Why the Regional Greenhouse Gas Initiative is Wrong for Pennsylvania

Allegheny Institute for Public Policy's Testimony before the

Pennsylvania House Environmental Resources and Energy Committee

August 24, 2020

Main Points

-RGGI states' emissions consistently fall below RGGI's cap proving RGGI fails to make an environmental difference and acts only as taxing entity.

- Pennsylvania's carbon dioxide emissions fell by 26 percent from 2000 to 2016 without joining RGGI.

-Dubious health claims- Pennsylvania's percentage of adults with asthma (10.1%) is lower than all current RGGI states except New York (9.2%).

- RGGI, Inc. predicts auction prices will increase to between $12 and $24/ton. In 2017 Pennsylvania's electric generators emitted 79.3 million tons of CO2. If Pennsylvania joined RGGI the projected cost to buy carbon allowances would be between $1 billion to $1.9 billion a year.

- Electricity prices for RGGI states increased by 64 percent compared to the non-RGGI comparison states.

-If Pennsylvania were to join RGGI it would cost the state between $58 to $87 billion over the next 10 years.

- Pennsylvania Public Utility Commission (PUC) anticipates natural gas capacity to almost double by 2022 along with increased capacity for solar and wind power. Therefore, Pennsylvania would meet RGGI's 2030 goal without having to join RGGI.

- From 2007 to 2017 Pennsylvania's per capita emissions from electric power plants decreased by 40 percent. Whereas, RGGI states fell 41 percent after adjusting for the emissions RGGI states moved to somewhere else by importing more electricity from other states. Unlike the RGGI states Pennsylvania was able to lower emissions at the same rate without a carbon tax and the additional problems associated with RGGI membership such as loss of jobs, increased electricity cost, and the need to import electricity from other states.

-The current situation in California, with rolling blackouts amid a heatwave, has placed the spotlight on renewable energy as sporadic winds are hampering wind farm generated power and solar panel's inability to adequately produce during the overnight hours.

Introduction

Governor Wolf has announced a plan for Pennsylvania to join the Regional Greenhouse Gas Initiative (RGGI). He wants to use the proceeds from the cap and trade under RGGI to fund his $4.5 billion "Restore Pennsylvania Infrastructure" program. Wolf 's desire to join RGGI seems to be more about exacting a carbon tax and little to do with actual environmental concerns. A closer look at RGGI reveals that the cooperative is more of a taxing entity and less of an environmental proponent it claims to be.

The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory market-based program in the United States to implement a cap and trade program aimed at decreasing greenhouse gas emissions (GHG). GHG is composed of carbon dioxide, methane, and nitrous oxide. Initially ten states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, Vermont and New Jersey joined in January of 2009. New Jersey left the cooperative in 2011 but will rejoin in 2020. The RGGI sets the cap for all states within the cooperative.

RGGI Rules

RGGI rules require fossil-fueled electric power generators with a capacity of 25 megawatts (MW) or greater to buy allowances equal to their carbon dioxide emission caps. RGGI Inc., the group responsible for overseeing the program, determines the cap and each plant must purchase allowances to equal their carbon dioxide emissions over a three-year compliance period. Each state sells the emissions allowances via auctions and is supposed to invest the proceeds in energy efficiency, renewable energy and other consumer benefit programs. Currently, 165 facilities are governed by RGGI emissions allowance rules.

RGGI has several key features as a cap and trade program: three-year compliance periods, emission allowances, emissions auctions and cost containment procedures. Each state is responsible for ensuring compliance. RGGI has no enforcement powers.

The specific carbon dioxide cap is in place for a three-year compliance period. The goal of the three-year compliance period is to offset price fluctuations caused by short-term market volatility. RGGI distributes 80 percent of allowances at quarterly auctions. Each state is responsible for implementing these auctions.

RGGI mandates a price floor for the emissions allowances. It determines the lowest price that an allowance can be sold for (i.e. in 2008 the price floor was $1.86 per allowance; in 2019 the price floor was $2.26 per allowance). RGGI permits emission allowance banking; allowing facilities to save emission allowances for future use in order to prevent potential allowance price volatility. Facilities are also able to sell their unused allowances on secondary markets. However, in 2014 a practice known as cost containment was established so that allowances in reserve can only be sold if allowance prices exceed the predefined price levels. In effect, the facilities are only able to sell if emission reduction costs are higher than projected. Each year the cost containment reserve price will increase by 2.5 percent through 2020. This is anti-market at best.

In 2017 seven of the RGGI states (Maine and New Hampshire declined to participate) added an additional feature to the program termed emissions containment reserve (ECR). Beginning in 2021 the RGGI will use a trigger price of $6/ton in 2021 (to rise 7 percent per year after) as a mechanism to manipulate the secondary market. It will force states to withhold emission allowances to keep them from being resold, unless the secondary market price is greater than the trigger price, thus effectively lowering the cap.

RGGI maintains that its cap and trade program is market-based, but the mechanisms it uses such as setting a minimum price called the "reserve price" and other market interventions like "cost containment reserve" and "emissions containment reserve" are not characteristic of free-market mechanisms. Given the complexities of the program, one wonders why not put a tax on electricity use to deter consumption rather than going through the elaborate auction and cap setting process? Is it because those in charge want to appear as if it's making an environmental difference by setting a cap? Also, from a political perspective "cap and trade program" may be easier to sell than just a carbon tax?

RGGI State Outcomes

David T. Stevenson of the CATO Institute analyzed the effects of RGGI's program on Pennsylvania and found it would cost the state between $58 to $87 billion over the next 10 years. [1]

RGGI's success and effectiveness are questionable. A very conspicuous failure of the program occurred in 2009 when RGGI's cap exceeded actual emissions. In 2009 actual emissions were 44 percent below cap emissions. Actual emissions were 105,958,243 metric tons of carbon dioxide ($MTCO_2$) and the cap was 188,000,000 $MTCO_2$. Which meant the RGGI effectively did nothing to decrease emissions, but only taxed emissions. The first emissions cap from 2009 to 2014 used assumptions based on 2005 emissions levels under the erroneous assumption that emissions would rise from that level and as a result set the cap far above actual emissions.

During the 2009 to 2014 period carbon dioxide emissions actually decreased in large part to a move to less carbon-intensive fuels (i.e. natural gas replacing coal) and the economic downturn. In 2012 the program was amended, and a revised lower cap was established in order to be more effective following the "failure" of the first cap. The new cap—set to go into effect in 2014—was 45 percent lower than the original level in order to match actual emissions.

The second review in 2017 requires the 2012 cap to be reduced by 2.5% per year through 2030. Note that from 2009 to 2016 (the most recent data available) actual emissions in the RGGI states have stayed below the emission cap. During 2009, RGGI's first year of implementation, emissions were 44 percent below the cap. In 2012 the cap was lowered, but emissions were still 44 percent below the cap. In 2014 after the cap was decreased by over 50 percent, actual emissions were still 5 percent below the cap. In 2016, the most current data available on emissions, the actual emissions in the RGGI states were 8 percent below the cap. Only by setting an artificial floor price could the system work in a

[1] Caesar Rodney Institute, "Inside Energy, Re: Pennsylvania and RGGI", https://www.caesarrodney.org/pdfs/Pennsylvania_and_RGGI.pdf

situation where supply exceeds demand. Moreover, the scheme is little more than a tax revenue generator as emissions have fallen below cap-constrained market. So much for having an impact on the environment.

A 2019 press release noted that "net benefits to the RGGI states' economies (are) on the order of $4 billion". The nine states currently in the program had a combined GDP of $3,250 billion in 2018 (quarterly average). Thus $4 billion represents a mere 0.12 percent of that total—hardly a noticeable benefit. [2]

States conduct the auctions and to date there have been 43 auctions totaling $3.2 billion in proceeds. From 2008 to 2016 states have used auction revenues for the following purposes: 50 percent to energy efficiency, 19 percent to energy bill assistance, 7 percent to greenhouse gas abatement, 4 percent to renewable energy projects, 6 percent to state budget reduction, 4 percent to state administration costs, and one percent to RGGI Inc. for program implementation. However, there is no explanation for the remaining 9 percent (of the $3.2 billion). Where does that 9 percent go?

The 19 percent allocated to bill assistance underlines the need to provide "rebates" for the increased cost of electricity due to the requirement of generators to buy emission allowances. Proponents of RGGI argue bill assistance programs are needed to offset increased costs. But even if it is distributed to customers, it is only for those with incomes low enough to qualify, the rest of the customer base is left with increased energy bills, including businesses.

Although, RGGI maintains that auction proceeds should be used for energy efficiency, bill assistance, and renewable energy projects, the reality is very different. Both New York and New Jersey used RGGI proceeds to help pay off state deficits.
RGGI states are supposed to use their revenues to fund energy efficient projects, however that is not the case. For example, Delaware has received $100 million in RGGI revenues, $55 million has been unspent, $22 million has been spent on administrative and fuel assistance, and $23 million (23 percent) for energy efficient projects. Furthermore, Maryland's Energy Administration reported in 2016 that only 25 percent of RGGI revenue went to energy efficient projects. This underscores the point that environmental concerns can be, and are being, used as pretext to gather support for taxation and government revenue.

RGGI's Dubious Health Claims

In 2019 a press release announced New Jersey has rejoined the program, RGGI Inc. also touted public health benefits from the program. It claimed the program resulted in

[2] "RGGI States Welcome New Jersey as Its CO2 Regulations are Finalized", https://www.rggi.org/sites/default/files/Uploads/Press-Releases/2019_06_17_NJ_Announcement_Release.pdf

asthma attacks being avoided and lives saved.[3] But according to the Center for Disease Control (CDC), Pennsylvania's percentage of adults with asthma (10.1 percent) is lower than all the current RGGI states except New York (9.2 percent). Pennsylvania's rate of 8.7 per million persons from asthma is lower than the four RGGI states (New York, Maryland, Connecticut and Massachusetts) with data reported on these deaths.

Electricity Costs

By levying an additional cost on electric power generation, the price of electricity is artificially driven up and passed on to consumers, especially businesses. Consumers face increased utility costs and additional costs due to secondary effects of higher energy prices.

Business growth, especially in the manufacturing sector, which relies on large amounts of energy, will be hampered by increased energy prices resulting in job losses. In a paper, "A Review of RGGI" by David T. Stevenson, from the CATO Institute, reviewed the claims of RGGI's proponents. The review revealed that RGGI state electric rates created a 35 percent reduction in energy-intensive industries (primary metals, food processing, paper products, petroleum refining and chemicals) and a 13 percent decrease in the overall goods production sector. For comparison, he looked at five non-RGGI states (Illinois, Ohio, Oregon, *Pennsylvania* and Texas) and noted that they had only a 4 percent decrease in energy-intensive industries and a 15 percent *increase* in goods production.

The CATO report also found increased electric rates among RGGI states. Using the weighted average nominal electricity revenue for multi-state groups, Stevenson found that from 2007 to 2015 electricity prices in RGGI states increased by 64 percent compared to the non-RGGI comparison states. The review also found RGGI's mandated allowances added $11 million a year to Delaware's electric bills and $28.5 million for indirect costs due to RGGI rules. [4]

RGGI, Inc. predicts auction prices will increase to between $12 and $24/ton. In 2017 Pennsylvania's electric generators emitted 79.3 million tons of CO_2. If Pennsylvania joined RGGI the projected cost to buy carbon allowances would be between $1 billion to $1.9 billion a year. [5]

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[3] RGGI States Welcome New Jersey as Its CO2 Regulation is Finalized", https://www.rggi.org/sites/default/files/Uploads/Press-Releases/2019_06_17_NJ_Announcement_Release.pdf

[4] Cato Journal, "A Review of the Regional Greenhouse Gas Initiative", https://www.cato.org/cato-journal/winter-2018/review-regional-greenhouse-gas-initiative

[5] Caesar Rodney Institute, "Inside Energy, Re: Pennsylvania and RGGI", https://www.caesarrodney.org/pdfs/Pennsylvania_and_RGGI.pdf

Pennsylvania's successful reduction of carbon emissions without RGGI

Pennsylvania has experienced an impressive reduction in carbon dioxide emissions in recent years without joining RGGI. Natural gas, which emits less carbon dioxide than coal, has largely replaced coal as the leading electricity source in the state. The EPA's data for Carbon Dioxide Emissions in Pennsylvania showcases the extraordinary results. Carbon dioxide emissions fell by 26 percent in the state from 2000 to 2016.

Pennsylvania Public Utility Commission (PUC) anticipates natural gas capacity to almost double by 2022 along with increased capacity for solar and wind power. Therefore, Pennsylvania would meet RGGI's 2030 goal without having to join RGGI and paying $10 billion for electric allowance fees. [6]

From 2007 to 2017 Pennsylvania's per capita emissions from electric power plants decreased by 40 percent. Whereas, RGGI states fell 41 percent after adjusting for the emissions RGGI states moved to somewhere else by importing more electricity from other states. [7] Unlike the RGGI states Pennsylvania was able to lower emissions at the same rate without a carbon tax and the additional problems associated with RGGI membership such as loss of jobs, increased electricity cost, and the need to import electricity from other states.

Keep in mind the emissions data includes all emissions from fossil fuel combustion statewide and not just the electric power generators that RGGI would impact. Pennsylvania has reduced carbon dioxide emissions through market solutions and without the tax burden that RGGI would levy. If Pennsylvania were to join RGGI the free-market success that the state has experienced due to natural gas exploration would be diminished.

Conclusion

The increased energy prices for taxpayers, loss of jobs due to mounting energy costs, and second order effects resulting from higher electricity costs are strong arguments against joining RGGI. It would be an ill-advised decision that would undermine much of the economic and environmental success the state has enjoyed in the last decade thanks to natural gas production and deregulation in the electricity market.

If Pennsylvania joins RGGI, coal production would be cut by 45 percent from the 49 million tons produced in 2017. Losing an estimated $1 billion in coal sales by 2030. [8]

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[6] Pennsylvania Public Utility Commission, "Electric Power Outlook for Pennsylvania 2018 to 2023", http://www.puc.state.pa.us/General/publications_reports/pdf/EPO_2019.pdf

[7] Caesar Rodney Institute, "Inside Energy, Re: Pennsylvania and RGGI", https://www.caesarrodney.org/pdfs/Pennsylvania_and_RGGI.pdf

[8] Caesar Rodney Institute, "Inside Energy, Re: Pennsylvania and RGGI", https://www.caesarrodney.org/pdfs/Pennsylvania_and_RGGI.pdf

Along with the loss of coal sales would be significant reduction of coal and coal-related jobs throughout Pennsylvania.

Currently California, a state that has already been emphasizing renewable electric generation sources such as solar panels, at the expense of natural gas, is experiencing blackouts for the first since 2001 as supply has not been able to keep up with demand during the current heat wave gripping the American West.

One of the culprits being mentioned is the intermittency of solar power generation which falls dramatically as evening sets in. Another problem are the sporadic winds that disrupted wind farm power generation. The state typically relies on natural-gas powered generators to fill the gap until sunrise when solar once again becomes viable. But over the last few years, in that state's drive toward solar power, natural-gas powered plants have been shuttered and that excess demand is unable to be met. The state has been unable to purchase electricity from neighboring states to fill the shortage. Consumers are now turning to gasoline-powered generators to power their homes during the blackouts, surely increasing pollution.

Natural gas is a proven clean energy resource and Pennsylvania certainly has more than enough, through the Marcellus and Utica Shale formations. In an era of increasing electricity demand, being caught without a reliable source would curtail the current standard of living and inhibit Pennsylvania's future economic growth potential.

State Specific SO2 and NOx Emissions 2002 thru 2018

State	SO2 (tons) 2002	SO2 (tons) 2011	SO2 (tons) 2014	SO2 (tons) 2015
AL	448,248	179,256.4	119,897.7	97,765.2
AR	70,738.3	73,622.9	75,897.7	45,543.8
AZ	70,693.1	32,427.6	22,560.2	17,618.1
CA	212.2	157.9	231.2	231.8
CO	87,711.6	43,322.7	26,961.1	22,905.6
CT	10,814.1	752.4	1,477.6	1,158
DC	1,087.2	723.1	0.0	0.0
DE	32,236.1	9,306.1	829.4	803.8
FL	466,904.2	94,710.3	99,074	61,395.6
GA	512,654.3	186,891.1	64,505.7	31,817.9
IA	127,847.1	95,945.6	64,916.6	41,091
ID	2.6	2.2	5.2	8.1
IL	353,699	205,630.2	122,463	94,666.1
IN	778,868	371,983.3	290,684.6	166,403.8
KS	129,763	39,591.7	31,533.8	13,862.7
KY	482,653.3	246,399.3	202,041.7	131,697.1
LA	101,887.3	93,275.2	74,260.2	53,538.6
MA	90,726.8	22,700.9	4,670.4	2,717.1
MD	255,359.6	32,275.1	23,553.4	20,495.4
ME	2,022.3	469.8	856	1,761.7
MI	342,998.7	222,701.8	152,565.3	132,199.9
MN	101,285.8	36,617.5	27,463.4	19,905.6
MO	235,532.4	196,265	132,852.8	113,695.3
MS	65,741.5	43,210.5	90,719.1	26,043.3
MT	20,650.1	15,788.7	13,859.8	11,070.5
NC	462,993.1	77,984.8	42,862	34,489.7
ND	140,533.7	91,494.7	51,237.7	46,017.6
NE	67,343.2	70,998.6	61,052.8	63,995.2
NH	43,946.5	24,445	2,636.1	1,813.3
NJ	48,269.2	5,414.4	2,654.5	2,285.6
NM	50,818.1	17,822.9	12,061.8	11,625.7
NV	49,240.5	5,271.9	10,609.8	5,341
NY	231,985	40,756.3	16,675.9	8,758.5
OH	1,132,069	575,474.4	290,402.5	177,253
OK	106,318.4	92,351.4	72,854.9	61,970.7
OR	12,280	13,130.5	7,475.9	4,618.1

PA	889,765.5	330,539.4	270,332.3	200,099.8
RI	12.3	20.2	17.1	19
SC	199,118	66,191.1	26,122.2	10,338.3
SD	11,757.4	10,662.9	13,845.9	4,806.8
TN	336,994.6	120,353.2	58,433.9	59,697.1
TX	562,515.7	426,487.3	343,423.2	260,135.6
UT	32,133.2	21,052.2	21,435.1	14,640
VA	230,845.7	68,070.8	33,087.6	15,617.7
VT	5.5	1.5	1.6	1.5
WA	19,053.9	1,152.8	3,071.5	2,425.2
WI	191,256.8	91,296.5	39,942.8	25,293.3
WV	507,110	95,692.9	94,334.6	58,959.6
WY	79,508.2	55,074.2	36,921.8	36,377.2
Total EGU tons	10,196,210	4,545,767.2	3,155,373.4	2,214,975.5
Tons Reduction		5,650,442.9	1,390,393.8	940,397.9
Percentage Reduction from Previous		55.4	30.6	29.8
Tons Reduction from 2002		5,650,442.9	7,040,836.7	7,981,234.6
Percentage Reduction from 2002		55.4	69.1	78.3

Compiled by Olympus Power, LLC using the EPA CAMD database

SO2 (tons) 2016	SO2 (tons) 2017	SO2 (tons) 2018	SO2 (tons) 2019	Percentage SO2 Reduction 2002-
25,034.2	10,477.7	12,023.2	6,419.6	98.6
46,572.5	47,769.3	51,772.9	39,345.3	44.4
12,902	13,328	16,478.6	12,093.8	82.9
189.5	158.2	164.2	156.1	26.4
19,087.7	15,107.5	11,381.4	11,365.4	87.0
361.5	420.8	690.2	131.8	98.8
0.0	0.0	0.0	0.0	100.0
512.8	545.0	643.7	279.1	99.1
39,186.4	35,699.9	29,201.5	17,075.1	96.3
18,386.2	13,855.3	13,929.8	12,406.2	97.6
29,707.1	30,394.7	34,144.9	26,743.3	79.1
6.9	6.4	7.1	9.4	263.0
66,992.9	54,511.5	57,357.2	50,082.7	85.8
87,083	63,735	68,508.6	47,779.6	93.9
7,137.5	5,555.5	5,447.0	4,861.5	96.3
76,423.6	57,119.2	55,142.8	49,949.2	89.7
43,327.6	39,698.6	38,179.8	23,687.9	76.8
1,717.5	1,082.9	742.4	193.8	99.8
16,728	8,087	11,310.7	5,645.6	97.8
368.7	443.6	643.2	49.7	97.5
83,652.6	65,369.6	65,503.6	50,554.5	85.3
16,516.4	13,465.7	16,563.0	9,079.5	91.0
99,457.1	105,992.9	102,606.8	88,917.1	62.2
3,173.7	2,568.9	3,189.7	3,145.2	95.2
8,971.2	9,222.0	8,261.8	9,126.1	55.8
30,136.3	22,265.3	21,521.6	21,977.9	95.3
46,444.7	39,957.8	39,560.7	32,931.3	76.6
50,927.2	50,276.4	58,946.5	45,078.3	33.1
572.7	473.1	1,196.9	416.8	99.1
1,725.3	1,721.8	1,433.1	1,249.7	97.4
8,257.9	9,042.6	3,663.3	4,172.3	91.8
2,684.4	1,957.6	3,345.5	4,785.4	90.3
4,533.2	2,561.1	4,888.9	1,999.1	99.1
94,485.9	96,188.4	86,569.7	68,904.6	93.9
49,484.7	42,080.6	30,855.3	8,718.3	91.8
3,714	3,322	2,360.7	3,980.6	67.6

98,006.2	69,790.0	69,017.6	52,393.7	94.1
14.5	18.3	21.7	16.1	31.0
7,983.2	6,108.5	6,842.3	5,731.1	97.1
829.4	847.6	1,005.6	1,098.1	90.7
31,269.5	24,312.3	11,735.2	11,224.3	96.7
245,737.1	275,993.4	211,025.5	149,135.2	73.5
9,669.6	9,608.0	8,735.1	9,153.6	71.5
10,315.9	5,790.7	8,875.3	2,342.8	99.0
1.4	1.2	1.2	1.2	78.9
1,470.8	1,739.6	1,557.0	1,538.5	91.9
12,824.8	11,545.3	10,070.5	4,887.6	97.4
43,693	40,545	45,825.2	38,741.4	92.4
31,949.1	32,541.7	31,026.8	28,832.9	63.7
1,490,227.4	1,343,304.7	1,263,975.3	968,408.3	90.5
724,748.1	146,922.7	79,329.4	295,567.0	
32.7	9.9	5.9	23.4	
8,705,982.7	8,852,905.4	8,932,234.8	9,227,801.8	
85.4	86.8	87.6	90.5	

NOx (tons) 2002	OS NOx (tons) 2002	non-OS NOx (tons) 2002	NOx (tons) 2011	Annual Heat Input (MMBtu) 2011
161,559.4	71,415.9	90,143.5	64,579	984,582,728.1
42,131	18,238.2	23,892.8	38,337.6	411,725,177.1
84,937.7	37,290.6	47,647.1	55,453	643,162,935.2
10,767.9	5,678.8	5,089.1	3,047.9	494,490,101.9
72,663.5	31,160.8	41,502.7	50,393.8	449,867,047.9
6,329.4	2,948.5	3,380.9	1,666.9	118,227,236.4
798.1	610.5	187.6	319.9	3,381,301.6
11,362.7	5,595.1	5,767.6	3,748	62,380,657.2
258,378.4	121,135.1	137,243.3	58,854.3	1,662,293,972.8
146,456.3	60,165.5	86,290.8	54,859.8	835,613,256.3
78,955.8	33,845.2	45,110.6	38,574.3	404,494,196.7
90.6	29.1	61.5	89.8	7,470,314.9
174,246.9	71,235.1	103,011.8	73,891.7	1,061,238,409.5
281,146.1	114,083.8	167,062.3	120,940.9	1,196,450,485.5
95,081.1	39,027.6	56,053.5	43,203.2	386,374,435.9
198,598.6	77,390.9	121,207.7	92,180.1	988,776,967.6
80,364.7	38,519.4	41,845.3	48,023.6	741,248,918.4
32,940.1	12,664.2	20,275.9	5,113	239,779,681.4
76,519.5	29,209.1	47,310.4	22,536.2	252,214,511.7
1,154.2	587.4	566.8	575.2	55,737,311.0
132,623.4	58,236.7	74,386.7	72,286.5	750,147,912.6
86,663.3	35,144.5	51,518.8	27,957.5	332,872,790.7
139,798.7	56,277.5	83,521.2	63,419.5	839,407,423.3
44,349.5	23,102.5	21,247.0	25,079.1	347,239,655.1
35,129.8	13,552.4	21,577.4	18,200.6	173,196,257.1
145,705.7	61,059.2	84,646.5	48,888.8	703,924,171.5
75,947.5	30,162.1	45,785.4	50,755.2	299,719,768.4
47,068.3	19,972	27,096.3	35,740.3	274,332,144.5
6,873.2	2,438.2	4,435.0	3,946.3	79,323,214.7
36,162.6	17,117.6	19,045.0	7,040.1	271,814,294.9
78,362.4	34,797.2	43,565.2	62,197.4	358,347,975.9
44,871.2	19,719.9	25,151.3	7,599.5	205,113,409.2
85,916.6	38,352.8	47,563.8	31,061.8	575,599,487.6
370,497.3	155,364	215,133.3	103,591.5	1,189,585,368.8
85,999.3	39,433.7	46,565.6	77,983	628,579,599.1
8,839.5	2,810.6	6,028.9	4,774.7	92,854,508.4

218,268.1	84,601.7	133,666.4	149,620.5	1,396,157,003.2
640.1	250.7	389.4	630.4	66,454,714.7
82,900.3	38,320.8	44,579.5	25,120	456,740,824.4
15,009.8	5,909.4	9,100.4	9,878.7	29,124,627.6
155,996.4	67,557.2	88,439.2	30,818.7	461,477,327.9
253,861.5	119,609.5	134,252.0	147,956.8	3,251,090,680.5
71,886.5	30,900.3	40,986.2	55,927.9	361,458,756.4
78,867.5	33,826.1	45,041.4	37,651.4	390,244,104.1
230.1	105.4	124.7	116.8	3,754,741.3
15,553	4,704.8	10,848.2	6,813.9	88,690,874.5
88,969.8	40,454.1	48,515.7	31,139.9	490,297,112.9
225,370.6	82,689.3	142,681.3	58,223.2	769,735,287.5
83,093.2	33,975.6	49,117.6	52,637.1	459,242,744.7
4,529,937.2	1,921,276.6	2,608,660.6	2,023,445	
			2,506,491.9	
			55.3	
			2,506,491.9	
			55.3	

Annual NOx Rate (lb/MMBtu) 2011	OS NOx (tons) 2011	non-OS NOx (tons) 2011	NOx (tons) 2014	OS NOx (tons) 2014
0.131	28,362.1	36,216.9	51,850.5	22,147.3
0.186	17,868.3	20,469.3	38,396.4	18,134.6
0.172	24,240.9	31,212.1	48,411.6	21,655.4
0.012	1,173.7	1,874.2	3,121.7	1,403.7
0.224	21,406.5	28,987.3	40,715.2	17,753.6
0.028	857.8	809.1	1,954.8	552.7
0.189	221.7	98.2	107.9	23.6
0.120	2,104.6	1,643.4	1,791.5	726.5
0.071	29,755	29,099.3	62,984.3	29,180.7
0.131	25,182.8	29,677.0	36,566.8	12,090.1
0.191	17,178.7	21,395.6	32,337.5	13,856.8
0.024	45.2	44.6	138.5	72.8
0.139	29,774.6	44,117.1	49,775.7	20,052.2
0.202	54,816.9	66,124.0	109,707.7	45,164.7
0.224	19,724	23,479.2	26,237.2	12,296.9
0.186	40,089	52,091.1	86,980.4	33,929.6
0.130	22,784.6	25,239.0	37,264.3	18,278.3
0.043	1,760.3	3,352.7	4,107.4	936.6
0.179	9,494.9	13,041.3	15,053.4	4,694.7
0.021	247.9	327.3	539	154.5
0.193	32,944.7	39,341.8	56,833.4	25,130.9
0.168	12,313.3	15,644.2	25,971	10,475.5
0.151	26,911.6	36,507.9	74,192.1	31,235.4
0.144	13,388.5	11,690.6	20,173.2	10,228.8
0.210	6,596.9	11,603.7	18,580.4	7,497.2
0.139	24,061.6	24,827.2	44,288.3	18,329.2
0.339	19,560.3	31,194.9	47,354.9	18,816.1
0.261	15,284.9	20,455.4	24,629.3	10,284.3
0.099	1,419.2	2,527.1	2,749	441.6
0.052	3,933.7	3,106.4	7,095.9	3,079.8
0.347	27,789.4	34,408.0	43,870	19,027.9
0.074	3,620.6	3,978.9	9,809.1	4,705.2
0.108	15,534	15,527.8	22,214.4	7,875.3
0.174	45,151.7	58,439.8	89,345.1	33,831.7
0.248	38,284.9	39,698.1	37,561.7	16,230
0.103	1,346.2	3,428.5	4,027.3	1,516.4

0.214	67,473.4	82,147.1	125,611.7	46,028.3
0.019	273.9	356.5	517.8	272.7
0.110	14,068.1	11,051.9	16,566.9	8,054.8
0.678	4,278.7	5,600.0	10,578.1	4,071.5
0.134	16,656.6	14,162.1	22,382.4	11,704.6
0.091	72,948.3	75,008.5	122,481.9	58,619.1
0.309	24,168.7	31,759.2	52,777.3	22,644.1
0.193	17,494.2	20,157.2	27,648.5	11,022.7
0.062	47.7	69.1	161	60.6
0.154	2,351.9	4,462.0	7,988.1	2,895.5
0.127	13,818.1	17,321.8	21,717.4	9,094.5
0.151	25,189.3	33,033.9	72,970.3	30,661.1
0.229	21,247.7	31,389.4	41,669.7	17,201.9
	915,248	1,108,198	1,699,808.0	714,142.0
	1,006,029.0	1,500,462.9	323,637.3	201,105.6
	52.4	57.5	16.0	22.0
	1,006,029.0	1,500,462.9	2,830,129.2	1,207,134.6
	52.4	57.5	62.5	62.8

non-OS NOx (tons) 2014	NOx (tons) 2015	OS NOx (tons) 2015	non-OS NOx (tons) 2015	NOx (tons) 2016	Annual Heat Input (MMBtu) 2016
29,703.2	47,340.5	21,478.8	25,861.7	31,126.9	826,895,867.2
20,261.8	23,613.3	12,560	11,053.3	26,892.5	382,621,452.0
26,756.2	39,874.4	19,611	20,263.4	33,188	597,460,133.5
1,718.0	3,422.6	1,905.3	1,517.3	2,847.6	603,255,919.2
22,961.6	35,672.4	15,981.1	19,691.3	29,506.3	425,303,069.1
1,402.1	1,716.8	643.7	1,073.1	1,057.7	127,141,400.5
84.3	66.8	20.5	46.3	68.1	1,140,520.2
1,065.0	1,453.1	689.2	763.9	1,307.6	63,657,389.1
33,803.6	57,244.3	27,219.4	30,024.9	51,437.1	1,648,858,786.0
24,476.7	29,396.1	10,785.9	18,610.2	25,832.2	806,518,162.8
18,480.7	25,666.8	12,177.8	13,489.0	21,549.4	275,337,885.3
65.7	256.5	151.8	104.7	196	22,913,633.3
29,723.5	40,054.9	18,160.4	21,894.5	33,298.3	820,123,498.2
64,543.0	88,671	39,907.3	48,763.7	82,614.7	982,319,423.6
13,940.3	17,786	8,136.3	9,649.7	14,806.6	278,034,444.4
53,050.8	65,755.4	27,794.3	37,961.1	57,764.4	799,779,762.8
18,986.0	41,558.1	19,257	22,301.1	38,835.8	697,154,092.3
3,170.8	3,636.1	1,338.9	2,297.2	2,882.9	184,317,454.5
10,358.7	10,763.7	4,305.4	6,458.3	9,395.2	199,103,506.4
384.5	720.1	109.4	610.7	288.3	25,813,978.0
31,702.5	49,619.3	21,783.7	27,835.6	40,329.4	716,848,243.2
15,495.5	20,325.6	8,105.2	12,220.4	17,639.2	329,039,903.1
42,956.7	45,182.2	18,854.8	26,327.4	56,555.4	651,869,141.0
9,944.4	12,000.8	6,438.3	5,562.5	12,690.1	446,058,589.0
11,083.2	17,385.1	7,167.2	10,217.9	14,412.5	162,469,182.8
25,959.1	39,636.3	19,891.2	19,745.1	34,287.2	696,947,670.6
28,538.8	44,952.7	18,790.1	26,162.6	38,223.8	306,585,465.1
14,345.0	23,565.2	10,582.8	12,982.4	19,739.8	225,082,116.2
2,307.4	2,168.2	415.5	1,752.7	1,326	54,276,047.4
4,016.1	5,113.7	2,293.7	2,820.0	4,382.1	353,517,626.7
24,842.1	45,262.4	19,937.5	25,324.9	37,439.5	284,290,142.9
5,103.9	4,330.9	2,404.5	1,926.4	3,611.5	216,752,274.7
14,339.1	20,979.3	10,980.1	9,999.2	16,220.7	532,559,843.9
55,513.4	67,059	28,707.5	38,351.5	55,754.1	944,754,129.5
21,331.7	28,684	13,921.6	14,762.4	25,316.3	514,866,040.9
2,510.9	3,294	1,755.4	1,538.6	2,608.9	122,923,450.5

79,583.4	99,432.8	37,402	62,030.8	79,449.6	1,136,594,140.2
245.1	543.9	283.2	260.7	448.4	47,610,780.4
8,512.1	13,458.1	7,022.2	6,435.9	12,854.5	361,615,181.6
6,506.6	3,258.7	853.3	2,405.4	1,146.9	31,528,882.8
10,677.8	21,822	12,498.4	9,323.6	22,609.8	445,338,069.0
63,862.8	108,051.3	55,428.3	52,623.0	106,497	3,032,196,972.8
30,133.2	47,058.8	19,799.3	27,259.5	31,396.7	316,881,851.2
16,625.8	24,138.9	10,300.9	13,838.0	22,219.1	532,242,458.2
100.4	151.2	51.8	99.4	166.8	4,779,778.9
5,092.6	6,153.3	3,085.1	3,068.2	5,489.6	129,412,925.8
12,622.9	20,132.3	9,080.8	11,051.5	16,034.5	483,783,294.5
42,309.2	63,324.5	28,056.6	35,267.9	52,583.9	745,515,755.5
24,467.8	42,158.1	18,096.9	24,061.2	36,088.4	445,763,425.0
985,666.0	1,413,911.5	636,221.4	777,690.1	1,232,417.3	############
122,531.7	285,896.5	77,920.6	207,975.9	467,390.7	
11.1	16.8	10.9	21.1	27.5	
1,622,994.6	3,116,025.7	1,285,055	1,830,971	3,297,519.9	
62.2	68.8	66.9	70.2	72.8	

Annual NOx Rate (lb/MMBtu) 2016	Percentage Annual NOx Tons Reduction 2002-2016	OS NOx (tons) 2016	Percentage OS NOx Reduction 2002-2016	non-OS NOx (tons) 2016
0.075	80.7	13,966.6	80.4	17,160.3
0.141	36.2	13,223.5	27.5	13,669.0
0.111	60.9	15,933.2	57.3	17,254.8
0.009	73.6	1,492.7	73.7	1,354.9
0.139	59.4	12,858.6	58.7	16,647.7
0.017	83.3	547.1	81.4	510.6
0.119	91.5	16.1	97.4	52.0
0.041	88.5	723.1	87.1	584.5
0.062	80.1	27,189	77.6	24,248.1
0.064	82.4	9,046	85.0	16,786.2
0.157	72.7	10,613.8	68.6	10,935.6
0.017	116.3 increase	111.5	283.2 increase	84.5
0.081	80.9	16,229	77.2	17,069.3
0.168	70.6	35,310.4	69.0	47,304.3
0.107	84.4	7,508.5	80.8	7,298.1
0.144	70.9	25,474	67.1	32,290.4
0.111	51.7	19,615	49.1	19,220.8
0.031	91.2	1,178.3	90.7	1,704.6
0.094	87.7	4,794.8	83.6	4,600.4
0.022	75.0	127.8	78.2	160.5
0.113	69.6	18,139.2	68.9	22,190.2
0.107	79.6	7,586.8	78.4	10,052.4
0.174	59.5	25,139.3	55.3	31,416.1
0.057	71.4	7,324.4	68.3	5,365.7
0.177	59.0	5,909.2	56.4	8,503.3
0.098	76.5	17,085.6	72.0	17,201.6
0.249	49.7	15,494.7	48.6	22,729.1
0.175	58.1	8,613.8	56.9	11,126.0
0.049	80.7	549.6	77.5	776.4
0.025	87.9	2,497.8	85.4	1,884.3
0.263	52.2	16,052.5	53.9	21,387.0
0.033	92.0	2,274.6	88.5	1,336.9
0.061	81.1	9,199.4	76.0	7,021.3
0.118	85.0	25,146.4	83.8	30,607.7
0.098	70.6	12,760.9	67.6	12,555.4
0.042	70.5	1,340	52.3	1,268.9

0.140	63.6	33,338.9	60.6	46,110.7
0.019	29.9	221	11.8	227.4
0.071	84.5	6,916.4	82.0	5,938.1
0.073	92.4	550.5	90.7	596.4
0.102	85.5	12,893.1	80.9	9,716.7
0.070	58.0	54,402.7	54.5	52,094.3
0.198	56.3	12,954.8	58.1	18,441.9
0.083	71.8	10,451.2	69.1	11,767.9
0.070	27.5	71.2	32.4	95.6
0.085	64.7	2,877.7	38.8	2,611.9
0.066	82.0	7,946.4	80.4	8,088.1
0.141	76.7	22,310.9	73.0	30,273.0
0.162	56.6	15,663.5	53.9	20,424.9
0.103	72.8	571,671.5	70.2	660,745.8
		142,470.5		324,920.2
		19.9		33.0
		1,349,605.1		1,947,914.8
		70.2		74.7

Percentage non-OS NOx Reduction 2002-	NOx (tons) 2017	Annual Heat Input (MMBtu) 2017	Annual NOx Rate (lb/MMBtu) 2017
81.0	24,085.4	768,555,309.9	0.063
42.8	27,499.7	391,814,297.8	0.140
63.8	33,599.9	577,001,949.6	0.116
73.4	3,624.4	533,168,543.0	0.014
59.9	25,180.3	418,644,258.6	0.120
84.9	1,052.0	112,535,243.6	0.019
72.3	66.7	929,966.9	0.143
89.9	889.1	52,204,426.7	0.034
82.3	46,907.1	1,616,936,892.1	0.058
80.5	24,572.5	739,964,097.0	0.066
75.8	22,562.8	292,980,946.7	0.154
37.4 increase	166.1	21,252,397.2	0.016
83.4	33,066.3	778,019,518.5	0.085
71.7	63,420.9	937,353,201.3	0.135
87.0	13,032.2	238,220,809.2	0.109
73.4	46,053.0	703,824,349.6	0.131
54.1	29,248.6	635,123,937.4	0.092
91.6	2,372.4	181,649,550.1	0.026
90.3	6,112.3	143,038,538.4	0.085
71.7	263.0	17,435,139.4	0.030
70.2	37,724.1	700,673,504.5	0.108
80.5	17,366.7	309,467,149.2	0.112
62.4	49,692.1	707,354,668.5	0.141
74.7	12,162.3	413,683,681.8	0.059
60.6	13,765.3	153,755,115.3	0.179
79.7	33,762.8	649,403,083.6	0.104
50.4	33,452.1	300,661,073.1	0.223
58.9	19,858.7	224,724,169.4	0.177
82.5	1,070.2	42,637,899.3	0.050
90.1	3,442.6	300,962,034.7	0.023
50.9	36,805.6	282,627,516.1	0.260
94.7	3,258.5	201,657,722.5	0.032
85.2	11,421.5	433,704,577.7	0.053
85.8	57,037.9	937,351,540.0	0.122
73.0	21,760.6	442,230,824.8	0.098
79.0	2,523.1	122,510,708.4	0.041

65.5	37,147.8	1,102,779,066.9	0.067
41.6	469.9	53,937,658.2	0.017
86.7	11,402.1	332,384,443.2	0.069
93.4	1,135.1	30,206,449.3	0.075
89.0	18,200.6	402,016,986.7	0.091
61.2	109,913.8	3,032,221,246.2	0.072
55.0	30,985.8	305,766,216.3	0.203
73.9	16,545.4	487,752,120.9	0.068
23.3	138.8	4,031,031.6	0.069
75.9	6,697.0	137,581,622.0	0.097
83.3	17,855.5	507,321,972.1	0.070
78.8	44,078.8	716,308,381.3	0.123
58.4	33,939.8	449,112,463.0	0.151
74.7	1,087,389.0	22,945,478,300.1	0.095
	145,028.3		
	11.8		
	3,442,548.2		
	76.0		

Percentage Annual NOx Reduction 2002-	OS NOx (tons) 2017	Ozone Season Heat Input (MMBtu) 2017	Ozone Season NOx Rate (lb/MMBtu) 2017
85.1	11,522.6	360,458,280.3	0.064
34.7	12,811.2	185,792,869.5	0.138
60.4	15,759.4	297,319,435.4	0.106
66.3	2,501.3	263,132,301.6	0.019
65.3	11,165.8	188,714,091.7	0.118
83.4	429.7	45,391,944.7	0.019
91.6	19.6	359,427.6	0.109
92.2	459.2	28,733,645.1	0.032
81.8	23,454.5	775,894,656.9	0.060
83.2	7,128.5	368,216,330.7	0.039
71.4	10,713.5	151,048,958.0	0.142
83.3 increase	91.5	10,107,428.4	0.018
81.0	14,530.6	352,275,728.6	0.082
77.4	22,387.1	414,632,039.0	0.108
86.3	6,392.3	117,661,382.6	0.109
76.8	20,053.0	320,704,767.3	0.125
63.6	14,608.6	302,016,165.7	0.097
92.8	878.5	82,864,658.4	0.021
92.0	2,938.6	76,723,406.1	0.077
77.2	84.7	7,962,701.5	0.021
71.6	16,950.4	321,721,920.5	0.105
80.0	7,032.0	133,202,032.1	0.106
64.5	15,135.6	319,720,187.9	0.095
72.6	6,001.1	191,130,916.6	0.063
60.8	5,680.9	61,417,109.9	0.185
76.8	16,471.6	311,797,715.1	0.106
56.0	13,949.9	125,846,297.3	0.222
57.8	9,229.0	104,536,822.5	0.177
84.4	399.3	20,249,225.5	0.039
90.5	1,684.2	145,781,963.2	0.023
53.0	15,947.2	125,257,548.6	0.255
92.7	2,085.4	99,495,983.2	0.042
86.7	5,614.6	207,995,272.9	0.054
84.6	21,004.2	412,664,770.1	0.102
74.7	11,043.2	228,047,829.5	0.097
71.5	1,296.6	50,869,256.5	0.051

83.0	14,282.3	498,775,915.3	0.057
26.6	193.4	24,876,455.5	0.016
86.2	6,073.8	163,685,338.4	0.074
92.4	544.9	14,702,725.2	0.074
88.3	10,134.8	209,326,887.3	0.097
56.7	54,069.0	1,505,656,699.6	0.072
56.9	13,417.4	136,525,785.5	0.197
79.0	8,040.8	238,087,243.3	0.068
39.7	54.8	1,623,949.3	0.068
56.9	2,792.9	58,785,310.3	0.095
79.9	8,133.8	222,058,299.7	0.073
80.4	18,463.2	329,108,490.6	0.112
59.2	15,253.0	199,218,093.2	0.153
76.0	478,909.4	10,812,176,263.8	0.089
	92,762.1		
	16.2		
	1,442,367.2		
	75.1		

Percentage OS NOx Reduction 2002-2017	non-OS NOx (tons) 2017	Percentage non-OS NOx Reduction 2002-2017	NOx (tons) 2018	Annual Heat Input (MMBtu) 2018
83.9	12,562.8	86.1	26,704.3	802,169,193.3
29.8	14,688.5	38.5	22,437.3	459,959,288.1
57.7	17,840.5	62.6	32,828.8	633,572,534.6
56.0	1,123.1	77.9	2,954.6	550,136,361.0
64.2	14,014.5	66.2	19,215.5	418,877,246.5
85.4	622.2	81.6	1,490.1	143,021,561.3
96.8	47.1	74.9	95.6	1,467,007.1
91.8	429.9	92.5	948.0	44,607,065.6
80.6	23,452.6	82.9	36,358.4	1,609,463,921.0
88.2	17,444.0	79.8	25,616.7	736,967,978.3
68.3	11,849.3	73.7	24,215.3	345,994,049.6
214.4 increase	74.6	21.3 increase	219.9	23,598,930.6
79.6	18,535.6	82.0	35,229.3	815,877,498.9
80.4	41,033.9	75.4	67,775.5	1,054,932,476.0
83.6	6,639.9	88.2	13,972.8	253,594,805.0
74.1	26,000.0	78.5	47,492.8	755,767,780.0
62.1	14,640.0	65.0	29,574.7	641,861,228.1
93.1	1,493.9	92.6	1,641.7	143,667,592.8
89.9	3,173.6	93.3	8,410.6	219,366,047.5
85.6	178.2	68.6	327.1	19,065,523.9
70.9	20,773.7	72.1	39,550.1	749,307,180.7
80.0	10,334.7	79.9	17,677.1	326,244,271.1
73.1	34,556.4	58.6	50,392.9	680,927,828.0
74.0	6,161.2	71.0	13,039.8	439,449,976.2
58.1	8,084.4	62.5	13,770.3	148,145,665.8
73.0	17,291.2	79.6	34,662.8	678,666,610.9
53.8	19,502.3	57.4	33,779.4	312,646,423.5
53.8	10,629.8	60.8	21,918.9	247,662,973.9
83.6	670.8	84.9	1,695.0	44,244,179.8
90.2	1,758.5	90.8	3,405.5	307,621,997.3
54.2	20,858.4	52.1	16,139.1	249,157,949.2
89.4	1,173.0	95.3	4,416.0	208,899,447.4
85.4	5,806.9	87.8	11,667.3	474,189,852.0
86.5	36,033.7	83.3	51,172.4	955,928,762.7
72.0	10,717.4	77.0	22,226.7	507,276,450.7
53.9	1,226.5	79.7	2,448.7	140,130,437.0

83.1	22,865.5	82.9	34,803.3	1,082,924,328.9
22.9	276.6	29.0	512.8	59,352,581.7
84.2	5,328.3	88.0	13,067.2	388,018,069.7
90.8	590.2	93.5	1,379.1	36,768,549.3
85.0	8,065.8	90.9	11,628.8	355,960,948.8
54.8	55,844.8	58.4	106,266.2	3,052,520,683.3
56.6	17,568.4	57.1	30,197.6	324,167,203.2
76.2	8,504.6	81.1	17,740.0	520,738,090.6
48.0	84.0	32.7	141.7	4,066,371.1
40.6	3,904.1	64.0	6,632.2	136,192,660.2
79.9	9,721.8	80.0	15,420.3	499,581,647.9
77.7	25,615.6	82.0	40,961.9	653,153,620.2
55.1	18,686.8	62.0	33,525.6	445,339,426.8
75.1	608,479.6	76.7	1,047,747.4	23,703,252,277.0
	52,266.2		39,641.6	
	7.9		3.6	
	2,000,181.0		3,482,189.8	
	76.7		76.9	

Annual NOx Rate (lb/MMBtu) 2018	Percentage Annual NOx Reduction 2002-2018	OS NOx (tons) 2018	Ozone Season Heat Input (MMBtu) 2018	Ozone Season NOx Rate (lb/MMBtu) 2018
0.067	83.5	12,758.8	387,337,672.5	0.066
0.098	46.7	10,952.3	220,308,849.7	0.099
0.104	61.3	15,703.5	317,776,759.9	0.099
0.011	72.6	1,318.6	253,643,224.7	0.010
0.092	73.6	8,551.8	188,100,276.3	0.091
0.021	76.5	562.6	63,376,254.6	0.018
0.130	88.0	19.6	437,733.8	0.090
0.043	91.7	467.5	21,891,899.0	0.043
0.045	85.9	17,995.7	779,277,599.1	0.046
0.070	82.5	7,077.0	361,747,340.9	0.039
0.140	69.3	10,383.9	162,671,254.1	0.128
0.019	142.7 increase	143.2	12,278,115.1	0.023
0.086	79.8	16,296.6	395,583,002.9	0.082
0.128	75.9	25,083.9	478,573,593.4	0.105
0.110	85.3	6,817.0	117,729,262.9	0.116
0.126	76.1	20,905.4	353,698,792.7	0.118
0.092	63.2	14,875.8	312,219,549.2	0.095
0.023	95.0	639.2	68,649,597.5	0.019
0.077	89.0	3,145.4	103,261,039.2	0.061
0.034	71.7	102.7	9,183,213.4	0.022
0.106	70.2	18,063.3	349,300,890.6	0.103
0.108	79.6	7,244.9	143,798,518.7	0.101
0.148	64.0	15,409.9	312,875,708.7	0.099
0.059	70.6	7,358.6	217,477,124.1	0.068
0.186	60.8	4,653.5	49,573,143.7	0.188
0.102	76.2	16,770.8	322,047,469.2	0.104
0.216	55.5	14,106.6	131,100,649.4	0.215
0.177	53.4	9,827.0	110,956,176.7	0.177
0.077	75.3	424.3	21,489,772.0	0.039
0.022	90.6	1,557.3	151,497,547.2	0.021
0.130	79.4	7,296.8	119,708,433.2	0.122
0.042	90.2	2,750.4	107,930,661.6	0.051
0.049	86.4	5,790.4	237,882,983.5	0.049
0.107	86.2	17,949.3	404,364,702.7	0.089
0.088	74.2	11,957.2	275,563,093.7	0.087
0.035	72.3	1,309.3	58,267,441.0	0.045

0.064	84.1	13,565.9	486,871,310.1	0.056
0.017	19.9	258.2	31,199,997.2	0.017
0.067	84.2	6,556.3	195,542,013.8	0.067
0.075	90.8	730.0	18,806,370.3	0.078
0.065	92.5	6,472.9	184,432,815.9	0.070
0.070	58.1	51,658.6	1,523,343,471.2	0.068
0.186	58.0	12,903.1	143,500,167.8	0.180
0.068	77.5	8,102.3	251,159,953.2	0.065
0.070	38.4	44.9	1,278,050.9	0.070
0.097	57.4	2,949.9	72,161,542.9	0.082
0.062	82.7	6,746.6	221,887,417.9	0.061
0.125	81.8	16,684.9	309,458,217.2	0.108
0.151	59.7	14,113.7	186,156,971.3	0.152
0.088	76.9	457,057.5	11,247,377,646.6	0.081
		21,851.9		
		4.6		
		1,464,219.1		
		76.2		

Percentage OS NOx Reduction 2002-2018	non-OS NOx (tons) 2018	Percentage non-OS NOx Reduction 2002-2018	NOx (tons) 2019
82.1	13,945.5	84.5	20,572.2
39.9	11,485.0	51.9	17,447.0
57.9	17,125.3	64.1	26,770.9
76.8	1,635.9	67.9	2,443.3
72.6	10,663.7	74.3	19,513.6
80.9	927.5	72.6	801.1
96.8	76.0	59.5	76.0
91.6	480.5	91.7	495.6
85.1	18,362.7	86.6	29,062.0
88.2	18,539.7	78.5	21,285.4
69.3	13,831.4	69.3	18,234.7
392.3 increase	76.6	24.6 increase	350.2
77.1	18,932.7	81.6	30,580.7
78.0	42,691.6	74.4	54,463.7
82.5	7,155.8	87.2	12,796.3
73.0	26,587.4	78.1	41,340.5
61.4	14,698.9	64.9	29,848.1
95.0	1,002.5	95.1	1,003.0
89.2	5,265.2	88.9	4,015.6
82.5	224.5	60.4	138.2
69.0	21,486.8	71.1	31,741.2
79.4	10,432.3	79.8	13,411.9
72.6	34,983.0	58.1	44,159.6
68.1	5,681.1	73.3	13,786.5
65.7	9,116.8	57.7	14,448.3
72.5	17,892.0	78.9	30,748.2
53.2	19,672.8	57.0	30,283.6
50.8	12,091.9	55.4	19,206.1
82.6	1,270.7	71.3	1,018.4
90.9	1,848.2	90.3	2,949.1
79.0	8,842.3	79.7	14,771.4
86.1	1,665.6	93.4	5,185.0
84.9	5,876.8	87.6	7,836.4
88.4	33,223.1	84.6	41,349.0
69.7	10,269.6	77.9	16,540.9
53.4	1,139.5	81.1	3,353.6

84.0	21,237.4	84.1	33,135.3
3.0 increase	254.6	34.6	452.9
82.9	6,510.8	85.4	10,908.6
87.6	649.1	92.9	1,352.1
90.4	5,155.9	94.2	10,256.6
56.8	54,607.6	59.3	95,589.1
58.2	17,294.5	57.8	30,450.8
76.0	9,637.7	78.6	11,506.0
57.4	96.8	22.4	132.7
37.3	3,682.3	66.1	6,048.3
83.3	8,673.6	82.1	11,619.9
79.8	24,277.0	83.0	37,012.5
58.5	19,411.9	60.5	29,134.5
76.2	590,689.9	77.4	899,626.6
	17,789.7		148,120.8
	2.9		14.1
	2,017,970.7		3,630,310.6
	77.4		80.1

Annual Heat Input (MMBtu) 2019	Annual NOx Rate (lb/MMBtu) 2019	Percentage Annual NOx Reduction 2002-2019	OS NOx (tons) 2019	Ozone Season Heat Input (MMBtu) 2019
739,580,279.8	0.056	87.3	9,755.8	352,138,808.9
414,388,293.4	0.084	58.6	8,965.1	202,680,199.4
607,463,404.4	0.088	68.5	13,575.4	297,009,863.6
525,400,975.7	0.009	77.3	1,195.5	218,912,794.4
417,515,643.5	0.093	73.1	7,723.4	174,799,516.3
135,784,264.0	0.012	87.3	409.3	57,644,669.1
1,404,063.8	0.108	90.5	18.2	413,765.7
32,535,238.4	0.030	95.6	303.3	19,599,160.1
1,556,818,889.0	0.037	88.8	15,457.6	765,180,765.5
728,113,071.7	0.058	85.5	7,833.0	391,599,453.2
280,311,537.5	0.130	76.9	8,566.6	133,545,510.6
31,458,451.4	0.022	-286.5	204.4	14,518,081.7
733,970,841.9	0.083	82.4	13,302.8	331,436,937.0
914,286,063.9	0.119	80.6	20,387.9	404,196,916.5
225,770,007.6	0.113	86.5	6,056.7	107,906,080.9
673,771,423.7	0.123	79.2	19,180.7	315,351,571.7
641,807,336.9	0.093	62.9	15,364.7	317,445,302.2
116,150,074.8	0.017	97.0	468.2	52,018,596.2
187,185,381.7	0.043	94.8	1,792.3	91,169,383.4
13,491,420.8	0.020	88.0	67.0	6,074,975.1
706,654,041.7	0.090	76.1	14,464.6	325,533,240.0
291,860,999.3	0.092	84.5	5,989.1	131,833,279.8
607,836,326.2	0.145	68.4	12,761.3	268,751,317.4
418,483,231.5	0.066	68.9	8,115.0	210,814,718.3
158,735,181.2	0.182	58.9	5,544.2	61,438,082.8
640,076,341.5	0.096	78.9	16,743.9	324,987,675.7
292,688,733.2	0.207	60.1	12,284.7	118,643,335.7
224,211,072.9	0.171	59.2	8,078.0	98,187,060.7
42,538,854.9	0.048	85.2	385.8	20,025,642.3
313,474,447.8	0.019	91.8	1,393.4	145,531,936.3
266,909,152.2	0.111	81.1	6,757.8	124,130,448.9
206,478,102.2	0.050	88.4	2,433.9	98,038,440.4
423,773,415.6	0.037	90.9	3,657.3	202,150,101.3
882,674,441.4	0.094	88.8	17,252.3	401,798,797.1
452,406,577.6	0.073	80.8	8,980.6	235,288,398.4
170,876,751.1	0.039	62.1	1,231.0	63,359,892.9

1,155,141,920.4	0.057	84.8	12,812.6	509,472,641.9
53,039,084.6	0.017	29.2	232.8	27,309,158.6
348,155,998.4	0.063	86.8	5,957.7	178,336,960.2
39,886,994.1	0.068	91.0	586.3	16,321,370.8
344,549,556.4	0.060	93.4	6,417.7	189,663,764.1
2,975,966,846.9	0.064	62.3	47,567.9	1,496,204,647.8
323,923,724.4	0.188	57.6	11,998.0	132,868,782.2
504,512,134.7	0.046	85.4	5,438.2	248,593,203.3
3,867,429.6	0.069	42.3	51.2	1,466,531.0
165,015,798.1	0.073	61.1	3,114.3	79,789,885.7
436,062,126.7	0.053	86.9	5,185.6	191,827,077.6
621,189,595.8	0.119	83.6	15,931.5	294,649,656.6
409,065,701.7	0.142	64.9	11,479.8	164,172,240.8
22,457,261,246.2	0.080	80.1	403,474.2	10,614,830,640.1
			53,583.2	
			11.7	
			1,517,802.4	
			79.0	

OS NOx Rate (lb/MMBtu) 2019	Percentage OS NOx Reduction 2002-2019	non-OS NOx (tons) 2019	Percentage non-OS NOx Reduction 2002-2019
0.055	86.3	10,816.4	88.0
0.088	50.8	8,481.9	64.5
0.091	63.6	13,195.6	72.3
0.011	78.9	1,247.8	75.5
0.088	75.2	11,790.3	71.6
0.014	86.1	391.8	88.4
0.088	97.0	57.8	69.2
0.031	94.6	192.2	96.7
0.040	87.2	13,604.4	90.1
0.040	87.0	13,452.4	84.4
0.128	74.7	9,668.1	78.6
0.028	-602.6	145.7	-137.0
0.080	81.3	17,277.9	83.2
0.101	82.1	34,075.8	79.6
0.112	84.5	6,739.5	88.0
0.122	75.2	22,159.8	81.7
0.097	60.1	14,483.4	65.4
0.018	96.3	534.7	97.4
0.039	93.9	2,223.3	95.3
0.022	88.6	71.2	87.4
0.089	75.2	17,276.6	76.8
0.091	83.0	7,422.8	85.6
0.095	77.3	31,398.3	62.4
0.077	64.9	5,671.6	73.3
0.180	59.1	8,904.1	58.7
0.103	72.6	14,004.2	83.5
0.207	59.3	17,998.9	60.7
0.165	59.6	11,128.2	58.9
0.039	84.2	632.7	85.7
0.019	91.9	1,555.7	91.8
0.109	80.6	8,013.6	81.6
0.050	87.7	2,751.0	89.1
0.036	90.5	4,179.0	91.2
0.086	88.9	24,096.8	88.8
0.076	77.2	7,560.3	83.8
0.039	56.2	2,122.6	64.8

0.050	84.9	20,322.7	84.8
0.017	7.2	220.2	43.5
0.067	84.5	4,950.9	88.9
0.072	90.1	765.8	91.6
0.068	90.5	3,838.9	95.7
0.064	60.2	48,021.2	64.2
0.181	61.2	18,452.8	55.0
0.044	83.9	6,067.8	86.5
0.070	51.4	81.5	34.6
0.078	33.8	2,934.0	73.0
0.054	87.2	6,434.3	86.7
0.108	80.7	21,081.0	85.2
0.140	66.2	17,654.7	64.1
0.076	79.0	496,152.4	81.0
		94,537.5	
		16.0	
		2,112,508.2	
		81.0	