOx SIP Call region were likely a minimum of \$0.50 per MMBTU higher than charted after factoring the basis cost differential to transport the gas into the SIP Call region from the Henry Hub Louisiana location. The same dynamic occurred during the first quarter of 2001 in the OTC nine state NOx budget program. Even in the face of significant NOx allowance supply overhang (60,589 banked NOx allowances were carried into 2001, some 28% of the total 2001 budget) NOx price rallied from \$900 to \$2000 (a 220% increase) as natural gas prices spiked and became significantly higher than oil. The reasoning lies in the fact that there is more fuel shifting between gas and oil than between other fuel types.

While high natural gas prices certainly provide an incentive to run coal generation facilities harder, coal's significant price advantage in general (even in times of lower natural gas prices) tends to baseload coal generation. Switching occurs "on the margin" between gas and oil, either at baseload or peaking facilities that are permitted to operate on either fuel. In fact, at the peak of the gas versus oil price spread that occurred in the first quarter of 2001, an operator of a dual fueled facility would have been rational to burn higher NOx emitting fuel oil and purchase NOx allowances for \$60,000 per allowance in lieu of burning the higher priced gas.

While the linkage of gas-oil pricing to NOx prices has been demonstrated in the market, we have entered this ozone season in a period of very high oil pricing, with oil even at premium to gas in some cases. The drivers this season will likely be weather and the performance of the newly installed SCR equipment in conjunction with the market's perception on flow control discounting of banked 2004 allowances in 2005 and beyond. Many operators of plants with newly installed SCR systems will likely wait until the end of this season to decide whether they will bring surplus allowances to market, after they have had a chance to see how their equipment performs.

But even if the new fleet of SCRs are running strong and overcontrolling NOx, an end of season sell off will ultimately be tempered by perceptions on the future worth of banked allowances. This will, in turn, be tied to the drawdown of the combined vintage 2003 surplus from last year and expected vintage 2004 surplus from deferred implementation of the program this year, as well as the issuance of early reduction credits. A sustained above average heat wave throughout the region and other factors such as forced outages on zero emitting units such as nu-

clear could hasten the depletion of this bank. Sources long allowances at the end of the season will be less likely to "dump" allowances in the market if they believe that they will have full compliance value two or three years in the future. If, however, sources have the perception in September that this excess supply will continue beyond 2006, it may provoke them to "take the money off the table now" and cash out some of their surplus.

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**Evolution Markets publishes the Executive Brief to inform markets and encourage discussion on important issues confronting energy and environmental markets. We encourage your feedback on the issues presented here and your input on future editions of the Executive Brief.**



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