Regional Haze
State Implementation Plan Revision

Alternative to Source Specific
Best Available Retrofit Technology
Demonstration

for

Electric Generating Facilities
In North Carolina

Prepared by

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Preface: This document serves as a revision to the North Carolina Regional Haze State Implementation Plan, submitted to the U.S. Environmental Protection Agency on December 17, 2007. This document contains the technical information and data supporting North Carolina's Alternative to Source-Specific Best Available Retrofit Technology (BART) Determination for BART-eligible coal-fired electrical generating units pursuant to 40 CFR §51.308 under the Regional Haze program.

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1.0 INTRODUCTION

1.1 Purpose

Regional haze is pollution that impairs visibility over a large region, including national parks, forests, and wilderness areas (many termed "Class I" areas). Regional haze is caused by sources and activities emitting fine particles and their precursors, often transported over long distances. Particles affect visibility through the scattering and absorption of light. Reducing fine particles in the atmosphere is generally considered to be an effective method of reducing regional haze, and thus improving visibility. Fine particles may either be emitted directly or formed from emissions of precursors, the most important of which are sulfur dioxides (SO_2) and nitrogen oxides (NOx). Secondary formation of ammonium sulfate is the largest contributor to visibility impairment at the North Carolina Class I areas, and reduction of SO_2 emissions has been targeted as the most effective means of reducing ammonium sulfate. In the southeast, the most important sources of haze-forming emissions are coal-fired power plants, industrial boilers and other combustion sources, but also include mobile source emissions, area sources, fires, and wind-blown dust.

In Section 169A(a)(1) of the 1977 Amendments to the Clean Air Act, Congress created a program for protecting visibility in Class I areas. In the 1990 Clean Air Act, as amended (CAA), Congress added Section 169B to address regional haze. In response to this requirement, the U.S. Environmental Protection Agency (EPA) promulgated the Regional Haze Rule (RHR) on July 1, 1999 to address regional haze (64 FR 35713) and codified the requirements in 40 Code of Federal Regulations (CFR) 51.308. The regional haze rule requires states to demonstrate reasonable progress towards meeting the national goal of a return to natural visibility conditions by 2064. States are required to submit State Implementation Plans (SIPs) to the EPA that set out each state's plan for complying with the regional haze rule. The first regional haze SIPs were due December 17, 2007 and the corresponding regional haze SIP for North Carolina was submitted on that date.

On June 7, 2012, the EPA finalized a limited disapproval of North Carolina's December 2007 SIP because of deficiencies arising from the remand of the Clean Air Interstate Rule (CAIR) by the U.S. Court of Appeals for the District of Columbia Circuit (77 FR 33642). CAIR was a multi-state cap and trade program intended to reduce NOx and particulate matter emissions from large fossil-fuel combustion sources and mitigate interstate transport of NOx, ground-level ozone and particulate matter. It affected 27 eastern states and the District of Columbia. North Carolina, similar to other states, relied on CAIR to address BART for NOx and SO_2 emissions from electric generating units (EGUs). This strategy, consistent with the EPA's own regulations, represented an element of North Carolina's long-term strategy for achieving reasonable progress goals for the regional haze program.

In a separate action taken on June 27, 2012, the EPA finalized a limited approval of North Carolina's December 17, 2007 SIP, as meeting some of the applicable regional haze requirements as set forth in Sections 169A and 169B of the CAA and in 40 CFR 51.300-308 (77 FR 38185). This limited approval resulted in the approval of North Carolina's entire regional haze submission, even of those parts that were deemed deficient.

Under both of these EPA actions, North Carolina is required to submit an approvable SIP revision that corrects the deficiencies related to the State's reliance on CAIR. This document serves as North Carolina's demonstration to satisfy its SIP obligation.

1.1 North Carolina Class I Areas

North Carolina has five Class I areas within its borders: Great Smoky Mountains National Park, Joyce Kilmer-Slickrock Wilderness Area, Linville Gorge Wilderness Area, Shining Rock Wilderness Area, and Swanquarter Wildlife Refuge. The Great Smoky Mountains National Park and Joyce Kilmer-Slickrock Wilderness Area are located in both North Carolina and Tennessee. The figure below illustrates the location of these Class I areas.

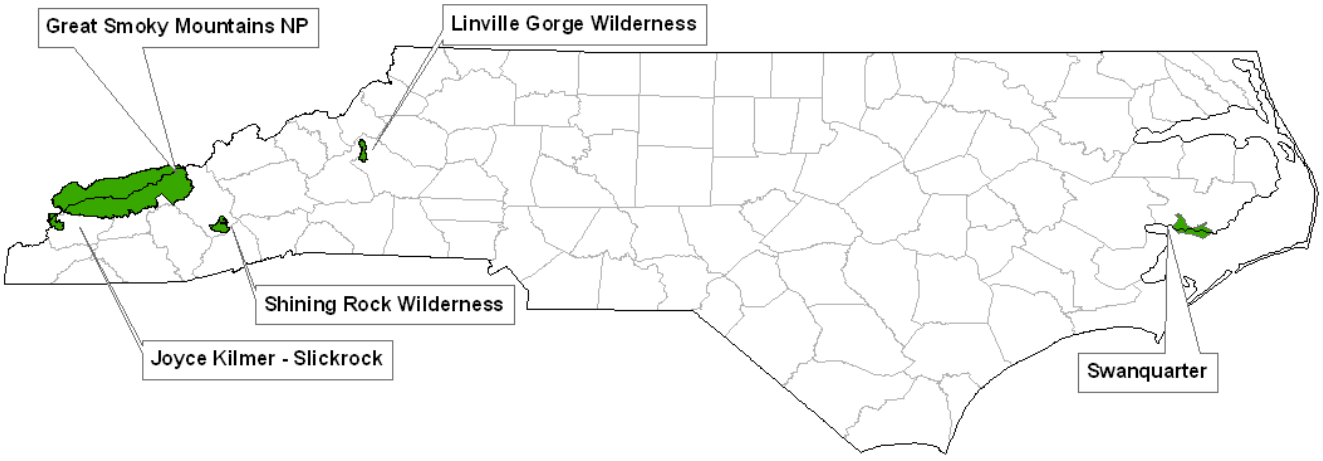


Figure 1. North Carolina Class I Areas

1.2 General Regional Haze SIP Requirements

States with emission sources impacting Class I areas are required to submit SIPs detailing anticipated actions taken in order to meet reasonable progress goals, as well as explaining the long-term strategy for meeting long-term return to the natural visibility goal. These requirements apply to any state having a Class I area as well as any state that contributes to visibility impairment at any (downwind) Class I area. The visibility goal must be designed both to improve visibility on the haziest days and to ensure that no degradation occurs on the clearest days.

Regional haze SIPs are required to include calculations of baseline and natural visibility conditions as well as monitoring strategies for tracking reasonable progress. Regional haze SIPs must also include a determination of Best Available Retrofit Technology (BART) for sources of a certain size or emissions profile that began operating during a specific timeframe.

Five years after the initial regional haze SIPs are submitted, states are required to submit an evaluation of the progress achieved. The states must also submit an update to the Regional Haze SIP in 2018 and 10 years thereafter to demonstrate the long-term strategy.

North Carolina submitted its Regional Haze SIP on December 17, 2007, and the Five Year Periodic Review SIP on May 31, 2013. Planning for the 2018 Regional Haze SIP, which covers the state's progress goals to 2028, has been initiated.

1.3 Results of the North Carolina 5-Year Periodic Review

States are required to submit SIPs to the EPA five years after the initial regional haze SIP was submitted evaluating the progress towards the reasonable progress goals for each Class I area located within the state and located outside the state which may be affected by emissions from within the state. North Carolina's regional haze SIP 5-year periodic review was submitted on May 31, 2013.

The progress report concluded that North Carolina's Class I areas have seen improvement on the 20% worst days since 2000. With the exception of the Swanquarter Wildlife Refuge, all other Class I areas have also seen improvement on the 20% best days based on 5-year average data since 2000. A slight increase in the haze index was measured at Swanquarter (less than 1 deciview (dv) for the 2006-2010 period as compared to the 2000-2004 period), partly due to incomplete data obtained from designated monitors. The deciview metric describes the total light extinction capability of all haze species in the ambient air at a given time at a given location, and is calculated as the natural logarithm of the total calculated light extinction on each day of measurement.

The report cited that post 2010 retirement of three coal-fired EGU facilities (Lee, Sutton, and Weatherspoon) was unaccounted for in the observed data, and associated reductions in EGU emissions and other improvements occurring at non-EGUs ensure that future improvement in the visibility on the 20% best days will occur. Indeed, the most recently released visibility data for Swanquarter shows significant improvement, with the annual average being less than the baseline for the first time since 2002. The average measurement for 2011 was 10.5 dv, resulting in the most recent 5-year average haze index of 12.1 dv, compared to the baseline average haze index of 12.0 dv.

2.0 BART DEMONSTRATION

2.1 Background

Section 169A(b)(2)(A) of the CAA, requires states with emissions that are reasonably anticipated to cause or contribute to visibility impairment in a Class I area to adopt a plan requiring BART for certain sources. On July 6, 2005, the EPA issued final Regional Haze Regulations and Guidelines for BART Determinations. The provision in the Regional Haze Rule (RHR) at 40 CFR 51.308(e)(2) gives states the authority to implement an alternative measure that achieves greater reasonable progress towards improving visibility at Class I areas than source-specific BART. In 2006, the EPA revised certain provisions and provided additional guidance on the alternative programs in the rule titled *Regional Haze Regulations: Revisions to Provisions Governing Alternative to BART Determinations* (referred to herein as Alternative BART Final Rule).

In May 2005, the EPA published the CAIR which required 27 states and the District of Columbia to reduce emissions of SO_2 and NOx that significantly contribute to, or interfere with maintenance of, the 1997 national ambient air quality standards for fine particulate matter and/or ozone in any downwind state. Using the flexibility allowed in the RHR to implement an alternative program in lieu of BART so long as the alternative program has been demonstrated to achieve greater progress toward the national visibility goal than would BART, the EPA determined that CAIR was "better-than-BART." This means that as a whole, the EPA determined that the CAIR cap-and-trade program improved visibility more than implementing BART for individual sources in states affected by CAIR.

The CAIR formed the regulatory underpinnings for most of the emissions reductions that were to produce visibility improvements in mandatory Class I areas from the electric power sector. A State that opted to participate in the CAIR program under 40 CFR 96.201-.224 (Subpart AAA through EEE) was not required to have a BART-eligible EGU install, operate, and maintain BART for SO_2 or NOx emissions. SO_2 is the main cause of fine particle pollution, haze and acid rain. NO_x is the main cause of ozone pollution, and to a lesser extent contributes to haze formation.

North Carolina relied on CAIR in the December 17, 2007 Regional Haze SIP for improvement in visibility expected as a result of controls planned or already installed in order to meet CAIR provisions in developing the State's long-term visibility strategy. The BART-eligible EGUs that relied on CAIR are listed below in Table 1.

Table 1. North Carolina BART-Eligible EGUs

Facility	Unit ID	Boiler Type*
Asheville	1	Dry bottom Wall-fired
	2	Dry bottom Wall-fired
Belews Creek	1	Dry bottom Wall-fired
	2	Dry bottom Wall-fired
Cliffside	5	Tangentially-fired
Marshall	1	Tangentially-fired
	2	Tangentially-fired
	3	Tangentially-fired
	4	Tangentially-fired
Roxboro	1	Tangentially-fired
	2	Tangentially-fired
	3	Dry bottom Wall-fired
Sutton	3	Dry bottom Wall-fired

* All units burn bituminous coal

For fine particulate matter (referred to as $PM_{2.5}$), North Carolina's EGUs were allowed to submit BART exemption modeling demonstrations. All six facilities with 13 BART-eligible EGUs (shown in Table 1) demonstrated that their emissions of particulate matter do not contribute to visibility impairment in any Class I area for particulate matter (see North Carolina's Dec. 2007 RH SIP).

On July 11, 2008, the U.S. Court of Appeals for the District of Columbia Circuit ruled that CAIR violated the CAA. The CAIR was initially vacated by the Court, but then in the final decision was remanded back to the EPA to promulgate a new rule consistent with the Court's opinion. This decision resulted in the June 7, 2012 EPA action to finalize a limited disapproval of the North Carolina Regional Haze SIP for reliance on CAIR to control NOx and SO_2 emissions from BART-eligible EGUs.

Per court order, the EPA replaced CAIR with the Cross State Air Pollution Rule (CSAPR) on August 8, 2011 (76 FR 48208). In a subsequent rulemaking, the EPA determined that in affected Class I areas, CSAPR achieves greater reasonable progress towards the national goal of achieving natural visibility conditions than source-specific BART; and participation by EGUs in CSAPR meets the requirements of an alternative program as prescribed in the Regional Haze Rule at § 51.308(e)(2) and (3).

Many states have elected to rely on CSAPR to satisfy EGU BART requirements. While North Carolina has the option to do the same, the State is compelled to submit a SIP revision in

response to the June 7, 2012 limited disapproval because many uncertainties still remain regarding the EPA's next steps due to the Supreme Court's decision to reinstate CSAPR after a lengthy legal process.

Using the same authority used by the EPA to justify CAIR and CSAPR as Alternative BART (per § 51.308(e)(2) and (3)), North Carolina is relying on the state's Clean Smokestacks Act (CSA) legislation as achieving greater reductions in NOx and SO_2 emissions than source-specific BART. The following sections provide an overview of the CSA and the state's alternative BART determination.

2.2 The Clean Smokestacks Act

The CSA was enacted by the North Carolina General Assembly in 2002 to improve air quality in North Carolina by imposing caps on the total annual emissions of SO_2 and NO_x from certain investor-owned coal-fired EGUs.[1] The legislation affected 14 coal-fired EGU facilities operated by Duke Energy and Progress Energy (recently merged to form Duke Energy Progress).

On August 21, 2009, North Carolina submitted an attainment demonstration for the Hickory-Morganton-Lenoir and Greensboro-Winston Salem-High Point 1997 $PM_{2.5}$ non attainment areas. These submittals included a request that the system-wide emission limitations from the CSA be incorporated into the State's federally approved SIP. The EPA determined that the paragraphs (a) through (e) of Section 1 of CSA (North Carolina Session Law 2001-4) are appropriate pursuant to the CAA (76 FR 59250). These provisions are adopted into the North Carolina SIP, which makes the specific CSA provisions permanent and enforceable. Further information on this action and accompanying amendment to the State SIP can be found in 40 CFR 52.178(h)[2].

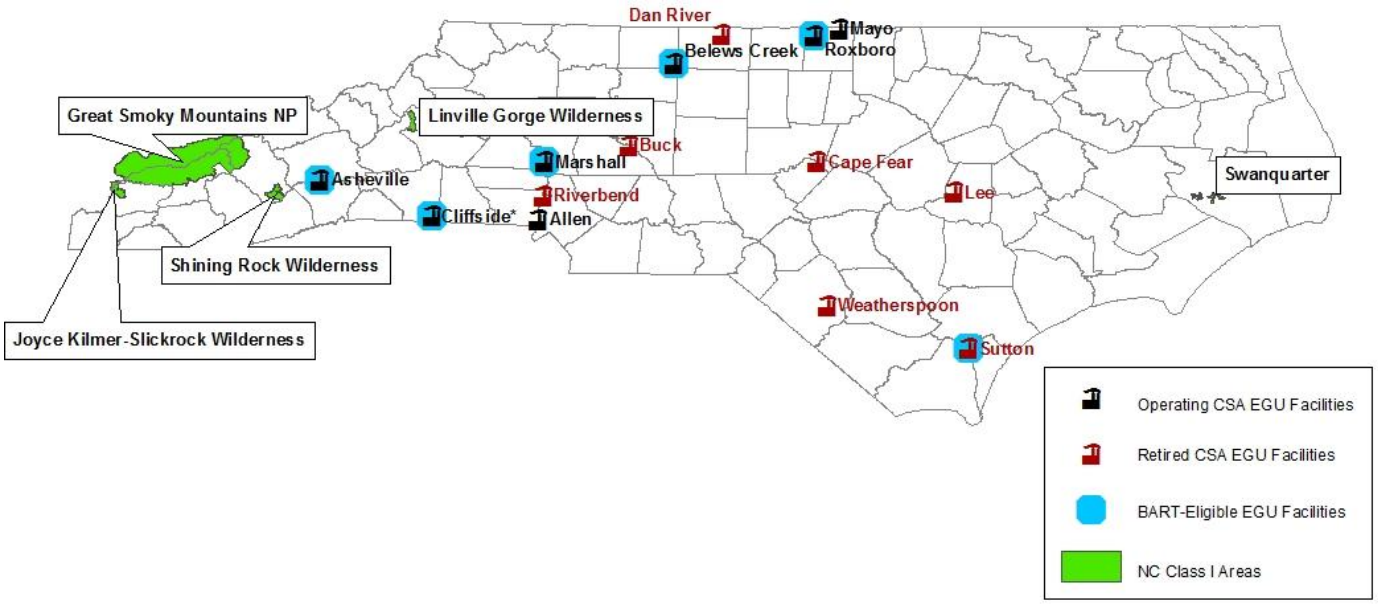
An important feature of the CSA is that Duke Energy and Progress Energy must achieve these cuts through actual reductions at their 14 EGU facilities in the state. Any buying, selling, or trading of emission credits is prohibited. Excess allowances must be surrendered to the North

[1] In 2002 the General Assembly of North Carolina passed Session Law 2002-4, also known as Senate Bill 1078. This legislation is titled "*An Act to Improve Air Quality in the State by Imposing Limits on the Emission of Certain Pollutants from Certain Facilities that Burn Coal to Generate Electricity and to Provide for Recovery by Electric Utilities of the Costs of Achieving Compliance with Those Limits*" (aka "Clean Smokestack Act"); see http://daq.state.nc.us/news/leg/cleanstacks.shtml.

[2] "North Carolina submitted a control strategy plan for particulate matter entitled, "An Act to Improve Air Quality in the State by Imposing Limits on the Emission of Certain Pollutants from Certain Facilities that Burn Coal to Generate Electricity and to Provide for Recovery by Electric Utilities of the Costs of Achieving Compliance with Those Limits." The State expects the resulting emission reductions of NO_x and SO_2 from this control plan will serve as a significant step towards meeting the 1997 $PM_{2.5}$ and 8-hour ozone NAAQS, among other NAAQS, improving visibility in the mountains and other scenic vistas, and reducing acid rain. The specific approved provisions, submitted on August 21, 2009, are paragraphs (a) through (e) of Section 1 of Session Law 2002-4, Senate Bill 1078 enacted and state effective on June 20, 2002. This approval does not include paragraphs (f) through (j) of Section 1 of Senate Bill 1078 nor any of Section 2 of Senate Bill 1078." See http://www.ecfr.gov/cgi-bin/text-idx?SID=ca15129758d822575878bf71f2605af9&node=40:4.0.1.1.1.15.1.12&rgn=div8

Carolina State Treasurer for the people of the State. In 2013, Duke Energy reported an excess of 58,961 CAIR SO_2 allowances and 1,987 CAIR NOx allowances above the CSA emissions limits. Progress Energy surrendered 78,050 CAIR SO_2 allowances. All of these excess allowances have been verified to be transferred to the State of North Carolina.

Table 2 lists the 14 coal-fired EGU facilities subject to the CSA. The CSA requirements apply to all electric generating units at each of these facilities, including the 13 BART-eligible EGUs at six facilities (listed in Table 1). Additionally, several non-BART-eligible EGUS that were excluded based on RHR applicability criteria and new units added since North Carolina's December 2007 SIP submittal, are also covered under the CSA legislation. Note, seven of the 14 coal-fired facilities have retired as of 2013, including one BART-eligible EGU facility (Sutton). Figure 2 illustrates the location of the retired and operating BART-eligible and CSA-subject EGU facilities relative to the Class I areas.



* Cliffside #4 retired

Figure 2. North Carolina BART-Eligible and CSA-Subject EGU Facilities

Table 2. North Carolina BART-Eligible and CSA-Subject EGUs

	Facility	Unit ID*	BART-Eligible EGU	CSA-Subject EGU	NOx Control	SO_2 Control
Operating	Asheville	1	X	X	SCR	FGD
		2	X	X	SCR	
	Belews Creek	1	X	X	SCR	
		2	X	X	SCR	
	Cliffside	5	X	X	SCR	
		6		X	SCR	
	Marshall	1	X	X	SNCR	
		2	X	X	SNCR	
		3	X	X	SCR	
		4	X	X	SNCR	
	Mayo	1		X	SCR	
	Roxboro	1	X	X	SCR	
		2	X	X	SCR	
		3	X	X	SCR	
		4		X	SCR	
	Allen	1-5		X	SNCR	
Retired/ Converted	Buck	5-9		X	SNCR	
	Cape Fear	5-6		X		
	Cliffside	4		X		
	Dan River	1-3		X		
	Lee	1-3		X		
	Riverbend	7-10		X		
	Sutton	3	X	X		
	Weatherspoon	1-3		X		

* All units burn bituminous coal

To comply with the CSA, the two utilities have installed emission controls as described in the Regional Haze Rule: scrubbers for SO_2 control and selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for NOx control. Table 2 characterizes each coal-fired EGU boiler in North Carolina in terms of its rated generating capacity, design type, SO_2 and NOx emission control technology and year of installation.

Calendar year 2007 marked the first milestone in meeting the NOx emissions reductions under the CSA. Duke Energy was limited to 35,000 tons of NOx in any calendar year beginning Jan. 1, 2007, and Progress Energy was limited to 25,000 tons of NOx (combined cap of 60,000 tons NOx). The end of 2009 marked the second milestone in emission reductions, when Duke Energy

was required to further reduce its calendar year NOx emissions to 31,000 tons, and Progress Energy to emit less than 25,000 tons (combined cap of 56,000 tons NOx). The annual NOx emissions must be below this limit for all future years. In summary, the combined sum of annual NOx emissions from the 14 coal-fired EGUs cannot exceed 56,000 tons in all future years.

For SO_2, 2009 marked the first milestone for both utilities to reduce calendar year emissions: Duke Energy to 150,000 tons and Progress Energy to 100,000 tons (combined cap of 250,000 tons SO_2). Calendar year 2013 marked the last milestone in meeting CSA emissions limits, with Duke Energy and Progress Energy required to reduce their annual SO_2 emissions to 80,000 tons and 50,000 tons, respectively (combined cap of 130,000 tons SO_2). In summary, the combined sum of annual SO2 emissions from the 14 coal-fired EGUs cannot exceed 130,000 tons in all future years.

Independent verification of compliance results is required to be conducted by the North Carolina Department of Environment and Natural Resources and the North Carolina Utilities Commission, and annual compliance reports are submitted to the North Carolina legislature (see http://www.ncair.org/news/leg/ for all posted reports). The utility companies have been and are in full compliance with all the CSA requirements. With only 7 EGU facilities remaining operational, actual NO_x and SO_2 emissions have been well below the CSA caps. Figure 3 illustrates the latest emissions reductions achieved. Collectively, the two utilities have reduced NOx emissions by 83 percent and SO_2 emissions by 89 percent relative to 1998 emission levels.

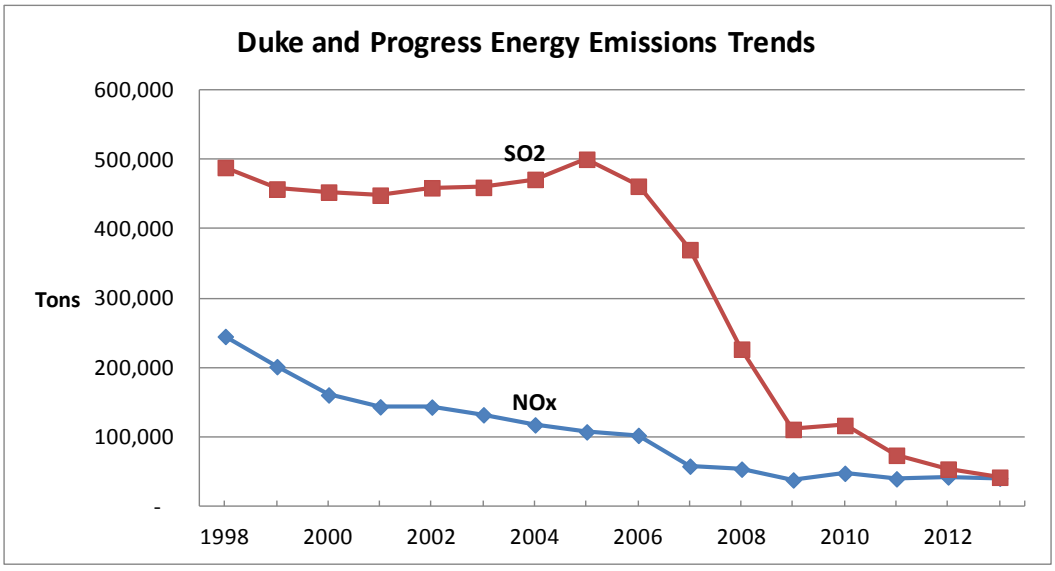


Figure 3. CSA Related Emissions Reductions

2.3 Criteria for Developing a BART Alternative

Specific criteria for determining if an alternative measure achieves greater reasonable progress than source-specific BART are set out in the Regional Haze Rule at 40 CFR §51.308(e)(2) and (3). The "better-than-BART" test may be satisfied as follows:

§51.308(e)(2)
(i) A demonstration that the emissions trading program or other alternative measure will achieve greater reasonable progress than would have resulted from the installation and operation of BART at all sources subject to BART in the State and covered by the alternative program. This demonstration must be based on the following:

> *(A) A list of all BART-eligible sources within the State.*
>
> *(B) A list of all BART-eligible sources and all BART source categories covered by the alternative program. The State is not required to include every BART source category or every*
> *BART-eligible source within a BART source category in an alternative program, but each BART-eligible source in the State must be subject to the requirements of the alternative program,*
> *have a federally enforceable emission limitation determined by the State and approved by EPA …*
>
> *(C) An analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each source within the State subject to BART and covered by the alternative program. This analysis must be conducted by making a determination of BART for each source subject to BART and covered by the alternative program …, unless the emissions trading program or other alternative measure has been designed to meet a requirement other than BART (such as the core requirement to have a longterm strategy to achieve the reasonable progress goals established by States). In this case, the State may determine the best system of continuous emission control technology and associated emission reductions for similar types of sources within a source category based on both source-specific and category-wide information, as appropriate.*
>
> *(D) An analysis of the projected emissions reductions achievable through the trading program or other alternative measure.*
>
> *(E) A determination under paragraph (e)(3) of this section or otherwise based on the clear weight of evidence that the trading program or other alternative measure achieves*

greater reasonable progress than would be achieved through the installation and operation of BART at the covered sources.

(iii) A requirement that all necessary emission reductions take place during the period of the first long-term strategy for regional haze...

(iv) A demonstration that the emission reductions resulting from the emissions trading program or other alternative measure will be surplus to those reductions resulting from the emissions trading program or other alternative measure will be surplus to those reductions resulting from measures adopted to meet requirements of the CAA as of the baseline date of the SIP.

(v) At the State's option, a provision that the emissions trading program or other alternative measure may include a geographic enhancement to the program to address the requirements under §51.302(c) related to BART for reasonably attributable impairment from the pollutants covered under the emissions trading program or other alternative measure.

(vi) For plans that include an emissions trading program that establishes a cap on total annual emissions of SO2 or NOx from sources subject to the program, requires the owners and operators of sources to hold allowances or authorizations to emit equal to emissions, and allows the owners and operators of sources and other entities to purchase, sell, and transfer allowances, the following elements are required concerning the emissions covered by the cap:

(A) …The State must demonstrate that the applicability provisions (including the size criteria for including sources in the program) are designed to prevent any significant potential shifting within the State of production and emissions from sources in the program to sources outside the program…
(B) Allowance provisions ensuring that the total value of allowances (in tons) issued each year under the program will not exceed the emissions cap (in tons) on total annual emissions from the sources in the program.
(C) Monitoring provisions providing for consistent and accurate measurements of emissions from sources in the program … The monitoring provisions must require that boilers, combustion turbines, and cement kilns in the program allowed to sell or transfer allowance must comply with the requirements of part 75…
(D) Recordkeeping provisions that ensure the enforceability of the missions monitoring provisions and other program requirements… must comply with the recordkeeping provisions of part 75….
(E) Reporting provisions requiring timely reporting of monitoring data with sufficient frequency to ensure the enforceability of the missions monitoring provisions…must comply with the reporting provisions of part 75…

(F) – (L) Various provisions related to tracking system, authorized account representative, allowance transfer, compliance, penalty, banking, and periodic program evaluation.

§51.308 (e)(3)

A State which opts under 40 CFR 51.308(e)(2) to implement an emissions trading program or other alternative measure rather than to require sources subject to BART to install, operate, and maintain BART may satisfy the final step of the demonstration required by that section as follows:

If the distribution of emissions is not substantially different than under BART, and the alternative measure results in greater emission reductions, then the alternative measure may be deemed to achieve greater reasonable progress.

If the distribution of emissions is significantly different, the State must conduct dispersion modeling to determine differences in visibility between BART and the trading program for each impacted Class I area, for the worst and best 20 percent of days. The modeling would demonstrate ''greater reasonable progress'' if both of the following two criteria are met: (i) Visibility does not decline in any Class I area, and (ii) There is an overall improvement in visibility, determined by comparing the average differences between BART and the alternative over all affected Class I areas.

2.4 BART Alternative Determination

North Carolina's approach for meeting each of the BART Alternative criteria listed above is discussed below. It is based on the EPA's own approaches for determining that CAIR achieves greater reasonable progress than BART in the RHR, and CSAPR is better than BART in the revised Alternative BART Final Rule. Other aspects of North Carolina's Alternative BART determination are derived from the EPA's Regional Haze BART Alternative SIP approvals for Connecticut and Massachusetts.

A. Identification of BART-eligible sources

Table 1, presented earlier, lists the 13 BART-eligible EGUs identified in the North Carolina's 2007 Regional Haze SIP. These EGUS are located at the following facilities: Asheville, Belews Creek, Cliffside, Marshall, Roxboro, and Sutton.

B. List of BART-eligible sources covered by the alternative program

Table 2, presented earlier, lists all coal-fired facilities and all of their associated emission units subject to the CSA that were operating in 2002 when the legislation was enacted. The CSA covers all 13 BART-eligible EGUs, one of which was retired in December 2013 (#3 at the Sutton Plant). Compliance with the CSA has also resulted in the retirement and/or conversion to natural gas of several non-BART-eligible EGUs at 6 other facilities.

C. Analysis of the best system of continuous emission control technology and emissions reductions achievable

§51.308(e)(2)(i)(C) requires an analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each source subject to BART and covered by the alternative program. This analysis can be conducted by making a determination of BART for each source subject to BART and covered by the alternative program per (e)(2)(i) or by determining the best system of continuous emission control technology and associated emission reductions for similar types of sources within a source category based on both source-specific and category-wide information, as appropriate.

In the Alternative BART Final Rule, the EPA stated that states are not required to make BART determinations under §51.308(e)(1) and may establish a BART benchmark based on an analysis of what BART is likely to be for similar types of sources within a source category. A state can establish a BART benchmark (i.e., emissions reductions that would result from the application of source-specific BART), and then can compare the emissions reductions achieved from the alternative measure with the emissions reductions that would be achieved from the BART benchmark. If the reductions from the alternative measure are greater than the BART benchmark, the state can assume that the alternative measure results in greater reasonable progress than BART. North Carolina applied this methodology, as was done by Connecticut and Massachusetts.

The RHR established control levels or emission rates as presumptive standards for EGUs greater than 200 megawatt (MW) capacity at plants with a total generating capacity in excess of 750 MW (40 CFR 51, Appendix Y). In developing the Alternative BART Final Rule, the EPA stated that "the States can apply the presumptive standards in developing a BART benchmark for an alternative program that includes such EGUs… In other words, when States are estimating emission reductions achievable from source-by-source BART, they must assume that the EGUs which would otherwise be subject to BART will control at the presumptive level." The EPA also stated that installation of presumptive level of controls is generally found to be BART and

by controlling the type of sources covered by the presumptions at the level of the presumptive standards will result in a substantial degree of visibility improvement.

Under the CSA, all currently operating coal-fired EGUs, including the BART-eligible units, have installed SO_2 and NOx emissions controls specified in the RHR: scrubbers for SO_2 and SCR or SNCR for NOx. Note, ten of the thirteen BART-eligible EGUs are operating with the most stringent NOx controls – SCR. Therefore, it can be concluded that the use of these controls to meet annual CSA compliance limits satisfies RHR requirements for BART-eligible units. The same system-wide compliance limits are SIP approved and federally enforceable, which satisfies the final requirements in RHR BART requirements. Nevertheless, North Carolina has performed a thorough analysis, as described in the RHR and the Alternative BART Final Rule, to conduct an Alternative BART demonstration by comparing emissions reductions between the BART benchmark using presumptive limits and the alternative measure.

The EPA has established the baseline date as "the date of the emissions inventories on which the regional haze SIP relies" (64 FR 35742). Therefore, any measure adopted after 2002 is considered "surplus" under 40 CFR 51.308(e)(2)(iv). CSA-related emissions controls became operational after 2002 which means these reductions are surplus and associated with the Alternative BART measure.

SO_2 Emissions Reductions – 2002 Estimates

The RHR specifies presumptive SO_2 BART limits for an EGU with an existing scrubber as 95 percent scrubber control efficiency or 0.15 pound per million Btu (lbs/MMBtu). This limit was used to calculate base year SO_2 emissions.

Table 3 shows the BART benchmark estimated SO_2 emissions for BART-eligible units, which are calculated by multiplying the presumptive limit by each unit's 2002 heat input in MMBtu. When compared to actual 2002 SO_2 emissions, the BART benchmark results in an estimated reduction of 274,668 tons of SO_2 from 2002 emissions.

Table 3. BART Benchmark for SO_2

BART-Eligible EGU Facility	BART Eligible Unit ID	2002 SO2 Emissions (Tons)	2002 Heat Input (MMBtu)	SO2 Presumptive Limit (lb/MMBtu)	BART Benchmark Estimated SO2 Emissions (tons)
Asheville	1	8,613	13,400,000	0.15	1,005
	2	8,089	12,200,000	0.15	915
Belews Creek	1	57,849	85,200,000	0.15	6,390
	2	45,236	67,800,000	0.15	5,085
Cliffside	5	19,429	24,200,000	0.15	1,815
Marshall	1	13,731	20,800,000	0.15	1,560
	2	14,825	22,400,000	0.15	1,680
	3	26,381	39,900,000	0.15	2,993
	4	27,323	41,700,000	0.15	3,128
Roxboro	1	12,028	17,500,000	0.15	1,313
	2	29,718	41,200,000	0.15	3,090
	3	30,610	42,400,000	0.15	3,180
Sutton	3	14,492	20,064,803	0.15	1,505
BART Eligible Sources Total		308,325			33,657
				SO2 Reductions with Presumptive Limit	**274,668**

Table 4 shows the Alternative BART estimated SO_2 emissions, which are representative of the emissions limitations specified in the CSA (80,000 tons for Duke Energy EGUs and 50,000 tons for Progress Energy EGUs). These system-wide emissions limitations are SIP approved. Using these emissions limitations, or "caps", the Alternative BART would result in an estimated emissions reduction of 337,321 tons from 2002 emissions. Compared to estimated reductions from BART alone, the Alternative BART achieves an additional SO_2 reduction of 62,653 tons (see Table 4).

Table 4. Base Year SO_2 Emissions Reductions from Alternative BART

Entity Subject to CSA	Facility	2002 SO2 Emissions (Tons)	Alternative BART SO2 Emissions Limit (Tons)
Duke Energy	Allen	31,132	
	Belews Creek[a]	103,085	
	Cliffside[a]	22,096	
	Marshall[a]	82,260	
	Buck[b]	7,428	
	Dan River[b]	2,949	
	Riverbend[b]	14,959	
	Subtotal	263,909	80,000
Progress Energy	Asheville[a]	16,702	
	Mayo	27,410	
	Roxboro[a]	95,610	
	Cape Fear	11,755	
	Lee[b]	15,535	
	Sutton[a, b]	20,865	
	Weatherspoon[b]	15,535	
	Subtotal	203,412	50,000
	Total	467,321	130,000
SO2 Reductions with Alternative BART			**337,321**
Additional Reductions with Alternative BART (BART Benchmark *minus* Alternative BART)			**62,653**

[a] BART-eligible EGU facilities

[b] EGU Facilities retired or converted to natural gas

SO_2 Emissions Reductions – 2018 Projections

Table 5 shows projected emissions with Alternative BART, specifically the projected SO_2 emissions from 2018 VISTAS (Visibility Improvement – State and Tribal Association of the Southeast) modeling which was used in the 2007 Regional Haze SIP. The VISTAS modeling incorporated the CSA emissions limits in developing 2018 emissions projections. For further

documentation on how VISTAS calculated the 2018 projections, please refer to the North Carolina's Regional Haze SIP. The 2018 VISTAS modeling projected total SO_2 emissions at 89,343 tons, well below the allowable 130,000 tons CSA cap. By comparing 2018 VISTAS projected SO_2 emissions with 2002 emissions, the Alternative BART reduces 377,978 tons SO_2 while the reductions from BART-eligible sources alone is 276,998 tons SO_2. Based on this data, it is apparent that the Alternative BART is projected to achieve an estimated 100,980 tons of additional SO_2 reductions than BART alone using 2018 VISTAS modeling results (see bottom of Table 5).

Table 5 also shows the EPA's latest 2018 emissions forecast using the Integrated Planning Model (IPM). The EPA's first version of the power sector modeling platform and its results were released on November 27, 2013 (http://www.epa.gov/powersectormodeling/BaseCasev513.html) for public input. The EPA plans to use these results to conduct interstate pollution transport modeling, assessment of revised air quality standards, and other national/regional analysis efforts. The EPA's latest modeling estimates that in 2018, total SO_2 emissions for North Carolina's EGUs will be about 24,732 tons, which is well below VISTAS 2018 projections (89,943 tons) and CSA emissions cap (130,000 tons). Using EPA's estimate of 2018 SO_2 emissions projections; the Alternative BART achieves an estimated 157,274 tons of additional SO_2 reductions than BART alone (see bottom of Table 5).

Table 5 also shows Duke Energy Progress' internal forecast of 2018 emissions projections due to the significant shift from coal to natural gas and retirement of uncontrolled units. These current estimates were provided by the utility company based on their own economic modeling, and differ only slightly from the EPA-IPM forecast. The primary difference is that Allen coal-fired EGUs were assumed to be shut down by IPM. Under Duke's future scenario, the Alternative BART achieves an estimated 156,916 tons of additional SO_2 reductions than BART alone.

In both the EPA-IPM and Duke modeling forecasts, Alternative BART achieves far greater emissions reductions than initially projected in 2018 VISTAS modeling. It is also clear that 2018 operating scenarios will results in total SO_2 emissions that are well below the CSA caps for all Alternative BART sources (i.e., 130,000 tons allowed compared to about 24,000 tons forecasted). Both of these comparisons provide additional assurances that projected emissions forecasts for Alternative BART will achieve greater reductions than BART alone.

Table 5. Projected SO_2 Emissions Reductions From Alternative BART

Entity Subject to CSA	Facility	2002 SO2 Emissions (Tons)	2018 VISTAS Projected SO2 Emissions (Tons)	2018 EPA-IPM Projected SO2 Emissions (Tons)*	2018 Duke Energy Progress Projected SO2 Emissions (Tons)**	Alternative BART SO2 Emissions Limit (Tons)
Duke Energy	Allen	31,132	2,573	0	492	
	Belews Creek[a]	103,085	5,754	4,488	7,222	
	Cliffside[a]	22,096	3,903	2,641	749	
	Marshall[a]	82,260	5,405	10,315	8,029	
	Buck[b]	7,428	9,934	0	0	
	Dan River[b]	2,949	6,799	0	0	
	Riverbend[b]	14,959	12,049	0	0	
	Subtotal	263,909	46,417	17,444	16,492	80,000
Progress Energy	Asheville[a]	16,702	1,075	926	975	
	Mayo	27,410	1,907	1,722	1,588	
	Roxboro[a]	95,610	8,085	4,640	4,846	
	Cape Fear	11,755	7,679	0	0	
	Lee[b]	15,535	12,257	0	0	
	Sutton[a, b]	20,865	7,105	0	0	
	Weatherspoon[b]	15,535	4,818	0	0	
	Subtotal	203,412	42,926	7,288	7,409	50,000
Alternative BART Total		467,321	89,343	24,732	23,901	130,000
Projected Reductions with Alternative BART (2002 minus 2018)			377,978	442,589	443,420	337,321
BART Eligible Sources Only Total		308,325	31,327	23,010	21,821	
Projected Reductions from BART Eligible Sources Only (2002 minus 2018)			276,998	285,315	286,504	
Projected Additional Reductions Beyond BART Eligible Sources Alone			100,980	157,274	156,916	

[a] BART-eligible EGU facilities

[b] EGU Facilities retired or convereted to natural gas

* Based on EPA's November 27, 2013 power sector modeling using the Integrated Planning Model (IPM)

** Based on company's own modeling and emissions projections

SO_2 Emissions Reductions – 2009-2013 Actual

Although not required, North Carolina conducted an analysis of actual reductions achieved with the Alternative BART since the passage of the CSA. Table 6 illustrates emissions reported to the EPA Air Markets Division from 2009 through 2013. 2009 is selected as the starting year because this is when the utilities were required to comply with the first set of emissions limits for SO_2.

The data show a precipitous decline in SO_2 emissions over the years. In each of the observed years, the actual emissions are far below the 130,000 tons allowable under the CSA (actual ranges between 110,818 tons in 2009 and 42,080 tons in 2013).

By the end of 2013, Alternative BART reduced 425,241 tons SO_2 while the reductions from BART-eligible sources were 273,408 tons. Based on these observations, it can be concluded that the Alternative BART achieved 151,833 tons of additional SO_2 reductions than BART alone in 2013, which is much higher than the reductions projected in 2018 VISTAS modeling to show reasonable progress for a long-term strategy.

The data also show that emissions reductions are uniform across all EGUs. Significant reductions have taken place at both BART-eligible and non BART-eligible facilities. This means that installed emissions controls are being utilized and CSA related actions are not isolated to a single facility or a group of facilities in order to stay below the CSA cap.

Table 6. Actual SO_2 Emissions Reductions with Alternative BART

Entity Subject to CSA	Facility	2002 SO2 Emissions (Tons)	2009 (Tons)	2010 (Tons)	2011 (Tons)	2012 (Tons)	2013 (Tons)
Duke Energy	Allen	31,132	8,832	2,071	1,665	707	846
	Belews Creek[a]	103,085	4,219	3,625	3,308	4,075	5,075
	Cliffside[a]	22,096	22,979	12,217	308	299	859
	Marshall[a]	82,260	4,571	3,658	3,853	4,599	4,704
	Buck[b]	7,428	2,394	6,499	3,839	1,420	566
	Dan River[b]	2,949	1,397	4,291	1,947	0	9
	Riverbend[b]	14,959	4,158	10,408	7,119	1,549	1,158
	Subtotal	263,909	48,549	42,769	22,038	12,649	13,216
Progress Energy	Asheville[a]	16,702	1,395	2,000	2,242	1,815	819
	Mayo	27,410	5,932	5,369	7,235	6,061	4,570
	Roxboro[a]	95,610	9,630	12,115	9,334	13,373	12,643
	Cape Fear	11,755	11,308	13,338	8,103	3,298	
	Lee[b]	15,535	12,953	15,536	9,609	5,931	15
	Sutton[a, b]	20,865	17,947	18,828	12,981	10,332	10,817
	Weatherspoon[b]	15,535	3,103	6,574	1,914		
	Subtotal	203,412	62,268	73,760	51,419	40,809	28,864
Alternative BART Total		467,321	110,818	116,529	73,457	53,458	42,080
Emissions Reductions with Alternative BART (2002 minus Actual)			356,503	350,791	393,864	413,862	425,241
BART Eligible Sources Only Total		308,325	60,741	52,443	32,026	34,492	34,917
Emissions Reductions from BART Eligible Sources Only (2002 minus Actual)			247,584	255,882	276,299	273,833	273,408
Additional Reductions Beyond BART Eligible Sources Alone			108,919	94,909	117,565	140,029	151,833

[a] BART-eligible EGU facilities

[b] EGU Facilities retired or convereted to natural gas

NOx Emissions Reductions – 2002 Estimates

The presumptive NOx limits, differentiated by boiler design and type of coal burned, are specified in the RHR. Table 7 lists the presumptive limits for the six BART-eligible EGUs based on boiler configuration.

Table 7. Presumptive NOx Emission Limits for BART-Eligible Coal-Fired Units

Boiler Type	Coal Type	NOx Presumptive Limit (lb/MMBtu)
Wall-fired*	Bituminous	0.39
Tangential-fired*	Bituminous	0.28

* Asheville (1, 2); Belews Creek (1,2); Roxboro (3); Sutton (3)
** Cliffside (5); Marshall (1, 2, 3, 4), Roxboro (1, 2)

Table 8 shows the BART benchmark estimated NOx emissions for the BART-eligible units, which are calculated by multiplying the presumptive limit by each unit's 2002 heat input in MMBtu. When compared to actual 2002 NOx emissions, the BART benchmark results in an estimated reduction of 19,364 tons of NOx from 2002 emissions.

Table 8. BART Benchmark for NOx

BART-Eigible EGU Facility	BART Eligible Unit ID	2002 NOx Emissions (Tons)	2002 Heat Input (MMBtu)	NOx Presumptive Limit (lb/MMBtu)	BART Benchmark Estimated NOx Emissions (tons)
Asheville	1	3,053	13,400,000	0.39	2,613
	2	2,051	12,200,000	0.39	2,379
Belews Creek	1	22,703	85,200,000	0.39	16,614
	2	22,179	67,800,000	0.39	13,221
Cliffside	5	2,913	24,200,000	0.28	3,388
Marshall	1	4,538	20,800,000	0.28	2,912
	2	3,247	22,400,000	0.28	3,136
	3	6,109	39,900,000	0.28	5,586
	4	5,277	41,700,000	0.28	5,838
Roxboro	1	3,033	17,500,000	0.39	3,413
	2	5,877	41,200,000	0.28	5,768
	3	9,109	42,400,000	0.39	8,268
Sutton	3	6,324	20,064,803	0.39	3,913
BART Eligible Sources Total		96,412			77,048
				NOx Reductions with Presumptive Limit	**19,364**

Table 9 shows the Alternative BART estimated NOx emissions, which are representative of the emissions limitations specified in the CSA. The Alternative BART results in estimated emissions reductions of 86,879 tons from 2002 emissions. Compared to estimated reductions from BART alone, the Alternative BART achieves an additional NOx reduction of 67,515 tons.

Table 9. Base Year NOx Emissions Reductions From Alternative BART

Entity Subject to CSA	Facility	2002 NOx Emissions (Tons)	Alternative BART NOx Emissions Limit (Tons)
Duke Energy	Allen	9,018	
	Belews Creek[a]	44,882	
	Cliffside[a]	3,633	
	Marshall[a]	19,170	
	Buck[b]	2,110	
	Dan River[b]	1,375	
	Riverbend[b]	3,794	
	Subtotal	83,982	25,000
Progress Energy	Asheville[a]	5,104	
	Mayo	9,710	
	Roxboro[a]	23,656	
	Cape Fear	2,645	
	Lee[b]	5,515	
	Sutton[a, b]	9,007	
	Weatherspoon[b]	3,258	
	Subtotal	58,896	31,000
	Total	142,879	56,000
NOx Reductions with Alternative BART			**86,879**
Additional Reductions with Alternative BART (BART Benchmark *minus* Alternative BART)			**67,515**

[a] BART-eligible EGU facilities

[b] EGU Facilities retired or converted to natural gas

NOx Emissions Reductions – 2018 Projections

Table 10 shows projected emissions with Alternative BART, specifically the projected NOx emissions from 2018 VISTAS modeling. By comparing 2018 VISTAS projected NOx emissions with 2002 emissions, the Alternative BART reduces 100,746 tons NOx while the reductions from BART-eligible sources is 69,485 tons NOx. Based on this data, it is apparent that the Alternative BART is projected to achieve an estimated 31,260 tons of additional NOx reductions than BART alone using 2018 VISTAS modeling results (see bottom of Table 10).

Table 10 also shows the EPA's latest 2018 NOx emissions forecast using IPM. The current estimates account for the dramatic shift from coal to natural gas which was not anticipated in 2007 when the 2018 VISTAS modeling was conducted. The EPA's latest modeling estimates that in 2018, total NOx emissions for North Carolina's EGUs will be about 22,792 tons, which is well below VISTAS 2018 projections (42,133 tons) and CSA emissions cap (56,000 tons). Using EPA's estimate of 2018 NOx emissions projections; the Alternative BART achieves an estimated 44,644 tons of additional NOx reductions than BART alone (see bottom of Table 10).

Table 10 also shows Duke and Progress Energy's internal forecast of 2018 NOx emissions. These current estimates were provided by the utility company based on their own economic modeling, and differ only slightly from IPM forecast. The primary difference is that Allen coal-fired EGUs were assumed to be shut down by IPM. Under Duke's future scenario, the Alternative BART achieves an estimated 45,178 tons of additional NOx reductions than BART alone.

In both the EPA-IPM and Duke modeling forecasts, Alternative BART achieves greater emissions reductions than initially projected in 2018 VISTAS modeling. It is also clear that 2018 operating scenarios will results in total NOx emissions that are well below the CSA caps for all Alternative BART sources (i.e., 56,000 tons allowed compared to about 23,000 tons forecasted). Both of these comparisons provide additional assurances that projected emissions forecasts for Alternative BART will achieve greater reductions than BART alone.

Table 10. Projected NOx Emissions Reductions From Alternative BART

Entity Subject to CSA	Facility	2002 NOx Emissions (Tons)	2018 VISTAS Projected NOx Emissions (Tons)	2018 EPA-IPM Projected NOx Emissions (Tons)*	2018 Duke Energy Progress Projected NOx Emissions (Tons)**	Alternative BART NOx Emissions Limit (Tons)
Duke Energy	Allen	9,018	3,397	0	490	
	Belews Creek[a]	44,882	5,230	3,565	4,474	
	Cliffside[a]	3,633	2,484	2,855	1,685	
	Marshall[a]	19,170	12,262	6,315	11,603	
	Buck[b]	2,110	1,788	0	0	
	Dan River[b]	1,375	1,095	0	0	
	Riverbend[b]	3,794	1,969	0	0	
	Subtotal	83,982	28,225	12,735	18,252	25,000
Progress Energy	Asheville[a]	5,104	997	1,568	376	
	Mayo	9,710	1,744	1,822	798	
	Roxboro[a]	23,656	3,784	6,667	2,988	
	Cape Fear	2,645	1,243	0	0	
	Lee[b]	5,515	2,135	0	0	
	Sutton[a, b]	9,007	2,170	0	0	
	Weatherspoon[b]	3,258	1,835	0	0	
	Subtotal	58,896	13,908	10,057	4,162	31,000
Alternative BART Total		142,879	42,133	22,792	22,414	56,000
Projected Reductions with Alternative BART (2002 minus 2018)			100,746	120,087	120,465	86,879
BART Eligible Sources Only Total		96,412	26,927	20,970	21,126	
Projected Reductions from BART Eligible Sources Only (2002 minus 2018)			69,485	75,442	75,286	
Projected Additional Reductions Beyond BART Eligible Sources Alone			31,260	44,644	45,178	

[a] BART-eligible EGU facilities

[b] EGU Facilities retired or convereted to natural gas

* Based on EPA's November 27, 2013 power sector modeling using the Integrated Planning Model (IPM)

** Based on company's own modeling and emissions projections

NOx Emissions Reductions – 2009-2013 Actual

North Carolina also conducted an analysis of actual reductions achieved with the Alternative BART since the passage of the CSA. Table 11 illustrates emissions reported to the EPA Air Markets Division from 2009 through 2013. 2009 is selected as the starting year because this is when the utilities were required to comply with the final set of emissions limits for NOx.

The data show a precipitous decline in NOx emissions over the years. In each of the observed years, the actual emissions are far below the 56,000 tons allowable under the CSA (actual ranges between 47,373 tons in 2010 and 40,410 tons in 2013).

By the end of 2013, Alternative BART reduced 102,468 tons NOx while the reductions from BART-eligible sources were 63,321 tons. Based on these observations, it can be concluded that the Alternative BART achieved 39,147 tons of additional NOx reductions than BART alone, which is much higher than the reductions projected in 2018 VISTAS modeling to show reasonable progress for a long-term strategy.

The data also show that emissions reductions are uniform across all EGUs. Significant reductions have taken place at both BART-eligible and non BART-eligible facilities. This means that installed emissions controls are being utilized and CSA related actions are not isolated to a single facility or a group of facilities in order to stay below the CSA cap.

Table 11. Actual NOx Emissions Reductions with Alternative BART

Entity Subject to CSA	Facility	2002 NOx Emissions (Tons)	2009 (Tons)	2010 (Tons)	2011 (Tons)	2012 (Tons)	2013 (Tons)
Duke Energy	Allen	9,018	3,821	5,045	4,401	2,297	3,155
	Belews Creek[a]	44,882	2,765	3,271	4,002	4,955	5,015
	Cliffside[a]	3,633	1,048	864	709	409	1,607
	Marshall[a]	19,170	9,744	9,608	9,085	11,027	11,854
	Buck[b]	2,110	374	1,144	639	338	221
	Dan River[b]	1,375	249	967	535	6	136
	Riverbend[b]	3,794	539	1,538	1,104	216	163
	Subtotal	83,982	18,541	22,438	20,474	19,248	22,151
Progress Energy	Asheville[a]	5,104	650	1,149	1,066	1,121	874
	Mayo	9,710	1,606	1,906	1,510	2,968	2,648
	Roxboro[a]	23,656	6,627	7,028	6,788	13,068	10,060
	Cape Fear	2,645	1,957	2,956	2,144	703	
	Lee[b]	5,515	3,053	4,428	2,620	1,717	996
	Sutton[a, b]	9,007	4,272	4,927	4,026	3,320	3,681
	Weatherspoon[b]	3,258	1,123	2,540	732		
	Subtotal	58,896	19,288	24,935	18,887	22,898	18,259
Alternative BART Total		142,879	37,829	47,373	39,361	42,147	40,410
Emissions Reductions with Alternative BART (2002 minus Actual)			105,049	95,506	103,518	100,732	102,468
BART Eligible Sources Only Total		96,412	25,106	26,847	25,677	33,900	33,091
Emissions Reductions from BART Eligible Sources Only (2002 minus Actual)			71,306	69,565	70,735	62,512	63,321
Additional Reductions Beyond BART Eligible Sources Alone			33,744	25,941	32,782	38,220	39,147

[a] BART-eligible EGU facilities

[b] EGU Facilities retired or convereted to natural gas

D. Geographical distribution of emissions

§51.308 (e)(3) specifies that "if the distribution of emissions is not substantially different than under BART, and the alternative measure results in greater emission reductions, then the alternative measure may be deemed to achieve greater reasonable progress." In this case, additional dispersion modeling is not required to determine differences in visibility between BART and Alternative BART for each impacted Class I area.

In North Carolina's demonstration, the geographic location where emissions reductions are taking place is not substantially different since all units subject to BART are included in the Alternative BART measure. As shown below in Figure 4 below and earlier in Table 2, all 13 BART-eligible EGUs (shown in blue) are covered in the Alternative BART (shown in black). The remaining non BART-eligible EGUs (Allen and Mayo) that are covered in the Alternative BART are in the geographic proximity of BART-eligible EGUs: Allen is located within 30 to 40 miles of Cliffside and Marshall and Mayo is located within 11 miles of Roxboro.

Figure 4. Remaining North Carolina EGUs

Based on the above illustrated source clustering, we do not believe that "emissions trading" that could occur within the seven CSA subject facilities would result in substantially different emissions distribution. Additionally, the likelihood of only the non-BART eligible EGUs (i.e., Allen and Mayo), operating controlled or uncontrolled under the CSA, is very low since the capacity of these EGUs is not sufficient to meet the state's annual electricity demand. Indeed, historical operating and emissions data from 2009 through 2013 show that all BART-eligible and non-BART eligible EGUs are producing electricity and operating with NOx and SO_2 emissions controls, which suggests uniform level of emissions reductions is achieved by all EGUs during these five years.

In addition to the above explanation, North Carolina is providing the following weight of evidence demonstration pursuant to 40 CFR 51.308(e)(2)(i)(E) that the CSA achieves greater reasonable progress than would be achieved through the installation and operation of BART at the covered sources.

Under all the emissions scenarios examined, emissions reductions with the Alternative BART measure are consistently higher than BART alone. This includes comparisons using: presumptive BART, three different 2018 emissions projections (2018 VISTAS, 2018 EPA-IPM, and 2018 Duke Energy forecast), and actual observed emissions levels between the years 2009 through 2013.

Additional evidence illustrating that emission reductions are indeed occurring at all 13 BART-eligible EGUs is shown in Table 6 for SO_2 and Table 10 for NOx. From 2009 through 2013, emissions reductions were indeed taking place at each and every EGU facility and these reductions were not isolated to any one specific facility or group of facilities as would be the case if "intrastate trading" was occurring. In fact, the percent reduction at the Alternative BART-eligible sources is nearly identical (95%) to the percent reduction at BART-eligible sources. This means that projected reductions are occurring in a uniform manner across all EGUs, and are not isolated to a single or small group of EGUs.

Each of the 13 BART-eligible EGUs and remaining non-BART EGUs are operating with RHR defined emission controls – FGD for SO_2 and SCR or SNCR for NOx. The Division of Air Quality's (DAQ's) review of historical operating data indicates that each of these controls are operated continuously, although some units' NOx control efficiencies appear to have declined in recent years due to the shift from coal plants operated as base load operation to intermediate operation (i.e., some boilers are operating at less than 20 percent of maximum output).

Actual NOx and SO_2 emissions rates (tons pollutant emitted per million Btu heat input) are within the range expected of SCR and/or SNCR controlled and FGD controlled EGUs, respectively. Appendix A summarizes unit level SO_2 and NOx emission rates in 2002 and from 2009 through 2013. The observed rates are below the presumptive rates for nearly all plants for each year. The few instances where the rates are higher are expected to result from units operating at much lower loads than historically operated at. It should be noted that overall total emissions are much less because the units are simply not operating long enough.

Based on the above weight of evidence discussion, North Carolina is concluding that all required criteria have been met for demonstrating that state's Alternative BART program achieves greater reasonable progress.

E. §51.308 (e)(2)(iii) through (vi) Requirements

The CSA legislation contains a schedule for compliance, including reporting process for accounting and monitoring emissions. All CSA related permitting and construction have been completed to meet the various 2007, 2009 and 2013 NOx and SO_2 emissions limitations, as documented in annual compliance reports submitted by the utility and the North Carolina Department of Environment and Natural Resources and the state Utilities Commission. The emissions reductions achieved from the CSA are surplus to those reductions resulting from measures adapted to meeting CAA requirements as of the baseline date of the SIP.

§51.308 (e)(2)(vi) requires certain elements to be fulfilled for sources participating in an emissions trading program that establishes a cap on total annual emissions of SO_2 and NOx from sources subject to the program. All CSA-subject sources are subject to the EPA CAIR and CSAPR, and are currently in compliance with federal requirements; therefore, all necessary provisions related to allowance tracking, monitoring, reporting, authorization, compliance, and other activities are being adhered to. Additionally, as discussed in Section 2.2, the CSA requires Duke and Progress Energy to surrender NOx and SO_2 allowances to the North Carolina State Treasurer for the people of the State. Under the CSA legislation, the utilities are prevented from buying, selling, or trading emission credits. In 2013, Duke Energy and Progress Energy reported excess SO_2 and/or NOx emissions relative to CAIR allowances, which were subsequently surrendered to the State. The transfer of allowances was tracked and verified by the DAQ.

2.5 Conclusion

40 CFR 51.308(e)(2) gives states the authority to implement an alternative measure that achieves greater reasonable progress towards improving visibility at Class I areas than source-specific BART. This provision gives states the flexibility in designing programs that reduce emissions from stationary sources so long as they can demonstrate that the alternative approach will achieve greater reasonable progress towards improving visibility than would have been achieved by implementation of the BART requirements.

In this SIP revision, North Carolina has relied on the federally enforceable CSA provisions pursuant to 40 CFR 52.1781(h) as an alternative BART for BART-eligible EGU sources, and has demonstrated that the alternative measure will achieve greater reasonable progress than would have resulted from the installation and operation of BART at all sources subject to BART and covered by the alternative program. As shown in Figures 5 and 6, this demonstration has determined that the alternative measure will result in an additional reduction of 157,274 tons of SO_2 and 44,644 tons NOx (using 2018 EPA-IPM modeling projections). Actual reductions with the alternative measure, as of 2013, have far surpassed initial 2018 VISTAS projected emissions levels.

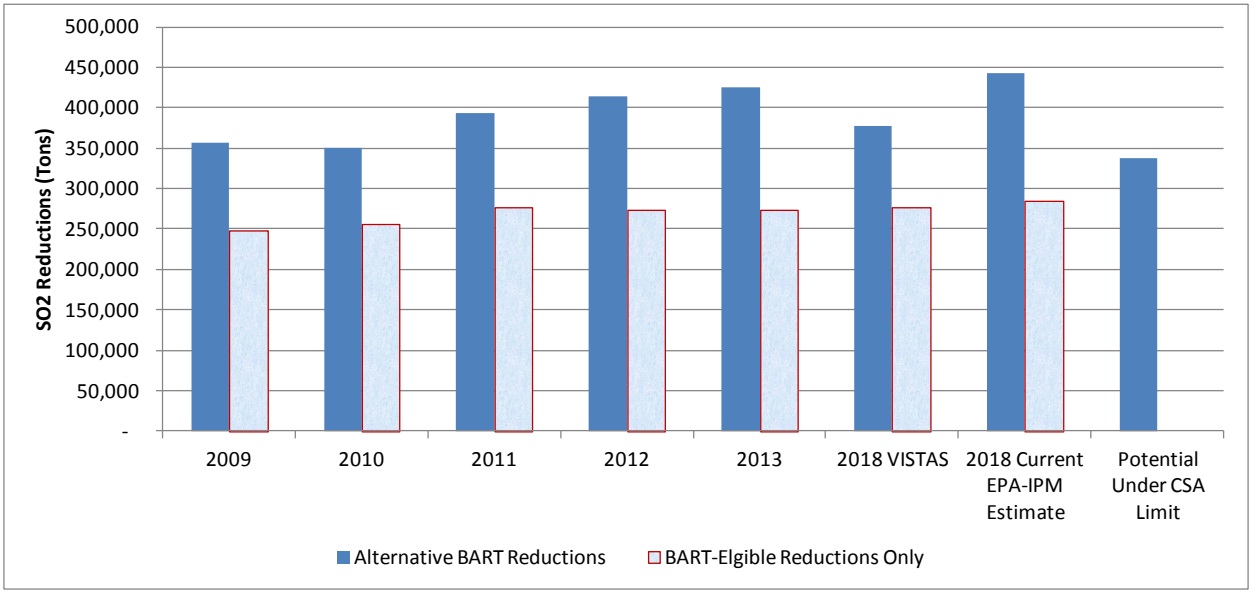


Figure 5. Comparison of SO_2 Emissions Reductions

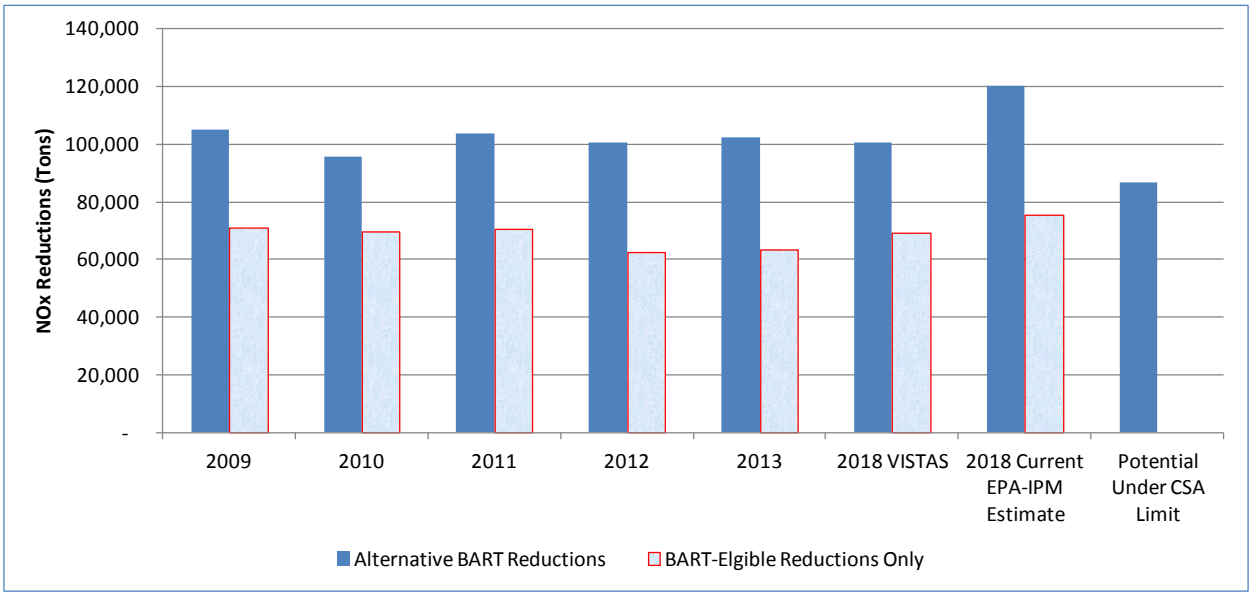


Figure 6. Comparison of NOx Emissions Reductions

Furthermore, the North Carolina CSA requirements have resulted in greater air quality benefit due to controls becoming operational before BART timing requirements. The EPA requires compliance with BART no later than 5 years after the agency approves the state's regional haze SIP (70 FR 39172) or before December 17, 2012 for North Carolina. Most of the SO_2 controls under the CSA were installed between 2006 and 2009, while the last scrubber came on line in

2012 after the start-up of a new coal-fired unit. All of the NOx controls under the CSA were installed between 2003 and 2008 (with the exception of controls added to the new Cliffside unit in 2012). As a result of this early implementation of the BART Alternative, North Carolina and its neighboring states have benefited from reduced SO_2 and NOx emissions for many years compared with when such reductions are required under the EPA's BART rule.

Additionally, although not directly relevant to this Alternative BART demonstration, it is noteworthy to state that if the CSAPR was reinstated in its current form, all but one of the CSA-subject EGU facilities would be in compliance with the 2014 CSAPR emissions budgets using 2013 actual emissions levels. The remaining facility would satisfy the emissions budget using 2014 projected emissions levels. This comparison illustrates that the current controls would also satisfy the EPA's CSAPR is "Better than BART" determination (in the event this rulemaking is upheld by the court).

In summary, North Carolina has determined that the alternative measure is sufficient for BART-eligible sources in the State to meet their obligations under the RHR and Alternative BART Final Rule. Actual SO_2 and NOx emissions in 2013 are comparable to 2018 assumptions, and projected emissions levels indicate that North Carolina is on track to meet the 2018 reasonable progress goals set in the original SIP. IMPROVE monitoring data indicate that visibility in Class I area is improving as planned. North Carolina is requesting that the EPA approve the accompanying alternative BART demonstration as satisfying the BART requirements and grant full approval of North Carolina's Regional Haze SIP.