2016 Non-Ozone Season NOx Emission Rate Application Compared to MANE-VU Best Observed Rate Analysis - 2028 EGU Projection

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BACKGROUND

In its summary white paper titled "Impact of Wintertime SCR/SNCR Optimization on Visibility Impairing Nitrate Precursor Emissions[1]," the MANE-VU Technical Support Committee analyzed the hypothetical impact of operating NOx control equipment on certain EGUs in the winter of 2028 by applying the best observed rate (BOR) that had ever been reported by the EGU to CAMD to heat input projections generated by version 2.6 of the ERTAC EGU forecasting tool.

Reliance on the historical BOR for the units examined in the report is an arbitrary action that ignores the capability of the existing NOx control equipment at the selected EGUs to achieve that the historical BOR.

Any discussion of the operation of these controls must necessarily begin with the point that these EGUs are being operated in conformity with and in compliance with both state and federal law. The CSAPR program results in unit-specific caps being placed on each of the subject power plants. In addition, all units are subject to Title V air permits and many units are subject to state or federal consent orders. These units are, in fact and in law, being operated appropriately.

Aside from the lack of any regulatory reason to maintain the BOR throughout the operation of NOx control equipment, there are myriad factors that prevent the BOR from being used as the indicator of unit performance today or in the future. These include but are certainly not limited to the following:

1. The efficiency of NOx control equipment inevitably degrades from initial unit operations. This best illustrated by the fact the when a unit begins operation it catalyst is completely new and therefor the most effective. After startup it is typical for the catalyst of a unit to be replaced at a rate of 25% every two years. Therefore there is never a time after unit startup that 100% of the catalyst is fresh.
2. Taking units from operation during the ozone season only to year round operation, raises maintenance issue for the units. This overtaxing of the units is known to plug-up air heaters and to result in ammonia slip.
3. The fact that units today may well be part of a control strategy to remove mercury also creates limitations on the ability of an EGU to optimize the unit for NOx. This is because the SCRs are being used to oxidized mercury so that it can be effectively captured the plant's baghouses. Optimizing for mercury necessarily means that the unit cannot be optimized for NOx.
4. It is also the case that units are not operated the same today as they have been operated historically. The reality of today's unit dispatching is that units swing load dramatically on a daily basis. This changing load not only results in lower efficiency of the control equipment as it seeks to follow the load of the generator, but also results in lower flue gas temperature which makes the unit less efficient and increases the potential for plugging.

[1] http://otcair.org/upload/Documents/Meeting%20Materials/Winter%20NOX%20Control%20Memo%20170905.docx

MANE-VU has not presented any data to show that it considered any of these operational factors in its analysis. In addition, the best observed rate used to calculate emission reductions during the non-ozone season shows a six-month reduction of about 95,700 tons from MANE-VU, LADCO, and SESARM sources relative to the ERTAC v2.6, or roughly 526 tons/day from all three regions. The MANE-VU memo fails, however, to offer any analysis about whether these emission reductions (even if true) would be enough to move the needle in Brigantine on a 20% worst day when the bulk of NOx is being generated within 100 miles from the mobile source sector.

BOR COMPARISON TO 2016 EMISSION RATES

Had MANE-VU's report used the more realistic 2016 emission rates for the EGUs examined, and not the BOR for those units, it is clear that the proposed strategy would have resulted is significantly lower emission reductions – and with no analysis in either case about what if any improvement in visibility would have resulted at Brigantine.

MANE-VU, in an attempt to estimate the impacts of optimizing post-combustion EGU controls during the winter on coal-fired sources, applied Maryland Department of Environment methodology for best operating rate (BOR) calculations to ERTAC v.2.6 projected heat input rates for 2028. The resultant NOx emission values were designed to develop a potential future year control strategy designed to address regional haze at the Brigantine NWR receptor.

As noted in the previous section, these "optimized" rates are far from achievable on a regular, annual basis, largely due to the limitations in the ability of the operators to match these "out of the box" rates when both the equipment and catalysts were new, as well as the reality of today's dispatching schedules, and daily load swings associated with operating an EGU.

To better estimate a realistic level of EGU operation in today's market environment, MOG sponsored the development of an independent analysis utilizing the same 2028 heat input projections from ERTAC v.2.6 and 2016 ozone season NOx emission rates.

As demonstrated in Table 1 (and at the unit level in Appendix A), using these most current operating rates, MOG found that projected emissions using 2016 rates were 117,405 tons higher (267,026 tons total) in the non-ozone season compared to MANE-VU's BOR rate application (149,621 tons total). This translated to a 2016-based average emission rate in 2028 of 0.127 lbs NOx/MMBtu compared to the BOR rate of 0.071 lbs NOx/MMBtu for the same 291 units.

MANE-VU also attempted to associate these calculated emission reductions to achieving visibility improvements at Brigantine, without the benefit of additional visibility modeling or analyses. In fact, MANE-VU chose to ignore the largest nitrate contributing source category, onroad motor vehicles, and dismissed the source sector by stating "the focus of the analysis is not on heavy-duty vehicles or mobile sources in total, which do have a large overall contribution". By excluding the onroad mobile category, MANE-VU was predisposed to controlling what category was next in line, although recent source

apportionment analyses[2] indicate EGU NOx contributions to monitors in both rural and urban MANE-VU states are less than half that of onroad source emissions.

Table 1. Comparison of MANE-VU calculated best reported rate compared to 2016 ozone season rate as applied to ERTAC EGU v.2.6 projected heat input to 2028.

State	ERTAC v.2.6 2028 Non-OS HI (MMBtu)	MANE-VU RH Memo Rate BOR (lbs/MMBtu)	CAMD 2016 OS Rate (lbs/MMBtu)	Non-OS NOx Emissions (Tons) BOR	2016 Rate	2016-BOR
AL Total	191,541,706	0.071	0.101	6,795.8	9,711.1	2,915.3
AR Total	54,733,294	0.052	0.055	1,431.9	1,512.2	80.2
DE Total	4,221,703	0.066	0.080	138.7	167.8	29.1
FL Total	221,835,645	0.074	0.168	8,168.6	18,582.9	10,414.4
GA Total	236,508,366	0.057	0.065	6,716.9	7,638.2	921.3
IA Total	59,268,687	0.117	0.117	3,461.4	3,479.5	18.1
IL Total	227,216,940	0.068	0.086	7,773.7	9,806.7	2,033.1
IN Total	310,223,130	0.066	0.148	10,209.6	22,944.9	12,735.4
KS Total	108,208,656	0.098	0.104	5,305.7	5,600.3	294.6
KY Total	308,613,182	0.062	0.115	9,499.4	17,779.3	8,279.9
LA Total	73,151,469	0.130	0.145	4,744.0	5,321.7	577.7
MD Total	121,527,670	0.085	0.090	5,169.8	5,487.8	318.0
MI Total	132,598,562	0.043	0.058	2,843.7	3,858.9	1,015.2
MN Total	57,141,572	0.098	0.102	2,795.1	2,921.6	126.5
MO Total	203,161,222	0.089	0.282	9,077.9	28,641.9	19,564.0
NC Total	159,254,668	0.075	0.135	6,007.8	10,780.1	4,772.3
NE Total	30,798,029	0.059	0.058	903.7	897.7	-6.0
NH Total	7,134,482	0.163	0.337	582.6	1,201.2	618.6
NJ Total	12,531,693	0.097	0.096	608.0	598.7	-9.3
OH Total	439,595,880	0.076	0.134	16,796.7	29,355.6	12,558.9
PA Total	333,510,141	0.069	0.221	11,542.1	36,888.4	25,346.4
SC Total	109,148,268	0.065	0.086	3,564.4	4,708.2	1,143.8
TN Total	106,916,646	0.057	0.071	3,063.8	3,800.4	736.6
TX Total	225,574,120	0.074	0.081	8,333.6	9,118.5	784.9
VA Total	46,994,277	0.165	0.193	3,876.7	4,545.5	668.7
WI Total	121,334,574	0.053	0.055	3,203.4	3,345.0	141.6
WV Total	290,110,938	0.048	0.126	7,006.5	18,332.9	11,326.4
Grand Total	**4,192,855,522**	**0.071**	**0.127**	**149,621.354**	**267,026.945**	**117,405.6**

Furthermore, visibility impairment in the northeast is still largely based on sulfate contributions for both the worst and best 20% visibility days. Figure 1 shows extinction budgets by group for 2015 at the Brigantine NWR receptor. Figure 2 shows the trend in light extinction at Brigantine on W20% days and the significant decrease in sulfate contribution compared to the constant nitrate contribution over the time period presented. During this time period of 2000 through 2016, both SO2 and NOx emissions from EGUs have decreased dramatically. This can be seen in Figures 3 and 4.

[2] http://midwestozonegroup.com/files/Relative_Contribution_of_Upwind_Sources_on_Key_Monitors.pdf

Figure 1. Extinction budget by group, 2015, Brigantine NWR.

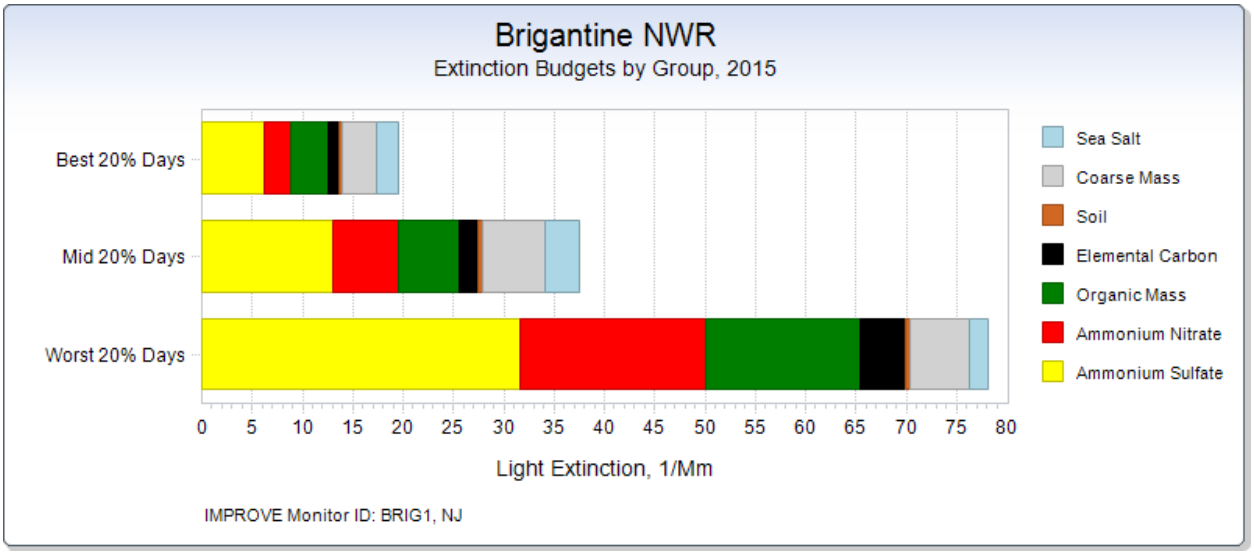
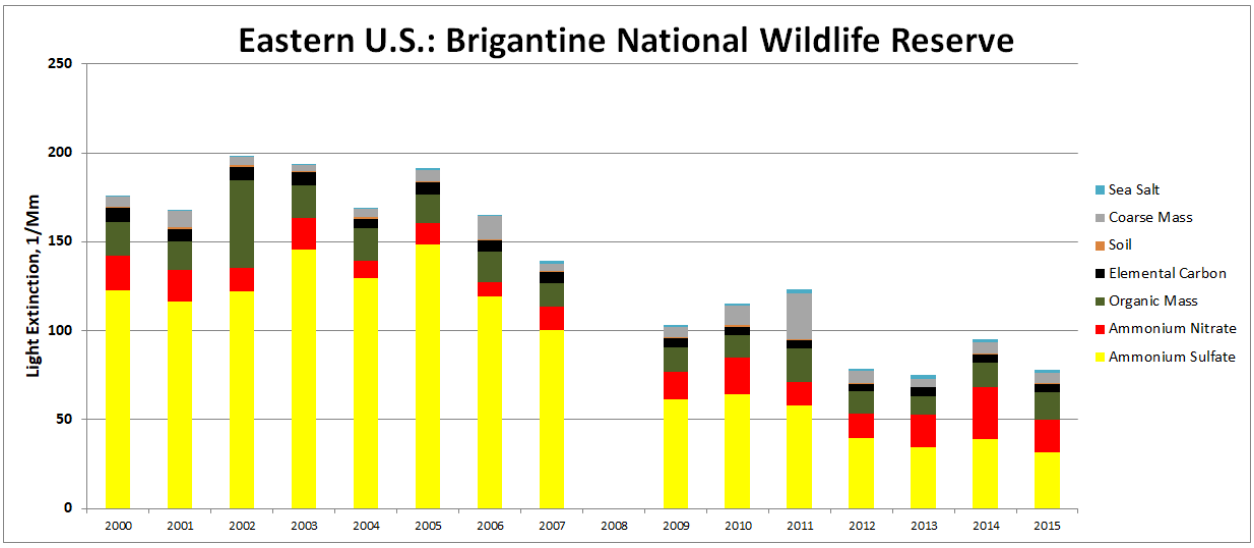


Figure 2. Relative contribution to light extinction at Brigantine NWR on W20% visibility days.



In fact, while the decrease in sulfate contribution to light extinction at Brigantine has largely traced the same reduction pattern as SO2 emissions from EGUs, the nitrate contribution does not demonstrate the same correlation, likely indicating a consistent NOx- emitting source category other than EGUs that is the significant contributor to poor visibility days. Figure 5 presents a trend of relative contribution by source category during the years 1990 through 2014. When looking at the window of time between 2000 and 2014, we note the relatively constant emission contribution from mobile and increasing industrial source emissions. Using relative NOx emission contributions as the indicator to nitrate contribution of light extinction at Brigantine, these results point to categories other than EGU sources.

Figure 3. National, annual EGU SO2 emission trends (2000-2016).

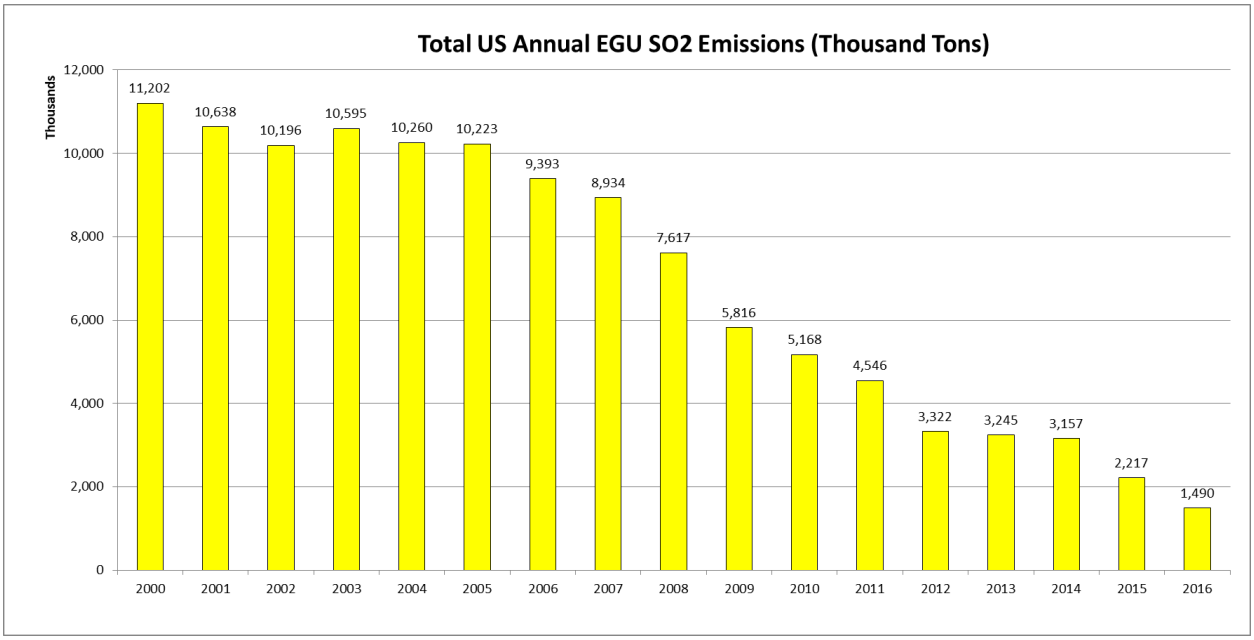


Figure 4. National, annual EGU NOx emission trends (2000-2016).

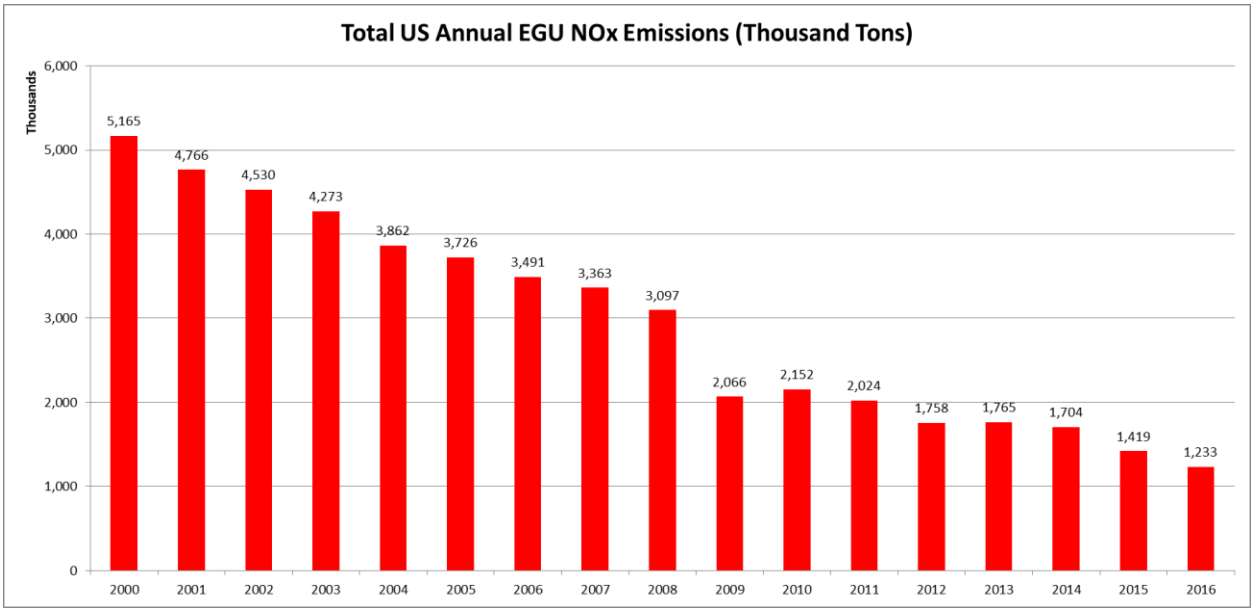
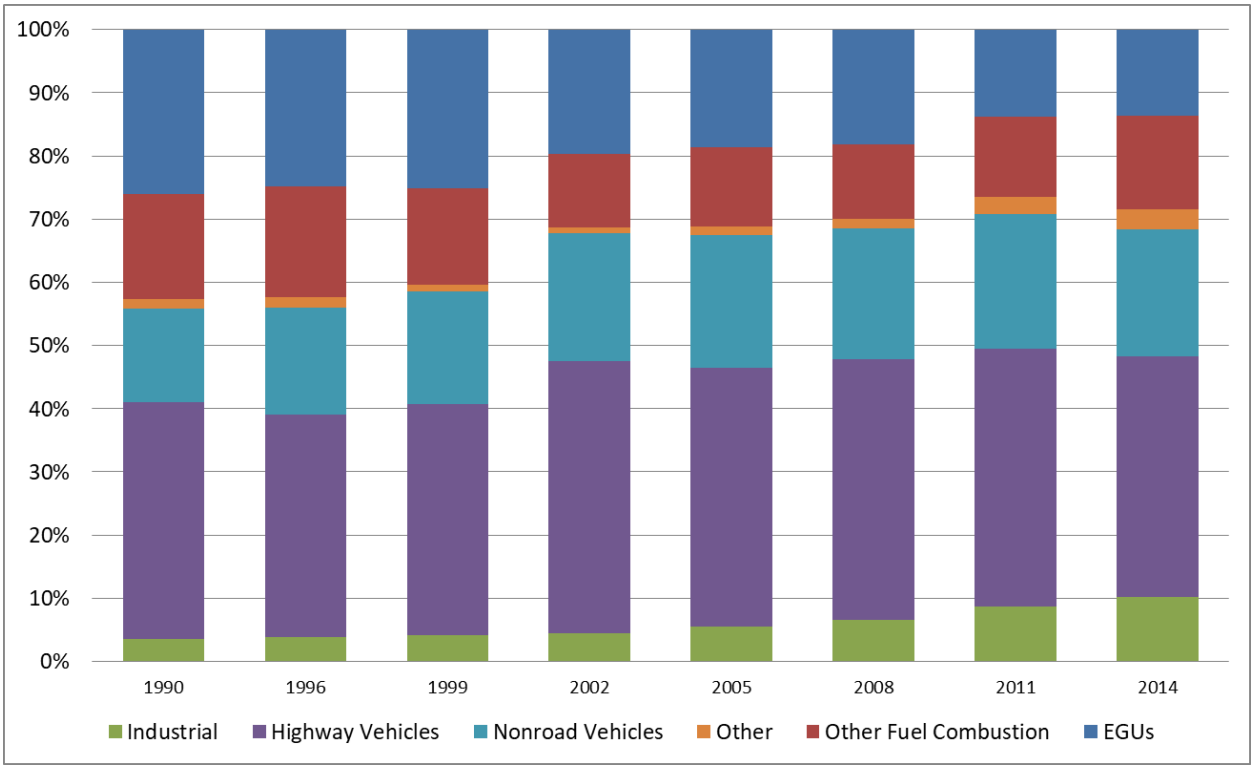


Figure 5. Relative contribution (%) trends of national, annual NOx emissions by category (1990-2014).



Appendix A

Tabular Unit Level Comparisons of MANE-VU Best Observed Rate (BOR) and 2016 Ozone Season Rate

State	Facility	ORISPL Code	Unit ID	ERTAC v.2.6 2028 Non-OS HI	MANE-VU RH Memo Rate BOR (lbs/MMBtu)	BOR Year	CAMD 2016 OS Rate (lbs/MMBtu)	Non-OS NOx Emissions (Tons) BOR	2016 Rate	2016-BOR
AL	Barry	3	4	3,189,719	0.2262	2008	0.3867	360.8	616.7	256.0
AL	Barry	3	5	8,849,823	0.0603	2010	0.0758	266.8	335.4	68.6
AL	Gorgas	8	10	14,652,959	0.068	2006	0.164	498.2	1,201.5	703.3
AL	E C Gaston	26	5	24,413,957	0.076	2007	0.0673	927.7	821.5	-106.2
AL	Charles R Lowman	56	2	8,489,901	0.164	2011	0.307	696.2	1,303.2	607.0
AL	Charles R Lowman	56	3	8,587,123	0.0585	2011	0.3094	251.2	1,328.4	1,077.3
AL	James H Miller Jr	6002	1	30,325,915	0.0656	2011	0.0737	994.7	1,117.5	122.8
AL	James H Miller Jr	6002	2	29,657,851	0.0538	2011	0.074	797.8	1,097.3	299.5
AL	James H Miller Jr	6002	3	30,622,532	0.0634	2006	0.0542	970.7	829.9	-140.9
AL	James H Miller Jr	6002	4	32,751,926	0.063	2008	0.0647	1,031.7	1,059.5	27.8
AL Total				**191,541,706**	**0.071**		**0.101**	**6,795.8**	**9,711.1**	**2,915.3**
AR	Plum Point Energy Station	56456	1	27,989,869	0.064	2012	0.071	897.1	986.6	89.6
AR	John W. Turk Jr. Power Plant	56564	SN-01	26,743,425	0.040	2014	0.039	534.9	525.5	-9.4
AR Total				**54,733,294**	**0.052**		**0.055**	**1,431.9**	**1,512.2**	**80.2**
DE	Indian River	594	4	4,221,703	0.066	2012	0.080	138.7	167.8	29.1
DE Total				**4,221,703**	**0.066**		**0.080**	**138.7**	**167.8**	**29.1**
FL	Seminole (136)	136	1	19,801,771	0.043	2010	0.065	429.7	641.6	211.9
FL	Seminole (136)	136	2	21,202,633	0.040	2011	0.064	428.3	680.6	252.3
FL	St. Johns River Power	207	1	16,471,181	0.127	2010	0.405	1,041.8	3,332.9	2,291.1
FL	St. Johns River Power	207	2	18,984,816	0.127	2010	0.344	1,209.3	3,262.5	2,053.2
FL	Curtis H. Stanton Energy Center	564	2	13,396,414	0.104	2015	0.102	698.0	684.6	-13.4
FL	Crystal River	628	4	18,271,653	0.050	2014	0.058	460.4	532.6	72.2
FL	Crystal River	628	5	26,618,549	0.045	2010	0.067	593.6	893.1	299.5
FL	Crist Electric Generating Plant	641	5	2,273,281	0.119	2015	0.433	135.6	491.9	356.3
FL	Crist Electric Generating Plant	641	7	15,466,794	0.084	2008	0.646	651.2	4,998.1	4,346.9
FL	Big Bend	645	BB01	15,417,742	0.082	2011	0.089	634.4	688.4	54.0
FL	Big Bend	645	BB02	6,765,198	0.081	2010	0.090	273.7	305.8	32.1
FL	Big Bend	645	BB03	13,827,237	0.091	2015	0.096	627.8	663.7	36.0
FL	Big Bend	645	BB04	17,451,110	0.075	2010	0.076	652.7	661.4	8.7
FL	Deerhaven	663	B2	4,873,224	0.057	2012	0.153	139.1	373.8	234.6
FL	Northside	667	1A	4,555,300	0.025	2013	0.064	57.4	145.5	88.1
FL	Northside	667	2A	6,458,741	0.042	2012	0.070	135.6	226.4	90.7

State	Facility	ORISPL Code	Unit ID	ERTAC v.2.6 2028 Non-OS HI	MANE-VU RH Memo Rate BOR (lbs/MMBtu)	BOR Year	CAMD 2016 OS Rate (lbs/MMBtu)	Non-OS NOx Emissions (Tons) BOR	2016 Rate	2016-BOR
FL Total				**221,835,645**	**0.074**		**0.168**	**8,168.6**	**18,582.9**	**10,414.4**
GA	Hammond	708	4	12,766,901	0.055	2007	0.114	353.0	729.6	376.6
GA	Wansley (6052)	6052	1	19,426,391	0.048	2010	0.054	461.4	528.4	67.0
GA	Wansley (6052)	6052	2	12,767,414	0.051	2006	0.058	323.7	372.8	49.2
GA	Scherer	6257	1	20,851,301	0.061	2014	0.064	639.1	666.2	27.1
GA	Scherer	6257	2	21,678,863	0.061	2014	0.063	656.9	682.9	26.0
GA	Scherer	6257	3	37,519,686	0.059	2012	0.064	1,112.5	1,198.8	86.3
GA	Scherer	6257	4	34,930,440	0.063	2013	0.065	1,095.1	1,138.7	43.7
GA	Bowen	703	1BLR	22,613,910	0.055	2008	0.061	618.5	693.1	74.6
GA	Bowen	703	2BLR	14,021,337	0.054	2006	0.064	380.7	448.7	68.0
GA	Bowen	703	3BLR	19,964,073	0.055	2006	0.059	552.0	590.9	38.9
GA	Bowen	703	4BLR	19,968,050	0.053	2013	0.059	524.2	588.1	63.9
GA Total				**236,508,366**	**0.057**		**0.065**	**6,716.9**	**7,638.2**	**921.3**
IA	Walter Scott Jr. Energy Center	1082	4	31,274,451	0.054	2010	0.055	839.7	852.2	12.5
IA	George Neal South	7343	4	27,994,237	0.187	2015	0.188	2,621.7	2,627.3	5.6
IA Total				**59,268,687**	**0.117**		**0.117**	**3,461.4**	**3,479.5**	**18.1**
IL	Coffeen	861	01	13,097,096	0.050	2011	0.074	324.2	483.9	159.8
IL	Coffeen	861	02	18,373,498	0.052	2008	0.078	481.4	714.7	233.3
IL	Kincaid Station	876	1	17,588,227	0.058	2013	0.064	507.4	561.1	53.6
IL	Kincaid Station	876	2	14,449,149	0.060	2009	0.066	433.5	475.4	41.9
IL	Powerton	879	51	18,176,473	0.099	2013	0.107	895.2	975.2	80.0
IL	Powerton	879	52	17,702,640	0.099	2015	0.101	873.6	894.9	21.2
IL	Baldwin Energy Complex	889	2	26,733,786	0.051	2010	0.074	680.4	994.5	314.1
IL	Havana	891	9	23,750,716	0.029	2008	0.077	344.4	914.4	570.0
IL	Dallman	963	31	2,701,834	0.094	2007	0.108	126.7	145.2	18.5
IL	Dallman	963	32	2,019,166	0.085	2008	0.105	85.4	106.0	20.6
IL	Dallman	963	33	5,094,406	0.060	2014	0.063	153.6	159.5	5.9
IL	Marion	976	4	8,113,687	0.079	2015	0.087	318.5	351.3	32.9
IL	Duck Creek	6016	1	13,700,030	0.074	2009	0.089	504.2	610.3	106.2
IL	Powerton	879	61	19,556,540	0.097	2013	0.112	951.4	1,095.2	143.7
IL	Powerton	879	62	20,596,799	0.089	2015	0.108	911.4	1,110.2	198.8
IL	Marion	976	123	5,562,894	0.066	2006	0.077	182.5	215.0	32.5

State	Facility	ORISPL Code	Unit ID	ERTAC v.2.6 2028 Non-OS HI	MANE-VU RH Memo Rate BOR (lbs/MMBtu)	BOR Year	CAMD 2016 OS Rate (lbs/MMBtu)	Non-OS NOx Emissions (Tons) BOR	2016 Rate	2016-BOR
IL Total				**227,216,940**	**0.068**		**0.086**	**7,773.7**	**9,806.7**	**2,033.1**
IN	Clifty Creek	983	1	9,115,849	0.074	2005	0.286	335.0	1,302.7	967.6
IN	Clifty Creek	983	2	8,935,489	0.075	2005	0.293	335.1	1,307.7	972.6
IN	Clifty Creek	983	3	8,798,629	0.074	2005	0.278	326.4	1,223.9	897.5
IN	Petersburg	994	2	18,846,119	0.051	2005	0.149	480.6	1,405.9	925.3
IN	Petersburg	994	3	22,611,928	0.047	2005	0.185	526.9	2,092.7	1,565.9
IN	Michigan City Generating Station	997	12	19,176,568	0.092	2005	0.084	882.1	805.4	-76.7
IN	F B Culley Generating Station	1012	2	638,351	0.148	2015	0.304	47.3	96.9	49.6
IN	F B Culley Generating Station	1012	3	10,744,140	0.089	2015	0.121	475.4	651.1	175.7
IN	R M Schahfer Generating Station	6085	14	10,456,066	0.098	2013	0.113	511.8	589.2	77.4
IN	Gibson	6113	1	19,491,802	0.034	2007	0.172	334.3	1,672.4	1,338.1
IN	Gibson	6113	2	17,017,384	0.067	2006	0.166	571.8	1,415.8	844.1
IN	Gibson	6113	3	16,123,137	0.066	2005	0.191	531.3	1,538.1	1,006.9
IN	Gibson	6113	4	26,691,428	0.063	2008	0.134	843.4	1,789.7	946.2
IN	Gibson	6113	5	20,603,364	0.060	2007	0.167	615.0	1,718.3	1,103.3
IN	A B Brown Generating Station	6137	1	5,987,883	0.076	2006	0.165	226.3	494.0	267.7
IN	A B Brown Generating Station	6137	2	8,907,281	0.101	2006	0.124	449.4	552.7	103.3
IN	Alcoa Allowance Management Inc	6705	4	14,947,498	0.095	2007	0.296	708.5	2,212.2	1,503.7
IN	Edwardsport	1004	CTG1	11,428,419	0.044	2014	0.056	253.1	321.1	68.0
IN	Edwardsport	1004	CTG2	11,110,826	0.052	2014	0.050	290.0	277.8	-12.2
IN	Merom	6213	1SG1	24,032,302	0.062	2014	0.061	745.0	728.2	-16.8
IN	Merom	6213	2SG1	24,558,668	0.059	2015	0.061	720.8	749.0	28.2
IN Total				**310,223,130**	**0.066**		**0.148**	**10,209.6**	**22,944.9**	**12,735.4**
KS	La Cygne	1241	1	22,973,562	0.081	2011	0.079	930.4	901.7	-28.7
KS	La Cygne	1241	2	30,745,283	0.091	2015	0.099	1,395.8	1,518.8	123.0
KS	Jeffrey Energy Center	6068	2	19,411,125	0.099	2015	0.113	958.9	1,099.6	140.7
KS	Jeffrey Energy Center	6068	3	35,078,687	0.115	2015	0.119	2,020.5	2,080.2	59.6
KS Total				**108,208,656**	**0.098**		**0.104**	**5,305.7**	**5,600.3**	**294.6**
KY	Ghent	1356	1	21,966,325	0.045	2005	0.071	492.0	774.3	282.3
KY	Ghent	1356	3	16,780,288	0.027	2005	0.173	228.2	1,451.5	1,223.3
KY	Ghent	1356	4	17,917,088	0.027	2005	0.108	243.7	964.8	721.2
KY	Mill Creek	1364	3	12,915,464	0.045	2005	0.063	290.6	408.1	117.5

State	Facility	ORISPL Code	Unit ID	ERTAC v.2.6 2028 Non-OS HI	MANE-VU RH Memo Rate BOR (lbs/MMBtu)	BOR Year	CAMD 2016 OS Rate (lbs/MMBtu)	Non-OS NOx Emissions (Tons) BOR	2016 Rate	2016-BOR
KY	Mill Creek	1364	4	20,482,974	0.037	2007	0.047	383.0	478.3	95.2
KY	Elmer Smith	1374	1	6,675,844	0.123	2006	0.242	410.2	809.1	398.9
KY	Elmer Smith	1374	2	12,994,198	0.218	2005	0.348	1,415.7	2,262.3	846.6
KY	Paradise	1378	3	27,270,666	0.100	2005	0.221	1,364.9	3,017.5	1,652.6
KY	East Bend	6018	2	29,471,104	0.052	2006	0.120	763.3	1,769.7	1,006.4
KY	H L Spurlock	6041	1	11,319,687	0.083	2008	0.088	469.2	499.2	30.0
KY	H L Spurlock	6041	2	24,616,064	0.073	2006	0.092	897.3	1,136.0	238.8
KY	H L Spurlock	6041	3	8,698,865	0.058	2015	0.064	251.0	276.6	25.7
KY	H L Spurlock	6041	4	13,580,904	0.060	2012	0.057	410.1	389.1	-21.1
KY	Trimble County	6071	1	18,340,496	0.031	2005	0.087	283.4	800.6	517.2
KY	Trimble County	6071	2	26,226,358	0.041	2015	0.048	533.7	629.4	95.7
KY	HMP&L Station 2	1382	H1	7,879,944	0.061	2007	0.209	238.8	822.3	583.5
KY	HMP&L Station 2	1382	H2	7,784,269	0.067	2009	0.147	259.2	573.7	314.5
KY	D B Wilson	6823	W1	23,692,644	0.048	2006	0.061	565.1	716.7	151.6
KY Total				**308,613,182**	**0.062**		**0.115**	**9,499.4**	**17,779.3**	**8,279.9**
LA	Dolet Hills Power Station	51	1	31,241,808	0.192	2014	0.200	2,994.5	3,122.6	128.1
LA	Rodemacher Power Station (6190)	6190	2	20,068,912	0.136	2015	0.174	1,362.7	1,748.0	385.3
LA	Rodemacher Power Station (6190)	6190	3-1	10,889,364	0.029	2011	0.040	157.4	216.7	59.3
LA	Rodemacher Power Station (6190)	6190	3-2	10,951,384	0.042	2014	0.043	229.4	234.4	4.9
LA Total				**73,151,469**	**0.130**		**0.145**	**4,744.0**	**5,321.7**	**577.7**
MD	Brandon Shores	602	1	16,806,243	0.059	2007	0.064	494.9	533.6	38.7
MD	Brandon Shores	602	2	16,164,190	0.073	2015	0.073	592.4	587.6	-4.8
MD	C P Crane	1552	1	2,084,856	0.278	2015	0.264	290.1	275.2	-14.9
MD	C P Crane	1552	2	2,234,516	0.235	2015	0.255	262.7	284.5	21.8
MD	Herbert A Wagner	1554	2	2,301,134	0.222	2015	0.170	255.7	195.4	-60.3
MD	Herbert A Wagner	1554	3	4,661,530	0.055	2015	0.060	128.7	139.1	10.5
MD	Mirant Chalk Point	1571	1	8,585,791	0.104	2014	0.133	446.5	570.5	124.1
MD	Mirant Chalk Point	1571	2	12,644,019	0.193	2009	0.191	1,218.3	1,207.5	-10.7
MD	Mirant Dickerson	1572	1	1,633,479	0.220	2015	0.222	179.4	181.2	1.7
MD	Mirant Dickerson	1572	2	2,392,387	0.221	2015	0.220	264.6	262.6	-2.0
MD	Mirant Dickerson	1572	3	2,062,323	0.218	2015	0.210	224.6	217.0	-7.6
MD	Mirant Morgantown	1573	1	20,238,476	0.025	2013	0.037	254.0	374.4	120.4

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MD	Mirant Morgantown	1573	2	19,876,982	0.031	2011	0.040	307.1	399.5	92.4
MD	AES Warrior Run	10678	001	9,841,742	0.051	2008	0.053	251.0	259.8	8.9
MD Total				**121,527,670**	**0.085**		**0.090**	**5,169.8**	**5,487.8**	**318.0**
MI	Dan E Karn	1702	1	7,774,205	0.049	2015	0.057	189.7	222.3	32.7
MI	Dan E Karn	1702	2	7,963,131	0.044	2015	0.046	176.4	183.2	6.8
MI	J H Campbell	1710	2	7,996,020	0.037	2015	0.031	146.3	124.7	-21.6
MI	J H Campbell	1710	3	36,198,399	0.041	2015	0.049	749.3	885.1	135.7
MI	Monroe	1733	1	28,956,830	0.038	2014	0.072	550.2	1,046.8	496.6
MI	Monroe	1733	3	16,988,518	0.057	2011	0.053	486.7	453.6	-33.1
MI	Monroe	1733	4	26,721,458	0.041	2013	0.071	545.1	943.3	398.1
MI Total				**132,598,562**	**0.043**		**0.058**	**2,843.7**	**3,858.9**	**1,015.2**
MN	Boswell Energy Center	1893	1	3,116,852	0.171	2014	0.174	266.2	270.7	4.5
MN	Boswell Energy Center	1893	2	3,409,822	0.171	2014	0.176	292.2	299.9	7.7
MN	Boswell Energy Center	1893	3	17,124,277	0.050	2010	0.057	428.1	484.6	56.5
MN	Boswell Energy Center	1893	4	27,705,074	0.106	2015	0.110	1,464.2	1,523.8	59.6
MN	Taconite Harbor Energy Center	10075	1	3,302,069	0.117	2014	0.114	193.5	187.7	-5.8
MN	Taconite Harbor Energy Center	10075	2	2,483,479	0.122	2014	0.125	150.9	154.8	4.0
MN Total				**57,141,572**	**0.098**		**0.102**	**2,795.1**	**2,921.6**	**126.5**
MO	Asbury	2076	1	8,191,041	0.092	2009	0.152	376.0	621.3	245.3
MO	Sibley	2094	1	1,624,851	0.341	2013	0.732	277.3	594.3	317.0
MO	Sibley	2094	2	1,073,888	0.416	2013	0.709	223.4	380.5	157.1
MO	Sibley	2094	3	13,151,184	0.079	2010	0.310	517.5	2,039.1	1,521.6
MO	New Madrid Power Plant	2167	1	24,836,445	0.090	2008	0.709	1,111.4	8,800.8	7,689.4
MO	New Madrid Power Plant	2167	2	19,161,991	0.094	2009	0.457	901.6	4,375.6	3,474.1
MO	Iatan	6065	1	26,551,497	0.061	2015	0.069	813.8	913.4	99.6
MO	John Twitty Energy Center	6195	1	7,660,210	0.083	2013	0.062	317.5	237.1	-80.4
MO	John Twitty Energy Center	6195	2	9,721,843	0.060	2014	0.067	289.7	327.1	37.4
MO	Sikeston	6768	1	11,926,846	0.105	2013	0.110	623.8	657.2	33.4
MO	Hawthorn	2079	5A	23,798,555	0.072	2012	0.074	854.4	884.1	29.7
MO	Thomas Hill Energy Center	2168	MB1	9,183,279	0.096	2010	0.450	439.9	2,063.9	1,624.1
MO	Thomas Hill Energy Center	2168	MB2	11,426,405	0.115	2015	0.469	657.0	2,680.1	2,023.0
MO	Thomas Hill Energy Center	2168	MB3	34,853,188	0.096	2010	0.233	1,674.7	4,067.4	2,392.7

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MO Total				**203,161,222**	**0.089**		**0.282**	**9,077.9**	**28,641.9**	**19,564.0**
NC	Roxboro	2712	1	6,045,312	0.084	2005	0.137	253.9	413.2	159.3
NC	Roxboro	2712	2	8,816,443	0.058	2011	0.102	253.5	450.1	196.6
NC	G G Allen	2718	4	1,032,515	0.178	2008	0.302	91.8	156.0	64.2
NC	G G Allen	2718	5	910,567	0.191	2012	0.259	87.1	118.1	31.1
NC	Cliffside	2721	5	2,818,693	0.056	2011	0.161	78.9	226.3	147.4
NC	Cliffside	2721	6	20,913,637	0.046	2013	0.052	477.9	547.9	70.1
NC	Marshall	2727	1	3,866,238	0.196	2010	0.249	378.9	481.3	102.5
NC	Marshall	2727	2	5,933,974	0.196	2010	0.256	580.3	760.1	179.8
NC	Marshall	2727	3	14,729,751	0.068	2009	0.097	500.1	712.9	212.8
NC	Marshall	2727	4	14,082,929	0.201	2008	0.230	1,413.9	1,622.4	208.4
NC	Belews Creek	8042	1	24,448,349	0.028	2007	0.134	342.3	1,635.6	1,293.3
NC	Belews Creek	8042	2	27,397,178	0.038	2009	0.114	523.3	1,563.0	1,039.7
NC	Roxboro	2712	3A	4,656,378	0.074	2005	0.171	172.8	397.2	224.4
NC	Roxboro	2712	3B	4,375,997	0.076	2005	0.170	165.4	371.3	205.9
NC	Roxboro	2712	4A	4,835,337	0.079	2009	0.116	191.7	280.9	89.2
NC	Roxboro	2712	4B	4,359,298	0.079	2009	0.117	172.8	254.8	82.0
NC	Westmoreland Partners Roanoke Valley II	54755	2	463,093	0.132	2015	0.155	30.5	35.8	5.3
NC	Mayo	6250	1A	5,018,471	0.061	2007	0.157	153.1	395.0	241.9
NC	Mayo	6250	1B	4,550,506	0.061	2007	0.157	139.7	358.1	218.4
NC Total				**159,254,668**	**0.075**		**0.135**	**6,007.8**	**10,780.1**	**4,772.3**
NE	Gerald Whelan Energy Center	60	2	4,033,768	0.062	2012	0.067	124.8	134.9	10.1
NE	Nebraska City Station	6096	2	26,764,261	0.058	2015	0.057	778.8	762.8	-16.1
NE Total				**30,798,029**	**0.059**		**0.058**	**903.7**	**897.7**	**-6.0**
NH	Merrimack	2364	1	2,060,525	0.161	2005	0.392	166.2	403.8	237.6
NH	Merrimack	2364	2	4,084,085	0.159	2006	0.343	324.7	699.6	374.9
NH	Schiller	2367	4	493,200	0.181	2007	0.199	44.7	49.0	4.3
NH	Schiller	2367	6	496,672	0.190	2007	0.197	47.1	48.9	1.8
NH Total				**7,134,482**	**0.163**		**0.337**	**582.6**	**1,201.2**	**618.6**
NJ	Hudson Generating Station	2403	2	2,894,535	0.075	2011	0.085	107.8	123.2	15.3
NJ	Mercer Generating Station	2408	1	1,069,221	0.073	2015	0.039	39.1	20.7	-18.4
NJ	Mercer Generating Station	2408	2	914,769	0.054	2015	0.056	24.9	25.6	0.7

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NJ	Logan Generating Plant	10043	1001	1,803,819	0.101	2015	0.106	91.0	96.0	5.0
NJ	Carneys Point	10566	1001	2,912,096	0.122	2009	0.121	177.3	176.3	-1.0
NJ	Carneys Point	10566	1002	2,937,253	0.114	2011	0.107	167.9	157.0	-10.9
NJ Total				**12,531,693**	**0.097**		**0.096**	**608.0**	**598.7**	**-9.3**
OH	Cardinal	2828	1	14,308,421	0.035	2009	0.091	249.0	652.5	403.5
OH	Cardinal	2828	2	3,093,344	0.043	2009	0.081	65.9	124.7	58.8
OH	Cardinal	2828	3	15,893,880	0.023	2007	0.086	179.6	685.0	505.4
OH	Miami Fort Generating Station	2832	7	22,754,229	0.054	2007	0.105	609.8	1,196.9	587.1
OH	Miami Fort Generating Station	2832	8	19,267,327	0.054	2007	0.170	520.2	1,637.7	1,117.5
OH	Avon Lake Power Plant	2836	12	12,591,976	0.284	2013	0.278	1,789.3	1,747.8	-41.6
OH	Conesville	2840	4	17,616,086	0.055	2010	0.089	480.9	786.6	305.6
OH	J M Stuart	2850	1	26,485,999	0.094	2009	0.098	1,243.5	1,295.2	51.6
OH	J M Stuart	2850	3	25,941,253	0.096	2006	0.098	1,246.5	1,265.9	19.5
OH	J M Stuart	2850	4	20,248,819	0.108	2015	0.098	1,091.4	996.2	-95.2
OH	W H Sammis	2866	5	6,714,116	0.106	2012	0.127	355.2	427.7	72.5
OH	W H Sammis	2866	7	25,506,628	0.102	2014	0.102	1,299.6	1,302.1	2.6
OH	Kyger Creek	2876	1	9,532,027	0.079	2005	0.192	375.6	913.2	537.6
OH	Kyger Creek	2876	2	9,454,812	0.079	2005	0.200	374.4	946.9	572.5
OH	Kyger Creek	2876	3	9,844,660	0.079	2005	0.206	387.4	1,012.5	625.1
OH	Kyger Creek	2876	4	6,313,295	0.079	2005	0.189	248.1	596.3	348.2
OH	Kyger Creek	2876	5	9,876,663	0.079	2005	0.198	387.7	978.3	590.6
OH	W H Zimmer Generating Station	6019	1	37,077,656	0.056	2006	0.198	1,041.9	3,674.4	2,632.5
OH	Killen Station	6031	2	24,039,656	0.089	2005	0.233	1,063.8	2,797.0	1,733.3
OH	Gen J M Gavin	8102	1	57,923,187	0.069	2007	0.113	1,986.8	3,281.3	1,294.6
OH	Gen J M Gavin	8102	2	65,111,845	0.055	2005	0.093	1,800.3	3,037.5	1,237.1
OH Total				**439,595,880**	**0.076**		**0.134**	**16,796.7**	**29,355.6**	**12,558.9**
PA	Homer City	3122	1	14,768,505	0.067	2006	0.241	492.5	1,775.9	1,283.4
PA	Homer City	3122	2	14,850,539	0.083	2006	0.352	613.3	2,610.7	1,997.4
PA	Homer City	3122	3	24,787,243	0.087	2005	0.267	1,080.7	3,310.3	2,229.6
PA	Seward	3130	1	13,134,455	0.075	2014	0.103	490.6	679.1	188.5
PA	Seward	3130	2	9,887,691	0.075	2012	0.105	368.3	516.6	148.3
PA	Keystone	3136	1	30,709,645	0.043	2006	0.183	661.8	2,813.0	2,151.2

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PA	Keystone	3136	2	40,498,207	0.043	2008	0.190	876.8	3,847.3	2,970.5
PA	Montour	3149	1	19,296,941	0.058	2006	0.379	560.6	3,659.7	3,099.1
PA	Montour	3149	2	27,736,336	0.058	2006	0.373	801.6	5,168.7	4,367.1
PA	Bruce Mansfield	6094	1	36,925,738	0.082	2008	0.143	1,514.0	2,636.5	1,122.5
PA	Bruce Mansfield	6094	2	36,424,914	0.080	2007	0.156	1,458.8	2,846.6	1,387.8
PA	Bruce Mansfield	6094	3	33,894,744	0.074	2005	0.185	1,260.9	3,128.5	1,867.6
PA	Cheswick	8226	1	13,102,013	0.090	2006	0.372	590.2	2,438.9	1,848.7
PA	Cambria Cogen	10641	1	2,911,573	0.095	2005	0.227	137.6	330.3	192.7
PA	Cambria Cogen	10641	2	3,086,466	0.095	2006	0.220	146.5	339.5	193.1
PA	Panther Creek Energy Facility	50776	1	2,583,779	0.105	2005	0.129	135.8	166.4	30.6
PA	Panther Creek Energy Facility	50776	2	2,567,796	0.106	2015	0.124	135.6	158.7	23.1
PA	Scrubgrass Generating Plant	50974	1	3,177,805	0.057	2005	0.144	91.0	229.0	137.9
PA	Scrubgrass Generating Plant	50974	2	3,165,751	0.079	2005	0.147	125.5	232.7	107.2
PA Total				**333,510,141**	**0.069**		**0.221**	**11,542.1**	**36,888.4**	**25,346.4**
SC	Cross	130	1	22,864,284	0.066	2014	0.069	759.1	790.0	30.9
SC	Cross	130	2	9,008,054	0.070	2012	0.097	316.2	435.1	118.9
SC	Cross	130	3	15,588,697	0.059	2012	0.068	459.9	530.0	70.1
SC	Cross	130	4	13,305,764	0.059	2012	0.070	393.2	463.7	70.5
SC	Winyah	6249	1	5,709,980	0.062	2005	0.084	177.9	240.4	62.5
SC	Winyah	6249	2	4,070,476	0.068	2005	0.082	138.2	167.7	29.5
SC	Winyah	6249	3	4,288,399	0.081	2015	0.087	174.1	186.1	12.0
SC	Winyah	6249	4	4,952,226	0.087	2012	0.089	215.2	220.4	5.2
SC	Wateree	3297	WAT1	7,019,496	0.060	2007	0.110	210.9	387.5	176.5
SC	Wateree	3297	WAT2	7,374,955	0.054	2006	0.110	199.5	404.5	205.0
SC	Williams	3298	WIL1	7,836,928	0.060	2005	0.110	235.5	429.1	193.6
SC	Cope Station	7210	COP1	7,129,009	0.080	2009	0.127	284.8	453.8	169.0
SC Total				**109,148,268**	**0.065**		**0.086**	**3,564.4**	**4,708.2**	**1,143.8**
TN	Bull Run	3396	1	4,021,259	0.062	2009	0.110	124.3	220.4	96.1
TN	Cumberland	3399	1	31,795,733	0.059	2009	0.080	934.8	1,265.5	330.7
TN	Cumberland	3399	2	46,389,555	0.061	2014	0.062	1,412.6	1,440.4	27.8
TN	Kingston	3407	1	3,532,624	0.050	2009	0.072	88.0	126.6	38.7
TN	Kingston	3407	2	1,668,234	0.050	2007	0.072	41.8	59.6	17.9

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TN	Kingston	3407	3	3,404,158	0.050	2007	0.072	85.8	123.1	37.3
TN	Kingston	3407	4	3,590,160	0.050	2007	0.071	89.9	128.2	38.2
TN	Kingston	3407	5	3,372,218	0.049	2007	0.071	81.9	119.7	37.8
TN	Kingston	3407	6	1,673,803	0.045	2006	0.070	37.5	58.5	21.0
TN	Kingston	3407	7	3,070,202	0.045	2006	0.070	68.6	108.1	39.5
TN	Kingston	3407	8	1,662,089	0.045	2006	0.069	37.2	57.6	20.4
TN	Kingston	3407	9	2,736,610	0.045	2006	0.068	61.4	92.8	31.3
TN Total				**106,916,646**	**0.057**		**0.071**	**3,063.8**	**3,800.4**	**736.6**
TX	Big Brown	3497	1	17,222,339	0.126	2015	0.130	1,085.9	1,122.9	37.0
TX	Big Brown	3497	2	20,428,967	0.131	2013	0.130	1,333.0	1,323.8	-9.2
TX	Monticello	6147	2	14,721,554	0.119	2014	0.138	873.7	1,015.1	141.3
TX	Monticello	6147	3	22,378,413	0.149	2014	0.134	1,661.6	1,494.9	-166.7
TX	W A Parish	3470	WAP5	17,087,636	0.038	2007	0.058	327.2	491.3	164.0
TX	W A Parish	3470	WAP6	22,405,862	0.039	2007	0.068	441.4	766.3	324.9
TX	W A Parish	3470	WAP7	15,558,399	0.036	2007	0.041	280.1	315.8	35.8
TX	W A Parish	3470	WAP8	21,050,877	0.036	2006	0.044	382.1	463.1	81.0
TX	Sandow 5	52071	5A	9,382,298	0.062	2011	0.069	289.9	325.6	35.7
TX	Sandow 5	52071	5B	7,135,841	0.063	2011	0.070	223.4	248.0	24.6
TX	Sandy Creek	56611	S01	20,822,640	0.040	2015	0.043	413.3	444.6	31.2
TX	Twin Oaks Power LP	7030	U1	4,352,952	0.097	2015	0.089	211.1	194.1	-17.0
TX	Twin Oaks Power LP	7030	U2	5,575,937	0.098	2015	0.085	272.9	237.8	-35.1
TX	J K Spruce	7097	**2	27,450,406	0.039	2011	0.049	538.0	675.3	137.3
TX Total				**225,574,120**	**0.074**		**0.081**	**8,333.6**	**9,118.5**	**784.9**
VA	Chesterfield Power Station	3797	4	2,020,003	0.049	2014	0.052	49.2	52.8	3.6
VA	Chesterfield Power Station	3797	5	3,160,873	0.031	2008	0.064	48.8	100.8	52.0
VA	Chesterfield Power Station	3797	6	10,932,891	0.033	2006	0.044	178.2	238.9	60.7
VA	Clover Power Station	7213	1	11,256,376	0.233	2005	0.277	1,309.7	1,558.4	248.8
VA	Clover Power Station	7213	2	10,752,238	0.243	2007	0.268	1,305.3	1,438.6	133.3
VA	Spruance Genco LLC	54081	BLR01A	822,003	0.261	2005	0.303	107.2	124.5	17.3
VA	Spruance Genco LLC	54081	BLR01B	885,291	0.260	2005	0.289	115.1	127.9	12.8
VA	Spruance Genco LLC	54081	BLR02A	905,255	0.255	2005	0.294	115.3	133.1	17.8
VA	Spruance Genco LLC	54081	BLR02B	895,508	0.255	2005	0.287	114.0	128.4	14.4

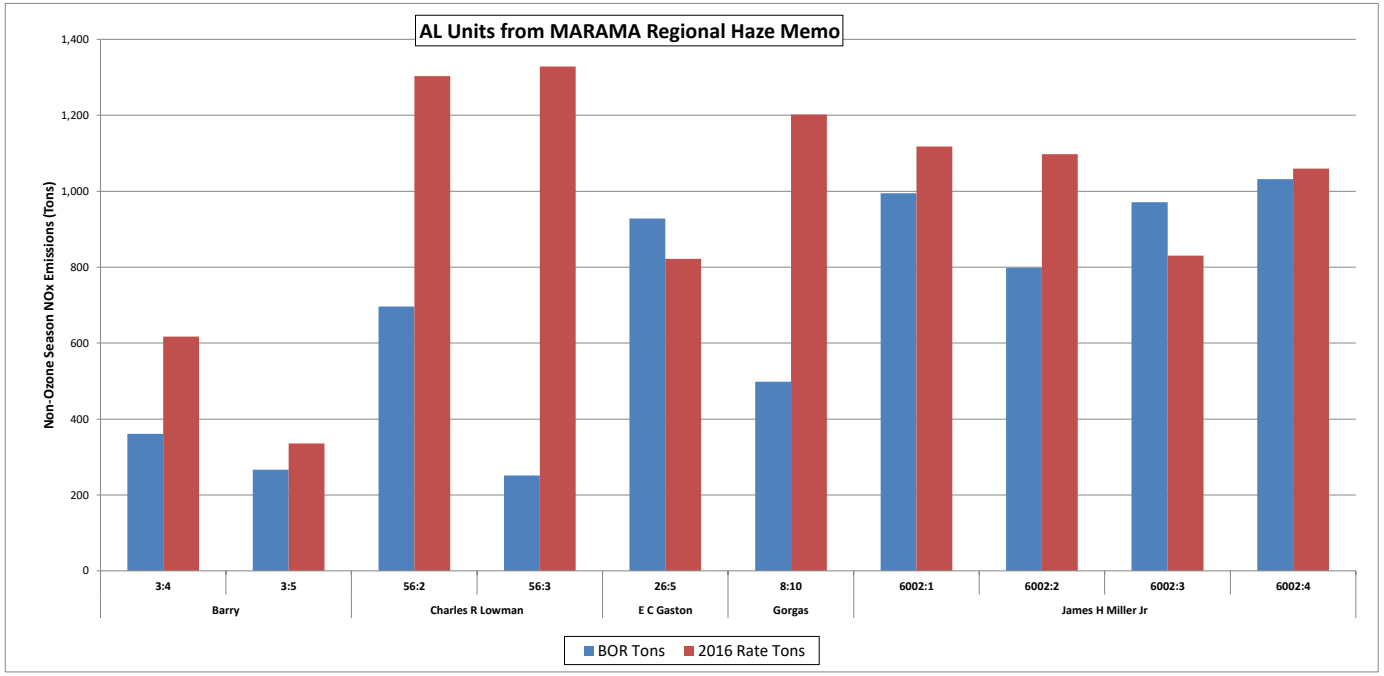
State	Facility	ORISPL Code	Unit ID	ERTAC v.2.6 2028 Non-OS HI	MANE-VU RH Memo Rate BOR (lbs/MMBtu)	BOR Year	CAMD 2016 OS Rate (lbs/MMBtu)	Non-OS NOx Emissions (Tons) BOR	2016 Rate	2016-BOR
VA	Spruance Genco LLC	54081	BLR03A	903,550	0.261	2005	0.304	118.1	137.4	19.3
VA	Spruance Genco LLC	54081	BLR03B	925,160	0.262	2005	0.302	121.0	139.5	18.5
VA	Spruance Genco LLC	54081	BLR04A	805,653	0.265	2005	0.301	106.7	121.2	14.5
VA	Spruance Genco LLC	54081	BLR04B	770,684	0.265	2005	0.307	102.0	118.5	16.5
VA	Birchwood Power Facility	54304	001	1,958,792	0.088	2008	0.128	86.1	125.4	39.3
VA Total				**46,994,277**	**0.165**		**0.193**	**3,876.7**	**4,545.5**	**668.7**
WI	South Oak Creek	4041	6	6,508,529	0.068	2013	0.068	221.6	221.6	0.0
WI	South Oak Creek	4041	7	10,159,306	0.060	2015	0.058	306.3	295.6	-10.7
WI	South Oak Creek	4041	8	11,327,927	0.061	2015	0.061	344.4	343.2	-1.1
WI	Edgewater (4050)	4050	5	14,875,938	0.036	2014	0.040	268.5	295.3	26.8
WI	Weston	4078	4	20,656,783	0.053	2014	0.048	547.4	492.7	-54.7
WI	Manitowoc	4125	9	1,444,794	0.037	2015	0.055	26.6	39.9	13.3
WI	Pleasant Prairie	6170	1	28,615,102	0.050	2007	0.059	712.5	847.0	134.5
WI	Pleasant Prairie	6170	2	17,345,848	0.060	2007	0.057	521.2	493.5	-27.8
WI	Elm Road Generating Station	56068	1	10,400,347	0.049	2010	0.061	254.8	316.2	61.4
WI Total				**121,334,574**	**0.053**		**0.055**	**3,203.4**	**3,345.0**	**141.6**
WV	John E Amos	3935	1	28,181,733	0.032	2006	0.072	446.7	1,007.5	560.8
WV	John E Amos	3935	2	27,667,041	0.031	2006	0.082	431.6	1,139.9	708.3
WV	Harrison Power Station	3944	1	22,973,011	0.063	2005	0.111	728.2	1,272.7	544.5
WV	Harrison Power Station	3944	2	24,136,809	0.066	2005	0.241	798.9	2,903.7	2,104.7
WV	Harrison Power Station	3944	3	19,456,008	0.066	2005	0.186	640.1	1,805.5	1,165.4
WV	Mount Storm Power Station	3954	1	12,205,889	0.054	2006	0.066	328.9	402.2	73.2
WV	Mount Storm Power Station	3954	2	9,363,032	0.049	2006	0.065	227.1	304.8	77.7
WV	Mount Storm Power Station	3954	3	8,989,539	0.077	2006	0.085	345.2	383.9	38.7
WV	Pleasants Power Station	6004	1	29,875,200	0.039	2005	0.186	588.5	2,784.4	2,195.8
WV	Pleasants Power Station	6004	2	24,326,553	0.039	2005	0.174	474.4	2,114.0	1,639.6
WV	Mountaineer (1301)	6264	1	53,781,873	0.039	2007	0.108	1,040.7	2,893.5	1,852.8
WV	Grant Town Power Plant	10151	1A	3,156,956	0.072	2005	0.298	113.8	469.6	355.8
WV	Longview Power	56671	001	25,997,292	0.065	2013	0.066	842.3	851.4	9.1
WV Total				**290,110,938**	**0.048**		**0.126**	**7,006.5**	**18,332.9**	**11,326.4**
Grand Total				**4,192,855,522**	**0.071**		**0.127**	**149,621.354**	**267,026.945**	**117,405.6**

Appendix B

Visual Unit Level Comparisons of MANE-VU Best Observed Rate (BOR) and 2016 Ozone Season Rate

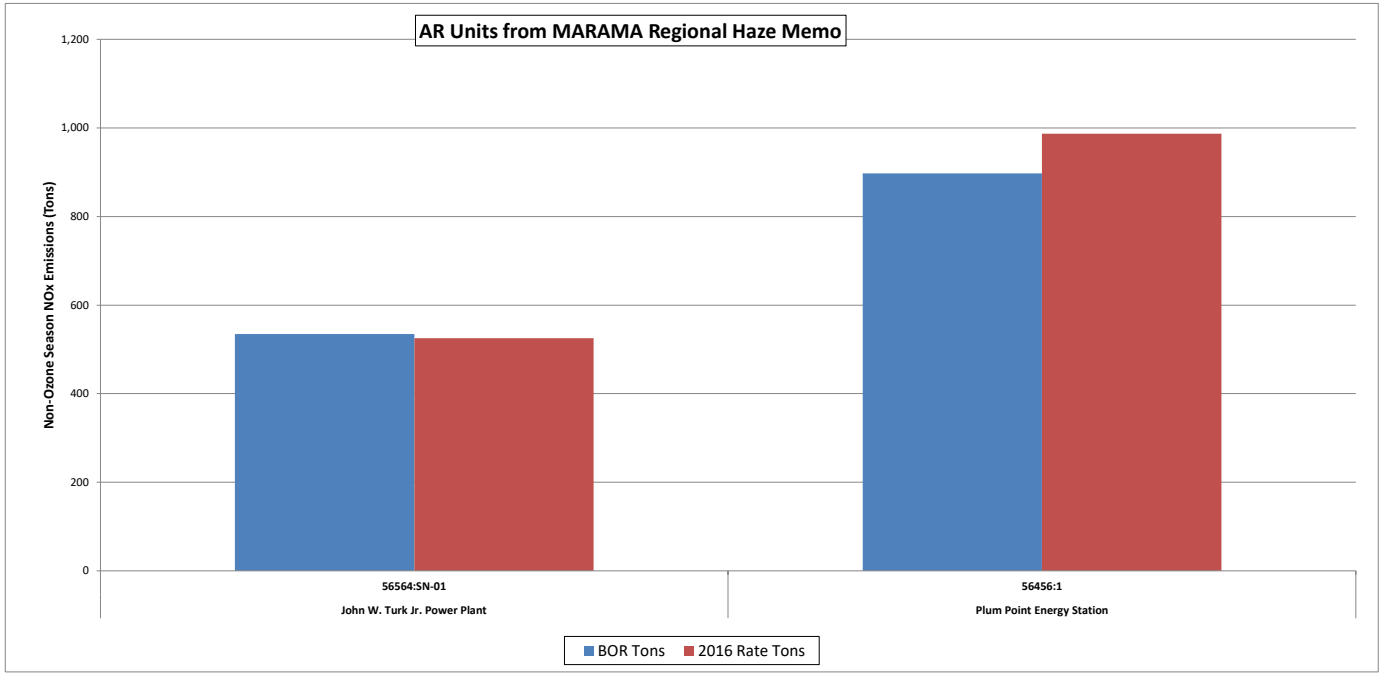
State	AL

Row Labels	BOR Tons	2016 Rate Tons
Barry	**628**	**952**
3:4	361	617
3:5	267	335
Charles R Lowman	**947**	**2,632**
56:2	696	1,303
56:3	251	1,328
E C Gaston	**928**	**822**
26:5	928	822
Gorgas	**498**	**1,202**
8:10	498	1,202
James H Miller Jr	**3,795**	**4,104**
6002:1	995	1,118
6002:2	798	1,097
6002:3	971	830
6002:4	1,032	1,060
Grand Total	**6,796**	**9,711**



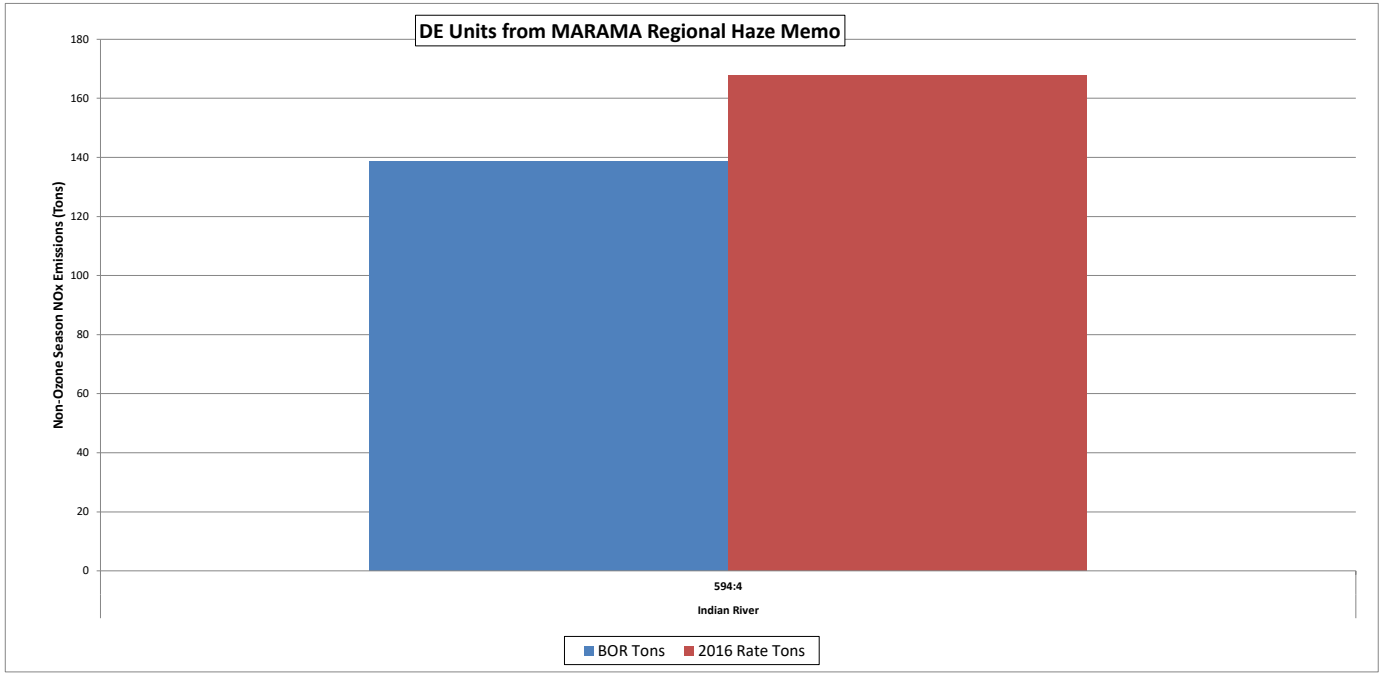
State	AR

Row Labels	BOR Tons	2016 Rate Tons
John W. Turk Jr. Power Plant	**535**	**526**
56564:SN-01	535	526
Plum Point Energy Station	**897**	**987**
56456:1	897	987
Grand Total	**1,432**	**1,512**



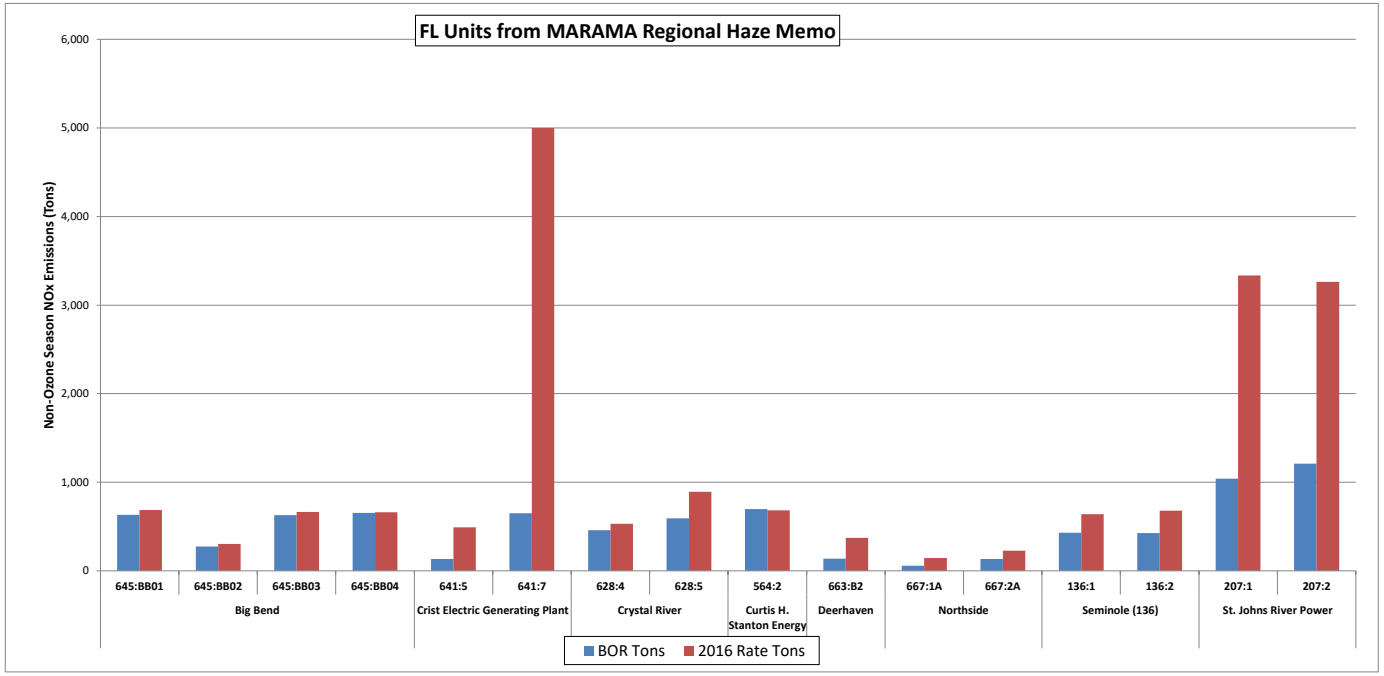
State	DE

Row Labels	BOR Tons	2016 Rate Tons
Indian River	**139**	**168**
594:4	139	168
Grand Total	**139**	**168**



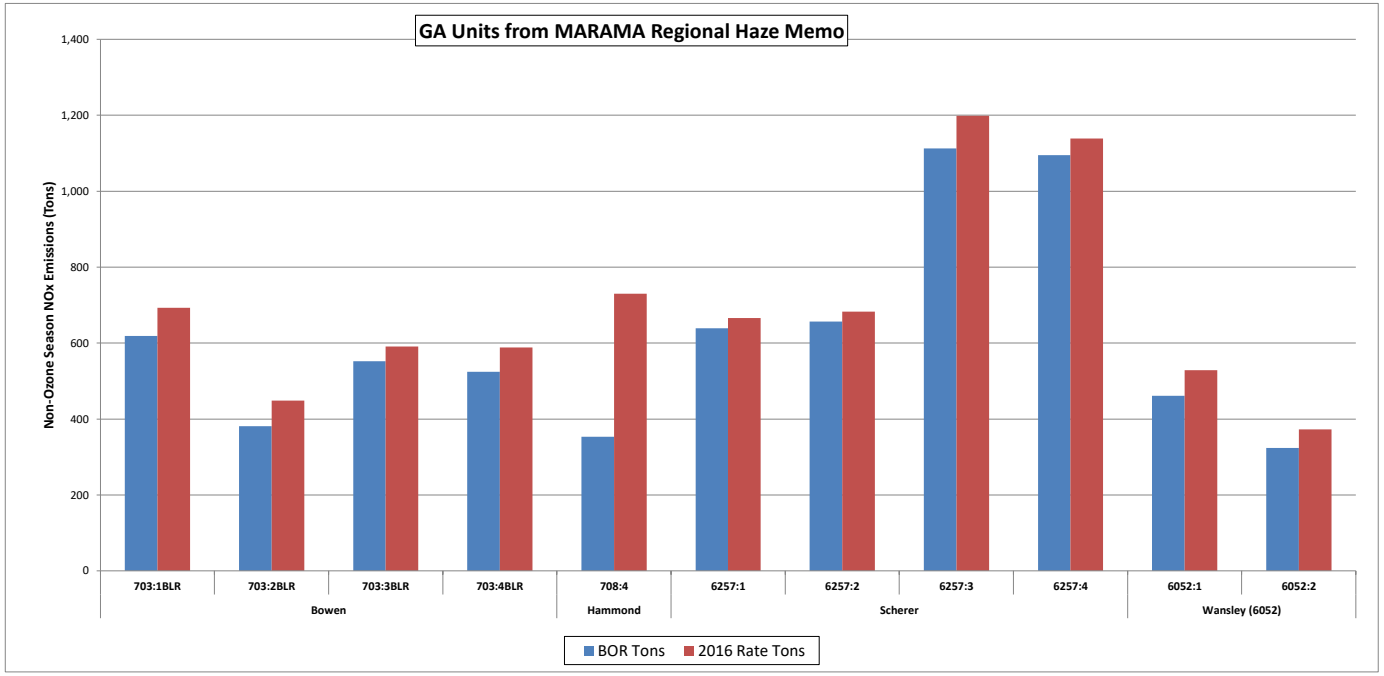
State	FL

Row Labels	BOR Tons	2016 Rate Tons
Big Bend	**2,189**	**2,319**
645:BB01	634	688
645:BB02	274	306
645:BB03	628	664
645:BB04	653	661
Crist Electric Generating Plant	**787**	**5,490**
641:5	136	492
641:7	651	4,998
Crystal River	**1,054**	**1,426**
628:4	460	533
628:5	594	893
Curtis H. Stanton Energy Center	**698**	**685**
564:2	698	685
Deerhaven	**139**	**374**
663:B2	139	374
Northside	**193**	**372**
667:1A	57	146
667:2A	136	226
Seminole (136)	**858**	**1,322**
136:1	430	642
136:2	428	681
St. Johns River Power	**2,251**	**6,595**
207:1	1,042	3,333
207:2	1,209	3,263
Grand Total	**8,169**	**18,583**



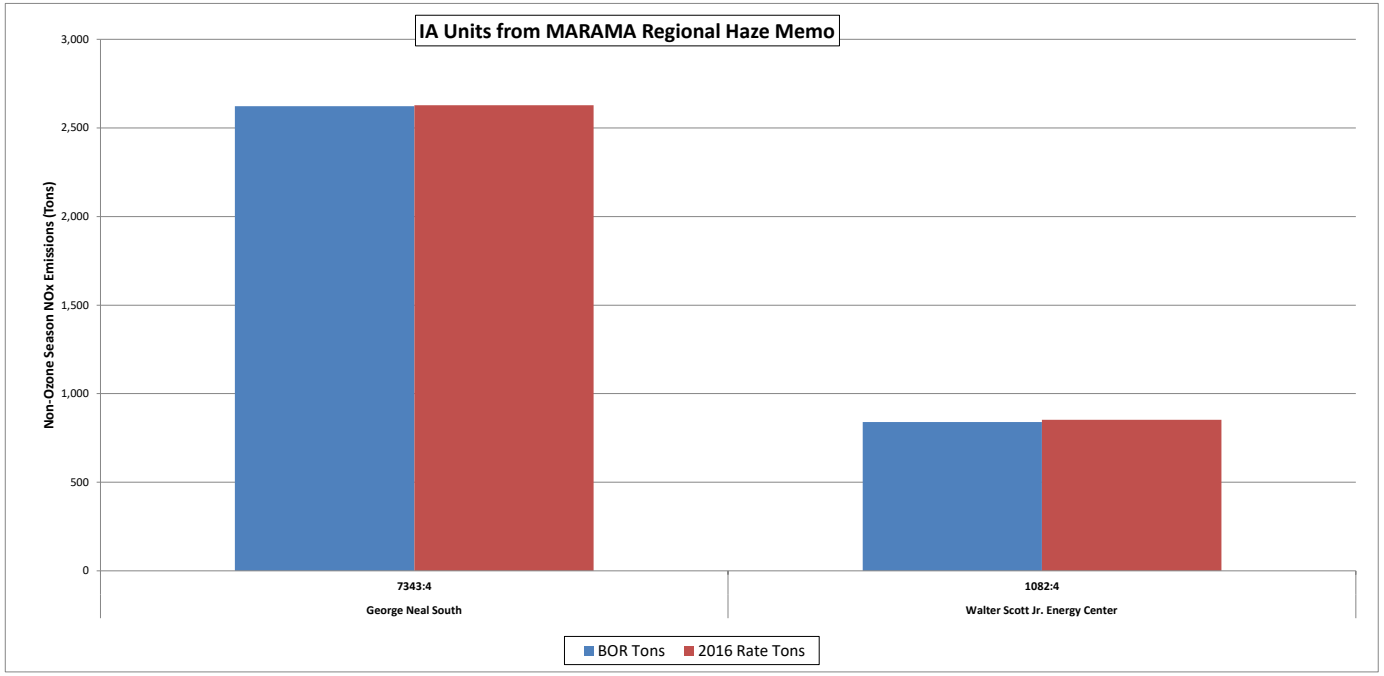
State	GA

Row Labels	BOR Tons	2016 Rate Tons
Bowen	**2,075**	**2,321**
703:1BLR	618	693
703:2BLR	381	449
703:3BLR	552	591
703:4BLR	524	588
Hammond	**353**	**730**
708:4	353	730
Scherer	**3,503**	**3,687**
6257:1	639	666
6257:2	657	683
6257:3	1,112	1,199
6257:4	1,095	1,139
Wansley (6052)	**785**	**901**
6052:1	461	528
6052:2	324	373
Grand Total	**6,717**	**7,638**



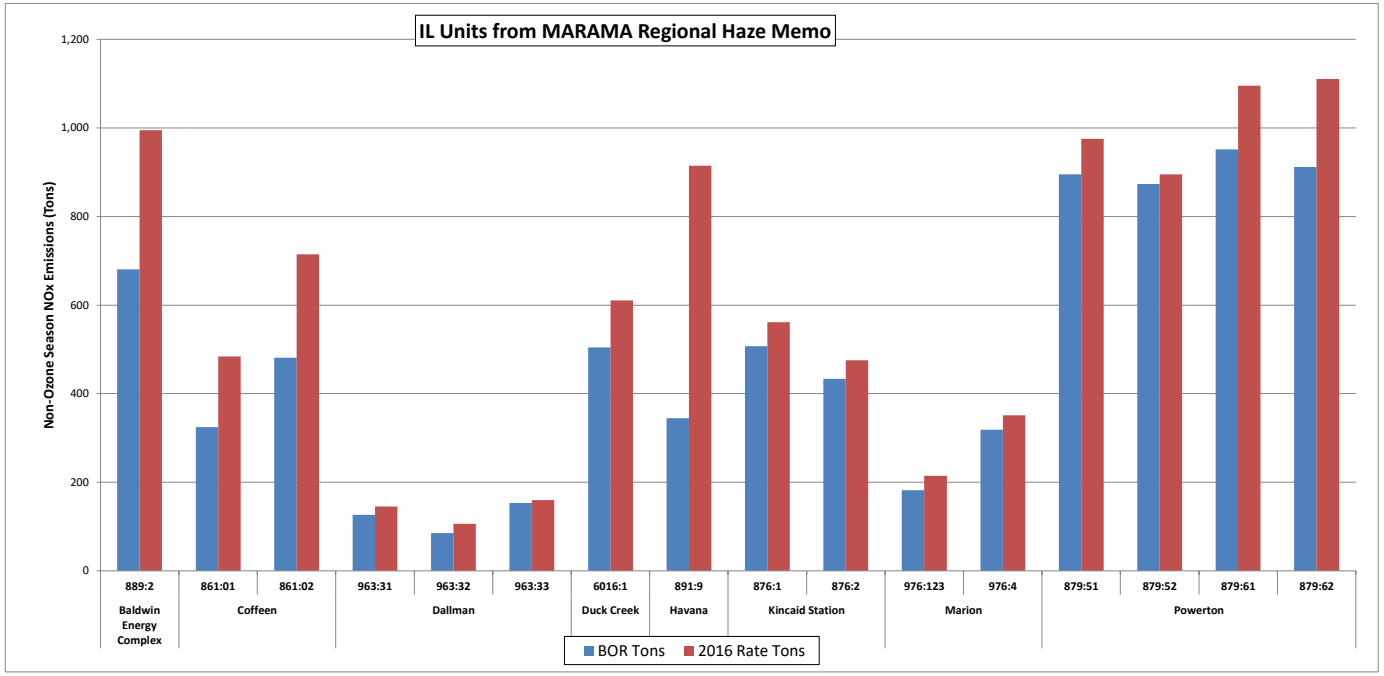
State	IA

Row Labels	BOR Tons	2016 Rate Tons
George Neal South	**2,622**	**2,627**
7343:4	2,622	2,627
Walter Scott Jr. Energy Center	**840**	**852**
1082:4	840	852
Grand Total	**3,461**	**3,479**



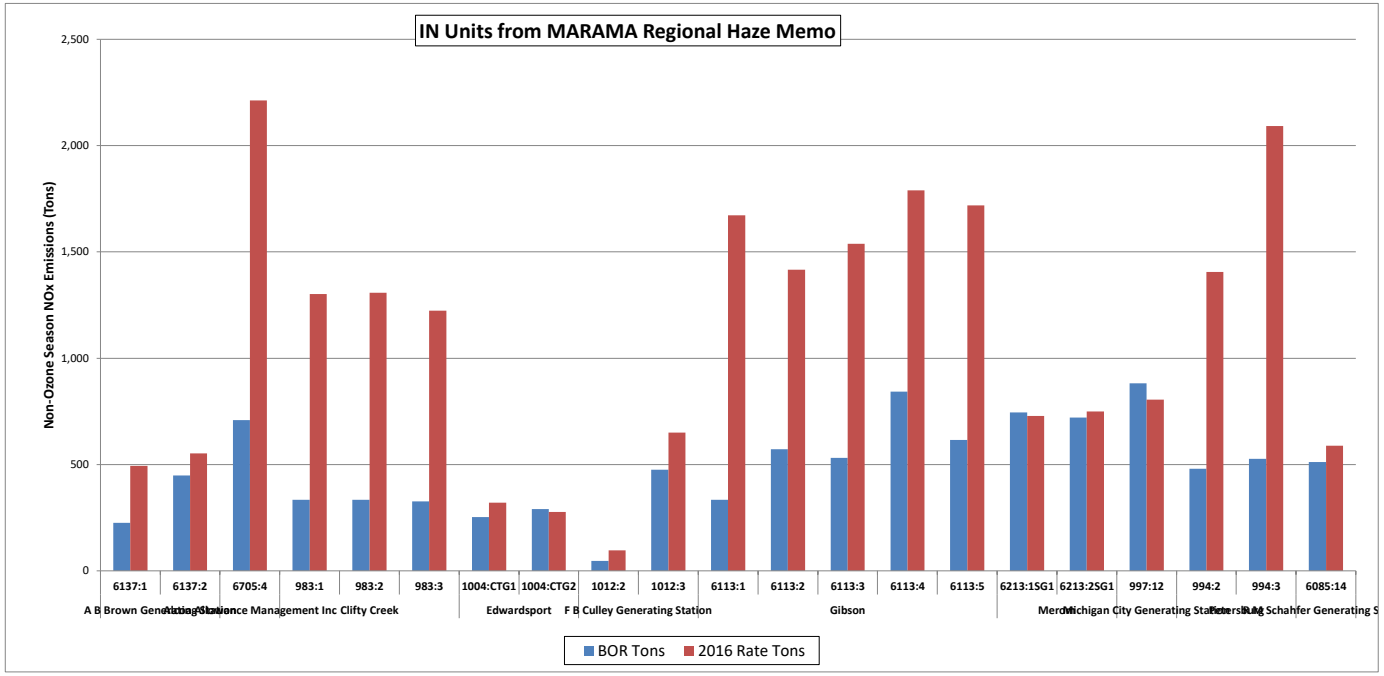
State	IL

Row Labels	BOR Tons	2016 Rate Tons
Baldwin Energy Complex	**680**	**994**
889:2	680	994
Coffeen	**806**	**1,199**
861:01	324	484
861:02	481	715
Dallman	**366**	**411**
963:31	127	145
963:32	85	106
963:33	154	159
Duck Creek	**504**	**610**
6016:1	504	610
Havana	**344**	**914**
891:9	344	914
Kincaid Station	**941**	**1,036**
876:1	507	561
876:2	433	475
Marion	**501**	**566**
976:123	182	215
976:4	318	351
Powerton	**3,632**	**4,075**
879:51	895	975
879:52	874	895
879:61	951	1,095
879:62	911	1,110
Grand Total	**7,774**	**9,807**



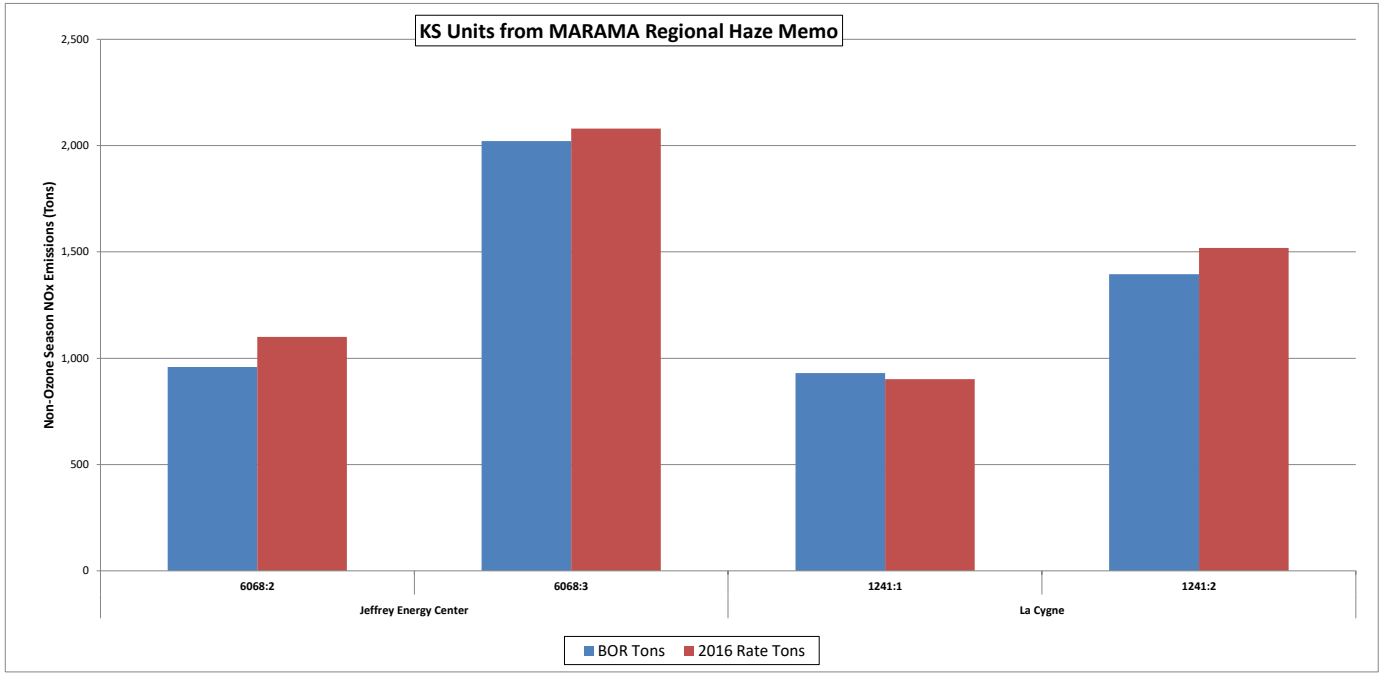
State	IN

Row Labels	BOR Tons	2016 Rate Tons
A B Brown Generating Station	**676**	**1,047**
6137:1	226	494
6137:2	449	553
Alcoa Allowance Management Inc	**709**	**2,212**
6705:4	709	2,212
Clifty Creek	**997**	**3,834**
983:1	335	1,303
983:2	335	1,308
983:3	326	1,224
Edwardsport	**543**	**599**
1004:CTG1	253	321
1004:CTG2	290	278
F B Culley Generating Station	**523**	**748**
1012:2	47	97
1012:3	475	651
Gibson	**2,896**	**8,134**
6113:1	334	1,672
6113:2	572	1,416
6113:3	531	1,538
6113:4	843	1,790
6113:5	615	1,718
Merom	**1,466**	**1,477**
6213:1SG1	745	728
6213:2SG1	721	749
Michigan City Generating Station	**882**	**805**
997:12	882	805
Petersburg	**1,007**	**3,499**
994:2	481	1,406
994:3	527	2,093
R M Schahfer Generating Station	**512**	**589**
6085:14	512	589
Grand Total	**10,210**	**22,945**



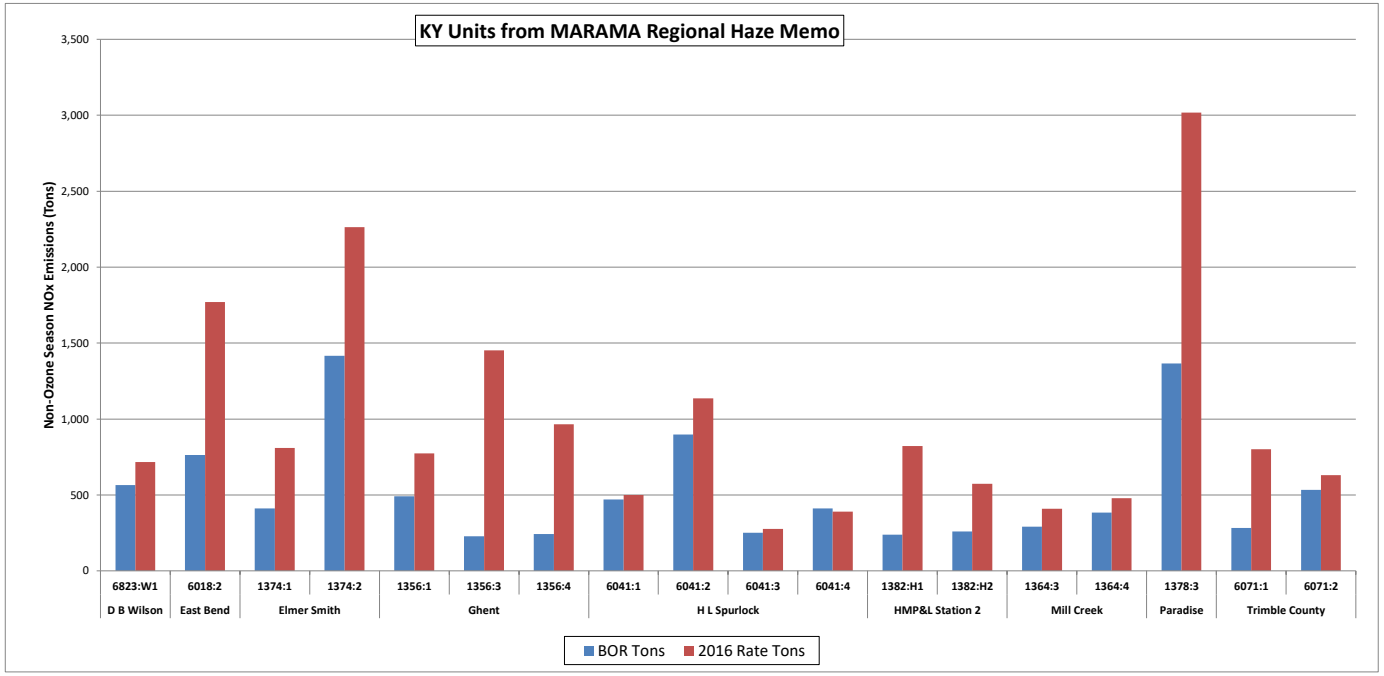
State	KS

Row Labels	BOR Tons	2016 Rate Tons
Jeffrey Energy Center	**2,979**	**3,180**
6068:2	959	1,100
6068:3	2,021	2,080
La Cygne	**2,326**	**2,421**
1241:1	930	902
1241:2	1,396	1,519
Grand Total	**5,306**	**5,600**



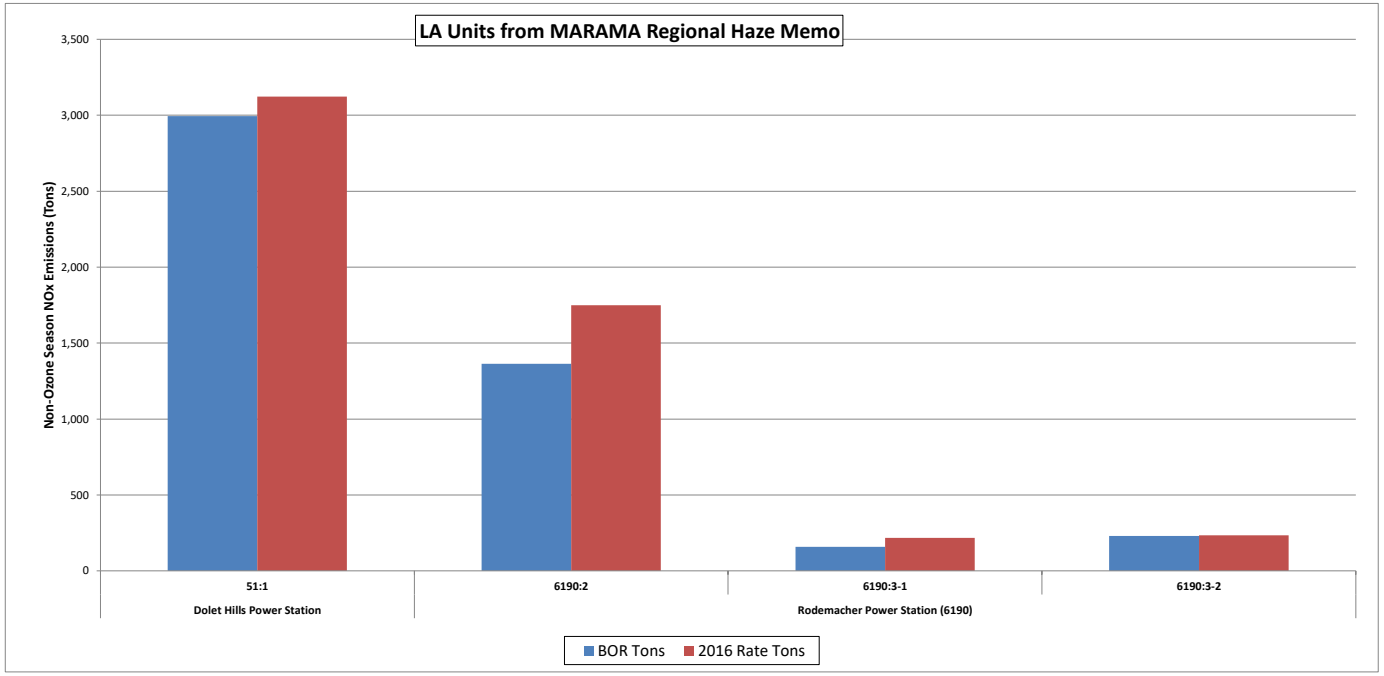
State	KY

Row Labels	BOR Tons	2016 Rate Tons
D B Wilson	**565**	**717**
6823:W1	565	717
East Bend	**763**	**1,770**
6018:2	763	1,770
Elmer Smith	**1,826**	**3,071**
1374:1	410	809
1374:2	1,416	2,262
Ghent	**964**	**3,191**
1356:1	492	774
1356:3	228	1,451
1356:4	244	965
H L Spurlock	**2,028**	**2,301**
6041:1	469	499
6041:2	897	1,136
6041:3	251	277
6041:4	410	389
HMP&L Station 2	**498**	**1,396**
1382:H1	239	822
1382:H2	259	574
Mill Creek	**674**	**886**
1364:3	291	408
1364:4	383	478
Paradise	**1,365**	**3,017**
1378:3	1,365	3,017
Trimble County	**817**	**1,430**
6071:1	283	801
6071:2	534	629
Grand Total	**9,499**	**17,779**



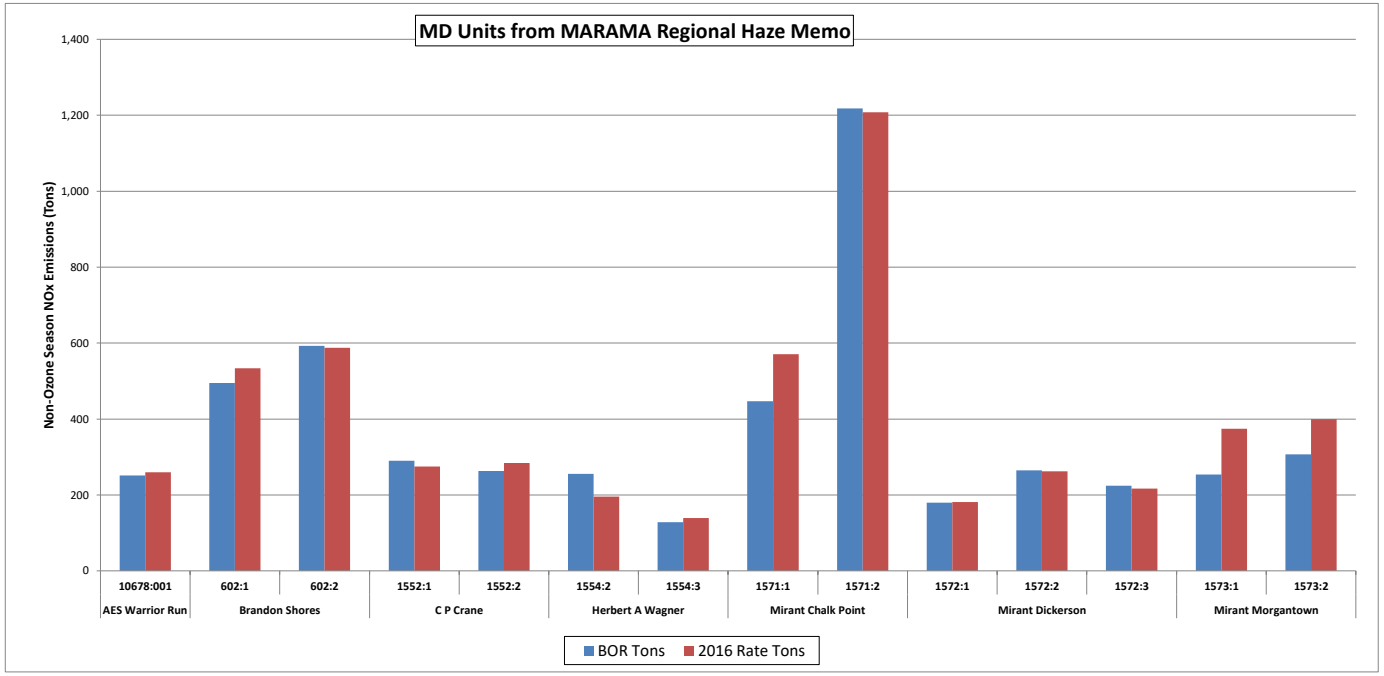
State	LA

Row Labels	BOR Tons	2016 Rate Tons
Dolet Hills Power Station	**2,995**	**3,123**
51:1	2,995	3,123
Rodemacher Power Station (6190)	**1,749**	**2,199**
6190:2	1,363	1,748
6190:3-1	157	217
6190:3-2	229	234
Grand Total	**4,744**	**5,322**



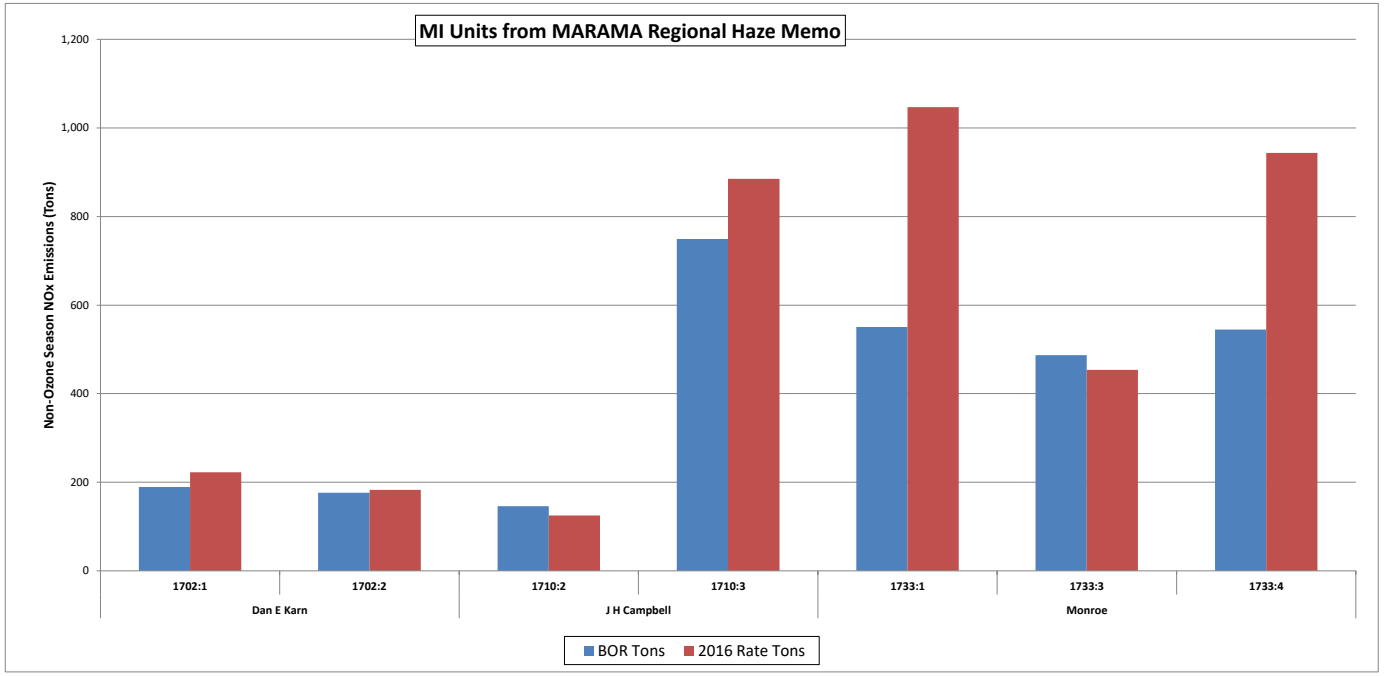
State	MD

Row Labels	BOR Tons	2016 Rate Tons
AES Warrior Run	**251**	**260**
10678:001	251	260
Brandon Shores	**1,087**	**1,121**
602:1	495	534
602:2	592	588
C P Crane	**553**	**560**
1552:1	290	275
1552:2	263	284
Herbert A Wagner	**384**	**335**
1554:2	256	195
1554:3	129	139
Mirant Chalk Point	**1,665**	**1,778**
1571:1	446	571
1571:2	1,218	1,208
Mirant Dickerson	**669**	**661**
1572:1	179	181
1572:2	265	263
1572:3	225	217
Mirant Morgantown	**561**	**774**
1573:1	254	374
1573:2	307	400
Grand Total	**5,170**	**5,488**



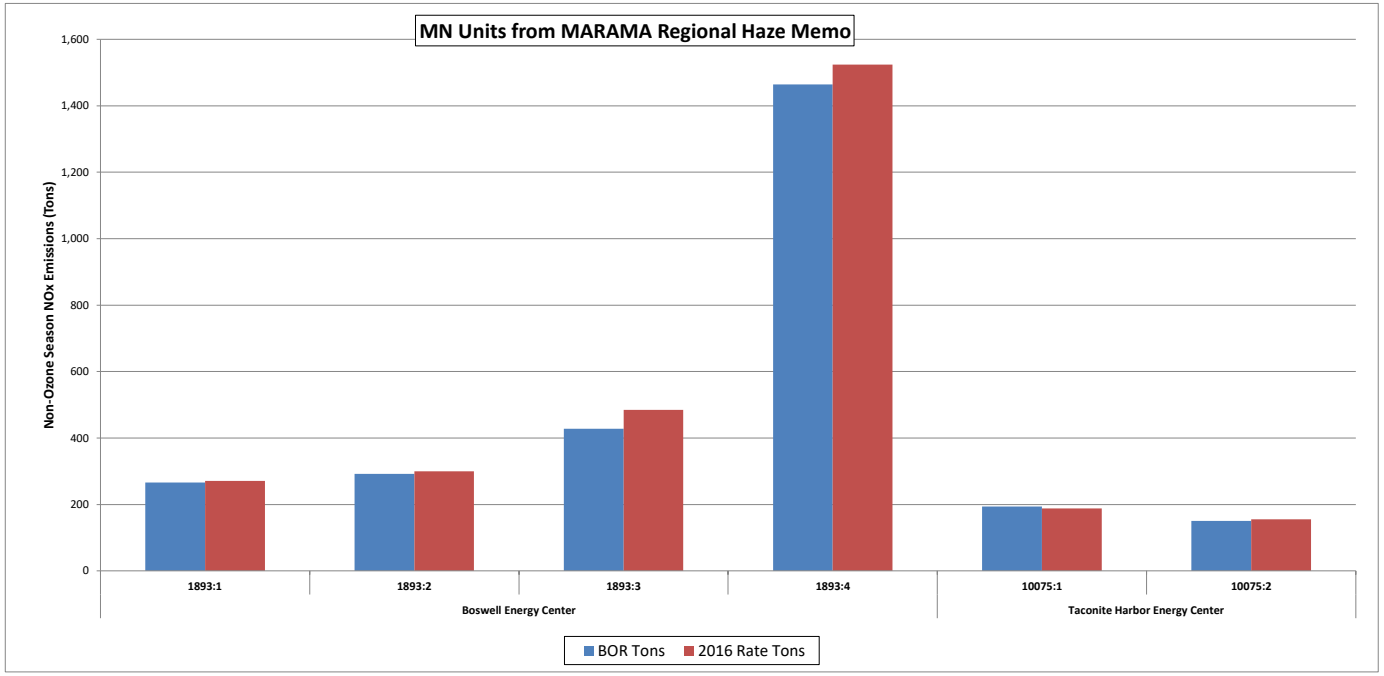
State	MI

Row Labels	BOR Tons	2016 Rate Tons
Dan E Karn	**366**	**405**
1702:1	190	222
1702:2	176	183
J H Campbell	**896**	**1,010**
1710:2	146	125
1710:3	749	885
Monroe	**1,582**	**2,444**
1733:1	550	1,047
1733:3	487	454
1733:4	545	943
Grand Total	**2,844**	**3,859**



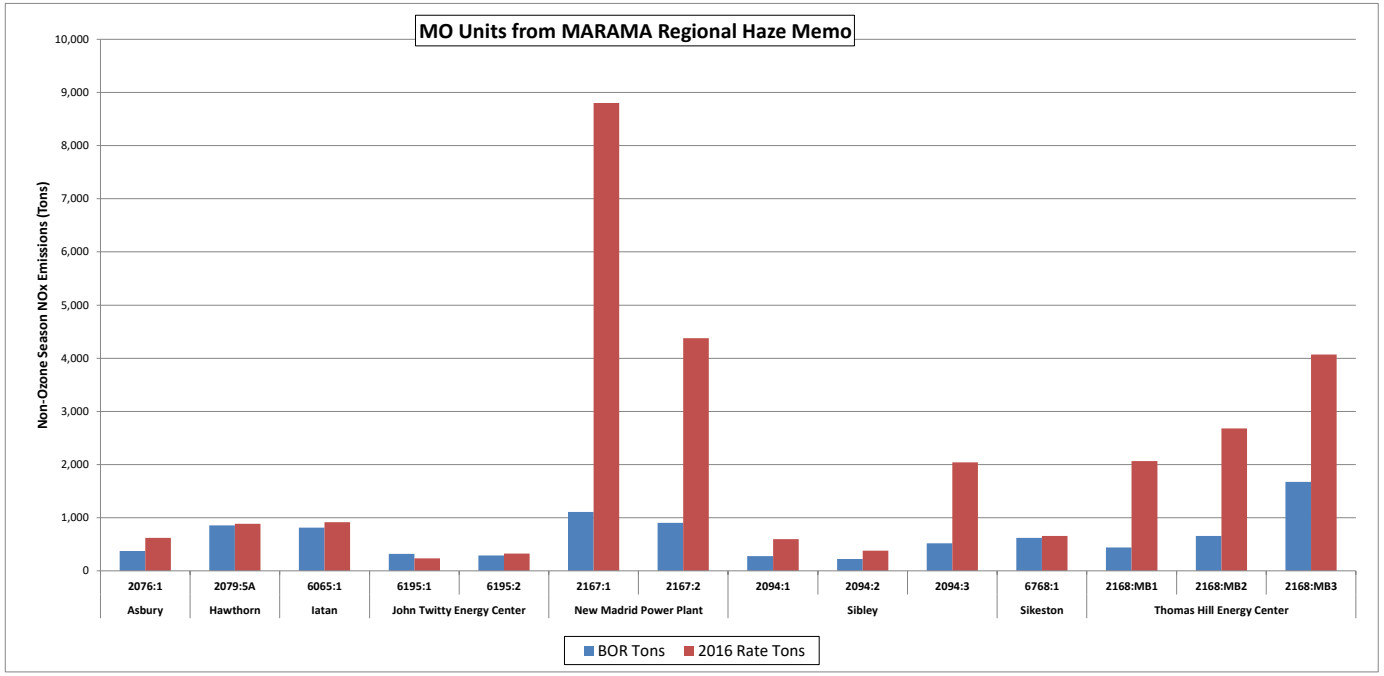
State	MN

Row Labels	BOR Tons	2016 Rate Tons
Boswell Energy Center	**2,451**	**2,579**
1893:1	266	271
1893:2	292	300
1893:3	428	485
1893:4	1,464	1,524
Taconite Harbor Energy Center	**344**	**343**
10075:1	194	188
10075:2	151	155
Grand Total	**2,795**	**2,922**



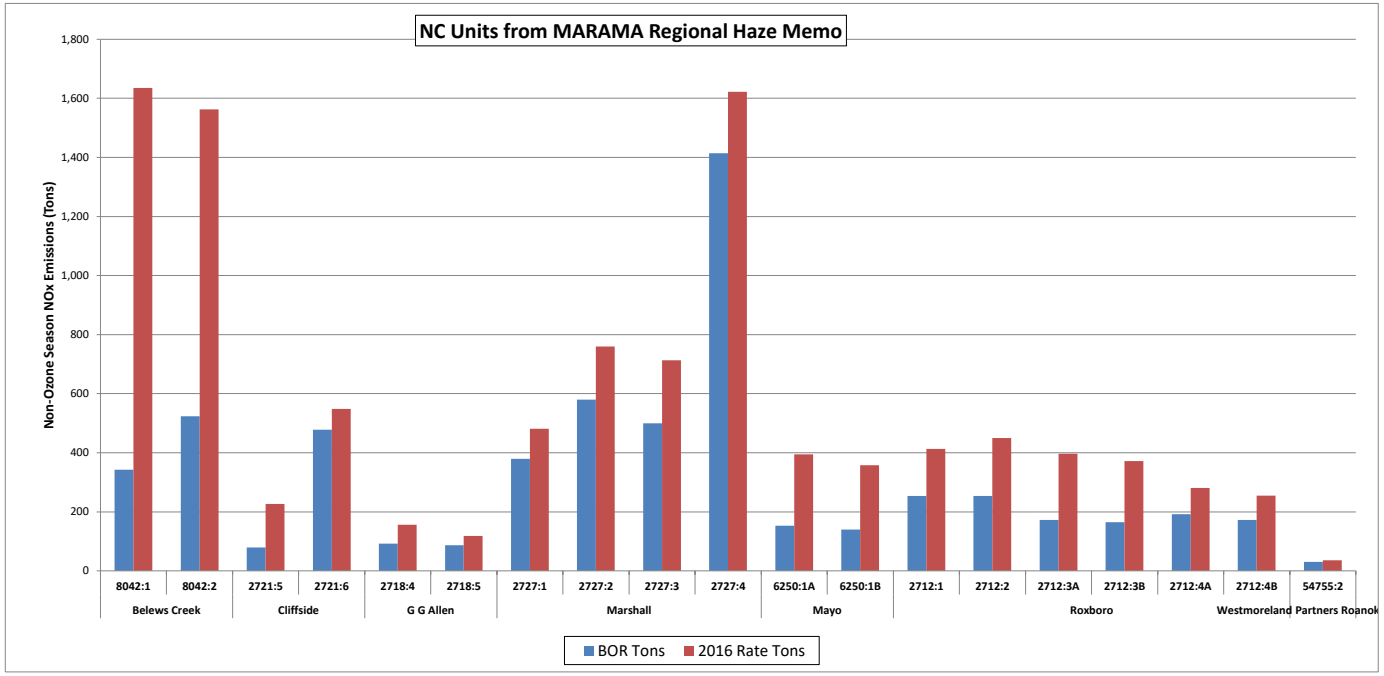
State	MO

Row Labels	BOR Tons	2016 Rate Tons
Asbury	**376**	**621**
2076:1	376	621
Hawthorn	**854**	**884**
2079:5A	854	884
Iatan	**814**	**913**
6065:1	814	913
John Twitty Energy Center	**607**	**564**
6195:1	318	237
6195:2	290	327
New Madrid Power Plant	**2,013**	**13,176**
2167:1	1,111	8,801
2167:2	902	4,376
Sibley	**1,018**	**3,014**
2094:1	277	594
2094:2	223	381
2094:3	517	2,039
Sikeston	**624**	**657**
6768:1	624	657
Thomas Hill Energy Center	**2,772**	**8,811**
2168:MB1	440	2,064
2168:MB2	657	2,680
2168:MB3	1,675	4,067
Grand Total	**9,078**	**28,642**



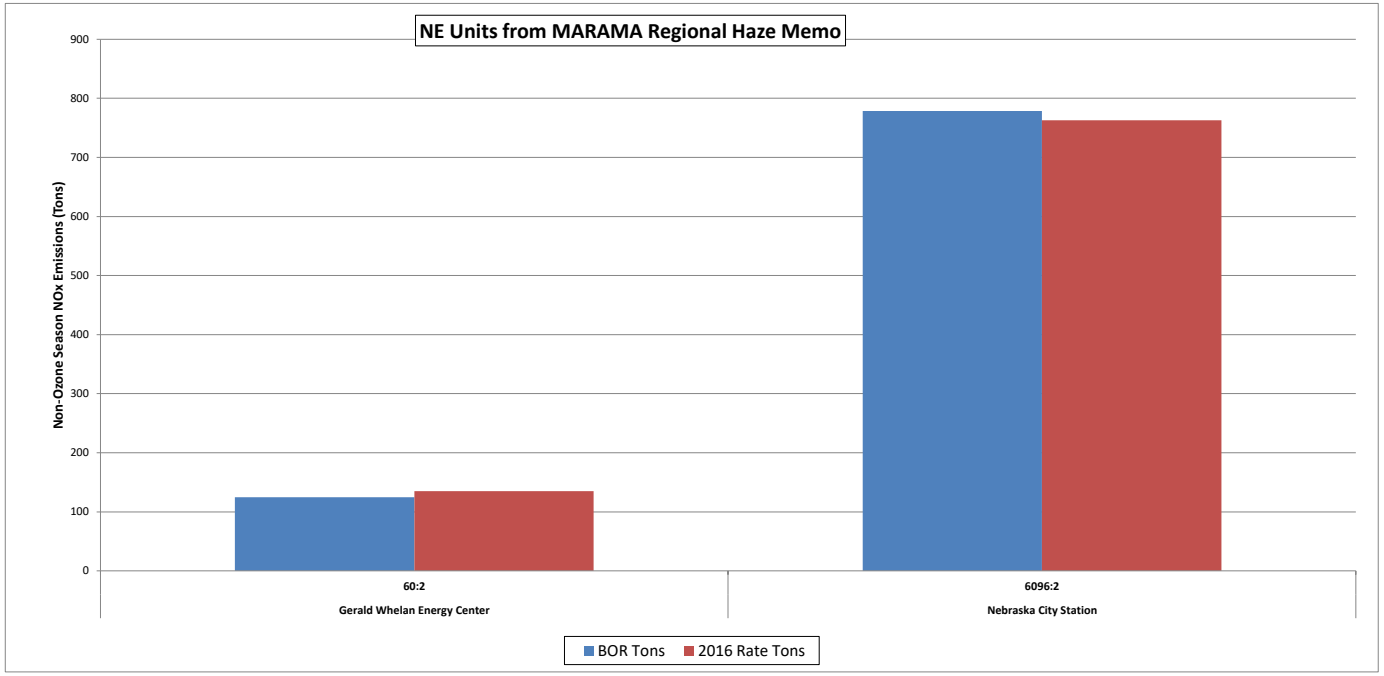
State	NC

Row Labels	BOR Tons	2016 Rate Tons
Belews Creek	**866**	**3,199**
8042:1	342	1,636
8042:2	523	1,563
Cliffside	**557**	**774**
2721:5	79	226
2721:6	478	548
G G Allen	**179**	**274**
2718:4	92	156
2718:5	87	118
Marshall	**2,873**	**3,577**
2727:1	379	481
2727:2	580	760
2727:3	500	713
2727:4	1,414	1,622
Mayo	**293**	**753**
6250:1A	153	395
6250:1B	140	358
Roxboro	**1,210**	**2,168**
2712:1	254	413
2712:2	253	450
2712:3A	173	397
2712:3B	165	371
2712:4A	192	281
2712:4B	173	255
Westmoreland Partners Roanoke Valley II	**30**	**36**
54755:2	30	36
Grand Total	**6,008**	**10,780**



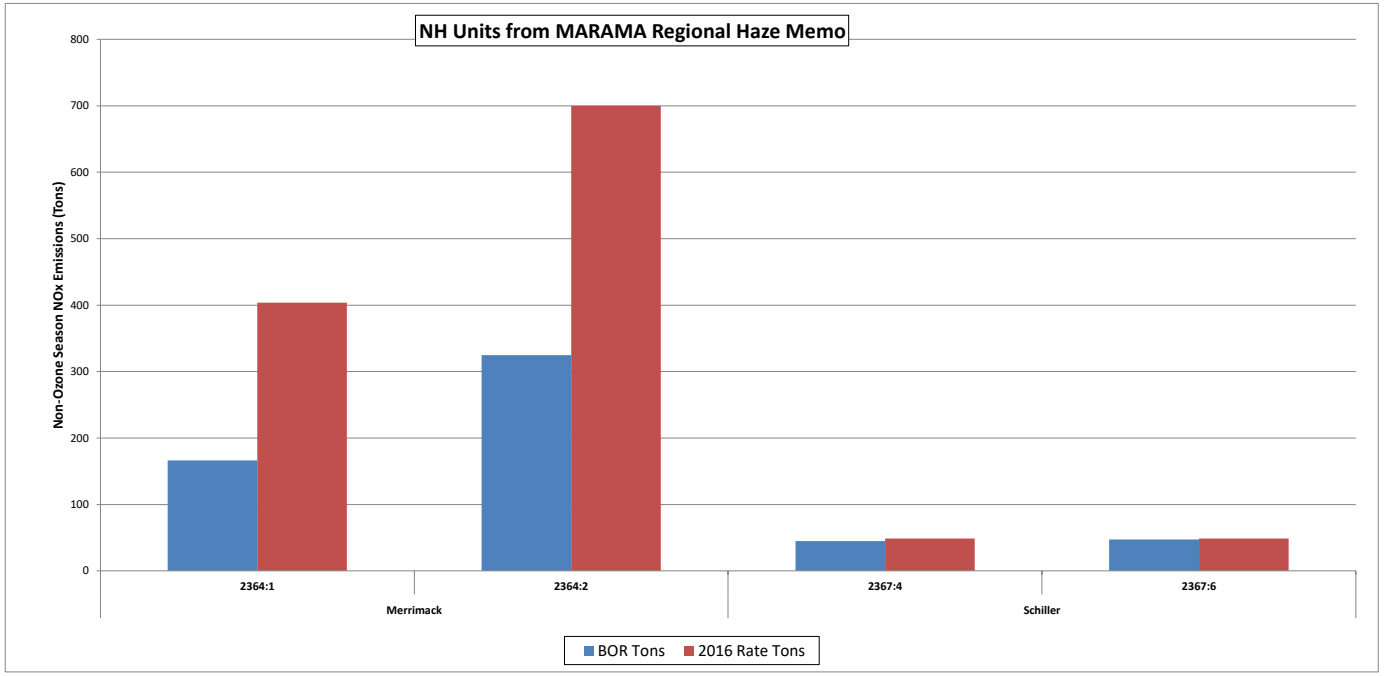
State	NE

Row Labels	BOR Tons	2016 Rate Tons
Gerald Whelan Energy Center	**125**	**135**
60:2	125	135
Nebraska City Station	**779**	**763**
6096:2	779	763
Grand Total	**904**	**898**



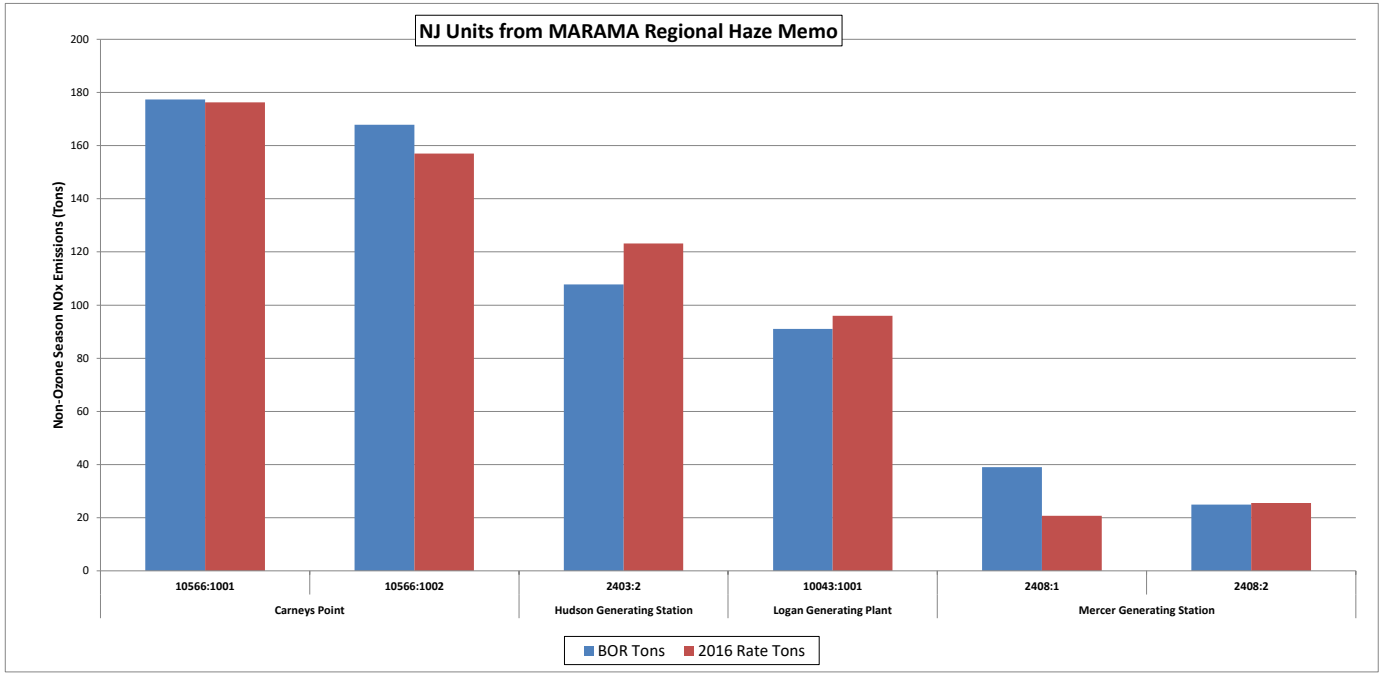
State	NH

Row Labels	BOR Tons	2016 Rate Tons
Merrimack	**491**	**1,103**
2364:1	166	404
2364:2	325	700
Schiller	**92**	**98**
2367:4	45	49
2367:6	47	49
Grand Total	**583**	**1,201**



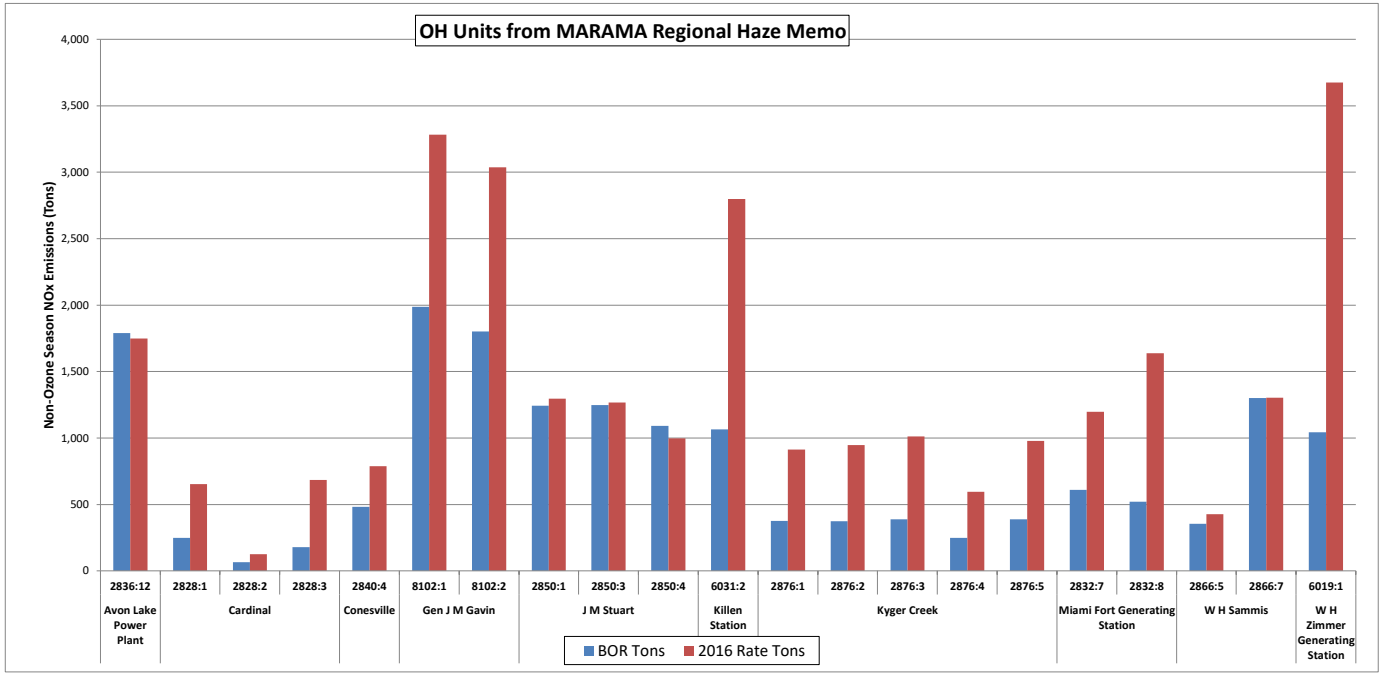
State	NJ

Row Labels	BOR Tons	2016 Rate Tons
Carneys Point	**345**	**333**
10566:1001	177	176
10566:1002	168	157
Hudson Generating Station	**108**	**123**
2403:2	108	123
Logan Generating Plant	**91**	**96**
10043:1001	91	96
Mercer Generating Station	**64**	**46**
2408:1	39	21
2408:2	25	26
Grand Total	**608**	**599**



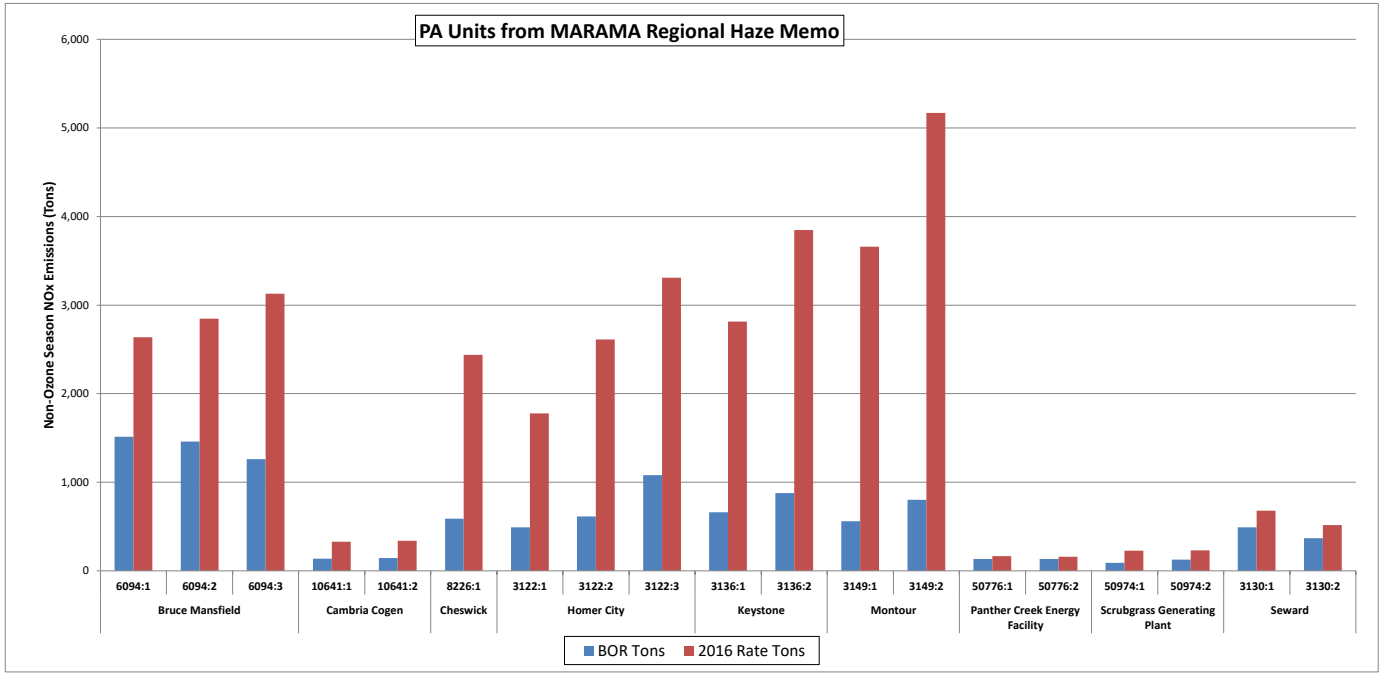
State	OH

Row Labels	BOR Tons	2016 Rate Tons
Avon Lake Power Plant	**1,789**	**1,748**
2836:12	1,789	1,748
Cardinal	**494**	**1,462**
2828:1	249	652
2828:2	66	125
2828:3	180	685
Conesville	**481**	**787**
2840:4	481	787
Gen J M Gavin	**3,787**	**6,319**
8102:1	1,987	3,281
8102:2	1,800	3,037
J M Stuart	**3,581**	**3,557**
2850:1	1,244	1,295
2850:3	1,246	1,266
2850:4	1,091	996
Killen Station	**1,064**	**2,797**
6031:2	1,064	2,797
Kyger Creek	**1,773**	**4,447**
2876:1	376	913
2876:2	374	947
2876:3	387	1,013
2876:4	248	596
2876:5	388	978
Miami Fort Generating Station	**1,130**	**2,835**
2832:7	610	1,197
2832:8	520	1,638
W H Sammis	**1,655**	**1,730**
2866:5	355	428
2866:7	1,300	1,302
W H Zimmer Generating Station	**1,042**	**3,674**
6019:1	1,042	3,674
Grand Total	**16,797**	**29,356**



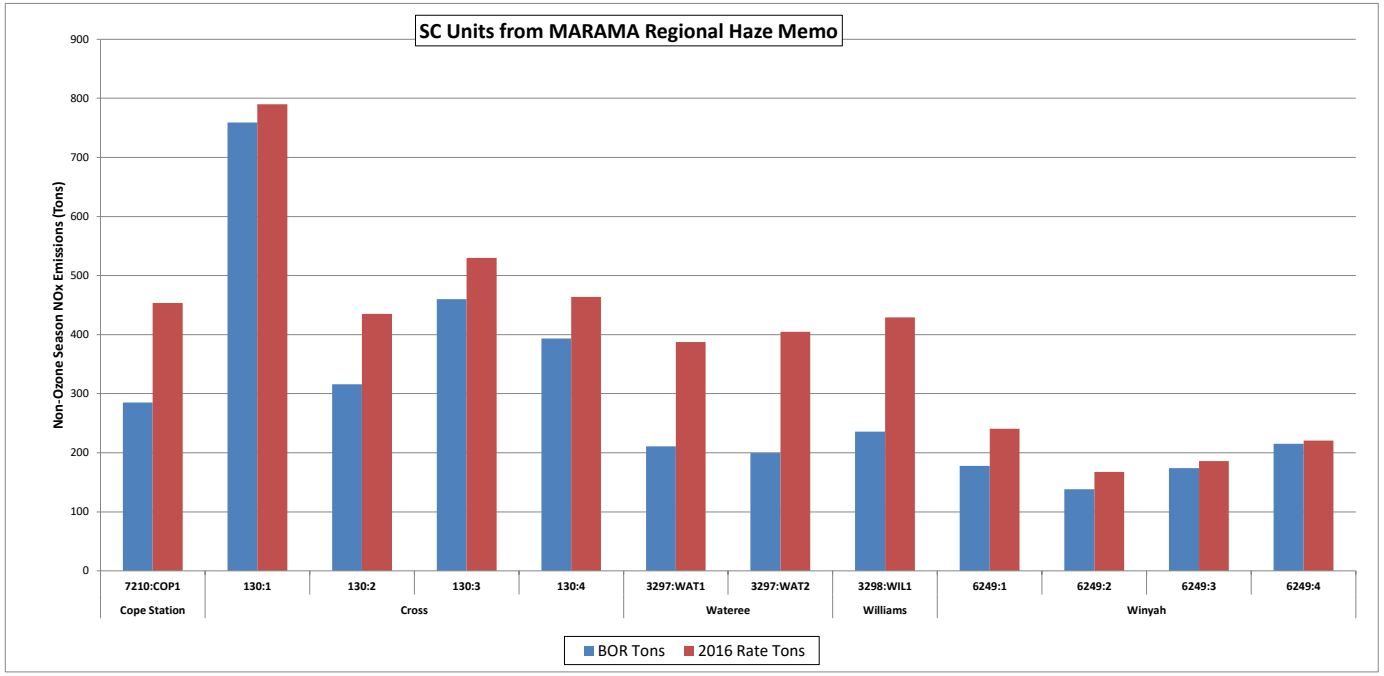
State	PA

Row Labels	BOR Tons	2016 Rate Tons
Bruce Mansfield	**4,234**	**8,612**
6094:1	1,514	2,636
6094:2	1,459	2,847
6094:3	1,261	3,128
Cambria Cogen	**284**	**670**
10641:1	138	330
10641:2	146	340
Cheswick	**590**	**2,439**
8226:1	590	2,439
Homer City	**2,187**	**7,697**
3122:1	493	1,776
3122:2	613	2,611
3122:3	1,081	3,310
Keystone	**1,539**	**6,660**
3136:1	662	2,813
3136:2	877	3,847
Montour	**1,362**	**8,828**
3149:1	561	3,660
3149:2	802	5,169
Panther Creek Energy Facility	**271**	**325**
50776:1	136	166
50776:2	136	159
Scrubgrass Generating Plant	**217**	**462**
50974:1	91	229
50974:2	126	233
Seward	**859**	**1,196**
3130:1	491	679
3130:2	368	517
Grand Total	**11,542**	**36,888**



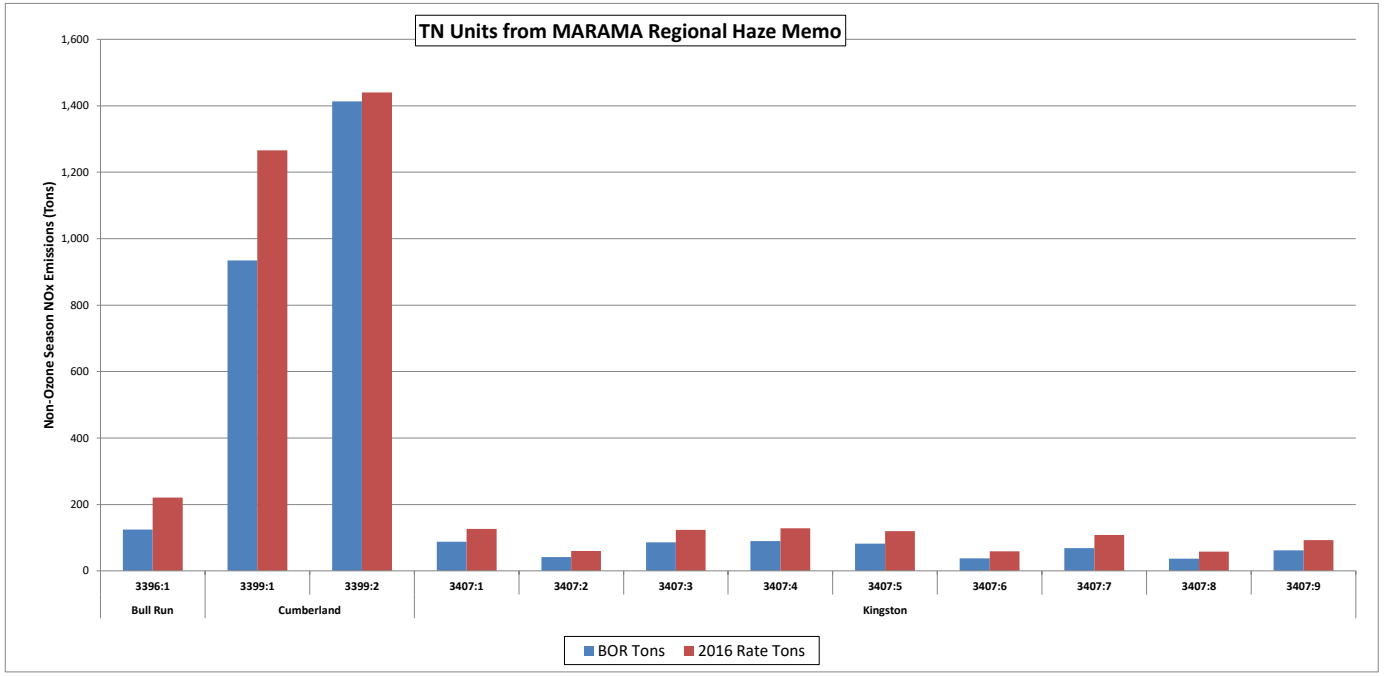
State	SC

Row Labels	BOR Tons	2016 Rate Tons
Cope Station	**285**	**454**
7210:COP1	285	454
Cross	**1,928**	**2,219**
130:1	759	790
130:2	316	435
130:3	460	530
130:4	393	464
Wateree	**410**	**792**
3297:WAT1	211	387
3297:WAT2	199	405
Williams	**235**	**429**
3298:WIL1	235	429
Winyah	**705**	**815**
6249:1	178	240
6249:2	138	168
6249:3	174	186
6249:4	215	220
Grand Total	**3,564**	**4,708**



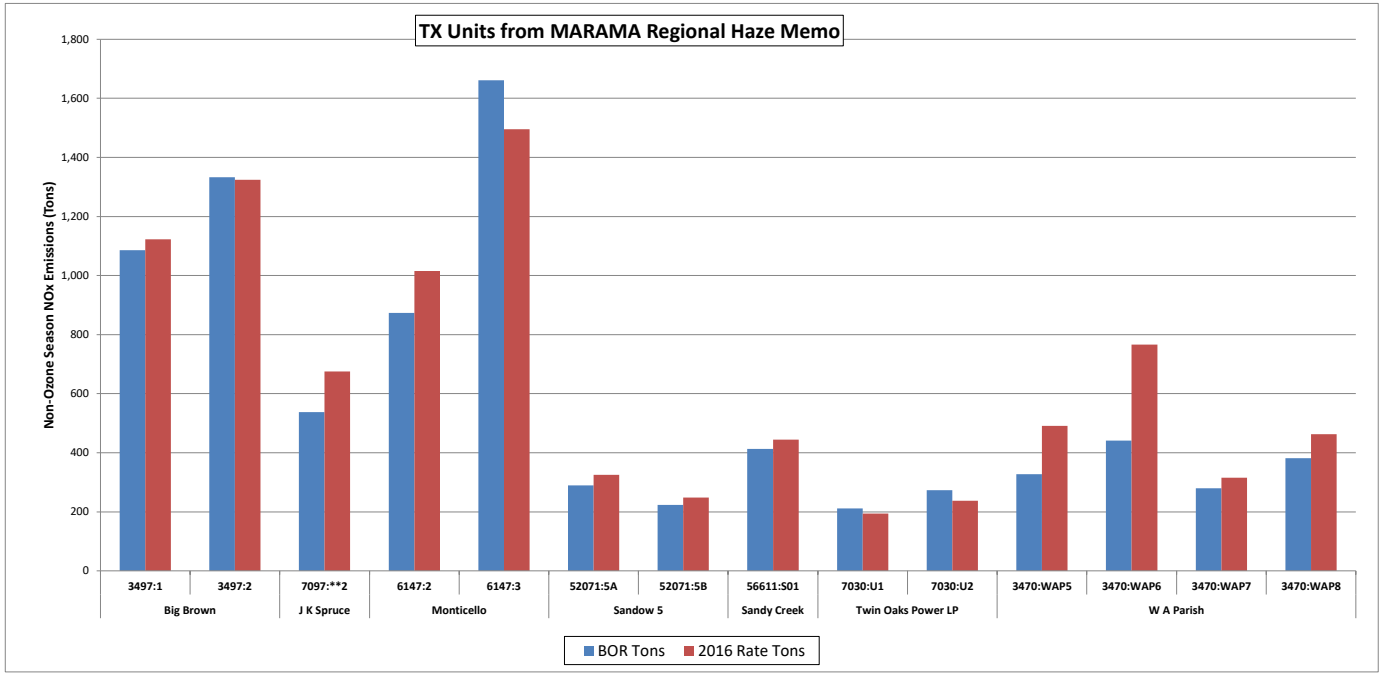
State	TN

Row Labels	BOR Tons	2016 Rate Tons
Bull Run	**124**	**220**
3396:1	124	220
Cumberland	**2,347**	**2,706**
3399:1	935	1,265
3399:2	1,413	1,440
Kingston	**592**	**874**
3407:1	88	127
3407:2	42	60
3407:3	86	123
3407:4	90	128
3407:5	82	120
3407:6	37	58
3407:7	69	108
3407:8	37	58
3407:9	61	93
Grand Total	**3,064**	**3,800**



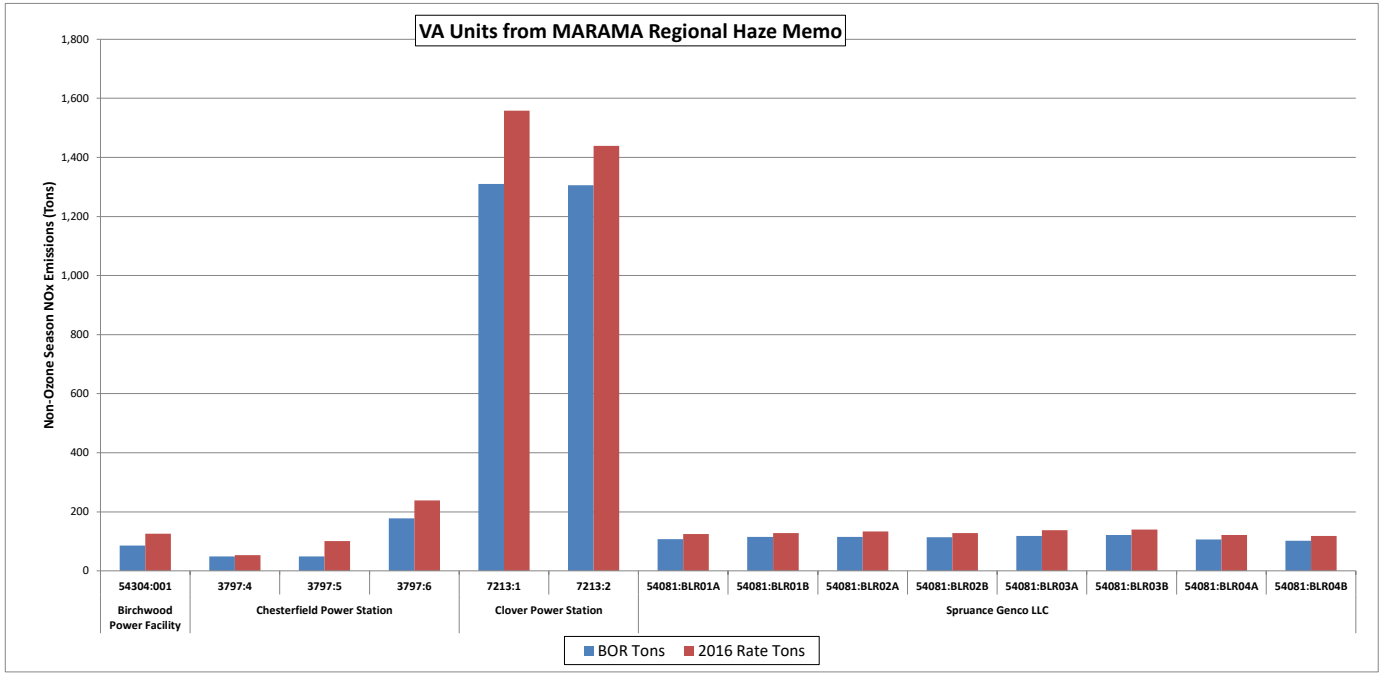
State	TX

Row Labels	BOR Tons	2016 Rate Tons
Big Brown	**2,419**	**2,447**
3497:1	1,086	1,123
3497:2	1,333	1,324
J K Spruce	**538**	**675**
7097:**2	538	675
Monticello	**2,535**	**2,510**
6147:2	874	1,015
6147:3	1,662	1,495
Sandow 5	**513**	**574**
52071:5A	290	326
52071:5B	223	248
Sandy Creek	**413**	**445**
56611:S01	413	445
Twin Oaks Power LP	**484**	**432**
7030:U1	211	194
7030:U2	273	238
W A Parish	**1,431**	**2,037**
3470:WAP5	327	491
3470:WAP6	441	766
3470:WAP7	280	316
3470:WAP8	382	463
Grand Total	**8,334**	**9,118**



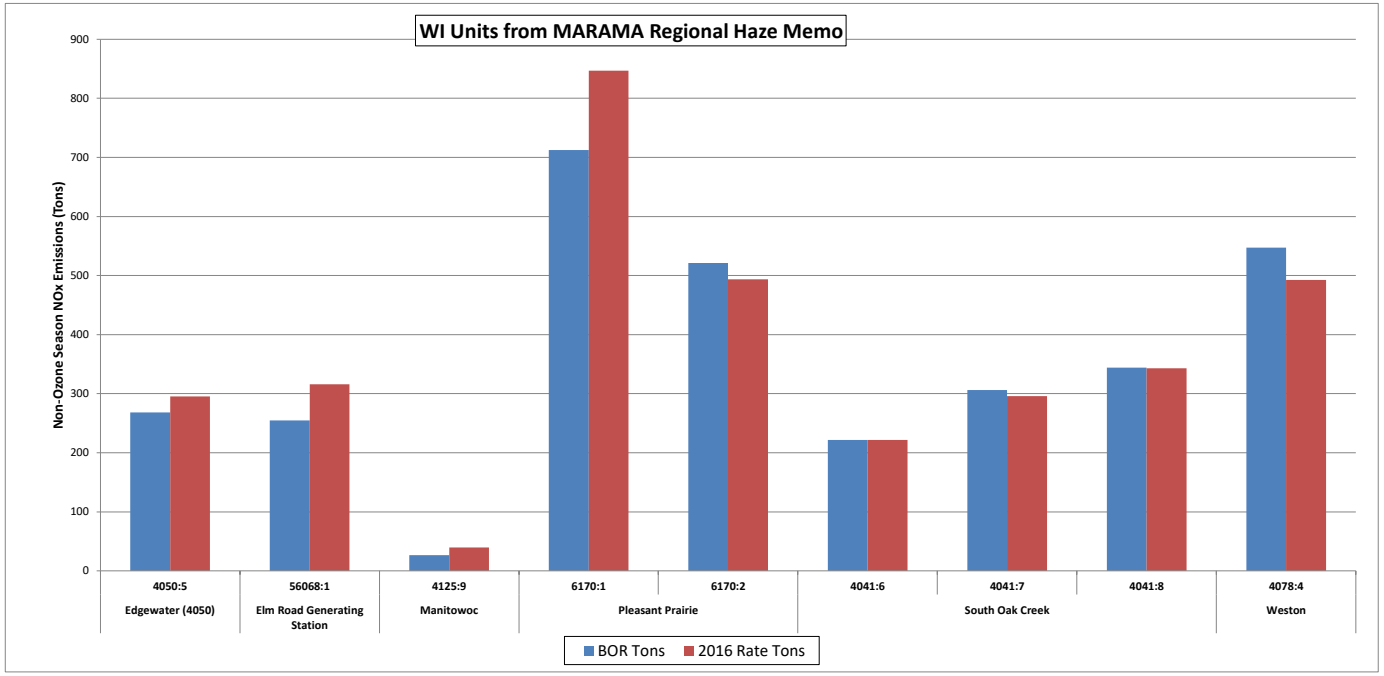
State	VA

Row Labels	BOR Tons	2016 Rate Tons
Birchwood Power Facility	**86**	**125**
54304:001	86	125
Chesterfield Power Station	**276**	**393**
3797:4	49	53
3797:5	49	101
3797:6	178	239
Clover Power Station	**2,615**	**2,997**
7213:1	1,310	1,558
7213:2	1,305	1,439
Spruance Genco LLC	**899**	**1,030**
54081:BLR01A	107	124
54081:BLR01B	115	128
54081:BLR02A	115	133
54081:BLR02B	114	128
54081:BLR03A	118	137
54081:BLR03B	121	140
54081:BLR04A	107	121
54081:BLR04B	102	118
Grand Total	**3,877**	**4,545**



State	WI

Row Labels	BOR Tons	2016 Rate Tons
Edgewater (4050)	**269**	**295**
4050:5	269	295
Elm Road Generating Station	**255**	**316**
56068:1	255	316
Manitowoc	**27**	**40**
4125:9	27	40
Pleasant Prairie	**1,234**	**1,340**
6170:1	713	847
6170:2	521	493
South Oak Creek	**872**	**860**
4041:6	222	222
4041:7	306	296
4041:8	344	343
Weston	**547**	**493**
4078:4	547	493
Grand Total	**3,203**	**3,345**



State	WV

Row Labels	BOR Tons	2016 Rate Tons
Grant Town Power Plant	**114**	**470**
10151:1A	114	470
Harrison Power Station	**2,167**	**5,982**
3944:1	728	1,273
3944:2	799	2,904
3944:3	640	1,806
John E Amos	**878**	**2,147**
3935:1	447	1,007
3935:2	432	1,140
Longview Power	**842**	**851**
56671:001	842	851
Mount Storm Power Station	**901**	**1,091**
3954:1	329	402
3954:2	227	305
3954:3	345	384
Mountaineer (1301)	**1,041**	**2,893**
6264:1	1,041	2,893
Pleasants Power Station	**1,063**	**4,898**
6004:1	589	2,784
6004:2	474	2,114
Grand Total	**7,006**	**18,333**