



**The NO<sub>x</sub>-SO<sub>x</sub> Meter <sup>SM</sup>:**  
**Volume OS-06 v.6-**  
*July 2006*  
*(released August 29, 2006)*

***Power & Energy Analytic Resources, Inc.***

- *The NO<sub>x</sub>-SO<sub>x</sub> Meter is a periodic update service based on work culminating in “Into the World of CAIR: Prospects For an Expanding Emissions Allowance Market” (released PEAR - June 2006)*
- *The NO<sub>x</sub>-SO<sub>x</sub> Meter proceeds from an expectation of the current NO<sub>x</sub> balance for the SIP Call Region and SO<sub>2</sub> balance for the country as whole. It is based on a reconciliation of historical emissions monitoring data for affected sources with allowance allocations, (including suspension of rules due to litigation,) announced compliance actions, and award of additional credits for early compliance.*
- *The projected NO<sub>x</sub> or SO<sub>2</sub> balance will be subject to change due to demand- and supply-side factors such as fuel prices, greater load (due to hotter or cooler weather,) unit availability, and power imports. The variation from expected emissions is analyzed by modeling the dispatch of electric generating units in the affected control areas using current approximated information on electric load, outages, and power sales, generally reported on OASIS sites for affected independent system operators.*
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# **The NO<sub>x</sub>-SO<sub>x</sub> Meter<sup>SM</sup>**

*Volume OS-06 v.6*

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## EXECUTIVE SUMMARY

### ***The State of the SO<sub>2</sub> Market: Finally In Compliance (Seven Years On)***

- With a lack of little “real” news, the allowance market keeps flirting with movement (principally by trying to tag along with gas prices) and then returning to its post-auction \$600-\$700 range. So without quite knowing what to expect, **traders have seemingly interpreted the latest round of emissions data from EPA as having validated their positions:** prices have not moved decisively since the August 18<sup>th</sup> release date.
- Perhaps the traders should look again: **if the 2006 second quarter emissions data make any case whatsoever, it is that natural gas matters little to SO<sub>2</sub> fundamentals.** Taken together with EIA’s latest generation data, it is clear that improved availability of baseload generation --nuclear in the East and hydro in the West-- helped back off coal in the first half of 2006.<sup>1</sup>
- Somewhat surprisingly, the reductions year-to-date appear to be largely from low sulfur coals, rather than new FGD. Otherwise, **there appear to be few surprises in the new release when it comes to SO<sub>2</sub>:** no “surprise” FGDs, (other than those anticipated,) no large resurgence of PRB coal returning to Eastern markets. However, there are apparent outages hinting at the wave of technology to come.
- All other things being equal, one might expect that reductions attributable to shifts in generation would be transitory, subject to the vagaries of rainfall, snowmelt, and nuclear outages. We note that last summer was the hottest on record, and **thus we expect the trend in declining heat input to continue: our “Trend-Based” projection puts 2006 SO<sub>2</sub> emissions at just over 9.5 million tons,** or roughly in compliance with Title IV Phase allocation limits for the first time.
  - Alternatively, should July-December heat input return to historic levels, our “Mean-Reverting” projection puts total 2006 SO<sub>2</sub> emissions at 9.635 million tons.
  - When combined with the nearly 490,000 ton reduction expected from new FGDs in 2007, **the next two years look likely to add to the SO<sub>2</sub> bank for the first time since 2000.**

### ***The State of the NO<sub>x</sub> Market: Finally In Compliance (Three Years On)***

- **The NO<sub>x</sub> market has generally operated in synchrony with the dynamics of the power market,** and one could argue that the second quarter emissions data confirm that status yet again: operating over a smaller region than the Acid Rain program, and including industrials in the mix, the generation pattern of NO<sub>x</sub> budget program units is largely the same as that of Title IV.
- But even with similar generation changes (both overall by fuel and regionally,) the second quarter data indicate **how much more variable the emissions performance of uncontrolled NO<sub>x</sub> units can be when contrasted with SO<sub>2</sub>:** while the heat input to SIP Call coal plants fell commensurate to that of all Title IV coal units (about -1.6%) NO<sub>x</sub> emissions actually rose by 1.5% in May-June 2006.
- With the first reporting for all Missouri SIP Call units, we can confirm our original projections that **Missouri will enter in 2007 in modest net surplus<sup>2</sup>** (about 1,400 tons.) Compared with our **“Trend-Based” projection of 2006 NO<sub>x</sub> emissions at 508,500 tons,** or our Mean-Reverting Projection of 517,700 tons, 2006-2007 are either even, or 9,000 tons in surplus, respectively.

<sup>1</sup> although there seems to be some discrepancy between the EPA and EIA data on this score.

<sup>2</sup> Provided the SCRs at New Madrid 1-2 are re-started, with the final reduction of 15,800 tons required.

## The NO<sub>x</sub>-SO<sub>x</sub>Meter Volume OS-06 v.6

Second Quarter Emissions Data

(released August 18, 2006)

### The State of the Integrated Power, Fuel, & Allowance Markets: Finally In Compliance

- With a lack of little “real” news, the allowance market keeps flirting with movement (principally by trying to tag along with gas prices) and then returning to its post-auction \$600- \$700 range. So without quite knowing what to expect, **traders have seemingly interpreted the latest round of emissions data from EPA as having validated their positions:** prices have not moved decisively since the August 18<sup>th</sup> release date.
- Perhaps the traders should look again: **if the 2006 second quarter emissions data make any case whatsoever, it is that natural gas matters little to SO<sub>2</sub> fundamentals.** Taken together with EIA’s latest generation data, it is clear that improved availability of baseload generation --nuclear in the East and hydro in the West-- helped back off coal in the first half of 2006.<sup>3</sup>
- **Coal is taking it on the chin from both sides.** On the demand side, year-to-date U.S. coal generation is down -1.6%, with June coal output falling off -3.4% over the same month last year. EIA attributes the drop to milder winter weather<sup>4</sup>, compounded by moderate June temperatures in the Eastern half of the country.
- **On the supply-side, conditions for coal are little better.** Improvements in outage rates for nuclear units contributed to a 2.9% boost in its generation year-to-date. At the same time, heavier rainfall in the Pacific Northwest has caused a robust 13.3% growth in hydroelectric generation over the same period since last year, (see *Fig. NM-OS-06 v.6-1.a.*)
- And where is natural gas in all of this? Clearly, with prices returning to earth from the post-Katrina bubble, gas generation increased strongly as well, (up 4.9% year-to-date.)
  - **But the impact of gas is largely in competition with oil to serve incremental generating requirements, rather than on coal.** With oil prices surging due to turbulence in the Middle East, petroleum-fired generation halved since 2005.

Fig NM-OS-06 v.6- 1.a: Change in Total U.S. Generation Year-to-Date

Jan-June 2006 vs Jan- June 2005

Million megawatthours

	Coal	Petroleum	Gas	Nuclear	Hydro	All Other	Total
2005 ytd	969	41	329	376	143	63	1,922
2006 ytd	954	20	345	387	162	66	1,934
Diff	(15)	(22)	16	11	19	4	13
% Diff	-1.6%	-52.7%	4.9%	2.9%	13.3%	5.6%	0.7%

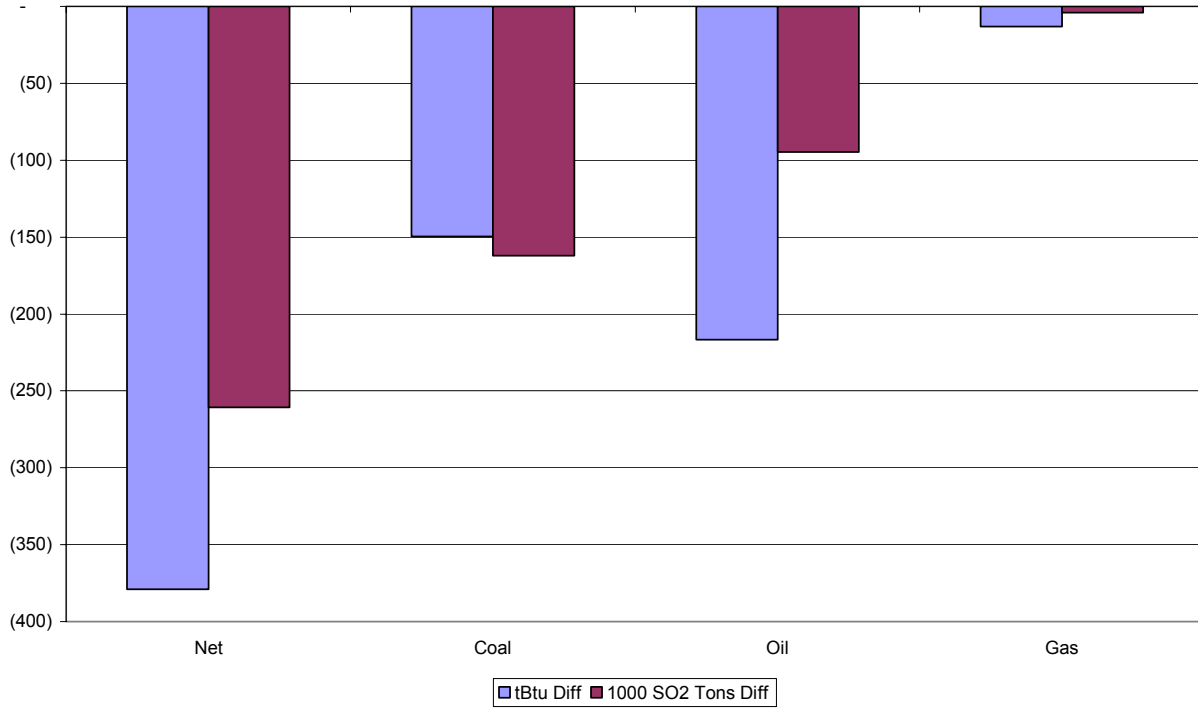
Source:

<http://www.eia.doe.gov/cneaf/electricity/epm/flash/august2006.pdf>

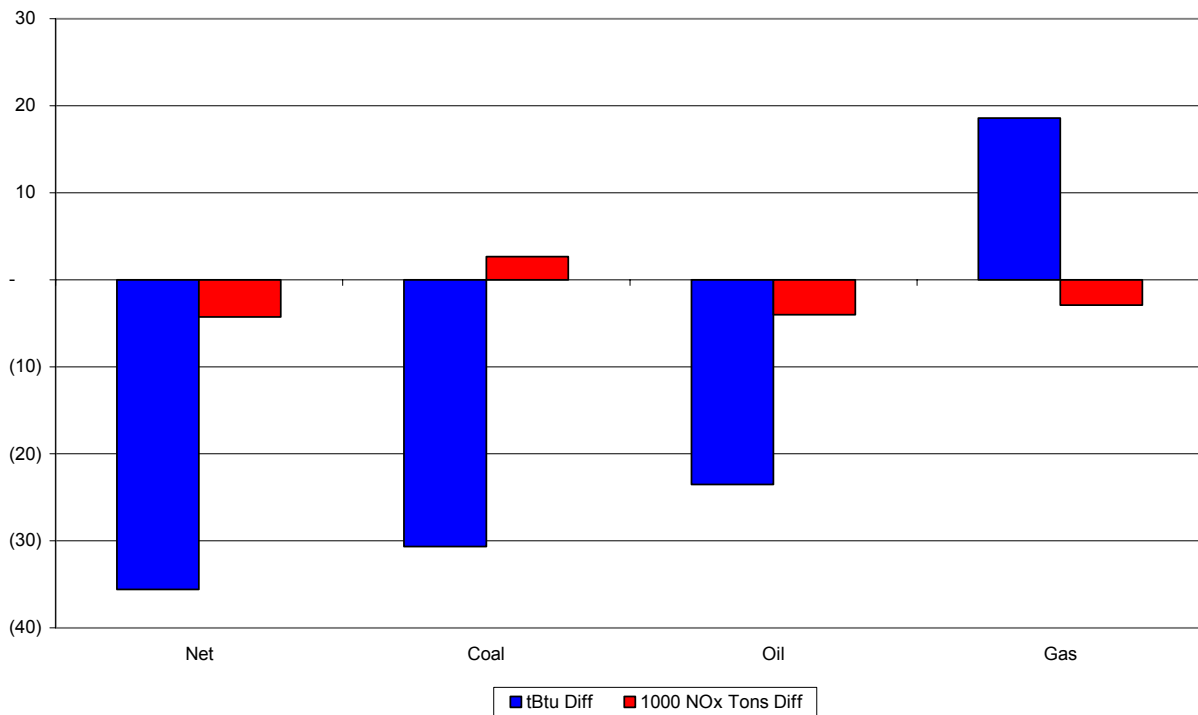
<sup>3</sup> although there seems to be some discrepancy between the EPA and EIA data due to Title IV reporting.

<sup>4</sup> Heating degree days dropped -10.2% over year earlier levels

**Fig. NM-OS-06 v.6-1.b: Net Change in Heat Input and SO2 Emissions  
by Fuel Type Jan- June 2005 vs Jan- June 2006**



**Fig. NM-OS-06 v.6-2: Net Change in Heat Input and NOx Emissions  
by Fuel Type May- June 2005 vs May June 2006**

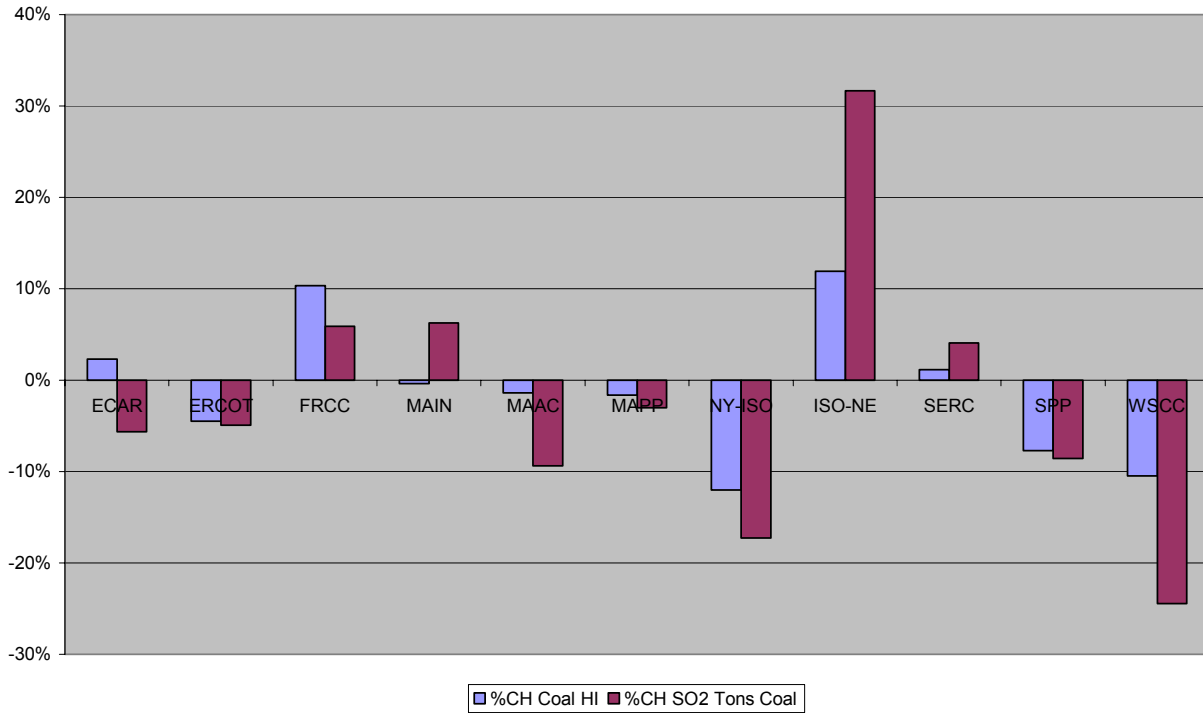


- **Translated from an emissions perspective, the overall year-to-date generation story remains largely intact.** First of all, the most direct comparison for year-to-date data is the Title IV program, since it covers 48 states and is in effect year-round.
- From the EPA 2006 Second Quarter SO<sub>2</sub> Emissions data, EIA's reported decline of -15 million mwh of coal-fired output and -22 million mwh of petroleum generation (see *Fig. NM-OS-06 v.6-1.a.* under "Diff") translates into a loss of -149 trillion Btu (tBtu) of coal and 217 tBtu of petroleum heat input, respectively, (see *Fig. NM-OS-06 v.6-1.b.*)
  - Associated with these reported heat input losses<sup>5</sup>, **we get 257,000 tons of Q2 SO<sub>2</sub> reductions**, (162,000 tons from coal and 95,000 tons from oil.)
- **Yet since many gas-fired generators are not Title IV reporting, the Q2 SO<sub>2</sub> data do not reflect the gains for gas-fired plant**, (which is why gas barely registers in *Fig. NM-OS-06 v.6-1.b.*)
  - To get a portion of that story, we can turn to the SIP Call data for the first two months of the ozone season. While gas-fired turbines do not emit SO<sub>2</sub>, they do emit NO<sub>x</sub>, and are thus covered in the NO<sub>x</sub> budget program.
- **The NO<sub>x</sub> market has generally operated in synchrony with the dynamics of the power market**, and one could argue that the second quarter emissions data confirm that status yet again: operating over a smaller region than the Acid Rain program, and including industrials in the mix, the generation pattern of NO<sub>x</sub> budget program units is largely the same as that of Title IV.
- From the EPA 2006 May-June NO<sub>x</sub> Emissions data, EIA's nation-wide reported six month decline in coal- and oil-fired output translates into a loss of -31 trillion Btu (tBtu) of coal and 24 tBtu of petroleum heat input, respectively.
  - But the rise in gas-fired generation shows up in the SIP Call states as an increase of 19 tBtu, (see *Fig. NM-OS-06 v.6-2.*)
- But even with similar generation changes the second quarter data indicate **how much more variable the emissions performance of uncontrolled NO<sub>x</sub> units can be when contrasted with SO<sub>2</sub>**: while the heat input to SIP Call coal plants fell commensurate to that of all Title IV coal units (about -1.6%) NO<sub>x</sub> emissions actually rose by 1.5% in May-June 2006.
  - On a tonnage basis, the drop in oil generation is associated with a -4,000 ton drop in NO<sub>x</sub>. At the same time, increased gas use must have been associated with an increased gas use at dual fuel units heretofore burning higher emitting oil<sup>6</sup>, resulting in a -3,000 ton reduction despite increased gas use.
  - **However, this is partially offset by a 2,750 ton increase due to coal. On a net basis, NO<sub>x</sub> emissions fell -4,300 tons year-to-date.**

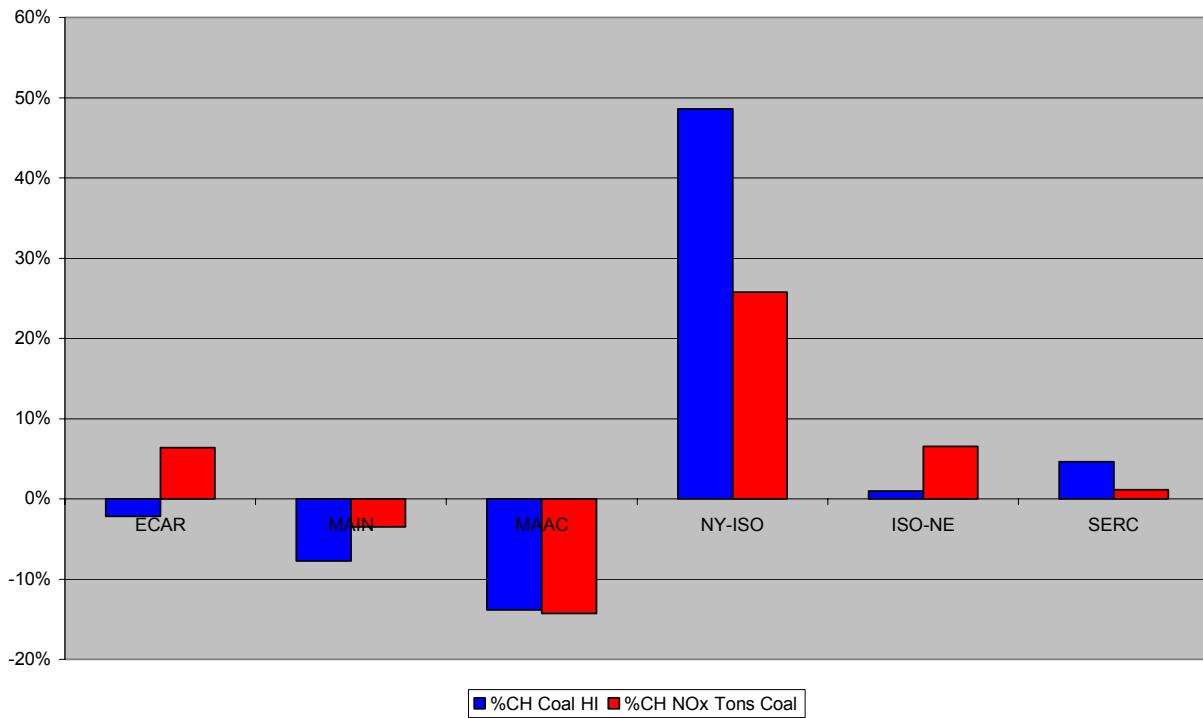
<sup>5</sup> but not caused exclusively by them, (i.e., see rate changes next section.)

<sup>6</sup> or with an improvement in the efficiency and emissions performance of gas-fired generation;

**Fig. NM-OS-06 v.6-3: Percentage Change in Heat Input vs SO<sub>2</sub> Emissions  
by Region Jan- June 2005 vs Jan- June 2006**



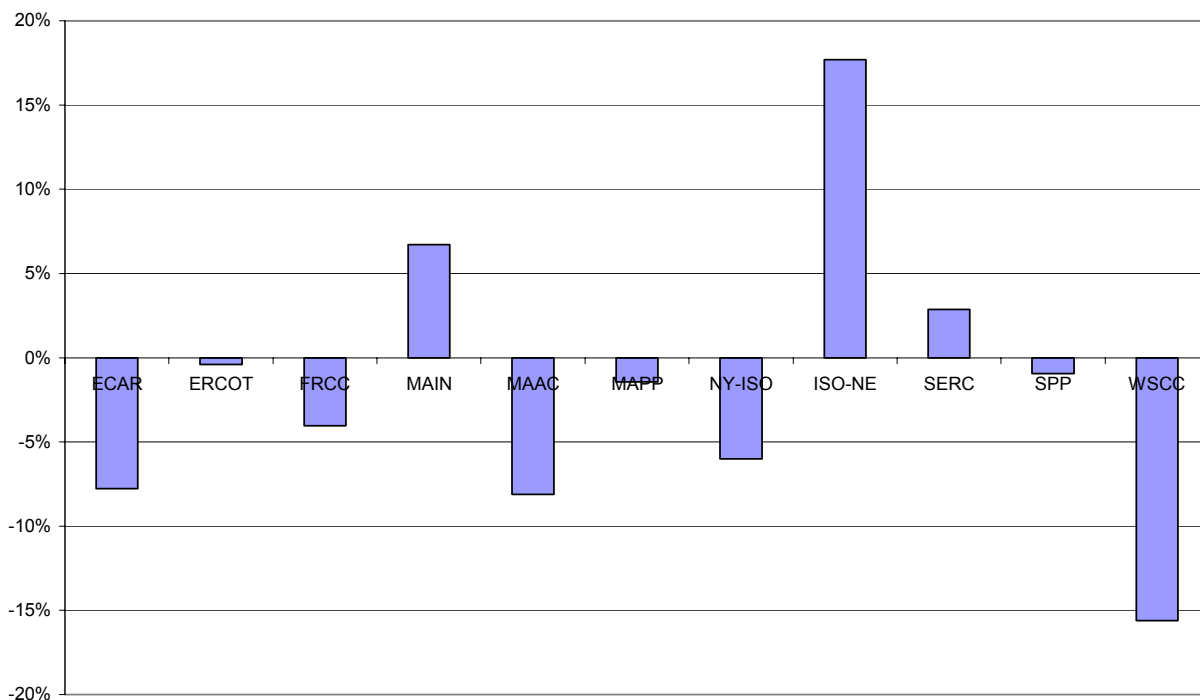
**Fig. NM-OS-06 v.6-4: Percentage Change in Heat Input vs NO<sub>x</sub> Emissions  
by Region May- June 2005 vs May June 2006**



*The Regional Split of Heat Input Changes- SO<sub>2</sub> vs. NO<sub>x</sub> Emissions*

- **“Title IV to CAIR” by Region: Disaggregated into a regional perspective, the overall year-to-date generation story seems recognizable.** In trying to decipher the differences in the compliance programs between the various regions, we assume that, all other things being equal, if no new control technologies (or fuel switches) have been put in, then a given percentage change in region’s heat input will result in a roughly equivalent change in the region’s emissions.
  - On this basis, for SO<sub>2</sub> it appears that coal-fired generators in SPP, MAPP, and ERCOT have little or no new technologies or fuel programs to report, (compare blue and magenta bars in *Fig. NM-OS-06 v.6-3.*)
- On the other hand, **additional reductions beyond that associated with shifts in heat input are clearly being undertaken in ECAR, MAAC, New York, and Florida (FRCC, where despite increases in tons emitted, heat input changes are even larger.)**
  - *Fig. NM-OS-06 v.6-5.a* highlights this conclusion, where all four regions exhibit -5% or greater reduction in average SO<sub>2</sub> emission rate year-to-date.
- The remaining stand-out in terms of SO<sub>2</sub> rate reductions is the Western States Coordinating Council (WSCC) region, with a nearly 15% reduction in rate. For the impact of growth hydroelectric output, it is clear that WSCC would be the most likely to be affected.

**Fig. NM-OS-06 v.6-5.a: Percent Change in Average SO<sub>2</sub> Emissions Rate Coal-fired Units by Region Jan- June 2005 vs Jan- June 2006**



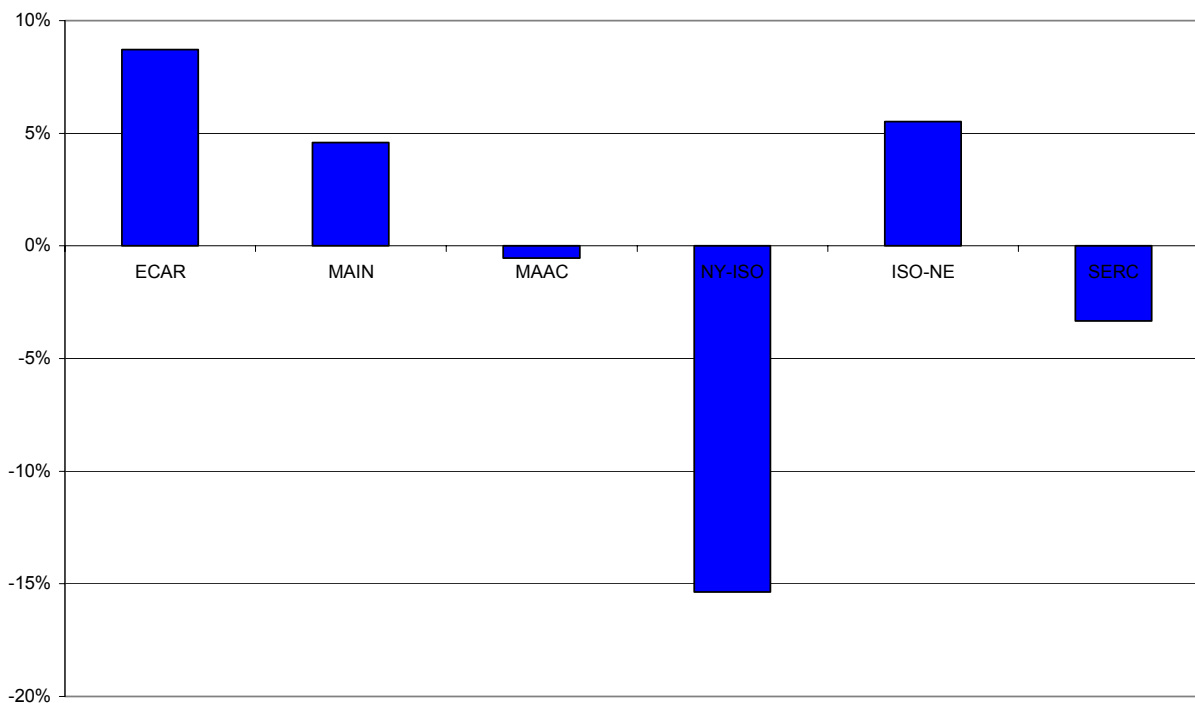
**Fig. NM-OS-06 v.6-5.b: Apparent Large Changes in SO<sub>2</sub> Emissions-Specific Units**

SO <sub>2</sub> Rate Change			YTD SO <sub>2</sub> Tons (1000)		SO <sub>2</sub> Rate			Notes	YTD Heat Input (tBtu)		
Region	Plant	Unit(s)	May-June 2005	May-June 2006	2005	2006	%CH		May-June 2005	May-June 2006	%CH
ECAR	Cardinal	2	25.7	12.3	2.79	1.33	-52%	LSC	18.5	18.5	0%
ECAR	Mitchell	33	0.7	0.4	0.17	0.10	-43%	FGD?	8.3	8.7	5%
ECAR	Willow Isle	1	0.6	0.4	1.89	1.03	-45%	LSC	0.6	0.8	24%
ECAR	E. Smith	All	2.9	1.4	0.43	0.19	-56%	FGD?	13.6	14.5	6%
ECAR	R E Burger	All	21.3	8.4	3.72	1.72	-54%	PRB	11.5	9.7	-15%
MAIN	Stoneman	All	0.4	0.3	2.31	1.66	-28%	PRB	0.3	0.3	-6%
MAIN	Vermilion	All	6.6	1.2	3.03	0.57	-81%	PRB	4.4	4.4	0%
NY-ISO	Dunkirk	1-2	5.8	2.1	1.65	0.69	-58%	PRB	7.1	6.2	-12%
SERC	Asheville	1-2	8.3	2.2	1.36	0.40	-71%	FGD?	12.2	11.3	-7%
<i>Heat Input Change (Retrofit In Progress?)</i>											
ECAR	Gibson	All	59.4	46.8	1.55	2.22	43%		76.7	42.2	-45%
ECAR	Bull Run	All	17.6	7.6	1.18	1.12	-5%		29.8	13.6	-54%
ECAR	Miami Fort	All	12.9	8.3	3.00	3.44	15%		8.6	4.8	-44%
MAIN	Alma	All	5.7	3.7	1.35	1.87	38%		8.4	4.0	-53%
MAIN	Meredosia	All	5.5	1.6	1.03	3.71	261%		10.8	0.9	-92%
ECAR	Subtotal		141.1	85.6	1.68	1.52	-10%		167.5	112.9	-33%
MAIN	Subtotal		7.0	1.5	2.98	0.64	-78%		4.7	4.7	-1%
NYISO	Subtotal		5.8	2.1	1.65	0.69	-58%		7.1	6.2	-12%
SERC	Subtotal		8.3	2.2	1.36	0.40	-71%		12.2	11.3	-7%
<b>TOTAL</b>			<b>162.2</b>	<b>91.5</b>	<b>1.69</b>	<b>1.36</b>	<b>-20%</b>		<b>191.5</b>	<b>135.0</b>	<b>-29%</b>

- In fact, coal-fired sources from WSCC reported reductions in heat input of 10% or greater (see blue bars in *Fig. NM-OS-06 v.6-3,*) and a combined reduction of nearly 40,000 tons SO<sub>2</sub>, (see *Appendix A* for table including regional detail by fuel type.) It appears that the large increase in hydro output displaced the higher-emitting coal fired Western plants.
- But as much as large percentage changes appear significant, the stability of the SO<sub>2</sub> emissions is represented by the relatively smaller changes in the two most significant regions for coal, which are the East Central Area Reliability (ECAR) Coordination Agreement and the Southeast Electric Reliability Council (SERC) regions. Between the two regions, **ECAR and SERC account for roughly half of the coal fired output in the U.S.**

- On a year-to-date basis, with the rest of the country declining, **ECAR coal-fired generation rose 2.3%, (56 tBtu.) At the same time, SO<sub>2</sub> emissions from ECAR coal plants fell -5.6% (or -89,000 tons,) indicating that ECAR is proceeding with its compliance plans.**
- Confirmation at the unit-level for the compliance actions of ECAR plants is demonstrated in *Fig. NM-OS-06 v.6-5.b*, indicating that nearly 80% of the reported large reductions year-to-date come from ECAR plants (55,000 tons out of 70,000 tons total.)
  - Perhaps most interesting is the fact that **the lion’s share of these ECAR reductions in the first half of 2006 come from low sulfur coal, rather than new FGD.**
  - And there is no dominant source of new supply either: the low sulfur coals (delivered to the Burger and Cardinal plants on the Ohio River) appear to be both from both PRB and Eastern sources
- Other than the prominence of low sulfur coal, **there appear to be few surprises in the new release when it comes to SO<sub>2</sub>:** no “surprise” FGDs, no large resurgence of PRB coal returning into Eastern markets on the one hand, and no apparent forced burning of much higher sulfur coals on the other.
- And yet there are hints in the data of technologies to come: plants reporting greater than fifty percent reductions in heat input through June 2006 versus the same period last year include Cinergy’s Gibson and Miami Fort stations, TVA’s Bull Run unit, and Ameren’s Meredosia plant, (see *Fig. NM-OS-06 v.6-5.b*.)
- On the other side, **SERC’s coal capacity increased its production (22 tBtu) boosting its emissions by (45,000 tons.)** The region’s apparent compliance completion for the period was the long-anticipated addition of FGD at Asheville 1-2.
- **“SIP Call to CAIR” by Region:** Unlike the SO<sub>2</sub> market, where there are substantial new compliance program changes underway, **affected SIP Call sources have largely completed their technology additions, and they are in a “wait-and-see” mode.**
- No matter how you delve into the market, it looks to be on hold: the only reductions in emissions are reported in the MAAC (traditional PJM) and MAIN regions, and in both cases the change in tons is exceeded on a percentage basis by the reduction in heat input, (compare red and blue bars in *Fig. NM-OS-06 v.6-4*.)
- Of the six reporting regions in the SIP Call, only two reported a reduction in average NO<sub>x</sub> rate through June. Of those two (SERC and New York) **only the New York change appears significant, and it appears to be due to a large increase in the use of low nitrogen Powder River Basin coal at its lake plants,** see *Fig. NM-OS-06 v.6-6.a and NM-OS-06 v.6-6.b*.)
- Otherwise, the only NO<sub>x</sub> related change is the SCR at Gaston 5, see *Fig. NM-OS-06 v.6-6.b*.

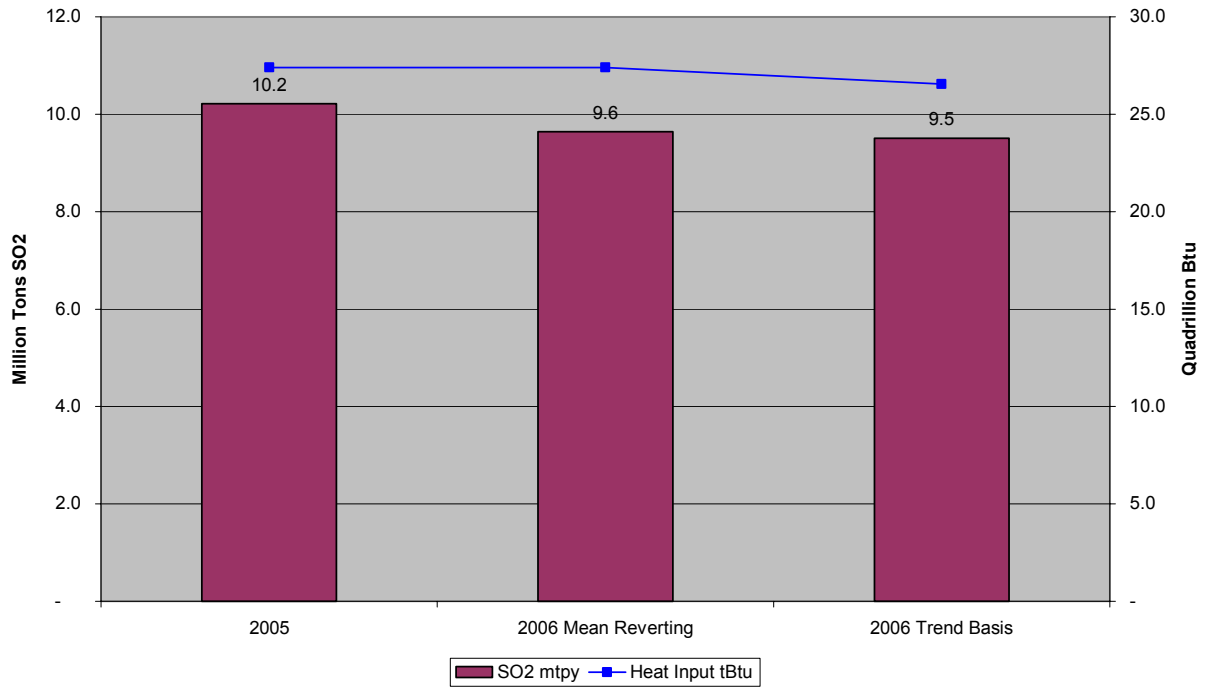
**Fig. NM-OS-06 v.6-6.a: Percent Change in NOx Emissions Rate  
Coal-fired Units by Region May- June 2005 vs May- June 2006**



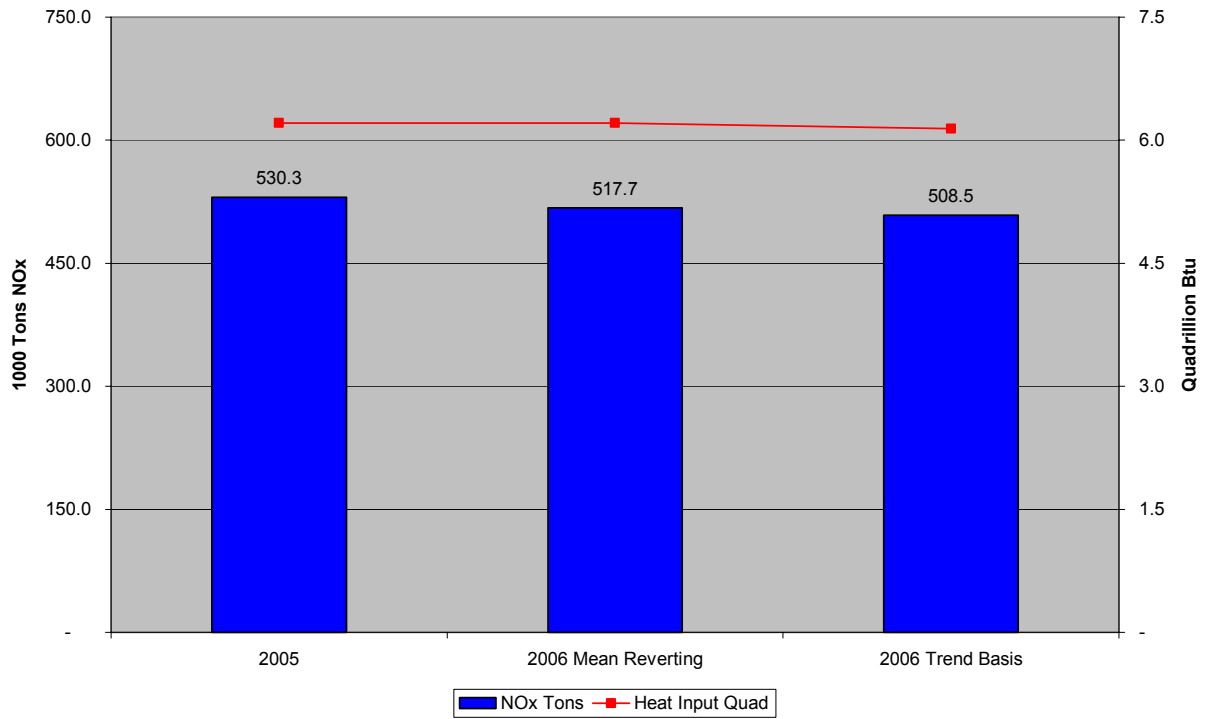
**Fig. NM-OS-06 v.6-6.b: Apparent Large Changes in NOx Emissions- Specific Units**

NOx Rate Change		YTD NOx Tons		NOx Rate			Notes	YTD Heat Input (tBtu)		
		May-June	May-June	2005	2006	%CH		May-June	May-June	%CH
Plant	Unit(s)	2005	2006	2005	2006	%CH		2005	2006	%CH
ECAR	Miami Fort	681	172	0.65	0.31	109%		2.1	1.1	-47%
ISONE	Mount Tom	233	65	0.25	0.12	-52%		1.9	1.1	-42%
SERC	E C Gaston	962	526	0.41	0.09	-79%	SCR	4.7	12.3	164%
SERC	GP Kenansville	79	28	0.50	0.25	101%		0.3	0.2	-30%
<i>Heat Input Change (Retrofit In Progress?)</i>										
		2005	2006	2005	2006	%CH		2005	2006	%CH
ECAR	Gibson	1,226	466	0.09	0.06	-28%		28.5	15.0	-47%
NYISO	Huntley Power	496	309	0.23	0.18	-27%		4.3	3.4	-21%
ECAR	Subtotal	1,907	638	0.12	0.08	-36%		30.6	16.1	-47%
ISONE	Subtotal	233	65	0.25	0.12	-52%		1.9	1.1	-42%
NYISO	Subtotal	496	309	0.23	0.18	-21%		4.3	3.4	-21%
SERC	Subtotal	79	28	0.50	0.25	-50%		0.3	0.2	-30%
<b>TOTAL</b>		<b>2,714</b>	<b>1,040</b>	<b>0.15</b>	<b>0.10</b>	<b>-32%</b>		<b>37.2</b>	<b>20.8</b>	<b>-44%</b>

**Fig. NM-OS-06 v.6-7: PEAR Projected SO<sub>2</sub> Emissions  
Mean-Reverting vs Trend Basis Heat Input Cases**



**Fig. NM-OS-06 v.6-8: PEAR Projected NO<sub>x</sub> Emissions  
Mean-Reverting vs Trend Basis Heat Input Cases**



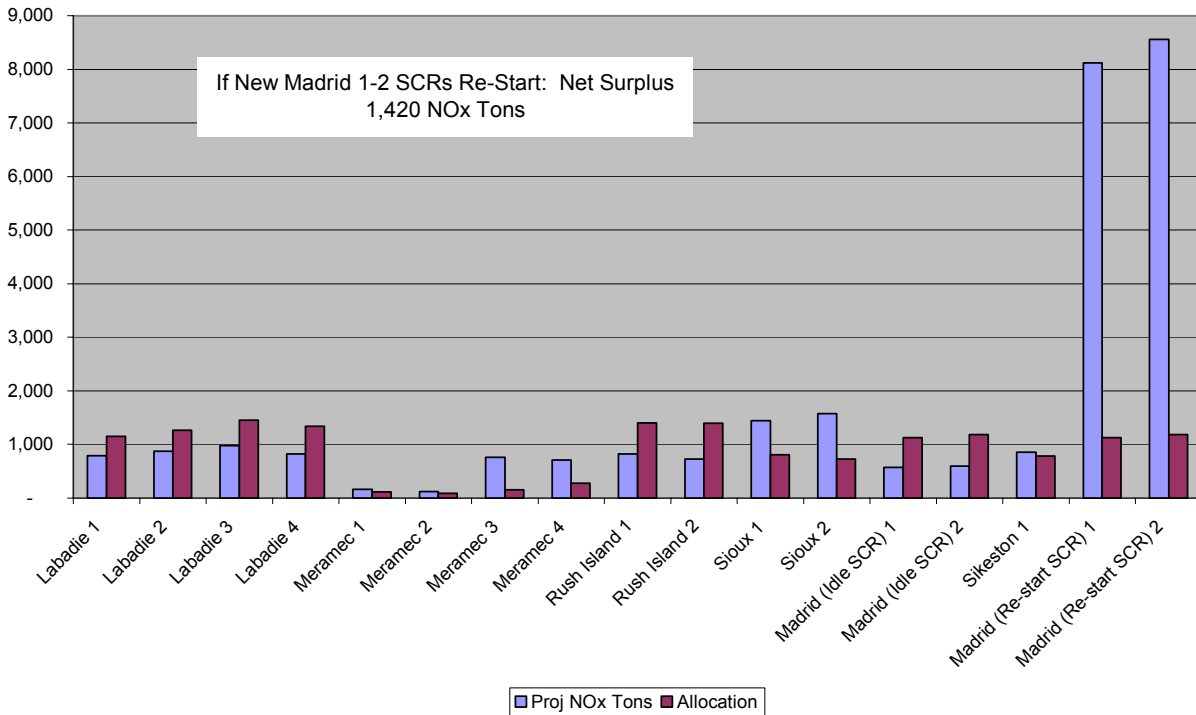
*Looking Forward: Projecting SO<sub>2</sub> & NO<sub>x</sub> Emissions 2006-2007*

- All other things being equal, one might expect that emission reductions attributable to shifts in generation (such as those experienced year-to-date) would be transitory, subject to the vagaries of rainfall, snowmelt, and nuclear outages.
  - Thus, our goal is to **discern whether the conditions under which generators are currently operating will continue** (they are part of a trend) **or whether we can expect a correction** from current conditions, (to use technical jargon, whether we will “revert to the mean.”)
  -
- The key factors in the short term outlook for emissions are:
  - Electricity demand;
  - Generation mix;
  - Emissions variability.
- As a result, looking forward over the next few years, we simplify our outlook, assuming that emission rates are fixed for each fuel by region at second quarter levels. Then we model two basic “states” of the world:
  - “**Trend-Based**”- assuming that the current growth rate for each fuel-region combination persists through the remainder of the year, or
  - “**Mean-Reverting**”- assuming that in the remainder of the year, each fuel-region returns to its historic operating rate.
- SO<sub>2</sub> Outlook 2006-2007: We note that last summer was the hottest on record, and **thus we expect the trend in declining heat input to continue: our “Trend-Based” projection puts 2006 SO<sub>2</sub> emissions at just over 9.5 million tons**, or roughly in compliance with Title IV Phase allocation limits for the first time.
- Alternatively, should July-December heat input return to historic levels, our “Mean-Reverting” projection puts total 2006 SO<sub>2</sub> emissions at 9.635 million tons, see *Fig. NM-OS-06 v.6-7*.
- Based on our survey of a variety of source materials, including financial disclosures, state permitting authorities, vendor contract awards announcements, etc., **for 2007 we have locked in FGD retrofits for 17 units**, (at AEP, Cinergy, LG&E Energy, and Progress Energy) **leading to a total of nearly 490,000 tons of reduction**, *Fig. NM-OS-06 v.6-9*.
  - Combining ton reduction expected from new FGDs in 2007, **the next two years look likely to add to the SO<sub>2</sub> bank for the first time since 2000**.
  - We should also note that most of the announced units have an interval estimate as to their estimated start date, so that some of them may actually be deferred. Given the extent of the projected surplus in 2007, (nearly 280,000 tons, see *Fig. NM-OS-06 v.6-11*, we are confident of our conclusion that we will be able to add to the bank.

**Fig NM-OS-06 v.6-9: Announced FGD Retrofits Schedule: 2007 Sorted by Company**  
 Locked-In for PEAR Compliance Options Model Simulation

Company	Plant	State	Deregulation Status	Start-up Year Company statement	PEAR assumption	SO2 Tons Removed PEAR estimate	
<b>AEP</b>	Big Sandy 2	KY	Not Active	2007- 2010	2007	35,590	
	Conesville 4	OH	Active	2007- 2010	2007	45,480	
	John E Amos 1	WV	Not Active	2007- 2010	2007	23,763	
	John E Amos 2				2007	28,093	
	John E Amos 3				2007	47,497	
	Mountaineer 1	WV	Not Active	2007	2007	43,849	
<b>Cinergy</b>	Muskingum River 5	OH	Active	2007- 2010	2007	47,722	
	Cayuga 1	IN	Not Active	by 2008	2007	30,801	
	Cayuga 2	IN	Not Active	by 2008	2007	33,299	
	Miami Fort 7	OH	Active	by 2008	2007	36,279	
	Miami Fort 8	OH	Active	by 2008	2007	9,971	
	Marshall 1	NC	Not Active	2007	2007	15,896	
	Marshall 2	NC	Not Active	2007	2007	12,218	
	<b>LG&amp;E</b>	Ghent 1	KY	Not Active	2007	2007	2,618
		<b>Progress Energy</b>	Mayo 1	NC	Not Active	2007	2007
	Roxboro 2		NC	Not Active	2005	2007	25,904
Roxboro 3	NC		Not Active	2007	2007	27,610	
<b>TOTAL 2007 SO2 Tons Removed</b>						<b>489,457</b>	

**Fig. NM-OS-06 v.6-10: PEAR Projected NOx Balance-  
 Missouri Units Entering SIP Call Region 2007**



- *NOx Outlook 2006-2007*: If, as expected **the trend in declining heat input continues, our “Trend-Based” projection pegs OS 2006 NOx emissions at 508,500 tons.**
  - On the other hand, if July-September heat input return to historic levels, our **“Mean-Reverting” Projection for OS 2006 is 517,700 tons.**
- With the first reporting for all Missouri SIP Call units, we can largely confirm our original projections that **Missouri will enter in 2007 in modest net surplus** (about 1,400 tons.)
  - As indicated in *Fig. NM-OS-06 v.6-10*, most of the units in Missouri are already operating at or below their allocated limits, with the noteworthy exception of New Madrid 1-2.
  - We also note that both units already have SCR equipment installed, which apparently has not operated this year. If the SCRs are re-started, the final reduction of 15,800 tons will be met.
- Under these circumstances, with Missouri as a modest seller, we expect that 2006-2007 are either even, or 9,000 tons in surplus, respectively. **Should that occur, flow control will once again be triggered in 2006-07, with the PFC discount in the range of 63-64%.**

***Conclusion: Should Be a Bigger Deal Than It Is***

- Thus, we expect that **both the SO<sub>2</sub> and NOx markets will for first time since their current phases began (2000 and 2004, respectively) be in aggregate emitting below their allocation “limits.”** If for no other reason that ceremonial obligation, such an outcome would seem to be worth noting.
- Were the Clean Air Interstate Rule not overshadowing the market with substantial additional reductions required in three-four years, being nominally “in compliance” might have greater impact on the market.
  - In fact, things are as they should be: **the key market driver of an allowance today is its potential value banked and surrendered to meet CAIR requirements.** Surpassing Title IV and SIP Call allocation levels is a milestone, but along a much longer road.

Fig NM-OS-06 v.6- 11: PEAR Projected SO2 Balance Summary: Title IV Reinforced by CAIR 2005-2007

	2004	2005	2006	2006	2007
<b>SO2 REDUCTION PROGRAM</b>	<i>Actual</i>	<i>Actual</i>	<i>Mean Reverting</i>	<i>Trend Basis</i>	<i>Mean Reverting</i>
Affected Region					<i>+</i>
					<i>Most Likely</i>
<b>Projected Base SO2 Emissions</b>	<b>10,262,581</b>	<b>10,211,658</b>	<b>9,635,010</b>	<b>9,505,548</b>	<b>9,750,630</b>
<b>Total SO2 Budget</b>	<b>9,541,084</b>	<b>9,541,085</b>	<b>9,541,085</b>	<b>9,541,085</b>	<b>9,541,085</b>
<b>SO2 Reduction Requirement</b>	<b>(721,497)</b>	<b>(670,573)</b>	<b>(93,925)</b>	<b>35,537</b>	<b>(209,545)</b>
<b>Sources of Emission Reductions</b>					
Total SO2 Reductions		-	-	-	
Switch to Low Sulfur Coals (1)		-	-	-	
FGD Retrofits (1)		-	-	-	489,457
Gas Conversions		-	-	-	
Multi-pollutant Technologies					
<b>Sub-total: Net Surplus</b>	<b>(721,497)</b>	<b>(670,573)</b>	<b>(93,925)</b>	<b>35,537</b>	<b>279,912</b>
<b>Allowances Held In Account</b>					
	<b>7,574,959</b>	<b>6,853,462</b>	<b>6,182,890</b>	<b>6,182,890</b>	<b>6,088,965</b>
<b>Allowances Deducted for Emissions</b>	<b>(10,262,581)</b>	<b>(10,211,658)</b>	<b>(9,635,010)</b>	<b>(9,505,548)</b>	<b>(9,750,630)</b>
<b>Banked Allowances</b>	<b>6,853,462</b>	<b>6,182,890</b>	<b>6,088,965</b>	<b>6,218,426</b>	<b>5,879,420</b>

Fig NM-OS-06 v.6-12. PEAR Projected NOx Balance- SIP Call Transition Toward CAIR 2005-2007

Thousand Tons	2005	2006 proj <i>Trend Basis</i>	2006 proj <i>Mean Reverting</i>	2007 proj <i>Trend Basis</i>	2007 proj <i>Mean Reverting</i>
<b>NOx REDUCTION PROGRAM- All Sectors</b>	<b>SIP Call</b>	<b>SIP Call</b>	<b>SIP Call</b>	<b>SIP Call</b>	<b>SIP Call</b>
Affected Region	SIP States	SIP States	SIP States	SIP States	SIP States
<b>Available Allowances</b>	exc MO	exc MO	exc MO	incl MO	incl MO
<b>NOx Budget</b>	516	516	516	530	530
Early Reduction Credits					
Other Accounts					
<b>Projected Base Emissions</b>	596	508	518	536	545
<b>Emission Reductions</b>					
Announced Technology	(58)			0	0
Other Retrofits Projected to Occur (1)				(16)	(16)
<i>Technology Retrofits-Subtotal</i>	(58)			(16)	(16)
<i>Non-technology Alternatives-Subtotal</i>	(7)			0	0
<b>Total Reductions</b>	(65)			(16)	(16)
<b>Net Emissions</b>	<b>530</b>	<b>508</b>	<b>518</b>	<b>520</b>	<b>530</b>
<i>CSP Allowances Retired</i>					
<i>Trial Balance</i>	(14)	8	(1)	9	(0)
<b>Net Allowances- Initial</b>	<b>194</b>	<b>201</b>	<b>192</b>	<b>211</b>	<b>192</b>
<i>Maximum @ 1:1</i>	52	52	52	53	53
Carried Forward: <i>Surrendered 1:1</i>	14	0	0	0	0
Carried Forward: <i>Surrendered 2:1</i>			0	0	0
<b>Net Allowances- Final</b>	<b>194</b>	<b>201</b>	<b>192</b>	<b>211</b>	<b>192</b>
Progressive Flow Control Triggered?	TRUE	TRUE	TRUE	TRUE	TRUE
Flow Control Factor	27%	26%	28%	25%	28%
Discount	64%	63%	64%	63%	64%

**NOTES:**

(1) Re-start of idled SCRs at New Madrid 1-2

**The NO<sub>x</sub>-SO<sub>x</sub>Meter *Volume OS-06 v.6***  
*July 2006 (released August 29, 2006)*

**Appendix Tables**

- A. Detail SO<sub>2</sub> Emissions & Heat Input by NERC Region by Fuel Type Jan- June 2005 vs 2006
- B. Detail NO<sub>x</sub> Emissions & Heat Input by NERC Region by Fuel Type Jan- June 2005 vs 2006

**Appendix A: Detail SO<sub>2</sub> Emissions & Heat Input by NERC Region by Fuel Type Jan- June 2005 vs 2006**

<b>Year-to-Date 2006 Results</b>		<b>Heat Input by Fuel Type</b>				<b>SO2 Tons by Fuel</b>		
<i>Region</i>		<i>Quadrillion Btu</i>			<i>Total</i>	<i>1000 Tons</i>		
		Coal	Oil	Gas	2005	Coal	Oil	Gas
2006 ytd	East Central Area Reliability CA	2.5	0.0	0.0	2.5	1,487	0	0
2006 ytd	Electric Reliability Council of Texas	0.7	0.0	0.6	1.3	226	0	0
2006 ytd	Florida Reliability Coordinating Council	0.4	0.1	0.3	0.8	122	37	0
2006 ytd	Mid-America Interconnected Network	0.7	0.0	0.0	0.7	220	1	0
2006 ytd	Mid-Atlantic Area Council	0.6	0.0	0.1	0.7	530	1	0
2006 ytd	Mid-Continent Area Power Pool	0.7	0.0	0.0	0.8	229	0	0
2006 ytd	New York ISO	0.1	0.1	0.1	0.3	43	9	0
2006 ytd	Northeast Power Coordinating Council	0.1	0.0	0.2	0.3	60	7	0
2006 ytd	Southeastern Electric Reliability Council	2.0	0.0	0.1	2.2	1,158	1	0
2006 ytd	Southwest Power Pool	1.1	0.0	0.4	1.5	320	2	0
2006 ytd	Western Systems Coordinating Council	1.0	0.0	0.5	1.5	122	0	0
2006 ytd	Subtotal by Fuel	9.8	0.3	2.3	12.5	4,516	59	1
<b>Year-to-Date 2005 Results</b>		<b>Heat Input by Fuel Type</b>				<b>SO2 Tons by Fuel</b>		
<i>Region</i>		<i>Quadrillion Btu</i>			<i>Total</i>	<i>1000 Tons</i>		
		Coal	Oil	Gas	2005	Coal	Oil	Gas
2005 ytd	East Central Area Reliability CA	2.4	0.0	0.1	2.6	1,576	3	0
2005 ytd	Electric Reliability Council of Texas	0.7	0.0	0.6	1.3	238	0	0
2005 ytd	Florida Reliability Coordinating Council	0.3	0.2	0.3	0.7	115	65	2
2005 ytd	Mid-America Interconnected Network	0.7	0.0	0.1	0.7	207	9	0
2005 ytd	Mid-Atlantic Area Council	0.6	0.1	0.0	0.7	584	11	0
2005 ytd	Mid-Continent Area Power Pool	0.8	0.0	0.0	0.8	236	2	1
2005 ytd	New York ISO	0.1	0.1	0.1	0.3	52	26	0
2005 ytd	Northeast Power Coordinating Council	0.1	0.1	0.2	0.3	46	21	0
2005 ytd	Southeastern Electric Reliability Council	2.0	0.0	0.1	2.2	1,113	6	1
2005 ytd	Southwest Power Pool	1.2	0.0	0.4	1.6	350	11	0
2005 ytd	Western Systems Coordinating Council	1.1	0.0	0.5	1.6	162	0	0
2005 ytd	Subtotal by Fuel	10.0	0.5	2.3	12.9	4,678	153	5

**Appendix A: Detail SO<sub>2</sub> Emissions & Heat Input by NERC Region by Fuel Type (cont'.)**

% Diff: Year-to-Date Results Region		Heat Input by Fuel Type				SO2 Tons by Fuel Type		
		Quadrillion Btu			Total	1000 Tons		
		Coal	Oil	Gas	2005	Coal	Oil	Gas
%								
Diff	East Central Area Reliability CA	2%	-87%	-75%	-3%	-6%	-90%	-65%
%								
Diff	Electric Reliability Council of Texas	-5%	84%	10%	3%	-5%	1054%	13%
%								
Diff	Florida Reliability Coordinating Council	10%	-18%	13%	5%	6%	-43%	-95%
%								
Diff	Mid-America Interconnected Network	0%	-92%	-64%	-8%	6%	-91%	-58%
%								
Diff	Mid-Atlantic Area Council	-1%	-82%	88%	-4%	-9%	-90%	-22%
%								
Diff	Mid-Continent Area Power Pool	-2%	-66%	-52%	-4%	-3%	-81%	-100%
%								
Diff	New York ISO	-12%	-23%	-3%	14%	-17%	-65%	-9%
%								
Diff	Northeast Power Coordinating Council	12%	-70%	-1%	10%	32%	-66%	2%
%								
Diff	Southeastern Electric Reliability Council	1%	-75%	0%	0%	4%	-88%	-92%
%								
Diff	Southwest Power Pool	-8%	-63%	6%	-5%	-9%	-85%	-8%
%								
Diff	Western Systems Coordinating Council	-10%	-9%	1%	-7%	-24%	237%	1%
%								
Diff	Subtotal by Fuel	-1%	-41%	-1%	-3%	-3%	-62%	-82%

**Appendix B : Detail SO<sub>2</sub> Emissions & Heat Input by NERC Region by Fuel Type**

Jan- June 2005 vs 2006

**Year-to-Date 2006 Results**

Region	Heat Input by Fuel Type				NOx Tons by Fuel Type			
	Quadrillion Btu			Total 2005	1000 Tons			
	Coal	Oil	Gas		Coal	Oil	Gas	
2006 ytd	East Central Area Reliability CA	0.8	0.0	0.1	0.9	82	0	2
2006 ytd	Mid-America Interconnected Network	0.2	0.0	0.0	0.2	12	0	0
2006 ytd	Mid-Atlantic Area Council	0.2	0.0	0.1	0.3	22	0	2
2006 ytd	New York ISO	0.0	0.0	0.1	0.1	6	2	1
2006 ytd	Northeast Power Coordinating Council	0.0	0.0	0.1	0.1	2	1	1
2006 ytd	Southeastern Electric Reliability Council	0.6	0.0	0.0	0.6	47	0	1
2006 ytd	Subtotal by Fuel	1.8	0.0	0.3	2.2	170.9	3.4	5.8

**Year-to-Date 2005 Results**

Region	Heat Input by Fuel Type				NOx Tons by Fuel Type			
	Quadrillion Btu			Total 2005	1000 Tons			
	Coal	Oil	Gas		Coal	Oil	Gas	
2005 ytd	East Central Area Reliability CA	0.9	0.0	0.1	0.9	77	0	2
2005 ytd	Mid-America Interconnected Network	0.2	0.0	0.0	0.2	13	0	0
2005 ytd	Mid-Atlantic Area Council	0.3	0.0	0.1	0.3	25	2	3
2005 ytd	New York ISO	0.0	0.0	0.0	0.1	5	3	1
2005 ytd	Northeast Power Coordinating Council	0.0	0.0	0.1	0.1	2	1	1
2005 ytd	Southeastern Electric Reliability Council	0.5	0.0	0.0	0.6	46	1	1
2005 ytd	Subtotal by Fuel	1.9	0.1	0.3	2.2	168.2	7.4	8.7

**Year-to-Date 2005 Results**

Region	Heat Input by Fuel Type				NOx Tons by Fuel Type			
	Quadrillion Btu			Total 2005	1000 Tons			
	Coal	Oil	Gas		Coal	Oil	Gas	
Diff	East Central Area Reliability CA	-2%	-75%	-5%	-3%	6%	-85%	-21%
Diff	Mid-America Interconnected Network	-8%	-99%	-34%	-10%	-3%	-99%	-21%
Diff	Mid-Atlantic Area Council	-14%	-73%	-5%	-15%	-14%	-83%	-49%
Diff	New York ISO	49%	-7%	34%	23%	26%	-36%	-27%
Diff	Northeast Power Coordinating Council	1%	-24%	8%	2%	7%	-23%	-2%
Diff	Southeastern Electric Reliability Council	5%	-47%	37%	6%	1%	-51%	-40%
	Subtotal by Fuel	-2%	-33%	7%	-2%	2%	-55%	-34%