Discussion of Short-term limits:

Petitioners have asserted that units are not operating their controls at all times and request EPA impose unit-specific 30-day emission rate limits. EPA analyzed ozone-season emission rates from all coal-fired units equipped with SCR and found that, based on 2017 emissions with the CSAPR Update in place, that 261 of 274 units had ozone-season emission rates below 0.2 lb/mmBtu indicating they were likely operating their controls throughout the ozone season. Five of the fourteen units with emission rates above 0.2 lb/mmBtu are not located in the CSAPR Update region.

To examine whether units with SCR operate their controls at all times during the ozone season, EPA examined hourly NO_X rates for coal-fired units with SCR and found that at low (hourly) capacity factors, units are not able to operate their SCRs and achieve optimal NO_X rates. Here we define hourly capacity factor (i.e., the ratio of the hourly output to the maximum possible hourly output) as the utilization factor. Note that capacity factor is usually based on an annual average operation, and here we are explicitly assessing the operation in each hour. For each unit, and for each hour that unit operated, EPA characterized: (1) the relative NO_X rate calculated as the hourly NO_X rate divided by the unit's ozone-season average NO_X rate and (2) the unit's hourly utilization factor. EPA examined the 2017 operational year. EPA then segregated (i.e., "binned") the data by units of hourly utilization factor (from 0 to values higher than 100). The numbers of hours of operation were tallied (i.e., counted) in each bin and the relative NO_X rates were averaged across units in bin. The result was a list of average relative NO_X emission rates and total numbers of hours of operation for all units as a function of hourly utilization factor. For 2017, the agency found that, assessed across all units, NO_X rates can be substantially higher at low hourly utilization factors as compared to higher hourly utilization factors. At about 25% hourly utilization factor, relative NO_X rates increased from 1.11 to 1.41 lb/mmBtu. As hourly utilization factor decreased further, the relative NO_X rate increased to a maximum of 4.15 at an hourly utilization factor of 17%. The hourly NO_X rate and hourly utilization factor data suggest that, on average, when operated below about 25% hourly utilization factor, the SCRs may not achieve the low NO_X emission rates that are achieved at higher hourly utilization factors (Figure 1). However, EPA assessed the amount of time units operate less than 25% hourly utilization factor and found that this equated to 2.2% of the time (Figure 2). Consequently, EPA concludes that, at a fleet wide level, current operational data do not suggest that there is widespread operation at hourly utilization factors where the SCR is not running with a reasonable efficiency.

It is possible that the fleetwide evaluation averages out particular individual units that are not consistently operating their controls. Consequently, EPA examined whether units turn off or turn down controls on high electricity demand days (HEDD) when demand for electricity is high (perhaps as a result of hot ozone-conducive weather conditions resulting in additional cooling demand). The auxiliary power savings for a unit would result in an approximate 0.6% savings in electricity generation.[1] We identified HEDD based on cumulative gross load for all EGUs in CAMD in Pennsylvania, New Jersey, New York, Delaware, Connecticut, and Maryland. For the top 10% of hours, we observe that 19 of the 27 units had NO_X rates below their seasonal average rate (Table 1). For the top 1% of hours, 17 of 26 units had NO_X

[1] See Chapter 5, IPM documentation, attachment 5-3. Updates to Cost and Performance for APC Technologies. https://www.epa.gov/sites/production/files/2015-08/documents/attachment_5-3_scr_cost_methodology.pdf

rates below their seasonal average rate and only 2 units had emission rates more than 20% higher than their seasonal average (Table 2). We conclude that, if there is any effect at all, that units typically operate their controls more-effectively on HEDD than on other days.[2]

However, we observed some units cycling their SCRs, turning them down or off during low demand times (Table 3). We identified 15 units in 2017 that had at least 20 days where the hourly NO_X rate doubled during the course of a single calendar day. These include units at the following facilities: Belews Creek, Cheswick, Roxboro, Montour, Conemaugh, Pleasants Power Station, Mountaineer, Gibson, JH Campbell, Gen JM Gavin, and Thomas Hill Energy Center. For these units, the maximum NOx rate occurred between noon and 6 pm only 17% of the time. That is, the units typically operated the SCR during the afternoon when ozone formation is most conducive. The maximum rates often occurred in the early morning (when demand is the lowest).

Consequently, EPA finds that units are consistently operating their SCRs throughout the season. The rare hours when the SCRs are turned down or off are usually associated with periods of low generation, most likely not occurring during peak ozone formation times in the afternoon hours. Stakeholders have asserted that engineering challenges of operating controls at low utilization, such as fouling and minimum operating temperature constraints, may drive some of this behavior.

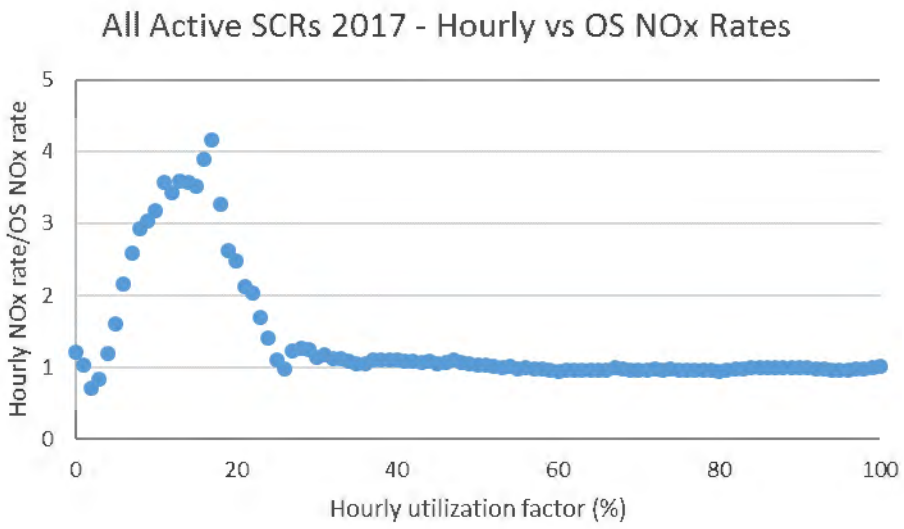

Figure 1. Average SCR rate relative to the seasonal average rate for the fleet as a function of hourly utilization factor. (Source: AMPD (https://ampd.epa.gov/ampd/), EPA, 2018)

[2]In the final rule, EPA reassessed the 2017 hourly data and the average NOx rates during HEDD for the units changed. These changes were not substantial enough to alter our conclusions.

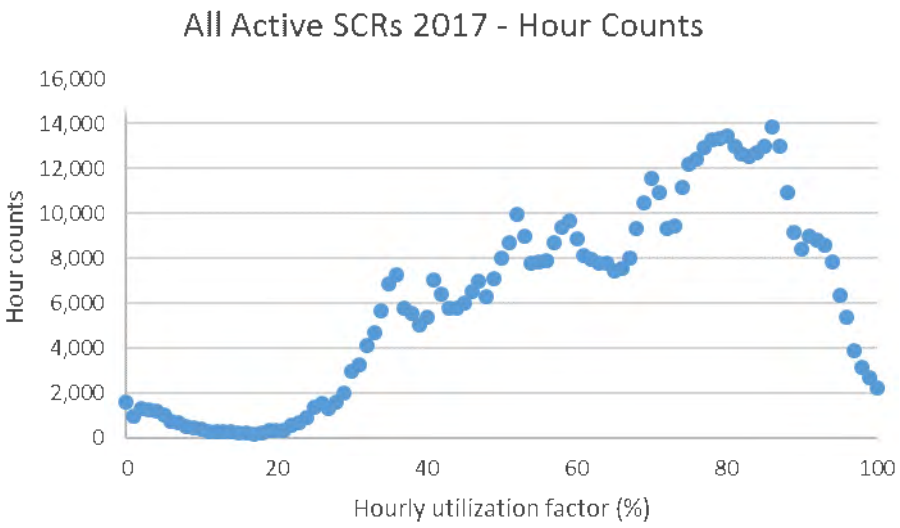

Figure 2. Number of hours of operation for the fleet as a function of hourly utilization factor. (Source: AMPD (https://ampd.epa.gov/ampd/), EPA, 2018)

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Table 1. Each unit's NOx emission rate during the top 10% of regional load hours compared with its seasonal average. (Source: AMPD (https://ampd.epa.gov/ampd/) , EPA, 2018)

Facility Name	State	ORIS	Boiler	Average NOx Rate During the Top 10% of Regional Load (lb/mmBtu)	2017 Ozone Season NOx Rate (lb/mmBtu)	Unit's NOx Rate Increase During the Top 10% of Regional Load (%)
Indian River	DE	594	4	0.075	0.084	-10%
Brandon Shores	MD	602	1	0.047	0.058	-20%
Brandon Shores	MD	602	2	0.058	0.067	-14%
Chalk Point	MD	1571	1	0.114	0.110	4%
Herbert A Wagner	MD	1554	3	0.058	0.063	-8%
Morgantown	MD	1573	1	0.037	0.038	-1%
Morgantown	MD	1573	2	0.033	0.036	-10%
Carneys Point	NJ	10566	1001	0.111	0.112	-1%
Carneys Point	NJ	10566	1002	0.111	0.113	-1%
Hudson Generating Station	NJ	2403	2	0.092	0.084	9%
Logan Generating Plant	NJ	10043	1001	0.122	0.112	9%
Cayuga Operating Company, LLC	NY	2535	1	0.113	0.197	-43%
Greenidge Generation LLC	NY	2527	6	0.078	0.179	-56%
Somerset Operating Company (Kintigh)	NY	6082	1	0.145	0.171	-15%
Bruce Mansfield	PA	6094	1	0.063	0.065	-3%
Bruce Mansfield	PA	6094	2	0.077	0.078	-1%
Bruce Mansfield	PA	6094	3	0.083	0.083	1%
Cheswick	PA	8226	1	0.111	0.156	-29%
Conemaugh	PA	3118	1	0.077	0.072	6%
Conemaugh	PA	3118	2	0.071	0.074	-4%
Homer City	PA	3122	1	0.206	0.176	17%
Homer City	PA	3122	2	0.204	0.179	14%
Homer City	PA	3122	3	0.108	0.115	-6%
Keystone	PA	3136	1	0.085	0.085	0%
Keystone	PA	3136	2	0.069	0.070	0%
Montour, LLC	PA	3149	1	0.112	0.144	-23%
Montour, LLC	PA	3149	2	0.117	0.153	-24%

Table 2. Each unit's NO_X emission rate during the top 1% of regional load hours compared with its seasonal average. (Source: AMPD (https://ampd.epa.gov/ampd/) , EPA, 2018)

Facility Name	State	ORIS	Boiler	Average NOx Rate During the Top 1% of Regional Load (lb/mmBtu)	2017 Ozone Season NOx Rate (lb/mmBtu)	Unit's NOx Rate Increase During the Top 1% of Regional Load (%)
Indian River	DE	594	4	0.077	0.084	-8%
Brandon Shores	MD	602	1	0.048	0.058	-18%
Brandon Shores	MD	602	2	0.057	0.067	-15%
Chalk Point	MD	1571	1	0.153	0.110	39%
Herbert A Wagner	MD	1554	3	0.056	0.063	-11%
Morgantown	MD	1573	1	0.041	0.038	8%
Morgantown	MD	1573	2	0.033	0.036	-11%
Carneys Point	NJ	10566	1001	0.111	0.112	-1%
Carneys Point	NJ	10566	1002	0.110	0.113	-2%
Hudson Generating Station	NJ	2403	2	Did not operate during this time period		
Logan Generating Plant	NJ	10043	1001	0.124	0.112	10%
Cayuga Operating Company, LLC	NY	2535	1	0.094	0.197	-52%
Greenidge Generation LLC	NY	2527	6	0.028	0.179	-85%
Somerset Operating Company (Kintigh)	NY	6082	1	0.119	0.171	-30%
Bruce Mansfield	PA	6094	1	0.089	0.065	37%
Bruce Mansfield	PA	6094	2	0.075	0.078	-4%
Bruce Mansfield	PA	6094	3	0.086	0.083	4%
Cheswick	PA	8226	1	0.111	0.156	-29%
Conemaugh	PA	3118	1	0.075	0.072	5%
Conemaugh	PA	3118	2	0.071	0.074	-4%
Homer City	PA	3122	1	0.203	0.176	16%
Homer City	PA	3122	2	0.203	0.179	13%
Homer City	PA	3122	3	0.107	0.115	-7%
Keystone	PA	3136	1	0.085	0.085	0%
Keystone	PA	3136	2	0.058	0.070	-16%
Montour, LLC	PA	3149	1	0.098	0.144	-32%
Montour, LLC	PA	3149	2	0.132	0.153	-14%

Table 3. Units that exhibit daily cycling behavior, where NO_X rates are at least twice as high in one of the hours. Number of days is the number of days in the ozone season, where this behavior is observed. We also note when during the day the peak NO_X rate was found. (Source: AMPD (https://ampd.epa.gov/ampd/) , EPA, 2018)

Facility Name	State	ORIS	Boiler ID	# Of Days	Non-Afternoon NO_X Maximum	Afternoon NO_X Maximum
Belews Creek	NC	8042	1	99	87	12
Cheswick	PA	8226	1	65	63	2
Roxboro	NC	2712	2	58	52	6
Belews Creek	NC	8042	2	56	40	16
Montour, LLC	PA	3149	1	49	45	4
Montour, LLC	PA	3149	2	45	43	2
Conemaugh	PA	3118	2	41	34	7
Pleasants Power Station	WV	6004	2	36	29	7
Mountaineer (1301)	WV	6264	1	35	33	2
Gibson	IN	6113	3	30	9	21
Gibson	IN	6113	5	30	19	11
J H Campbell	MI	1710	3	24	14	10
Conemaugh	PA	3118	1	23	20	3
Gen J M Gavin	OH	8102	1	23	19	4
Thomas Hill Energy Center	MO	2168	MB3	22	22	0