APPENDIX C

ANALYSIS AND RECOMMENDATIONS ON 30-DAY ROLLING AVERAGE EMISSION LIMITS

I. Running Power Plant Controls to Help Address Regional and Local Contributions to Ozone in the East

A Straw Proposal from Maryland (4/15/15)

What Does the Science Tell Us About How These Controls Should be Run?

Background

A SCOOT Workgroup has been established to look at how power plant controls need to be run to help address the ozone problem in the East. Other emission sources are also being looked at as part of the SCOOT process.

There is a large amount of scientific information that can provide insight into this issue. In general terms, there are two distinct pieces to the ozone problem in the East. A large regional component that is created primarily by regional power plant and mobile source NOx emissions from June to August and a daily piece created by more local emission sources (again, primarily power plant and mobile sources) on the days just before … or the day of … high ozone readings.

Again, in very general terms, ozone measurements show that in most difficult ozone areas about 70% of the problem comes from the regional component of the problem and about 30% from the local component. This is a gross generalization.

For the daily contribution piece of the problem, the timing and "contributing units" will be different for areas in different regions. A more local approach is needed to address the daily contribution component of different areas ozone problems.

For the regional component, regional sources across much of the East contribute to a summer-long reservoir of ozone that is consistently measured in the 50 to 70 ppb range. The regional reservoir of ozone is seen all summer, covers most of the East and is most easily explained by looking at how ozone builds up over time, moves aloft at night and mixes down every day in the early morning.

During the ozone season, regional ozone builds up and collects in a large "reservoir" of high ozone. Measurements clearly show that the ozone reservoir exists. At night, the earth cools and a nocturnal inversion sets up. The inversion separates the reservoir from the surface. Surface ozone readings at night are often in the 20 to 30 ppb range. Aloft measurements at night (above the inversion) show ozone levels continue to be as high as 50 to 80 ppb. In the morning, the earth heats up and the nocturnal inversion breaks down. The reservoir of high ozone that has been trapped aloft overnight mixes down in the mid-morning and ground level monitors all begin to record levels nearly identical to the higher aloft levels of ozone recorded all night long.

A consistent regional approach covering much of the East can be used to address the regional component of the ozone problem (the ozone reservoir) while the daily component will need a more localized approach to insure success. Ozone transport can be part of what creates the regional and the local component to an areas ozone problem.

A Proposal from Maryland

1. All sources must continue to meet federal requirements including any trading programs and annual or ozone season tonnage caps.
2. To supplement the federal program, require sources to constrain their trading programs to meet 30 day rolling average NOx emission rates (for individual units or a company's system [this paper uses a system approach, but this could apply unit-by-unit) in each state) that is consistent with demonstrated past performance. Separate system-wide averages will be established for units with SCRs and units with SNCRs. The system wide averages would apply from June to August (or some other period agreed upon by the workgroup). The rates should be established for a large region including at least the following states: CT, DE, IL, IN, KY, MA, MD, MI, NC, NJ, NY, OH, PA, TN, VA, WV.
    - This concept is designed to address the "summertime" regional component of ozone problems across the East
3. Establish 24-hour block average NOx emission rates for units whose emissions are close to nonattainment areas who believe that short-term limits are needed to address daily or "peak day" ozone issues. In this white paper, these limits would apply all summer. As a preliminary concept, "close by" might be defined as in an adjacent state and within 200 miles of the nonattainment area of concern. Nonattainment areas who believe this requirement is not needed should have the right to implement other appropriate controls for their area.
    - This concept is designed to address the daily "episodic or peak day" component of an areas ozone problem.

Explanation

The easiest way to explain Maryland's ideas on how to address the two separate components of an areas ozone problem is to use an example, like Philadelphia, PA. In this example, Maryland is used as one "contributing state". Other contributing states would have to implement similar controls. This proposal focuses on coal-fired power plant controls but many of the regional and local contribution concepts also apply to mobile and other sources.

- Federal Requirements: Federal requirements, caps, trading programs and other limits continue to apply.
- Regional Controls: To address the regional component of the problem in Philadelphia Maryland would implement the following 30 day rolling average limits as constraints to each companies trading program used to meet federal requirements. These requirements would also eliminate Maryland's regional contribution to all other nonattainment areas in the East.
    - Maryland has 2 companies that operate coal fired generators in the state.
        - Company 1
            - SCR Units – Treated as a "system". The system of SCR units would be required to meet a .08 lb/MMBTU 30 day rolling average limit between June and August. This rate is based upon analysis of historical performance data and includes all operating modes including start-up and shut-down.
            - SNCR Units - Treated as a "system". The system of SNCR units would be required to meet a .28 lb/MMBTU 30 day rolling average limit between June and August. This rate is based upon analysis of historical performance data and includes all operating modes including start-up and shut-down.
            - The system-wide averaging provides sources with considerable flexibility while insuring solid, deep reductions during the core ozone season.
            - This approach could also be applied unit-by-unit.
        - Company 2
            - SCR Units - Treated as a "system". The system of SCR units would be required to meet a .10 lb/MMBTU 30 day rolling average limit between June and August. This rate is based upon analysis of historical performance data and includes all operating modes including start-up and shut-down.

- SNCR Units - Treated as a "system". The system of SNCR units would be required to meet a .30 lb/MMBTU 30 day rolling average limit between June and August. This rate is based upon analysis of historical performance data and includes all operating modes including start-up and shut-down.
- The system-wide averaging provides sources with considerable flexibility while insuring solid, deep reductions during the core ozone season.
- This approach could also be applied unit-by-unit.

- Local Controls: To address the local contribution that Maryland sources make to the daily ozone problem in the Philadelphia nonattainment area. These limits would also eliminate Maryland's daily contribution to the Baltimore and Washington, DC nonattainment areas.
    - Maryland has 2 companies that operate coal fired generators in the state.
        - Company 1
            - SCR Units – Unit-by-unit 24-hour block NOx emission rates would be established for each unit in Maryland. For Company 1, analyses of historical data indicate that these rates would range from 0.05 lb/MMBTU to 0.09 lb/MMBTU 24-hour block average for each day of the summer. These rates are based upon analysis of historical performance data but include separate limits that apply during start-up, shut-down and other operating modes linked to low capacity operations.
            - SNCR Units - Unit-by-unit 24-hour block NOx emission rates would be established for each unit in Maryland. For Company 1, analyses of historical data indicate that these rates would range from 0.25 lb/MMBTU to 0.34 lb/MMBTU 24-hour block average for each day of the summer. These rates are based upon analysis of historical performance data but include separate limits that apply during start-up, shut-down and other operating modes linked to low capacity operations.
        - Company 2
            - SCR Units – Unit-by-unit 24-hour block NOx emission rates would be established for each unit in Maryland. For Company 2, analyses of historical data indicate that these rates would range from 0.07 lb/MMBTU to 0.12 lb/MMBTU 24-hour block average for each day of the summer. These rates are based upon analysis of historical performance data but include separate limits that

apply during start-up, shut-down and other operating modes linked to low capacity operations.

- SNCR Units - Unit-by-unit 24-hour block NOx emission rates would be established for each unit in Maryland. For Company 2, analyses of historical data indicate that these rates would range from 0.28 lb/MMBTU to 0.33 lb/MMBTU 24-hour block average for each day of the summer. These rates are based upon analysis of historical performance data but include separate limits that apply during start-up, shut-down and other operating modes linked to low capacity operations.

II. Maryland 30-Day Rolling Average NOx Rates for Coal-Fired Units Equipped With SCR and SNCR Post-Combustion

The State Collaborative on Ozone Transport (SCOOT) formed a technical workgroup to better define the term "running NOx Controls". Maryland is a member of this workgroup. One discussion point has been how to determine if EGU units have optimized the operation of their NOx emission controls.

For this end Maryland is providing a data base which shows what level of NOx emissions rate (Indicator Rate) represent full operation of controls. Each EGU Indicator Rate is equal to the maximum 30-day rolling average rate, which captures a reasonably restrictive unit by unit NOx rate while still allowing for some natural rate variation. The Indicator rate can be used in the 2015 ozone season to evaluate performance.

The steps to calculating the 30-day rolling average:

- Use ERTAC unit availability file, narrow the list to the modeling Domain, choose coal-fired EGU's (ERTAC includes those over 25 MW), narrow the list to those EGU's with existing controls identified through CAMD – result 29 states

- Selected the year for which the lowest ozone season NOx rate was identified (as reported to CAMD 2005-2014, or for one ozone season after the control was installed if the control was installed after 2005)
- Download daily mass and heat input from CAMD for the chosen units.
- Calculate a series of 30-day rolling averages, using the daily ozone season values from the identified best ozone season for that unit, beginning on the 30th day of operation during ozone season. 30-day rolling averages were calculated by summing the total tons of NOx emitted for that day and the previous 29 days and dividing by the sum of the heat input for that day and the previous 29 days. From those rolling averages, three averages were identified: the minimum 30-day rolling average, the median 30-day rolling average, and the maximum 30-day rolling average
- Evaluate maximum 30-day rolling average for viability

Maryland believes the maximum 30-day rolling average from the best/lowest reported ozone year to be the rate representative of a well-controlled unit. By selecting the best/lowest ozone season NOx emission rate but also selecting the maximum 30-day rolling average from the same year, Maryland considers the combination results to be a good, but also readily achievable, NOx emission rate that states can use as an indicator of running controls well.

The following Table is a list of 29 states in the modeling domain, with coal units with an SCR or SNCR, showing the Maryland calculated Maximum 30-day Rolling Average. If the rate has been substituted through evaluation there is an * with a note at the bottom of the Table including an explanation. An Appendix is also available with additional details of the 30-day rolling average calculations.

30-Day Rolling Average Ozone Season NOx Rates for Coal-Fired Units with SCR or SNCR Controls

Plant ID (ORISPL)	State	Facility Name	Unit ID	Post-Combustion Control Type	Best Performing Ozone Season Emission Rate Year (Year)	Best Performing Ozone Season Emission Rate (lb/mmBtu)	Max 30-Day Rolling Average (lb/mmBtu)	
ERTAC	ERTAC	ERTAC	ERTAC	CAMD	CAMD 2005-2014		Calculated	
3	AL	Barry	3	SNCR	2007	0.2626	0.2849	**
3	AL	Barry	4	SNCR	2008	0.2262	0.2349	
3	AL	Barry	5	SCR	2010	0.0603	0.0629	
56	AL	Charles R Lowman	2	SCR	2011	0.1640	0.1828	
56	AL	Charles R Lowman	3	SCR	2011	0.0585	0.0743	
47	AL	Colbert	5	SCR	2007	0.0385	0.0419	***
26	AL	E C Gaston	5	SCR	2007	0.0760	0.0920	
8	AL	Gorgas	10	SCR	2006	0.0680	0.0898	
6002	AL	James H Miller Jr	1	SCR	2011	0.0656	0.0685	
6002	AL	James H Miller Jr	2	SCR	2011	0.0538	0.0572	
6002	AL	James H Miller Jr	3	SCR	2006	0.0634	0.0682	
6002	AL	James H Miller Jr	4	SCR	2008	0.0630	0.0679	
50	AL	Widows Creek	7	SCR	2007	0.0600	0.0438	*
56564	AR	John W. Turk Jr. Power Plant	SN-01	SCR	2014	0.0400	0.0408	
56456	AR	Plum Point Energy Station	1	SCR	2012	0.0641	0.0697	
594	DE	Indian River	4	SCR	2012	0.0657	0.0730	
10672	FL	Cedar Bay Generating	CBA	SNCR	2009	0.1451	0.1501	

		Co.						
10672	FL	Cedar Bay Generating Co.	CBB	SNCR	2009	0.1461	0.1542	
10672	FL	Cedar Bay Generating Co.	CBC	SNCR	2009	0.1447	0.1507	
641	FL	Crist Electric Generating Plant	4	SNCR	2012	0.1235	0.1235	*** **
641	FL	Crist Electric Generating Plant	5	SNCR	2013	0.1354	0.1490	
641	FL	Crist Electric Generating Plant	6	SCR	2014	0.1050	0.0883	*
641	FL	Crist Electric Generating Plant	7	SCR	2008	0.0842	0.0919	
628	FL	Crystal River	4	SCR	2014	0.0504	0.0620	
628	FL	Crystal River	5	SCR	2010	0.0446	0.0589	
564	FL	Curtis H. Stanton Energy Center	2	SCR	2014	0.1480	0.1585	
663	FL	Deerhaven	B2	SCR	2012	0.0571	0.0729	
50976	FL	Indiantown Cogen	1	SCR	2009	0.1486	0.1502	
643	FL	Lansing Smith Generating Plant	1	SNCR	2010	0.2917	0.3089	
643	FL	Lansing Smith Generating Plant	2	SNCR	2010	0.2918	0.3024	
667	FL	Northside	1A	SNCR	2013	0.0252	0.0331	
667	FL	Northside	2A	SNCR	2012	0.0420	0.0420	*** **
136	FL	Seminole (136)	1	SCR	2010	0.0434	0.0605	
136	FL	Seminole (136)	2	SCR	2011	0.0404	0.0443	
207	FL	St. Johns River Power	1	SCR	2010	0.1265	0.1613	
207	FL	St. Johns River Power	2	SCR	2010	0.1274	0.1593	
703	GA	Bowen	1BLR	SCR	2008	0.0547	0.0575	

703	GA	Bowen	2BLR	SCR	2006	0.0543	0.0573	
703	GA	Bowen	3BLR	SCR	2006	0.0553	0.0591	
703	GA	Bowen	4BLR	SCR	2013	0.0525	0.0561	
708	GA	Hammond	4	SCR	2007	0.0553	0.0583	
6257	GA	Scherer	1	SCR	2014	0.0613	0.0636	
6257	GA	Scherer	2	SCR	2014	0.0606	0.0635	
6257	GA	Scherer	3	SCR	2012	0.0593	0.0611	
6257	GA	Scherer	4	SCR	2013	0.0627	0.0695	
6052	GA	Wansley (6052)	1	SCR	2010	0.0475	0.0491	
6052	GA	Wansley (6052)	2	SCR	2006	0.0507	0.0516	
1091	IA	George Neal North	3	SNCR	2014	0.1665	0.2132	*** *
7343	IA	George Neal South	4	SNCR	2014	0.1885	0.2144	
1047	IA	Lansing	4	SCR	2014	0.0950	0.1464	
1082	IA	Walter Scott Jr. Energy Center	4	SCR	2010	0.0537	0.0587	
889	IL	Baldwin Energy Complex	1	SCR	2009	0.0535	0.0574	
889	IL	Baldwin Energy Complex	2	SCR	2010	0.0509	0.0505	
861	IL	Coffeen	01	SCR	2011	0.0495	0.0579	
861	IL	Coffeen	02	SCR	2008	0.0524	0.0676	
963	IL	Dallman	31	SCR	2007	0.0938	0.1096	
963	IL	Dallman	32	SCR	2008	0.0846	0.1093	
963	IL	Dallman	33	SCR	2014	0.0603	0.0906	
963	IL	Dallman	4	SCR	2011	0.0447	0.0483	
6016	IL	Duck Creek	1	SCR	2009	0.0736	0.0876	
856	IL	E D Edwards	3	SCR	2005	0.0808	0.1106	
891	IL	Havana	9	SCR	2008	0.0290	0.0318	

384	IL	Joliet 29	71	SNCR	2013	0.0964	0.1061	**
384	IL	Joliet 29	72	SNCR	2013	0.0961	0.1026	**
384	IL	Joliet 29	81	SNCR	2013	0.0913	0.0958	**
384	IL	Joliet 29	82	SNCR	2013	0.0909	0.0940	**
874	IL	Joliet 9	5	SNCR	2013	0.1121	0.1304	**
876	IL	Kincaid Station	1	SCR	2013	0.0577	0.0644	
876	IL	Kincaid Station	2	SCR	2009	0.0600	0.0661	
976	IL	Marion	123	SNCR	2006	0.0656	0.0738	
976	IL	Marion	4	SCR	2005	0.0964	0.1263	
879	IL	Powerton	51	SNCR	2013	0.0985	0.1098	
879	IL	Powerton	52	SNCR	2013	0.0995	0.1114	
879	IL	Powerton	61	SNCR	2013	0.0973	0.1113	
879	IL	Powerton	62	SNCR	2013	0.0968	0.1096	
55856	IL	Prairie State Gen Co	01	SCR	2013	0.0665	0.0548	*
55856	IL	Prairie State Gen Co	02	SCR	2013	0.0590	0.0659	
884	IL	Will County	4	SNCR	2013	0.0903	0.0918	
6137	IN	A B Brown Generating Station	1	SCR	2006	0.0756	0.0866	
6137	IN	A B Brown Generating Station	2	SCR	2006	0.1009	0.1104	
6705	IN	Alcoa Allowance Management	4	SCR	2007	0.0948	0.1035	
995	IN	Bailly Generating Station	8	SCR	2012	0.1223	0.1196	*
983	IN	Clifty Creek	1	SCR	2005	0.0735	0.0895	
983	IN	Clifty Creek	2	SCR	2005	0.0750	0.0896	
983	IN	Clifty Creek	3	SCR	2005	0.0742	0.0836	
983	IN	Clifty Creek	4	SCR	2006	0.2359	0.3772	
983	IN	Clifty Creek	5	SCR	2006	0.2406	0.2924	

1004	IN	Edwardsport	CTG1	SCR	2014	0.0443	0.0401	*
1004	IN	Edwardsport	CTG2	SCR	2014	0.0522	0.0760	
1012	IN	F B Culley Generating Station	2	SCR	2007	0.1524	0.1816	
1012	IN	F B Culley Generating Station	3	SCR	2009	0.0965	0.1466	
6113	IN	Gibson	1	SCR	2007	0.0343	0.0412	
6113	IN	Gibson	2	SCR	2006	0.0672	0.0832	
6113	IN	Gibson	3	SCR	2005	0.0659	0.0883	
6113	IN	Gibson	4	SCR	2008	0.0632	0.0888	
6113	IN	Gibson	5	SCR	2007	0.0597	0.0837	
990	IN	Harding Street Station	50	SNCR	2009	0.2090	0.2261	**
990	IN	Harding Street Station	60	SNCR	2006	0.2141	0.2496	**
990	IN	Harding Street Station	70	SCR	2007	0.0666	0.0908	**
6213	IN	Merom	1SG1	SCR	2014	0.0620	0.0684	
6213	IN	Merom	2SG1	SCR	2014	0.0616	0.0668	
997	IN	Michigan City Gen St	12	SCR	2005	0.0920	0.1009	
994	IN	Petersburg	2	SCR	2005	0.0510	0.0618	
994	IN	Petersburg	3	SCR	2005	0.0466	0.0605	
6085	IN	R M Schahfer	14	SCR	2013	0.0979	0.1161	
988	IN	Tanners Creek	U1	SNCR	2010	0.2737	0.2893	***
988	IN	Tanners Creek	U2	SNCR	2010	0.2768	0.3185	***
988	IN	Tanners Creek	U3	SNCR	2010	0.2668	0.2871	***
6068	KS	Jeffrey Energy Center	1	SCR	2018	0.0080	0.0800	*** **
6068	KS	Jeffrey Energy Center	2	SNCR	2018	0.0397	0.0397	*** **
6068	KS	Jeffrey Energy Center	3	SNCR	2013	0.1236	0.1287	

1241	KS	La Cygne	1	SCR	2011	0.0810	0.0907	
1241	KS	La Cygne	2	SCR	2018	0.0440	0.0440	*** **
1353	KY	Big Sandy	BSU2	SCR	2005	0.0971	0.1181	***
6823	KY	D B Wilson	W1	SCR	2006	0.0477	0.0533	
1355	KY	E W Brown	3	SCR	2014	0.1787	0.1865	
6018	KY	East Bend	2	SCR	2006	0.0518	0.0671	
1374	KY	Elmer Smith	1	SCR	2006	0.1229	0.1594	
1374	KY	Elmer Smith	2	SNCR	2005	0.2179	0.2489	
1356	KY	Ghent	1	SCR	2005	0.0448	0.0470	
1356	KY	Ghent	3	SCR	2005	0.0272	0.0304	
1356	KY	Ghent	4	SCR	2005	0.0272	0.0301	
6041	KY	H L Spurlock	1	SCR	2008	0.0829	0.0851	
6041	KY	H L Spurlock	2	SCR	2006	0.0729	0.0793	
6041	KY	H L Spurlock	3	SNCR	2014	0.0648	0.0704	
6041	KY	H L Spurlock	4	SNCR	2012	0.0604	0.0609	
1382	KY	HMP&L Station 2	H1	SCR	2007	0.0606	0.0750	
1382	KY	HMP&L Station 2	H2	SCR	2009	0.0666	0.0907	
1384	KY	John S. Cooper	2	SCR	2014	0.1349	0.0818	*
1364	KY	Mill Creek	3	SCR	2005	0.0450	0.0521	
1364	KY	Mill Creek	4	SCR	2007	0.0374	0.0411	
1378	KY	Paradise	1	SCR	2006	0.0982	0.1020	**
1378	KY	Paradise	2	SCR	2005	0.0904	0.0991	**
1378	KY	Paradise	3	SCR	2005	0.1001	0.1201	
6071	KY	Trimble County	1	SCR	2005	0.0309	0.0339	
6071	KY	Trimble County	2	SCR	2011	0.0540	0.0588	
6055	LA	Big Cajun 2	2B1	SNCR	2014	0.1381	0.1410	**

6055	LA	Big Cajun 2	2B2	SNCR	2014	0.1380	0.1409	**
6055	LA	Big Cajun 2	2B3	SNCR	2014	0.1218	0.1271	**
6190	LA	Rodemacher Power Station	3-1	SNCR	2011	0.0289	0.0482	
6190	LA	Rodemacher Power Station	3-2	SNCR	2014	0.0419	0.0670	
1619	MA	Brayton Point	1	SCR	2007	0.0402	0.0549	***
1619	MA	Brayton Point	3	SCR	2007	0.0399	0.0406	***
1606	MA	Mount Tom	1	SCR	2007	0.0684	0.0616	*
1626	MA	Salem Harbor	3	SNCR	2012	0.0808	0.1237	***
10678	MD	AES Warrior Run	001	SNCR	2008	0.0510	0.0670	
602	MD	Brandon Shores	1	SCR	2007	0.0589	0.0466	*
602	MD	Brandon Shores	2	SCR	2014	0.0823	0.1126	
1552	MD	C P Crane	1	SNCR	2014	0.3478	0.5594	
1552	MD	C P Crane	2	SNCR	2014	0.2584	0.4152	
1554	MD	Herbert A Wagner	2	SNCR	2014	0.2702	0.3332	
1554	MD	Herbert A Wagner	3	SCR	2010	0.0607	0.0864	
1571	MD	Mirant Chalk Point	1	SCR	2014	0.1040	0.0854	*
1571	MD	Mirant Chalk Point	2	SACR	2009	0.1927	0.2258	
1572	MD	Mirant Dickerson	1	SNCR	2014	0.2353	0.2490	
1572	MD	Mirant Dickerson	2	SNCR	2014	0.2368	0.2610	
1572	MD	Mirant Dickerson	3	SNCR	2014	0.2353	0.2604	
1573	MD	Mirant Morgantown	1	SCR	2013	0.0251	0.0314	
1573	MD	Mirant Morgantown	2	SCR	2011	0.0309	0.0402	
54415	MI	Cadillac Renewable Energy	EUBLR	SNCR	2010	0.1181	0.1326	
1702	MI	Dan E Karn	1	SCR	2010	0.0639	0.0500	*
1702	MI	Dan E Karn	2	SCR	2014	0.0449	0.0441	*

54751	MI	Genesee Power Station	01	SNCR	2012	0.1399	0.1706	
1710	MI	J H Campbell	2	SCR	2014	0.1378	0.1332	*
1710	MI	J H Campbell	3	SCR	2012	0.0687	0.0485	*
1733	MI	Monroe	1	SCR	2014	0.0380	0.0511	
1733	MI	Monroe	2	SCR	2018	0.0800	0.0800	*** **
1733	MI	Monroe	3	SCR	2011	0.0573	0.0809	
1733	MI	Monroe	4	SCR	2013	0.0408	0.0475	
1915	MN	Allen S King	1	SCR	2010	0.0860	0.0915	
1893	MN	Boswell Energy Center	1	SNCR	2014	0.1708	0.1844	
1893	MN	Boswell Energy Center	2	SNCR	2014	0.1714	0.1826	
1893	MN	Boswell Energy Center	3	SCR	2010	0.0500	0.0554	
1893	MN	Boswell Energy Center	4	SNCR	2014	0.1071	0.1148	
10075	MN	Taconite Harbor Energy Center	1	SNCR	2014	0.1172	0.1262	
10075	MN	Taconite Harbor Energy Center	2	SNCR	2014	0.1215	0.1353	
2076	MO	Asbury	1	SCR	2009	0.0918	0.0707	*
2079	MO	Hawthorn	5A	SCR	2012	0.0718	0.0721	
6065	MO	Iatan	1	SCR	2014	0.0648	0.0688	
6065	MO	Iatan	2	SCR	2011	0.0462	0.0558	
2161	MO	James River	4	SNCR	2009	0.1507	0.1728	*** *
2161	MO	James River	5	SNCR	2009	0.1377	0.1453	*** *
6195	MO	John Twitty Energy Center	1	SCR	2013	0.0829	0.0925	
6195	MO	John Twitty Energy Center	2	SCR	2014	0.0596	0.0707	
2167	MO	New Madrid Power	1	SCR	2008	0.0895	0.0967	

		Plant					
2167	MO	New Madrid Power Plant	2	SCR	2009	0.0941	0.1145
2094	MO	Sibley	1	SNCR	2013	0.3413	0.3829
2094	MO	Sibley	2	SNCR	2013	0.4161	0.3588
2094	MO	Sibley	3	SCR	2010	0.0787	0.1090
6768	MO	Sikeston	1	SNCR	2013	0.1046	0.1216
2168	MO	Thomas Hill Energy Center	MB1	SCR	2010	0.0958	0.1467
2168	MO	Thomas Hill Energy Center	MB2	SCR	2011	0.4198	0.6374
2168	MO	Thomas Hill Energy Center	MB3	SCR	2010	0.0961	0.1042
2706	NC	Asheville	1	SCR	2009	0.0455	0.0487
2706	NC	Asheville	2	SCR	2008	0.0612	0.0992
8042	NC	Belews Creek	1	SCR	2007	0.0280	0.0336
8042	NC	Belews Creek	2	SCR	2009	0.0382	0.0486
2721	NC	Cliffside	5	SCR	2011	0.0560	0.0631
2721	NC	Cliffside	6	SNCR	2013	0.0457	0.0616
2718	NC	G G Allen	1	SNCR	2005	0.1643	0.2681
2718	NC	G G Allen	2	SNCR	2007	0.1601	0.1652
2718	NC	G G Allen	3	SNCR	2007	0.1712	0.1933
2718	NC	G G Allen	4	SNCR	2008	0.1778	0.1827
2718	NC	G G Allen	5	SNCR	2012	0.1912	0.2467
2727	NC	Marshall	1	SNCR	2010	0.1960	0.2122
2727	NC	Marshall	2	SNCR	2010	0.1956	0.2083
2727	NC	Marshall	3	SCR	2011	0.0431	0.0445
2727	NC	Marshall	4	SNCR	2007	0.1967	0.2229

6250	NC	Mayo	1A	SCR	2007	0.0610	0.0644
6250	NC	Mayo	1B	SCR	2007	0.0614	0.0650
2712	NC	Roxboro	1	SCR	2005	0.0840	0.0887
2712	NC	Roxboro	2	SCR	2011	0.0575	0.0628
2712	NC	Roxboro	3A	SCR	2005	0.0742	0.0812
2712	NC	Roxboro	3B	SCR	2005	0.0756	0.0845
2712	NC	Roxboro	4A	SCR	2009	0.0793	0.0862
2712	NC	Roxboro	4B	SCR	2009	0.0793	0.0862
54755	NC	Westmoreland Partners Roanoke Valley II	2	SNCR	2011	0.1635	0.1671
60	NE	Gerald Whelan Energy Center	2	SCR	2012	0.0619	0.0706
6096	NE	Nebraska City Station	2	SCR	2012	0.0630	0.0660
2364	NH	Merrimack	1	SCR	2005	0.1613	0.1727
2364	NH	Merrimack	2	SCR	2006	0.1590	0.1952
2367	NH	Schiller	4	SNCR	2007	0.1811	0.1877
2367	NH	Schiller	6	SNCR	2007	0.1896	0.2019
2378	NJ	B L England	1	SNCR	2012	0.3805	0.4434
2378	NJ	B L England	2	SNCR	2012	0.3147	0.4424
10566	NJ	Carneys Point	1001	SCR	2009	0.1218	0.1268
10566	NJ	Carneys Point	1002	SCR	2011	0.1143	0.1205
2403	NJ	Hudson Generating Station	2	SNCR	2011	0.0745	0.0791
10043	NJ	Logan Generating Plant	1001	SCR	2010	0.1276	0.1323
2408	NJ	Mercer Generating Station	1	SCR	2010	0.0808	0.0866
2408	NJ	Mercer Generating Station	2	SCR	2011	0.0823	0.1023
2535	NY	AES Cayuga, LLC	1	SCR	2009	0.1789	0.2388

2535	NY	AES Cayuga, LLC	2	SCR	2018	0.1200	0.1200	*** **
6082	NY	AES Somerset (Kintigh)	1	SCR	2005	0.1361	0.1801	
2554	NY	Dunkirk	2	SNCR	2014	0.1128	0.1488	
2549	NY	Huntley Power	67	SNCR	2013	0.1063	0.2002	
2549	NY	Huntley Power	68	SNCR	2014	0.0962	0.1066	
50202	NY	Niagara Generation, LLC	1	SNCR	2009	0.0948	0.1433	
2836	OH	Avon Lake Power Plant	12	SNCR	2013	0.2842	0.3425	
2828	OH	Cardinal	1	SCR	2009	0.0348	0.0281	*
2828	OH	Cardinal	2	SCR	2009	0.0426	0.0480	
2828	OH	Cardinal	3	SCR	2007	0.0226	0.0273	
2840	OH	Conesville	4	SCR	2010	0.0546	0.0421	*
2837	OH	Eastlake	3	SNCR	2009	0.2123	0.3095	***
2837	OH	Eastlake	5	SNCR	2011	0.2621	0.2849	***
8102	OH	Gen J M Gavin	1	SCR	2007	0.0686	0.0759	
8102	OH	Gen J M Gavin	2	SCR	2005	0.0553	0.0602	
2850	OH	J M Stuart	1	SCR	2009	0.0939	0.1108	
2850	OH	J M Stuart	2	SCR	2009	0.1076	0.1330	
2850	OH	J M Stuart	3	SCR	2006	0.0961	0.0976	
2850	OH	J M Stuart	4	SCR	2007	0.1106	0.1115	
6031	OH	Killen Station	2	SCR	2005	0.0885	0.0965	
2876	OH	Kyger Creek	1	SCR	2005	0.0788	0.0854	
2876	OH	Kyger Creek	2	SCR	2005	0.0792	0.0841	
2876	OH	Kyger Creek	3	SCR	2005	0.0787	0.0841	
2876	OH	Kyger Creek	4	SCR	2005	0.0786	0.0843	
2876	OH	Kyger Creek	5	SCR	2005	0.0785	0.0841	
2832	OH	Miami Fort Generating	6	SNCR	2008	0.2212	0.2262	***

		Station						
2832	OH	Miami Fort Generating Station	7	SCR	2007	0.0536	0.0583	
2832	OH	Miami Fort Generating Station	8	SCR	2007	0.0540	0.0691	
2872	OH	Muskingum River	5	SCR	2007	0.0481	0.0577	***
2866	OH	W H Sammis	5	SNCR	2012	0.1058	0.1128	
2866	OH	W H Sammis	6	SCR	2011	0.0959	0.1120	
2866	OH	W H Sammis	7	SCR	2014	0.1019	0.1207	
6019	OH	W H Zimmer Generating Station	1	SCR	2006	0.0562	0.0500	*
10676	PA	AES Beaver Valley LLC	032	SNCR	2013	0.3402	0.4307	***
10676	PA	AES Beaver Valley LLC	033	SNCR	2009	0.2808	0.2915	***
10676	PA	AES Beaver Valley LLC	034	SNCR	2014	0.3167	0.3425	*, ***
10676	PA	AES Beaver Valley LLC	035	SNCR	2005	0.3181	0.3428	***
6094	PA	Bruce Mansfield	1	SCR	2008	0.0820	0.0887	
6094	PA	Bruce Mansfield	2	SCR	2007	0.0801	0.0862	
6094	PA	Bruce Mansfield	3	SCR	2005	0.0744	0.0858	
3140	PA	Brunner Island	1	SCR	2005	0.2848	0.3033	*** *
3140	PA	Brunner Island	2	SCR	2005	0.2886	0.3040	*** *
3140	PA	Brunner Island	3	SCR	2005	0.2537	0.3068	*** *
10641	PA	Cambria Cogen	1	SNCR	2005	0.0945	0.1150	
10641	PA	Cambria Cogen	2	SNCR	2006	0.0949	0.1153	
8226	PA	Cheswick	1	SCR	2006	0.0901	0.0970	
3118	PA	Conemaugh	1	SCR	2018	0.2000	0.2000	*** **

3118	PA	Conemaugh	2	SCR	2018	0.2000		*** **
3122	PA	Homer City	1	SCR	2006	0.0667	0.0722	
3122	PA	Homer City	2	SCR	2006	0.0826	0.0695	*
3122	PA	Homer City	3	SCR	2005	0.0872	0.1049	
3136	PA	Keystone	1	SCR	2006	0.0431	0.0479	
3136	PA	Keystone	2	SCR	2008	0.0433	0.0459	
3149	PA	Montour	1	SCR	2006	0.0581	0.0477	*
3149	PA	Montour	2	SCR	2006	0.0578	0.0876	
3138	PA	New Castle	3	SNCR	2014	0.1964	0.1964	*** **
3138	PA	New Castle	4	SNCR	2014	0.1593	0.1593	*** **
3138	PA	New Castle	5	SNCR	2014	0.2923	0.2923	*** **
50776	PA	Panther Creek Energy Facility	1	SNCR	2005	0.1051	0.1162	
50776	PA	Panther Creek Energy Facility	2	SNCR	2005	0.1093	0.1162	
50974	PA	Scrubgrass Generating Plant	1	SNCR	2005	0.0573	0.0692	
50974	PA	Scrubgrass Generating Plant	2	SNCR	2005	0.0793	0.0856	
3130	PA	Seward	1	SNCR	2014	0.0747	0.0878	
3130	PA	Seward	2	SNCR	2012	0.0745	0.0880	
3131	PA	Shawville	1	SNCR	2011	0.3706	0.4839	***
3131	PA	Shawville	2	SNCR	2013	0.3925	0.4216	***
3131	PA	Shawville	3	SNCR	2008	0.3437	0.3521	***
3131	PA	Shawville	4	SNCR	2008	0.3453	0.3587	***
7210	SC	Cope Station	COP1	SCR	2009	0.0799	0.0894	

130	SC	Cross	1	SCR	2014	0.0664	0.0707	
130	SC	Cross	2	SCR	2012	0.0702	0.0789	
130	SC	Cross	3	SCR	2012	0.0590	0.0604	
130	SC	Cross	4	SCR	2012	0.0591	0.0604	
3297	SC	Wateree	WAT1	SCR	2007	0.0601	0.0717	
3297	SC	Wateree	WAT2	SCR	2006	0.0541	0.0657	
3298	SC	Williams	WIL1	SCR	2005	0.0601	0.0678	
6249	SC	Winyah	1	SCR	2005	0.0623	0.0690	
6249	SC	Winyah	2	SCR	2005	0.0679	0.0799	
6249	SC	Winyah	3	SCR	2014	0.0840	0.0904	
6249	SC	Winyah	4	SCR	2012	0.0869	0.0950	
3393	TN	Allen	1	SCR	2006	0.0568	0.0614	
3393	TN	Allen	2	SCR	2006	0.0711	0.0828	
3393	TN	Allen	3	SCR	2005	0.0664	0.0738	
3396	TN	Bull Run	1	SCR	2009	0.0618	0.0705	
3399	TN	Cumberland	1	SCR	2009	0.0588	0.0785	
3399	TN	Cumberland	2	SCR	2014	0.0609	0.0789	
3406	TN	Johnsonville	1	SNCR	2014	0.1652	0.1743	***
3406	TN	Johnsonville	2	SNCR	2014	0.1625	0.1743	***
3406	TN	Johnsonville	3	SNCR	2014	0.1626	0.1744	***
3406	TN	Johnsonville	4	SNCR	2014	0.1625	0.1744	***
3407	TN	Kingston	1	SCR	2009	0.0498	0.0662	
3407	TN	Kingston	2	SCR	2007	0.0501	0.0613	
3407	TN	Kingston	3	SCR	2007	0.0504	0.0631	
3407	TN	Kingston	4	SCR	2007	0.0501	0.0619	
3407	TN	Kingston	5	SCR	2007	0.0486	0.0550	
3407	TN	Kingston	6	SCR	2006	0.0448	0.0480	

3407	TN	Kingston	7	SCR	2006	0.0447	0.0474	
3407	TN	Kingston	8	SCR	2006	0.0448	0.0481	
3407	TN	Kingston	9	SCR	2006	0.0449	0.0479	
3497	TX	Big Brown	1	SNCR	2014	0.1290	0.1363	
3497	TX	Big Brown	2	SNCR	2013	0.1305	0.1378	
7097	TX	J K Spruce	**2	SCR	2011	0.0392	0.0406	
6147	TX	Monticello	1	SNCR	2011	0.1269	0.1285	
6147	TX	Monticello	2	SNCR	2014	0.1187	0.1234	
6147	TX	Monticello	3	SNCR	2014	0.1485	0.1646	
6180	TX	Oak Grove	1	SCR	2011	0.0650	0.0697	
6180	TX	Oak Grove	2	SCR	2011	0.0665	0.0691	
6648	TX	Sandow	4	SCR	2011	0.0607	0.0593	
52071	TX	Sandow Station	5A	SCR	2011	0.0618	0.0629	
52071	TX	Sandow Station	5B	SCR	2011	0.0626	0.0641	
56611	TX	Sandy Creek	S01	SCR	2014	0.0419	0.0480	
3470	TX	W A Parish	WAP5	SCR	2007	0.0383	0.0420	
3470	TX	W A Parish	WAP6	SCR	2007	0.0394	0.0423	
3470	TX	W A Parish	WAP7	SCR	2007	0.0360	0.0395	
3470	TX	W A Parish	WAP8	SCR	2006	0.0363	0.0405	
54304	VA	Birchwood Power Facility	001	SCR	2008	0.0879	0.0980	
3803	VA	Chesapeake Energy Center	1	SNCR	2008	0.2211	0.2838	***
3803	VA	Chesapeake Energy Center	2	SNCR	2008	0.2315	0.2587	***
3803	VA	Chesapeake Energy Center	3	SCR	2009	0.0269	0.0298	***
3803	VA	Chesapeake Energy Center	4	SCR	2007	0.0356	0.0380	***

3797	VA	Chesterfield Power Station	4	SCR	2014	0.0487	0.0417	*
3797	VA	Chesterfield Power Station	5	SCR	2008	0.0309	0.0327	
3797	VA	Chesterfield Power Station	6	SCR	2006	0.0326	0.0347	
3775	VA	Clinch River	1	SNCR	2012	0.1899	0.2395	**
3775	VA	Clinch River	2	SNCR	2012	0.1940	0.2324	**
3775	VA	Clinch River	3	SNCR	2013	0.1714	0.2372	***
7213	VA	Clover Power Station	1	SNCR	2005	0.2327	0.2464	
7213	VA	Clover Power Station	2	SNCR	2007	0.2428	0.2496	
54081	VA	Spruance Genco, LLC	BLR01 A	SNCR	2005	0.2608	0.2752	
54081	VA	Spruance Genco, LLC	BLR01 B	SNCR	2005	0.2600	0.2750	
54081	VA	Spruance Genco, LLC	BLR02 A	SNCR	2005	0.2548	0.2608	
54081	VA	Spruance Genco, LLC	BLR02 B	SNCR	2005	0.2547	0.2599	
54081	VA	Spruance Genco, LLC	BLR03 A	SNCR	2005	0.2614	0.2705	
54081	VA	Spruance Genco, LLC	BLR03 B	SNCR	2005	0.2616	0.2700	
54081	VA	Spruance Genco, LLC	BLR04 A	SNCR	2005	0.2648	0.2833	
54081	VA	Spruance Genco, LLC	BLR04 B	SNCR	2005	0.2647	0.2851	
56808	VA	Virginia City Hybrid	1	SNCR	2013	0.0639	0.0663	
56808	VA	Virginia City Hybrid	2	SNCR	2013	0.0655	0.0675	
3809	VA	Yorktown Power Station	1	SNCR	2008	0.2242	0.2309	***
3809	VA	Yorktown Power Station	2	SNCR	2008	0.2204	0.2290	***

4140	WI	Alma	B4	SNCR	2013	0.2989	0.3781	***
4140	WI	Alma	B5	SNCR	2014	0.3309	0.3489	***
3982	WI	Bay Front	1	SNCR	2009	0.1355	0.1600	
3982	WI	Bay Front	2	SNCR	2012	0.1391	0.1477	
8023	WI	Columbia	2	SCR	2014	0.1055	0.1143	*** *
4050	WI	Edgewater (4050)	3	SNCR	2012	0.1582	0.1582	***
4050	WI	Edgewater (4050)	4	SNCR	2010	0.1381	0.1608	**
4050	WI	Edgewater (4050)	5	SNCR	2014	0.0361	0.0394	
56068	WI	Elm Road Generating Station	1	SCR	2010	0.0490	0.0891	
56068	WI	Elm Road Generating Station	2	SCR	2011	0.0497	0.0850	
4143	WI	Genoa	1	SNCR	2014	0.0985	0.1080	
4125	WI	Manitowoc	9	SNCR	2006	0.0478	0.0322	*
4054	WI	Nelson Dewey	1	SNCR	2014	0.2503	0.2419	***
4054	WI	Nelson Dewey	2	SNCR	2014	0.2516	0.2444	***
6170	WI	Pleasant Prairie	1	SCR	2007	0.0498	0.0505	
6170	WI	Pleasant Prairie	2	SCR	2007	0.0601	0.0657	
4041	WI	South Oak Creek	5	SCR	2014	0.0701	0.0734	
4041	WI	South Oak Creek	6	SCR	2013	0.0681	0.0684	*
4041	WI	South Oak Creek	7	SCR	2014	0.0698	0.0771	
4041	WI	South Oak Creek	8	SCR	2014	0.0668	0.0732	
4078	WI	Weston	4	SCR	2014	0.0530	0.0533	*
10151	WV	Grant Town Power Plant	1A	SNCR	2005	0.0721	0.0622	*
10151	WV	Grant Town Power Plant	1B	SNCR	2005	0.0722	0.0622	*
3944	WV	Harrison Power Station	1	SCR	2005	0.0634	0.0657	
3944	WV	Harrison Power Station	2	SCR	2005	0.0662	0.0845	

3944	WV	Harrison Power Station	3	SCR	2005	0.0658	0.0831	
3935	WV	John E Amos	1	SCR	2006	0.0317	0.0380	
3935	WV	John E Amos	2	SCR	2006	0.0312	0.0349	
3935	WV	John E Amos	3	SCR	2012	0.0614	0.0732	
56671	WV	Longview Power	001	SCR	2013	0.0648	0.0656	
3948	WV	Mitchell (WV)	1	SCR	2009	0.0547	0.0554	
3948	WV	Mitchell (WV)	2	SCR	2008	0.0520	0.0546	
3954	WV	Mount Storm Power Station	1	SCR	2006	0.0539	0.0618	
3954	WV	Mount Storm Power Station	2	SCR	2006	0.0485	0.0597	
3954	WV	Mount Storm Power Station	3	SCR	2006	0.0768	0.0891	
6264	WV	Mountaineer (1301)	1	SCR	2007	0.0387	0.0455	
3938	WV	Phil Sporn	31	SNCR	2012	0.2406	0.2673	***
3938	WV	Phil Sporn	41	SNCR	2012	0.2448	0.2681	***
6004	WV	Pleasants Power Station	1	SCR	2005	0.0394	0.0461	
6004	WV	Pleasants Power Station	2	SCR	2005	0.0390	0.0448	

*	Max 30-Day Rolling Average Rate is not appropriate. The Median 30-Day Rolling Average Rate has been substituted.
**	Unit scheduled in ERTAC 2.3 for fuel switch. Max 30-Day Rolling Average Rate is for coal-firing.
***	Unit scheduled in ERTAC 2.3 for retirement. Max 30-Day Rolling Average Rate is suggested up to the retirement date.
****	Unit scheduled in ERTAC 2.3 for control. Recognize that units may not be able to hit the identified controlled rate without the control installation. If, however, a unit has demonstrated that it can hit a lower rate without the control installed, then the Max 30-Day Rolling Average Rate is calculated from that better year.
*****	Max 30-Day Rolling Average Rate or Median 30-Day Rolling Average Rate is not appropriate as it is significantly higher than the Minimum 30-Day Rolling Average Rate and the Lowest Ozone Season Average Rate, or because it cannot be calculated. The Lowest Ozone Season Average Rate has been substituted.