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STATE OF GEORGIA
COUNTY OF FULTON

AFFIDAVIT OF ROSA CHI IN SUPPORT OF CLAIM THAT INFORMATION IS PROTECTED UNDER GEORGIA LAW FROM DISCLOSURE TO THE PUBLIC

PERSONALLY APPEARED before the undersigned officer, authorized to administer oaths, ROSA CHI, Affiant who, first being duly sworn, testifies as follows:

1. My name is ROSA CHI. I am of the age of majority and am competent in all respects to give this Affidavit. My testimony herein is based on personal knowledge and upon documents maintained in the files of Georgia Power Company's ("Georgia Power" or "Company") Corporate Office.

2. Georgia Power Company is a corporation headquartered in Atlanta, Georgia and is authorized to transact business in the State of Georgia. I am the Air Manager for Georgia Power, with primary responsibility for managing permitting, reporting, compliance guidance, and strategy services for Georgia Power facilities and business units. In my role as Air Manager, I am authorized to provide this Affidavit on behalf of Georgia Power.

3. On October 15, 2021, Georgia Power Company will have submitted to the Air Protection Branch of the Georgia Environmental Protection Division ("EPD") a response to a September 2, 2021 comment letter and July 10, 2020 analysis request from EPD related to the Regional Haze Rule (referred to hereinafter as the "Submittal"), including a public Technical Appendix A and trade secret Technical Appendix B. The Submittal is provided in compliance with EPD's Procedures for Submitting Information Pursuant to a Claim that Information in the Submittal is Protected Under Georgia Law from Disclosure to the Public. I affirmatively declare that information contained in the Technical Appendix B to the Submittal to EPD is protected under the Georgia Open Records Act, O.C.G.A. § 50-18-70, *et seq.*, from disclosure to the public and that the Redacted Copy is submitted to EPD for disclosure to the public as is, and that the Protected Copy is submitted to EPD with the expectation and understanding that information contained therein is subject to the claim Georgia Power declares in this affidavit that such information is protected under Georgia law from disclosure to the public. Support for this declaration, including citation to the specific provisions of Georgia law, is included below.

4. The Georgia Open Records Act provides in pertinent part that –

(a) Public disclosure shall not be required for records that are:

(34) Any trade secrets obtained from a person or business entity that are required by law, regulation, bid, or request for proposal to be submitted to an agency. An entity submitting records containing trade secrets that wishes to keep such records confidential under this paragraph shall submit and attach to the records an affidavit affirmatively declaring that specific information in the records constitute trade secrets pursuant to Article 27 of Chapter 1 of Title 10.

O.C.G.A. § 50-18-72(a)(34).

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5. The Georgia Trade Secrets Act, O.C.G.A. § 10-1-760, *et seq.*, provides that a

> (4) 'Trade secret' means information, without regard to form, including, but not limited to, technical or nontechnical data, a formula, a pattern, a compilation, a program, a device, a method, a technique, a drawing, a process, financial data, financial plans, product plans, or a list of actual or potential customers or suppliers which is not commonly known by or available to the public and which information:
>
> (A) Derives economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use; and
>
> (B) Is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.
>
> O.C.G.A. § 10-1-761(4).

6. The Submittal was required to be submitted to EPD pursuant to 391-3-1-.02(6)(b) of the Georgia Rules for Air Quality Control.

7. On behalf of Georgia Power Company, I affirmatively declare that the unit-specific operating data, costs, vendor quotes, and contracts that comprise the Technical Appendix B to the Submittal, constitute trade secrets pursuant to the Georgia Trade Secrets Act as shown herein (all of the foregoing is, collectively, referred to hereinafter as the "Trade Secrets").

8. The Trade Secrets are proprietary information because they are not commonly known and are not readily ascertainable by reasonable means by persons outside the business of Georgia Power. The Trade Secrets contain details of actual operating parameters, conditions, and measured values for Georgia Power's electric generating units, as well as certain unit-specific cost information. This proprietary commercial information has not been made publicly available outside of Georgia Power and its public disclosure has the potential to put the Company at a disadvantage compared to its competitors in the marketplace. Georgia Power has made reasonable efforts over time to maintain the secrecy of these Trade Secrets, which efforts include, but are not limited to, limiting and controlling employee access to such information, and prohibiting public disclosure of such information. Georgia Power has previously protected similar information under this same authority in its submittals to the Georgia Public Service Commission. Georgia Power submits this affidavit in furtherance of its ongoing and continual efforts to maintain the secrecy of the Trade Secrets.

9. Under Georgia Code § 12-9-19 and Georgia Rule for Air Quality Control 391-3-1-.08, "reports on the nature and amounts of stationary source emissions obtained by the division shall be available for public inspection," but the Trade Secrets do not include any such reports and do not contain the kind of information that EPD procedures indicate cannot be claimed or treated as protected. All information necessary to determine the "nature and amounts" of emissions from Georgia Power electric generating units is contained in Georgia Power's publicly available Submittal and Technical Appendix A. The Technical Appendix B contains additional

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background information for use by EPD in verifying the origin or source of the data that is provided in the publicly available Submittal and Technical Appendix A.

10. Georgia Power Company understands that receipt by EPD of this Affidavit and the Submittal does not mean that EPD agrees or has made a determination that the information identified in this Affidavit is protected under the Georgia Open Records Act from disclosure to the public. However, for claims made in this Affidavit that information in the Submittal constitute trade secrets pursuant to the Georgia Trade Secrets Act, I understand that Section 50-18-72(a)(34) of the Georgia Open Records Act proscribes a procedure for producing such information in response to a request under that Act.

FURTHER Affiant saith not.

Rosa Chi
Air Manager
Georgia Power Company
241 Ralph McGill Boulevard, N.E.
Bin # 10221
Atlanta, Georgia 30308-3374

Subscribed and sworn to before me this 14 day of October, 2021.

[NAME of Notary Public]

My Commission expires:

MELISSA A. MEJIA
NOTARY PUBLIC
BARTOW COUNTY, GEORGIA
MY COMMISSION EXPIRES
MAY 20 2025

Regional Haze 4-Factor Analysis
Georgia Power Plant Bowen

October 2021

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1.0 Executive Summary

The United States Environmental Protection Agency's (EPA) Regional Haze Rule requires states to evaluate visibility impacts to mandatory Class I Federal areas through the development and submission of state implementation plans (SIP) every 10 years. In these SIP submissions, states are required to establish reasonable progress goals (RPGs) toward natural visibility conditions and an associated long-term strategy for each mandatory Class I Federal area within the state or affected by emissions from the state.[1]

Following the requirements of the Regional Haze Rule, Georgia Environmental Protection Division (EPD) is developing Georgia's Regional Haze SIP for the second implementation period through 2028 and, as part of that effort, EPD is working with the Southeast U.S. regional planning organization, Visibility Improvement State and Tribal Association of the Southeast (VISTAS). While visibility degradation in all of Georgia's three Class I areas is well below the glidepath needed to achieve natural visibility conditions, Georgia EPD requested four-factor analyses from sources which had a modeled impact ≥1.00% of the total visibility impairment remaining, including Georgia Power Plant Bowen SO_2 emissions.[2]

Under current operations, the coal-fired electric generating units (EGUs) at Plant Bowen, Units 1-4, must burn ≤3% sulfur coal and are fully controlled for SO_2 with wet flue gas desulfurization (FGD) scrubbers that are operated year-round. All units are subject to the Georgia Multi-pollutant Rule, which requires the scrubbers to be operated with an average 95% removal rate or greater, and scrubber operation is further optimized for compliance with all applicable environmental regulations, including the Mercury and Air Toxics Standard (MATS) and Effluent Limitation Guidelines (ELG). Compared to emissions preceding installation of the scrubber, Plant Bowen has reduced annual SO_2 emissions from Units 1-4 by over 96%.

This four-factor analysis for Plant Bowen uses a "top-down" approach to evaluate all available SO_2 emissions control measures, as requested in Georgia EPD's July 10th letter. SO_2 emission reduction measures identified for Units 1-4 are coal switching to Powder River Basin (PRB) coal, coal switching to Central Appalachian (CAPP) coal, and replacing the current FGD scrubbers with dry FGD scrubbers. These measures are evaluated against the Regional Haze Rule's four statutory factors of cost of compliance, time necessary for compliance, energy, and non-air quality environmental impacts, and remaining useful life. The two coal switching options are both found to be highly unreasonable due to the high cost per ton SO_2 reduced for both coal types. The dry FGD scrubbers are determined to be an inferior control option that would provide no additional, and likely even decreased, SO_2 reductions over baseline plant operations and, therefore, were not carried forward through the four-factor analysis. Table 1 summarizes the SO_2 emissions control effectiveness and calculated cost effectiveness for each evaluated option.

Table 1. Summary of Plant Bowen Four-Factor Analysis Results

Emission Reduction Measure	Control Effectiveness	Cost Effectiveness ($/ton)
Coal Switching to PRB Coal	81%	$6,424
Coal Switching to CAPP Coal	56%	$13,447

[1] 40 CFR 51.308(f).
[2] Georgia EPD letter to Georgia Power on July 10, 2020

The additional SO_2 emission reduction measures identified for Plant Bowen Units 1-4 were determined to result in unreasonable costs of compliance. Also, coal switching to PRB coal or CAPP coal would have significant energy impacts on the operations of Units 1-4 that could affect the remaining useful life of the units. While Georgia Power does not have current plans to retire Plant Bowen Units 1-4, the 2019 Integrated Resource Plan (IRP) final order places significant cost restrictions on Units 1-2 through July 2022, and the remaining useful life of Units 1-4 will be further evaluated during the 2022 IRP process. These facts confirm that none of the additional control technologies or emission reduction measures identified are necessary to make reasonable progress toward meeting the national visibility goal.

Considering this conclusion and that Plant Bowen Units 1-4 are already fully controlled with wet FGD scrubber systems that are optimized not only for SO_2 emissions removal but also for other environmental compliance programs, Georgia Power recommends EPD adopt the MATS alternative SO_2 limit of 0.20 lb/MMBtu for Plant Bowen Units 1-4 in the Georgia Regional Haze SIP for the second implementation period.

2.0 Introduction

The Regional Haze Rule, 40 CFR 51.308, requires states to evaluate visibility impacts to mandatory Class I Federal areas through the development and submission of state implementation plans SIP every 10 years. In these SIP submissions, states are required to establish RPGs toward natural visibility conditions and an associated long-term strategy for each mandatory Class I Federal area within the state or affected by emissions from the state.[3]

The long-term strategy must include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the RPGs. The Clean Air Act definition of "reasonable progress" requires states to consider "the costs of compliance, the time necessary for compliance, and the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any existing source."[4] In addition, the Regional Haze Rule requires states to consider additional factors in developing its long-term strategy, including "[e]mission reductions due to ongoing air pollution control programs" and "the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy."[5]

Following the requirements of the Regional Haze Rule, Georgia EPD is developing Georgia's Regional Haze SIP for the second implementation period through 2028 and, as part of that effort, EPD is working with the Southeast U.S. regional planning organization, VISTAS. There are three Class I areas located in Georgia: Cohutta Wilderness Area, Okefenokee Wilderness Area, and Wolf Island Wilderness Area. VISTAS completed source apportionment analyses and photochemical modeling to estimate the visibility impacts of individual sources. Based on the results of those analyses and trends in actual visibility measurements, visibility degradation in all of Georgia's three Class I areas appear to be well below the glidepath needed to achieve natural visibility conditions.[6] Even so, Georgia EPD requested four-factor analyses from sources which had a modeled impact ≥1.00% of the total sulfate or nitrate visibility impairment from EGU and non-EGU point sources on the most impaired days for any Class I Federal areas.[7]

On July 10, 2020, Georgia EPD requested that Georgia Power complete a four-factor analysis by November 30, 2020 for Plant Bowen, based on modeled visibility sulfate impacts of 1% or greater at ten Class I Federal areas and projected 2028 SO_2 emissions of 10,453.41 tons per year (tpy).

Under current operations, the coal-fired EGUs at Plant Bowen, Units 1-4, must burn ≤3% sulfur coal and are fully controlled for SO_2 with wet FGD scrubbers that are operated year-round. All units are subject to the Georgia Multi-pollutant Rule, which requires the scrubbers to be operated with an average 95% removal rate or greater, and scrubber operation is further optimized for compliance with all applicable environmental regulations, including MATS and ELG. Since 1990, Plant Bowen has reduced annual SO_2 emissions from Unit 1-4 by over 96%. Baseline Plant Bowen operations, emissions controls, and applicable regulations are described further in Section 3.0.

[3] 40 CFR 51.308(f).
[4] 42 U.S.C. 7491(g)(1)
[5] 40 CFR 51.308(d)(3)(v)(A)&(G)
[6] VISTAS Regional Haze Project Update, May 20, 2020. Retrieved from: https://www.metro4-sesarm.org/sites/default/files/VISTAS%20Pres%20Stakeholders%20Final%20200520.pdf
[7] Georgia EPD letter to Georgia Power on July 10, 2020

Although Georgia EPD's letter describes the VISTAS analyses as identifying "facilities that significantly impact visibility impairment" and "sources most likely contributing to poor visibility in Class I Federal areas,"[8] the contribution to visibility degradation by the sources selected for individual review is relatively small, only a few percentage points at most. Also, the majority of the Class I Federal areas modeled by VISTAS, including all ten areas identified as potentially impacted by Plant Bowen, are more than 10 years ahead of schedule on the glidepath necessary for a uniform rate of progress to meet natural conditions.[9]

This report satisfies the request to conduct a four-factor analysis by November 30, 2020 for all significant sources of SO_2 emissions at Plant Bowen, which are the EGUs, Units 1-4. The four-factor analysis in Section 4.0 uses a "top-down" approach to evaluate control measures for technical feasibility and cost effectiveness starting with the highest level of control effectiveness as requested in Georgia EPD's July 10th letter. The four-factor analysis has been completed in accordance with the visibility provisions of the Clean Air Act (42 USC 7491), the Regional Haze Rule adopted by the United States EPA, as revised (40 CFR Part 51 Subpart P), and as interpreted and clarified in EPA's Regional Haze guidance, including both the final 2019 "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period." Where any inconsistencies may exist among EPA's guidance documents, this analysis follows the binding statutory and regulatory requirements and the direction provided by EPD.

Section 4.1 identifies all available SO2 control technologies or emission reduction methods that may be applicable to Plant Bowen. Section 4.2 evaluates whether any potential control technologies are technically infeasible and therefore should be eliminated from the analysis. Section 4.3 ranks the remaining control technologies by control effectiveness. Section 4.4 evaluates the list of measures, from the top down, using the four statutory factors in accordance with EPA's Regional Haze Rule to determine whether they are necessary to make reasonable progress. Finally, Section 4.5 proposes a reasonable progress recommendation in the form of an enforceable emission limit based on the control technology evaluation for Plant Bowen.

[8] Georgia EPD letter to Georgia Power on July 10, 2020
[9] VISTAS Regional Haze Project Update, May 20, 2020.

3.0 Baseline Operation & Environmental Controls at Plant Bowen

3.1 Description of Units 1-4

Georgia Power Plant Bowen, located in Cartersville, Bartow County, GA, began commercially operating in 1975 and consists of four bituminous coal-fired electric generating units. Plant Bowen has maximum planning capacities of 724 MW for each of Units 1 and 2 and 892 MW for each of Units 3 and 4. Through 2019, Georgia Power has invested over $6 billion in environmental capital projects, including the environmental controls at Plant Bowen. Each unit is equipped with selective catalytic reduction (SCR), electrostatic precipitators (ESPs), and wet FGD scrubbers. Units 3 and 4 are also equipped with fabric filter baghouses, and all units utilize hydrated lime and activated carbon injection systems as needed for performance optimization and to maintain mercury compliance with the MATS rule.

3.2 Baseline SO_2 Emissions

Plant Bowen Unit 1-4 SO_2 emissions were 9,231 tons in 2019, which is a 96% decrease from 1990 levels, as shown in Figure 1.[10]

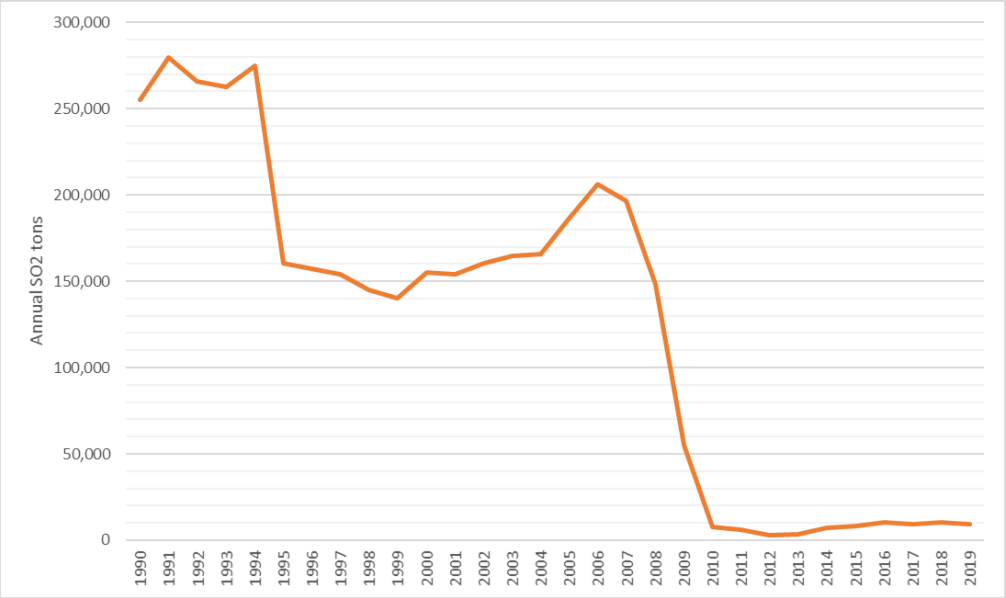

Figure 1. Plant Bowen Annual SO2 Emissions, 1990-2019

The total actual SO_2 emissions for Plant Bowen in 2019 were below Georgia EPD's 2028 projection of 10,453 tpy. Due to the combination of sustained low natural gas prices, reduced energy demand growth, and capital expenditure limitations described in Section 4.0, Georgia Power does not expect Plant Bowen generation or SO_2 emissions to exceed 2019 levels in 2028. Therefore, Georgia Power conservatively assumes actual 2019 operation and SO_2 totals as the projected 2028 baseline for estimating the control effectiveness of each control measure in this four-factor analysis.

This approach is consistent with EPA Regional Haze guidance, which states that "the projected 2028 (or the current) scenario can be a reasonable and convenient choice for use as the baseline control scenario," which is generally "based at least in part on information on the source's operation and emissions during a representative historical period."[11] Actual 2019 Plant Bowen data from continuous

[10] See Technical Appendix Document A5.1 for supporting data.
[11] U.S. Environmental Protection Agency, *Guidance on Regional Haze State Implementation Plans for the Second Implementation Period*, at 29 (2019)

emissions monitoring systems (CEMS) reported for federal and state compliance are summarized in Table 2.[12]

Table 2. 2019 Plant Bowen Units 1-4 Data Used as Projected 2028 Baseline

Plant Bowen 2019 Data	Unit 1	Unit 2	Unit 3	Unit 4	Total Units 1-4
Total Net Generation (MWh)	3,342,955	2,342,644	1,873,360	3,428,128	10,987,087
Total Heat Input (MMBtu)	37,995,217	24,257,188	20,413,398	36,206,975	118,872,778
Total SO_2 Emissions (tons)	3,026	1,778	1,749	2,678	9,231
Average SO_2 rate (lb/MMBtu)	0.16	0.14	0.17	0.14	0.16
Average SO_2 removal rate (%)	96.3	96.5	96.0	96.4	96.3

3.3 Applicable SO_2 Regulations

Plant Bowen Units 1-4 are fully controlled for SO_2 with wet FGD scrubbers that operate year-round, which were placed in service in 2008 for Units 3 & 4, 2009 for Unit 2, and 2010 for Unit 1. Units 1-4 are subject to Georgia Rules for Air Quality Control 391-3-1-.02(2)(sss), Multi-pollutant Control for Electric Utility Steam Generating Units, and 391-3-1-.02(2)(uuu), SO_2 Emissions from Electric Utility Steam Generating Units, which not only require these EGUs to be equipped with FGD systems but also to maintain compliance with a 30-day rolling average SO_2 removal of greater than 95%.

Plant Bowen Units 1-4 are also subject to Georgia Rule 391-3-1-.02(2)(g), which requires all fuel fired in the units not to exceed 3% sulfur, by weight. Plant Bowen Units 1-4 burn Illinois Basin (IB) bituminous coal with sulfur content ≤ 3%, to which coal washing methods are applied by the coal suppliers for additional sulfur and impurity removal, as appropriate based on the coal properties.[13] All oil fired as the secondary fuel for Units 1-4 and in any ancillary equipment, such as startup boilers or stationary engines at the facility, is vendor certified as ultra-low sulfur diesel fuel with a sulfur content less than 0.0015%. Plant Bowen monitors and reports compliance for Units 1-4 with Georgia Rule (uuu) and (g) in quarterly Title V reports to Georgia EPD, as required by Plant Bowen Title V Permit Condition 6.1.4.

Plant Bowen Units 1-4 are subject to the Acid Rain Program and the Cross-State Air Pollution Rule (CSAPR) and participate in the associated allowance trading programs on an annual basis for SO_2. For Acid Rain Program and CSAPR compliance, SO_2 emissions data and associated CEMS quality assurance (QA) and certification results are reported to EPA quarterly through the Emissions Collection and Monitoring Plan System (ECMPS). Note that Plant Bowen was determined to meet the Best Available Retrofit Technology (BART) requirements of the first implementation period of the Regional Haze Rule through compliance with CSAPR.

Plant Bowen Units 1-4 became subject to the MATS rule on April 16, 2016.[14] As incorporated into Plant Bowen Title V Permit V-04-0 Condition 3.3.8, the MATS Rule provides an alternative to the HCl emissions limit for EGUs equipped with FGDs and SO_2 CEMS to comply with an SO_2 limit of 0.20 lb/MMBtu.

[12] See Technical Appendix Documents A2.1-4, 2.3-1, and 2.3-2 for supporting data.
[13] Plant Bowen also receives Northern Appalachian bituminous coal, which has similar heat and sulfur content to IB coal.
[14] The compliance deadline of the MATS rule was April 16, 2015 for existing units. Georgia EPD granted 1-year extensions for Plant Bowen Units 3 and 4 on September 10, 2013 for the installation of the baghouse, hydrated lime, and activated carbon injection systems and for Plant Bowen Units 1 and 2 on February 23, 2015 to allow for the evaluation and implementation of significant changes due the MATS Startup and Shutdown Reconsideration Rule.

Plant Bowen Unit 1 transitioned to the MATS alternative SO_2 limit on October 1, 2020, while Units 2-4 qualified for MATS low-emitting EGU (LEE) status for HCl as of 3rd Quarter 2020 through test results showing emissions levels less than half the MATS limit for three consecutive years.

3.4 Baseline SO_2 Controls: Operation & Optimization

Plant Bowen Units 1-4 are equipped with Chiyoda Jet Bubbling Reactor (JBR) wet FGD scrubbers, in which the flue gas from the boiler flows down a large set of sparger tubes submerged into a limestone slurry in the scrubber vessel. The flue gas is forced through the slurry bath where SO_2 from the flue gas reacts with the limestone to form gypsum, effectively removing SO_2 from the flue gas stream before it exits the stack. The primary chemical reaction for SO_2 control from the wet FGD is the following:

$$CaCO_3 + SO_2 + 2\ H_2O + {}^{1}/_{2}\ O_2 \leftrightarrow CaSO_4 \bullet 2\ H_2O + CO_2$$

The SO_2 removal rate from the JBR scrubber is dependent on a multitude of interconnected oxidation level parameters, including slurry liquid level in the scrubber vessel (known as submergence level), oxidation air levels, and limestone concentration of the slurry mixture. An increased submergence level means the flue gas has a longer contact time with the slurry which increases the potential for SO_2 removal. Oxidation air levels, which impact the reaction rate in the scrubber system, are controlled to the scrubber vessel through oxidation air blowers or jet air spargers that introduce additional air to the system. Limestone concentration of the slurry affects the pH levels of the scrubber, which are used to optimize and control the scrubber system.

The scrubbers are also critical to mercury control and MATS compliance, since the scrubber can capture mercury in the scrubber liquid or reagent, depending on how it is operated. Ongoing compliance with the MATS mercury limit of 1.2 lb/TBtu is demonstrated for all units through a mercury CEMS. To meet both the mercury and SO2 limits, scrubber operating parameters must be balanced and optimized, particularly with respect to oxidation levels. As oxidation levels increase, SO2 removal rates may increase as well, but high oxidation levels can also reduce mercury removal rates by converting the mercury into the elemental state that is not as easily captured and retained in the scrubber, resulting in "re-emission" of mercury.

To mitigate mercury re-emission, Units 1 and 2 have been equipped with mercury re-emission control systems (MRCS), which inject powder activated carbon material directly into the scrubber vessel. However, these systems can only reduce mercury re-emission, they cannot eliminate it. Units 3 & 4 do not have MRCS since their mercury control strategy includes baghouses as upstream controls.

The conversion to elemental mercury caused by high scrubber oxidation rates also causes mercury to dissociate from the gypsum byproduct, thereby increasing the mercury concentration in the scrubber liquid which requires additional wastewater treatment, which may impact additional non-air environmental regulatory requirements, such as wastewater requirements under the ELG. High oxidation rates may also affect selenium in similar fashion by resulting in greater production of selenate, which is more difficult to treat in wastewater than selenite form which occurs at lower oxidation rates.

For Bowen Units 1-4, scrubber operating parameters are optimized based on Georgia Power's operational experience to maintain SO_2 removal compliance, mercury removal compliance, and wastewater treatment requirements for both mercury and selenium, while balancing the increased equipment wear and scrubber vessel scaling experienced at higher submergence levels and pH levels. The 2019 average SO_2 removal rate was 96.3% for Units 1-4 and reflects the level of oxidation needed to comply with all applicable regulatory requirements.

4.0 Four-Factor Analysis for Additional SO_2 Controls at Plant Bowen

4.1 Step 1: Identification of Additional SO2 Control Technologies

The additional SO_2 emission reduction measures in Sections 4.1.1 through 4.1.3 were identified for Plant Bowen Units 1-4 for evaluation in this four-factor analysis. Note that coal switching to PRB coal and CAPP coal are evaluated as two separate options, due to differing levels of control effectiveness and considerations for costs and energy impacts. This approach is consistent with BART guidelines, which indicates that "evaluat[ing] other levels of control in addition to the most stringent level for a given device… would be useful, particularly in cases where the selection of additional options would have widely varying costs and other impacts."[15]

4.1.1 Coal Switching to PRB Coal

SO_2 emissions could be reduced by switching to lower sulfur Powder River Basin (PRB) sub-bituminous coal. PRB sub-bituminous coal has a sulfur content of 0.2-0.7% with heat content between 8,200-9,000 Btu/lb. PRB coal is extremely friable with a high dusting potential and increased ignitability. PRB coal has significantly lower heat content and higher moisture content, which will require more coal to be burned to achieve the same facility heat input and generation. As a result, PRB coal will also cause derates in unit capacity due to limitations of the coal handling systems, which will limit the units from achieving the operational levels necessary to reach the maximum design capacity of the units. Any effort to minimize the derate would require significant investments in equipment to try to mitigate the impact of the lower heating value of sub-bituminous coals. PRB coal has lower ash and sulfur content, which will also impact the amounts of fly ash and gypsum available for sale to the wallboard and cement industries.

4.1.2 Coal Switching to CAPP Coal

Coal switching to Central Appalachian (CAPP) bituminous coal is another lower sulfur coal option that would result in lower SO_2 emissions. CAPP bituminous coal has a sulfur content of 0.6-2.0% with heat content between 11,400-13,200 Btu/lb. Compared to IB coal, CAPP coal is significantly more expensive and, due to changes in heat, sulfur, and ash contents, operation on CAPP coal will produce varying impacts on the amounts of fly ash and gypsum to be handled for sale or disposal.

4.1.3 Dry FGD Scrubbers

Flue gas desulfurization can be completed as a wet or dry process. EPA's Control Cost Manual Chapter 5 for SO_2 controls states, "About 170,000 MW of the U.S. electric generating capacity are controlled using wet scrubbers, while dry scrubbers account for only about 30,000 MW capacity."[16] As part of this analysis, Georgia Power reviewed the EPA Control Cost Manual Chapter 5 for SO_2 Controls that EPA proposed for public comment in July 2020, since it includes new details on dry FGD scrubber systems that were not included in the previous version of Chapter 5. This proposed chapter is consistent with other EPA Control Cost Manual information.

[15] 40 CFR 51 Appendix Y (BART Guidelines), Section IV.D.3. Although the BART guidelines are not mandatory in this reasonable progress four-factor analysis, EPA has previously indicated that the analysis may be similar in many respects. See U.S. Environmental Protection Agency, *Draft Guidance on Progress Tracking Metrics, Long-term Strategies, Reasonable Progress Goals and Other Requirements for Regional Haze State Implementation Plans for the Second Implementation Period*, at 94, 114, & App. D (2016) ("2016 Draft Regional Haze Guidance").

[16] U.S. Environmental Protection Agency, *Air Pollution Control Cost Manual*, Sec. 5, Ch. 1, at 1-6 (proposed July 2020) (EPA-HQ-OAR-2015-0341-0082) ("Proposed SO_2 Control Cost Manual").

Dry FGD processes include spray dry absorber (SDA) and circulating dry scrubber (CDS) systems. SDA systems use lime or hydrated lime reagents sprayed with small amounts of water into a gas absorber to remove SO_2 upstream of and in conjunction with particulate controls, such as baghouses. CDS systems use a circulating bed of hydrated lime reagent to remove SO_2 in conjunction with an integrated fabric filter system. The EPA Control Cost Manual provides average installation costs for SDA and CDS systems at $37 million and $81 million, respectively.[17]

The EPA Control Cost Manual lists SDA and CDS systems using lime reagent as having between 85-98% SO_2 removal efficiencies. However, it should also be noted that dry FGD systems are typically installed on smaller units with uncontrolled SO_2 concentrations around 2 lb/MMBtu.[18] Further, SDA systems have poor removal efficiency for uncontrolled SO_2 emissions levels higher than 3 lb/MMBtu. In fact, the EPA Control Cost Manual states that "combustion units that are retrofit with SDA systems lose the option of burning high sulfur content coal."[19] CDS systems have higher removal efficiencies than SDA systems, but these systems have limited use in the U.S. and are used only on small units (50-250 MW) for applications in Europe.[20]

4.2 Step 2: Elimination of Technically Infeasible Options

The emission reduction measures discussed above should all be considered technically feasible for Plant Bowen Units 1-4. However, some options will not provide any additional SO_2 reduction benefit over baseline existing plant SO_2 emissions control as described below.

4.2.1 Coal Switching to PRB Coal

Switching to PRB coal is a technically feasible emission reduction measure for SO_2 emissions from Plant Bowen Units 1-4. Since the 1990s, many coal-fired EGUs in the U.S. have switched to a lower sulfur coal as part of their compliance strategies for the Acid Rain Program and, more recently, for the MATS rule, at facilities for which coal switching was more cost-effective than FGD scrubber installation.

Due to significantly lower heat content and higher moisture content, burning PRB coal requires additional coal to be burned to achieve the same amount of energy as a bituminous coal. The current coal handling systems for Plant Bowen Units 1-4 would not be able to handle this required increase in coal throughput, and the limited operational level of the unit would cause a derate of the maximum design capacity proportional to the difference in heat contents of PRB coal compared to IB coal. Unit capacity derates due to switching to PRB coal would require the purchase of replacement capacity and energy to restore Georgia Power and the Southern Company system to a comparable level of reliability. Investments in upgrades to the coal handling system would also be needed to address increased dusting and ignitability conditions. Burning PRB coal can have a negative effect on boiler temperatures and efficiencies, causing excessive slagging and fouling in the boiler, and additional ongoing maintenance capital will be needed for the increased wear on the system from operating on PRB coal.

Coal switching from IB coal to PRB coal is considered a technically feasible emission reduction measure for this four-factor analysis and will be ranked by emission reduction effectiveness in Section 4.3 and evaluated against the four statutory factors in Section 4.4.

[17] Proposed SO_2 Control Cost Manual, at 1-7 and 1-8.
[18] Proposed SO_2 Control Cost Manual, at 1-10, 1-34, and 1-35.
[19] Proposed SO_2 Control Cost Manual, at 1-35.
[20] Proposed SO_2 Control Cost Manual, at 1-37.

4.2.2 Coal Switching to CAPP Coal

Switching to CAPP coal is a technically feasible emission reduction measure for SO_2 emissions from Plant Bowen Units 1-4. Fully equipped with wet FGD scrubbers, Units 1-4 currently fire Illinois Basin (IB) bituminous coal with a sulfur content ≤ 3%.[21] Plant Bowen Units 1-4 switched from CAPP coal to IB coal in 2014. Burning CAPP coal is significantly more expensive than IB coal and would greatly impact the economic dispatch of Units 1-4 to the extent that these units would likely not operate unless needed to support the Southern Company system for reliability purposes. However, this analysis conservatively assumes an equal operational baseline in order to evaluate the cost of this control option in this four-factor analysis. Thus, coal switching from IB coal to CAPP coal is considered a technically feasible emission reduction measure and will be ranked by emission reduction effectiveness in Section 4.3 and evaluated against the four statutory factors in Section 4.4.

4.2.3 Dry FGD Scrubbers

Dry FGD scrubbers are best suited for smaller units with less than 200 MW capacities that burn low-sulfur fuels. The EPA Control Cost Manual only provides cost calculation methodologies for the SDA-type dry FGD system, which is capable of up to 95% SO_2 removal.[22] The EPA Control Cost Manual also indicates that the cost calculations provided are not valid for units with over 3 lb/MMBtu uncontrolled SO_2 emission rates.[23] Plant Bowen Units 1-4 fire coal with a sulfur content ≤ 3%, which can have an uncontrolled SO_2 rates over 5 lb/MMBtu depending on sulfur content and heat content of the coal. Note that wet FGD systems are more expensive and are capable of higher removal efficiencies than dry FGD systems. Wet FGD systems also provide additional other emissions control benefits, such as mercury, organic hazardous air pollutants (HAP), and other acid gases.[24]

Dry FGD scrubbers are technically feasible for Plant Bowen Units 1-4. However, Georgia Power has already equipped these units with wet FGD systems that are more effective for SO_2 removal. Therefore, dry FGD systems constitute inferior control options that would achieve less effective SO_2 emissions reductions than the current wet FGD systems.

4.3 Step 3: Ranking of Remaining Control Technologies by Control Effectiveness

Since all the SO_2 emission reduction measures identified in Section 4.1 are considered technically feasible, Table 3 lists these options in order of SO_2 control effectiveness.

Table 3. Ranking of SO_2 Emission Reduction Measures by Control Effectiveness

Emission Reduction Measure	Control Effectiveness
Coal Switching to PRB Coal	81%
Coal Switching to CAPP Coal	56%
Dry FGD Scrubbers	0%

[21] Plant Bowen also receives Northern Appalachian bituminous coal, which has similar heat and sulfur content to IB coal.
[22] Proposed SO_2 Control Cost Manual, at 1-35, 1-41.
[23] Proposed SO_2 Control Cost Manual, at 1-39.
[24] Proposed SO_2 Control Cost Manual, at 1-8.

Using a top-down approach, first coal switching to PRB coal and then coal switching to CAPP coal will be evaluated against the four statutory factors to further analyze the feasibility of each option. While technically feasible, dry FGD scrubbers are inferior control options that would provide no additional, and likely even decreased, SO_2 reductions compared to baseline plant operations and therefore will not be evaluated further in this analysis.

4.4 Step 4: Application of the Four Statutory Factors

For all options in this analysis, the cost effectiveness of the SO_2 emission reduction measures was calculated in accordance with the EPA Control Cost Manual cost estimation concepts and methodologies in order to create a cost per ton of SO_2 reduced for each option on a comparable annualized basis. As discussed in Section 3.0, actual operational and emissions data on IB coal from 2019 for Plant Bowen Units 1-4 are conservatively used as the baseline for these analyses. Although 2019 actual SO_2 emissions were less than the projected 2028 emissions from Georgia EPD, they are higher than future annual emissions actually projected by Georgia Power. This conservative baseline is used to create an equal comparison for each coal type, even though a switch to these lower-sulfur coals would likely have significant negative impacts on operations.

Cost effectiveness was calculated using SO_2 emissions reduction calculations and the following cost calculation method from Chapter 2 of the EPA Control Cost Manual:[25]

Total Costs = Indirect Costs + Direct Costs – Recovery Credits

These total costs are determined on an annual basis in comparison to the 2019 actual baseline costs on IB coal to represent the cost difference in operating Units 1-4 on a different type of coal. This annual cost difference is then divided by the difference in annual SO_2 emissions compared to the 2019 actual baseline emissions on IB coal to determine the cost effectiveness in $/ton SO_2 reduced.

Georgia Power's 2019 IRP acknowledged continued economic pressure on the company's remaining coal-fired units, including Plant Bowen Units 1 and 2. In recognition of economic challenges facing Plant Bowen Units 1 and 2 in certain planning scenarios, Georgia Power committed to defer major capital investments at the units but noted that indefinite deferral of investments or otherwise limiting capital expenditures will likely cause the units to become unavailable starting with the latest applicability date of EPA's ELG Rule, which at the time was set for December 2023.[26] The Georgia Public Service Commission's (GPSC) final order on the 2019 IRP, which was ordered on July 29, 2019, set limits on capital expenditures specific to Plant Bowen Units 1 and 2 at $19 million per year or $57 million for the three-year period ending July 31, 2022. Any expenditures that may be needed to maintain safe and reliable operation of Units 1 and 2 that exceed these limits require justification from Georgia Power to the GPSC Staff.[27] To maintain reliability and fill a capacity need in the potential absence of Plant Bowen Units 1 and 2 and any other remaining steam units, Georgia Power issued the 2022-2028 Capacity Request for Proposals (RFP) on August 31, 2020, seeking to procure approximately 1,000 to 3,000 MW of capacity and energy resources. Georgia Power plans to propose the desired mix of resources to be procured and retired in conjunction with the 2022 IRP filing.[28]

[25] U.S. Environmental Protection Agency, *Air Pollution Control Cost Manual*, Sec. 1, Ch.2., at 12 (Equation 2.1) ("EPA Control Cost Manual Chapter 2").
[26] Docket No. 42310 2019 Integrated Resource Plan, filed on January 31, 2019, Main Document Sections 1.7, 10.5, and 10.6
[27] Docket Nos. 42310 & 42311 Order Adopting Stipulation as Amended, filed on July 29, 2019, Stipulation Supply Side Plan Paragraph 13
[28] Docket No. 42641 Final Approved RFP and PPAs, filed on August 31, 2020, Capacity RFP Section I

4.4.1 Coal Switching to PRB Coal

4.4.1.1. PRB Coal: Statutory Factor #1 Costs of Compliance

PRB coal has significantly lower heat content than IB coal, and this decrease in heat content paired with an increase in coal moisture content is estimated to result in a total capacity decrease, or derate, of Units 1-4. A capacity derate of around 27% or greater would be expected using current unit equipment to process PRB coal at the same rate as current IB coal operations, based on the heat contents of PRB coal at 8,800 Btu/lb and 2019 Bowen Baseline IB coal at 12,002 Btu/lb. This 27% derate assumption will be used to evaluate the coal switching to PRB coal option in this four-factor analysis.
Note that the level of unit capacity derate does not impact the annual SO_2 emissions reduction since the analysis assumes that the 2019 baseline annual heat input is achievable at this derated unit capacity with an increased amount of operating time. Based on this information and the 2019 actual baseline data, the estimated emission reduction for PRB coal is shown in Table 4.

Table 4. Emission Reduction Estimates for Coal Switching to PRB Coal

	2019 Bowen Baseline on IB Coal	**PRB Coal**
Sulfur Content (%)	2.6%	0.4%
Heat Content (MMBtu/lb)	12,002	8,800
2019 Bowen Baseline Annual Heat Input (MMBtu)	118,872,778	
2019 Bowen Baseline Average SO_2 Removal (%)	96.3%	
Average SO_2 rate (lb/MMBtu)	0.16	0.03
Annual SO_2 Emissions (tons)	9,231	1,749
Delta Annual SO_2 compared to Baseline (tons)	-	(7,482)
Emission Reduction Percentage from Baseline (%)	-	81%

Georgia Power also considered if the projected derate on PRB coal could be reduced by increasing coal throughput capacity via the installation of an additional pulverizer to each unit's coal handling system and any associated boiler work. These additional investments have not been implemented at Georgia Power facilities that have historically switched to PRB coal, and no applicable examples in practice were identified to substantiate the feasibility of these projects, including the quantification of the equipment needs or engineering and construction requirements, which would be highly site-specific. In addition to unknown capital investment costs needed, these projects would need to be evaluated for New Source Review (NSR) construction permitting, and the associated permitting costs of these significant equipment installations and modifications could also be incurred.[29] Therefore, while additional capital investment could potentially reduce the capacity derate somewhat, those changes would likely be very costly or may not be feasible considering space and design constraints. Because the feasibility is unclear for Plant Bowen, this analysis focuses on the 27% derate scenario.

[29] *Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations*, 84 Fed. Reg. 32520, 32357 (July 8, 2019) (recognizing that NSR-related costs are relevant in evaluating cost effectiveness analyses).

The cost effectiveness calculations for coal switching to PRB coal are summarized in Table 5 with supporting information provided in the following sections on Indirect Costs, Direct Costs, and Recovery Credits.

Table 5. Summary of Cost Effectiveness Calculations for Coal Switching to PRB Coal

Delta compared to Baseline	**2019 Bowen Baseline on IB Coal**	**PRB Coal**
Annualized Capacity Penalty (Million $)	Baseline	51.7
Total Indirect Costs (Million $)	**Baseline**	**51.7**
Annual Fixed O&M Cost (Million $)	Baseline	1.1
Annual Variable O&M Cost (Million $)	Baseline	(8.9)
Annual Fuel Cost (Million $)	Baseline	1.2
Total Direct Costs (Million $)	**Baseline**	**(6.6)**
Annual Ash/Gypsum Sales (Million $)	Baseline	(3.0)
Total Recovery Credits (Million $)	**Baseline**	**(3.0)**
Total Annual Costs ($)	Baseline	53,466,513
Total Annual SO_2 Reduction (tons)	Baseline	7,482
Cost Effectiveness Relative to Baseline ($/ton)	**Baseline**	**6,424**

Indirect Costs

Indirect costs are costs that are not incurred on an annual basis, such as the purchase, installation, and startup of capital equipment.[30] In order to combine these indirect costs with direct costs and recovery credits which have an annual basis, indirect costs are amortized to determine an annual value.[31] For this analysis, Georgia Power has calculated the net present value of any indirect costs over a 30-year period and the associated annualized payment using a firm-specific real interest rate of 6.04%, consistent with the Control Cost Manual.[32,33] A 30-year timeframe was selected using the equipment lifetime methodology provided in the Control Cost Manual, which also aligns with the unit retirement planning timeframes used during Georgia Power's IRP evaluations.[34] Any escalations for inflation or carrying costs, such as Allowance for Funds Used During Construction (AFUDC), are not included in the capital costs in this analysis, in accordance with the methods described in the EPA Control Cost Manual.[35] Also, these capital recovery costs do not include other potential indirect costs listed in the EPA Control Cost Manual, such as taxes, insurance, and administrative charges.

Capacity Penalty Costs

The first indirect cost listed for switching to PRB coal for Plant Bowen Units 1-4 is the capacity penalty cost associated with the derate to unit capacities. Plant Bowen Units 1-4 provide capacity value by supporting system reliability and by avoiding costs associated with replacement capacity that would be required to meet customer peak demands and reserve margin requirements in the absence of such Plant Bowen units. Without these units, Georgia Power would have to procure short-term and long-

[30] EPA Control Cost Manual Chapter 2, at 12.
[31] EPA Control Cost Manual Chapter 2, at 21.
[32] Firm-specific rate based on financial conditions from Georgia Power 2019 Rate Case Order, filed by the Georgia PSC on December 31, 2019. See Technical Appendix Document A1.2 for supporting data.
[33] EPA Control Cost Manual Chapter 2, at 16. Real interest rates do not account for inflation.
[34] EPA Control Cost Manual Chapter 2, at 22.
[35] EPA Control Cost Manual Chapter 2, at 11-12 & 18.

term replacement capacity in order to restore Georgia Power and the Southern Company system to a comparable level of reliability that the system currently holds. The cost of replacement capacity in any year is assumed to be at either a market rate or the cost of new construction depending on whether Georgia Power has a projected capacity need in such year without Plant Bowen Units 1-4.

The $51 million annualized cost of the estimated 27% derate of Plant Bowen Units 1-4 is therefore the annualized difference between the net present value of (1) the maximum capacity of the units on IB coal times the cost of replacement capacity in each year of the study period and (2) the maximum capacity of the units on PRB coal times the cost of replacement capacity in each year of the study period.[36]

Capital Costs

Beyond the capacity penalty costs, other differences in capital costs expected on PRB coal in comparison to IB coal include capital associated with equipment installations needed and associated ongoing maintenance expenses.

In addition to derating the unit capacities, the properties of PRB coal create challenges in the fuel handling processes through increased dusting potential and ignitibility of this type of coal. At a minimum, a transition to PRB coal would require further investment capital costs for equipment installation costs associated with dust control systems, coal conveyor and transfer point changes, coal bunker conversions to silos, fire protection systems for coal silos, and the addition of fire inerting systems to pulverizers. An increase in annual maintenance capital costs would also be expected associated with these additional or modified systems. Due to the highly site-specific nature of these costs, detailed engineering studies and analyses would be needed to fully estimate the costs associated for Plant Bowen. Two historical examples from Plant Scherer, which was already burning PRB coal, for small capital projects associated with a narrow scope of improving coal handling fire protection and dust suppression had costs totaling more than $2.5 million.[37] Plant Bowen's scope of work for fire protection and dust suppression for a full switch to PRB coal would be expected to be much more costly. However, due to the high level of uncertainty for the capital costs associated with the 27% derate scenario, Georgia Power has not included specific capital investment costs in the cost effectiveness calculation for PRB coal in order to review a conservatively low estimate for the purposes of this analysis.

A Department of Energy (DOE) Technical Paper from 2004 further illustrates this cost uncertainty. The paper studied the cost of switching from bituminous coal to PRB coal across the industry, with capital investment estimates based on a March 1994 EIA review of 6 case studies of plants that completed the switch to PRB coal. The studies show a range in capital cost from $31.6 to $118.6 per kilowatt in 1992 dollars. Assuming 2% inflation, the equivalent 2019 dollars range would be $53.94 per kW to $202.44 per kW. Costs included in "[t]his investment is for equipment items needed to (1) reduce fire and explosion hazards through dust control and fire protection; (2) modify pulverizers, coal handling, and ash handling; and (3) install electrostatic precipitators and so on."[38] While Plant Bowen already has cold-side electrostatic precipitators (ESP) and would likely not need to incur additional ESP costs to switch to PRB, the plants studied in the DOE paper likely had other advantages for burning PRB coal that Plant Bowen does not currently have, such as in coal silos, coal handling, and boiler dimensions, which could result in additional costs for Plant Bowen. However, even using the low end of the capital

[36] See Technical Appendix Document A1.3-1 for calculations and supporting documentation used for the 2019 IRP.
[37] See Technical Appendix Document B5.2a and b.
[38] Malvadkar, Smith, & McGurl. (2004). "Supply Curves for Using Powder River Basin Coal to Reduce Sulfur Emissions," Journal of Air & Waste Management Association. 54:6. p.743. See Technical Appendix Document A5.2.

investment range in the DOE paper as an indicative estimate would result in a $180 million estimate to switch all four Plant Bowen units to PRB coal.

As discussed above, this analysis does not include any capital investment costs associated with attempting to mitigate the unit derates with additional pulverizers and coal handling system equipment. As noted in the DOE study, even with capital investment, some case study plants still experienced derating as much as 15%, confirming that the derate associated with PRB would not be eliminated entirely, even with costly investments to the plant.[39] Although detailed engineering and design study as well as test burns would be needed to determine the exact impact to Bowen, it is reasonable to assume that the plant would still experience a fairly significant derate even with capital investment as much as $180 million. Because of the high level of uncertainty around costs and impacts of minimizing the derate from burning PRB coal, this information is presented for completeness but is not included in the quantitative analysis.

Direct Costs

Direct costs are variable and semi-variable costs on an annual basis that vary with some measure of production, including raw materials, utilities, waste treatment/disposal, and labor, that are "directly usable in financial analyses".[40] For this analysis, the difference in direct costs compared to the 2019 actual baseline costs on IB coal were calculated by determining any changes needed in fixed operating and maintenance (O&M), variable O&M, and fuel costs for each coal type assuming equal baseline annual heat input.

Fixed O&M Costs

Fixed O&M costs are assumed to have additional labor costs needed on PRB coal, due to the increased coal throughput and additional fuel handling systems for fire suppression and fugitive dust control. This annual increase of over $1 million is associated with 20 additional full-time equivalent laborers (2,000 hours per year) at $27 per hour.

Variable O&M Costs

The annual variable O&M costs for the operation of Units 1-4 on PRB coal are conservatively assumed to be equal to the IB coal baseline, except for the anticipated changes in environmental commodities costs, even though increases in coal throughputs on PRB coal would likely cause additional increases in variable O&M at equal heat inputs. Therefore, the differences in variable O&M costs compared to the IB baseline are assumed to be equal to the differences in fuel additive, limestone, hydrated lime, ammonia, and activated carbon usages.[41]

On PRB coal, these differences are estimated to be an 82% reduction in limestone usage based on the difference in uncontrolled SO_2 emissions compared to IB coal, 100% decrease in hydrated lime usage, and a 20% reduction in ammonia usage. PRB coal is also expected to have additional fuel additive costs proportional to the additional coal throughput needed to achieve the baseline annual heat input. The increased costs for activated carbon injection are estimated for Units 1-4, based on operational experience at Plant McIntosh and Scherer. Based on these environmental commodities adjustments, PRB coal would have variable O&M costs of an annual net decrease of $8.9 million.

[39] Malvadkar et al. p. 743
[40] EPA Control Cost Manual Chapter 2, at 12.
[41] See Technical Appendix Tables A3.2 and A3.3 for supporting data.

Fuel Costs

The delivered fuel cost for PRB coal to Plant Bowen is estimated to be $0.01/MMBtu greater than the actual 2019 Bowen baseline coal costs on a heat input basis. Using the equal baseline annual heat input, differences in fuel costs compared to IB coal are more than $1.1 million per year for PRB coal.

Recovery Credits

Recovery credits are revenue created by a facility through the recovery of materials that can be sold as a benefit, such as scrubber byproduct (gypsum) to wallboard manufacturers.[42] Plant Bowen has contracts for the sales of ash and gypsum from Units 1-4. In 2019 on IB coal, Plant Bowen sold a total of $3.9 million in bottom and fly ash and $1.9 million in gypsum. Based on the heat content and ash percentages of PRB coal compared to IB coal, PRB coal is estimated to create 17% less fly ash and 26% more bottom ash; therefore, these adjustment factors were applied to the annual average revenues from ash sales for IB coal to result in an annual decrease of more than $0.6 million for PRB coal.

For gypsum sales, the amount of gypsum produced was estimated to be directly proportional to the difference in sulfur content for PRB coal. Therefore, compared to the actual IB coal baseline, PRB coal would create 80% less gypsum. Note that Plant Bowen has contracts with the gypsum purchasers that require Plant Bowen to produce a threshold amount of gypsum per year. If Plant Bowen does not meet this quota, Georgia Power must pay the gypsum purchaser liquidated damages for the remaining amount. Estimated calculations based on the 2019 actual baseline gypsum tonnage shows that Plant Bowen would not meet these required gypsum quotas on PRB coal. However, to be conservative, this additional cost has not been included in the cost effectiveness calculation.

In summary, on recovery credits, coal switching to PRB coal would create an estimated loss of more than $2.9 million annually.

Summary of Cost Effectiveness of Coal Switching to PRB Coal

Using the methodologies and concepts presented in the EPA Control Cost Manual, Georgia Power has completed SO_2 emissions reduction and total annual cost calculations for associated indirect costs, direct costs, and recovery credits to compare switching to PRB coal from the current IB coal fired in Plant Bowen Units 1-4, as summarized in Table 6. Even considering a potential SO_2 reduction of more than 80%, these calculations strongly demonstrate that, at over $6,000 per ton of SO_2 reduced, PRB coal is cost ineffective for SO_2 emissions reduction for Plant Bowen Units 1-4.

Table 6. Summary of Statutory Factor 1, Cost of Compliance, for Coal Switching to PRB Coal

Emission Reduction Measure	Control Effectiveness	Cost Effectiveness ($/ton)
Coal Switching to PRB Coal	81%	$6,424

4.4.1.2 PRB Coal: Statutory Factor #2 Time Necessary for Compliance

The second statutory factor to be considered for evaluating control technologies and emission reduction measures is the time necessary for compliance, or the estimated time needed for a source to comply with a potential control measure. Switching to PRB coal would require extensive engineering evaluations to complete new equipment installations to implement necessary systems for fire safety and

[42] EPA Control Cost Manual Chapter 2, at 13-14.

dust suppression, which would require time for construction. As described in Section 4.4.1.1., due to the significant uncertainty associated with the scope of work needed to install these new systems to allow Plant Bowen to burn PRB coal, it is expected that a December 31, 2028 timeframe would be necessary for switching to PRB coal.

The time necessary to switch to PRB coal would also be impacted by coal contract timeframes for Plant Bowen, which due to the variability of the fuel market are set on approximately 2-year timeframes. Plant Bowen currently has IB coal purchase commitments contracted through 2023. Therefore, for this analysis, the timeframe for receiving only PRB coal would be December 31, 2024 since coal shipments associated with coal purchase commitments may be received into the following year, which means Plant Bowen could continue to receive IB coal shipments from current contracts in 2024. The exact timing will necessarily depend on when the coal contract commitments can be executed for PRB coal, which further supports a December 31, 2028 compliance timeframe needed for switching to PRB coal.

4.4.1.3 PRB Coal: Statutory Factor #3 Energy and Non-Air Quality Environmental Impacts

The third statutory factor to be considered for evaluating control technologies and emission reduction measures is the energy and non-air environmental impacts. Coal switching to PRB coal would reduce the amount of energy produced by Plant Bowen Units 1-4 through reductions in unit capacities.

As described in previous sections, the lower heat content and higher moisture content of PRB coal will lead to unit capacity derates in the range of 27% or greater. The current coal handling system, including conveyors, pulverizers, and feeders, would not be able to process the increased amount of coal throughput needed to achieve equal generation loads from Units 1-4. In addition, the higher moisture content of PRB coal will lead to efficiency decreases and therefore heat rate increases, and the low ash fusion temperature of PRB coal can cause increased boiler slagging. Consistent with EPA Regional Haze guidance, which states that "states should consider energy and non-air quality impacts primarily as components of the costs of compliance," the energy impact of switching to PRB coal is demonstrated through the capacity penalty costs associated with procuring capital needed to offset this capacity loss included in the discussion of indirect costs in Section 4.4.1.1.[43]

While coal switching to PRB coal was already shown to be cost ineffective for SO_2 reduction for Plant Bowen Units 1-4, the energy impacts associated with PRB coal also weigh against selection of PRB coal as necessary for making reasonable progress.

4.4.1.4 PRB Coal: Statutory Factor #4 Remaining Useful Life of Existing Source

The fourth statutory factor to be considered for evaluating control technologies and emission reduction measures is the remaining useful life of an existing source. In situations in which the unit has an enforceable retirement date before the 2028 RPG date, a state may consider the remaining useful life factor to determine that no control of that unit is required.[44] Similarly, in situations in which the unit will retire before the conclusion of the assumed control-equipment life used for the capital recovery factor in annualizing the cost of the control options, the state may consider the remaining useful life factor in determining the cost effectiveness of the control options being evaluated.[45]

[43] 2019 Final Regional Haze Guidance, at 37.
[44] 2019 Final Regional Haze Guidance, at 20.
[45] 2019 Final Regional Haze Guidance, at 33-34.

As discussed in Section 4.4, Plant Bowen Units 1-4 do not currently have dates for retirement approved by the GPSC; therefore, the remaining useful life of these units is considered 30 years for this analysis, which is consistent with the unit retirement planning timeframes used during Georgia Power's IRP evaluations and the cost calculations in Section 4.4.1.1. Also, note that the 30-year timeframe is conservatively applied to the annualized cost calculation and that a shorter-time frame would result in even higher costs.

Investment restrictions are placed on Units 1 and 2 through July 31, 2022 by the GPSC 2019 IRP final order, and Georgia Power's capacity needs, including the remaining useful life of each Plant Bowen unit, will be further evaluated during the 2022 IRP process. Although this factor was not considered in the cost-effectiveness evaluation provided above, this factor likewise weighs against selection of PRB coal as necessary for making reasonable progress.

4.4.2 Coal Switching to CAPP Coal

Because the option ranked with the highest control effectiveness, coal switching to PRB coal, is not cost effective, the next option of coal switching to CAPP coal with a potential 56% SO_2 emissions reduction is evaluated below.

4.4.2.1 CAPP Coal: Statutory Factor #1 Costs of Compliance

The cost effectiveness of switching to CAPP coal was calculated using the same 2019 actual Plant Bowen IB coal baseline and the financial methods presented in Sections 4.4 and 4.4.1, in accordance with the EPA Control Cost Manual cost estimation concepts and methodologies to determine the cost per ton of SO_2 reduced on a comparable annualized basis. [46]

As noted above, the heat input baseline based on 2019 Plant Bowen actual operational data is used to create an equal comparison for each coal type, even though the different coals would significantly impact operations. For CAPP coal, the significant increase in fuel costs would be anticipated to impact the economic dispatch operation of Units 1-4 to the point that they would potentially run only when needed to ensure the reliability of the Southern Company system. Although not directly addressed in EPA's final 2019 guidance, EPA's draft guidance on Regional Haze states that "in determining whether the cost of compliance raises issues regarding the viability of continued plant operations, a state may take into consideration the conditions of the plant and the economic effects, such as the effect on product prices and the market share and profitability of the source."[47] The cost of compliance for coal switching to CAPP coal provided below is representative of costs associated with assumed operation at 2019 levels, even though these increased costs would likely lead to decreased operation of Plant Bowen Units 1-4 because these levels of dispatch would not be economically viable at these costs, according to Georgia Power resource planning modeling. Therefore, assuming ongoing operation on CAPP coal at 2019 operating levels is highly conservative.

Even after conservatively assuming the equal baseline for annual heat input, the analysis below confirms that switching to CAPP coal would be an inferior option because it would achieve fewer SO_2 emissions reductions at a higher cost per ton SO_2 reduced as compared to switching to PRB coal. The emissions reduction calculated for the CAPP coal alternative is provided in Table 7.

Table 7. Emission Reduction Estimates for Coal Switching to CAPP Coal

[46] Equation 2.1 from pg. 12, EPA Control Cost Manual Chapter 2
[47] 2016 Draft Regional Haze Guidance, at 101.

	2019 Bowen Baseline on IB Coal	CAPP Coal
Sulfur Content (%)	2.6%	1.1%
Heat Content (MMBtu/lb)	12,002	12,000
2019 Bowen Baseline Annual Heat Input (MMBtu)	118,872,778	
2019 Bowen Baseline Average SO_2 Removal (%)	96.3%	
Average SO_2 rate (lb/MMBtu)	0.16	0.07
Annual SO_2 Emissions (tons)	9,231	4,032
Delta Annual SO_2 Emissions compared to Baseline (tons)	-	(5,199)
Emission Reduction Percentage from Baseline (%)	-	56%

Costs for Plant Bowen Units 1-4 to switch to CAPP coal are summarized in Table 8. Though the estimates show a reduction in variable O&M and a potential small gain in ash sales, the increase in delivered fuel costs leads to significant net annual costs, which demonstrates that this option is extremely cost ineffective. Further details on the Indirect Costs, Direct Costs, and Recovery Credits included in this calculation are provided in the following sections.

Table 8. Summary of Cost Effectiveness Calculations for Coal Switching to CAPP Coal

Delta compared to Baseline	**2019 Bowen Baseline on IB Coal**	**CAPP Coal**
Annualized Capacity Penalty (Million $)	Baseline	N/A
Total Indirect Costs (Million $)	**Baseline**	**-**
Annual Fixed O&M Cost (Million $)	Baseline	N/A
Annual Variable O&M Cost (Million $)	Baseline	(16.8)
Annual Fuel Cost (Million $)	Baseline	86.8
Total Direct Costs (Million $)	**Baseline**	**70.0**
Annual Ash/Gypsum Sales (Million $)	Baseline	0.1
Total Recovery Credits (Million $)	**Baseline**	**0.1**
Total Annual Costs ($)	Baseline	69,911,996
Total Annual SO_2 Reduction (tons)	Baseline	5,199
Cost Effectiveness Relative to Baseline ($/ton)	**Baseline**	**13,447**

Indirect Costs

Indirect costs are calculated using the same financial methods to produce an annualized value as described in Section 4.4.1.1. for PRB coal.

Capacity Penalty Costs

Plant Bowen Units 1-4 provide capacity value by supporting system reliability and by avoiding costs associated with replacement capacity that would be required to meet customer peak demands and reserve margin requirements in the absence of such Plant Bowen units. Without these units, Georgia Power would have to procure short-term and long-term replacement capacity in order to restore Georgia Power and the Southern Company system to a comparable level of reliability that the system currently holds.

No capacity penalty cost would be incurred on CAPP coal since the units would be able to maintain their current maximum capacities.

Capital Costs

Capital costs are expected to remain the same on CAPP coal as compared to IB coal, conservatively assuming equal operation on CAPP coal. There are no investment capital costs associated with switching to CAPP coal since no additional equipment installations will be needed. The transition to CAPP coal is assumed to result in no change in annual maintenance capital costs compared to the 2019 actual maintenance capital costs on IB coal.

Direct Costs

Direct costs are calculated for switching to CAPP coal using the same methods described in Section 4.4.1.1. for PRB coal.

Fixed O&M Costs

Assuming the equal operational baseline, no change in annual fixed O&M costs is expected for a switch to CAPP coal because no change in labor costs would be needed.

Variable O&M Costs

The annual variable O&M costs for the operation of Units 1-4 on CAPP coal are conservatively assumed to be equal to the IB coal baseline, except for the anticipated decreases in environmental commodities costs, even though increases in coal throughputs on CAPP coal would likely cause additional increases in variable O&M at equal heat inputs. Therefore, the differences in variable O&M costs compared to the IB baseline are assumed to be equal to the differences in fuel additive, limestone, hydrated lime, ammonia, and activated carbon usages.

On CAPP coal, the differences in variable O&M costs are estimated based on a 42% reduction in limestone usage based on the difference in uncontrolled SO_2 emissions compared to IB coal, 37% decrease in hydrated lime usage, and no difference expected in ammonia usage. CAPP coal does not require any fuel additive; therefore, a 100% reduction in fuel additive costs is accounted for in the change in variable O&M. No additional activated carbon injection is needed for CAPP coal versus IB coal. Based on these environmental commodities adjustments, CAPP coal would have variable O&M costs of an annual net decrease of more than $16 million.

Fuel Costs

The increase in fuel costs for CAPP coal is significant compared to IB coal. On a heat input basis, estimated CAPP coal delivered fuel cost is $0.73/MMBtu more than current actual IB coal costs. Therefore, using the equal baseline annual heat input, differences in CAPP coal fuel costs compared to IB coal are increased by more than $86 million per year. It should be noted that this significant increase in fuel costs on CAPP coal would greatly impact the economic dispatch of Plant Bowen Units 1-4, such that the units would be reserved primarily for reliability purposes. These energy impacts are discussed further in Section 4.4.2.3.

Recovery Credits

Recovery credits are revenue created by a facility through the recovery of materials that can be sold as a benefit, such as scrubber byproduct (gypsum) to wallboard manufacturers.[48] Plant Bowen has contracts for the sales of ash and gypsum from Units 1-4. In 2019 on IB coal, Plant Bowen sold a total of $3.9 million in bottom and fly ash and $1.9 million in gypsum. Based on the heat content and ash

[48] EPA Control Cost Manual Chapter 2 pg. 13-14

percentages of CAPP coal compared to IB coal, CAPP coal is estimated to create 43% more fly ash and 63% more bottom ash; therefore, these adjustment factors were applied to the annual average revenues from ash sales for IB coal to result in an annual increase of more than $1.6 million.

For gypsum sales, the amount of gypsum produced was estimated to be proportional to the difference in sulfur content for CAPP coal. Therefore, compared to the actual IB coal baseline, CAPP coal would create 54% less gypsum. Note that Plant Bowen has contracts with the gypsum purchasers that require Plant Bowen to produce a threshold amount of gypsum per year. If Plant Bowen does not meet this quota, Georgia Power must pay the gypsum purchaser liquidated damages for the remaining amount. Estimated calculations based on the 2019 actual baseline gypsum tonnage shows that Plant Bowen would not meet these required gypsum quotas on CAPP coal. However, to be conservative, this additional cost has not been included in the cost effectiveness calculation.

In summary, on recovery credits, coal switching to CAPP coal would create an estimated gain of less than $90,000 annually.

Summary of Cost Effectiveness of Coal Switching to CAPP Coal

Using the methodologies and concepts presented in the EPA Control Cost Manual, Georgia Power has completed SO_2 emissions reduction and total annual cost calculations for associated indirect costs, direct costs, and recovery credits to compare coal switching to CAPP coal from the current IB coal fired in Plant Bowen Units 1-4. As summarized in Table 9, these calculations strongly demonstrate that CAPP coal is extremely cost ineffective that is not necessary to make reasonable progress. The results of the evaluation for both PRB and CAPP coals are provided below to illustrate that CAPP coal is an inferior option because it would achieve less SO_2 reduction for more cost than PRB coal.

Table 9. Summary of Statutory Factor 1, Cost of Compliance, for Coal Switching to CAPP Coal

Emission Reduction Measure	Control Effectiveness	Cost Effectiveness ($/ton)
Coal Switching to PRB Coal	81%	$6,424
Coal Switching to CAPP Coal	56%	$13,447

4.4.2.2 CAPP Coal: Statutory Factor #2 Time Necessary for Compliance

The second statutory factor to be considered for evaluating control technologies and emission reduction measures is the time necessary for compliance, or the estimated time needed for a source to comply with a potential control measure. The time needed for switching to CAPP coal would be dependent on coal contract timeframes for Plant Bowen, which due to the variability of the fuel market are set on approximately 2-year timeframes. Plant Bowen currently has IB coal purchase commitments contracted through 2023. Therefore, for this analysis, the time needed for switching to CAPP coal would be at least December 31, 2024 since coal shipments associated with coal purchase commitments may be received into the following year, which means Plant Bowen could continue to receive IB coal shipments from current contracts in 2024. The exact timing will necessarily depend on when the coal contract commitments can be executed for CAPP coal.

4.4.2.3 CAPP Coal: Statutory Factor #3 Energy and Non-Air Quality Environmental Impacts

The third statutory factor to be considered for evaluating control technologies and emission reduction measures is the energy and non-air environmental impacts. For CAPP coal, the significant increase in fuel costs would be anticipated to impact the economic dispatch of Units 1-4 to the point that they would potentially run only when needed for reliability of the power system, which would reduce the amount of energy produced by these units. For the cost analysis in Section 4.4.2.1, a baseline of operation was assumed for all coal types by using an equal annual heat input to allow for equal comparison of SO_2 emissions reductions from coal switching; however, these operational levels do not reflect resource planning modeling for each coal type. Therefore, the energy impact of CAPP coal is primarily addressed through the large increase in delivered coal cost incurred in order to maintain the equal annual heat input, consistent with EPA Regional Haze guidance.[49]

While coal switching to CAPP coal was already shown to be highly cost ineffective for SO_2 reduction for Plant Bowen Units 1-4, the energy impacts associated with CAPP coal also weigh against selection of CAPP coal as necessary for making reasonable progress.

4.4.2.4 CAPP Coal: Statutory Factor #4 Remaining Useful Life of Existing Source

The fourth statutory factor to be considered for evaluating control technologies and emission reduction measures is the remaining useful life of an existing source. As discussed in Section 4.4.1.4, Plant Bowen Units 1-4 do not currently have dates for retirement approved by the GPSC, but investment restrictions are placed on Units 1 and 2 through July 31, 2022 by the GPSC 2019 IRP final order. For this analysis, the remaining useful life is considered to be 30 years which is consistent with the unit retirement planning timeframes used during Georgia Power's IRP evaluations. Georgia Power's capacity needs, including the remaining useful life of each Plant Bowen unit, will be further evaluated during the 2022 IRP process. Although this factor was not considered in the cost-effectiveness evaluation provided above, this factor likewise weighs against selection of CAPP coal as necessary for making reasonable progress.

4.5 Step 5: Reasonable Progress Recommendation for Plant Bowen

The Regional Haze Rule requires that second implementation period SIPs "include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress as determined pursuant to [51.308](f)(2)(i) through (iv)."[50] Therefore, this section of the Regional Haze evaluation for Plant Bowen summarizes the results of the four-factor analysis for identified technically feasible SO_2 emission reduction measures and also proposes a reasonable progress recommendation to reflect the fact that Plant Bowen is already complying with all measures, including emissions levels in compliance with the MATS SO_2 alternative emissions limit, that may be considered necessary for making reasonable progress in addressing visibility at surrounding federal Class I areas.

As requested by Georgia EPD in the July 10, 2020 Regional Haze letter to Georgia Power, this report includes a detailed four-factor analysis for all significant sources of SO_2 emissions at Plant Bowen. Sections 4.1-4.3 of this report identify, evaluate technical feasibility, and rank applicable emission reduction measures for Plant Bowen Units 1-4. Then, using a top-down approach, these emission reduction measures were evaluated in Section 4.4 against the four statutory factors of cost of compliance, time necessary for compliance, energy, and non-air quality environmental impacts, and remaining useful life of the source. While all identified options were considered technically feasible,

[49] 2019 Final Regional Haze Guidance, at 37.
[50] 40 CFR 51.308(f)(2).

Table 10 summarizes that the cost evaluations found that the only two emission reduction measures that provided any additional emission reductions, namely coal switching to PRB coal and coal switching to CAPP coal, were both highly unreasonable due to the high cost per ton SO_2 reduced for both coal types. The other technically feasible option of replacing the current scrubbers with dry FGD scrubbers would not provide any additional SO_2 reduction benefit from the baseline because Plant Bowen Units 1-4 are fully controlled with wet FGD scrubbers operated year-round.

Table 10. Summary of Cost Effectiveness Analysis Results

Emission Reduction Measure	Control Effectiveness	Cost Effectiveness ($/ton)
Coal Switching to PRB Coal	81%	$6,424
Coal Switching to CAPP Coal	56%	$13,447
Dry FGD Scrubbers	0%	N/A

In conclusion, the additional SO_2 emission reduction measures identified were determined to result in unreasonable costs of compliance. Also, as described in Sections 4.4.1.3 and 4.4.2.3, coal switching to PRB coal or CAPP coal would have significant energy impacts on the operations of Units 1-4 that could even affect the remaining useful life of the units. Sections 4.4.1.4 and 4.4.2.4 concluded that, while Georgia Power does not have current plans to retire Plant Bowen Units 1-4, the 2019 IRP final order places significant cost restrictions on Units 1-2 through July 2022, and the remaining useful life of Units 1-4 will be further evaluated during the 2022 IRP process. Therefore, none of the identified control technologies or emission reduction measures are necessary or appropriate for Plant Bowen for the purpose of setting or achieving the 2028 RPGs.

Considering this conclusion and that Plant Bowen Units 1-4 are fully controlled with wet FGD scrubber systems that are operated and maintained to optimize performance for not only SO_2 emissions removal but also for other environmental compliance requirements, such as MATS mercury emissions limits and ELG selenium wastewater treatment, Georgia Power recommends that the MATS alternative SO_2 limit of 0.20 lb/MMBtu for Plant Bowen Units 1-4 be included in the Georgia Regional Haze SIP for the second implementation period.

This conclusion is supported by EPA Regional Haze guidance, which states that, "if a state determines that an in-place emission control at a source is a measure that is necessary to make reasonably progress and there is not already an enforceable emission limit corresponding to that control in the SIP, the state is required to adopt emission limits based on those controls as part of its [long-term strategy (LTS)]" for the second implementation period Regional Haze SIP submission.[51]

The Plant Bowen Title V permit currently allows for Units 1-4 to comply with either the MATS HCl limit or the alternative SO_2 limit. To adopt the MATS alternative SO_2 limit into Georgia's Regional Haze SIP, Georgia Power recommends that Georgia EPD issue a permit under its SIP-approved permitting program to impose the MATS SO2 limit and then modify the Plant Bowen Title V permit to remove the HCl limit

[51] 2019 Final Regional Haze Guidance, at 43.

option. These actions will create a federally enforceable SO_2 limit for Plant Bowen Units 1-4 beyond the allowance trading program requirements of CSAPR and the Acid Rain Program.[52] Georgia Power anticipates that the SIP permit for Plant Bowen Units 1-4 will be included in the Georgia Regional Haze SIP submission. Georgia Power recommends that the permit issued to implement the MATS SO_2 limit make clear that compliance with the limit will be required immediately upon approval of Georgia's Regional Haze SIP by EPA.

Incorporation of the MATS SO_2 limit into the 2021 Georgia Regional Haze SIP would demonstrate that Units 1-4 are already fully controlled for SO_2 with optimized wet FGD scrubber systems and that through compliance with an already applicable federal air quality rule, Plant Bowen is meeting, if not exceeding, any measures that are necessary to make reasonable progress toward improved visibility conditions at surrounding federal Class I areas.

[52] 2019 Final Regional Haze Guidance, at 44. ("[I]f a permit issued under a SIP-approved minor [NSR] program, … the state may want to consult with the EPA Regional office to ensure that limit is appropriately included into the SIP. This can often be accomplished by what is commonly referred to as a source-specific SIP revision.").

Technical Appendix A (Public)

Technical Appendix A includes public information of documentation to support the calculations, organized by Table & Footnote number. Documents labeled A5 support information in the analysis report.

List of Technical Appendix A documents

A1.2 Georgia Power 2019 Rate Case Order Documentation for Firm-Specific Interest Rate

A2.1-1 2019 EIA 923 Schedule 2-5 Page 5 Fuel Receipts and Costs

A2.1-2a EIA 923 Coal Transportation Costs Table 3c Real Basin to State Rail

A2.1-2b EIA 923 Coal Transportation Costs Table 4c Real State to State Rail

A2.1-4 2019 Plant Bowen SO_2 CEMS Data

A2.2-1 2019 IRP Reference Table – Bowen Unit Capacities

A2.3-1 2019 EPA AMPD Query – Plant Bowen Heat Input and SO_2 tons

A2.3-2 2019 EIA 923 Schedule 2-5 Page 4 Generator Data

A3.3-2 2019 EIA 923 Schedule 8C for Limestone Costs

A3.3-7 Nordin & Merriam 1997 US DOE PRB Coal Utility NOX Report

A4.1-1 2019 EIA 923 Schedule 8B Financial Information for Ash Gypsum Sales

A4.2-3 2019 EIA 923 Schedule 2-5 Page 1 Generation & Fuel Data

A5.1 Plant Bowen Historical SO_2 Emissions from Figure 1

A5.2 Malvadkar, Smith, and McGurl 2004 Journal of the AWMA Volume 54 Issue 6 Pages 741-749

A1.2 Firm-Specific Interest Rate Calculation

	Capital Structure[1]	Cost[2,3]	Weighted Average Cost of Capital (WACC)[4]	After Tax Rate[5] (used for discounting)
Debt	44.0%	4.1%	1.82%	1.36%
Equity	56.0%	10.5%	5.88%	5.88%
Total	100.0%		7.70%	7.24%

Real Interest Rate = Total After Tax Rate (7.24%) - Rate of Inflation for 2019 (1.2%) = 6.04%

1. Capital Structure set as defined in GPC 2019 Rate Case Order section 7
2. Cost of equity set as defined in GPC 2019 Rate Case Order section 6
3. Cost of debt from document #177523 in GPC 2019 Rate Case docket #42516 DPP-SPA-MBR-3, Schedule 2, Workpaper 1
4. WACC = Capital Structure * Cost
5. After tax rate for debt, based on tax rate of 25.296%, from document #177523 in GPC 2019 Rate Case docket #42516 DPP-SPA-MBR-3, Schedule 2, Workpaper 1

GEORGIA POWER COMPANY

WEIGHTED AVERAGE COST OF CAPITAL
AVERAGE FOR THE THIRTEEN MONTHS ENDING JULY 31, 2020
(AMOUNTS IN THOUSANDS)

Line No.	Component	Average Adjusted Balance 7/31/2020	Component Ratio	Average Cost	Weighted Average Cost of Capital	After-Tax Rate	Revenue Requirement (Pre-Tax) Rate
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Long-Term Debt	$ 11,752,692	43.92%	4.14%	1.82%	1.36%	1.82%
2	Common Equity	15,009,316	56.08%	10.90%	6.11%	6.11%	8.18%
3	Total	$ 26,762,008			7.93%	7.47%	10.00%

Note: Details may not add to totals due to rounding.

FRED Graph Observations
Federal Reserve Economic Data
Link: https://fred.stlouisfed.org
Help: https://fredhelp.stlouisfed.org
Economic Research Division
Federal Reserve Bank of St. Louis

A191RI1A225NBEA Gross Domestic Product: Implicit Price Deflator, Percent Change from Preceding Period, Annual, Not Seasonally Adjusted

Frequency: Annual

observation_date	A191RI1A225NBEA
2000-01-01	2.3
2001-01-01	2.3
2002-01-01	1.6
2003-01-01	2.0
2004-01-01	2.7
2005-01-01	3.1
2006-01-01	3.1
2007-01-01	2.7
2008-01-01	1.9
2009-01-01	0.6
2010-01-01	1.2
2011-01-01	2.1
2012-01-01	1.9
2013-01-01	1.8
2014-01-01	1.9
2015-01-01	1.0
2016-01-01	1.0
2017-01-01	1.9
2018-01-01	2.4
2019-01-01	1.8
2020-01-01	1.2

Georgia Public Service Commission

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Docket No. 42516

In Re: Georgia Power Company's 2019 Rate Case

SHORT ORDER ADOPTING SETTLEMENT AGREEMENT AS MODIFIED

Record Submitted: November 27, 2019 Decided: December 17, 2019

APPEARANCES

On behalf of Georgia Public Service Commission Public Interest Advocacy Staff:

JEFFREY STAIR, Esq., DANIEL WALSH, Esq., and PRESTON THOMAS, Esq.

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NEWTON M. GALLOWAY, Esq., and TERRI M. LYNDALL, Esq.

On behalf of Georgia Restaurant Association:

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On behalf of Georgia Watch:

LIZ COYLE

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ROBERT B. BAKER, JR., Esq.

On behalf of Resource Supply Management:

JIM CLARKSON

On behalf of Sierra Club:

ROBERT JACKSON, Esq., and ZACHERY M. FABISH, Esq.

On behalf of U.S. Department of Defense and other affected Federal Executive Agencies:

EMILY W. MEDLYN, Esq.

BY THE COMMISSION:

I. GEORGIA POWER COMPANY'S 2019 RATE CASE STATEMENT OF PROCEEDINGS

Pursuant to the Rate Plan approved by the Georgia Public Service Commission ("Commission") in the December 17, 2013 Order Adopting Settlement Agreement in Docket No. 36989-U, Georgia Power Company's 2013 Rate Case, the Commission ordered Georgia Power Company ("GPC" or "Company") to file by July 1, 2016, a general rate case for dealing with any changes in revenue requirements. Subsequent to that decision, the Commission established in its April 14, 2016 decision on the Joint Request of Atlanta Gas Light Company, AGL Resources Inc., and The Southern Company for a Finding that Southern Company's Merger with AGL Resources Complies With Applicable Law And SouthStar Energy Services LLC d/b/a Georgia Natural Gas; Application for a Natural Gas Marketer Certificate of Authority filed respectively in Dockets 39971 and 9574 that the current 2013 Georgia Power accounting order would continue in effect until December 31, 2019 and Georgia Power would file its next retail rate case, or request for an accounting order, on July 1, 2019.

On May 21, 2019, in accordance O.C.G.A. § 50-13-13, the Commission entered a Procedural and Scheduling Order ("PSO") to govern the hearings. On June 28, 2019, pursuant to the PSO, Georgia Power Company filed its 2019 Rate Case. On September 24, 2019, Georgia Power filed an errata to reflect the revenue requirement impacts from various items included in the amended Stipulation approved by the Commission in the Company's 2019 Integrated Resource Plan ("IRP") and DSM Certification proceedings in Docket Nos. 42310 and 42311 ("Errata").

Georgia Power's 2019 Rate Case filing, as amended by the Errata, requested approval to continue the three-year alternate rate plan ("ARP") structure and requested rate increases of $560 million, $144 million and $233 million to be effective January 1, 2020, 2021 and 2022, respectively. These proposed increases included a one-time levelized adjustment for traditional base rates and ECCR tariffs and annual increases to recover compliance costs associated with ash pond closure as well as the demand side management and municipal franchise fee tariffs. Hearings on Georgia Power's direct case in support of its filing were held September 30, 2019 through October 2, 2019.

In addition to the Commission's Public Interest Advocacy Staff ("PIA Staff"), which has a statutory right to participate in this proceeding, interventions were filed by a number of interested parties. These interested parties included the City of Atlanta; the Commercial Group; Concerned Ratepayers of Georgia; the U.S. Department of Defense (on behalf of all Other Federal Executive Agencies) ("DOD/FEA"); Georgia Association of Manufacturers ("GAM"); Georgia Industrial Group ("GIG"); Georgia Interfaith Power & Light, Inc . ("GIPL"), Southface Energy Institute, Inc. ("Southface"), and Vote Solar, Inc.; the Georgia Solar Energy Association, Inc. ("GSEA") and Georgia Solar Energy Industries Association ("GSEIA"); Georgia Restaurant Association ("GRA"); Georgia Watch; The Kroger Company ("Kroger"); Metropolitan Atlanta Rapid Transit

Authority ("MARTA"); Resource Supply Management ("RSM"); and the Sierra Club. Thereafter, on October 17, 2019, PIA Staff and Intervenors filed testimony and exhibits presenting their respective direct cases. With the exception of Concerned Ratepayers of Georgia, GSEIA/GSEA, and Georgia Watch, all other parties to this case filed testimony in this proceeding. Hearings on PIA Staff and Intervenors' direct cases were held November 4-6, 2019.

The Company filed its rebuttal testimony on November 15, 2019 in response to the positions advocated by PIA Staff and various intervenors. The Company presented its rebuttal case on November 25, 2019, at which time the hearings in this matter were concluded. On December 4, 2019, parties in this matter filed proposed orders and briefs.

At each phase of the hearings of evidence in this case the Commission also heard from numerous public witnesses who expressed their views on the Company's application, either individually or on behalf of specific groups.

II. COMMISSION ACTION

Following its rebuttal testimony, the Company filed a proposed Settlement Agreement designed to resolve the issues in the case except for the return on equity ("ROE") and the capital structure. The Settlement Agreement was executed on behalf of the Company and several intervenors. The following parties executed the Settlement Agreement: the Commercial Group, GIG, GMA, the City of Atlanta, MARTA, and the Kroger Co. At the Administrative Session on December 17, 2019, a Commissioner Motion was passed that set the ROE at 10.50% and set the capital structure at 56% equity and 44% debt and adopted the Settlement Agreement with two modifications, discussed in more detail below.

The Settlement Agreement was designed to set rates to go into effect January 1, 2020 using a three-year Alternate Rate Plan ("ARP") with an earnings band of 9.50% to 12.00%. Rates under the accounting order would be set as described in the Settlement Agreement with a 10.50% ROE The Settlement Agreement further provided for the continuation of the Environmental Compliance Cost Recovery ("ECCR") Tariff which will collect certain environmental costs which will be incurred by the Company including compliance with Coal Combustion Residual Asset Retirement Obligations ("CCR ARO"). The Settlement Agreement further provides for an increase in the municipal franchise fee tariff as well as an increase in the DSM tariffs.

The Settlement Agreement also provides that the traditional base tariffs shall be adjusted in 2021 and 2022 to recover the revenue requirements for traditional base rates, the ECCR tariff, the DSM tariffs, and the municipal franchise fee tariff. The Settlement Agreement also provides for continuation of the Interim Cost Recovery ("ICR") mechanism approved in the 2010 Rate Case in Docket No. 31958 throughout the term of this ARP utilizing the earnings band in Paragraph 6 of the Settlement Agreement. For Annual Surveillance Reporting ("ASR") purposes, beginning January 1, 2020, the earnings band shall be set at 9.5% to 12.0% ROE and the Company shall report earnings based on the actual historic cost of debt and approved capital structure. The

Company shall not file a general rate case unless its calendar year retail earnings are projected to be less than 9.5% ROE.

At its regular Administrative Session held on December 17, 2019, the Commission voted to adopt the Settlement Agreement with the modifications set forth in the Commissioner's Motion ("Motion").

III. FINDINGS OF FACT

1.

The Commission finds that the resolution of the matters raised in this docket, as provided in the Settlement Agreement as modified by the Commission, is appropriate and will result in just and reasonable rates.

2.

The Settlement Agreement provides that, effective January 1, 2020, the Company shall (1) not increase its traditional base rate tariff in 2020, any increases in base rates shall not be levelized but adjusted year by year, (2) collect an additional $12 million through the DSM tariffs, and (3) collect an additional $12 million effective January 1, 2020, $5 million effective January 1, 2021, and $9 million effective January 1, 2022 through the Municipal Franchise Fee ("MFF") tariff.

3.

The Settlement Agreement provides that the Basic Service Charge ("BSC") for all tariffs in the Domestic Group shall increase by $2 in 2021 and another $2 in 2022. Further, effective January 1, 2021, the basic service charge for all tariffs in the Medium Business, Large Business and Marginally priced tariff groups shall be increased to 100% of the levels shown in the Company's Exhibit LTL-1 column labeled "Period 1 Cost of Service Study Customer Related Costs" rounded to the nearest dollar. The remainder of tariff groups, with the exception of the Domestic Group addressed in Paragraph 18, shall have their basic service charges adjusted as proposed by the Company in Exhibit LTL-1 column labeled "2021 Estimated Alternative Rate Plan Basic Service Charge" starting in 2021. The kWh and/or demand charges in each rate shall be correspondingly adjusted to collect the revenue requirement.

4.

For Annual Surveillance Reporting ("ASR") purposes, beginning January 1, 2020, the earnings band shall be set at 9.5% to 12.0% ROE and the Company shall report earnings based on the actual historic cost of debt and approved capital structure. The Company shall not file a general rate case unless its calendar year retail earnings are projected to be less than 9.5% ROE.

Subsequent to finalization of PIA Staff's review of the respective ASR, any retail earnings above 12.0% ROE shall be shared, with forty percent (40%) being applied to regulatory assets in the following priority: Accumulated CCR ARO, Retired Generating Plant, Obsolete Inventory, Environmental Remediation, and Storm Damage, forty percent (40%) being directly refunded to customers, allocated on a percentage basis to all customer groups including the base revenue contribution of Real Time Pricing ("RTP") incremental usage, and the remaining twenty percent (20%) retained by the Company. The Commission finds that it is fair and reasonable that in the event the Company is earning above the top end of the earnings band, the portion of the excess earnings not flowing to the Company's shareholders be devoted to customer rate reductions.

The Company shall make its ASR filings for this ARP by March 15th of the following year. The Commission will consider the ASR filing and determine any direct refunds and reduction of regulatory assets by July 31st of that year.

5.

For purposes of the 2021 and 2022 rate adjustments, the Company shall make compliance filings of the updated tariffs at least ninety (90) days prior to the effective date of the tariffs. The Company's compliance filings will include the following updates including updated estimates to incorporate the capital structure and rate setting return on equity approved by the Commission on December 17, 2019:

a) Effective January 1, 2021, (i) the traditional base tariffs shall be adjusted to collect an additional estimated $93 million. This estimate shall be adjusted in the Company's compliance filing to incorporate the capital structure and rate setting return on equity approved by the Commission; (ii) the ECCR tariff shall be increased based upon the Compliance filing with updated CCR ARO costs as filed in the most recent semi-annual report for calendar year 2020; (iii) the DSM tariff shall be increased to reflect the additional approved DSM costs for calendar year 2021 as approved in Docket No. 42311 and as adjusted based on the DSM True up process agreed to by the Company and PIA Staff; and (iv) the MFF tariff shall be adjusted to collect the municipal franchise fee cost incurred by the Company. The 2021 increase to traditional base rate tariffs, ECCR tariff, DSM tariff will use the most current kWh sales forecast for the applicable year to set the rates.

b) Effective January 1, 2022, (i) the traditional base tariffs shall be adjusted to collect an additional estimated $197 million. This estimate shall be adjusted in the Company's compliance filing to incorporate the capital structure and rate setting return on equity approved by the Commission; (ii) the ECCR tariff shall be increased based upon the Compliance filing with updated CCR ARO costs as filed in the most recent semi-annual report for calendar year 2021; (iii) the DSM tariff shall be increased to reflect the additional approved DSM costs for calendar year 2022 as approved in Docket No. 42311 and as adjusted based on the DSM True up process agreed to by the Company and PIA Staff; and (iv) the MFF tariff shall be adjusted to collect the municipal franchise fee cost incurred by the Company. The 2022 increase to traditional base rate

tariffs, ECCR tariff, DSM tariff will use the most current kWh sales forecast for the applicable year to set the rates.

6.

As set forth in the Motion, the Commission finds that rates shall be set using a 10.50% ROE, which appropriately balances the interests of the Company and its customers, and which the Commission finds to be just and reasonable. The difference between the respective ROE recommendations of Georgia Power and PIA Staff represented the largest dollar amount of any single issue in the case. Georgia Power recommended a ROE of 10.9% and PIA Staff recommended a ROE of 9.2%.

PIA Staff recommended a 9.2% ROE with a range of 9 - 9.4%. DOD/FEA recommended a ROE of 9.1%. The witness for DOD/FEA also stated that the financial risk adjustment is not needed because the difference between Georgia Power's book-value and capital structure and the proxy group's market-value capital structure is already captured in the various market-based ROE methodologies.

The Commission finds that the ROE Range Negotiated in the Settlement Agreement will allow the Company continued access to the capital markets at competitive rates and will allow the Company to construct infrastructure necessary to serve customers and comply with environmental regulations. Accordingly, the Commission also finds that the appropriate ROE for setting rates is 10.50%.

7.

The Settlement Agreement left it to the Commission to determine the appropriate capital structure and the Commission finds that the appropriate capital structure is 56% equity and 44% long term debt. Georgia Power proposed that a capital structure containing approximately 44% debt and 56% common equity be used for ratemaking purposes in this proceeding. The Company maintained that the proposed ROE and 56% equity ratio will ensure that Georgia Power has access to capital whenever necessary, provides the opportunity to earn a fair return for its investors and does so at rates favorable to customers. The Company highlighted that its allowed equity was reviewed in 2018 following the passage of the Tax Cuts & Jobs Act which lowered the federal income tax rate from 35% to 21%. As pointed out by the Company, in April 2018, this Commission adjusted the Company's equity ratio upward from the 51%, which was previously approved in the 2013 Rate Case, to 55% as a part of the Tax Cuts & Jobs Act settlement between the Company and Commission PIA Staff in Docket No. 36989 ("Tax Reform Settlement"). The equity adjustment approved in the Tax Reform Settlement was implemented to address the negative implications of tax reform, provide support for maintaining the Company's credit profile, and allow the Company timely access to capital markets and the ability to borrow at reasonable interest rates.

Based on the evidence presented, the Commission finds and concludes that the Settlement Agreement's proposed capital structure of 56% common equity level is just and reasonable considering all the evidence presented and is necessary to avoid a credit rating downgrade.

8.

The Interim Cost Recovery ("ICR") mechanism approved in the 2010 Rate Case in Docket No. 31958 is continued throughout the term of this ARP utilizing the earnings band as discussed above. Under the ICR mechanism, if at any time during the term of the rate plan, the Company projects that its retail earnings will be lower than 9.50% retail ROE for any calendar year, based on the most recent budget, including the latest projections regarding rate base, revenues, expenses, changes in projected debt and preferred security costs, it may petition the Commission for the implementation of an ICR ("Interim Cost Recovery") tariff which will be used to adjust the Company's earnings back to 9.50% ROE. Any ICR tariff approved by the Commission shall expire at the earlier of the date upon which the next general rate case takes effect or the end of the calendar year in which the ICR tariff becomes effective. Continuation of the ICR mechanism also maintains certain procedural guidelines regarding the filing of any request for implementation of an ICR tariff, and further maintains that in lieu of requesting implementation of an ICR tariff, or if the Commission chooses not to implement the ICR, the Company may file a full rate case. Georgia Power must file its request to implement the ICR tariff no less than 90 days prior to its proposed effective date.

The Commission finds that the portion of the Settlement Agreement allowing for continuation of the ICR mechanism during the term of the rate plan is just and reasonable and provides ratepayers with rate stability.

The Commission also finds that continuation of the ICR mechanism does not expose ratepayers to increased risks as compared to either a traditional rate case setting, or the format of the alternative rate plans that Georgia Power has operated under in recent years. Any adjustment filed by the Company under the ICR tariff would not take effect unless and until it is approved by the Commission. If the Commission does not act by the proposed effective date of the ICR tariff, the Company's filing would be deemed denied. Furthermore, the Company would have the burden of proof to demonstrate that its proposed adjustment was appropriate. The Commission would maintain the discretion to reject any filing by the Company pursuant to this tariff. In such an instance, Georgia Power would have the ability to file a traditional rate case, provided that it was dissatisfied with the Commission's ruling and maintained that its earnings were projected to be below the bottom of the earnings band set in this proceeding.

9.

The Settlement provides that, with the exception of easements and right of ways, Generation and Transmission property in Plant held for Future Use ("PHFFU") that has been held in PHFFU account for 15 consecutive years shall undergo review during the first IRP proceeding following the 15th year that such property has been held in PHFFU. Distribution property in PHFFU that has been held in PHFFU account for 15 consecutive years shall undergo review during

the first base rate proceeding following the 15th year that such property has been held in PHFFU. In the respective proceeding, the Company will be required to present the specific plan for the property(s) that has exceeded 15 consecutive years in PHFFU. The Commission will decide the matter in that proceeding.

10.

Regarding over earnings that the Company has reported above the earnings band in 2018 to the Commission through the ASR process in Docket No. 36989, the Settlement Agreement provides that fifty percent (50%) of the customer share (approximately $51 million) of earnings above the band in 2018 shall be utilized to reduce the December 31, 2019, storm damage regulatory asset. Regulatory assets are to be written down in the following priority: Obsolete Inventory, Environmental Remediation, Accumulated CCR ARO, Retired Generating Plant, and Storm Damage. The remaining fifty percent (50%) of the customer share shall be refunded to customers in 2020 with a special line-item on the bill.

In the Settlement Agreement, the Company anticipates earnings in excess of the earnings band in 2019. The Company shall forego its share of the 2019 earnings over the top of the earnings band. Fifty percent (50%) of all the earnings over the 2019 band shall be refunded to customers with a special line item on the bill, and fifty percent (50%) shall be used for the early retirement of regulatory assets including $49 million spent to investigate the Stewart County site and other regulatory assets in the following priority: Accumulated CCR ARO, Retired Generating Plant, Obsolete Inventory, Environmental Remediation, and Storm Damage.

The Settlement Agreement also provides that the Company shall accelerate amortization of an estimated $88 million in regulatory assets in 2020 in the following priority: Accumulated CCR ARO, Retired Generating Plant, Storm Damage, Obsolete Inventory, and Environmental Remediation. The actual amount accelerated may be different than estimated in this paragraph depending upon the capital structure and rate setting return on equity approved by the Commission. The estimated $88 million shall be adjusted to reflect the updated projected revenue sufficiency by incorporating the capital structure and rate setting return on equity approved by the Commission and will be reflected in the Company's compliance filing.

11.

Additionally, the Settlement Agreement provides that the Company and Staff shall collaborate in 2020 to increase marketing of the TOU-RD rate. Beginning January 1, 2021, the Company shall utilize the TOU-RD rate as the default rate for newly constructed residential premises. The Company will report back to the Commission at the time of its next base rate case regarding the adoption of TOU-RD and its use as the default rate for newly constructed residential premises.

12.

The Settlement Agreement also requires the Company to further investigate the need for, and costs associated with, providing hourly usage information to all of its metered customers. The Company is required to file this information within six months of the final order in this docket, after which the Commission will provide further guidance on whether such a program should be implemented.

13.

The Settlement Agreement provides that within ninety (90) days of the Final Order in this docket, the Company, Georgia Watch, and Commission Staff shall collaborate on a process to consider potential options for the expansion of income qualified discount opportunities to assist customers. This process will allow for parties to provide input on the options to be considered. Stipulating Parties further agree that within 270 days of the Final Order in this docket, the Company after having taken input from other parties will report back to the Commission on their findings and may recommend additional action. Any potential program options must consider cost impacts to non-participating customers as well as the impacts of any revenue erosion.

The Settlement Agreement provides that the Company agrees to further promote Project Share to customers and increase the Company's matching to 150% of customer contributions up to $1.5 million annually.

14.

In accordance with the Settlement Agreement, the TOU-MB rate shall be made available to all food services and drinking places identified as 722 of the North American Classification System (NAICS). A franchise with multiple accounts shall no longer be an applicability requirement. Any existing customers on TOU-MB not qualifying as 722 will be considered grandfathered on TOU-MB an allowed to remain on the rate. During the term of the ARP qualifying food services and drinking places will be accepted on TOU-MB on a first come, first allowed basis until the number of accounts on the rate equals 6,000. The rate will be reviewed in the next base rate case. Any revenue erosion from the TOU-MB rate conversion during the term of the ARP will be captured in a regulatory asset account and recovered through rates in 2021 and 2022. All revenue loss resulting from the implementation of this provision shall be recovered by the Company from the TOU- MB rate.

15.

The Settlement Agreement provided for the issues raised in this proceeding regarding the method for bi directional metering utilized by Georgia Power under the Georgia Cogeneration and Distributed Generation Act of 2001 ("Cogen Act") O.C.G.A. § 46-3-51, to be considered as part of the PIA Staff review of the Company's methodology and computation of avoided cost in Docket No. 4822 that was provided for in the Commission's Final Order issued in Docket Nos. 42310 and 42311. This provision of the Settlement Agreement was modified by the Commission

to provide that the "Behind the Meter" netting period length shall be changed from instant to monthly for the first 5000 rooftop solar ratepayer or until the installed capacity reaches 32 Mw, whichever comes first. Following that, any new rooftop solar ratepayers would be subject to the current scheme of instant net metering.

16.

The Settlement Agreement provides that the Electric Transportation ("ET") tariff shall be allocated 70% of the base rate increase in 2021 and 2022. The revenue deficiency for this adjustment shall be accounted for within the Governmental/Institutional tariff group.

17.

The Settlement provides that the tariff language changes proposed by the Company to the Real Time Pricing Tariff ("RTP tariff") in the Company's filing shall be modified as follows: The definition for "Existing Load" shall be defined as load previously served by Georgia Power and shall include load moved from one location to another provided that the operation at the new location is substantially identical to the operation at the former location. The definition of "New Load" shall mean load not defined as "Existing Load." "New Load" shall also include load at a location that has been vacant less than twenty-four months provided that the operation is not substantially identical to the previous operation at that location. Finally, CBL reductions shall be allowed to reflect the impact of equipment removal/replacement and energy efficiency improvements implemented during the initial Term of Contract that result in measurable reduction in electric power demand and/or energy usage, provided that the Company's financial requirements are met. This language shall be incorporated into the appropriate places within the RTP tariff.

18.

The Settlement Agreement provides that funds for electric vehicle infrastructure will be allowed as proposed by the Company with an additional $6 million per year to be invested in support of wire and transformer upgrades for customer sited charging stations.

19.

The Settlement Agreement provides that the Environmental Compliance Cost Recovery tariff ("ECCR") shall include the cost for compliance with Coal Combustion Residual Asset Retirement Obligations ("CCR ARO"). The collection of CCR AROs through ECCR will be in addition to compliance costs already included in the ECCR tariff. For purposes of settlement, the forecasted contingency for CCR AROs and traditional ECCR has been removed from the annual expenditure projections. For rate setting purposes the full weighted average cost of capital will be applied to the under recovered balance of CCR AROs. Effective January 1, 2020, it is estimated that the ECCR tariff will be adjusted to collect an additional $324 million, an estimated $115 million effective January 1, 2021, and $180 million effective January 1, 2022. These estimates

will be adjusted in setting actual 2020 ECCR tariff rate and in the Company's compliance filings to incorporate the capital structure and rate setting return on equity approved by the Commission. The projection of CCR ARO cost will be updated in 2020 and 2021 through compliance filings to set the actual ECCR tariff rates for 2021 and 2022.

20.

The Company will maintain the Residential Service tariff as a rate option available to all residential customers for the term of the ARP.

21.

The Commission modified the Settlement Agreement to provide that the fee for Analog Meter Ratepayers shall be dropped by $1.00 per month. The Commission will reevaluate the fee and this change in the next rate case.

22.

The date on which the rates pursuant to the Settlement Agreement shall become effective is January 1, 2020.

23.

The Commission finds that a three-year term for the Settlement Agreement ending December 31, 2022 is reasonable. By July 1, 2022, the Company shall file testimony and exhibits required in a general rate case along with supporting schedules required by the Commission to support a "traditional" rate case. The test period utilized by the Company in its rate case filing shall be from August 1, 2022 to July 31, 2023. The Company may propose to continue, modify or discontinue this Alternate Rate Plan. The Company shall also file projected revenue requirements for calendar years 2023, 2024, and 2025.

CONCLUSIONS OF LAW

1.

The Georgia Public Service Commission has general ratemaking jurisdiction over Georgia Power Company under O.C.G.A. Ch. 2, T. 46. The Georgia Public Service Commission has general supervision over electric light and power companies. O.C.G.A. §§ 46-2-20(a) and 46-2-21. The Commission has "exclusive power to determine what are just and reasonable rates and charges to be made by any person, firm, or corporation subject to its jurisdiction." O.C.G.A. § 26-2-23; see also O.C.G.A. §§ 46-1-1(5), 46-2-24, 46-2-25, 46-2-26.1, and 46-2-26.2.

2.

The Settlement Agreement complies with the test year statute for electric utilities which provides in relevant part:

> In any proceeding to determine the rates to be charged by an electric utility, the electric utility shall file jurisdictionally allocated cost of service data on the basis of a test period, and the commission shall utilize a test period, consisting of actual data for the most recent 12 month period for which data are available, fully adjusted separately to reflect estimated operations during the 12 months following the utility's proposed effective date of the rates. After the initial filing and until new rates go into effect, the utility shall file actual cost of service data as they become available for each month following the actual data which were filed. The utility shall have the burden of explaining and supporting the reasonableness of all estimates and adjustments contained in its cost of service data.

(O.C.G.A. § 46-2-26.1(b))

Georgia Power filed the requisite data on the basis of a test period, and the Settlement Agreement uses the test period as a starting point and then makes necessary and appropriate adjustments to reflect operations during the 12 months following the utility's proposed effective date of the rate. The test period data serves as the benchmark from which adjustments are made for each year of the Alternative Rate Plan. This methodology is consistent both with the statute and with Commission precedent in rate case proceedings dating back to 1998.

3.

The rates resulting from the Settlement Agreement are fair, just and reasonable. By adopting the Settlement Agreement as modified, the Commission retains its jurisdiction to ensure that the Company's rates are fair, just and reasonable.

4.

The remaining terms and conditions of the Settlement Agreement as modified are reasonable and appropriate. By adopting the Settlement Agreement as modified, the Commission adopts a reasonable resolution of the remaining issues in this docket.

5.

The Commission retains its jurisdiction to ensure that the Company abides by and implements the rates, terms and conditions set forth in the Settlement Agreement, as modified, adopted herein, and to issue such further order or orders as this Commission may deem proper.

III. ORDERING PARAGRAPHS

WHEREFORE, IT IS ORDERED, that the Settlement Agreement shall be and the same hereby is adopted as modified here in, that its terms and conditions are fully incorporated herein, and that Georgia Power Company shall comply with said terms and conditions.

ORDERED FURTHER, that the terms and conditions set forth in the Settlement Agreement as modified are just and reasonable and shall take effect for service rendered from and after January 1, 2020.

ORDERED FURTHER, that the tariffs implemented by Georgia Power to implement the aforesaid annual rate increase in the years 2020, the adjustments contemplated in 2021 and 2022, as well as the terms and conditions of the Settlement Agreement as modified shall be subject to review by the Commission to ensure that such tariffs, as implemented, are proper and just.

ORDERED FURTHER, that for purposes of the rate increase in the year 2020, Georgia Power shall file compliance tariffs within 30 days of the issuance of this Order, reflecting rates to implement the rate increases ordered herein. These tariffs shall reflect the rate allocations adopted in this Order, and shall be subject to the Commission's review for final approval.

ORDERED FURTHER, that for purposes of the rate adjustments specified in the Settlement Agreement, the Company shall make compliance filings of the updated tariffs at least 90 days prior to the effective date of the tariffs. Compliance filings shall be served upon all parties of record to this proceeding. Upon receipt of such compliance filing, parties may offer input relative to the filing to the Commission.

ORDERED FURTHER, that due to the complexity of this matter and the short statutory deadline for the issuance of an order, the Commission issues this order as a short order. The Commission will promptly issue a more detailed order in this matter further explaining its decisions, findings and conclusions.

ORDERED FURTHER, that all findings, conclusions and decisions contained within the preceding sections of this Order are adopted as findings of fact, conclusions of law, and decisions of regulatory policy of this Commission.

ORDERED FURTHER, that jurisdiction over this proceeding is expressly retained for the purpose of entering such further order or orders as this Commission may deem proper.

ORDERED FURTHER, any motion for reconsideration, rehearing, or oral argument shall not stay the effectiveness of this order unless expressly ordered by the Commission.

The above by action of the Commission in Administrative Session on the 17th of December, 2019.

Reece McAlister
Executive Secretary

12-31-19
Date

Lauren "Bubba" McDonald
Chairman

12/31/19
Date

U.S. Department of Energy, The Energy Information Administration (EIA)
Fuel Receipts and Cost Time Series File, 2019 Final
Sources: EIA-923 and EIA-860 Reports
Retrieved from https://www.eia.gov/electricity/data/eia923/

YEAR	MONTH	Plant Id	Plant Name	Plant State	ENERGY_SOURCE	FUEL_GROUP	Coalmine State	SUPPLIER	QUANTITY	Average Heat Content	Average Sulfur Content	Average Ash Content	FUEL_COST	Operator Name
2019	1	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	131,723.0	23.660	2.72	9.00	309.1	Georgia Power Co
2019	1	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	40,705.0	23.378	2.46	8.30	303.7	Georgia Power Co
2019	1	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	143,263.0	23.690	2.68	8.80	282.9	Georgia Power Co
2019	2	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	41,946.0	23.174	2.37	8.60	306.3	Georgia Power Co
2019	2	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	159,596.0	23.810	2.71	8.60	286.2	Georgia Power Co
2019	2	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	27,669.0	24.032	2.64	8.50	291.1	Georgia Power Co
2019	3	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	42,576.0	23.354	2.43	8.80	301.4	Georgia Power Co
2019	3	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	221,174.0	23.626	2.72	8.50	287.0	Georgia Power Co
2019	4	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	14,658.0	23.514	2.34	8.40	300.6	Georgia Power Co
2019	4	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	215,727.0	23.716	2.71	8.20	284.7	Georgia Power Co
2019	5	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	173,328.0	23.838	2.72	7.80	284.3	Georgia Power Co
2019	5	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	55,518.0	23.356	2.46	8.40	303.3	Georgia Power Co
2019	6	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	55,518.0	23.356	2.46	8.40	303.3	Georgia Power Co
2019	6	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	173,328.0	23.838	2.72	7.80	284.3	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	42,551.0	23.422	2.69	8.80	303.9	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	88,345.0	23.862	2.73	7.90	287.5	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	115,804.0	23.790	2.73	8.10	280.7	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	71,366.0	23.400	2.65	8.80	298.4	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	143,218.0	24.014	2.80	7.80	282.9	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	39,588.0	23.130	2.56	9.50	307.1	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	140,867.0	23.964	2.74	7.80	278.9	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	28,449.0	23.864	2.77	8.10	268.8	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	14,185.0	23.386	2.44	8.90	300.4	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	43,493.0	23.264	2.46	9.00	301.6	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	41,771.0	24.188	2.72	7.60	291.2	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	200,534.0	23.990	2.75	7.90	279.7	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	71,825.0	24.064	2.76	7.90	267.2	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	52,056.0	23.382	2.45	8.80	298.4	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	43,367.0	23.948	2.76	8.30	283.7	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	42,075.0	23.088	2.47	9.00	306.3	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	71,910.0	24.016	2.71	7.80	270.6	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	71,277.0	24.048	2.76	8.00	286.4	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	29,517.0	23.168	2.42	9.10	301.6	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	27,437.0	23.296	2.49	9.00	299.3	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	41,595.0	23.798	2.67	8.40	286.8	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	97,123.0	23.820	2.68	8.00	273.3	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	29,430.0	23.222	2.45	9.10	297.0	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	13,227.0	23.760	2.67	7.80	266.2	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	82,116.0	23.418	2.58	8.70	260.9	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	43,792.0	23.794	2.68	8.10	285.6	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	27,420.0	23.374	2.47	8.50	303.3	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IL	ALLIANCE COAL LLC	112,429.0	23.406	2.45	8.60	261.9	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	70,865.0	23.754	2.65	7.40	266.7	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	29,160.0	23.774	2.63	8.30	282.5	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IL	FORESIGHT COAL SALES LLC	28,700.0	23.964	2.70	8.20	271.7	Georgia Power Co
2019	1	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	39,192.0	23.220	2.70	8.00	299.9	Georgia Power Co
2019	2	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	52,161.0	22.674	2.70	8.30	306.5	Georgia Power Co
2019	3	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	25,970.0	23.262	2.76	7.50	301.7	Georgia Power Co
2019	4	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	64,487.0	22.848	2.85	8.70	307.1	Georgia Power Co
2019	5	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	39,040.0	22.688	2.88	9.10	303.6	Georgia Power Co
2019	6	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	39,040.0	22.688	2.88	9.10	303.6	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	51,484.0	23.036	2.73	8.10	302.2	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	IN	WHITE STALLION ENERGY, LLC	50,364.0	22.788	2.42	8.10	313.4	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	37,064.0	22.758	2.80	8.80	302.5	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	37,332.0	22.610	2.79	9.10	313.1	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	IN	WHITE STALLION ENERGY, LLC	25,865.0	22.670	2.27	8.20	314.3	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	48,464.0	22.970	2.81	8.90	304.8	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	11,250.0	23.114	2.89	8.50	310.0	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	IN	WHITE STALLION ENERGY, LLC	25,938.0	23.048	2.32	8.10	308.2	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	36,986.0	22.838	2.92	9.30	301.7	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	11,229.0	23.230	2.92	8.10	311.0	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	51,375.0	22.754	2.88	9.00	301.4	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	38,986.0	22.954	2.80	8.90	303.7	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	IN	SUNRISE COAL LLC	13,049.0	22.970	2.87	8.00	313.0	Georgia Power Co
2019	1	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	14,227.0	26.100	2.78	7.60	231.6	Georgia Power Co
2019	2	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	14,501.0	26.000	2.51	7.70	236.1	Georgia Power Co
2019	2	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	56,165.0	25.930	2.47	7.60	308.0	Georgia Power Co
2019	3	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	50,320.0	26.076	2.52	7.50	306.4	Georgia Power Co
2019	4	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	53,764.0	25.906	2.65	7.70	311.2	Georgia Power Co
2019	5	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	146.0	26.100	2.78	7.60	230.9	Georgia Power Co
2019	5	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	99,919.0	25.848	2.50	7.70	308.5	Georgia Power Co
2019	6	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	146.0	26.100	2.78	7.60	230.9	Georgia Power Co
2019	6	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	99,919.0	25.848	2.50	7.70	308.5	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	14,316.0	26.078	2.57	7.60	331.6	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	54,962.0	26.166	2.31	7.40	237.8	Georgia Power Co
2019	7	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	15,055.0	25.982	2.21	7.70	284.8	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	86,730.0	26.078	2.38	7.70	239.1	Georgia Power Co
2019	8	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	43,389.0	26.056	2.22	7.60	284.6	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	70,705.0	25.900	2.26	7.60	241.6	Georgia Power Co
2019	9	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	41,899.0	26.062	2.34	7.60	286.6	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	83,088.0	25.942	2.58	8.00	239.5	Georgia Power Co
2019	10	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	12,599.0	25.992	2.49	7.70	291.7	Georgia Power Co
2019	11	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	54,283.0	25.938	2.60	8.10	242.1	Georgia Power Co
2019	12	703	Bowen	GA	BIT	Coal	PA	CONSOL ENERGY INC	51,700.0	25.950	2.61	7.80	286.0	Georgia Power Co
								Annual Weighted Averages based on Quantity		24.00	2.64	8.22	$ 2.87	

https://www.eia.gov/coal/transportationrates/

Table 3c. Real Average Annual Coal Transportation Costs from Coal Basin to State by Railroad (2017 dollars per ton)

Coal Supply Basin	Destination State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 (Preliminary)
Northern Appalachia	Alabama	-	-	-	-	-	-	-	-	W	-	-	-
Northern Appalachia	Georgia	-	W	-	W	-	-	W	W	W	W	W	W
Central Appalachia	Alabama	W	W	W	W	-	-	W	-	-	-	-	-
Central Appalachia	Georgia	$28.38	$26.39	$30.77	$23.69	$24.59	$24.81	$20.93	$31.10	$30.54	$28.04	W	W
Southern Appalachia	Alabama	$16.41	W	W	W	W	W	W	W	W	-	W	W
Southern Appalachia	Georgia	W	W	W	-	-	-	-	-	-	-	-	-
Illinois Basin	Alabama	W	W	W	W	$14.85	$16.33	$17.92	$19.94	W	W	W	W
Illinois Basin	Georgia	W	W	W	$40.59	$39.78	$31.76	$26.68	$33.58	$33.67	$33.87	$31.19	W
Powder River Basin	Alabama	W	W	W	W	W	$19.79	$18.81	W	W	W	W	W
Powder River Basin	Georgia	W	W	W	W	W	W	W	W	W	W	W	W
Uinta Region	Alabama	$36.82	W	W	W	W	W	W	-	-	-	-	-
Uinta Region	Georgia	W	-	-	-	-	-	-	-	-	-	-	-

AL 2013 value (2017 to 2019 dollars)	**$20.59**
AL 2014 value (2017 to 2019 dollars)	**$19.57**
Average to AL in 2019 dollars	**$20.08**

https://www.eia.gov/coal/transportationrates/

Table 4c. Real Average Annual Coal Transportation Costs from State to State by Railroad (2017 dollars per ton)

Origin State	Destination State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 (Preliminary)
Alabama	**Alabama**	**$16.41**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**-**	**W**	**W**
Alabama	Georgia	W	W	W	-	-	-	-	-	-	-	-	-
Colorado	Alabama	$39.47	W	W	W	W	W	W	-	-	-	-	-
Colorado	Georgia	W	-	-	-	-	-	-	-	-	-	-	-
Illinois	Alabama	W	W	-	W	W	W	$18.16	W	W	W	W	-
Illinois	Georgia	W	-	W	$42.37	$39.88	$28.76	$27.21	$33.56	$33.62	$33.88	$31.39	W
Indiana	Alabama	-	W	W	W	W	$21.73	W	$20.53	W	W	W	W
Indiana	Georgia	W	W	W	$37.86	W	W	$31.67	W	$34.16	W	W	W
Kansas	Georgia	-	-	-	-	-	-	-	-	W	-	-	-
Kentucky	Alabama	W	W	W	W	W	W	$15.01	W	-	-	-	-
Kentucky	Georgia	$27.96	$25.87	$30.53	$20.33	$22.31	$23.92	$20.60	$31.36	W	W	W	W
Montana	Alabama	-	-	-	-	-	-	-	-	-	W	-	-
Pennsylvania	Alabama	-	-	-	-	-	-	-	-	W	-	-	-
Pennsylvania	Georgia	-	W	-	W	-	-	W	W	W	W	W	W
Tennessee	Alabama	-	W	-	-	-	-	W	-	-	-	-	-
Tennessee	Georgia	$27.78	$27.49	$28.50	W	-	-	-	-	-	-	-	-
Utah	Alabama	W	W	W	W	W	-	-	-	-	-	-	-
Virginia	Alabama	W	W	W	-	-	-	W	-	-	-	-	-
Virginia	Georgia	$29.24	$27.66	$30.26	$31.52	$33.25	W	W	W	W	W	W	-
West Virginia	Alabama	W	W	-	-	-	-	-	-	-	-	-	-
West Virginia	Georgia	$31.76	$28.83	$33.74	$30.65	W	$36.01	W	W	-	-	-	-
Wyoming	Alabama	W	W	W	W	W	$19.79	$18.81	W	W	W	W	W
Wyoming	Georgia	W	W	W	W	W	W	W	W	W	W	W	W

2008 AL to AL Value (2017 to 2019 dollars)	**$17.07**

Qual Data Report

Bowen - Daily / 30-Day - Unit 1 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

	Op_Rpt_time - Valid Operating Hours			Removal_30Day_pct - SO2 Removal 30 Day			Removal_pct - SO2 Removal Efficiency Pct			SO2_30Day_lb_mmbtu - SO2 Rate 30 Day Average			SO2_lb_mmbtu - SO2 Rate Daily Average		
Sample Time	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**
1/1/2019 00:00	24		24	96.27		30	96.02		24	0.15		30	0.18		24
1/2/2019 00:00	24		24	96.27		30	96.01		24	0.15		30	0.18		24
1/3/2019 00:00	24		24	96.26		30	95.99		24	0.15		30	0.17		24
1/4/2019 00:00	8		24	96.26		30	96.11		8	0.15		30	0.16		8
1/5/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/6/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/7/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/8/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/9/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/10/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/11/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/12/2019 00:00	0		24	96.26		30	0	Off	0	0.15		30	0	Off	0
1/13/2019 00:00	24		24	96.31		30	98.13		24	0.15		30	0.08		24
1/14/2019 00:00	24		24	96.28		30	96.24		24	0.15		30	0.17		24
1/15/2019 00:00	24		24	96.25		30	96.18		24	0.15		30	0.17		24
1/16/2019 00:00	24		24	96.24		30	96.01		24	0.15		30	0.17		24
1/17/2019 00:00	24		24	96.23		30	95.9		24	0.15		30	0.18		24
1/18/2019 00:00	24		24	96.2		30	95.84		24	0.15		30	0.18		24
1/19/2019 00:00	24		24	96.18		30	95.82		24	0.15		30	0.18		24
1/20/2019 00:00	24		24	96.17		30	95.99		24	0.16		30	0.17		24
1/21/2019 00:00	24		24	96.16		30	96		24	0.16		30	0.17		24
1/22/2019 00:00	24		24	96.15		30	95.94		24	0.16		30	0.18		24
1/23/2019 00:00	24		24	96.12		30	95.94		24	0.16		30	0.18		24
1/24/2019 00:00	24		24	96.11		30	95.92		24	0.17		30	0.18		24
1/25/2019 00:00	24		24	96.08		30	95.92		24	0.17		30	0.17		24
1/26/2019 00:00	24		24	96.07		30	96.34		24	0.17		30	0.15		24
1/27/2019 00:00	24		24	96.06		30	96.02		24	0.17		30	0.17		24
1/28/2019 00:00	24		24	96.06		30	95.96		24	0.17		30	0.17		24
1/29/2019 00:00	24		24	96.07		30	96.16		24	0.17		30	0.17		24
1/30/2019 00:00	24		24	96.07		30	95.95		24	0.17		30	0.17		24
1/31/2019 00:00	24		24	96.07		30	96.03		24	0.17		30	0.17		24
2/1/2019 00:00	24		24	96.08		30	96.52		24	0.17		30	0.15		24
2/2/2019 00:00	24		24	96.1		30	96.31		24	0.17		30	0.14		24
2/3/2019 00:00	24		24	96.09		30	95.93		24	0.17		30	0.17		24
2/4/2019 00:00	24		24	96.1		30	96.01		24	0.17		30	0.17		24
2/5/2019 00:00	24		24	96.1		30	95.92		24	0.17		30	0.17		24
2/6/2019 00:00	24		24	96.1		30	95.99		24	0.17		30	0.17		24
2/7/2019 00:00	24		24	96.11		30	96.12		24	0.17		30	0.17		24
2/8/2019 00:00	24		24	96.11		30	95.96		24	0.17		30	0.17		24
2/9/2019 00:00	24		24	96.11		30	96.07		24	0.17		30	0.17		24
2/10/2019 00:00	24		24	96.12		30	96.27		24	0.17		30	0.15		24
2/11/2019 00:00	24		24	96.12		30	96.12		24	0.17		30	0.16		24
2/12/2019 00:00	24		24	96.05		30	95.99		24	0.17		30	0.16		24
2/13/2019 00:00	24		24	96.04		30	96.06		24	0.17		30	0.17		24
2/14/2019 00:00	24		24	96.04		30	96.06		24	0.17		30	0.19		24
2/15/2019 00:00	24		24	96.03		30	95.92		24	0.17		30	0.18		24
2/16/2019 00:00	24		24	96.03		30	95.96		24	0.17		30	0.18		24
2/17/2019 00:00	24		24	96.04		30	95.94		24	0.17		30	0.18		24
2/18/2019 00:00	24		24	96.05		30	96.32		24	0.17		30	0.16		24
2/19/2019 00:00	24		24	96.07		30	96.37		24	0.17		30	0.16		24
2/20/2019 00:00	24		24	96.09		30	96.66		24	0.17		30	0.14		24
2/21/2019 00:00	24		24	96.1		30	96.39		24	0.17		30	0.16		24
2/22/2019 00:00	24		24	96.11		30	96.15		24	0.17		30	0.17		24
2/23/2019 00:00	24		24	96.11		30	96.01		24	0.17		30	0.17		24
2/24/2019 00:00	24		24	96.12		30	96		24	0.17		30	0.17		24
2/25/2019 00:00	24		24	96.12		30	96.44		24	0.17		30	0.16		24
2/26/2019 00:00	24		24	96.12		30	96.15		24	0.17		30	0.17		24
2/27/2019 00:00	24		24	96.13		30	96.14		24	0.17		30	0.17		24
2/28/2019 00:00	24		24	96.14		30	96.44		24	0.16		30	0.15		24

Qual Data Report

Bowen - Daily / 30-Day - Unit 1 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

3/1/2019 00:00	24		24	96.15		30	96.1		24	0.16		30	0.17		24
3/2/2019 00:00	24		24	96.14		30	95.95		24	0.17		30	0.18		24
3/3/2019 00:00	24		24	96.12		30	95.93		24	0.17		30	0.18		24
3/4/2019 00:00	24		24	96.12		30	96.11		24	0.17		30	0.17		24
3/5/2019 00:00	24		24	96.15		30	96.92		24	0.17		30	0.13		24
3/6/2019 00:00	24		24	96.15		30	96.14		24	0.17		30	0.17		24
3/7/2019 00:00	24		24	96.16		30	96.19		24	0.17		30	0.17		24
3/8/2019 00:00	24		24	96.16		30	95.98		24	0.17		30	0.16		24
3/9/2019 00:00	24		24	96.16		30	95.92		24	0.17		30	0.17		24
3/10/2019 00:00	24		24	96.16		30	95.97		24	0.16		30	0.16		24
3/11/2019 00:00	24		24	96.15		30	95.99		24	0.16		30	0.16		24
3/12/2019 00:00	24		24	96.14		30	95.98		24	0.17		30	0.17		24
3/13/2019 00:00	24		24	96.14		30	95.91		24	0.17		30	0.18		24
3/14/2019 00:00	24		24	96.13		30	95.88		24	0.17		30	0.18		24
3/15/2019 00:00	24		24	96.13		30	95.93		24	0.17		30	0.18		24
3/16/2019 00:00	24		24	96.12		30	95.92		24	0.17		30	0.18		24
3/17/2019 00:00	24		24	96.13		30	96.01		24	0.17		30	0.17		24
3/18/2019 00:00	24		24	96.13		30	96.02		24	0.17		30	0.17		24
3/19/2019 00:00	24		24	96.13		30	95.95		24	0.17		30	0.17		24
3/20/2019 00:00	24		24	96.14		30	96.55		24	0.17		30	0.13		24
3/21/2019 00:00	24		24	96.13		30	96.25		24	0.17		30	0.17		24
3/22/2019 00:00	24		24	96.11		30	96.09		24	0.17		30	0.18		24
3/23/2019 00:00	24		24	96.1		30	95.99		24	0.17		30	0.18		24
3/24/2019 00:00	24		24	96.1		30	96.1		24	0.17		30	0.18		24
3/25/2019 00:00	24		24	96.1		30	95.94		24	0.17		30	0.18		24
3/26/2019 00:00	24		24	96.1		30	96.04		24	0.17		30	0.18		24
3/27/2019 00:00	24		24	96.08		30	95.9		24	0.17		30	0.17		24
3/28/2019 00:00	24		24	96.03		30	94.73		20	0.17		30	0.23		20
3/29/2019 00:00	24		24	96.03		30	96.04		24	0.17		30	0.17		24
3/30/2019 00:00	24		24	96.01		30	95.96		24	0.17		30	0.18		24
3/31/2019 00:00	24		24	96.01		30	96.12		24	0.17		30	0.17		24
4/1/2019 00:00	24		24	96.02		30	96.18		24	0.17		30	0.15		24
4/2/2019 00:00	24		24	96.03		30	96.1		24	0.17		30	0.16		24
4/3/2019 00:00	24		24	96.03		30	96.05		24	0.17		30	0.18		24
4/4/2019 00:00	24		24	96		30	96.09		24	0.17		30	0.17		24
4/5/2019 00:00	24		24	96		30	96.12		24	0.17		30	0.17		24
4/6/2019 00:00	24		24	95.99		30	96.08		24	0.17		30	0.18		24
4/7/2019 00:00	24		24	95.99		30	95.98		24	0.17		30	0.18		24
4/8/2019 00:00	24		24	95.99		30	95.92		24	0.17		30	0.17		24
4/9/2019 00:00	24		24	95.99		30	95.97		24	0.17		30	0.17		24
4/10/2019 00:00	24		24	96		30	96.1		24	0.17		30	0.17		24
4/11/2019 00:00	24		24	96		30	96		24	0.17		30	0.17		24
4/12/2019 00:00	24		24	96		30	95.94		24	0.17		30	0.17		24
4/13/2019 00:00	24		24	96		30	96.02		24	0.17		30	0.18		24
4/14/2019 00:00	24		24	96.01		30	96.09		24	0.17		30	0.16		24
4/15/2019 00:00	24		24	96.01		30	95.94		24	0.17		30	0.17		24
4/16/2019 00:00	24		24	96.02		30	96.2		24	0.17		30	0.16		24
4/17/2019 00:00	6		24	96.02		30	96.17		6	0.17		30	0.17		6
4/18/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/19/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/20/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/21/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/22/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/23/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/24/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/25/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/26/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/27/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/28/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/29/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
4/30/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 1 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

5/1/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/2/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/3/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/4/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/5/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/6/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/7/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/8/2019 00:00	0		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/9/2019 00:00	8		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/10/2019 00:00	4		24	96.02		30	0	Off	0	0.17		30	0	Off	0
5/11/2019 00:00	12		24	96.13		30	99.31		1	0.17		30	0.01		1
5/12/2019 00:00	23		24	96.17		30	97.61		15	0.17		30	0.09		15
5/13/2019 00:00	24		24	96.2		30	97.07		22	0.17		30	0.12		22
5/14/2019 00:00	24		24	96.21		30	96.45		24	0.17		30	0.15		24
5/15/2019 00:00	24		24	96.23		30	96.56		24	0.17		30	0.14		24
5/16/2019 00:00	24		24	96.25		30	96.75		24	0.16		30	0.13		24
5/17/2019 00:00	24		24	96.27		30	96.55		24	0.16		30	0.15		24
5/18/2019 00:00	24		24	96.27		30	96.08		24	0.16		30	0.17		24
5/19/2019 00:00	24		24	96.27		30	95.99		24	0.16		30	0.16		24
5/20/2019 00:00	24		24	96.32		30	96.08		24	0.16		30	0.15		24
5/21/2019 00:00	24		24	96.32		30	96.06		24	0.16		30	0.15		24
5/22/2019 00:00	24		24	96.32		30	96.09		24	0.16		30	0.15		24
5/23/2019 00:00	24		24	96.32		30	96.12		24	0.16		30	0.17		24
5/24/2019 00:00	24		24	96.32		30	96.22		24	0.16		30	0.15		24
5/25/2019 00:00	24		24	96.32		30	96.02		24	0.16		30	0.16		24
5/26/2019 00:00	24		24	96.32		30	96.05		24	0.16		30	0.15		24
5/27/2019 00:00	24		24	96.32		30	96.02		24	0.16		30	0.16		24
5/28/2019 00:00	24		24	96.32		30	96.07		24	0.16		30	0.17		24
5/29/2019 00:00	24		24	96.31		30	95.98		24	0.16		30	0.17		24
5/30/2019 00:00	24		24	96.32		30	96.1		24	0.16		30	0.17		24
5/31/2019 00:00	24		24	96.32		30	96.08		24	0.16		30	0.18		24
6/1/2019 00:00	24		24	96.33		30	96.07		24	0.16		30	0.18		24
6/2/2019 00:00	24		24	96.33		30	96.27		24	0.16		30	0.16		24
6/3/2019 00:00	24		24	96.34		30	96.24		24	0.16		30	0.16		24
6/4/2019 00:00	24		24	96.34		30	95.99		24	0.16		30	0.18		24
6/5/2019 00:00	24		24	96.34		30	96.02		24	0.16		30	0.17		24
6/6/2019 00:00	24		24	96.34		30	95.98		24	0.16		30	0.17		24
6/7/2019 00:00	24		24	96.34		30	96.02		24	0.16		30	0.17		24
6/8/2019 00:00	10		24	96.34		30	96.32		10	0.16		30	0.15		10
6/9/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/10/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/11/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/12/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/13/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/14/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/15/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/16/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/17/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/18/2019 00:00	0		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/19/2019 00:00	4		24	96.34		30	0	Off	0	0.16		30	0	Off	0
6/20/2019 00:00	24		24	96.38		30	97.31		17	0.16		30	0.11		17
6/21/2019 00:00	24		24	96.28		30	96.28		24	0.16		30	0.16		24
6/22/2019 00:00	24		24	96.24		30	96.34		24	0.16		30	0.15		24
6/23/2019 00:00	24		24	96.21		30	96.12		22	0.16		30	0.16		24
6/24/2019 00:00	24		24	96.19		30	96.06		24	0.16		30	0.17		24
6/25/2019 00:00	24		24	96.17		30	95.94		24	0.16		30	0.17		24
6/26/2019 00:00	24		24	96.15		30	96.15		24	0.16		30	0.16		24
6/27/2019 00:00	24		24	96.14		30	96.17		24	0.16		30	0.17		24
6/28/2019 00:00	24		24	96.14		30	96.13		24	0.16		30	0.17		24
6/29/2019 00:00	24		24	96.15		30	96.14		24	0.16		30	0.17		24
6/30/2019 00:00	24		24	96.15		30	96.07		24	0.16		30	0.16		24

Qual Data Report

Bowen - Daily / 30-Day - Unit 1 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

7/1/2019 00:00	24	24	96.15	30	96.04	24	0.16	30	0.16	24
7/2/2019 00:00	24	24	96.15	30	96.19	24	0.16	30	0.17	24
7/3/2019 00:00	24	24	96.16	30	96.27	24	0.16	30	0.16	24
7/4/2019 00:00	24	24	96.15	30	96.14	24	0.16	30	0.17	24
7/5/2019 00:00	24	24	96.16	30	96.09	24	0.16	30	0.16	24
7/6/2019 00:00	24	24	96.16	30	96.06	24	0.17	30	0.17	24
7/7/2019 00:00	24	24	96.15	30	96	24	0.17	30	0.17	24
7/8/2019 00:00	24	24	96.16	30	96.29	24	0.17	30	0.16	24
7/9/2019 00:00	24	24	96.17	30	96.21	24	0.16	30	0.16	24
7/10/2019 00:00	24	24	96.18	30	96.31	24	0.16	30	0.16	24
7/11/2019 00:00	24	24	96.19	30	96.52	24	0.16	30	0.15	24
7/12/2019 00:00	24	24	96.21	30	96.58	24	0.16	30	0.15	24
7/13/2019 00:00	24	24	96.22	30	96.58	24	0.16	30	0.15	24
7/14/2019 00:00	24	24	96.24	30	96.75	24	0.16	30	0.14	24
7/15/2019 00:00	24	24	96.26	30	96.69	24	0.16	30	0.14	24
7/16/2019 00:00	24	24	96.28	30	96.56	24	0.16	30	0.15	24
7/17/2019 00:00	24	24	96.3	30	96.7	24	0.16	30	0.14	24
7/18/2019 00:00	24	24	96.32	30	96.6	24	0.16	30	0.14	24
7/19/2019 00:00	24	24	96.33	30	96.65	24	0.16	30	0.14	24
7/20/2019 00:00	24	24	96.31	30	96.59	24	0.16	30	0.15	24
7/21/2019 00:00	24	24	96.32	30	96.63	24	0.16	30	0.14	24
7/22/2019 00:00	24	24	96.33	30	96.63	23	0.16	30	0.14	23
7/23/2019 00:00	24	24	96.35	30	96.61	24	0.16	30	0.14	24
7/24/2019 00:00	24	24	96.36	30	96.62	24	0.16	30	0.14	24
7/25/2019 00:00	24	24	96.39	30	96.62	24	0.15	30	0.14	24
7/26/2019 00:00	24	24	96.4	30	96.68	24	0.15	30	0.13	24
7/27/2019 00:00	24	24	96.42	30	96.59	24	0.15	30	0.14	24
7/28/2019 00:00	24	24	96.44	30	96.67	24	0.15	30	0.13	24
7/29/2019 00:00	24	24	96.45	30	96.63	24	0.15	30	0.15	24
7/30/2019 00:00	24	24	96.47	30	96.66	24	0.15	30	0.13	24
7/31/2019 00:00	24	24	96.49	30	96.58	24	0.15	30	0.14	24
8/1/2019 00:00	24	24	96.51	30	96.7	24	0.15	30	0.14	24
8/2/2019 00:00	24	24	96.52	30	96.62	24	0.15	30	0.14	24
8/3/2019 00:00	24	24	96.53	30	96.62	24	0.15	30	0.14	24
8/4/2019 00:00	24	24	96.55	30	96.63	24	0.14	30	0.13	24
8/5/2019 00:00	24	24	96.57	30	96.63	24	0.14	30	0.14	24
8/6/2019 00:00	24	24	96.61	30	97.06	24	0.14	30	0.11	24
8/7/2019 00:00	24	24	96.61	30	96.49	24	0.14	30	0.15	24
8/8/2019 00:00	24	24	96.63	30	96.6	24	0.14	30	0.15	24
8/9/2019 00:00	24	24	96.64	30	96.66	24	0.14	30	0.15	24
8/10/2019 00:00	24	24	96.64	30	96.62	24	0.14	30	0.15	24
8/11/2019 00:00	24	24	96.64	30	96.67	24	0.14	30	0.13	24
8/12/2019 00:00	24	24	96.65	30	96.65	24	0.14	30	0.14	24
8/13/2019 00:00	24	24	96.64	30	96.62	24	0.14	30	0.14	24
8/14/2019 00:00	24	24	96.64	30	96.65	24	0.14	30	0.14	24
8/15/2019 00:00	24	24	96.65	30	96.77	24	0.14	30	0.13	24
8/16/2019 00:00	24	24	96.65	30	96.63	24	0.14	30	0.14	24
8/17/2019 00:00	24	24	96.65	30	96.69	24	0.14	30	0.14	24
8/18/2019 00:00	24	24	96.65	30	96.63	24	0.14	30	0.14	24
8/19/2019 00:00	24	24	96.65	30	96.62	24	0.14	30	0.14	24
8/20/2019 00:00	24	24	96.64	30	96.49	24	0.14	30	0.15	24
8/21/2019 00:00	24	24	96.63	30	96.16	24	0.14	30	0.16	24
8/22/2019 00:00	24	24	96.61	30	96.09	24	0.14	30	0.15	24
8/23/2019 00:00	24	24	96.59	30	96.07	24	0.14	30	0.17	24
8/24/2019 00:00	24	24	96.57	30	96.06	24	0.14	30	0.15	24
8/25/2019 00:00	24	24	96.55	30	95.96	24	0.14	30	0.17	24
8/26/2019 00:00	24	24	96.53	30	95.95	24	0.14	30	0.18	24
8/27/2019 00:00	24	24	96.51	30	96.04	24	0.15	30	0.17	24
8/28/2019 00:00	24	24	96.49	30	96.16	24	0.15	30	0.17	24
8/29/2019 00:00	24	24	96.47	30	96	24	0.15	30	0.16	24
8/30/2019 00:00	24	24	96.45	30	96.02	24	0.15	30	0.16	24
8/31/2019 00:00	24	24	96.44	30	96.24	24	0.15	30	0.14	24

Qual Data Report

Bowen - Daily / 30-Day - Unit 1 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

9/1/2019 00:00	24		24	96.42		30	96.01		24	0.15		30	0.16		24
9/2/2019 00:00	24		24	96.41		30	96.33		24	0.15		30	0.13		24
9/3/2019 00:00	24		24	96.39		30	96.11		24	0.15		30	0.15		24
9/4/2019 00:00	24		24	96.38		30	96.24		24	0.15		30	0.14		24
9/5/2019 00:00	24		24	96.35		30	96.23		24	0.15		30	0.15		24
9/6/2019 00:00	24		24	96.34		30	96.32		24	0.15		30	0.15		24
9/7/2019 00:00	24		24	96.33		30	96.17		24	0.15		30	0.16		24
9/8/2019 00:00	24		24	96.32		30	96.37		24	0.15		30	0.14		24
9/9/2019 00:00	24		24	96.31		30	96.22		24	0.15		30	0.16		24
9/10/2019 00:00	24		24	96.29		30	96.22		24	0.15		30	0.15		24
9/11/2019 00:00	24		24	96.27		30	96.17		24	0.15		30	0.15		24
9/12/2019 00:00	24		24	96.27		30	96.43		24	0.15		30	0.15		24
9/13/2019 00:00	24		24	96.26		30	96.44		24	0.15		30	0.15		24
9/14/2019 00:00	24		24	96.24		30	96.16		24	0.15		30	0.16		24
9/15/2019 00:00	24		24	96.22		30	96.12		24	0.15		30	0.15		24
9/16/2019 00:00	24		24	96.21		30	96.28		24	0.15		30	0.16		24
9/17/2019 00:00	24		24	96.2		30	96.26		24	0.15		30	0.16		24
9/18/2019 00:00	24		24	96.18		30	96.2		24	0.16		30	0.16		24
9/19/2019 00:00	24		24	96.18		30	96.25		24	0.16		30	0.16		24
9/20/2019 00:00	24		24	96.17		30	95.97		24	0.16		30	0.17		24
9/21/2019 00:00	24		24	96.17		30	96.02		24	0.16		30	0.17		24
9/22/2019 00:00	24		24	96.17		30	96.15		24	0.16		30	0.15		24
9/23/2019 00:00	24		24	96.18		30	96.25		24	0.16		30	0.15		24
9/24/2019 00:00	24		24	96.19		30	96.3		24	0.16		30	0.15		24
9/25/2019 00:00	24		24	96.2		30	96.31		24	0.15		30	0.16		24
9/26/2019 00:00	24		24	96.21		30	96.46		24	0.15		30	0.14		24
9/27/2019 00:00	24		24	96.22		30	96.23		24	0.15		30	0.16		24
9/28/2019 00:00	24		24	96.23		30	96.32		24	0.15		30	0.15		24
9/29/2019 00:00	24		24	96.23		30	96.04		24	0.15		30	0.16		24
9/30/2019 00:00	24		24	96.23		30	96.22		24	0.15		30	0.15		24
10/1/2019 00:00	24		24	96.24		30	96.35		24	0.15		30	0.15		24
10/2/2019 00:00	24		24	96.24		30	96.27		24	0.15		30	0.16		24
10/3/2019 00:00	24		24	96.23		30	95.95		24	0.15		30	0.16		24
10/4/2019 00:00	23		24	96.23		30	96.11		23	0.16		30	0.16		23
10/5/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/6/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/7/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/8/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/9/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/10/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/11/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/12/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/13/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/14/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/15/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/16/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/17/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/18/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/19/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/20/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/21/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/22/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/23/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/24/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/25/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/26/2019 00:00	0		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/27/2019 00:00	19		24	96.23		30	0	Off	0	0.16		30	0	Off	0
10/28/2019 00:00	11		24	96.31		30	98.75		7	0.15		30	0.04		7
10/29/2019 00:00	0		24	96.31		30	0	Off	0	0.15		30	0	Off	0
10/30/2019 00:00	0		24	96.31		30	0	Off	0	0.15		30	0	Off	0
10/31/2019 00:00	0		24	96.31		30	0	Off	0	0.15		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 1 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

11/1/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/2/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/3/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/4/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/5/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/6/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/7/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/8/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/9/2019 00:00	0	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/10/2019 00:00	9	24	96.31	30	0	Off	0	0.15	30	0	Off	0
11/11/2019 00:00	22	24	96.37	30	98.14		10	0.15	30	0.06		9
11/12/2019 00:00	24	24	96.43	30	97.81		24	0.15	30	0.09		24
11/13/2019 00:00	24	24	96.46	30	97.3		24	0.15	30	0.11		24
11/14/2019 00:00	24	24	96.48	30	96.9		24	0.15	30	0.13		24
11/15/2019 00:00	24	24	96.47	30	96.07		24	0.15	30	0.15		24
11/16/2019 00:00	24	24	96.49	30	96.52		24	0.15	30	0.13		24
11/17/2019 00:00	24	24	96.48	30	96.16		24	0.15	30	0.16		24
11/18/2019 00:00	24	24	96.47	30	96.09		24	0.15	30	0.16		24
11/19/2019 00:00	24	24	96.46	30	96.1		24	0.15	30	0.16		24
11/20/2019 00:00	24	24	96.46	30	96.12		23	0.15	30	0.17		23
11/21/2019 00:00	24	24	96.46	30	96.19		24	0.15	30	0.17		24
11/22/2019 00:00	24	24	96.46	30	96.2		24	0.15	30	0.18		24
11/23/2019 00:00	24	24	96.45	30	96.05		24	0.15	30	0.18		24
11/24/2019 00:00	24	24	96.45	30	96.08		24	0.15	30	0.17		24
11/25/2019 00:00	21	24	96.49	30	97.2		16	0.15	30	0.12		15
11/26/2019 00:00	24	24	96.5	30	96.47		24	0.15	30	0.17		24
11/27/2019 00:00	24	24	96.5	30	96.04		24	0.15	30	0.18		24
11/28/2019 00:00	24	24	96.49	30	96.02		24	0.15	30	0.18		24
11/29/2019 00:00	24	24	96.48	30	95.97		24	0.15	30	0.18		24
11/30/2019 00:00	24	24	96.47	30	95.92		24	0.15	30	0.18		24
12/1/2019 00:00	24	24	96.46	30	96.06		24	0.15	30	0.16		24
12/2/2019 00:00	24	24	96.45	30	96.03		24	0.15	30	0.17		24
12/3/2019 00:00	24	24	96.44	30	95.96		24	0.16	30	0.18		24
12/4/2019 00:00	24	24	96.43	30	95.96		24	0.16	30	0.19		24
12/5/2019 00:00	24	24	96.43	30	96.02		24	0.16	30	0.18		24
12/6/2019 00:00	24	24	96.42	30	96.2		24	0.16	30	0.17		24
12/7/2019 00:00	24	24	96.41	30	95.96		24	0.16	30	0.18		24
12/8/2019 00:00	24	24	96.41	30	95.93		24	0.16	30	0.19		24
12/9/2019 00:00	24	24	96.41	30	95.93		24	0.16	30	0.18		24
12/10/2019 00:00	24	24	96.31	30	95.98		24	0.16	30	0.17		24
12/11/2019 00:00	24	24	96.25	30	96.2		24	0.16	30	0.17		24
12/12/2019 00:00	24	24	96.19	30	96.08		24	0.17	30	0.18		24
12/13/2019 00:00	24	24	96.15	30	96.04		24	0.17	30	0.18		24
12/14/2019 00:00	24	24	96.12	30	95.91		24	0.17	30	0.17		24
12/15/2019 00:00	24	24	96.11	30	95.9		24	0.17	30	0.17		24
12/16/2019 00:00	24	24	96.09	30	95.96		24	0.17	30	0.18		24
12/17/2019 00:00	24	24	96.09	30	95.98		24	0.17	30	0.17		24
12/18/2019 00:00	24	24	96.08	30	96.01		24	0.17	30	0.17		24
12/19/2019 00:00	24	24	96.08	30	96.03		24	0.17	30	0.16		24
12/20/2019 00:00	24	24	96.08	30	96.22		24	0.17	30	0.15		24
12/21/2019 00:00	24	24	96.09	30	96.28		24	0.17	30	0.16		24
12/22/2019 00:00	24	24	96.09	30	96.37		24	0.17	30	0.16		24
12/23/2019 00:00	24	24	96.1	30	96.31		24	0.17	30	0.15		24
12/24/2019 00:00	24	24	96.11	30	96.48		24	0.17	30	0.14		24
12/25/2019 00:00	24	24	96.09	30	96.36		24	0.17	30	0.15		24
12/26/2019 00:00	24	24	96.08	30	96.28		24	0.17	30	0.15		24
12/27/2019 00:00	24	24	96.09	30	96.29		24	0.17	30	0.16		24
12/28/2019 00:00	24	24	96.1	30	96.3		24	0.17	30	0.15		24
12/29/2019 00:00	24	24	96.11	30	96.3		24	0.17	30	0.16		24
12/30/2019 00:00	24	24	96.12	30	96.4		24	0.17	30	0.16		24
12/31/2019 00:00	24	24	96.13	30	96.3		24	0.17	30	0.16		24
Average with Op > 0 hours			**96.3**					**0.16**				

Qual Data Report

Bowen - Daily / 30-Day - Unit 2 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

	Op_Rpt_time - Valid Operating Hours			Removal_30Day_pct - SO2 Removal 30 Day			Removal_pct - SO2 Removal Efficiency Pct			SO2_30Day_lb_mmbtu - SO2 Rate 30 Day Average			SO2_lb_mmbtu - SO2 Rate Daily Average		
Sample Time	Value	Flag	Smps	Value	Flag	Smps	Value	Flag	Smps	Value	Flag	Smps	Value	Flag	Smps
1/1/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/2/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/3/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/4/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/5/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/6/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/7/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/8/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/9/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/10/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/11/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/12/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/13/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/14/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/15/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/16/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/17/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/18/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/19/2019 00:00	0		24	96.6		30	0	Off	0	0.12		30	0	Off	0
1/20/2019 00:00	8		24	96.72		30	99.96		8	0.12		30	0		8
1/21/2019 00:00	24		24	96.75		30	97.68		24	0.12		30	0.1		24
1/22/2019 00:00	24		24	96.76		30	96.67		24	0.12		30	0.15		24
1/23/2019 00:00	24		24	96.75		30	96.27		24	0.12		30	0.16		24
1/24/2019 00:00	24		24	96.75		30	96.39		24	0.12		30	0.16		24
1/25/2019 00:00	24		24	96.75		30	96.27		24	0.13		30	0.16		24
1/26/2019 00:00	24		24	96.75		30	96.35		24	0.13		30	0.15		24
1/27/2019 00:00	24		24	96.75		30	96.22		24	0.13		30	0.16		24
1/28/2019 00:00	24		24	96.72		30	96.19		24	0.13		30	0.16		24
1/29/2019 00:00	24		24	96.72		30	96.34		24	0.13		30	0.16		24
1/30/2019 00:00	24		24	96.7		30	96.4		24	0.13		30	0.15		24
1/31/2019 00:00	24		24	96.67		30	96.34		24	0.13		30	0.15		24
2/1/2019 00:00	24		24	96.67		30	96.44		24	0.13		30	0.14		24
2/2/2019 00:00	24		24	96.64		30	96.28		24	0.14		30	0.14		24
2/3/2019 00:00	24		24	96.61		30	96.14		24	0.14		30	0.15		24
2/4/2019 00:00	24		24	96.6		30	96.23		24	0.14		30	0.15		24
2/5/2019 00:00	1		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/6/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/7/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/8/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/9/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/10/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/11/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/12/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/13/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/14/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/15/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/16/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/17/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/18/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/19/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/20/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/21/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/22/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/23/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/24/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/25/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/26/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/27/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
2/28/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 2 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

3/1/2019 00:00	0		24	96.6		30	0	Off	0	0.14		30	0	Off	0
3/2/2019 00:00	8		24	96.6		30	0	Off	0	0.14		30	0	Off	0
3/3/2019 00:00	24		24	96.65		30	97.73		18	0.14		30	0.09		18
3/4/2019 00:00	24		24	96.64		30	96.22		24	0.14		30	0.16		24
3/5/2019 00:00	24		24	96.62		30	96.33		24	0.14		30	0.15		24
3/6/2019 00:00	15		24	96.62		30	96.32		15	0.14		30	0.16		15
3/7/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/8/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/9/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/10/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/11/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/12/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/13/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/14/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/15/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/16/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/17/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/18/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/19/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/20/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/21/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/22/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/23/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/24/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/25/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/26/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/27/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/28/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/29/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/30/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
3/31/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/1/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/2/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/3/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/4/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/5/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/6/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/7/2019 00:00	0		24	96.62		30	0	Off	0	0.14		30	0	Off	0
4/8/2019 00:00	22		24	96.68		30	98.6		11	0.14		30	0.05		11
4/9/2019 00:00	24		24	96.66		30	96.44		24	0.14		30	0.15		24
4/10/2019 00:00	24		24	96.63		30	96.36		24	0.15		30	0.16		24
4/11/2019 00:00	24		24	96.63		30	96.26		24	0.15		30	0.16		24
4/12/2019 00:00	24		24	96.63		30	96.51		24	0.14		30	0.14		24
4/13/2019 00:00	24		24	96.63		30	96.28		24	0.15		30	0.16		24
4/14/2019 00:00	24		24	96.63		30	96.39		24	0.15		30	0.14		24
4/15/2019 00:00	24		24	96.62		30	96.32		24	0.15		30	0.15		24
4/16/2019 00:00	24		24	96.62		30	96.44		24	0.15		30	0.15		24
4/17/2019 00:00	24		24	96.63		30	96.65		24	0.15		30	0.14		24
4/18/2019 00:00	24		24	96.52		30	96.55		24	0.15		30	0.15		24
4/19/2019 00:00	24		24	96.47		30	96.3		24	0.15		30	0.15		24
4/20/2019 00:00	24		24	96.46		30	96.34		24	0.15		30	0.15		24
4/21/2019 00:00	24		24	96.46		30	96.25		24	0.15		30	0.16		24
4/22/2019 00:00	24		24	96.46		30	96.24		24	0.15		30	0.16		24
4/23/2019 00:00	24		24	96.46		30	96.24		24	0.15		30	0.16		24
4/24/2019 00:00	24		24	96.46		30	96.45		24	0.15		30	0.16		24
4/25/2019 00:00	24		24	96.47		30	96.37		24	0.15		30	0.16		24
4/26/2019 00:00	24		24	96.48		30	96.62		24	0.15		30	0.15		24
4/27/2019 00:00	24		24	96.48		30	96.27		24	0.15		30	0.16		24
4/28/2019 00:00	24		24	96.48		30	96.41		24	0.15		30	0.16		24
4/29/2019 00:00	24		24	96.48		30	96.4		24	0.15		30	0.16		24
4/30/2019 00:00	24		24	96.48		30	96.44		24	0.15		30	0.16		24

Qual Data Report

Bowen - Daily / 30-Day - Unit 2 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

5/1/2019 00:00	24		24	96.49		30	96.47		24	0.15		30	0.16		24
5/2/2019 00:00	24		24	96.5		30	96.45		24	0.15		30	0.15		24
5/3/2019 00:00	24		24	96.5		30	96.44		24	0.15		30	0.15		24
5/4/2019 00:00	24		24	96.46		30	96.4		24	0.15		30	0.14		24
5/5/2019 00:00	24		24	96.46		30	96.34		24	0.15		30	0.15		24
5/6/2019 00:00	24		24	96.46		30	96.36		24	0.15		30	0.16		24
5/7/2019 00:00	24		24	96.47		30	96.56		24	0.15		30	0.14		24
5/8/2019 00:00	24		24	96.4		30	96.59		24	0.15		30	0.15		24
5/9/2019 00:00	24		24	96.42		30	96.81		24	0.15		30	0.13		24
5/10/2019 00:00	24		24	96.42		30	96.43		24	0.15		30	0.14		24
5/11/2019 00:00	24		24	96.42		30	96.25		24	0.15		30	0.16		24
5/12/2019 00:00	24		24	96.41		30	96.38		24	0.15		30	0.15		24
5/13/2019 00:00	24		24	96.42		30	96.54		24	0.15		30	0.14		24
5/14/2019 00:00	24		24	96.42		30	96.43		23	0.15		30	0.14		23
5/15/2019 00:00	24		24	96.42		30	96.25		23	0.15		30	0.15		23
5/16/2019 00:00	24		24	96.42		30	96.39		24	0.15		30	0.14		24
5/17/2019 00:00	24		24	96.41		30	96.43		24	0.15		30	0.15		24
5/18/2019 00:00	24		24	96.41		30	96.42		24	0.15		30	0.14		24
5/19/2019 00:00	24		24	96.41		30	96.41		24	0.15		30	0.13		24
5/20/2019 00:00	24		24	96.42		30	96.43		24	0.15		30	0.13		24
5/21/2019 00:00	24		24	96.44		30	96.85		24	0.15		30	0.11		24
5/22/2019 00:00	24		24	96.45		30	96.64		24	0.15		30	0.13		24
5/23/2019 00:00	24		24	96.46		30	96.42		24	0.15		30	0.15		24
5/24/2019 00:00	24		24	96.46		30	96.51		24	0.15		30	0.14		24
5/25/2019 00:00	24		24	96.46		30	96.42		24	0.14		30	0.14		24
5/26/2019 00:00	24		24	96.45		30	96.39		24	0.14		30	0.14		24
5/27/2019 00:00	24		24	96.45		30	96.32		24	0.14		30	0.15		24
5/28/2019 00:00	24		24	96.45		30	96.38		24	0.14		30	0.15		24
5/29/2019 00:00	24		24	96.45		30	96.47		24	0.14		30	0.15		24
5/30/2019 00:00	24		24	96.46		30	96.57		24	0.14		30	0.15		24
5/31/2019 00:00	24		24	96.45		30	96.33		24	0.14		30	0.16		24
6/1/2019 00:00	24		24	96.45		30	96.46		24	0.14		30	0.15		24
6/2/2019 00:00	24		24	96.46		30	96.47		24	0.14		30	0.15		24
6/3/2019 00:00	24		24	96.46		30	96.41		24	0.14		30	0.15		24
6/4/2019 00:00	24		24	96.46		30	96.41		24	0.14		30	0.16		24
6/5/2019 00:00	24		24	96.46		30	96.46		24	0.14		30	0.15		24
6/6/2019 00:00	24		24	96.45		30	96.36		24	0.14		30	0.15		24
6/7/2019 00:00	24		24	96.45		30	96.47		24	0.14		30	0.15		24
6/8/2019 00:00	24		24	96.43		30	96.33		24	0.14		30	0.14		24
6/9/2019 00:00	24		24	96.43		30	96.32		24	0.14		30	0.13		24
6/10/2019 00:00	24		24	96.43		30	96.33		24	0.14		30	0.14		24
6/11/2019 00:00	24		24	96.43		30	96.4		24	0.14		30	0.13		24
6/12/2019 00:00	24		24	96.43		30	96.35		24	0.14		30	0.15		24
6/13/2019 00:00	24		24	96.43		30	96.37		24	0.14		30	0.15		24
6/14/2019 00:00	24		24	96.44		30	96.69		24	0.14		30	0.14		24
6/15/2019 00:00	24		24	96.44		30	96.47		24	0.14		30	0.15		24
6/16/2019 00:00	24		24	96.45		30	96.51		24	0.14		30	0.14		24
6/17/2019 00:00	24		24	96.45		30	96.6		24	0.14		30	0.15		24
6/18/2019 00:00	24		24	96.47		30	96.87		24	0.14		30	0.12		24
6/19/2019 00:00	24		24	96.47		30	96.62		24	0.14		30	0.13		24
6/20/2019 00:00	24		24	96.47		30	96.63		24	0.14		30	0.14		24
6/21/2019 00:00	24		24	96.46		30	96.59		24	0.14		30	0.14		24
6/22/2019 00:00	24		24	96.46		30	96.25		24	0.14		30	0.15		24
6/23/2019 00:00	24		24	96.45		30	96.22		24	0.15		30	0.15		24
6/24/2019 00:00	24		24	96.44		30	96.24		24	0.15		30	0.17		24
6/25/2019 00:00	24		24	96.44		30	96.23		24	0.15		30	0.16		24
6/26/2019 00:00	24		24	96.43		30	96.18		24	0.15		30	0.16		24
6/27/2019 00:00	24		24	96.43		30	96.32		24	0.15		30	0.16		24
6/28/2019 00:00	24		24	96.43		30	96.39		24	0.15		30	0.15		24
6/29/2019 00:00	24		24	96.42		30	96.39		24	0.15		30	0.15		24
6/30/2019 00:00	24		24	96.43		30	96.43		24	0.15		30	0.14		24

Qual Data Report

Bowen - Daily / 30-Day - Unit 2 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

7/1/2019 00:00	24		24	96.42		30	96.34		24	0.15		30	0.15		24
7/2/2019 00:00	24		24	96.42		30	96.47		24	0.15		30	0.15		24
7/3/2019 00:00	24		24	96.42		30	96.28		22	0.15		30	0.16		22
7/4/2019 00:00	24		24	96.42		30	96.34		24	0.15		30	0.16		24
7/5/2019 00:00	24		24	96.41		30	96.28		24	0.15		30	0.15		24
7/6/2019 00:00	24		24	96.41		30	96.34		24	0.15		30	0.15		24
7/7/2019 00:00	24		24	96.4		30	96.33		24	0.15		30	0.16		24
7/8/2019 00:00	24		24	96.41		30	96.5		24	0.15		30	0.15		24
7/9/2019 00:00	24		24	96.41		30	96.38		24	0.15		30	0.15		24
7/10/2019 00:00	24		24	96.41		30	96.41		24	0.15		30	0.15		24
7/11/2019 00:00	24		24	96.42		30	96.44		24	0.15		30	0.15		24
7/12/2019 00:00	24		24	96.42		30	96.34		24	0.15		30	0.16		24
7/13/2019 00:00	24		24	96.42		30	96.43		24	0.15		30	0.16		24
7/14/2019 00:00	24		24	96.4		30	96.25		24	0.15		30	0.16		24
7/15/2019 00:00	24		24	96.4		30	96.32		24	0.15		30	0.15		24
7/16/2019 00:00	24		24	96.39		30	96.28		23	0.15		30	0.16		23
7/17/2019 00:00	24		24	96.39		30	96.46		24	0.15		30	0.15		24
7/18/2019 00:00	24		24	96.37		30	96.36		24	0.15		30	0.15		24
7/19/2019 00:00	24		24	96.36		30	96.3		24	0.15		30	0.16		24
7/20/2019 00:00	24		24	96.35		30	96.38		24	0.15		30	0.16		24
7/21/2019 00:00	24		24	96.34		30	96.39		24	0.15		30	0.16		24
7/22/2019 00:00	24		24	96.35		30	96.41		24	0.15		30	0.15		24
7/23/2019 00:00	24		24	96.35		30	96.4		23	0.15		30	0.15		23
7/24/2019 00:00	24		24	96.36		30	96.41		23	0.15		30	0.15		23
7/25/2019 00:00	24		24	96.36		30	96.33		24	0.15		30	0.15		24
7/26/2019 00:00	24		24	96.37		30	96.27		24	0.15		30	0.15		24
7/27/2019 00:00	24		24	96.37		30	96.35		24	0.15		30	0.15		24
7/28/2019 00:00	24		24	96.37		30	96.35		24	0.15		30	0.14		24
7/29/2019 00:00	24		24	96.37		30	96.38		23	0.15		30	0.15		24
7/30/2019 00:00	24		24	96.36		30	96.4		24	0.15		30	0.14		24
7/31/2019 00:00	24		24	96.36		30	96.33		24	0.15		30	0.14		24
8/1/2019 00:00	24		24	96.36		30	96.26		24	0.15		30	0.15		24
8/2/2019 00:00	24		24	96.36		30	96.33		24	0.15		30	0.15		24
8/3/2019 00:00	24		24	96.36		30	96.4		24	0.15		30	0.15		24
8/4/2019 00:00	24		24	96.36		30	96.31		24	0.15		30	0.14		24
8/5/2019 00:00	24		24	96.36		30	96.27		24	0.15		30	0.16		24
8/6/2019 00:00	24		24	96.36		30	96.4		24	0.15		30	0.14		24
8/7/2019 00:00	24		24	96.36		30	96.34		24	0.15		30	0.15		24
8/8/2019 00:00	22		24	96.36		30	96.43		22	0.15		30	0.16		22
8/9/2019 00:00	0		24	96.36		30	0			0.15		30	0	Off	0
8/10/2019 00:00	0		24	96.36		30	0			0.15		30	0	Off	0
8/11/2019 00:00	16		24	96.38		30	96.96		9	0.15		30	0.11		9
8/12/2019 00:00	24		24	96.38		30	96.46		24	0.15		30	0.15		24
8/13/2019 00:00	24		24	96.37		30	96.28		24	0.15		30	0.15		24
8/14/2019 00:00	24		24	96.37		30	96.25		24	0.15		30	0.16		24
8/15/2019 00:00	24		24	96.38		30	96.45		24	0.15		30	0.14		24
8/16/2019 00:00	24		24	96.38		30	96.42		24	0.15		30	0.15		24
8/17/2019 00:00	24		24	96.39		30	96.57		24	0.15		30	0.14		24
8/18/2019 00:00	24		24	96.39		30	96.38		24	0.15		30	0.15		24
8/19/2019 00:00	24		24	96.39		30	96.38		24	0.15		30	0.14		24
8/20/2019 00:00	24		24	96.39		30	96.41		24	0.15		30	0.15		24
8/21/2019 00:00	24		24	96.39		30	96.33		24	0.15		30	0.15		24
8/22/2019 00:00	24		24	96.39		30	96.45		24	0.15		30	0.14		24
8/23/2019 00:00	24		24	96.39		30	96.43		24	0.15		30	0.15		24
8/24/2019 00:00	24		24	96.4		30	96.62		24	0.15		30	0.13		24
8/25/2019 00:00	24		24	96.4		30	96.4		24	0.15		30	0.15		24
8/26/2019 00:00	24		24	96.4		30	96.34		24	0.15		30	0.16		24
8/27/2019 00:00	24		24	96.4		30	96.34		24	0.15		30	0.16		24
8/28/2019 00:00	24		24	96.41		30	96.61		24	0.15		30	0.14		24
8/29/2019 00:00	24		24	96.41		30	96.34		24	0.15		30	0.15		24
8/30/2019 00:00	24		24	96.41		30	96.43		24	0.15		30	0.14		24
8/31/2019 00:00	24		24	96.41		30	96.52		24	0.15		30	0.13		24

Qual Data Report

Bowen - Daily / 30-Day - Unit 2 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

9/1/2019 00:00	24		24	96.42		30	96.36		24	0.15		30	0.15		24
9/2/2019 00:00	24		24	96.43		30	96.67		24	0.15		30	0.12		24
9/3/2019 00:00	24		24	96.44		30	96.79		24	0.15		30	0.12		24
9/4/2019 00:00	24		24	96.47		30	97.13		24	0.14		30	0.11		24
9/5/2019 00:00	24		24	96.48		30	96.58		24	0.14		30	0.13		24
9/6/2019 00:00	24		24	96.49		30	96.61		24	0.14		30	0.14		24
9/7/2019 00:00	24		24	96.5		30	96.61		24	0.14		30	0.14		24
9/8/2019 00:00	24		24	96.5		30	96.59		24	0.14		30	0.13		24
9/9/2019 00:00	24		24	96.5		30	96.35		24	0.14		30	0.15		24
9/10/2019 00:00	24		24	96.49		30	96.6		24	0.14		30	0.13		24
9/11/2019 00:00	24		24	96.5		30	96.74		24	0.14		30	0.13		24
9/12/2019 00:00	24		24	96.51		30	96.54		24	0.14		30	0.14		24
9/13/2019 00:00	24		24	96.51		30	96.32		23	0.14		30	0.15		23
9/14/2019 00:00	0		24	96.51		30	0	Off	0	0.14		30	0	Off	0
9/15/2019 00:00	14		24	96.58		30	98.55		5	0.14		30	0.05		5
9/16/2019 00:00	24		24	96.58		30	96.53		24	0.14		30	0.15		24
9/17/2019 00:00	24		24	96.59		30	96.61		24	0.14		30	0.14		24
9/18/2019 00:00	24		24	96.59		30	96.63		24	0.14		30	0.14		24
9/19/2019 00:00	24		24	96.59		30	96.41		24	0.14		30	0.16		24
9/20/2019 00:00	24		24	96.59		30	96.36		24	0.14		30	0.16		24
9/21/2019 00:00	24		24	96.6		30	96.43		24	0.14		30	0.15		24
9/22/2019 00:00	24		24	96.6		30	96.51		24	0.14		30	0.14		24
9/23/2019 00:00	24		24	96.61		30	96.7		24	0.14		30	0.13		24
9/24/2019 00:00	24		24	96.6		30	96.53		24	0.14		30	0.14		24
9/25/2019 00:00	24		24	96.6		30	96.38		24	0.14		30	0.15		24
9/26/2019 00:00	24		24	96.61		30	96.5		24	0.14		30	0.14		24
9/27/2019 00:00	24		24	96.62		30	96.56		24	0.14		30	0.15		24
9/28/2019 00:00	24		24	96.61		30	96.5		24	0.14		30	0.14		24
9/29/2019 00:00	24		24	96.62		30	96.64		24	0.14		30	0.14		24
9/30/2019 00:00	24		24	96.64		30	96.86		24	0.14		30	0.13		24
10/1/2019 00:00	24		24	96.64		30	96.58		24	0.14		30	0.14		24
10/2/2019 00:00	24		24	96.65		30	96.66		24	0.14		30	0.14		24
10/3/2019 00:00	24		24	96.64		30	96.27		24	0.14		30	0.15		24
10/4/2019 00:00	24		24	96.63		30	96.6		24	0.14		30	0.14		24
10/5/2019 00:00	24		24	96.61		30	96.41		24	0.14		30	0.15		24
10/6/2019 00:00	24		24	96.6		30	96.52		24	0.14		30	0.14		24
10/7/2019 00:00	24		24	96.6		30	96.42		24	0.14		30	0.15		24
10/8/2019 00:00	24		24	96.59		30	96.38		24	0.14		30	0.14		24
10/9/2019 00:00	24		24	96.58		30	96.36		24	0.14		30	0.15		24
10/10/2019 00:00	24		24	96.59		30	96.66		24	0.14		30	0.14		23
10/11/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/12/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/13/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/14/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/15/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/16/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/17/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/18/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/19/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/20/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/21/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/22/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/23/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/24/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/25/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/26/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/27/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/28/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/29/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/30/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
10/31/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 2 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

11/1/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/2/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/3/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/4/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/5/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/6/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/7/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/8/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/9/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/10/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/11/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/12/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/13/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/14/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/15/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/16/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/17/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/18/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/19/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/20/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/21/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/22/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/23/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/24/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/25/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/26/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/27/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/28/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/29/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
11/30/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/1/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/2/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/3/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/4/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/5/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/6/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/7/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/8/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/9/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/10/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/11/2019 00:00	14		24	96.59		30	0	Off	0	0.14		30	0	Off	0
12/12/2019 00:00	14		24	96.69		30	99.52		5	0.14		30	0.02		3
12/13/2019 00:00	0		24	96.69		30	0	Off	0	0.14		30	0	Off	0
12/14/2019 00:00	4		24	96.69		30	0	Off	0	0.14		30	0	Off	0
12/15/2019 00:00	24		24	96.72		30	97.75		20	0.14		30	0.09		20
12/16/2019 00:00	24		24	96.72		30	96.47		24	0.14		30	0.16		24
12/17/2019 00:00	24		24	96.72		30	96.4		24	0.14		30	0.16		24
12/18/2019 00:00	24		24	96.65		30	96.42		24	0.14		30	0.15		24
12/19/2019 00:00	24		24	96.65		30	96.52		24	0.14		30	0.15		24
12/20/2019 00:00	24		24	96.65		30	96.4		24	0.14		30	0.15		24
12/21/2019 00:00	21		24	96.64		30	96.36		21	0.14		30	0.15		21
12/22/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/23/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/24/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/25/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/26/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/27/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/28/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/29/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/30/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
12/31/2019 00:00	0		24	96.64		30	0	Off	0	0.14		30	0	Off	0
Average with Op > 0 hours				**96.50**						**0.14**					

Qual Data Report

Bowen - Daily / 30-Day - Unit 3 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

	Op_Rpt_time - Valid Operating Hours			Removal_30Day_pct - SO2 Removal 30 Day			Removal_pct - SO2 Removal Efficiency Pct			SO2_30Day_lb_mmbtu - SO2 Rate 30 Day Average			SO2_lb_mmbtu - SO2 Rate Daily Average		
Sample Time	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**
1/1/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/2/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/3/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/4/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/5/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/6/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/7/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/8/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/9/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/10/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/11/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/12/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/13/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/14/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/15/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/16/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/17/2019 00:00	0		24	96.17		30	0	Off	0	0.15		30	0	Off	0
1/18/2019 00:00	17		24	96.21		30	97.17		17	0.14		30	0.11		17
1/19/2019 00:00	24		24	96.21		30	96.03		24	0.14		30	0.17		24
1/20/2019 00:00	24		24	96.21		30	95.95		24	0.14		30	0.17		24
1/21/2019 00:00	24		24	96.21		30	95.95		24	0.14		30	0.17		24
1/22/2019 00:00	24		24	96.2		30	95.89		24	0.15		30	0.18		24
1/23/2019 00:00	24		24	96.19		30	95.89		24	0.15		30	0.17		24
1/24/2019 00:00	24		24	96.18		30	95.93		24	0.15		30	0.17		24
1/25/2019 00:00	24		24	96.18		30	95.96		24	0.15		30	0.17		24
1/26/2019 00:00	24		24	96.17		30	96.01		24	0.15		30	0.16		24
1/27/2019 00:00	24		24	96.09		30	95.91		24	0.15		30	0.17		24
1/28/2019 00:00	24		24	96.08		30	95.92		24	0.15		30	0.17		24
1/29/2019 00:00	24		24	96.07		30	95.91		24	0.16		30	0.17		24
1/30/2019 00:00	19		24	96.09		30	96.42		14	0.16		30	0.14		14
1/31/2019 00:00	24		24	96.09		30	96		24	0.16		30	0.17		24
2/1/2019 00:00	23		24	96.1		30	96.09		22	0.16		30	0.16		22
2/2/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/3/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/4/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/5/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/6/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/7/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/8/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/9/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/10/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/11/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/12/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/13/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/14/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/15/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/16/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/17/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/18/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/19/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/20/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/21/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/22/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/23/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/24/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/25/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/26/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/27/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
2/28/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 3 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

3/1/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/2/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/3/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/4/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/5/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/6/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/7/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/8/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/9/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/10/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/11/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/12/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/13/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/14/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/15/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/16/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/17/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/18/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/19/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/20/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/21/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/22/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/23/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/24/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/25/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/26/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/27/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/28/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/29/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/30/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
3/31/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/1/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/2/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/3/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/4/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/5/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/6/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/7/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/8/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/9/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/10/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/11/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/12/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/13/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/14/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/15/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/16/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/17/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/18/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/19/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/20/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/21/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/22/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/23/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/24/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/25/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/26/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/27/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/28/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/29/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
4/30/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 3 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

5/1/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/2/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/3/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/4/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/5/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/6/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/7/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/8/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/9/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/10/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/11/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/12/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/13/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/14/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/15/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/16/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/17/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/18/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/19/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/20/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/21/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/22/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/23/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/24/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/25/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/26/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/27/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/28/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/29/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/30/2019 00:00	0		24	96.1		30	0	Off	0	0.16		30	0	Off	0
5/31/2019 00:00	1		24	96.1		30	0	Off	0	0.16		30	0	Off	0
6/1/2019 00:00	23		24	96.1		30	0	Off	0	0.16		30	0	Off	0
6/2/2019 00:00	9		24	96.21		30	99.41		7	0.15		30	0.02		7
6/3/2019 00:00	0		24	96.21		30	0	Off	0	0.15		30	0	Off	0
6/4/2019 00:00	0		24	96.21		30	0	Off	0	0.15		30	0	Off	0
6/5/2019 00:00	7		24	96.21		30	0	Off	0	0.15		30	0	Off	0
6/6/2019 00:00	7		24	96.3		30	98.64		7	0.15		30	0.06		7
6/7/2019 00:00	3		24	96.3		30	0	Off	0	0.15		30	0	Off	0
6/8/2019 00:00	1		24	96.3		30	0	Off	0	0.15		30	0	Off	0
6/9/2019 00:00	13		24	96.4		30	99.18		5	0.15		30	0.04		5
6/10/2019 00:00	24		24	96.43		30	96.99		24	0.15		30	0.13		24
6/11/2019 00:00	24		24	96.44		30	96.43		23	0.15		30	0.16		23
6/12/2019 00:00	24		24	96.45		30	96.06		24	0.15		30	0.17		24
6/13/2019 00:00	24		24	96.45		30	96.05		24	0.15		30	0.17		24
6/14/2019 00:00	24		24	96.42		30	95.45		24	0.16		30	0.21		24
6/15/2019 00:00	24		24	96.42		30	95.81		24	0.16		30	0.19		24
6/16/2019 00:00	24		24	96.41		30	95.93		24	0.16		30	0.17		24
6/17/2019 00:00	24		24	96.38		30	95.83		24	0.16		30	0.19		24
6/18/2019 00:00	24		24	96.38		30	96.03		24	0.16		30	0.16		24
6/19/2019 00:00	24		24	96.37		30	95.93		24	0.16		30	0.17		24
6/20/2019 00:00	24		24	96.36		30	95.9		24	0.16		30	0.18		24
6/21/2019 00:00	24		24	96.35		30	95.85		24	0.16		30	0.18		24
6/22/2019 00:00	24		24	96.3		30	95.5		24	0.17		30	0.2		24
6/23/2019 00:00	24		24	96.27		30	95.42		24	0.17		30	0.2		24
6/24/2019 00:00	24		24	96.27		30	95.77		24	0.17		30	0.18		24
6/25/2019 00:00	24		24	96.27		30	95.86		24	0.17		30	0.18		24
6/26/2019 00:00	24		24	96.26		30	95.77		24	0.17		30	0.19		24
6/27/2019 00:00	24		24	96.26		30	95.79		24	0.17		30	0.19		24
6/28/2019 00:00	24		24	96.26		30	96.01		24	0.17		30	0.18		24
6/29/2019 00:00	24		24	96.26		30	95.8		24	0.17		30	0.19		24
6/30/2019 00:00	24		24	96.26		30	96.01		24	0.17		30	0.18		24

Qual Data Report

Bowen - Daily / 30-Day - Unit 3 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

7/1/2019 00:00	24		24	96.26		30	95.94		24	0.17		30	0.18		24
7/2/2019 00:00	24		24	96.25		30	95.86		24	0.17		30	0.18		24
7/3/2019 00:00	24		24	96.26		30	95.92		24	0.17		30	0.18		24
7/4/2019 00:00	24		24	96.24		30	95.91		24	0.17		30	0.18		24
7/5/2019 00:00	24		24	96.24		30	95.98		24	0.17		30	0.18		24
7/6/2019 00:00	24		24	96.23		30	95.96		24	0.17		30	0.18		24
7/7/2019 00:00	24		24	96.12		30	95.95		24	0.18		30	0.17		24
7/8/2019 00:00	24		24	96.03		30	95.91		24	0.18		30	0.16		24
7/9/2019 00:00	24		24	95.92		30	95.95		24	0.18		30	0.18		24
7/10/2019 00:00	24		24	95.89		30	96.02		24	0.18		30	0.18		24
7/11/2019 00:00	15		24	95.87		30	95.91		11	0.18		30	0.18		10
7/12/2019 00:00	24		24	95.89		30	96.53		22	0.18		30	0.15		22
7/13/2019 00:00	24		24	95.88		30	95.93		24	0.18		30	0.18		24
7/14/2019 00:00	24		24	95.89		30	95.86		24	0.18		30	0.18		24
7/15/2019 00:00	24		24	95.9		30	95.91		24	0.18		30	0.18		24
7/16/2019 00:00	24		24	95.9		30	95.96		24	0.18		30	0.18		24
7/17/2019 00:00	24		24	95.9		30	95.93		24	0.18		30	0.18		24
7/18/2019 00:00	24		24	95.9		30	95.86		24	0.18		30	0.18		24
7/19/2019 00:00	24		24	95.89		30	95.81		24	0.18		30	0.19		24
7/20/2019 00:00	24		24	95.89		30	95.9		24	0.18		30	0.18		24
7/21/2019 00:00	24		24	95.89		30	95.86		24	0.18		30	0.18		24
7/22/2019 00:00	24		24	95.91		30	95.98		24	0.18		30	0.17		24
7/23/2019 00:00	24		24	95.93		30	95.93		24	0.18		30	0.18		24
7/24/2019 00:00	24		24	95.93		30	95.88		24	0.18		30	0.18		24
7/25/2019 00:00	24		24	95.93		30	95.88		24	0.18		30	0.18		24
7/26/2019 00:00	24		24	95.94		30	95.93		24	0.18		30	0.16		24
7/27/2019 00:00	24		24	95.94		30	95.93		24	0.18		30	0.16		24
7/28/2019 00:00	24		24	95.94		30	96		24	0.18		30	0.16		24
7/29/2019 00:00	24		24	95.94		30	95.86		24	0.18		30	0.18		24
7/30/2019 00:00	24		24	95.94		30	95.97		24	0.18		30	0.17		24
7/31/2019 00:00	24		24	95.94		30	96.03		24	0.17		30	0.16		24
8/1/2019 00:00	24		24	95.95		30	95.91		24	0.17		30	0.17		24
8/2/2019 00:00	24		24	95.95		30	95.92		24	0.17		30	0.18		24
8/3/2019 00:00	24		24	95.95		30	95.91		24	0.17		30	0.18		24
8/4/2019 00:00	24		24	95.95		30	95.99		24	0.17		30	0.16		24
8/5/2019 00:00	24		24	95.94		30	95.89		24	0.17		30	0.18		24
8/6/2019 00:00	24		24	95.94		30	95.98		24	0.17		30	0.16		24
8/7/2019 00:00	24		24	95.94		30	95.9		24	0.17		30	0.18		24
8/8/2019 00:00	24		24	95.95		30	96.09		24	0.17		30	0.18		24
8/9/2019 00:00	24		24	95.96		30	96.22		24	0.17		30	0.17		24
8/10/2019 00:00	24		24	95.96		30	96.07		24	0.17		30	0.18		24
8/11/2019 00:00	24		24	95.95		30	96.14		24	0.17		30	0.16		24
8/12/2019 00:00	24		24	95.95		30	96.14		24	0.17		30	0.16		24
8/13/2019 00:00	24		24	95.96		30	96.08		24	0.17		30	0.16		24
8/14/2019 00:00	24		24	95.96		30	95.98		24	0.17		30	0.18		24
8/15/2019 00:00	24		24	95.97		30	96.11		24	0.17		30	0.15		24
8/16/2019 00:00	24		24	95.97		30	96		24	0.17		30	0.17		24
8/17/2019 00:00	24		24	95.98		30	96.01		24	0.17		30	0.17		24
8/18/2019 00:00	24		24	95.98		30	95.97		24	0.17		30	0.18		24
8/19/2019 00:00	24		24	95.99		30	96.01		24	0.17		30	0.17		24
8/20/2019 00:00	24		24	95.99		30	96.1		24	0.17		30	0.17		24
8/21/2019 00:00	24		24	96		30	96.21		24	0.17		30	0.16		24
8/22/2019 00:00	23		24	96.01		30	96.17		23	0.17		30	0.15		22
8/23/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/24/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/25/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/26/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/27/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/28/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/29/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/30/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
8/31/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 3 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

9/1/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
9/2/2019 00:00	0		24	96.01		30	0	Off	0	0.17		30	0	Off	0
9/3/2019 00:00	18		24	96.14		30	99.7		7	0.17		30	0.01		7
9/4/2019 00:00	24		24	96.15		30	96.18		24	0.17		30	0.14		24
9/5/2019 00:00	24		24	96.15		30	95.98		24	0.17		30	0.16		24
9/6/2019 00:00	24		24	96.15		30	96.01		24	0.17		30	0.16		24
9/7/2019 00:00	24		24	96.15		30	96.07		24	0.17		30	0.17		24
9/8/2019 00:00	24		24	96.16		30	95.97		24	0.17		30	0.16		24
9/9/2019 00:00	24		24	96.16		30	96		24	0.16		30	0.16		24
9/10/2019 00:00	24		24	96.16		30	96.04		24	0.16		30	0.16		24
9/11/2019 00:00	24		24	96.16		30	96.06		24	0.16		30	0.16		24
9/12/2019 00:00	24		24	96.17		30	96.07		24	0.16		30	0.17		24
9/13/2019 00:00	24		24	96.17		30	95.9		24	0.16		30	0.17		24
9/14/2019 00:00	24		24	96.16		30	95.88		24	0.16		30	0.18		24
9/15/2019 00:00	24		24	96.17		30	95.91		24	0.16		30	0.16		24
9/16/2019 00:00	24		24	96.16		30	95.81		24	0.16		30	0.18		24
9/17/2019 00:00	24		24	96.16		30	95.87		24	0.16		30	0.18		24
9/18/2019 00:00	24		24	96.16		30	95.99		24	0.16		30	0.18		24
9/19/2019 00:00	24		24	96.15		30	95.98		24	0.16		30	0.18		24
9/20/2019 00:00	24		24	96.14		30	95.89		24	0.16		30	0.18		24
9/21/2019 00:00	24		24	96.14		30	95.98		24	0.17		30	0.18		24
9/22/2019 00:00	24		24	96.12		30	95.59		24	0.17		30	0.18		24
9/23/2019 00:00	18		24	96.11		30	95.76		18	0.17		30	0.18		17
9/24/2019 00:00	0		24	96.11		30	0	Off	0	0.17		30	0	Off	0
9/25/2019 00:00	0		24	96.11		30	0	Off	0	0.17		30	0	Off	0
9/26/2019 00:00	23		24	96.1		30	95.85		13	0.17		30	0.18		13
9/27/2019 00:00	24		24	95.49		30	95.85		24	0.17		30	0.19		24
9/28/2019 00:00	24		24	95.49		30	95.8		24	0.17		30	0.18		24
9/29/2019 00:00	24		24	95.48		30	95.9		24	0.17		30	0.17		24
9/30/2019 00:00	24		24	95.48		30	95.87		24	0.17		30	0.17		24
10/1/2019 00:00	24		24	95.48		30	96.03		24	0.17		30	0.17		24
10/2/2019 00:00	24		24	95.48		30	95.97		24	0.17		30	0.17		24
10/3/2019 00:00	24		24	95.47		30	95.99		24	0.17		30	0.16		24
10/4/2019 00:00	24		24	95.46		30	96.01		24	0.17		30	0.17		24
10/5/2019 00:00	24		24	95.34		30	95.98		24	0.17		30	0.17		24
10/6/2019 00:00	24		24	95.34		30	96.02		24	0.17		30	0.17		24
10/7/2019 00:00	24		24	95.33		30	95.93		24	0.17		30	0.17		24
10/8/2019 00:00	24		24	95.33		30	95.94		24	0.17		30	0.17		24
10/9/2019 00:00	24		24	95.33		30	96.01		24	0.17		30	0.17		24
10/10/2019 00:00	24		24	95.31		30	95.49		24	0.17		30	0.2		24
10/11/2019 00:00	24		24	95.31		30	95.89		24	0.17		30	0.19		24
10/12/2019 00:00	24		24	95.3		30	95.89		22	0.18		30	0.19		21
10/13/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/14/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/15/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/16/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/17/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/18/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/19/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/20/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/21/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/22/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/23/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/24/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/25/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/26/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/27/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/28/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/29/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/30/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
10/31/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 3 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

11/1/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/2/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/3/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/4/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/5/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/6/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/7/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/8/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/9/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/10/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/11/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/12/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/13/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/14/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/15/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/16/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/17/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/18/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/19/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/20/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/21/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/22/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/23/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/24/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/25/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/26/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/27/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/28/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/29/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
11/30/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/1/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/2/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/3/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/4/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/5/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/6/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/7/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/8/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/9/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/10/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/11/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/12/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/13/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/14/2019 00:00	0		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/15/2019 00:00	8		24	95.3		30	0	Off	0	0.18		30	0	Off	0
12/16/2019 00:00	24		24	95.35		30	97.52		8	0.17		30	0.11		14
12/17/2019 00:00	24		24	95.38		30	96.94		22	0.17		30	0.13		24
12/18/2019 00:00	24		24	95.42		30	96.95		24	0.17		30	0.13		24
12/19/2019 00:00	24		24	95.46		30	97.01		24	0.17		30	0.12		24
12/20/2019 00:00	24		24	95.49		30	96.93		24	0.17		30	0.12		24
12/21/2019 00:00	1		24	95.51		30	96.47		1	0.17		30	0	Off	0
12/22/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/23/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/24/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/25/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/26/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/27/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/28/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/29/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/30/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
12/31/2019 00:00	0		24	95.51		30	0	Off	0	0.17		30	0	Off	0
Average with Op > 0 hours				96.0						0.17					

Qual Data Report

Bowen - Daily / 30-Day - Unit 4 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

	Op_Rpt_time - Valid Operating Hours			Removal_30Day_pct - SO2 Removal 30 Day			Removal_pct - SO2 Removal Efficiency Pct			SO2_30Day_lb_mmbtu - SO2 Rate 30 Day Average			SO2_lb_mmbtu - SO2 Rate Daily Average		
Sample Time	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**	**Value**	**Flag**	**Smps**
1/1/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/2/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/3/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/4/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/5/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/6/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/7/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/8/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/9/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/10/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/11/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/12/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/13/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/14/2019 00:00	0		24	96.49		30	0	Off	0	0.14		30	0	Off	0
1/15/2019 00:00	13		24	96.53		30	97.42		13	0.14		30	0.1		13
1/16/2019 00:00	24		24	96.54		30	96.42		24	0.14		30	0.15		24
1/17/2019 00:00	4		24	96.56		30	97.11		4	0.14		30	0.12		4
1/18/2019 00:00	0		24	96.56		30	0	Off	0	0.14		30	0	Off	0
1/19/2019 00:00	7		24	96.63		30	98.46		7	0.13		30	0.06		7
1/20/2019 00:00	24		24	96.65		30	96.92		24	0.13		30	0.13		24
1/21/2019 00:00	18		24	96.65		30	96.35		18	0.13		30	0.16		18
1/22/2019 00:00	0		24	96.65		30	0	Off	0	0.13		30	0	Off	0
1/23/2019 00:00	8		24	96.7		30	97.69		8	0.13		30	0.1		8
1/24/2019 00:00	24		24	96.7		30	96.35		24	0.13		30	0.16		24
1/25/2019 00:00	24		24	96.7		30	96.37		24	0.14		30	0.16		24
1/26/2019 00:00	24		24	96.7		30	96.34		24	0.14		30	0.16		24
1/27/2019 00:00	24		24	96.69		30	96.31		24	0.14		30	0.16		24
1/28/2019 00:00	24		24	96.69		30	96.32		24	0.14		30	0.16		24
1/29/2019 00:00	24		24	96.69		30	96.31		24	0.14		30	0.16		24
1/30/2019 00:00	24		24	96.69		30	96.29		24	0.14		30	0.16		24
1/31/2019 00:00	24		24	96.7		30	96.33		24	0.14		30	0.15		24
2/1/2019 00:00	24		24	96.7		30	96.34		24	0.14		30	0.14		24
2/2/2019 00:00	5		24	96.59		30	96.29		5	0.14		30	0.15		5
2/3/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/4/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/5/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/6/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/7/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/8/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/9/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/10/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/11/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/12/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/13/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/14/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/15/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/16/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/17/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/18/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/19/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/20/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/21/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/22/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/23/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/24/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/25/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/26/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/27/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
2/28/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 4 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

3/1/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
3/2/2019 00:00	0		24	96.59		30	0	Off	0	0.14		30	0	Off	0
3/3/2019 00:00	3		24	96.59		30	0	Off	0	0.14		30	0	Off	0
3/4/2019 00:00	24		24	96.53		30	95.32		13	0.15		30	0.19		13
3/5/2019 00:00	24		24	96.53		30	96.23		24	0.15		30	0.16		24
3/6/2019 00:00	24		24	96.52		30	96.31		24	0.15		30	0.16		24
3/7/2019 00:00	24		24	96.52		30	96.38		24	0.15		30	0.16		24
3/8/2019 00:00	1		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/9/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/10/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/11/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/12/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/13/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/14/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/15/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/16/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/17/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/18/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/19/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/20/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/21/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/22/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/23/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/24/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/25/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/26/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/27/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/28/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/29/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/30/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
3/31/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/1/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/2/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/3/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/4/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/5/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/6/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/7/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/8/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/9/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/10/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/11/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/12/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/13/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/14/2019 00:00	0		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/15/2019 00:00	18		24	96.52		30	0	Off	0	0.15		30	0	Off	0
4/16/2019 00:00	24		24	96.59		30	98.39		17	0.15		30	0.06		17
4/17/2019 00:00	24		24	96.6		30	96.35		24	0.15		30	0.16		24
4/18/2019 00:00	24		24	96.6		30	96.49		24	0.15		30	0.15		24
4/19/2019 00:00	24		24	96.6		30	96.56		24	0.15		30	0.14		24
4/20/2019 00:00	24		24	96.6		30	96.41		24	0.15		30	0.15		24
4/21/2019 00:00	24		24	96.59		30	96.35		24	0.15		30	0.16		24
4/22/2019 00:00	24		24	96.59		30	96.32		24	0.15		30	0.16		24
4/23/2019 00:00	24		24	96.58		30	96.3		24	0.15		30	0.16		24
4/24/2019 00:00	24		24	96.58		30	96.39		24	0.15		30	0.16		24
4/25/2019 00:00	24		24	96.54		30	96.32		24	0.15		30	0.16		24
4/26/2019 00:00	24		24	96.54		30	96.38		24	0.15		30	0.16		24
4/27/2019 00:00	24		24	96.52		30	96.33		24	0.15		30	0.16		24
4/28/2019 00:00	24		24	96.45		30	96.34		24	0.15		30	0.16		24
4/29/2019 00:00	24		24	96.43		30	96.35		24	0.16		30	0.16		24
4/30/2019 00:00	24		24	96.43		30	96.4		24	0.16		30	0.16		24

Qual Data Report

Bowen - Daily / 30-Day - Unit 4 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

5/1/2019 00:00	24		24	96.38		30	96.37		24	0.16		30	0.16		24
5/2/2019 00:00	24		24	96.38		30	96.35		24	0.16		30	0.16		24
5/3/2019 00:00	24		24	96.39		30	96.4		24	0.16		30	0.15		24
5/4/2019 00:00	24		24	96.39		30	96.35		24	0.16		30	0.15		24
5/5/2019 00:00	24		24	96.39		30	96.35		24	0.16		30	0.16		24
5/6/2019 00:00	24		24	96.39		30	96.46		24	0.15		30	0.16		24
5/7/2019 00:00	24		24	96.4		30	96.43		24	0.15		30	0.15		24
5/8/2019 00:00	24		24	96.4		30	96.5		24	0.15		30	0.15		24
5/9/2019 00:00	24		24	96.41		30	96.42		24	0.15		30	0.15		24
5/10/2019 00:00	24		24	96.41		30	96.42		24	0.15		30	0.15		24
5/11/2019 00:00	24		24	96.42		30	96.53		24	0.15		30	0.15		24
5/12/2019 00:00	24		24	96.46		30	96.71		24	0.15		30	0.14		24
5/13/2019 00:00	24		24	96.47		30	96.53		24	0.15		30	0.14		24
5/14/2019 00:00	24		24	96.48		30	96.44		24	0.15		30	0.15		24
5/15/2019 00:00	24		24	96.48		30	96.38		5	0.15		30	0.16		5
5/16/2019 00:00	24		24	96.48		30	0	Off	0	0.15		30	0	Off	0
5/17/2019 00:00	24		24	96.48		30	0	Off	0	0.14		30	0	Off	0
5/18/2019 00:00	24		24	96.48		30	0	Off	0	0.13		30	0	Off	0
5/19/2019 00:00	24		24	96.41		30	96.37		8	0.13		30	0.15		8
5/20/2019 00:00	24		24	96.41		30	96.46		24	0.13		30	0.14		24
5/21/2019 00:00	24		24	96.41		30	96.35		24	0.13		30	0.15		24
5/22/2019 00:00	24		24	96.4		30	96.36		24	0.13		30	0.15		24
5/23/2019 00:00	24		24	96.4		30	96.31		24	0.13		30	0.16		24
5/24/2019 00:00	24		24	96.4		30	96.3		24	0.13		30	0.16		24
5/25/2019 00:00	24		24	96.4		30	96.33		24	0.13		30	0.16		24
5/26/2019 00:00	24		24	96.4		30	96.34		24	0.13		30	0.16		24
5/27/2019 00:00	24		24	96.4		30	96.32		24	0.13		30	0.16		24
5/28/2019 00:00	24		24	96.4		30	96.32		24	0.13		30	0.16		24
5/29/2019 00:00	24		24	96.42		30	96.36		24	0.15		30	0.16		24
5/30/2019 00:00	24		24	96.41		30	96.35		24	0.15		30	0.16		24
5/31/2019 00:00	24		24	96.4		30	96.32		23	0.13		30	0.16		23
6/1/2019 00:00	24		24	96.42		30	96.4		24	0.15		30	0.16		24
6/2/2019 00:00	24		24	96.42		30	96.54		24	0.15		30	0.15		24
6/3/2019 00:00	24		24	96.43		30	96.43		24	0.15		30	0.16		24
6/4/2019 00:00	24		24	96.43		30	96.5		24	0.15		30	0.16		24
6/5/2019 00:00	24		24	96.43		30	96.37		24	0.15		30	0.16		24
6/6/2019 00:00	24		24	96.43		30	96.41		24	0.15		30	0.16		24
6/7/2019 00:00	24		24	96.42		30	96.32		24	0.15		30	0.16		24
6/8/2019 00:00	24		24	96.42		30	96.37		24	0.15		30	0.14		24
6/9/2019 00:00	24		24	96.4		30	96.36		24	0.13		30	0.14		24
6/10/2019 00:00	24		24	96.41		30	96.36		24	0.15		30	0.15		24
6/11/2019 00:00	23		24	96.4		30	96.42		23	0.13		30	0.15		22
6/12/2019 00:00	0		24	96.4		30	0	Off	0	0.13		30	0	Off	0
6/13/2019 00:00	0		24	96.4		30	0	Off	0	0.13		30	0	Off	0
6/14/2019 00:00	0		24	96.4		30	0			0.15		30	0	Off	0
6/15/2019 00:00	0		24	96.4		30	0			0.15		30	0	Off	0
6/16/2019 00:00	0		24	96.4		30	0			0.15		30	0	Off	0
6/17/2019 00:00	0		24	96.4		30	0			0.15		30	0	Off	0
6/18/2019 00:00	12		24	96.45		30	97.94		4	0.15		30	0.08		4
6/19/2019 00:00	24		24	96.45		30	96.45		24	0.15		30	0.14		24
6/20/2019 00:00	24		24	96.45		30	96.35		24	0.15		30	0.16		24
6/21/2019 00:00	24		24	96.44		30	96.37		24	0.15		30	0.16		24
6/22/2019 00:00	18		24	96.45		30	96.93		11	0.14		30	0.13		10
6/23/2019 00:00	24		24	96.44		30	96.28		24	0.15		30	0.16		24
6/24/2019 00:00	24		24	96.45		30	96.31		24	0.15		30	0.16		24
6/25/2019 00:00	24		24	96.44		30	96.36		24	0.15		30	0.16		24
6/26/2019 00:00	24		24	96.44		30	96.32		24	0.15		30	0.16		24
6/27/2019 00:00	24		24	96.44		30	96.3		24	0.15		30	0.16		24
6/28/2019 00:00	24		24	96.44		30	96.45		24	0.15		30	0.16		24
6/29/2019 00:00	24		24	96.45		30	96.39		24	0.15		30	0.16		24
6/30/2019 00:00	24		24	96.45		30	96.48		22	0.15		30	0.15		22

Qual Data Report

Bowen - Daily / 30-Day - Unit 4 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

7/1/2019 00:00	24		24	96.45		30	96.35		24	0.15		30	0.16		24
7/2/2019 00:00	24		24	96.46		30	96.43		24	0.15		30	0.16		24
7/3/2019 00:00	24		24	96.46		30	96.31		24	0.15		30	0.16		24
7/4/2019 00:00	24		24	96.46		30	96.39		24	0.15		30	0.16		24
7/5/2019 00:00	24		24	96.46		30	96.37		24	0.15		30	0.16		24
7/6/2019 00:00	24		24	96.45		30	96.37		24	0.15		30	0.16		24
7/7/2019 00:00	24		24	96.45		30	96.36		24	0.15		30	0.15		24
7/8/2019 00:00	24		24	96.45		30	96.48		24	0.15		30	0.15		24
7/9/2019 00:00	24		24	96.45		30	96.42		24	0.15		30	0.16		24
7/10/2019 00:00	24		24	96.45		30	96.42		24	0.15		30	0.16		24
7/11/2019 00:00	24		24	96.45		30	96.41		24	0.15		30	0.16		24
7/12/2019 00:00	24		24	96.45		30	96.53		24	0.15		30	0.15		24
7/13/2019 00:00	24		24	96.46		30	96.43		24	0.15		30	0.16		24
7/14/2019 00:00	24		24	96.46		30	96.37		24	0.15		30	0.16		24
7/15/2019 00:00	24		24	96.46		30	96.57		24	0.16		30	0.15		24
7/16/2019 00:00	24		24	96.47		30	96.48		24	0.16		30	0.16		24
7/17/2019 00:00	24		24	96.47		30	96.37		24	0.16		30	0.16		24
7/18/2019 00:00	24		24	96.41		30	96.35		24	0.16		30	0.16		24
7/19/2019 00:00	24		24	96.41		30	96.4		24	0.16		30	0.16		24
7/20/2019 00:00	24		24	96.42		30	96.45		24	0.16		30	0.16		24
7/21/2019 00:00	24		24	96.42		30	96.45		24	0.16		30	0.15		24
7/22/2019 00:00	24		24	96.4		30	96.38		24	0.16		30	0.15		24
7/23/2019 00:00	24		24	96.4		30	96.34		24	0.16		30	0.16		24
7/24/2019 00:00	24		24	96.4		30	96.37		24	0.16		30	0.16		24
7/25/2019 00:00	24		24	96.4		30	96.37		24	0.16		30	0.16		24
7/26/2019 00:00	23		24	96.41		30	96.37		23	0.16		30	0.14		23
7/27/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
7/28/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
7/29/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
7/30/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
7/31/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
8/1/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
8/2/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
8/3/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
8/4/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
8/5/2019 00:00	0		24	96.41		30	0	Off	0	0.16		30	0	Off	0
8/6/2019 00:00	20		24	96.44		30	97.42		10	0.16		30	0.1		10
8/7/2019 00:00	24		24	96.45		30	96.66		24	0.15		30	0.14		24
8/8/2019 00:00	24		24	96.45		30	96.43		24	0.15		30	0.15		24
8/9/2019 00:00	24		24	96.45		30	96.3		24	0.15		30	0.16		24
8/10/2019 00:00	24		24	96.44		30	96.26		24	0.16		30	0.17		24
8/11/2019 00:00	24		24	96.44		30	96.34		24	0.15		30	0.14		24
8/12/2019 00:00	24		24	96.44		30	96.4		24	0.15		30	0.15		24
8/13/2019 00:00	24		24	96.44		30	96.47		24	0.15		30	0.14		24
8/14/2019 00:00	24		24	96.43		30	95.79		24	0.15		30	0.17		24
8/15/2019 00:00	24		24	96.42		30	96.06		24	0.15		30	0.15		24
8/16/2019 00:00	24		24	96.4		30	95.87		24	0.15		30	0.17		24
8/17/2019 00:00	24		24	96.39		30	96.18		24	0.15		30	0.16		24
8/18/2019 00:00	24		24	96.39		30	96.53		24	0.15		30	0.15		24
8/19/2019 00:00	24		24	96.39		30	96.43		24	0.15		30	0.14		24
8/20/2019 00:00	24		24	96.4		30	96.64		24	0.15		30	0.14		24
8/21/2019 00:00	24		24	96.4		30	96.41		24	0.15		30	0.15		24
8/22/2019 00:00	24		24	96.4		30	96.56		24	0.15		30	0.13		24
8/23/2019 00:00	24		24	96.4		30	96.46		24	0.15		30	0.14		24
8/24/2019 00:00	24		24	96.4		30	96.48		24	0.15		30	0.13		24
8/25/2019 00:00	24		24	96.4		30	96.41		24	0.15		30	0.15		24
8/26/2019 00:00	23		24	96.4		30	96.42		23	0.15		30	0.15		23
8/27/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0
8/28/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0
8/29/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0
8/30/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0
8/31/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0

Qual Data Report

Bowen - Daily / 30-Day - Unit 4 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

9/1/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0
9/2/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0
9/3/2019 00:00	0		24	96.4		30	0	Off	0	0.15		30	0	Off	0
9/4/2019 00:00	7		24	96.4		30	0	Off	0	0.15		30	0	Off	0
9/5/2019 00:00	24		24	96.43		30	97.21		24	0.15		30	0.11		24
9/6/2019 00:00	24		24	96.43		30	96.52		24	0.15		30	0.14		24
9/7/2019 00:00	24		24	96.43		30	96.5		24	0.15		30	0.14		24
9/8/2019 00:00	24		24	96.43		30	96.41		24	0.15		30	0.14		24
9/9/2019 00:00	24		24	96.44		30	96.48		24	0.15		30	0.14		24
9/10/2019 00:00	24		24	96.44		30	96.54		24	0.14		30	0.13		24
9/11/2019 00:00	24		24	96.45		30	96.51		24	0.14		30	0.14		24
9/12/2019 00:00	24		24	96.46		30	96.62		24	0.14		30	0.14		24
9/13/2019 00:00	24		24	96.46		30	96.41		23	0.14		30	0.15		23
9/14/2019 00:00	24		24	96.43		30	96.45		24	0.14		30	0.15		24
9/15/2019 00:00	24		24	96.41		30	96.28		24	0.14		30	0.14		24
9/16/2019 00:00	24		24	96.41		30	96.46		24	0.14		30	0.15		24
9/17/2019 00:00	24		24	96.42		30	96.44		24	0.14		30	0.15		24
9/18/2019 00:00	24		24	96.43		30	96.7		24	0.14		30	0.14		24
9/19/2019 00:00	9		24	96.44		30	96.55		9	0.14		30	0.15		8
9/20/2019 00:00	0		24	96.44		30	0	Off	0	0.14		30	0	Off	0
9/21/2019 00:00	0		24	96.44		30	0	Off	0	0.14		30	0	Off	0
9/22/2019 00:00	24		24	96.48		30	97.56		16	0.14		30	0.1		16
9/23/2019 00:00	24		24	96.49		30	96.9		24	0.14		30	0.13		24
9/24/2019 00:00	24		24	96.51		30	96.37		24	0.14		30	0.15		24
9/25/2019 00:00	24		24	96.52		30	96.39		24	0.14		30	0.15		24
9/26/2019 00:00	24		24	96.54		30	96.51		24	0.14		30	0.14		24
9/27/2019 00:00	24		24	96.55		30	96.48		24	0.14		30	0.15		24
9/28/2019 00:00	24		24	96.55		30	96.47		24	0.14		30	0.15		24
9/29/2019 00:00	24		24	96.55		30	96.43		24	0.14		30	0.15		24
9/30/2019 00:00	24		24	96.55		30	96.53		24	0.14		30	0.14		24
10/1/2019 00:00	24		24	96.55		30	96.54		24	0.14		30	0.14		24
10/2/2019 00:00	24		24	96.55		30	96.58		24	0.14		30	0.14		24
10/3/2019 00:00	24		24	96.55		30	96.4		24	0.14		30	0.15		24
10/4/2019 00:00	24		24	96.55		30	96.48		24	0.14		30	0.15		24
10/5/2019 00:00	24		24	96.55		30	96.44		24	0.14		30	0.15		24
10/6/2019 00:00	24		24	96.57		30	96.87		24	0.14		30	0.13		24
10/7/2019 00:00	24		24	96.54		30	96.48		24	0.14		30	0.15		24
10/8/2019 00:00	24		24	96.54		30	96.48		24	0.14		30	0.14		24
10/9/2019 00:00	24		24	96.55		30	96.61		24	0.14		30	0.14		24
10/10/2019 00:00	24		24	96.55		30	96.57		24	0.14		30	0.15		24
10/11/2019 00:00	24		24	96.55		30	96.48		24	0.14		30	0.16		24
10/12/2019 00:00	24		24	96.55		30	96.46		23	0.14		30	0.16		23
10/13/2019 00:00	24		24	96.55		30	96.45		24	0.14		30	0.15		24
10/14/2019 00:00	24		24	96.54		30	96.39		24	0.15		30	0.16		24
10/15/2019 00:00	24		24	96.54		30	96.39		24	0.15		30	0.14		24
10/16/2019 00:00	8		24	96.53		30	96.32		8	0.14		30	0.15		7
10/17/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/18/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/19/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/20/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/21/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/22/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/23/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/24/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/25/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/26/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/27/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/28/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/29/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/30/2019 00:00	0		24	96.53		30	0	Off	0	0.14		30	0	Off	0
10/31/2019 00:00	16		24	95.22		30	56.97		7	0.14		30	0.01		4

Qual Data Report

Bowen - Daily / 30-Day - Unit 4 FGD - Daily / 30-Day

Location: 317 Covered Bridge Rd, Cartersville, GA 30120

Report Period: 1/1/2019 to 12/31/2019

11/1/2019 00:00	24		24	95.25		30	97.38		24	0.14		30	0.11		24
11/2/2019 00:00	24		24	95.26		30	96.7		24	0.14		30	0.13		24
11/3/2019 00:00	24		24	95.25		30	96.39		24	0.14		30	0.16		24
11/4/2019 00:00	24		24	95.27		30	97.02		24	0.14		30	0.13		24
11/5/2019 00:00	24		24	95.26		30	97.25		24	0.14		30	0.13		24
11/6/2019 00:00	24		24	95.27		30	97.27		24	0.14		30	0.12		24
11/7/2019 00:00	24		24	95.3		30	97.28		24	0.14		30	0.11		24
11/8/2019 00:00	24		24	95.33		30	97.3		24	0.14		30	0.11		24
11/9/2019 00:00	24		24	95.36		30	97.28		24	0.14		30	0.12		24
11/10/2019 00:00	24		24	95.38		30	97.28		24	0.14		30	0.12		24
11/11/2019 00:00	24		24	95.4		30	97.01		24	0.14		30	0.13		24
11/12/2019 00:00	24		24	95.43		30	97.43		24	0.14		30	0.11		24
11/13/2019 00:00	24		24	95.46		30	97.42		24	0.13		30	0.11		24
11/14/2019 00:00	24		24	95.49		30	97.36		24	0.13		30	0.11		24
11/15/2019 00:00	24		24	95.52		30	97.43		24	0.13		30	0.11		24
11/16/2019 00:00	24		24	95.55		30	97.31		24	0.13		30	0.11		24
11/17/2019 00:00	24		24	95.58		30	97.27		24	0.13		30	0.12		24
11/18/2019 00:00	24		24	95.6		30	97.27		24	0.13		30	0.12		24
11/19/2019 00:00	24		24	95.62		30	97.27		24	0.13		30	0.12		24
11/20/2019 00:00	24		24	95.64		30	97.24		24	0.13		30	0.12		24
11/21/2019 00:00	24		24	95.67		30	97.27		24	0.13		30	0.12		24
11/22/2019 00:00	24		24	95.69		30	97.26		22	0.13		30	0.12		22
11/23/2019 00:00	24		24	95.71		30	97.29		24	0.12		30	0.12		24
11/24/2019 00:00	24		24	95.74		30	97.22		24	0.12		30	0.12		24
11/25/2019 00:00	24		24	95.77		30	97.47		24	0.12		30	0.11		24
11/26/2019 00:00	24		24	95.8		30	97.26		24	0.12		30	0.12		24
11/27/2019 00:00	24		24	95.83		30	97.3		24	0.12		30	0.12		24
11/28/2019 00:00	24		24	95.86		30	97.26		24	0.12		30	0.12		24
11/29/2019 00:00	24		24	95.89		30	97.27		24	0.12		30	0.12		24
11/30/2019 00:00	24		24	97.23		30	97.28		24	0.12		30	0.12		24
12/1/2019 00:00	24		24	97.22		30	96.93		24	0.12		30	0.12		24
12/2/2019 00:00	24		24	97.21		30	96.34		24	0.12		30	0.15		24
12/3/2019 00:00	24		24	97.2		30	96.26		24	0.12		30	0.16		24
12/4/2019 00:00	24		24	97.18		30	96.33		24	0.12		30	0.17		24
12/5/2019 00:00	24		24	97.15		30	96.3		24	0.12		30	0.16		24
12/6/2019 00:00	24		24	97.12		30	96.31		24	0.12		30	0.16		24
12/7/2019 00:00	24		24	97.08		30	96.29		24	0.13		30	0.17		24
12/8/2019 00:00	24		24	97.05		30	96.27		24	0.13		30	0.17		24
12/9/2019 00:00	24		24	97.02		30	96.31		24	0.13		30	0.16		24
12/10/2019 00:00	24		24	96.98		30	96.31		24	0.13		30	0.16		24
12/11/2019 00:00	24		24	96.96		30	96.37		24	0.13		30	0.16		24
12/12/2019 00:00	24		24	96.93		30	96.32		24	0.13		30	0.17		24
12/13/2019 00:00	24		24	96.89		30	96.39		24	0.14		30	0.17		24
12/14/2019 00:00	24		24	96.86		30	96.3		24	0.14		30	0.16		24
12/15/2019 00:00	24		24	96.82		30	96.28		24	0.14		30	0.16		24
12/16/2019 00:00	24		24	96.78		30	96.29		24	0.14		30	0.17		24
12/17/2019 00:00	24		24	96.75		30	96.2		24	0.14		30	0.17		24
12/18/2019 00:00	24		24	96.72		30	96.44		24	0.14		30	0.15		24
12/19/2019 00:00	24		24	96.69		30	96.48		24	0.14		30	0.15		24
12/20/2019 00:00	24		24	96.67		30	96.43		24	0.15		30	0.14		24
12/21/2019 00:00	24		24	96.64		30	96.35		24	0.15		30	0.15		24
12/22/2019 00:00	24		24	96.61		30	96.36		24	0.15		30	0.16		24
12/23/2019 00:00	24		24	96.58		30	96.44		24	0.15		30	0.14		24
12/24/2019 00:00	24		24	96.55		30	96.43		22	0.15		30	0.14		24
12/25/2019 00:00	24		24	96.51		30	96.3		24	0.15		30	0.15		24
12/26/2019 00:00	24		24	96.48		30	96.27		24	0.15		30	0.16		24
12/27/2019 00:00	24		24	96.45		30	96.29		24	0.15		30	0.17		24
12/28/2019 00:00	24		24	96.42		30	96.32		24	0.15		30	0.16		24
12/29/2019 00:00	24		24	96.38		30	96.33		24	0.16		30	0.16		24
12/30/2019 00:00	24		24	96.35		30	96.37		24	0.16		30	0.16		24
12/31/2019 00:00	1		24	96.34		30	96.61		1	0.16		30	0	Off	0
Average with Op > 0 hours				96.4						0.14					

2019 Resource Ledger - Base Case Existing & Committed Generating Unit Data
Georgia Power Company

Type	Unit Name	Ownership	Retail Capacity (MW)	In-Service Year	Retirement Year* (Mix Study)
Nuclear	HATCH 1	50.1%	438.9	1975	2035
	HATCH 2	50.1%	442.4	1979	2038
	VOGTLE 1	50.7%	538.6	1987	2047
	VOGTLE 2	50.7%	539.5	1989	2049
	VOGTLE 3	45.7%	503.6	2021	CTO
	VOGTLE 4	45.7%	503.6	2022	CTO
Coal	BOWEN 1	100.0%	724.0	1971	CTO
	BOWEN 2	100.0%	724.0	1972	CTO
	BOWEN 3	100.0%	892.0	1974	CTO
	BOWEN 4	100.0%	892.0	1975	CTO
	SCHERER 1	8.4%	72.2	1982	CTO
	SCHERER 2	8.4%	72.2	1984	CTO
	SCHERER 3	75.0%	503.7	1987	CTO
	WANSLEY 1	53.5%	466.5	1976	CTO
	WANSLEY 2	53.5%	466.5	1978	CTO
Combined Cycle	MCDONOUGH 4	100.0%	821.0	2012	CTO
	MCDONOUGH 5	100.0%	823.0	2012	CTO
	MCDONOUGH 6	100.0%	826.0	2012	CTO
	MCINTOSH 10	100.0%	661.0	2005	CTO
	MCINTOSH 11	100.0%	657.6	2005	CTO
Oil/Gas Steam	GASTON 1 GAS	50.0%	114.5	2015	CTO
	GASTON 2 GAS	50.0%	115.4	2015	CTO
	GASTON 3 GAS	50.0%	114.5	2016	CTO
	GASTON 4 GAS	50.0%	115.2	2015	CTO
	YATES 6 GAS	100.0%	322.7	2015	CTO
	YATES 7 GAS	100.0%	325.7	2015	CTO
Combustion Turbine	BOULEVARD 1	100.0%	14.0	1970	CTO
	GASTON A	50.0%	7.7	1970	CTO
	MCDONOUGH 3A	100.0%	-	1971	CTO
	MCDONOUGH 3B	100.0%	-	1971	CTO
	MCINTOSH 1	100.0%	82.2	1995	CTO
	MCINTOSH 2	100.0%	82.2	1995	CTO
	MCINTOSH 3	100.0%	82.2	1994	CTO
	MCINTOSH 4	100.0%	82.2	1994	CTO
	MCINTOSH 5	100.0%	82.2	1994	CTO
	MCINTOSH 6	100.0%	82.2	1994	CTO
	MCINTOSH 7	100.0%	82.2	1994	CTO
	MCINTOSH 8	100.0%	82.2	1994	CTO
	MCMANUS 3A	100.0%	44.4	1972	CTO
	MCMANUS 3B	100.0%	44.4	1972	CTO
	MCMANUS 3C	100.0%	44.4	1972	CTO
	MCMANUS 4A	100.0%	44.4	1972	CTO

* CTO denotes that for thermal units remaining available, the units would continue to operate throughout the planning period.
**Solar reflects Support Capacity Adjustment per the RCB Framework and summer combustion turbine equivalence.

EPA Air Markets Program Data (AMPD) Query for Plant Bowen, All Programs, Monitoring Location, 2019. Available at https://ampd.epa.gov/ampd/

State	Facility Name	Facility ID (ORISPL)	Stack/Unit/Pipe ID	Associated Units	Year	Program(s)	Operating Time	SO2 (tons)	Avg. NOx Rate (lb/MMBtu)	NOx (tons)	CO2 (short tons)	Heat Input (MMBtu)
GA	Bowen	703	1BLR		2019	ARP, CSNOX, CSOSG1, CSSO2G2, MATS	6,864					37,995,213
GA	Bowen	703	2BLR		2019	ARP, CSNOX, CSOSG1, CSSO2G2, MATS	5,038					24,257,186
GA	Bowen	703	3BLR		2019	ARP, CSNOX, CSOSG1, CSSO2G2, MATS	3,218					20,413,399
GA	Bowen	703	4BLR		2019	ARP, CSNOX, CSOSG1, CSSO2G2, MATS	5,643					36,206,972
GA	Bowen	703	MS1BYP	1BLR	2019		0					
GA	Bowen	703	MS1FGD	1BLR	2019		6,864	3,026	0	1,994	3,898,309	37,995,217
GA	Bowen	703	MS2BYP	2BLR	2019		0					
GA	Bowen	703	MS2FGD	2BLR	2019		5,038	1,778	0	1,029	2,488,784	24,257,188
GA	Bowen	703	MS3BYP	3BLR	2019		0					
GA	Bowen	703	MS3FGD	3BLR	2019		3,218	1,749	0	874	2,094,415	20,413,398
GA	Bowen	703	MS4BYP	4BLR	2019		0					
GA	Bowen	703	MS4FGD	4BLR	2019		5,643	2,678	0	1,835	3,714,830	36,206,975
						Plant Bowen Annual Totals	**20,763**	**9,231**	**0**	**5,732**	**12,196,339**	**118,872,778**

U.S. Department of Energy, The Energy Information Administration (EIA)
EIA-923 Monthly Generating Unit Net Generation Time Series File, 2019 Final
Sources: EIA-923 and EIA-860 Reports

												(MWh)	
Plant Id	Combined Heat And Power Plant	Plant Name	Operator Name	Operator Id	Plant State	Census Region	NERC Region	NAICS Code	Sector Number	Sector Name	Generator Id	Net Generation Year To Date	YEAR
703	N	Bowen	Georgia Power Co	7140	GA	SAT	SERC	22	1	Electric Utility	1	3,342,955	2019
703	N	Bowen	Georgia Power Co	7140	GA	SAT	SERC	22	1	Electric Utility	2	2,342,644	2019
703	N	Bowen	Georgia Power Co	7140	GA	SAT	SERC	22	1	Electric Utility	3	1,873,360	2019
703	N	Bowen	Georgia Power Co	7140	GA	SAT	SERC	22	1	Electric Utility	4	3,428,128	2019
											Plant Bowen 2019 Total	**10,987,087**	

U.S. Department of Energy, The U.S. Energy Information Administration (EIA)
Annual Environmental Information, Schedule 8. Part C. FGD Operation and Maintenance Expenditures, 2019 Final
Sources: Form EIA-923, Power Plant Operations Report

Year	Plant ID	FGD Unit ID	FGD Feed Materials And Chemicals Costs (thousand dollars)
2019	703	1S	6,165
2019	703	2S	3,562
2019	703	3S	3,018
2019	703	4S	5,385
		Total Costs	**18,130**

WRI-97-R033

NOx EMISSIONS PRODUCED WITH COMBUSTION OF POWDER RIVER BASIN COAL IN A UTILITY BOILER

Topical Report

March 1996 – March 1997

By
John S. Nordin
Norman W. Merriam

April 1997

Work Performed Under Cooperative Agreement
DE-FC21-93MC30127 Task 9

For
U.S. Department of Energy
Office of Fossil Energy
Federal Energy Technology Center
Morgantown, West Virginia

By
Western Research Institute
Laramie, Wyoming

DISCLAIMER

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EXECUTIVE SUMMARY

Nitric oxide (and nitrous oxide) emissions from coal-fired utilities depend primarily on how the coal is burned and to a lesser extent on the nitrogen content of the coal itself, even though most of the NOx produced originates from coal nitrogen. With a combination of tight, computerized combustion control, including controlling temperatures and the use of low-NOx burners utilities should be able to meet the Clean Air Act Title IV NOx limits. For tangentially fired boilers the limits are 0.45 lb/mm Btu (Phase I) and 0.40 lb/mm Btu (Phase II). For dry-bottom, wall-fired boilers the limits are 0.50 lb/mm Btu (Phase 1) and 0.46 lb/mm BTU (Phase II). Compliance for phase I is January 1996; compliance for phase II is January 2000. Emission limits for these laws and regulations are expressed as equivalent NO_2 even though nitric oxide (NO), and to a much lesser extent nitrous oxide (N_2O), are the chemical species actually emitted. Local and regional regulatory agencies may place more stringent limits on utility NOx emissions than the Title IV standards in an effort to meet ambient air quality standards, especially in ozone nonattainment areas.

Powder River Basin (PRB) coal offers an advantage for utilities meeting NOx limitations because it is a more reactive coal and when burned in a utility boiler fitted with low-NOx burner technology can produce 20% less NOx than burning an eastern bituminous coal. While this may not seem like a major improvement, because the U.S. Environmental Protection Agency (EPA) has set Phase II limits near what low-NOx burner and tight combustion control is technically capable of achieving, any improvement will help. This is providing, however, that the furnace is clean and well maintained, as a dirty furnace with slag buildup will result in higher burning temperatures and increased NOx. Burning PRB coal can result in more furnace slag buildup than when burning eastern coals. This buildup is not easily removed with soot blowers; frequent cleaning with waterlances is required.

Nevertheless, in laboratory and in pilot plant demonstrations using more reactive, subbituminous coals NOx emissions have been lower than those from bituminous coals. NOx emissions lower than those from eastern coals have also been demonstrated in power plants burning PRB coal. The greater reactivity is related to the higher quaternary nitrogen functionally (compared with pyridinic and pyrolic nitrogen functionality) of subbituminous coal (including PRB coal), which produces less NOx when burned in low-NOx burners. The term "quaternary" does not mean a four-ring structure but refers to what is believed to be a six-ring structure containing nitrogen with oxygen as part of the ring. This report reviews laboratory and pilot plant work on NOx emissions related to coal nitrogen structure, as well as the experience of utility with NOx emissions burning PRB coal.

U.S. Department of Energy, The U.S. Energy Information Administration (EIA)
Annual Environmental Information, Schedule 8. Part B. Financial Information, 2019 Final
Sources: Form EIA-923, Power Plant Operations Report

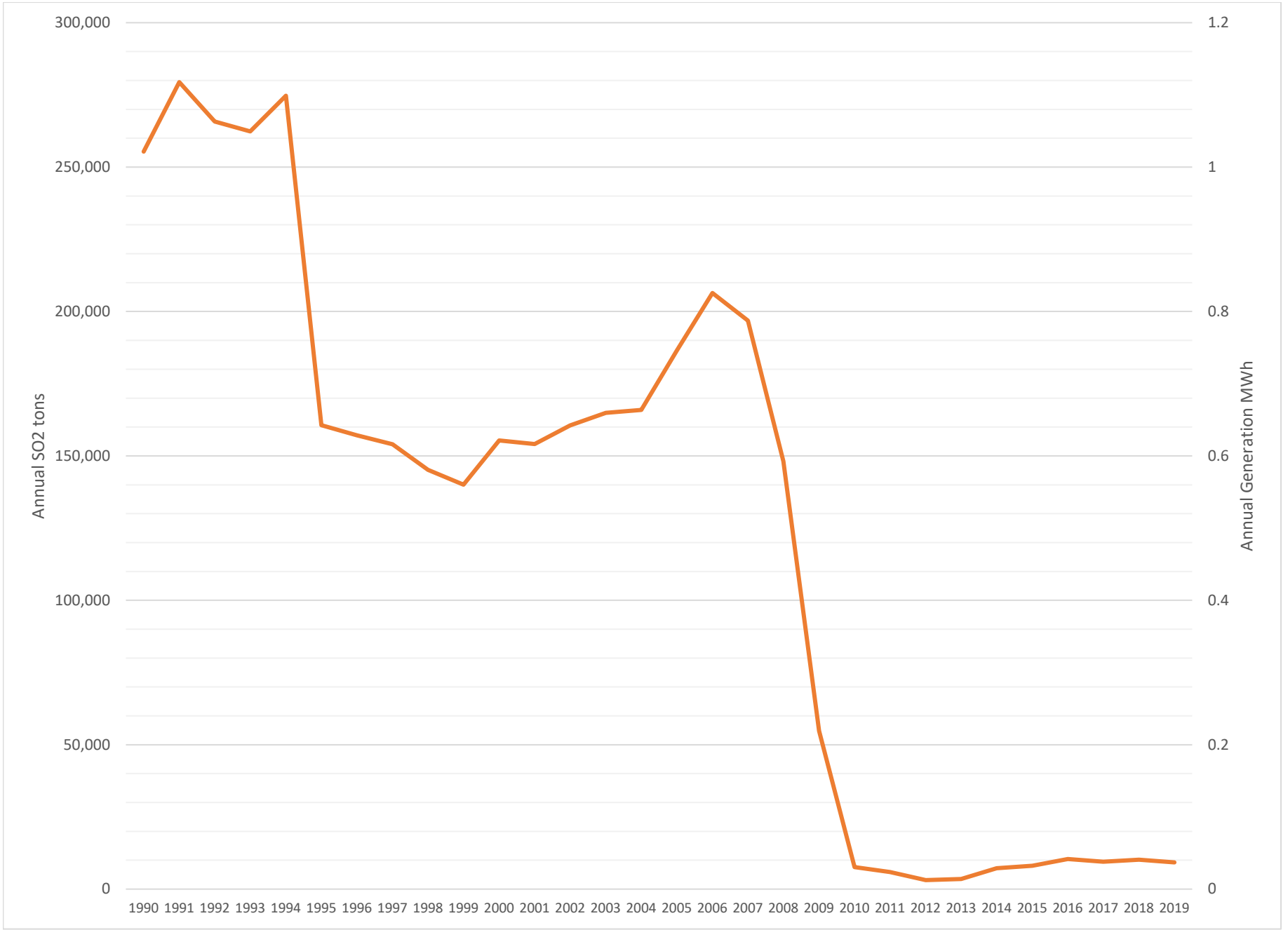
Year	Plant ID	Fly Ash Revenues	Bottom Ash Revenues	Fly/Bottom Ash Intermingled Revenues	FGD Byproducts Revenues	Other Byproducts Revenues	Total Revenues
2019	703	3,777	85	.	2,951	.	6,813

U.S. Department of Energy, The Energy Information Administration (EIA)
EIA-923 Monthly Generation and Fuel Consumption Time Series File, 2019 Final
Sources: EIA-923 and EIA-860 Reports

													Year-To-Date					
Plant Id	**Plant Name**	**Operator Name**	**Operator Id**	**Plant State**	**Census Region**	**NERC Region**	**NAICS Code**	**EIA Sector Number**	**Sector Name**	**Reported Fuel Type Code**	**AER Fuel Type Code**	**Physical Unit Label**	**Total Fuel Consumption Quantity**	**Electric Fuel Consumption Quantity**	**Total Fuel Consumption MMBtu**	**Elec Fuel Consumption MMBtu**	**Net Generation (Megawatthours)**	**YEAR**
703	Bowen	Georgia Power Co	7140	GA	SAT	SERC	22	1	Electric Utility	BIT	COL	short tons	**4,515,728**	4,515,728	107,997,958	107,997,958	10,962,860	2019
703	Bowen	Georgia Power Co	7140	GA	SAT	SERC	22	1	Electric Utility	DFO	DFO	barrels	41,156	41,156	239,404	239,404	24,227	2019
																Plant Bowen Total	**10,987,087**	

Plant Bowen Units 1-4 Historical Annual SO2 Emissions,
as submitted for Emissions Inventory Reporting

Year	SO2 (Tons)
1990	255,406
1991	279,419
1992	265,810
1993	262,399
1994	274,689
1995	160,653
1996	157,173
1997	154,063
1998	145,151
1999	140,060
2000	155,374
2001	154,082
2002	160,535
2003	164,884
2004	165,914
2005	186,470
2006	206,442
2007	196,841
2008	148,149
2009	54,811
2010	7,618
2011	5,888
2012	3,119
2013	3,511
2014	7,204
2015	8,104
2016	10,453
2017	9,451
2018	10,169
2019	9,231


300,000
250,000
200,000
150,000
100,000
50,000
0
Annual SO2 tons
1.2
1
0.8
0.6
0.4
0.2
0
Annual Generation MWh
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

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Supply Curves for Using Powder River Basin Coal to Reduce Sulfur Emissions

Shreekant B. Malvadkar , Dennis Smith & Gilbert V. McGurl

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Supply Curves for Using Powder River Basin Coal to Reduce Sulfur Emissions

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ABSTRACT

Supply curves were prepared for coal-fired power plants in the contiguous United States switching to Wyoming's Powder River Basin (PRB) low-sulfur coal. Up to 625 plants, representing ~44% of the nameplate capacity of all coal-fired plants, could switch. If all switched, more than $8.8 billion additional capital would be required and the cost of electricity would increase by up to $5.9 billion per year, depending on levels of plant derating. Coal switching would result in sulfur dioxide (SO_2) emissions reduction of 4.5 million t/yr. Increase in cost of electricity would be in the range of 0.31–0.73 cents per kilowatt-hour. Average cost of S emissions reduction could be as high as $1298 per t of SO_2. Up to 367 plants, or 59% of selected plants with 32% of 44% nameplate capacity, could have marginal cost in excess of $1000 per t of SO_2. Up to 73 plants would appear to benefit from both a lowering of the annual cost and a lowering of SO_2 emissions by switching to the PRB coal.

INTRODUCTION

On February 14, 2002, President George W. Bush announced the Clear Skies Initiative, the goal being to drastically reduce emissions of sulfur oxides (SO_x) by 73%, nitrogen oxides (NO_x) by 67%, and mercury (Hg) by 69% from the nation's utility power plants. The initiative is to be implemented in two stages, the first by 2010 and the second by 2018. The targets of allowable emissions are provided in Table 1. To comply with the simultaneous emission reductions of all three pollutants, each plant management will need to view the plant as an integrated unit and consider tradeoffs, capital requirements, technology reliability issues, and other issues pertinent to its operation.

The Clear Skies Initiative emphasizes the proven market-based approach. Individual power plants have latitude in implementation approaches to meet the initiative's targets, assuming they are legislatively mandated. For example, to reduce sulfur (S) emissions, a plant may switch or blend coal to reduce S in their coal supply, switch fuel from coal to natural gas or oil, trade allowances, retire units, undertake boiler retrofit, install and operate flue gas desulfurization equipment, or use a combination of these options.

Historically, S emission caps have led to more use of low-S coal by power plants.[1] (Even some mineshaft power plants have switched from local high-S coal to low-S coal.[2]) This study, therefore, focuses on incremental SO_x emissions reduction costs incurred by coal-fired power plants that switch to Wyoming Powder River Basin (PRB) coal. Even within the option of coal switching, there are many sub-options available (e.g., using different types of coal, using different mines, or importing foreign coal).

IMPLICATIONS

A full-scale switch to Wyoming's PRB low-sulfur coal would not meet the proposed targets of SO_2 allowable emissions for 2010 and 2018 (4.5 and 3 million t/yr, respectively) under the Clear Skies Initiative. The emphasis of the Initiative on a proven market-based approach would make it likely that 25–59% of plants would not opt for this approach because of their high marginal cost effectiveness depending on their deratings.

SCOPE OF THE STUDY

This study involves 1155 utility coal power plants in the contiguous United States. The study derives costs associated with switching to the Wyoming PRB low-S coal, including the mine-shaft coal cost, coal transportation cost, additional capital cost, and operating and maintenance (O&M) costs that result from coal switching. The

Table 1. Target emissions reduction under the Clear Skies Initiative.

Pollutant	Current Emissions	Year 2010 Emissions	Year 2018 Emissions
SO_2 (t/yr)	11×10^6	4.5×10^6	3×10^6
NO_x (t/yr)	5×10^6	2.1×10^6	1.7×10^6
Hg (t/yr)	48	26	15

study calculates costs in terms of \$/t SO_2 emissions reduced for each power plant. In these calculations, all unit and actual costs are adjusted for inflation by employing the Gross Domestic Product Implicit Price Deflator to the fourth quarter of 2000.

Because the analysis is incremental, the annual delivered coal cost before the switchover is subtracted out. Secondly, all the computed annual costs are assigned to the decrement in annual SO_2 emissions resulting from the switchover to the PRB coal. These calculated costs (\$/t SO_2) are then ranked in ascending order and are plotted along with the cumulative annual cost versus cumulative SO_2 emissions to generate the supply curves. The plant derating effect of coal switching is incorporated in the study parametrically as outlined later, which resulted in generation of a series of supply curves.

Mineshaft Coal Cost

The mineshaft coal cost (\$/t) to the utilities buying the coal is clearly determined by market forces. For example, Tom Throop,[3] Director of the Equality State Policy Center, stated on September 20, 2001, that the average mineshaft price for southern PRB coal in July 2001 was \$11.06/t. He also projected that it would settle well above the average of \$4.50 for the previous year. An October 2000 Energy Information Agency (EIA) report[4] states that the PRB coal averaged \$5.67 per short t (1997 dollars). EIA's Wyoming coal statistics show a mineshaft cost of \$5.38 per t[5] (1999 dollars). EIA, in its coal news and markets report for the week of October 12, 2003, reports that PRB prices, at \$6.70 per short t, now stand 47% below the peak average price of \$12.75 reached in May 2001.[6] For this study, a value of \$5.50 per short t (2000 dollars) is employed on the basis of EIA's data contained in Form 423.[7]

BTU Content of the PRB Coal

An average value of 8697 higher heating value (HHV) BTUs/lb of the PRB coal is employed for this study. This average value is the weighted average of the high heating values of all the PRB coal consumed.[7] In calculating tons of the PRB coal to be used by the power plants, thermal input to the boilers is assumed to remain the same as before the coal switchover.

Sulfur Content of the PRB Coal

An average value of 0.311 lb S/100 lb coal (0.358 lb per million HHV BTUs at 8697 HHV BTUs/lb of PRB coal) is employed for this study. This average value is the weighted average of all the PRB coal consumed.[7]

Railroad Transportation Distances

Although the PRB is a large area, for this study all coal is assumed to originate from Gillette, WY. Also, all coal is assumed to be transported by railroad from the mineshafts to the power plants. However, some power plants may not have direct access to a railroad and part of their coal transportation may need to be by truck or barge for economic or logistical reasons. Many plants located on the lower Ohio River, Tennessee River, and Mississippi River do receive coal by barges. National statistics of the Association of American Railroads show that in 2000 ~65% of coal was delivered by railroads, 13% by inland waterways, 11% by trucks, and 9% by conveyor belts, slurry pipelines, and tramways.[8]

Of the four major American railroad companies (Burlington North Santa Fe [BNSF], Union Pacific, Norfolk Southern Railway System, and CSX Transportation), only BNSF and Union Pacific currently serve the PRB and, of these two, only BNSF has a Web site with a feature that provides distances from one station to another within its network. Canadian National railroad also jointly provides coals to power plants in Illinois, Kentucky, Michigan, and Mississippi.[9] (According to R. Bonskowski of EIA,[10] "the Surface Transportation Board has recently approved Dakota, Minnesota & Eastern railroad's environmental review, with a few changes. If no major lawsuits interfere, by 2007 or 2008, the DM&E could begin hauling coal out of the PRB to Chicago and upper Midwest destinations or interchanges.")

For the power plants that are not on the BNSF network, a combination of railroad distance to the nearest BNSF station and distance by highway from that station to the power plant is used to estimate the railroad distance. For the power plants in the eastern states, the nearest BNSF stations considered are Chicago, IL; St. Louis, MO; Memphis, TN; and Birmingham, AL. For the power plants in the western states, the nearest BNSF stations considered are Grand Junction, CO; Dallas, TX; and Albuquerque, NM.

Unit Cost of Coal Transportation

The unit cost of coal transportation would be expected to be market-driven and would partly depend on the length of the contract (number of years), the quantity of coal

hauled per year, the availability of the track, ownership or lease arrangement of coal cars, number of transfer points, and so on. A plot of shipping cost ($/t) versus shipment distance was prepared and showed a significant scatter (R^2 = 0.4388). The scatter may be partly attributed to the shipment quantity per trip and for variations in contract agreements. According to an EIA report of October 2000, the average rate per ton-mile for contract low-S coal shipment in 1997 was 11.6 mills (1.16 cents). This is the value employed for this study.

Capital Cost Requirement for Coal Switching

Information collected from various case studies shows that when a utility power plant switches from high-S to low-S coal, capital investment is needed. This investment is for equipment items needed to (1) reduce fire and explosion hazards through dust control and fire protection; (2) modify pulverizers, coal handling, and ash handling; and (3) install electrostatic precipitators and so on.

Of the six case studies described in a March 1994 EIA report,[11] the capital investment ranged from $31.6 to 118.6 per kilowatt (1992 dollars) for switchover to lower S western coal. For this study, an average value of $56 per kilowatt (1992 dollars) is used and it is applied for only those plants that are currently using bituminous coal. In applying this factor, derating is assumed to be 0% and the nameplate capacity was employed to determine the capital cost requirement.

Levelized Carrying Charge Fraction of the Capital Investment

This item is applicable only for those plants that are currently using bituminous coal. A value of 0.127 is used for the constant dollar basis levelization factor L_{20} (i.e., to spread the investment over 20 years, as given by EPRI's 1993 Technical Assessment Guide [Table 6.10]).[12] The choice of 20 years is appropriate because the capital investment is for existing plants, many of which are quite old.

O&M Cost Increases Resulting from Coal Switching

This item is applicable only for those plants that are currently using bituminous coal. No data could be located for the O&M costs pertaining specifically to required new capital equipment items. However, the EIA Web site[13] states that the nonfuel cost was ~4 mills (0.4 cents) per kilowatt-hour (kWh) in 1997.

For this study, incremental O&M costs resulting from coal switching is arbitrarily set at 0.2 mills (0.02 cents)/kWh, which is an increase of 5%. Derating of 0% is assumed when computing this cost increase for all the derating cases.

Derating Considerations

The March 1994 EIA report shows that the six case studies involving switchover to the western coal led to the power plant being derated to a maximum extent of 15%, although some plants showed no derating. Clearly, this is plant-specific and partly depends on the age, configuration, and over-design factor of the plant.

For the purpose of this study, derating is considered through parametric analysis. Derating is assumed to be 0, 5, 10, or 15% for the same thermal input as before the switchover. They are applied only to plants that are currently using bituminous coal, because operations of plants that currently use (higher-S) lignite or subbituminous coal would probably not encounter major problems or derating because of coal switchover. For each level of derating, lost revenues are computed at 30 mills (or 3 cents)/kWh. They are attributed to the coal switchover and assigned to the cost of reduction in SO_2 emissions. For each of the derating levels, separate supply curves were generated.

Coal Switching Criteria

Coal power plants in the contiguous United States that (1) have flue gas desulfurization unit(s), (2) currently use Wyoming coal, or (3) would emit more SO_x than they do now if they switch to the PRB coal were deemed unsuitable for switching to the PRB coal. Of the 1155 coal power plants in the contiguous states, 625 plants were identified as being suitable for coal switching.

Among the noncandidate plants, there are 224 plants that have some S emission control equipment. These plants would lower their S emissions further by switching to PRB coal and also would gain benefit by lowering the chemicals and raw materials needed to operate this equipment. However, such plants were not considered for coal switching, because additional SO_2 emissions reduction for these plants from coal switching would be relatively small.

The Delivered Coal Cost before the Switchover

The delivered coal cost before the switchover for each plant was obtained from the Federal Energy Regulatory Commission (FERC) database F-423.[14] These costs are the actual delivered coal costs reported by the regulated power plants to the FERC.[15]

DISCUSSION AND CONCLUSIONS

A complete switchover to the PRB coal by all the selected 625 power plants in the contiguous United States, keeping thermal energy input the same as before the switchover, will require a supply of 462 million t of PRB coal per year in addition to the 307 million t of the PRB coal per year supplied in 2000. The total of 769 million t per year

is substantially higher than the current throughput and shipment of the PRB coal resources. EIA projects[16] that no more than 559 million t per year PRB coal would be available by 2020.

This additional demand has implications to the transportation infrastructure, mining operations, adequacy of trained personnel supply, security, and so on. It probably also has a negative impact on the global climate change efforts.

According to Hill & Associates, Inc.,[17] a management consultant company specializing in coal supply studies, the PRB production capacity was 394 million t per year in 2001 and was projected to expand to 428 million t per year in 2002, which is less than 56% of that required after the total switchover. The introduction of the recently approved DM&E railroad's proposed operation by 2007 or 2008 would partly alleviate projected future PRB coal transportation problems.

EIA-compiled statistical data[18] show that, over the period of 1977–1992, there was ~77% decline in the annual capital expenditures by the western coal mining industry. As of 1999, according to an article in the August 2000 issue of Railway Age,[19] only two of 10 PRB mines had made investments for adequate load-out to ensure that the trains are not held up at mineheads during loading. (Even these investments by the two mines may be inadequate under the scenario of total switchover to the PRB coal, because the daily loading rate would have to be increased by a factor of 1.8.) An estimate is that perhaps 3 times as many railroad cars may be needed to transport this much coal from the PRB; but this may not be a major problem, because railroad cars currently supplying coals from other regions can be diverted for shipment from the PRB region. (The need for extra railroad cars is partly because the distances between the PRB area and the power plants are considerably longer, which results in a longer time to make the round trips to deliver the coal to various power plants.)

Lawrence H. Kaufman, contributing editor of Railway Age, states that the PRB of Wyoming and Montana has 250–300 years of coal supply at current rate of use.[19] According to congressional testimony given in October 2001 by Ryan Tew,[20] a representative of Peabody Energy Corporation and National Mining Association, current economically recoverable PRB coal reserves were reported to be 60 billion t. On this basis, the total switchover to PRB coal would exhaust the PRB reserves in ~78 years. Assessment based on the EIA's data[18] is less optimistic. EIA projected that the ratio of western regional coal reserves to annual production rate in 1997 was ~27 years. According to the EIA data, only 451 million t of PRB coal was produced in 1997. A total switchover, with a needed production rate of 769 million t per year, would exhaust the PRB reserves in less than 16 years. Because of the wide range estimated for the number of years PRB reserves would last, this issue needs further scrutiny.

A net reduction in SO_2 emissions of ~4.52 million t of per year is projected if total switchover can be implemented. This reduction does not meet the 2010 or 2018 target of the Clear Skies Initiative. Therefore, additional measures would have to be implemented beyond the coal switchover to meet these targets.

This study does not consider (1) the impact of switching to PRB coal on other pollutant emissions, including those of ash, NO_x, and Hg, or (2) operational difficulties encountered (e.g., grindability of the coal), resulting from the switch. The low-S advantage of the PRB coal narrows when assessed in terms of SO_2 emissions per MWh in generated electricity, as a result of its lower HHV BTU content. This is partly and indirectly accounted for in this study by considering different derating levels.

For 160 of the 625 candidate coal power plants, even without considering SO_2 emissions reduction, switching to PRB coal is found to lower annual delivered coal cost for the same thermal energy input as before the switch. This is the case despite the fact that the differences in the HHV BTU values of two coal sources (the PRB coal source versus the current coal source) result in power plants having to buy more PRB coal.

Total capital investment of more than $8.8 billion is estimated for the candidate plants in the contiguous United States that currently employ bituminous coal, or ~$15 million per plant ($66/kW nameplate capacity). Among the selected 625 plants, many have low operating factors and are old. They may choose not to switch to PRB coal, particularly if coal switching would entail their having to invest additional capital. Their inclusion in the analysis thus leads to an upper limit of S emissions reduction through the switchover. If the 23 plants that are more than 55 years old are omitted, ~20,700 t of SO_2 emissions reduction per year will not be attained. But this would lower the capital requirement by $52 million and the annual additional cost by as much as $23 million. The average operating factor for all coal power plants is ~67%. If, therefore, the 57 plants that have operating factors of less than 30% are omitted, ~46,800 t SO_2 emissions reduction per year will not be attained. But this would lower the capital requirement by $139 million and the annual additional cost by as much as $35 million.

Most power plants incur additional annual costs to reduce SO_2 emissions and have positive values of $/t SO_2 for their coal switchover. However, some power plants were found to get the double benefit of lower S emissions and lower annual cost resulting from the switchover to the PRB coal. These plants thus have negative values of $/t SO_2 emissions reduced. There may, however, be technical,

logistical, or legal reasons for their not switching to PRB coal. For example, a particular plant may have types of furnaces and boilers that are not well suited for PRB coal, it may be located at a mineshaft mouth, or it may have a long-term coal purchase contract with its current coal supplier. According to Dr. C. Romero[21] of the Energy Research Center of Lehigh University, the increase in rate of furnace slagging and rate of convective pass plugging is caused by the increased PRB content in the feed coal blend. This is the result of ash interactions and the formation of low fusion temperature slags. Furnaces designed for bituminous coal are known to be more prone to slagging when blends of bituminous coal and PRB coal are fired. Other operational difficulties resulting from mill capacity limitations and coal pipe plugging are also observed when blends are employed.

Of the selected power plants, there are 20 plants with nameplate capacity of 5121 MW (1.6% of nameplate capacities of all coal-fired power plants) located in the western states that currently employ sub-bituminous, lignite coal, or low-S bituminous coal. Some of them, for example, those in North Dakota and Texas, are mine-mouth power plants. Although, in recent years, even mine-mouth plants have begun to supplement or wholly replace their coal supply with low-S coal to meet more stringent clean air laws,[22] if these 20 plants choose not to switch to the PRB coal, 194,000 t of SO_2 per year emissions reduction will not be attained, but it would lower capital requirement by $104 million and annual cost by up to $14 million, depending on the derating level.

Figures 1–4 provide for the four levels of derating the supply curves for marginal cost ($/t SO_2) and cumulative annual cost increases versus cumulative SO_2 emissions that result from coal switchover by the selected 625 power plants. The range is quite wide, from −$49,395 to +$1,886,631/t of SO_2. Large negative and positive values of $/t SO_2 are for plants in which S emission reductions are very small. The minima seen in the curves for cumulative annual costs are caused by the negative additional annual costs for few plants in each of the derating cases. Rankings of different power plants are not the same in all the curves. For example, a plant ranked as having the 10th lowest $/t SO_2 for 0% derating may not have the same ranking for other levels of derating for the reasons cited later.

The wide range of impact that coal switching has on power plants is the consequence of differences between power plants in terms of (1) their locations with respect to the Wyoming PRB region, (2) the prices currently being paid by the plants for delivered coal, (3) the BTU values and S contents of their current coal supplies, (4) whether the plants need retrofit capitals, and (5) the level of derating.

Although total switchover to the Wyoming PRB coal does not meet the objectives of the Clear Skies Initiative, this study still provides valuable information on the total increased annual cost, total capital investment, range of and average marginal cost ($/t SO_2 emissions reduction), and increased cost of electricity (cents/kWh) for the four cases of derating. These are given in Table 2. Clear trends

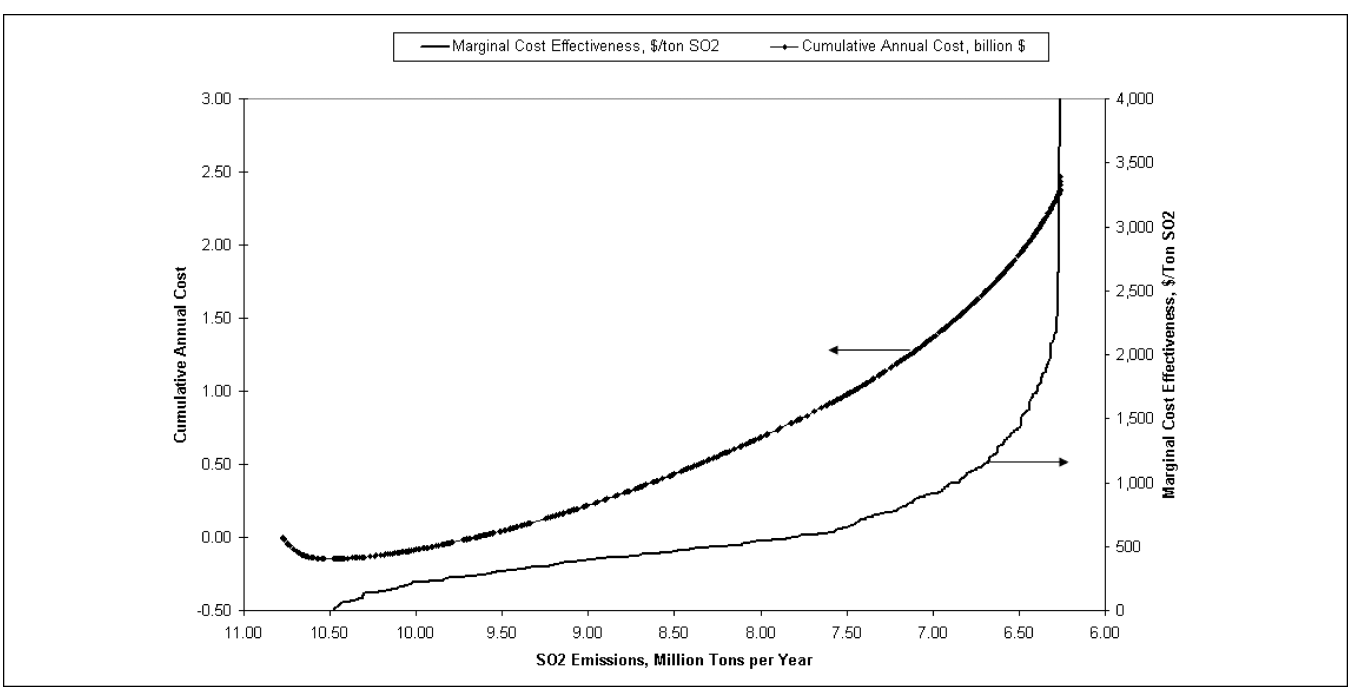

Figure 1. Coal switching supply curve for coal power plants (0% derating).

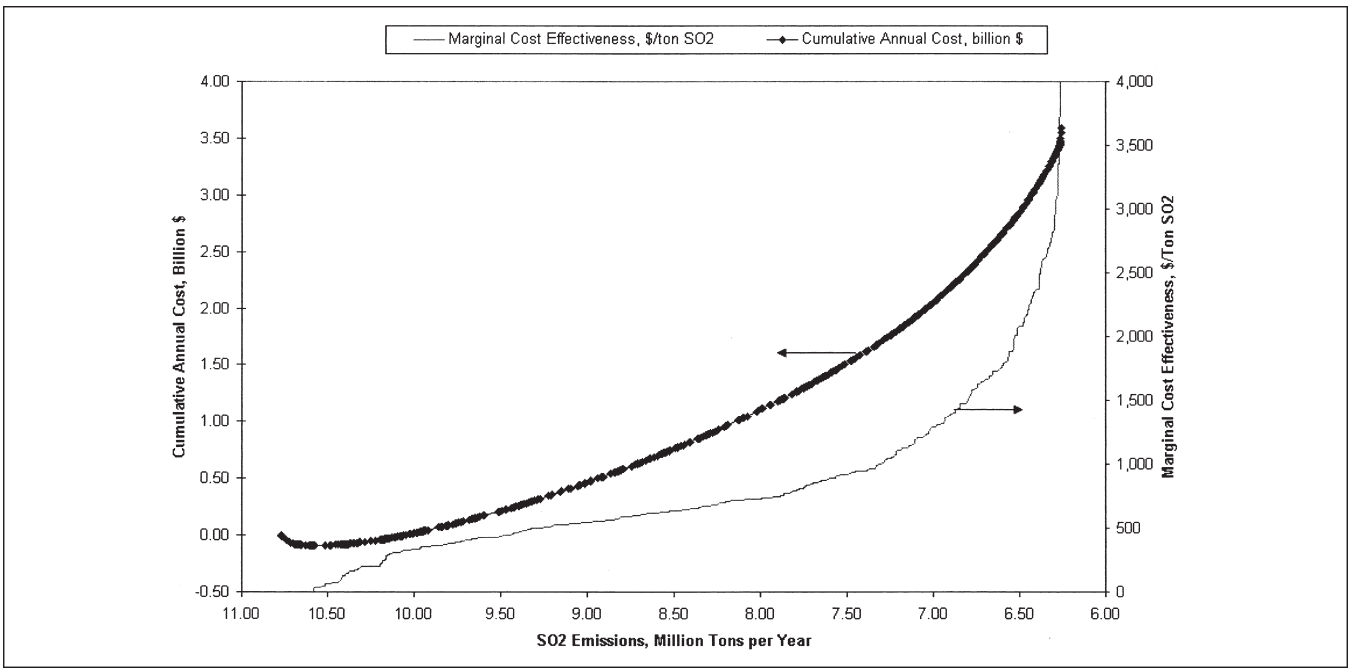

Figure 2. Coal switching supply curve for coal power plants (5% derating).

are observed. The total capital investment of more than $8.8 billion for the 625 coal power plants in the contiguous United States is independent of the derating level, because it is based on the nameplate capacities of plants. On the other hand, the total increased annual cost is linearly dependent on the derating level. As a result, the average, minimum, and maximum marginal cost values ($/t SO_2) increase with the derating level. Increased cost of electricity ranges from 0.31 to 0.73 cents/kWh.

When the target emissions of the Clear Skies Initiative are legislated, the annual aggregate S emission caps will be much lower for 2010 and 2018 than they are now. (It is also possible that combo caps involving all three pollutants will be introduced.) This will increase the S

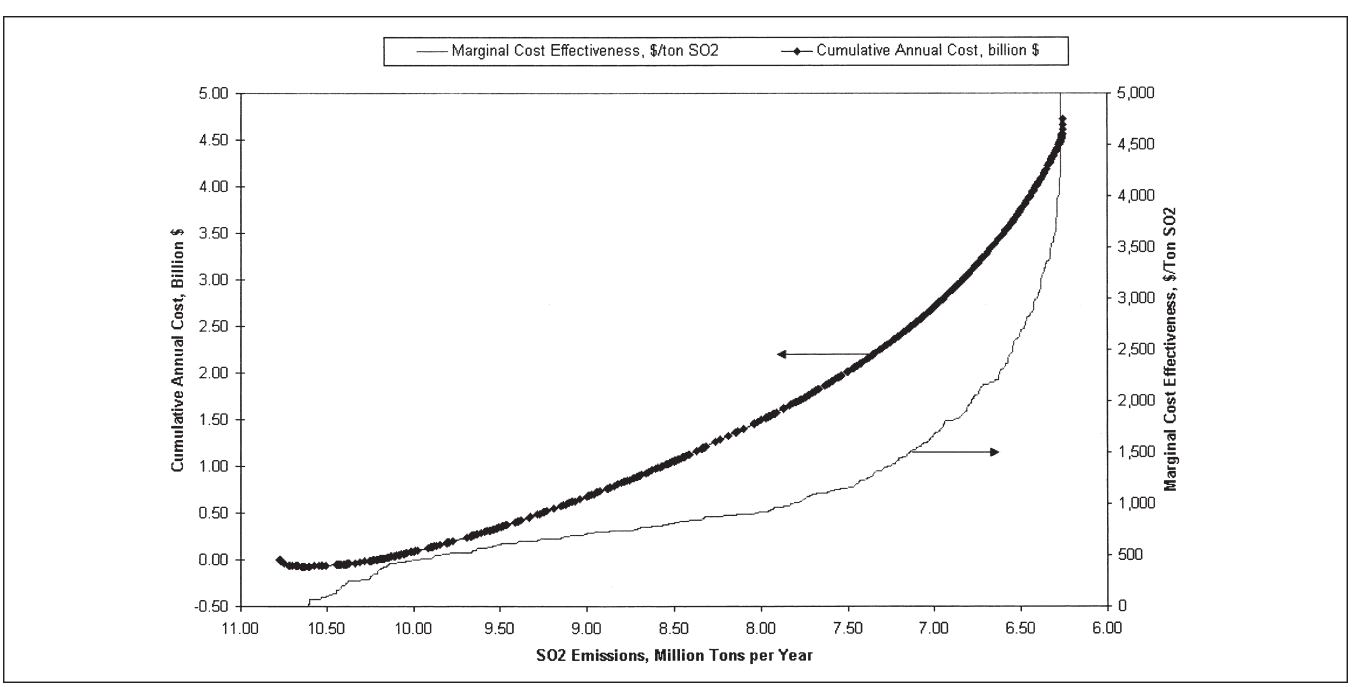

Figure 3. Coal swithching supply curve for coal power plants (10% derating).

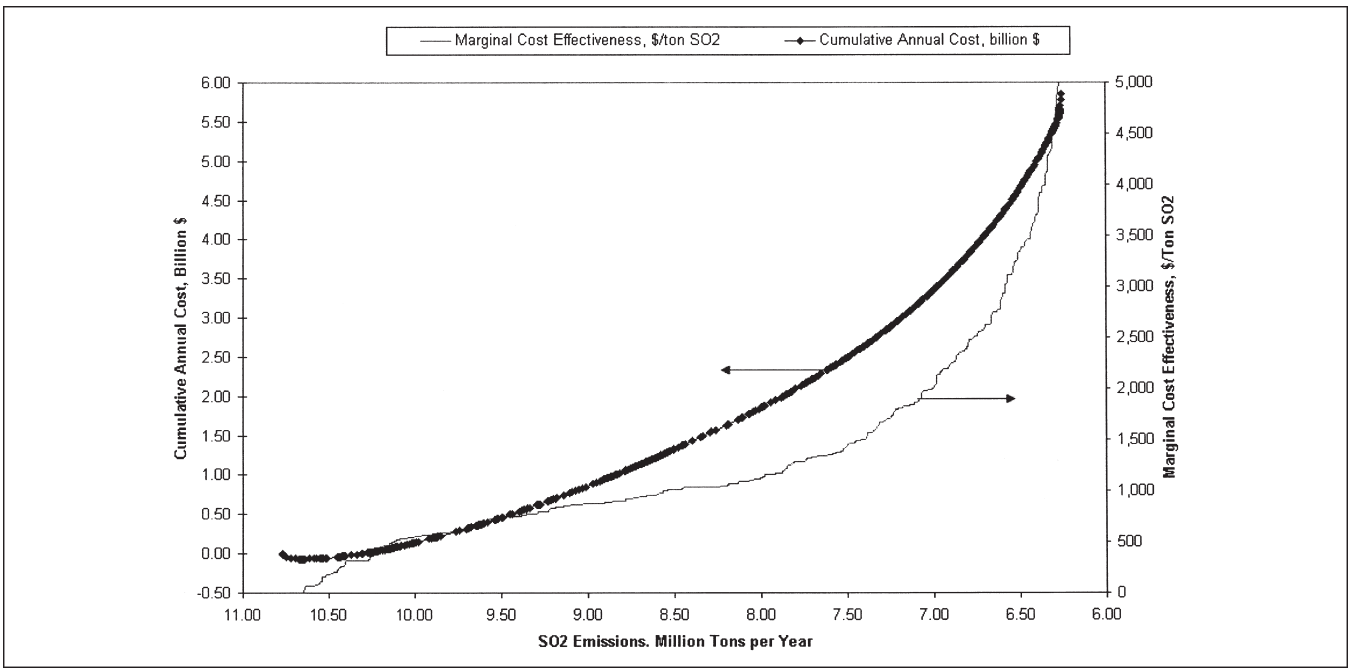

Figure 4. Coal switching supply curve for coal power plants (15% derating).

allowance cost from the current value of ~$200 per t SO_2. Figure 5 is a histogram of the number of plants versus their marginal costs. At low levels of derating, most plants cluster around the low end of marginal cost effectiveness. At high levels of derating, most plants cluster around the high end of marginal cost effectiveness. The projected range of average marginal costs is quite wide, from $548 to $1298 per t SO_2, depending on the derating level. These average marginal cost values are considerably higher than the current price for trading allowances.

Plants with large marginal cost effectiveness are those in which S emission reductions are very small. Such plants are unlikely to opt for the coal switchover option. The number of plants that doubly benefit from coal switching (i.e., reduced S emissions and reduced cost of operation) decreases when level of derating increases from 0 to 15%. At 0% derating, 74 plants would benefit from both lowering of annual cost and lowering of SO_2 emissions. A higher derating level means more loss of revenue and, hence, increased annual cost attributable to SO_2 emissions reduction, reducing the number of such plants from 74 to 24 at 15% derating.

Figure 6 is a histogram of SO_2 emissions reduction attained versus the plants' marginal cost effectiveness. At low levels of derating, large fractions of emissions reduction cluster around the low end of marginal cost effectiveness, and at high levels of derating, large fractions of emissions reduction cluster around the high end of marginal cost effectiveness.

Figure 7 is a histogram of the impacted nameplate capacity versus the plants' marginal cost effectiveness. Overall, such a coal switchover impacts 44% of the total nameplate capacity of all coal-fired power plants. At 15% derating, 367 plants, or 59% of the selected plants with a 32% out of 44% nameplate capacity, would have marginal cost in excess of $1000 per t SO_2.

In Figures 5–7, the number of plants with less than −$1000/t SO_2 marginal cost, their combined SO_2 emissions reduction and their combined nameplate capacity do not appear to vary much with level of derating as compared with those for other ranges of marginal cost effectiveness. This is because the majority of the plants with less than −$1000/t SO_2 marginal cost employ lignite or sub-bituminous coal, while 95% of the selected 625 plants employ bituminous coal.

Table 2. Cost information for switchover to the Wyoming PRB coal.

	0% Derating	5% Derating	10% Derating	15% Derating
Total Capital Investment (Million $)		8836		
Total Increased Annual Cost (Million $/yr)	2467	3596	4725	5855
Minimum Marginal Cost Effectiveness ($/t SO_2)	−49,395	−49,395	−49,395	−49,395
Maximum Marginal Cost Effectiveness ($/t SO_2)	844,493	1,191,872	1,539,252	1,886,631
Average Marginal Cost Effectiveness ($/t SO_2)	548	797	1048	1298
Increase in Cost of Electricity (cents/kWh)	0.31	0.45	0.59	0.73

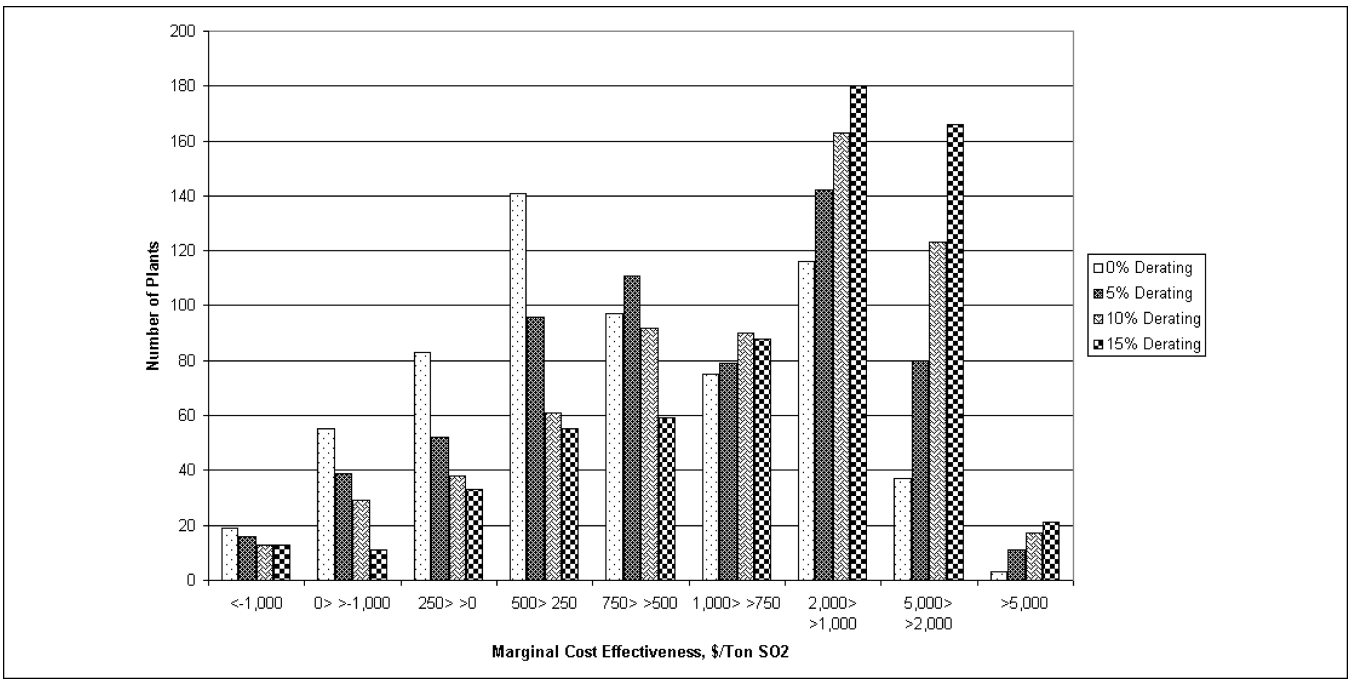

Figure 5. Plant distribution vs. marginal cost effectiveness.

The data clearly show that for any individual power plant, the level of derating and the resultant loss of revenues have a major impact on the plant's SO_2 emissions reduction cost ($/t SO_2). While the reductions in S emissions for individual plants are independent of derating level, revenue losses are linearly dependent on the derating level. The impact of derating level for some plants may even range from negative values of $/t SO_2 (lowering of the cost) to positive (actual increase in cost). Therefore, many plants would have the incentive to mitigate the consequences of a coal switchover by undertaking retrofitting the plant to minimize the derating level. However, for many plants with very large positive marginal cost ($/t SO_2), switching to the PRB coal will remain nonviable.

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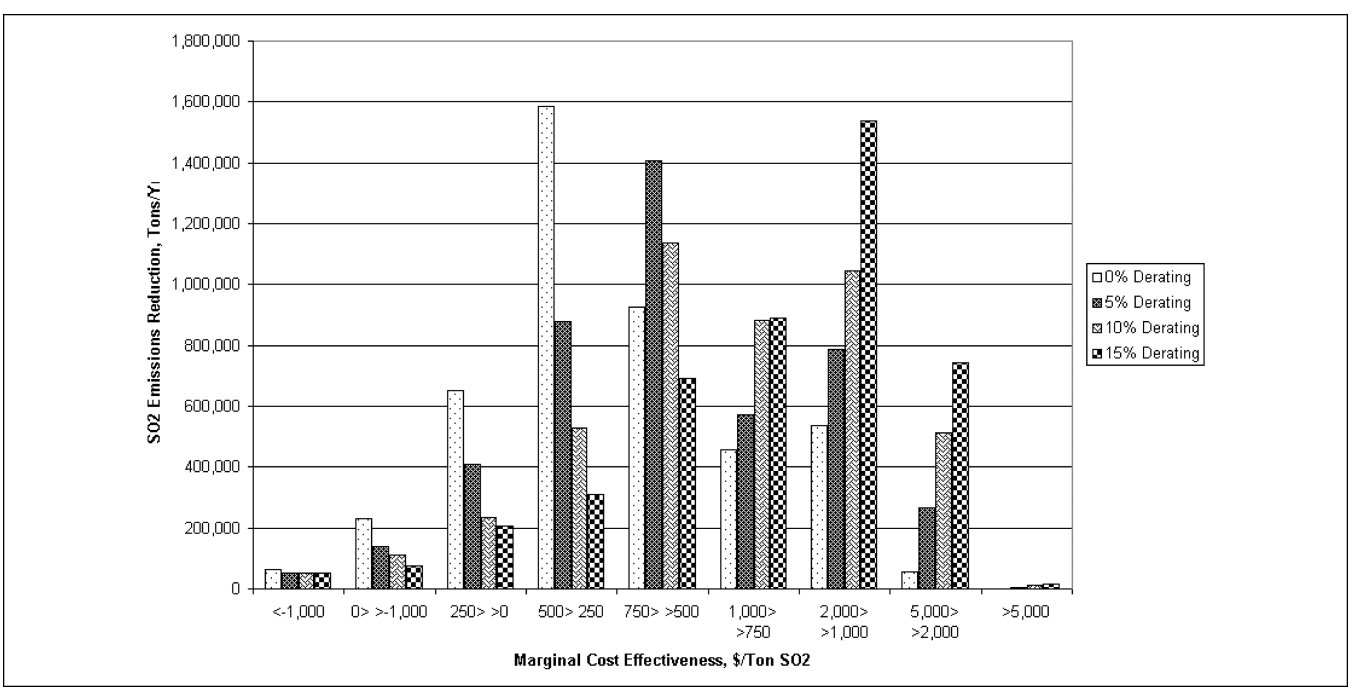

Figure 6. SO_2 emissions reduction vs. marginal cost effectiveness.

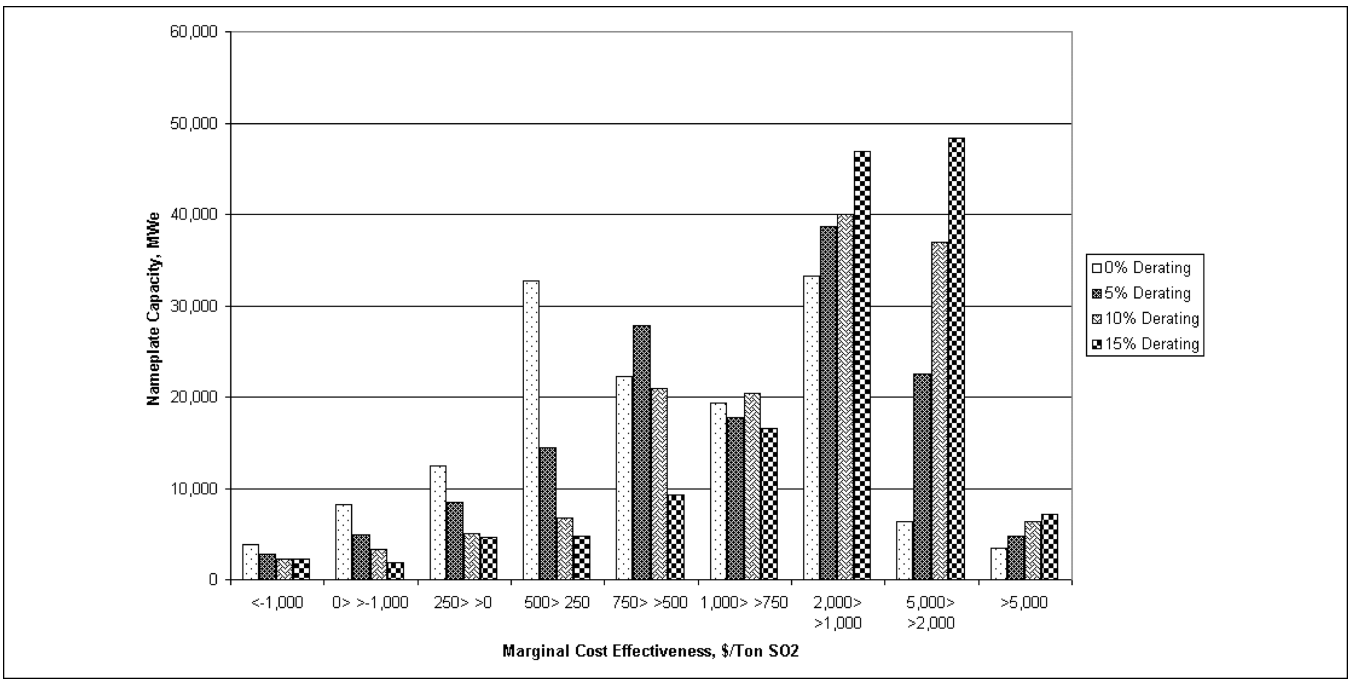

Figure 7. Impacted nameplate capacity vs. marginal cost effectiveness.

provided support and insights on the issues involved, and these insights have been employed and incorporated in completing this study.

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Technical Appendix B (Trade Secret)

Technical Appendix B includes trade secret information, beginning with the Cost Effectiveness Calculation spreadsheet. In addition to the documentation provided in public Technical Appendix A, documentation supporting the calculations are organized by Table & Footnote number. Documents labeled B5 support information in the analysis report.

List of Technical Appendix B documents

Plant Bowen Regional Haze Analysis Cost Effectiveness Calculations

B1.3-1a Capacity Penalty Calculations based on 2019 IRP Information

B1.3-1b 2019 IRP Capacity Planning Documentation

B2.1-2 Delivered Fuel Cost Estimates for PRB and CAPP Coals

B2.1-2a CSX Transportation Contract Language

B2.1-2b CSX Transportation Pricelist Information

B3.3-1 2019 Plant Bowen Environmental Commodities Costs

B3.3-9a Powder Activated Carbon Vendor Quote

B3.3-9b Plant McIntosh Unit 1 Non-Baghouse PAC Usage and Cost Calculation

B3.3-9c Plant Scherer Unit 1 Baghouse PAC Usage and Cost Calculation

B3.4-6 Plant Bowen 2014 MATS Optimization Testing Information for Hydrated Lime

B5.2a Plant Scherer Fuel Handling Capital Project Vendor Quote

B5.2b Plant Scherer Dust Suppression Capital Project Vendor Quote

Plant Bowen Regional Haze Analysis Supporting Calculations

Table A1.1. Cost Effectiveness of Coal Switching to PRB Coal and CAPP Coal

Calculation Values	PRB Coal	CAPP Coal
Total Annual Costs ($)[1]	$ 48,059,482	$ 69,911,996
Total Annual SO2 Emissions Reduction (tons)[2]	7,482	5,199
Cost Effectiveness ($/ton SO2 reduced)[3]	**$ 6,424**	**$ 13,447**

1. Total Annual Costs calculated according to the EPA Control Cost Manual Chapter 2 pg. 12: "Total Cost (TC) refers to costs that are incurred yearly. TC has three elements: direct costs (DC), indirect costs (IC), and recovery credits (RC), which are related by the following equation: TC = DC + IC − RC." See Tables A1.2 and A1.3 for cost calculation details.
2. Total Annual SO2 Emissions Reduction calculations provided in Table A2.3.
3. Cost Effectiveness ($/ton SO2 reduced) = Total Annual Costs ($) / Total Annual SO2 Emissions Reduction (tons)

Table A1.2. Financial Amortization Values

Timeframe (years)[1]	30
Real Interest Rate (%)[2]	6.04%

1. A 30-year timeframe was selected using the most conservative equipment lifetime methodology provided in the EPA Control Cost Manual, which also aligns with the unit retirement planning timeframes used during Georgia Power's IRP evaluations.
2. Firm-specific real interest rate based on Georgia Power 2019 Rate Case Short Order, according to EPA Control Cost Manual Chapter 2, at 16. Real interest rates do not account for inflation. See Technical Appendix Document A1.2 for supporting documentation.

Table A1.3. Annual Cost Data: Delta compared to 2019 Bowen Baseline

Cost Estimation (in Million $)	2019 Bowen Baseline	PRB Coal	CAPP Coal
Capacity Penalty Cost Delta[1]	$ -	$ 709.0	$ -
Total Annualized Indirect Costs Delta[2,3]	**$ -**	**$ 51.7**	**$ -**
Annual Fixed O&M Cost Delta[4]	$ -	$ 1.1	$ -
Annual VOM Cost Delta[5]	$ -	$ (8.9)	$ (16.8)
Annual Fuel Cost Delta[6]	$ -	$ 1.2	$ 86.8
Total Annual Direct Costs Delta[7,8]	**$ -**	**$ (6.6)**	**$ 70.0**
Annual Ash & Gypsum Sales Delta[9]	$ -	$ (3.0)	$ 0.1
Total Annual Recovery Credits Delta[10,11]	**$ -**	**$ (3.0)**	**$ 0.1**
Total Annual Costs Delta[11]	**$ -**	**$ 48.1**	**$ 69.9**

1. Capacity penalty cost is a total net present value (NPV) associated with 27% derate of unit capacities on PRB Coal compared to 2019 Bowen Baseline operations on IB coal. See Technical Appendix Document A1.3-1 for calculations.
2. Total Annualized Indirect Costs are the annual payment calculation of any indirect cost NPVs using the financial factors established in Table A1.2.
3. EPA Control Cost Manual Chapter 2, at 21: "Annualization involves establishing an annual 'payment' sufficient to finance the investment for its entire life, using the formula: PM T = NPV*(i/1-(1+i)-n) where PMT is the equivalent uniform payment amount over the life of the control equipment, n, at an interest rate, i."
4. See Table A3.5 for Fixed O&M Cost Calculations.
5. See Table A3.2 through A3.4 for Variable O&M (VOM) Cost Calculations. EPA Control Cost Manual Chapter 2, at 12: "Variable costs are those that vary with some measure of productivity - generally the company's productive output. But for our purposes, the proper metric may be the quantity of exhaust gas processed by the control system per unit time."
6. See Table A3.1 for Delivered Fuel Cost Calculations.
7. Total Annual Direct Costs are the sum of the deltas calculated for all direct costs included in this analysis: fixed O&M, VOM, and fuel costs.
8. EPA Control Cost Manual Chapter 2, at 12: "Direct costs include costs for raw materials (reagents or adsorbers), utilities (steam, electricity, process and cooling water), waste treatment and disposal, maintenance materials (greases and other lubricants, gaskets, and seals), replacement parts, and operating, supervisory, and maintenance labor."
9. See Tables A4.1 through A4.3 for Ash & Gypsum Sales Calculations.
10. Total Annual Recovery Credits are equal to the total losses or gains associated with switching to each coal type. A negative delta represents a loss in sales which will add to the total costs, while a positive delta represents a gain in sales which will reduce the total costs.
11. EPA Control Cost Manual Chapter 2, at 13-14: "Finally, direct and indirect annual costs can be offset by recovery credits, taken for materials or energy recovered by the control system, which may be sold, recycled to the process, or reused elsewhere at the site."
12. Total Annual Costs Delta = Indirect Costs Delta + Direct Costs Delta - Recovery Credits Delta, per the EPA Control Cost Manual Chapter 2.

Table A2.1. SO2 Emissions Rates - 2019 Actuals for IB Coal, Estimations for PRB Coal and CAPP Coal

Estimation Values	2019 Bowen Baseline[1]	PRB Coal[2]	CAPP Coal[2]
Heat Content (Btu/lb)	12,002	8,800	12,000
Sulfur Content (%)	2.6%	0.4%	1.1%
Uncontrolled SO2 Rate (lb/MMBtu)[3]	4.40	0.80	1.83
FGD Removal Rate (%)[4]	96.3%	96.3%	96.3%
Controlled SO2 Rate (lb/MMBtu)[5]	0.16	0.03	0.07

1. 2019 Actual Information for heat content and sulfur content from EIA 923 Schedule 2-5 Page 5. See Technical Appendix Document A2.1-1. Available at: https://www.eia.gov/electricity/data/eia923/ Plant Bowen also receives Northern Appalachian (NAPP) bituminous coal, which has similar heat and sulfur content to IB coal. This 2019 actual cost accounts for NAPP costs.
2. Heat Content and Sulfur Content based on Southern Company Fuels Procurement information from coal cost estimation. See Technical Appendix Document A2.1-2.
3. Uncontrolled SO2 Rate (lb/MMBtu) for PRB & CAPP Coals assumes coal sulfur converted to SO2 = Sulfur Content / Heat Content * 2 * 10^6.
4. 2019 average actual FGD SO2 removal rate from Plant Bowen CEMS Data and used for all coal types. See Technical Appendix Document 2.1-4.
5. Controlled SO2 Rate (lb/MMBtu) = Uncontrolled SO2 Rate * (1 - FGD Removal Rate)

Table A2.2. Plant Capacity Derate Estimation for PRB Coal

Coal Type	Heat Content (Btu/lb)	Max Annual Capacity for Units 1-4 (MWh)[1,2]
2019 Bowen Baseline	12,002	28,312,320
PRB Coal	8,800	20,758,908
Unit Capacity Derate[3]	**-27%**	

1. Maximum Annual Capacity for Units 1-4, 2019 Bowen Baseline = (Total Max Planning Unit Capacities of 724 MW each for Units 1 & 2 and 892 MW each for Units 3 & 4) * 8,760 hours/year. See Technical Appendix Document A2.2-1.
2. Maximum Annual Capacity for Units 1-4, PRB Coal = 2019 Bowen Baseline Max Annual Capacity * (100 - 27% Derate).
3. The unit capacity reduction, or derate, from switching to PRB coal is estimated as the ratio of the heat contents for PRB Coal to 2019 Bowen Baseline IB coal: (PRB Coal heat content - 2019 Bowen Baseline heat content)/ 2019 Bowen Baseline heat content.

Table A2.3. Annual Operational & SO2 Emissions Data - 2019 Actuals for IB Coal, Estimations for PRB Coal and CAPP Coal

Calculation Values	2019 Bowen Baseline	PRB Coal	CAPP Coal
Annual Heat Input (MMBtu)[1]	118,872,778	118,872,778	118,872,778
Projected SO2 Rates (lb/MMBtu)[4]	0.16	0.03	0.07
Annual SO2 Emissions (tons)[5]	9,231	1,749	4,032
Annual SO2 Emissions Reduction (tons) compared to 2019 Bowen Baseline[6]	-	**7,482**	**5,199**
Percent SO2 Emissions Reduction from 2019 Bowen Baseline[7]	-	**81%**	**56%**

1. 2019 Bowen Baseline actual heat input is available from EPA's Air Market Programs Data database and used as equal annual baseline for all coal types. See Technical Appendix Document A2.3-1. Available at https://ampd.epa.gov/ampd/
2. 2019 Bowen Baseline generation is actual total MWh for Plant Bowen Units 1-4 from EIA 923 Schedule 2-5 Page 4. See Technical Appendix Document A3.2-1. Available at https://www.eia.gov/electricity/data/eia923/
3. PRB and CAPP Coal annual generation calculated based on equal 2019 Baseline heat input and associated heat rates for each coal type.
4. Projected SO2 Rates from Table A2.1. above.
5. 2019 Bowen Baseline actual SO2 emissions available from EPA's Air Market Programs Data database. See Technical Appendix Document A2.3-1. Available at https://ampd.epa.gov/ampd/
6. Annual SO2 Emissions Reduction = Actual Annual SO2 tons from 2019 Bowen Baseline - Calculated Annual SO2 tons for PRB or CAPP Coal. For example for PRB Coal, Annual SO2 Reduction = 9,231 - 1,749 = 7,482 tons.
7. Percent SO2 Emissions Reduction = Annual SO2 Emissions Reduction for each coal type / 2019 Bowen Baseline Annual SO2 Emissions * 100%

Table A3.1. Plant Bowen Delivered Fuel Costs

Coal Type	Delivered Coal Cost ($/MMBtu)[1,2]	Annual Heat Input (MMBtu)[3]	Calculated Annual Delivered Coal Cost[4]	Delivered Coal Cost Delta from Baseline[5]
2019 Bowen Baseline (IB Coal)	$ 2.87	118,872,778	$ 341,164,873	Baseline
PRB Coal	$ 2.88	118,872,778	$ 342,353,601	$ 1,188,727.78
CAPP Coal	$ 3.60	118,872,778	$ 427,942,001	$ 86,777,127.94

1. Weighted average actual Plant Bowen coal fuel cost ($/MMBtu) from 2019 EIA 923 Schedule 2-5 Page 5. See Technical Appendix Document A2.1-1. Available at: https://www.eia.gov/electricity/data/eia923/
   Plant Bowen also receives Northern Appalachian (NAPP) bituminous coal, which has similar heat and sulfur content to IB coal. This 2019 actual cost accounts for NAPP costs.
2. Estimated PRB and CAPP coal delivered fuel cost to Plant Bowen using 2019 market prices & transportation cost estimates from Southern Company Fuels Procurement. See Technical Appendix Document B2.1-2.
3. 2019 Bowen Baseline actual heat input is available from EPA's Air Market Programs Data database and used as equal annual baseline for all coal types. See Technical Appendix Document A2.3-1. Available at https://ampd.epa.gov/ampd/
4. Annual Delivered Coal Costs ($) calculated as Delivered Coal Cost ($/MMBtu) * Annual Heat Input (MMBtu)
5. Delivered Coal Cost Delta ($) calculated as Annual Cost of PRB or CAPP Coal - Annual Delivered Cost of 2019 Bowen Baseline.

Table A3.2. Summary of Variable O&M (VOM) Costs Compared to 2019 Bowen Baseline

Environmental Commodities	2019 Bowen Baseline	PRB Coal	CAPP Coal
Limestone Adjustment	Baseline	$ (14,851,769)	$ (10,574,539)
Hydrated Lime Adjustment	Baseline	**REDACTED**	**REDACTED**
Ammonia Adjustment	Baseline	**REDACTED**	**REDACTED**
Fuel Additive Adjustment	Baseline	**REDACTED**	**REDACTED**
Activated Carbon Adjustment	Baseline	**REDACTED**	**REDACTED**
Total Adjustment[3]	Baseline	$ (8,915,480)	$ (16,782,219)

1. 2019 Bowen Baseline generation is actual total MWh for Plant Bowen Units 1-4 from EIA 923 Schedule 2-5 Page 4. See Technical Appendix Document A2.3-2. Available at https://www.eia.gov/electricity/data/eia923/
2. PRB and CAPP Coal annual generation calculated based on equal 2019 Baseline heat input and associated heat rates for each coal type.
3. All environmental commodities cost adjustments calculated in Tables A3.3 and A3.4 below.
4. VOM Rate Delta ($/MWh) = Total Adjustment ($) / Annual Generation for each coal type (MWh).
5. Total Annual VOM Delta ($) = VOM Rate Delta ($/MWh) * Annual Generation for each coal type (MWh).

Table A3.3. Environmental Commodities Adjustments for PRB Coal

Environmental Commodities	2019 Bowen Baseline Actual Annual Costs[1,2]	Adjustment Factor for PRB Coal	Adjusted Costs for PRB Coal[3]	PRB Coal Delta from Baseline[4]
Limestone[5]	$ 18,129,939	18%	$ 3,278,170	$ (14,851,769)
Hydrated Lime[6]	**REDACTED**	0%	**REDACTED**	**REDACTED**
Ammonia[7]	**REDACTED**	80%	**REDACTED**	**REDACTED**
Fuel Additive[8]	**REDACTED**	150%	**REDACTED**	**REDACTED**
Activated Carbon Injection[9]	**REDACTED**	N/A	**REDACTED**	**REDACTED**

1. 2019 Actual commodities costs from Georgia Power financial tracking SOFIA system. See Technical Appendix Document B3.3-1.
2. 2019 Actual limestone spend also available from EIA 923 Schedule 8C as FGD Feed Materials and Chemicals Costs. See Technical Appendix Document A3.3-2. Available at: https://www.eia.gov/electricity/data/eia923/
3. Adjusted Costs = 2019 Bowen Baseline Cost * Adjustment Factor
4. Delta from Baseline = Adjusted Cost - 2019 Bowen Baseline Cost
5. Applied 82% limestone reduction based on difference in uncontrolled SO2 emissions from coal sulfur contents, 0.4% PRB Coal compared to 2.6% for 2019 Bowen Baseline from Table A2.1.
6. No hydrated lime needed on PRB Coal.
7. Applied 20% ammonia reduction on PRB Coal from Eastern Bituminous from pg. v of U.S. Department of Energy report by Nordin & Merriam (April 1997) entitled, "Nox Emissions Produced with Combustion of Powder River Basin Coal in a Utility Boiler." See Technical Appendix Document A3.3-7.
8. Additional fuel additive cost based on additional coal tons on PRB for equal baseline heat input of 118,872,778 MMBtu and PRB heat content of 8,800 Btu/lb = 6,754,135 tons PRB coal / 4,515,728 tons 2019 Bowen Baseline coal = 150%.
9. Activated carbon injection costs for PRB coal calculated based on vendor cost quote and historical usage data for Plant McIntosh Unit 1 for Bowen Units 1 & 2 with no baghouses and for Plant Scherer Unit 1 for Bowen Units 3 & 4 with baghouses.

Table A3.4. Environmental Commodities Adjustments for CAPP Coal

Environmental Commodities	2019 Bowen Baseline Actual Annual Costs[1,2]	Adjustment Factor for CAPP Coal	Adjusted Costs for CAPP Coal[3]	CAPP Coal Delta from Baseline[4]
Limestone[5]	$ 18,129,939	42%	$ 7,555,400	$ (10,574,539)
Hydrated Lime[6]	**REDACTED**	37%	**REDACTED**	**REDACTED**
Ammonia[7]	**REDACTED**	100%	**REDACTED**	**REDACTED**
Fuel Additive[8]	**REDACTED**	0%	**REDACTED**	**REDACTED**
Activated Carbon Injection[9]	**REDACTED**	100%	**REDACTED**	**REDACTED**

1. 2019 Actual commodities costs from Georgia Power financial tracking SOFIA system. See Technical Appendix Document B3.3-1.
2. 2019 Actual limestone spend also available from EIA 923 Schedule 8C as FGD Feed Materials and Chemicals Costs. See Technical Appendix Document A3.3-2. Available at: https://www.eia.gov/electricity/data/eia923/
3. Adjusted Costs = 2019 Bowen Baseline Cost * Adjustment Factor
4. Delta from Baseline = Adjusted Cost - 2019 Bowen Baseline Cost
5. Applied 42% limestone reduction based on difference in uncontrolled SO2 emissions from coal sulfur contents, 1.1% CAPP Coal compared to 2.6% for 2019 Bowen Baseline from Table A2.1.
6. Derived from 2014 Plant Bowen MATS optimization testing. See Technical Appendix Document B3.4-6.
7. No ammonia reduction since both fuels are bituminous.
8. No additive needed for CAPP Coal.
9. No change in activated carbon injection (ACI) since both fuels are bituminous.

Table A3.5. Fixed O&M Costs Compared to 2019 Bowen Baseline

Fixed O&M Cost Type	2019 Bowen Baseline	PRB Coal	CAPP Coal
Additional Employees[1]	Baseline	20	N/A
Additional Labor Costs[2]	Baseline	$ 1,080,000	N/A

1. PRB Coal assumed to require 20 additional full-time employee equivalents for additional fuel handling needs. No change in employees for CAPP Coal.
2. Labor costs calculated for $27 per hour for 2000 hours per year.

Table A4.1. Ash & Gypsum Sales Information

Sales Type	2019 Bowen Baseline[1]	PRB Coal Adjustment Factor[2]	PRB Coal Sales Estimate[3]	CAPP Coal Adjustment Factor[2]	CAPP Coal Sales Estimate[3]
Fly ash	$ 3,777,000	0.83	$ 3,142,929	1.43	$ 5,408,631
Bottom ash	$ 85,000	1.26	$ 107,406	1.63	$ 138,625
Total ash	$ 3,862,000	0.91	$ 3,250,334	1.47	$ 5,547,256
Gypsum	$ 2,951,000	0.20	$ 585,161	0.46	$ 1,348,657
Total Ash & Gypsum Sales	$ 6,813,000		$ 3,835,495		$ 6,895,913
Sales Delta compared to Baseline	-		**$ (2,977,505)**		**$ 82,913**

1. 2019 Bowen Baseline fly ash, bottom ash, and gypsum sales from EIA 923 Schedule 8B. See Technical Appendix Document A4.1-1. Available at https://www.eia.gov/electricity/data/eia923/

2. Coal Adjustment Factors calculated in Tables A4.2. and A4.3. below based on characteristics of each coal type (heat content, ash content, sulfur content) to determine the ratio of ash or gypsum for coal type compared to the 2019 Bowen Baseline.

3. Sales Estimates for each coal type = 2019 Bowen Baseline Sales * Adjustment Factor

Table A4.2. Ash Sales Adjustment Factors

Coal Type	Annual Heat Input (MMBtu)[1]	Heat Content (Btu/lb)[2]	Annual Coal Usage (tons)[3]	Expected % Ash	Total Ash Produced (tons)[4]	Total Ash Ratio compared to 2019 Bowen Baseline	Fly Ash Produced (tons)[5]	Fly Ash Ratio compared to 2019 Bowen Baseline	Bottom Ash Produced (tons)[5]	Bottom Ash Ratio compared to 2019 Bowen Baseline
2019 Bowen Baseline	118,872,778	N/A	4,515,728	8%	371,193	Baseline	304,378	Baseline	66,815	Baseline
PRB Coal	118,872,778	8,800	6,754,135	5%	337,707	0.91	253,280	0.83	84,427	1.26
CAPP Coal	118,872,778	12,000	4,953,032	11%	544,834	1.47	435,867	1.43	108,967	1.63

1. 2019 Bowen Baseline actual heat input is available from EPA's Air Market Programs Data database and used as equal annual baseline for all coal types. See Technical Appendix Document A2.3-1. Available at https://ampd.epa.gov/ampd/

2. Heat Content for PRB & CAPP Coals based on Southern Company Fuels Procurement information from coal cost estimation. See Technical Appendix Document A2.1-2.

3. Annual coal tons for PRB and CAPP calculated from the equal baseline Annual Heat Input / Heat Content of each coal type. 2019 Bowen Baseline coal tons and ash content from EIA 923 Schedule 2-5 Page 1 and Page 5, respectively. See Technical Appendix Documents A4.2-3 and A2.1-1. Available at https://www.eia.gov/electricity/data/eia923/

4. Total Ash Produced = Annual Coal tons * Expected % Ash for each coal type. Average ash % for PRB and CAPP coals estimated from 2019 EIA 923 data.

5. IB Coal ash is 82% fly ash and 18% bottom ash. PRB Coal ash is 75% fly ash and 25% bottom ash. CAPP Coal ash is 80% fly ash and 20% bottom ash. These percentages are applied to the Total Ash Produced to estimate fly ash and bottom ash production.

Table A4.3. Gypsum Sales Adjustment Factors

Coal Type	Annual Coal Usage (tons)	Sulfur Content (%)[1,2]	Scrubber Factor[3]	Gypsum Factor[4]	Total Gypsum Produced (tons)[5]	Total Gypsum Ratio compared to 2019 Bowen Baseline
2019 Bowen Baseline	4,515,728	2.6	0.037	1.6	689,213	Baseline
PRB Coal	6,754,135	0.4	0.037	1.6	136,666	0.20
CAPP Coal	4,953,032	1.1	0.037	1.6	314,982	0.46

1. 2019 Bowen Baseline coal tons and sulfur content from EIA 923 Schedule 2-5 Page 1 and Page 5, respectively. See Technical Appendix Documents A4.2-3 and A2.1-1. Available at https://www.eia.gov/electricity/data/eia923/

2. Sulfur Content for PRB & CAPP Coals based on Southern Company Fuels Procurement information from coal cost estimation. See Technical Appendix Document A2.1-2.

3. Scrubber factor accounts for FGD SO2 removal rate to reflect amount of gypsum to be produced and is equal to 1 - FGD Removal Rate. 2019 Bowen Baseline FGD Removal rate of 96.3% used from Table A2.1.

4. Gypsum factor is equal to the chemical balance of limestone to gypsum (100 g/mol / 64 g/mol).

5. Total Gypsum Produced = Annual Coal Usage * Sulfur Content * Scrubber Factor * Gypsum Factor

Due to the voluminous nature of these attachments, Technical Appendix B supporting documents are redacted in their entirety for the purpose of the public disclosure version of this submittal.