Draft Guidance on Progress Tracking Metrics, Long-term Strategies, Reasonable Progress Goals and Other Requirements for Regional Haze State Implementation Plans for the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

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Draft Guidance on Progress Tracking Metrics, Long-term Strategies, Reasonable Progress Goals and Other Requirements for Regional Haze State Implementation Plans for the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

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Glossary of Terms Abbreviations and Acronyms

AERMOD – American Meteorological Society/Environmental Protection Agency Regulatory Model.

AFUDC – Allowance for funds used during construction.

AirControlNet – A database tool for conducting pollutant emissions control strategy and costing analysis, no longer supported by the EPA.

BART– Best Available Retrofit Technology.

Baseline period – The years of 2000 to 2004. The end of the baseline period is December 31, 2004.

b_{ext} – Light extinction coefficient.

Basic smoke management practices – Types of actions that the manager of a prescribed fire can take to reduce the amount of smoke generated by a prescribed fire and/or to reduce public exposure to the smoke that is generated.

CAA – Clean Air Act.

CAIR– Clean Air Interstate Rule, also referred to as the Transport Rule.

CALPUFF – A Lagrangian puff air quality modeling system.

CEM or CEMS – Continuous emissions monitoring system.

Class I area – In this document, this term is used for brevity and refers to a mandatory Federal Class I area as defined in 40 CFR 51.301, unless the term "non-mandatory" appears before it. This is a different usage than in 40 CFR part 51 subpart P, where this term encompasses both mandatory and non-mandatory Class I areas.

Clearest days – The 20 percent of monitored days in a calendar year with the lowest actual values of the deciview index.

CM – Coarse PM, equal to the difference between PM_{10} and $PM_{2.5}$.

CoST – Control Strategy Tool, part of the EPA's emissions modeling framework.

CSAPR– Cross State Air Pollution Rule.

Current visibility conditions – The average visibility impairment for the most impaired and clearest days during the most recent rolling 5-year period for which IMPROVE data are available as of a date 6 months preceding the required date of the progress report.

Deciview or dv – The unit of measurement on the deciview index scale for quantifying in a standard manner human perceptions of visibility.

Deciview index – A value for a day that is derived from calculated light extinction, such that uniform increments of the index correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to very obscured. The deciview index is calculated

based on the following equation (for the purposes of calculating deciview, the atmospheric light extinction coefficient must be calculated from aerosol measurements):

Deciview index = 10 ln (b_{ext}/10 Mm^{-1}).

b_{ext} = the atmospheric light extinction coefficient, expressed in inverse megameters (Mm^{-1}).

EGU– Electric generating unit.

End of the applicable implementation period – December 31 of the year in which the next periodic implementation plan revision is due under 40 CFR 51.308(f).

Federal Class I area or Class I Federal area – Any federal land that is classified or reclassified Class I.

Federal Land Manager – The Secretary of the department with authority over the Federal Class I area (or the Secretary's designee) or, with respect to Roosevelt-Campobello International Park, the Chairman of the Roosevelt-Campobello International Park Commission.

FIP – Federal implementation plan.

FLM – Federal land manager.

f(RH) – A function of relative humidity representing the growth in particle size/mass with increasing ambient humidity.

Haziest days or worst visibility days – The 20 percent of monitored days in a calendar year with the highest actual values of the deciview index.

Implementation plan – Any SIP, TIP or FIP.

IMPROVE – The Interagency Monitoring of Protected Visual Environments monitoring program.

Indian tribe or tribe – Any Indian tribe, band, nation or other organized group or community, including any Alaska Native village, which is federally recognized as eligible for the special programs and services provided by the U.S. to Indians because of their status as Indians.

LAC – Light absorbing carbon, a species or component of PM.

Long-term strategy or LTS – The enforceable emissions limitations, compliance schedules and other measures necessary to achieve the reasonable progress goals for Class I areas affected by the state.

Mandatory Class I Federal Area, mandatory Federal Class I area – Any area identified in 40 CFR part 81.

MEVE1 – Mesa Verde National Park Class I area.

Mm – Millions of meters or megameters.

Mm^{-1} – Inverse megameters (used to indicate division by the number of megameters).

NC-II natural visibility conditions – A set of estimates of natural conditions for each Class I, widely used in the first implementation period. For each Class I area, the set included a value for the 20 percent least impaired days ("p10"), a value for the 20 percent most impaired days ("p90") and an annual average value. As used in the first implementation period, the term "least impaired days" corresponds to the term "clearest days" in this document, and the term "most impaired days" corresponds to the term "haziest days."

O&M – Operation and maintenance.

MMBtu, mmBtu or mmbtu – Millions of British Thermal Units.

Most impaired days – The 20 percent of monitored days in a calendar year with the highest amounts of visibility impairment.

Natural conditions – Naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast or coloration.

Natural visibility conditions – The visibility (contrast, coloration and texture) that would have existed under natural conditions. Natural visibility conditions vary with time and location, and are estimated or inferred rather than directly measured.

NOx– Nitrogen oxides.

OMC – Organic carbonaceous material, a component or species of PM.

p10 – See NC-II natural visibility conditions.

p90 – See NC-II natural visibility conditions.

PM – Particulate matter.

PM species – A portion of PM of a certain chemical species or type, also referred to as a PM component.

Prescribed fire – Any fire intentionally ignited by management actions in accordance with applicable laws, policies and regulations to meet specific land or resource management objectives.

Reasonably attributable – Attributable by visual observation or any other appropriate technique.

Reasonable progress goal or RPG – A visibility goal, in deciviews, for a Class I area that provides for reasonable progress towards achieving natural visibility conditions. There are two RPGs for each Class I area: one for the most impaired days and one for the clearest days.

Reasonably attributable visibility impairment or RAVI – Visibility impairment that is caused by the emission of air pollutants from one, or a small number of sources.

Regional haze – Visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area. Such sources include, but are not limited to, major and minor stationary sources, mobile sources and area sources.

RH – Relative humidity.

RHR – Regional Haze Rule (used only in Appendix D).

RPO – Regional planning organization.

SCICHEM – A Lagrangian photochemical puff air quality model.

SCR – Selective catalytic reduction.

SIP – State implementation plan.

Smoke management program – A framework to minimize the impact of smoke from prescribed agricultural and/or wildland management burning operations that includes enforceable restrictions on prescribed fire. In the context of the Regional Haze Rule, the EPA considers a program to be a "smoke management program" if it has these six features: (i) authorization to burn, (ii) minimizing air pollutant emissions, (iii) smoke management components of burn plans, (iv) public education and awareness, (v) surveillance and enforcement and (vi) program evaluation. "Authorization to burn" means that a government authority restricts where, when and/or by whom a prescribed fire may be conducted.

SNCR – Selective non-catalytic reduction.

SO_2 – Sulfur dioxide.

Soil or fine soil – The portion, species or component of $PM_{2.5}$ attributable to crustal material, as estimated based on the quantity of certain chemical elements in the sample of $PM_{2.5}$.

State – One of the 50 states, the District of Columbia, or the Virgin Islands. Other U.S. territories are not subject to the Regional Haze Rule.

Stationary source – The Regional Haze Rule defines this term as "any building, structure, facility or installation which emits or may emit any air pollutant." In this document, the term is used less precisely, and depending on context, it may also refer to a single emission release point, process or unit at a facility. Statements in this document that include the word "source" are not necessarily meant to interpret the provisions of the Regional Haze Rule.

TIP – Tribal implementation plan.

URP – Uniform rate of progress.

U.S. – The United States.

Visibility – The degree of perceived clarity when viewing objects at a distance. Visibility includes perceived changes in contrast, coloration and texture elements in a scene.

Visibility impairment – The Regional Haze Rule defines this term as "any humanly perceptible difference between actual visibility conditions and natural visibility conditions. Because natural visibility conditions can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured." While the regulatory definition of visibility impairment inherently means anthropogenic visibility impairment, this document sometimes adds the word "anthropogenically" when it may be useful to the reader to emphasize this point or to draw a distinction between reductions in visibility due to anthropogenic emissions and reductions in visibility due to emissions from natural sources.

We, us or the EPA – The U.S. Environmental Protection Agency

Wildfire – Any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has

been declared to be a wildfire. A wildfire that predominantly occurs on wildland is a natural event.

Wildland – An area in which human activity and development is essentially non-existent, except for roads, railroads, power lines and similar transportation facilities. Structures, if any, are widely scattered.

WIMO – Wichita Mountains Class I area.

1. Introduction

1.1. Regional haze

Regional haze, as defined in the Regional Haze Rule at 40 CFR 51.300, is "visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area. Such sources include, but are not limited to, major and minor stationary sources, mobile sources, and area sources."[1] This visibility impairment is a result of particles and gases in the atmosphere that scatter and absorb light, thus acting to reduce overall visibility. The primary cause of atmospheric haze is light extinction (scattering and absorption) by particulate matter (PM).[2] The Regional Haze Rule requires states to submit a series of state implementation plans (SIPs) to protect visibility in certain national parks and wilderness areas, known as mandatory Federal Class I areas. A state should also recognize that progress towards natural visibility conditions will require the accumulation of reductions in air pollution and associated light extinction that may not be individually perceptible.

1.2. Purpose of this guidance

The purpose of this guidance is to advise states on how to develop and submit regional haze SIPs for the second implementation period (2018-2028), which are due by July 31, 2021. The required content of these SIPs is specified in 40 CFR 51.308(f), which was revised in 2016.[3] This guidance contains current EPA interpretations of the requirements of the Clean Air Act (CAA) and this section of the Regional Haze Rule.

None of the recommendations contained in this guidance are binding or enforceable against any person, and no part of the guidance or the guidance as a whole constitutes final agency action that could injure any person or represent the consummation of agency decision making. Because this guidance is not binding or enforceable, states may choose not to follow the recommendations in this guidance provided that they adhere to the relevant statutory and regulatory requirements and provide rational explanations for their decision making. Only final actions taken to approve or disapprove SIP submissions that implement any of the recommendations in this guidance would be final actions for purposes of CAA section 307(b). Therefore, this guidance is not judicially reviewable. This document is not a rule or regulation, and the guidance it contains may not apply to a particular situation based upon the individual

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[1] While the Regional Haze Rule's definition of visibility impairment inherently means anthropogenic visibility impairment, this document sometimes adds the word "anthropogenically" when it may be useful to the reader to emphasize this point or to draw a distinction between reductions in visibility due to anthropogenic emissions and reductions in visibility due to emissions from natural sources.

[2] For purposes of the Regional Haze Rule, light extinction is estimated from measurements of PM and its chemical components (sulfate, nitrate, organic carbonaceous material (OMC), light absorbing carbon (LAC), fine soil, sea salt and coarse material (CM)), assumptions about relative humidity at the monitoring site and the use of a commonly accepted algorithm. *See* section 5.12. These estimates of light extinction are logarithmically transformed to deciviews. The PM measurements used in the regional haze program are collected by the IMPROVE (Interagency Monitoring for PROtected Visual Environments) monitoring network.

[3] Note to reviewers of this draft guidance document: For clarity for purposes of comment and for ease in finalization, this draft version of this guidance document is written as if the revisions proposed in May 2016 have been finalized as proposed. Later footnotes, addressed to reviewers like this one, provide most specific explanations when needed for clarity. If the final revisions to the Regional Haze Rule differ from this assumption, corresponding changes will be made in the final guidance document.

facts and circumstances. This guidance does not change or substitute for any law, regulation or other legally binding requirement and is not legally enforceable. The use of non-mandatory language such as "guidance," "recommend," "may," "should" and "can" is intended to describe the EPA's policies and recommendations. Mandatory terminology such as "must" and "required" is intended to describe controlling legal requirements under the terms of the CAA and the EPA regulations. Neither such language nor anything else in this document is intended to or does establish legally binding requirements in and of itself.

This guidance may be replaced or supplemented for subsequent planning periods. It is not meant to be the final road map for the regional haze program.

This guidance document frequently cites other, more detailed or specialized existing EPA guidance already available to states. As needed, additional guidance will be prepared by the EPA in a timely manner.

In any case in which a portion of this guidance conflicts with the revised 2016 Regional Haze Rule, including any applicable interpretations by a court that may be issued, the rule or the court interpretation supersedes that portion of this guidance.

The entirety of the following previous guidance document from the EPA is superseded by this guidance document:

- Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program, June 1, 2007, revised.

1.3. Issues addressed in this guidance

In addition to providing states and tribes stepwise guidance to developing regional haze SIPs, this guidance focuses on issues related to the determination of natural, baseline and current visibility conditions and the uniform rate of progress (URP); the development of a long-term strategy (LTS) consisting of emission reduction measures needed to make reasonable progress towards the national goal of eliminating anthropogenic visibility impairment;[4] and the projection of visibility conditions as of the end of the second implementation period in order to set reasonable progress goals (RPGs).

In particular, this guidance addresses a number of key concepts and issues that have sometimes been a source of confusion or concern to states and stakeholders during the first implementation period (2001-2018). It also addresses some issues that will be particularly important in the second implementation period, as the focus of planning shifts from primarily the control of large sources subject to best available retrofit technology (BART) requirements to other sources, including non-BART sources and potentially more diverse sources that may need additional controls in order to achieve reasonable progress toward the elimination of anthropogenic impairment. These issues include the following:

[4] Many emission reduction measures adopted to meet other requirements of the CAA, or to meet goals set by a state for itself, will contribute to progress towards eliminating visibility impairment at Class I areas. In this document, the term "long-term strategy" or "LTS" generally refers to the set of specific measures included in a periodic regional haze SIP revision.

- Whether and how visibility benefits should be considered along with the four statutory factors a state must consider when developing its LTS to achieve reasonable progress.
- The relationship between the LTS and RPGs.
- The definition of the URP line and how the comparison of the RPG for the 20 percent most impaired days affects the planning obligation of a state.
- How small stationary sources and area sources should be evaluated for additional controls.
- The obligation of states to consider measures necessary to make reasonable progress at Class I areas in other states.
- Improving the benefit of consultation among states and between states and federal land managers (FLMs).
- The difficulty of discerning improvement in visibility due to control of anthropogenic sources in areas where highly variable natural sources, especially large fires, can dominate visibility on the haziest days.
- How impacts from sources outside the United States (U.S.) that are beyond the control of states and the federal government can be accounted for in a reasonable way.
- How regional haze SIPs should address the expectation that climate change will make wildfires on wildland more frequent.

1.4. How to use this guidance

This guidance contains the EPA's recommendations for how states should implement the regional haze program. The preambles to previous rulemakings in which the EPA approved or disapproved regional haze SIPs and court decisions reviewing those rulemaking should also be consulted for a complete understanding of the relevant statutory and regulatory requirements and permissible approaches. Appendices B and C list these rulemakings and court decisions. The EPA believes that states have discretion to determine what emission reduction measures are necessary to make reasonable progress.[5] However, this discretion is not unbounded, and the EPA's role in reviewing states' determinations is more than ministerial.[6] In addition to reviewing SIPs for completeness, the EPA conducts a substantive review to determine whether SIPs comply with the requirements of the CAA and the Regional Haze Rule, and to assess whether states have applied reasoned decision making and provided appropriate and sound technical analyses to support their determinations. The EPA believes that reasoned decision making includes substantial consideration of the recommendations in this guidance document. States that choose not to follow one or more of the recommendations in this guidance document should provide a detailed rationale for the departure, including an explanation why the chosen approach is sufficient to meet the relevant statutory and regulatory requirements. We strongly encourage states to discuss with their EPA regional office early in their SIP development the approach they anticipate taking and how the recommendations in this guidance may affect their SIPs.

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[5] The preamble to the 1999 Regional Haze Rule stated: "The flexibility for State discretion is, of course, exactly what the regional haze rule provides." 64 FR 35760.

[6] *See, e.g.*, *North Dakota v. EPA*, 730 F.3d 750, 760-61 (8th Cir. 2013) ("Although the CAA grants states the primary role of determining the appropriate pollution controls within their borders, EPA is left with more than the ministerial task of routinely approving SIP submissions.").

1.5. Applicability to tribes and tribal lands

This guidance applies to plans to protect visibility in mandatory Class I areas, none of which are located on tribal land.[7] However, under the CAA and EPA regulations, a tribe may, but is not required to, apply for "treatment in the same manner as a state" (TAS) status for purposes of developing a tribal implementation plan (TIP), including a regional haze TIP. Many provisions of the Regional Haze Rule would apply to a regional haze TIP in the same way they apply to a SIP from a state that does not contain a mandatory Class I area. Thus, depending on context, statements in this guidance referring to a "state" may apply to a tribe developing a regional haze TIP. Also, the EPA may adopt a regional haze plan for a tribal area if the Administrator determines such action is necessary or appropriate.[8]

[7] While some tribes have voluntarily re-designated portions of their lands to Class I status, the Regional Haze Rule does not apply to these non-mandatory Class I areas.

[8] In the first implementation period, the EPA adopted federal implementation plan (FIP) requirements addressing certain regional haze requirements for two sources on tribal lands, the Four Corners Power Plant and the Navajo Generating Station.

2. The statutory and regulatory provisions that address regional haze

For background, this section provides a summary of the decades-long evolution of the visibility program established by the CAA. The program began in 1977, when Congress amended the CAA to require EPA to issue regulations to protect and restore visibility in mandatory Class I Federal areas. The most recent event in the evolution of the program was the EPA's 2016 revisions to the Regional Haze Rule that extended the submission deadline for SIPs covering the second implementation period to July 31, 2021, and made several important substantive clarifications and improvements to the program.[9]

2.1. Statutory provisions

In section 169A of the 1977 Amendments to the CAA, Congress created a program for protecting and restoring visibility in the nation's national parks, wilderness areas, and other Class I areas due to their "great scenic importance."[10] This section of the CAA establishes as a national goal the "prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution." This section also required the EPA to issue regulations requiring states to adopt implementation plans containing emission limits as may be necessary to make reasonable progress towards meeting this goal, including BART limits for particular types of large industrial sources.

In 1990, Congress added section 169B to the CAA to focus on regional haze issues. Among other things, this section included provisions for the EPA to conduct visibility research on regional regulatory tools with the National Park Service and other federal agencies, and to provide periodic reports to Congress on visibility improvements due to implementation of other air pollution protection programs. Section 169B also allowed the Administrator to establish visibility transport commissions and specifically required the Administrator to establish a commission for the Grand Canyon area.

2.2. EPA regulations and guidance

1980 Reasonably Attributable Visibility Impairment (RAVI) Rule

In 1980, the EPA promulgated regulations to address visibility impairment in Class I areas, including but not limited to impairment that is "reasonably attributable" to a single source or small group of sources, i.e., "reasonably attributable visibility impairment" or "RAVI." 45 FR 80084 (December 2, 1980). These regulations, codified at 40 CFR 51.300 through 51.307 (since revised), represented the first phase in addressing visibility impairment from existing sources. They also addressed potential visibility and other air quality-related impacts from new and modified major sources already subject to permitting requirements for purposes of protection of the National Ambient Air Quality Standards (NAAQS) and preventing significant deterioration of air quality. The EPA explicitly deferred action on regional haze (visibility-impairing pollution

[9] For clarity for purposes of comment and for ease in finalization, this draft version of this guidance document is written as if the revisions proposed in May 2016 have been finalized as proposed, except as specifically noted. If the final revisions to the Regional Haze Rule differ from this assumption, corresponding changes will be made in the final guidance document.

[10] H.R. Rep. No. 294, 95th Cong. 1st Sess. at 205 (1977).

that is caused by the emission of air pollutants from numerous sources located over a wide geographic area) until some future date when improvement in monitoring techniques would provide more data on source-specific levels of visibility impairment, regional scale models would become refined and our scientific knowledge about the relationships between emitted air pollutants and visibility impairment would improve. The regulations on RAVI originally promulgated in 1980 were substantially revised in 2016.

1999 Regional Haze Rule[11]

In 1999, the EPA promulgated new regulations to address regional haze. 64 FR 35714 (July 1, 1999). The Regional Haze Rule established a more comprehensive visibility protection program for Class I areas. The requirements for regional haze are found at 40 CFR 51.308 and 51.309.

Applicability. All 50 states, the District of Columbia, and the Virgin Islands are subject to the requirements of the Regional Haze Rule and must submit regional haze SIPs. (Other U.S. territories do not contain mandatory Class I areas and are too distant from any Class I area to affect it.)

Schedule for SIPs. States must submit the first implementation plans addressing regional haze visibility impairment no later than December 17, 2007. 70 FR 39104. Further, under 40 CFR 51.308(f) states must submit periodic comprehensive revisions no later than July 31, 2018, and every ten years thereafter.

Content of periodic SIPs. The periodic SIP revisions must address a number of elements, including current visibility conditions and actual progress made toward natural conditions during the previous implementation period, a reassessment of the effectiveness of the LTS at achieving the RPGs over the prior implementation period and affirmation of or revision to the RPGs.

RPGs. States must set RPGs, calculated in deciviews, in every planning period for each Class I area within the state that provide for reasonable progress towards achieving natural visibility conditions. For each Class I area, states must set two RPGs, one for the most impaired days and one for the least impaired days. The goal for the most impaired days must provide for an improvement in visibility over the period of the implementation plan, and the goal for the least impaired days must ensure no degradation of visibility over the period of the implementation plan.

LTS. Each state must submit an LTS that addresses visibility impairment at Class I areas affected by the state. The strategy includes enforceable emissions limitations and compliance schedules. The contents of the LTS form the basis for the calculation of the visibility improvement expected over the period of the implementation plan and the development of the RPGs.

Progress reports. 40 CFR 51.308(g) requires each state to submit progress reports, in the form of SIP revisions, every 5 years following the submission of the initial SIP due on December 17, 2007. These progress reports must evaluate the progress made towards the RPGs for Class I

[11] In summarizing the requirements of the 1999 Regional Haze Rule and the 2005 BART rule, the present tense is used here even though some of these requirements were revised in 2016 and some of the requirements have already been fully met by some or all states.

areas located within the state as well as those Class I areas located outside the state that may be affected by emissions from within the state.

Coordination with planning to address RAVI. The 1999 Regional Haze Rule sought to improve efficiency and transparency by requiring states to coordinate their regional haze planning obligations with their planning obligations under the 1980 RAVI rule.

URP framework. States must analyze and determine the consistent rate of progress over time needed to attain natural visibility conditions on the 20 percent most impaired days by the year 2064. This glidepath is referred to in this document as the uniform rate of progress (URP) line. The URP is the slope of this line. In establishing their RPGs, states must consider the URP and the emission reduction measures needed to achieve this level of improvement in visibility for the time period covered by the implementation plan. When the progress anticipated in the SIP for the implementation period is less than the URP, a state must project when (after 2064) natural visibility conditions would be reached if the SIP's rate of progress were to continue beyond the end of the implementation period. Attaining natural visibility conditions by the end of 2064 is not an enforceable requirement of the regional haze program.

BART. As a one-time requirement during the first implementation period, 40 CFR 51.308(e) directs states to evaluate potential BART controls at certain larger, often uncontrolled, older stationary sources in order to address visibility impacts from these sources. States must conduct BART determinations for "BART-eligible" sources that are anticipated to cause or contribute to any visibility impairment in a Class I area. As an alternative to requiring source-specific BART controls, states have the flexibility to adopt an emissions trading program or other alternative program as long as the alternative provided greater reasonable progress towards improving visibility than BART and met certain other requirements set out in 40 CFR 51.308(e)(2).

2005 BART Guidelines

In 2005, the EPA published the Guidelines for BART Determinations Under the Regional Haze Rule at appendix Y to 40 CFR part 51 (BART Guidelines) to assist states in determining which of their sources should be subject to the BART requirements and in setting appropriate emission limits for each applicable source. 70 FR 39104 (July 6, 2005). In this rulemaking, the EPA also established that the Clean Air Interstate Rule (CAIR) would result in greater reasonable progress than source-specific BART, and adopted regulations allowing states to rely on participation in CAIR to meet the BART requirements with respect to SO_2 and NOx emissions from electric generating units (EGUs) subject to CAIR.

States undertook the BART determination process during the first regional haze implementation period; thus, this guidance document does not address the process for establishing BART emission limitations. Although the BART process is not repeated in subsequent implementation periods, BART-eligible sources may be re-assessed for more control in later implementation periods as part of the requirement to provide for reasonable progress, which is addressed in this guidance document.

While the BART Guidelines are not requirements that states must meet when addressing reasonable progress, much of the material in the BART Guidelines is still informative and useful. Appendix D contains a section-by-section explanation of what material in the BART Guidelines is relevant to reasonable progress determinations.

2006 Questions and Answers from the EPA

In 2006, the EPA informally distributed to the states a document titled "Additional Regional Haze Questions, September 27, 2006 Revision." Most of these questions and answers related to the BART requirements, but some were related to issues that still apply in the second implementation period. Additionally, some of the information contained in the 2006 document is superseded by this guidance document. Appendix F reproduces this earlier set of questions and answers and indicates which answers are still relevant as EPA guidance for the second implementation period.

2007 EPA Guidance on Reasonable Progress

In 2007, EPA issued a guidance document titled, "Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program," June 1, 2007, revised. As stated in section 1.1, this 2007 guidance document is hereby withdrawn and is no longer applicable.

2012 CSAPR Better-than-BART rule

As mentioned above, the EPA's regulations allowed states to rely on participation in CAIR to meet the BART requirements with respect to SO_2 and NOx emissions from EGUs subject to the rule. Subsequently, CAIR was remanded by the D.C. Circuit, and the EPA promulgated the Cross-State Air Pollution Rule (CSAPR) to replace CAIR. In 2012, the EPA finalized a rule that allowed participation in the CSAPR trading programs to serve as an alternative to BART for EGUs in participating states. In the 2012 rulemaking, the EPA also finalized limited disapprovals of certain states' regional haze SIPs that previously relied on CAIR to improve visibility and substituted federal implementation plans (FIP) that rely on CSAPR for some but not all of the states affected by these disapprovals. 77 FR 33642.

2.3. 2016 Revisions to the visibility protection program for Class I areas[12]

In 2016, the EPA issued a final rule revising certain requirements that states have to meet as they implement programs for the protection of visibility in mandatory Class I areas.[13] These revisions supported continued environmental progress by clarifying or revising existing regulatory provisions and removing older provisions that had been superseded by subsequent developments. Many of the revisions addressed administrative aspects of the program in order to reduce unnecessary burden. All of the revisions apply to periodic state implementation plans developed for the second and subsequent implementation periods and for progress reports submitted subsequent to those plans. These changes include:

[12] Note to reviewers of this draft guidance document: For clarity for purposes of comment and for ease in finalization, this draft version of this guidance document is written as if the revisions proposed in May 2016 have been finalized as proposed. If the final revisions to the Regional Haze Rule differ from this assumption, corresponding changes will be made in the final guidance document.

[13] [Citation to final rule]

Extension of 2018 due date for SIPs. The EPA extended the due date for the next round of regional haze SIPs, from July 31, 2018, to July 31, 2021. This one-time change will benefit states by allowing them to obtain and take into account information on the effects of a number of other regulatory programs that may affect sources over the next several years, such as the Mercury and Air Toxics Standards. The change will also allow states to develop SIP revisions for the second implementation period that are more integrated with state planning for other upcoming planning requirements, such as ozone and SO_2 attainment planning. This advantage was widely confirmed in discussions with states and is anticipated to result in greater environmental progress than if planning for these multiple programs were not as well integrated.

Relationship between the LTS and RPGs. The EPA clarified the relationship between LTS and RPGs in state plans and the LTS obligation of all states. These clarifications reflect long-standing EPA interpretation of the CAA and Regional Haze Rule and are intended to ensure consistent understanding of these requirements as states prepare their plans for the second implementation period.

Progress tracking. The EPA revised the way in which some days during each year are to be selected for purposes of tracking progress towards natural visibility conditions in order to focus attention on days when anthropogenic emissions impair visibility and away from days when wildfires and natural dust storms are the greatest contributors to visibility impairment. These changes will provide the public and state officials with more meaningful information on how emission reduction measures contribute to reductions in anthropogenic visibility impairment by greatly reducing the -distorting effect of wildfires and natural dust storms on estimates of reasonable progress.

Possible adjustment of the URP for the impacts of non-U.S. anthropogenic sources and certain wildland prescribed fire. The EPA added a provision that allows the Administrator to approve an adjustment to the URP to reflect the impacts of these causes of visibility impairment, if the adjustment has been developed through scientifically valid data and methods. The adjustment would be done by adding to the value of natural visibility conditions the estimate of the impact of one or both of these source types, only for the purposes of calculating the URP. The specific type of wildland fires that could be included in this adjustments are fires that were conducted with the objective to establish, restore and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied.

Progress reports. The EPA revised the due dates for progress reports and removed the requirement for progress reports to be SIP revisions.

RAVI. The EPA updated, simplified and extended to all states the provisions for RAVI. At the same time, EPA revoked existing FIPs implementing the 1980 RAVI requirements.[14]

FLM consultation. The EPA made changes to FLM consultation requirements to help ensure that the expertise and perspective of these officials are brought into the state plan development

[14] Note to reviewers of this draft guidance document: This draft version of this guidance document does not further address the RAVI provisions of the visibility protection regulations. *See* the discussion in Section IV.G of the May 4, 2016, proposed rulemaking for more information. 81 FR 26961.

process early enough for them to meaningfully contribute during the state's technical analysis and deliberations.

Monitoring strategy. The EPA removed the requirement for progress reports to re-address the monitoring strategy for regional haze. The requirement for periodic SIP revisions to re-address the monitoring strategy was retained.

Appendix G reproduces the sections of the 2016 Regional Haze Rule that are relevant to the preparation of the SIPs due by July 31, 2021.

3. The key steps in developing the regional haze SIP and the roadmap for this guidance document

Key steps in developing the regional haze SIP

Table 3.1 lists the key steps in developing an LTS and RPGs for the second implementation period that meet the requirements of the Regional Haze Rule. Each step corresponds to a section of this guidance document. For each step, the governing provisions of the Regional Haze Rule are listed. The complete relevant text from the Regional Haze Rule is in Appendix G. Specific relevant rule provisions also appear at the start of many sections and subsections of this document.

Table 3.1. Key steps in developing the regional haze SIP

Step 1	*Ambient data analysis* – Quantify baseline, current and natural conditions of visibility and the uniform rate of progress that would achieve natural conditions in 2064. 40 CFR 51.308(f)(1)	Section 5
Step 2	*Screening of sources* – Identify the pollutants and emission sources for which a full reasonable progress analysis will be completed and explain why it is appropriate to limit the full analysis to only these sources. 40 CFR 51.308(f)(2)	Section 6
Step 3	*Source and emission control measure analysis* – Identify potential emission control measures for sources selected in the screening step and develop data on the four statutory factors and visibility benefits if they will be considered. 40 CFR 51.308(f)(2)	Section 7
Step 4	*Decisions on the content of the LTS* – Consider applicable factors and decide on new emission controls for incorporation into the LTS. 40 CFR 51.308(f)(2)	Section 8
Step 5	*Regional scale modeling* – Model the emission reductions that will result from implementation of the LTS and other enforceable measures that will reduce visibility impairment to set the RPGs for 2028. 40 CFR 51.308(f)(3)	Section 9
Step 6	*Progress, degradation and glidepath checks* – Demonstrate that there will be an improvement on the 20 percent most impaired days. Demonstrate that there is no degradation on the 20 percent clearest days. Compare the 2028 RPG for the 20 percent most impaired days to the 2028 point on the URP line (the glidepath) and, if required, provide additional justification for the reasonableness of the RPG.	Section 10

	Revise the LTS if additional measures are identified as necessary to make reasonable progress. 40 CFR 51.308(f)(3)	
Step 7	*Additional requirements for SIPs* – Provide additional information necessary to ensure that other requirements of the Regional Haze Rule are met.	Section 11

These steps can be broken down into a larger number of finer steps and tasks. Appendix A contains a more detailed list of steps that may be helpful to states in planning their work. In Appendix A, many of these finer steps and tasks are linked to the relevant sections of this guidance document.

Roadmap

Section 4 of this document briefly covers a number of cross-cutting concepts that apply to one or more of the seven steps listed in Table 3.1. An initial familiarity with these concepts will help the reader's understanding of the remaining sections, which each address one of the steps in developing the SIP, as indicated in Table 1.

4. Overarching Issues

4.1. Screening sources prior to the four-factor analysis and deferring some sources to later implementation periods

A state may use a screening analysis that considers visibility impacts, or surrogates for such impacts,[15] to select a subset of sources for full four-factor analysis and decision. However, the state should conduct its screening analysis for each Class I area that may be affected by sources within the state. In other words, if a source or group of sources has large visibility impacts at one Class I areas but not at others, the state should bring forward the source for a full four-factor analysis.

CAA section 169A(b)(2) does not provide any direction regarding which sources or source categories a state should analyze when determining appropriate measures to ensure reasonable progress. Similarly, CAA section 169A(g)(1) requires states to consider the four listed factors for "any existing source subject to such requirements," but unlike the BART provisions that apply to a specifically defined set of sources, this section does not identify which sources or source categories should be subject to reasonable progress requirements. Given the statutory purpose of the visibility program, we believe that allowing states to consider visibility impacts when determining the scope of the reasonable progress analysis is a reasonable interpretation of the statute.

The use of an appropriate screening analysis is also consistent with the Regional Haze Rule, which anticipates that a state may not fully analyze all sources for the four factors in a given SIP revision. Specifically, Section 51.308(f)(2)(i) requires states to document the criteria used to determine which sources or groups of sources will be evaluated for potential controls. By considering the visibility impacts of sources or groups of sources, states will have a rational way to differentiate between potentially hundreds of sources that vary in distance from Class I areas, emit different visibility impairing pollutants in varying amounts and are subject to diverse meteorological conditions that affect the transport of visibility-impairing pollutants. Accordingly, states may develop screening metrics and thresholds that identify those sources with the greatest visibility impacts for further analysis in the second implementation period. A state using a screening analysis would defer full consideration of sources with lower visibility impacts to later implementation periods. A state should not justify its screening threshold based on it being the limit of what is humanly perceptible. Progress towards natural visibility conditions will require the accumulation of reductions in air pollution and associated light extinction that may not be individually perceptible.

[15] Surrogate here refers to a quantitative metric that is correlated to some degree with visibility impacts (or benefits) as they would be estimated via air quality modeling. A simple surrogate is emissions in tons/year divided by distance to an affected Class I area in miles or kilometers, also known as Q/d. A more complicated surrogate could, for example, incorporate information from wind trajectories. *See* section 6.3.

4.2. Considering visibility impacts and benefits when screening sources and conducting the four-factor analysis

Consideration of visibility[16]*during the first implementation period*

In the first implementation period, all of the regional planning organizations (RPOs) and states gave at least some consideration to visibility in evaluating emission reductions measures to meet the BART requirements and to ensure reasonable progress.

As a general matter, the RPOs and states considered visibility impacts when developing their SIPs by considering source apportionment modeling results; the extinction budgets for IMPROVE sites in Class I areas (which suggest which pollutants and thus source categories are contributing to or causing current or projected impairment); and source emissions levels, distances between sources and Class I areas and wind transport patterns (all of which are indicators of the potential to contribute to or cause visibility impairment).

For individual subject-to-BART sources, the CAA and the Regional Haze Rule specify that the expected visibility benefits of potential controls are a factor that states must consider when determining BART for a particular source. Most states applied a visibility impact threshold to determine if a source that was eligible for BART was also subject to BART. In most instances, states individually modeled the expected visibility benefits of potential controls for their subject-to-BART sources.[17]

States also modeled the visibility impact and/or benefits of control measures for some non-BART sources and source categories (i.e., "reasonable progress sources") to decide whether to require those measures (or to ask another state to require those measures).

In some FIP actions in the first implementation period, the EPA considered visibility impacts in a screening step and/or the visibility benefits of controls along with the four statutory factors.

The EPA's recommendation for considering visibility impacts and benefits in the second implementation period

CAA section 169A(g)(1) lists four factors that a state must consider to decide what control measures are necessary to make reasonable progress, none of which are the visibility improvements that would result from implementation of the measure. Section 51.308(f)(2)(i) of the Regional Haze Rule requires consideration of the same factors. Thus, baseline visibility impacts and prospective visibility benefits are not a "fifth factor" that states must consider when determining reasonable progress. However, given that the goal of the regional haze program is to improve visibility, the EPA believes that states may consider visibility in addition to the four

[16] Unless stated more specifically, in this document "consideration of visibility" refers to the consideration of recent, or anticipated "future baseline," visibility impacts from sources or groups of sources and/or to consideration of potential visibility benefits from additional emission reductions measures applied to such sources.

[17] Source-specific visibility benefits were not required to be modeled or considered for BART-eligible EGUs included in a CAIR-based or CSAPR-based better-than-BART alternative or for any source being subject to the most stringent control technology.

statutory factors when making their reasonable progress determinations, as long as they do so in a reasonable fashion.[18]

For the second implementation period, we recommend that states first conduct a screening analysis that considers baseline visibility impacts to identify the sources or source categories that will be subject to a four-factor analysis. After the screening step, we recommend that states consider only the four statutory factors to determine whether control measures are necessary to achieve reasonable progress. For reasons explained below, we do not recommend that states model visibility benefits and weigh those benefits against the four statutory factors to identify appropriate control measures. Rather, for each source or source category that is selected for further analysis during the screening process, states would require whatever control measures are determined to be reasonable after considering the four statutory factors alone. Section 8.1 provides detailed recommendations for states that choose to follow the recommended approach.

In addition to the recommended approach, states may follow one of two alternative approaches. Under the first alternative approach, states would simply consider the available control measures for all sources. For each source or source category, states would adopt those measures that are deemed reasonable after considering the four statutory factors. Visibility would not be used as screening metric or as a consideration in the four-factor analysis. This approach is clearly permissible under the plain language of CAA section 169A(g)(1), but may be very resource-intensive for most air agencies.

Under the second alternative approach, states would consider visibility both during the screening step and when considering the four statutory factors. When conducting their four-factor analyses, states would weigh the visibility benefits of potential control measures along with the four statutory factors and adopt those measure that are reasonable. It should be clear, however, that under this approach, visibility is not an explicit fifth factor and does not have the same weight as the four statutory factors. The EPA notes that regional haze is "visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area." 40 CFR 51.301. At any given Class I area, hundreds or even thousands of individual sources may contribute to regional haze. Thus, it is not appropriate to reject a control measure for a single emission unit, a single source, or even a group of sources on the basis of the associated visibility benefits being imperceptible to the human eye. (Note, however, that we do expect that a given Class I area will generally experience perceptible visibility improvements due to the cumulative effect of LTSs in upwind states.) While this approach was used during the first implementation period, experience has shown that it presents considerable technical challenges. These technical challenges include modeling visibility improvement and interpreting the modeled results, as well making comparisons among the results from different modeling platforms that use different emission assumptions and chemistry.[19] In addition, developing information on visibility benefits can be very resource-intensive. Finally, the first

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[18] *See* our final action on the reasonable progress aspects of the Oklahoma and Texas regional haze SIPs. 81 FR 296 at 309, January 5, 2016. *See* also *North Dakota v. EPA*, 730 F.3d 750, 764-766 (8th Cir. 2013).

[19] For example, a discussion Further discussion of these differences is between the modeling that was conducted for BART determinations during the first implementation period and potential reasonable-progress modeling approaches is provided in section 6.2.

implementation period revealed that it can be very difficult for states to make logical and consistent decisions regarding the appropriate weight to give visibility benefits when weighing them against the four statutory factors. Consequently, we recommend that states considering this second alternative approach seek input from EPA, FLMs and the public on a draft analytical work plan and proposed decision-making criteria before committing to this approach. The EPA's FIP for Texas[20] during the first implementation period is an example of the analytical rigor that we believe is required under this approach and the resources required to complete it.

4.3. Focusing on the 20 percent most impaired days

The EPA recommends that states focus on visibility impacts and benefits on the 20 percent most impaired days when conducting their screening analyses and four-factor analyses.[21]

At the screening step, we recommend that states using a visibility-impact threshold consider both (1) the maximum source impact within this set of days and (2) the average source impact across this set of days multiplied by a constant value.[22] If either metric exceeds the state's chosen visibility-impact threshold, then the state should bring forward the source for a full four-factor analysis. This will ensure that states analyze those sources that have relatively large impacts on at least one of the 20 percent most impaired days, as well as those sources with more chronic impacts during these this set of days. Section 6.2 and 6.3 discuss the use of thresholds in a screening analysis in more detail.

The EPA also recommends that states following the second alternative approach (described in section 4.2) consider both (1) the maximum visibility benefit on the 20 percent most impaired days, as well as other values at the high end of this distribution, and (2) the average visibility benefit across this set of days. Many people visit Class I areas only for one day, so it is important to consider the days on which these visitors will receive the most benefit.

While the Regional Haze Rule does not require states to generate information on visibility impacts or benefits on days other than the 20 percent most impaired days, states may nonetheless choose to do so. Such information may also become available during the SIP development process. In these cases, states should consider visibility impacts and benefits on days outside the

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[20] 81 FR 295 (Jan. 5, 2016).

[21] This recommendations in this section presume that visibility impacts and benefits have been estimated for the indicated types of days, or that a suitable surrogate for visibility impacts and benefits on particular days is available. The day-specific source impacts and benefits should be included in the material provided for public comment and submitted to the EPA with the SIP revision.

[22] Note to reviewers of this draft guidance document: The text of this draft document refers to the use of one value for the screening threshold, and of comparing both a source's or group of sources' maximum and average visibility impacts to the one threshold, but only after multiplying the average impact by some constant value. Effectively, this would be equivalent to having one threshold for the maximum impact and a second, lower threshold for the actual value of the average impact. We specifically invite comment on the appropriateness of the final guidance recommending a specific value for a constant multiplier, or a specific ratio of two separate thresholds, for this purpose. We have observed that for the sources and Class I areas involved in the Texas FIP case, the maximum visibility impact across the 20 percent haziest days was consistently about three times the average impact on these days, and the same factor applied to visibility benefits. In a similar situation, using a multiple of about three would likely not greatly affect what sources are brought forward, since sources with an average impact one-third of the threshold would generally have a maximum impact greater than the threshold, while using a larger multiple might bring forward additional sources.

20 percent most impaired days if they are significant and would affect the state's decision making.

4.4. Determining the measures "necessary to make reasonable progress"

The very definition of "regional haze" recognizes that progress towards natural visibility conditions will require the accumulation of reductions in air pollution and associated light extinction, achieved through emission control measures applied to many sources over a broad geographic area. The visibility benefits of these measures may not be individually perceptible.

The EPA recognizes that determining whether a measure is necessary to make reasonable progress is ultimately a fact-specific inquiry regarding a particular source or source category and the affected Class I areas that takes place in the context of legal requirements and input from stakeholders. In our actions on SIPs and FIPs in the first implementation period, we did not apply any general formula or bright-line test to evaluate state decisions or reach our own decisions as to what measures are necessary to make reasonable progress, and we are not recommending any such formula in this guidance. This does not mean, however, that a state has unbounded flexibility or discretion in its decision making. States must use reasoned decision making and give due consideration to well-developed factual information and public comments. States should develop their factual information according to the recommendations in sections 5, 6 and 7 of this guidance document. States may deviate from these recommendations, but must justify any approach that contradicts a specific recommendation. States should avoid clear inconsistencies when making control decisions for similarly situated sources and adequately explain relevant distinguishing considerations. The EPA is likely to view unexplained inconsistencies as an indication of arbitrary decision making.

The EPA believes that a state following the recommended approach to developing an LTS will satisfy the Regional Haze Rule's LTS requirements as long as the state bases its decisions on properly established facts; brings forward from screening sources that, in the aggregate, represent the large majority of controllable emissions that are impairing visibility; reasonably considers the four statutory factors for those sources; considers the recommendations in this guidance; considers relevant FLM and public comments; and provides and documents a reasoned and logical explanation for its decisions on the control measures necessary to make reasonable progress. The EPA will review the substance of state SIPs for compliance with the applicable requirements of the CAA and the Regional Haze Rule, consistency with this and other relevant guidance and reasonableness. Except for the omission of any screening step, the same applies to a state following the first alternative approach.

Similarly, the EPA believes that a state following the second alternative approach will satisfy the Regional Haze Rule's LTS requirements as long as the state takes the steps explained above and explains and documents how visibility benefits were taken into account in considering the four statutory factors. In light of the challenges associated with the second alternative approach mentioned above in section 4.3, we recommend that states considering this approach seek input from EPA, FLMs and the public on their draft analytical work plans and proposed decision making criteria before committing to this approach.

4.5. The Relationship between the LTS and the RPGs

Under 40 CFR 51.308(f)(2)(i), states must consider the four statutory factors to decide what emission control measures are necessary to make reasonable progress toward natural visibility conditions at Class I areas. This obligation applies equally to states with Class I areas and states with sources that contribute to impairment at Class I areas in other states.[23] The four factors are:

- The costs of compliance.
- The time necessary for compliance.
- The energy and non-air quality environmental impacts of compliance.
- The remaining useful life of any potentially affected major or minor stationary source or group of sources.

A state must incorporate all emission control measures necessary to make reasonable progress into the LTS in enforceable form. Once a state has developed its LTS, the state must use a regional photochemical air quality model to project the future visibility conditions at each of its Class I areas on the 20 percent most impaired days and 20 percent clearest days.[24] These visibility conditions are the RPGs for each Class I area. Thus, the content of the LTS determines the RPGs; the LTS is not a means to achieve RPGs set by some other process. The RPGs are unenforceable analytical tools used to draw comparisons to the URP and to allow for comparisons to actual visibility conditions in progress reports and future SIP revisions.[25]

4.6. Comparing the RPGs to the URP

Under 40 CFR 51.308(f)(3)(ii)(A), states with Class I areas must compare their RPGs for the 20 percent most impaired days to the URP in 2028 (as described in section 10 of this document). The URP is the rate of progress necessary to reach natural visibility conditions at the Class I area by the end of 2064. States are not required to set RPGs that meet or exceed the URP, nor does meeting or exceeding the URP create a safe harbor that exempts states from the requirements of the Regional Haze Rule. If the 2028 RPG is above the URP line, however, the state must demonstrate that there are no additional emission reduction measures that would be reasonable to include in the LTS. To satisfy this requirement, states may need to consider sources that screened out of the four-factor analysis or take a second look at emission controls for sources that were selected for the four-factor analysis. If the state determines that no additional emission control measures are reasonable to bring the 2028 RPG at or below the URP line, the state must explain

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[23] Contributing states are those other states with sources that may be reasonably anticipated to contribute to visibility impairment at the Class I area.

[24] The future emissions scenario used to project the 2028 RPGs for a Class I area must be based on the content of the LTS of the state with the Class I area, the LTS of any contributing states, and any other enforceable measures that are in place or are otherwise scheduled to take effect by 2028. The 2028 RPGs also should reflect expected source utilization in 2028, including for source categories treated as aggregated area sources.

[25] The Regional Haze Rule requires states to include in their SIP submissions for the second implementation period, due by July 31, 2021, a commitment to submit one progress report in each of the second and subsequent implementation periods, the next of which will be due by January 31, 2025. The 2028 RPGs will serve as reference points in the 2025 progress report for tracking whether actual progress is happening as anticipated. If not, states should investigate the reasons for the lack of expected progress and determine whether additional reductions are needed. The Regional Haze Rule requires every progress report to include a determination by the state as to whether the SIP is adequate to achieve the RPGs. The Regional Haze Rule does not require the progress reports to be submitted as SIP revisions.

and document its reasoning. Under 40 CFR 51.308(f)(3)(ii)(B), upwind states that contribute to impairment at a Class I area for which the 2028 RPG is above the URP line have the same obligations, i.e., to take a second look at the LTS, determine whether additional control measures are reasonable, and provide adequate documentation. Sections 4.5 and 11 of this guidance document discuss this issue.

4.7. Documentation

Regional Haze Rule provisions

51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.*

* * *

In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) The State must consider and analyze emission reduction measures based on the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected major or minor stationary source or group of sources. The State must document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy.

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(iii) The State must consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Federal area.

(A) *Contributing States*. Where the State has emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area located in another State or States, the State must consult with the other State(s) in order to develop coordinated emission management strategies. The State must demonstrate that it has included in its implementation plan all measures necessary to obtain its share of the emission reductions needed to provide for reasonable progress towards natural visibility conditions in the mandatory Class I Federal area located in the other State or States. If the State has participated in a regional planning process, the State must also ensure that it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(B) *States affected by contributing States*. A State with a mandatory Class I Federal area must consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in that area regarding the emission reductions needed in each State to provide for reasonable progress towards natural visibility conditions in that area. If the State has participated in a regional planning process, the State must ensure it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(C) In any situation in which a State cannot agree with another State or group of States on the emission reductions needed for reasonable progress towards natural visibility conditions in any mandatory Class I Federal area, each involved State must describe in its

submittal the actions taken to resolve the disagreement. In reviewing the State's implementation plan submittal, the Administrator will take this information into account in determining whether the State's implementation plan provides for reasonable progress towards natural visibility conditions at each mandatory Class I Federal area that is located in the State or that may be affected by emissions from the State. All substantive interstate consultations must be documented.

(iv) As part of the demonstration required by (f)(2)(i), the State must document the technical basis, including information on the factors listed in (f)(2)(i) and modeling, monitoring, and emissions information, on which the State is relying to determine the emission reductions from anthropogenic sources in the State that are necessary for achieving reasonable progress towards natural visibility conditions in each mandatory Class I Federal area it affects. The State may meet this requirement by relying on technical analyses developed by a regional planning process and approved by all State participants. The State must identify the baseline emissions inventory on which its strategies are based. The baseline emissions inventory year shall be the most recent year for which the State has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of subpart A of this part unless the State adequately justifies the use of another inventory year.

States should be attentive to the documentation requirements in the above provisions of the Regional Haze Rule. The FLMs who reviewed all the SIP submissions in the first implementation period have shared with the EPA their assessment that the SIPs from California, Colorado, Florida, Minnesota, New Mexico and North Carolina provide good examples of how to document the basis for a regional haze SIP submission. These submissions can be found in the dockets for the EPA actions on them, listed in Appendix B.

4.8. Consultation

Consultation with other states

Regional Haze Rule provisions

51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.*

* * *

(iii) The State must consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Federal area.

(A) *Contributing States*. Where the State has emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area located in another State or States, the State must consult with the other State(s) in order to develop coordinated emission management strategies. The State must demonstrate that it has included in its implementation plan all measures necessary to obtain its share of the emission reductions needed to provide for reasonable progress towards natural visibility conditions in the mandatory Class I Federal area located in the other State or States. If the State has participated in a regional planning process, the State must also ensure that it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(B) *States affected by contributing States*. A State with a mandatory Class I Federal area must consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in that area regarding the emission reductions needed in each State to provide for reasonable progress towards natural visibility conditions in that area. If the State has participated in a regional planning process, the State must ensure it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(C) In any situation in which a State cannot agree with another State or group of States on the emission reductions needed for reasonable progress towards natural visibility conditions in any mandatory Class I Federal area, each involved State must describe in its submittal the actions taken to resolve the disagreement. In reviewing the State's implementation plan submittal, the Administrator will take this information into account in determining whether the State's implementation plan provides for reasonable progress towards natural visibility conditions at each mandatory Class I Federal area that is located in the State or that may be affected by emissions from the State. All substantive interstate consultations must be documented.

The Regional Haze Rule requires states to consult about interstate impacts on visibility in Class I areas. *See* 40 CFR 51.308(f)(2)(iii). These consultation requirements apply to states with affected Class I areas and states with sources that may reasonably be anticipated to contribute to visibility impairment at out-of-state Class I areas. These requirements apply regardless of when states plan to submit their SIP revisions.

The EPA offers the following recommendations to guide the interstate consultation process:

- If a source or sources in one state are reasonably anticipated to contribute to visibility impairment at a Class I area in another state, the contributing state ("upwind state") must consider the inclusion of control measures for its own sources in its LTS based on a consideration of the four factors. If the upwind state is following the second alternative approach, it would also consider visibility benefits along with the four factors.
- A state with a Class I area should consult with a contributing upwind state and, if appropriate, request that the upwind state adopt additional emission controls on a source or source category.
- In the interest of efficient use of resources, the states should consult early on a plan for the development of factual information on the degree to which upwind sources individually contribute to the visibility impact of downwind Class I areas, how those sources can be controlled and the cost of those controls. Generally, the upwind state with the source will be in the best position to obtain information on the source's physical configuration, recent and current emissions, planned modifications and potential additional emission controls. This may involve compilation of information already available to the upwind state via routine reporting systems, special information collection from source owners, air quality modeling, cost analysis and other efforts. However, the downwind state with the Class I area cannot simply cite a lack of information from the upwind state as justification for not considering a source in the upwind state at all and thus not requesting additional control of it.
- The EPA recognizes that a state with a Class I area cannot actually require controls in a contributing state. However, the EPA believes that every state has inherent authority to

request such controls, because under the Regional Haze Rule such a request does not itself create an obligation on the part of the contributing state.

- An upwind state should consider the information provided by the downwind state and should take reasonable steps to obtain additional and more certain information relevant to the visibility impacts from the source or source category in the upwind state and the four factors. Generally, a state with authority over a source or source category will be better able to obtain information on its baseline emissions and the potential for additional emission control.
- An upwind state may recommend action by the downwind state with respect to the downwind state's own sources but is not obligated to do so.
- If states disagree on the elements of the analysis or controls that are required for reasonable progress, the respective EPA regional offices are available to assist the states towards a mutually agreeable outcome that will be approvable under the Regional Haze Rule. However, the EPA cannot direct either state as to the content of the SIP it submits. Should two states ultimately submit SIP revisions that disagree on the controls in each state that are needed for reasonable progress, the Regional Haze Rule provides for the EPA to consider the technical information presented by both states when considering whether to approve each state's SIP. This may entail reviewing and acting upon the two state SIPs simultaneously. Even when there is agreement by the states on the controls that are required (or not required) for reasonable progress, the EPA will independently review their conclusions against Regional Haze Rule requirements.

Consultation between a state and FLMs

Regional Haze Rule provisions

51.307 New source review.

(a) For purposes of new source review of any new major stationary source or major modification that would be constructed in an area that is designated attainment or unclassified under section 107(d) of the CAA, the State plan must, in any review under §51.166 with respect to visibility protection and analyses, provide for:

(1) Written notification of all affected Federal Land Managers of any proposed new major stationary source or major modification that may affect visibility in any Federal Class I area. Such notification must be made in writing and include a copy of all information relevant to the permit application within 30 days of receipt of and at least 60 days prior to public hearing by the State on the application for permit to construct. Such notification must include an analysis of the anticipated impacts on visibility in any Federal Class I area,

(2) Where the State requires or receives advance notification (e.g. early consultation with the source prior to submission of the application or notification of intent to monitor under §51.166) of a permit application of a source that may affect visibility the State must notify all affected Federal Land Managers within 30 days of such advance notification, and

(3) Consideration of any analysis performed by the Federal Land Manager, provided within 30 days of the notification and analysis required by paragraph (a)(1) of this section, that such proposed new major stationary source or major modification may have

an adverse impact on visibility in any Federal Class I area. Where the State finds that such an analysis does not demonstrate to the satisfaction of the State that an adverse impact will result in the Federal Class I area, the State must, in the notice of public hearing, either explain its decision or give notice as to where the explanation can be obtained.

(b) The plan shall also provide for the review of any new major stationary source or major modification:

(1) That may have an impact on any integral vista of a mandatory Class I Federal area listed in §51.304(b), or

(2) That proposes to locate in an area classified as nonattainment under section 107(d)(1) of the Clean Air Act that may have an impact on visibility in any mandatory Class I Federal area.

* * *

51.308(i) *What are the requirements for State and Federal Land Manager coordination?* (1) By November 29, 1999, the State must identify in writing to the Federal Land Managers the title of the official to which the Federal Land Manager of any mandatory Class I Federal area can submit any recommendations on the implementation of this subpart including, but not limited to:

(i) Identification of impairment of visibility in any mandatory Class I Federal area(s); and

(ii) Identification of elements for inclusion in the visibility monitoring strategy required by §51.305 and this section.

(2) The State must provide the Federal Land Manager with an opportunity for consultation, in person at a point early enough in the State's technical and policy analyses of its long-term strategy emission reduction obligation and prior to development of reasonable progress goals so that information and recommendations provided by the Federal Land Manager can meaningfully inform the State's development of the long-term strategy. The opportunity for consultation will be deemed to have been early enough if the consultation has taken place at least 120 days prior to holding any public hearing or other public comment opportunity on an implementation plan (or plan revision) or progress report for regional haze required by this subpart. The opportunity for consultation must be provided no less than 60 days prior to said public hearing or public comment opportunity. This consultation must include the opportunity for the affected Federal Land Managers to discuss their:

(i) Assessment of impairment of visibility in any mandatory Class I Federal area; and

(ii) Recommendations on the development of the reasonable progress goal and on the development and implementation of strategies to address visibility impairment.

(3) In developing any implementation plan (or plan revision) or progress report, the State must include a description of how it addressed any comments provided by the Federal Land Managers.

(4) The plan (or plan revision) must provide procedures for continuing consultation between the State and Federal Land Manager on the implementation of the visibility protection program required by this subpart, including development and review of

implementation plan revisions and progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in mandatory Class I Federal areas.

Consultation between a state and FLMs should begin early and continue throughout development of the SIP revision. This consultation should encompass the approach a state anticipates taking in its SIP development, the state's photochemical and source apportionment modeling protocol including any questions of the meaning or applicability of EPA's guidance for such modeling, the assessment of the results of this modeling, and the decisions about the sources and source categories to be carried from the screening analysis into the four factor analysis.

The 2016 Regional Haze Rule revisions added a requirement for consultation early enough to allow full consideration of FLM input by the state. This is best accomplished by involving the FLMs in the planning of information gathering and analytical work, including the specific topics listed in the previous paragraph. FLM input on options is best sought before important decisions are made by state decision makers as to what proposed LTS will be presented for public comment. See section 51.308(i)(2). The Regional Haze Rule requires that consultation take place no less than 60 days before the start of a public comment period or public hearing. While the rule also provides that consultation will be considered to meet the requirement that it be "early enough" if it takes place at least 120 days before the start of a public comment period or public hearing, the EPA expects that most states will take significant steps in SIP development well before the 120-day point, and that states will benefit from FLM input at those times.

Note that the Regional Haze Rule also requires the SIP to provide procedures for ongoing consultation.

Section 40 CFR 51.307 on new source review was promulgated in 1980. This provision implements certain requirements of the Prevention of Significant Deterioration Program under section 165(d) of the Clean Air Act for the protection of visibility and extends them to sources locating in areas designated as nonattainment under section 107 of the CAA. While it does not establish any criteria for approval of regional haze SIPs, section 51.307 does provide criteria for the new source review components of state SIPs to ensure the protection of visibility in Class I areas. States should be aware of and comply with the notification and information sharing requirements in this provision. State programs' rules should require written notification to the FLMs of any proposed new major stationary source or major modification that may affect visibility in a Class I area. Such notification must include a copy of all information relevant to the permit application and an analysis of the anticipated visibility impacts of the source. The FLMs consider *relevant information* to include the public notice (or draft public notice), draft permit, associated staff analyses and the complete permit application.

Traditionally, the EPA has interpreted "*may affect"* to mean *any* major source or major modification that is proposing to locate within 100 km of a Class I area, *or* any such source that will be located further than 100 km from a Class I area and will have emissions that the FLM is concerned may cause visibility (and other AQRV) impacts. In permitting guidance, the EPA has recognized that sources locating beyond 100 km may cause adverse impact on Class I area under some conditions. In light of the recognition that sources may affect visibility at Class I areas that are several hundred or more kilometers from the source, a notion that is reflected in the regional

haze program, states should not restrict this type of consultation to only permit activities involving sources closer than 100 kilometers from the Class I area.[26]

Consultation with the EPA

Consultation with the EPA should also begin early and be continual. In these consultations, we can help states understand the provisions of the Regional Haze Rule and this guidance document, and advise the state on how they should be applied in the context of the state's SIP.

The EPA will, to the extent possible, support technical work by states through multi-state organizations. The EPA's Office of Air Quality Planning and Standards routinely shares technical products (modeling platform inputs and outputs for specific control scenarios and projection years) that may be useful to individual states or multi-state organizations doing joint technical work.

Consultation with tribes

Tribes have interests in the content of SIPs because SIPs affect air quality in and around tribal land. The EPA recognizes the value in states and multi-state organizations maintaining an on-going dialog with tribes through all stages of developing their regional haze SIPs. As noted earlier, it may be that the tribe or the EPA has responsibility for regulating a source on tribal land for purposes of regional haze, depending on the status of the tribe for purposes of implementing CAA programs. If a state believes that additional control of a source on tribal land is needed for reasonable progress at one of the state's Class I areas, the state may contact the EPA regional office to discuss the situation and possible courses of action.

The EPA will consult with tribes under its tribal consultation policy as appropriate when acting to approve or disapprove a regional haze SIP submitted by a state, when promulgating a FIP to fill gaps in a state SIP and when developing a regional haze plan for a tribal area.

[26] *See* the 1990 Draft NSR Workshop Manual at E.16, *http://www.epa.gov/nsr/nsr-workshop-manual-draft-october-1990.*

5. Ambient data analysis (Step 1)

5.1. What are the visibility progress tracking metrics and calculations required by the Regional Haze Rule?

Under 40 CFR 51.308(f)(1)(i)-(vi), states must calculate the following tracking metrics using data collected by the IMPROVE monitoring program:

- Baseline, natural and current visibility conditions for the most impaired and clearest days. These six conditions must be quantified in deciviews.
- Actual progress made on the most impaired and clearest days toward natural visibility conditions (1) since the baseline period and (2) in the previous implementation period. These four calculations must be quantified in deciviews.
- The difference between current and natural visibility conditions for the most impaired and clearest days. These two calculations must be quantified in deciviews.
- The URP for the most impaired days between baseline visibility conditions and natural visibility conditions. The URP must be quantified in deciviews per year.

More discussion of these calculations is provided throughout section 5 of this guidance document, as shown in Table 5.1.

Table 5.1. Sections of this guidance that address ambient data analysis

20 Percent Most Impaired Days	Sections 5.2-5.6
20 Percent Clearest Days	Section 5.7
Current Visibility Conditions	Section 5.8
Baseline Visibility Conditions	Section 5.9
Natural Visibility Conditions	Section 5.10 and 5.11
Actual progress and difference between current and natural visibility conditions	Section 5.16
Uniform Rate of Progress	Section 5.17

5.2. How was visibility progress tracked in the first implementation period of the Regional Haze Rule?

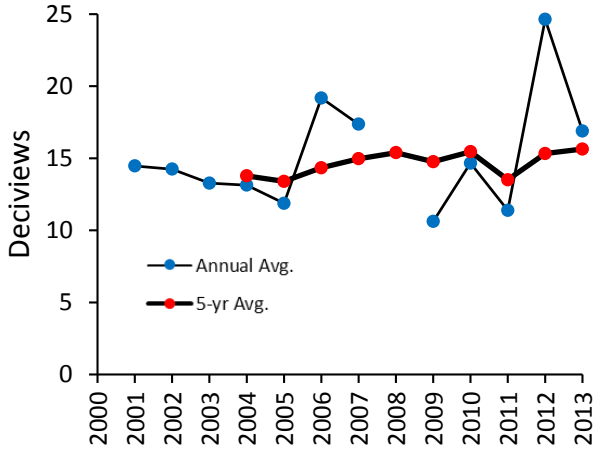
The rule text adopted in 1999 defined "visibility impairment" as a humanly perceptible change (i.e., difference) in visibility from that which would have existed under natural conditions.[27] The 1999 rule text directed states to track visibility impairment on the 20 percent "most impaired days" and 20 percent "least impaired days" in order to determine progress towards natural visibility conditions. 40 CFR 51.308(d)(2)(i)-(iv). The 1999 rule text did not define "most impaired days" or "least impaired days" or clearly indicate whether they were the days with the highest and lowest values for both natural and anthropogenic impairment or for anthropogenic impairment only. However, the preamble to the 1999 final rule stated that the least and most

[27] *See* 64 FR 35764. Section 51.301.

impaired days were to be selected as the monitored days with the lowest and highest actual deciview levels, respectively, which encompass both natural and anthropogenic contributions to reduced visibility.[28] In 2003, the EPA issued guidance describing in detail the steps for selecting and calculating light extinction on the "worst" and "best" visibility days, which also indicated that states should determine the least and most impaired days based on monitoring data rather than determining and selecting the days with the highest and lowest anthropogenic impacts.[29]

The "worst" visibility days for some Class I areas are impacted by natural emissions (e.g., wildfires and dust storms). These natural contributions to haze vary in magnitude and timing. Anticipating this variability, the 1999 Regional Haze Rule required states to use 5-year averages of visibility data to minimize the impacts of inter-annual variability in natural events. However, as the IMPROVE monitoring network has collected more years of data, it has become apparent that 5-year averages do not sufficiently minimize these impacts for some Class I areas. Figure 5.1 shows an example of the extreme wildfire events that affected Sawtooth Wilderness Area, especially in 2012.

Figure 5.1. Visibility conditions on the 20 percent worst visibility days at the Sawtooth Wilderness Area (Idaho) from 2000 to 2013. Blue points are single-year values; red points are 5-year averages.



Data from the last 15 years for a number of Class I areas show that uncontrollable natural variability can obscure visibility improvements resulting from decreases in anthropogenic emissions. In addition, because of the logarithmic nature of the deciview scale, reductions in anthropogenic emissions have little effect on the deciview value on days with high PM concentrations and light extinction that are dominated by natural sources. Consequently, focusing on the days with the highest deciview index values (i.e., the worst visibility days) without considering the source of the visibility impacts has made it difficult to track the visibility improvements resulting from controls on anthropogenic sources. States have identified this difficulty and asked the EPA to explore options for focusing the visibility tracking metrics on controllable anthropogenic emissions. In response to this request, the 2016 Regional Haze Rule

[28] *See* 64 FR 35728
[29] Guidance for Tracking Progress Under the Regional Haze Rule, September 2003, *http://www3.epa.gov/ttnamti1/files/ambient/visible/tracking.pdf.*

revisions require a new approach to the tracking metrics; this new approach is described in the remaining subsections of section 5.

5.3. How will visibility progress be tracked in the second and future implementation periods?

The CAA established the national goal of remedying existing and preventing future visibility impairment resulting from *anthropogenic* air pollution. The 2016 Regional Haze Rule revisions require all states to use a new approach for tracking visibility on days with the most anthropogenic impairment.[30] Under the new approach, in the second and future implementation periods states must select the "20 percent most impaired days" based on daily anthropogenic impairment. The Regional Haze Rule does not specify how states should determine anthropogenic impacts, but this guidance document contains the EPA's recommendations for doing so for the second implementation period.[31] States may deviate from these recommendations if they demonstrate an adequate basis for taking another approach. The EPA recommends that a justification for an alternative approach include a comparison of the state's approach with the approach recommended here, including an explanation of why the state's approach is more appropriate and how it affects the comparison of the RPG to the URP line. Because the EPA or the IMPROVE program will provide user-ready data files reflecting the approach recommended here, this comparison should not involve significant additional effort by the state. The Regional Haze Rule continues to require the use of deciviews (dv) as the unit of visibility and visibility impairment. The program has used and continues to use deciviews, rather than light extinction (b_{ext}), because an increment on the deciview scale reflects increments in human perception of visibility of a given scenic vista across a wide range of perceived visibility conditions, while this is not true for the light extinction scale.

The Regional Haze Rule continues to require the use of the "20 percent least impaired days" for setting the other RPG, but now refers to these days as the "20 percent clearest days" in an effort to be as specific as possible.

The details of the steps involved in selecting days based on the amount of anthropogenic impairment are provided in the following subsections of section 5. These subsections supersede much of the previous 2003 guidance on progress tracking.[32] The approaches presented in the following subsections also apply to progress reports beginning with the reports due on January 31, 2025.

5.4. What does it mean to choose the 20 percent most impaired days based on daily anthropogenic impairment?

The 2016 Regional Haze Rule revisions define *visibility impairment* as "any humanly perceptible difference between actual visibility conditions and natural visibility conditions. Because natural

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[30] Note to reviewers of this draft guidance document: The EPA has proposed in the alternative in the recent rule revisions NPRM to either require states to use the new approach for choosing the 20 percent most impaired visibility days or to allow each state to choose between the original (20 percent worst overall visibility days) and the new approach. For simplicity, this draft has been written as if all states are required to use the new approach. When finalized, the guidance will be written to be consistent with the final rule revisions.

[31] As the scientific understanding of the sources of and contributors to haze are refined, the EPA may provide additional guidance on determining anthropogenic impacts for the second and future implementation periods.

[32] Appendix D identifies portions of this earlier guidance that are still informative and relevant going forward.

visibility conditions can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured." 40 CFR 51.301. In other words, the Regional Haze Rule's definition of visibility impairment is synonymous with anthropogenic impairment. To select the 20 percent most impaired days using anthropogenic impairment rather than total impairment, a logical metric must be used that reflects both the magnitude of the light extinction above natural levels (in Mm^{-1}) as well as the logarithmic relationship between light extinction and perceived visibility. This metric is the difference between the deciview value that actually exists and the deciview value that would have existed if there were only natural sources causing reduced visibility, i.e., the metric is the "delta deciviews" due to anthropogenic emissions. We recommend that states use Equation 5.1, where dv_{total} is the overall deciview value for a day, and $dv_{natural}$ is the natural portion of the deciview value for a day, to calculate anthropogenic impairment. We provide more details on the derivation of the impairment metric in the technical support document (companion TSD) that accompanies this guidance document.[33]

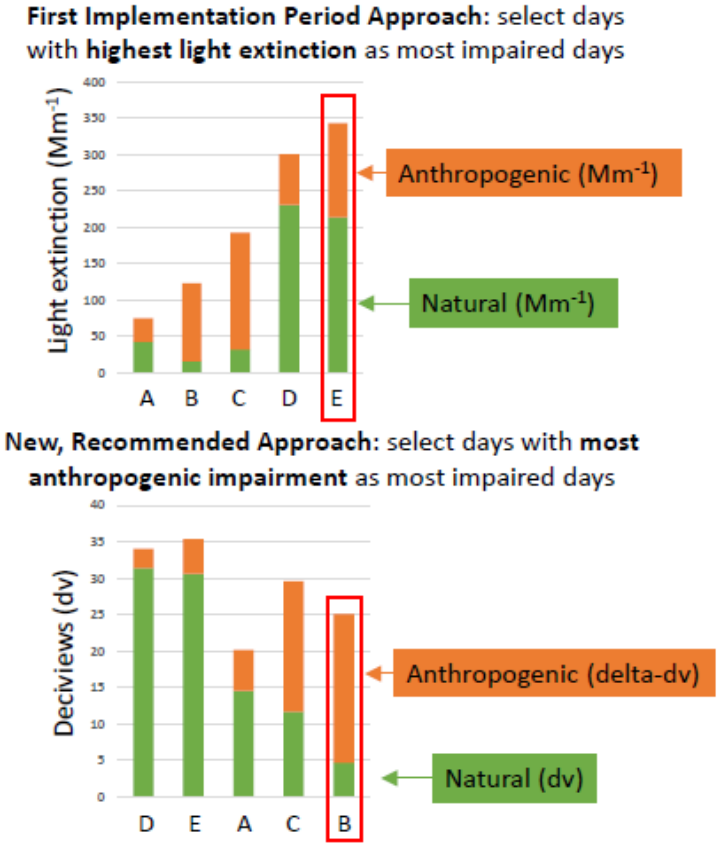
$$dv_{anthropogenic\ impairment} = dv_{total} - dv_{natural} \qquad \text{(Eqn 5.1)}$$

Because of the logarithmic relationship between deciviews and light extinction, a high value of light extinction due to anthropogenic impacts does not necessarily translate to a high value for visibility impairment. For example, if large anthropogenic impacts occur on the same day that a large natural impact occurs, then those anthropogenic impacts will not be as perceptible as if the same anthropogenic impacts occurred on a day with smaller natural impacts. Conceptually, choosing the 20 percent most impaired days based on days with the highest anthropogenic impairment means that days dominated by anthropogenic impacts are selected and days dominated by high natural impacts are not selected. Under this approach, the days with the highest light extinction due to uncontrollable impacts from natural sources such as wildfires and dust storms will no longer be selected, a result that particularly affects Class I areas in western states. Days with moderate to high light extinction from anthropogenic sources and low light extinction due to natural sources will instead be selected as the 20 percent most impaired days.

An illustration of the different approaches for selecting the most impaired days is shown in Figure 5.2. In Figure 5.2, the vertical scale for the Current Approach is in light extinction (Mm^{-1}) and the vertical scale for the New Approach is in deciviews.

[33] Draft Technical Support Document (TSD): Revised Recommendations for Visibility Progress Tracking Metrics for the Regional Haze Program, USEPA Office of Air Quality Planning and Standards, Air Quality Assessment Division, March 17, 2016.

Figure 5.2. Illustration of the conceptual differences between choosing the 20 percent most impaired days based on total haze (top) versus anthropogenic impairment (bottom).



In the approach used in the first implementation period (top of Figure 5.2), the days with the highest overall light extinction (days similar to Day E) were selected into the 20 percent most impaired days, even if the light extinction was primarily due to natural sources. In the new approach, shown on the bottom, the days with the highest anthropogenic impairment, defined by the "delta deciview" metric (days similar to Day B), are selected.

Table 5.2 translates the illustration shown in Figure 5.2 into numbers to further demonstrate the results of using anthropogenic impairment and equation 5.1 to sort the IMPROVE data. For example, Day C has higher light extinction due to anthropogenic sources (160.6 Mm^{-1}) than Day B (107 Mm^{-1}), but Day C also has a higher natural contribution (32.2 Mm^{-1}) than day B (16 Mm^{-1}). Therefore, anthropogenic impairment (calculated according to Eqn 5.1) on Day C (17.9 deciview) is lower than on Day B (20.4 deciview). We do not recommend selecting days based only on the days with the largest anthropogenic contributions to light extinction (i.e., days like Day C) because these may still occur on days with large natural contributions, where less of a

difference in visibility would be noticeable due to a reduction in the anthropogenic contribution.[34]

Table 5.2. Numerical illustration to accompany Figure 5.2. Column "Rank by dv_{Total}" corresponds to the top of Figure 5.2 (sorting by total haze). Column "Rank by $dv_{anthro\ impairment}$" corresponds to the bottom of Figure 5.2 (sorting by anthropogenic impairment).

Day	Total b_{ext} (Mm^{-1})	Natural b_{ext} (Mm^{-1})	Anthro b_{ext} (Mm^{-1})	dv_{Total}	Rank by dv_{Total}	$dv_{natural}$	$dv_{anthro\ impairment}$	Rank by $dv_{anthro\ impairment}$
A	75	42.8	32.3	20.1	5	14.5	5.6	3
B	123	16.0	107	25.1	4	4.7	20.4	1
C	193.8	32.2	160.6	29.6	3	11.7	17.9	2
D	300	231	69.0	34.0	2	31.4	2.6	5
E	342.8	214.2	128.5	35.3	1	30.6	4.7	4

5.5. How does the EPA recommend estimating daily natural and anthropogenic visibility impacts and light extinction budgets?

It currently is not possible to directly measure the natural or anthropogenic fractions of total light extinction, so these fractions must be estimated. This guidance document presents our current recommendation for estimating these fractions. The EPA may publish refinements to this method or additional methods through additional guidance as such methods become available. The

[34] We investigated selecting days based only on their rank in terms of anthropogenic light extinction contributions (in Mm^{-1}), rather than the difference in deciviews between actual/overall and natural visibility conditions as we are recommending, but we decided that using anthropogenic impairment (in "delta deciviews") is more true to the definition of visibility impairment within the Regional Haze Rule as "any humanly *perceptible* difference between actual visibility conditions and natural visibility conditions". [Emphasis added.] This definition of visibility impairment includes human perception of the differences in visibility with and without anthropogenic contributions. Reduction of anthropogenic light extinction on days with high natural light extinction will not be as perceptible as reductions of anthropogenic contributions on days with low natural contributions. This supports the recommendation of using the difference in deciviews between actual and natural visibility conditions (rather than anthropogenic light extinction) to select the most impaired days. For example, if a source or set of sources impacts a Class I area only on days impacted by fire, then other sources that impact the area on non-fire days are more important to consider for improving the perceptible differences in visibility. Additionally, we found that the recommended method (using the difference, in deciviews, between actual and natural visibility conditions) it is less sensitive to the exact details of the method selected for splitting the concentration data for each PM species into "natural" and "anthropogenic". We found the two approaches often identified the same or nearly the same set of days at most eastern Class I areas, while there are noticeable differences in the days selected as impaired in the West, especially during high fire years (i.e., 2012). Our analysis shows that the "non-overlap" days (i.e., days not selected by anthropogenic impairment but selected as having the highest anthropogenic light extinction) are more like Days D and E in Figure 5.2 than Day C, which indicates that our recommended approach is not likely to miss inclusion of a day like Day C with high anthropogenic light extinction. The resulting extinction budgets for the different sets of days may also differ. *See* TSD for a more detailed explanation of the comparison between anthropogenic impairment and anthropogenic light extinction.

IMPROVE program and the EPA will work together to conduct these analyses and provide datasets to states for their use. *See* section 5.13.

In general, the recommended approach to splitting daily light extinction into natural and anthropogenic fractions is to estimate the natural contributions to light extinction, then attribute the remaining light extinction to anthropogenic sources. The natural contributions can be of two types – "episodic" and "routine." Episodic natural contributions are those that occur relatively infrequently, may differ in number and size from year to year, and likely result from extreme events. Routine natural contributions are those that occur on all or most days in a year or season and are more consistent from year to year. Large wildfires and strong dust storms are examples of episodic natural contributions, while biogenic secondary aerosol is an example of a routine contribution.[35] It is useful to make this distinction because the values used by most states in the first implementation period to represent natural visibility conditions, the "NC-II" estimates,[36] are generally recognized as representing the influences of routine natural sources, but not episodic natural sources.[37] As explained below, the annual average NC-II estimates are used in the recommended method described in this section, but in a manner that is consistent with the premise that they represent only the influences of routine natural sources.

The recommended steps (A through E) to estimate natural and anthropogenic light extinction are detailed below, using an example for Mesa Verde National Park (MEVE1). Note that the values throughout this example are unique to MEVE1 and have been included for illustrative purposes only. Each Class I area is treated individually, and these values do not apply to any site other than MEVE1.

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[35] The EPA recognizes that this dichotomy between "episodic" and "routine" natural contributions is a simplification of actual emissions and atmospheric processes. For one thing, the distance between a natural emission source and the Class I area may affect whether the source is effectively treated as episodic. The effective dichotomy is operationally defined by the recommended calculation method as applied at each Class I area.

[36] "NC-II" refers to a set of estimates of natural conditions for each Class I area contained in *Regional Haze Rule Natural Level Estimates Using the Revised IMPROVE Aerosol Reconstructed Light Extinction Algorithm*, available at *http://vista.cira.colostate.edu/improve/Publications/GrayLit/032_NaturalCondIIpaper/Copeland_etal_NaturalConditionsII_Description.pdf*; Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation Data, available at *http://vista.cira.colostate.edu/improve/Publications/GrayLit/019_RevisedIMPROVEeq/RevisedIMPROVEAlgorithm3.doc*; and Regional Haze Data Analysis Workshop, June 8, 2005, Denver, CO, agenda and documents available at *http://www.wrapair.org/forums/aamrf/meetings/050608den/index.html*. These more recent estimates effectively supplanted the values presented earlier in the EPA's 2003 guidance on estimating natural conditions. Both the values in the EPA guidance and the NC-II estimates trace back to work by Trijonis. *See* Trijonis, J.C., Characterization of Natural Background Aerosol Concentrations, Appendix A in Acidic Deposition: State of the Science and Technology, Report 24, Visibility Existing and Historical Condition – Causes and Effects, National Acid Precipitation Assessment Program, 1990.

[37] Tombach, I. 2008. Natural Haze Levels Sensitivity, Assessment of Refinements of Estimates of Natural Conditions. Prepared for the Western Governors Association. Available online at *http://www.wrapair.org/forums/aamrf/projects/NCS/Haze_Sensitivity_Report-Final.pdf*.

Step A: Establish light extinction thresholds to identify extreme events

For each Class I area, using data from the IMPROVE monitor associated with the area, identify for each year the 95th percentile 24-hour carbon (organic + light-absorbing) light extinction.[38] Choose the year between 2000 and 2014 with the lowest such value. This year represents the "low wildfire" year of this period. Also, choose the year with the lowest 95th percentile 24-hour dust (CM + fine soil) light extinction. This year represents the "low dust storm" year of this period. It is possible that the same year will have the lowest 95th percentile values for both carbon and dust. It is also possible that, at particular Class I areas, there will be little difference among the 95th percentile values across the years. The 95th percentile carbon and dust values for these years will serve as the threshold values used to identify impacts on carbon and dust light extinction from extreme episodic events in those year and other years.

Using the 95th percentile value effectively defines what will be considered an extreme episodic event. In the "low wildfire" or "low dust storm" years, there will typically be 5 or 6 monitored days affected by an extreme episodic event because the IMPROVE program monitors every third day. At Class I areas where episodic influences vary significantly from year to year, like some western areas, it will not be unusual for more than five percent of the monitored days to be affected by extreme episodic events in years other than the "low wildfire" and "low dust storm" years. Thus, this approach allows a different number of high carbon days or high dust days in different years to be identified as ones with an extreme episodic impact, but all the days that are identified will have carbon or dust concentrations at least as high as the respective threshold.[39]

The EPA's recommendation that states use the 95th percentile dust and carbon values as described above is a judgment call. Statisticians commonly use 95th percentiles to distinguish between the part of a distribution that is "regularly behaved" and the part that reflects influences from unusual or extreme processes, and we are using them here based on this reasoning.[40] Our investigations have indicated that the results would not be greatly different if another high percentile were used for this purpose, and we provide more details in the companion TSD.

To find the 95th percentile value for carbon for one year, sort the carbon values from high to low. Then, determine the number of complete values available for the year (n). For MEVE1 in 2003, there were 113 complete values for carbon. The 95th percentile value will be the 0.95*n measured value. If 0.95*n is not an integer value, the 95th percentile value is the closest monitored value higher than the 95th percentile. For MEVE1 in 2003, 0.95*113 is 107.35, so the 95th percentile value would be the 108th highest value, out of 113. In 2003, the 108th highest

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[38] Total carbon is used here as an indicator of fire impact. *See* Jaffe et al. (2008) Interannual Variations in $PM_{2.5}$ due to Wildfires in the Western United States *Environ. Sci. Technol. 42,* 2812–2818 and Spracklen, D. V., J. A. Logan, L. J. Mickley, R. J. Park, R. Yevich, A. L. Westerling; D. A. Jaffe (2007), Wildfires drive interannual variability of organic carbon aerosol in the western U.S. in summer, Geophys. Res. Lett., 34, L16816, doi:10.1029/2007GL030037; Hand et al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V June 2011.

[39] In contrast, if the 95th percentile point were used in each year separately, all years would be treated as having the same number of days affected by what was called an extreme episodic event, but the severity of the impacts could be very different from year to year.

[40] This use of 95th percentile values is not related to the use of particular statistical forms for the National Ambient Air Quality Standards. Such statistical forms are used in order to provide reasonable stability to the programs that implement those standards.

carbon value is 25.36 Mm^{-1}. Repeat this process to get a 95th percentile value for each year for carbon and dust. The results for each year of available data for MEVE1 are shown in Table 5.3.

Table 5.3. 95th percentile values for carbon and dust light extinction from 2000-2014 at MEVE1.

Year	Annual 95th percentile carbon light extinction (Mm^{-1})	Annual 95th percentile dust light extinction (Mm^{-1})
2000	12.68	7.73
2001	7.00	6.69
2002	16.14	19.60
2003	25.36	16.45
2004	5.94	5.50
2005	9.64	5.66
2006	7.81	5.33 (lowest)
2007	11.72	5.68
2008	7.54	9.26
2009	10.55	10.35
2010	7.11	13.30
2011	5.29	9.73
2012	10.66	8.93
2013	5.40	8.22
2014	5.05 (lowest)	9.28

2014 and 2006 have the lowest carbon and dust 95th percentile values, respectively. The 95th percentile value of carbon in 2014 was 5.05 Mm^{-1}, and the 95th percentile value of dust in 2006 was 5.33 Mm^{-1}. These 95th percentile values are the threshold values for identifying episodic light extinction for MEVE1 for all years.

Step B: Assign the portions of carbon and dust light extinction that are in excess of these thresholds to "natural (episodic)".

Table 5.4. Total and speciated light extinction for an example day (May 12, 2003) in MEVE1

PM Species	Total Light Extinction (Mm^{-1})	Threshold (Mm^{-1})	Light extinction (Mm^{-1}) on May 12, 2003 associated with natural (episodic)	Light extinction (Mm^{-1}) on May 12, 2003 remaining after episodic treatment
Sulfate	2.96	NA	0	2.96
Nitrate	0.81	NA	0	0.81

OMC (21.78 Mm^{-1}) + LAC (3.58 Mm^{-1})	25.36	5.05	20.31	5.05
Fine Soil (1.14 Mm^{-1}) + CM (1.56 Mm^{-1})	2.70	5.33	0	2.70
Sea salt	0.00147	NA	0	0.00147
Rayleigh	9	NA	0	9
TOTAL	40.83	NA	20.31	20.52

The IMPROVE light extinction data for one day (May 12, 2003) at MEVE1 are shown in Table 5.4. The light extinction from carbon (25.36 Mm^{-1}) on this day is greater than the threshold of 5.05 Mm^{-1}. Therefore, 25.36-5.05 or 20.31 Mm^{-1} is assigned to "natural (episodic)." Carbon light extinction in the amount of 5.05 Mm^{-1} remains to be split between "natural (routine)" and "anthropogenic." The dust-related light extinction of 2.70 Mm^{-1} is less than the threshold value of 5.33 Mm^{-1}, therefore no dust light extinction is assigned to "natural (episodic)." However, the 2.70 Mm^{-1} value for dust-related light extinction does need to be split between "natural (routine)" and "anthropogenic" in Step D below, after the combined values of carbon and dust are reallocated to OMC, LAC, Fine Soil and CM (Step C). A summary of the thresholds used and the light extinction assigned to "natural (episodic)" is shown in Table 5.4.

Step C: Reallocate the combined carbon and dust light extinction remaining after assigning values over the threshold values to "natural (episodic)" into OMC, LAC, FS and CM.

Separate the combined carbon and dust back into OMC, LAC, Fine Soil and CM based on the original percentages of the individual PM species to the grouped light extinction. For example, at MEVE1 on May 12, 2003, the total carbon light extinction was 25.36 Mm^{-1}, with OMC light extinction of 21.78 and LAC Mm^{-1} light extinction of 3.58 Mm^{-1}. The total dust light extinction was 2.70 Mm^{-1} with 1.14 Mm^{-1} from Fine Soil and 1.56 Mm^{-1} from CM. Therefore, on May 12, 2003, carbon light extinction was 85.9 percent from OMC and 14.1 percent from LAC; dust light extinction was 42.2 percent from FS and 57.8 percent from CM. Separate the estimates of "natural (episodic)" and the remaining light extinction back into OMC, LAC, FS and CM using these percentages. Table 5.5 shows the results of these calculations for this example day at MEVE1. For example, of the 20.31 Mm^{-1} of carbon assigned to natural ("episodic"), 17.45 Mm^{-1} (or 85.9 percent) is reallocated to OMC and 2.86 Mm^{-1} (14.1 percent) is reallocated to LAC. Because there are no regulatory consequences to how carbon and dust are separated back into OMC, LAC, Fine Soil and CM, states may use other approaches than the one recommended here.

Table 5.5. Light extinction for an example day (May 12, 2003) in MEVE1 after splitting into natural (episodic). Results of reallocating the carbon and dust into the individual species are shown.

PM Species	Total Light Extinction (Mm^{-1})	Threshold (Mm^{-1})	Light extinction (Mm^{-1}) on May 12, 2003 associated with natural (episodic)		Light extinction (Mm^{-1}) on May 12, 2003 remaining after episodic treatment	
			Grouped	Reallocated	Grouped	Reallocated
OMC	21.78	5.05	20.31	17.45	5.05	4.34

(85.9% of carbon)						
LAC (14.1% of carbon)	3.58			2.86		0.712
FS (42.2% of dust)	1.14	5.33	0	0	2.70	1.14
CM (57.8% of dust)	1.56			0		1.56

Step D: Further split the remaining OMC, LAC, Fine Soil and CM light extinction into "natural (routine)" and "anthropogenic" based in part on the NC-II estimates[41].

Using the results from Step C for all days in a year, calculate the annual average light extinction values for each PM species, excluding light extinction already attributed to episodic events. This is the annual average corresponding to the right-most columns of Tables 5.4 and 5.5.

For all PM species except sea salt (which is treated as all "natural (routine)"), use the existing NC-II annual average light extinction values to calculate a daily estimate of "natural (routine)," along with the daily light extinction values and the annual averages for the site (both excluding light extinction already attributed to episodic events).[42] These values appear in Table 5.6 for the MEVE1 example.

[41] *http://vista.cira.colostate.edu/improve/Publications/GrayLit/gray_literature.htm; http://vista.cira.colostate.edu/improve/Publications/GrayLit/032_NaturalCondIIpaper/Copeland_etal_NaturalConditionsII_Description.pdf*

[42] The EPA recognizes that use of the annual average NC-II estimates as a starting point for determining daily estimates of "natural (routine) light extinction in the revised URP framework poses issues for at least some Class I areas. One obvious issue, that observed average sea salt extinction at some Class I areas is higher than the NC-II estimates of sea salt contributions to natural visibility conditions, has been addressed in our recommended approach by treating all measured sea salt concentrations as natural. There also appear to be issues with the NC-II estimates of naturally occurring OCM being too high at some eastern Class I areas. Because our approach to estimating natural conditions on individual historical days makes use of the NC-II estimates (other than for sea salt) to help allocate measured concentrations of PM species between natural and anthropogenic sources, these issues with the NC-II estimates in some cases will affect the results of our recommended approach to calculating the single value of "natural visibility conditions for the 20 percent most impaired days." However, we do not believe that these issues rise to the level that would make our recommended approach inappropriate for use in SIP development. Also, a state, or states and the EPA working together, may develop substitutes for the annual average values for particular Class I areas (or all Class I areas) and re-execute the calculations.

Table 5.6. The remaining light extinction at MEVE1 on May 12, 2003, after applying thresholds to allocate some light extinction to natural ("episodic"). The NC-II average light extinction estimates and the 2003 annual average light extinction excluding the episodic light extinction are also shown.

PM Species	Light extinction on May 12, 2003 remaining after episodic treatment (Mm^{-1})	NC-II average natural light extinction estimates (Mm^{-1})	2003 Annual average light extinction (excluding episodic events) (Mm^{-1})
Sulfate	2.96	0.57	4.12
Nitrate	0.81	0.58	1.60
OMC	4.34	1.83	3.19
LAC	0.712	0.2	0.86
Soil	1.14	0.50	0.88
CM	1.56	1.73	2.35
Sea salt	0.00147	NA	0.028
Rayleigh	9	9	9

The remainder of Step D depends on whether, for a given PM species, the annual average light extinction value (excluding episodic events) for the particular year is greater than or less than the NC-II estimate of annual average natural light extinction.

For sites and PM species with annual average light extinction values (excluding episodic events) greater than the NC-II estimates, such as the example MEVE1 day illustrated here:

The daily estimates of "natural (routine)" light extinction are assumed to vary throughout the year because there are natural seasonal variations in light extinction, but when averaged, the daily contributions equal the NC-II annual average value. The daily contributions to "natural (routine)" are calculated according to Equation 5.2:

$$natural(routine) = \frac{daily\ extinction * NCII\ estimate}{annual\ average\ excluding\ episodes} \qquad \text{(Eqn 5.2)}$$

An example for the carbon (LAC + OMC) light extinction on May 12, 2003 at MEVE1, using extinction values shown in Table 5.6, is shown below.

$$natural(routine)_{carbon} = \frac{4.34 * 1.83}{3.19} = 2.49\ Mm^{-1}$$

Repeat this calculation for dust, sulfate and nitrate light extinction (not shown here).

For sites and PM species with annual average light extinction values (excluding episodic events) less than the NC-II estimates:

Assign all of the daily light extinction associated with carbon or dust, after the threshold treatment for extreme events, to "natural (routine)."[43]

Step E: Consider the remaining light extinction from sulfate, nitrate, carbon and dust "anthropogenic."

Starting with the total light extinction measured on each day, subtract the "natural (episodic)" and "natural (routine)" to find the natural and anthropogenic light extinction attributable to each PM species and overall, i.e., the light extinction budgets.[44] Results for each of the three budgets and the total light extinction are shown in Table 5.7.

Table 5.7. The light extinction budgets at MEVE1 on May 12, 2003, after splitting the light extinction into natural ("episodic"), natural ("routine") and anthropogenic.

PM Species	Total extinction on May 12, 2003 at MEVE1 (Mm^{-1})	Light extinction on May 12, 2003 associated with natural (episodic) (Mm^{-1})	Light extinction on May 12, 2003 associated with natural (routine) (Mm^{-1})	Light extinction on May 12, 2003 associated with anthropogenic (Mm^{-1})
Sulfate	2.96	NA	0.41	2.55
Nitrate	0.81	NA	0.29	0.52
OMC	21.78	17.45	2.49	1.84
LAC	3.58	2.86	0.165	0.555
Soil	1.14	0	0.649	0.491
CM	1.56	0	1.14	0.42
Sea salt	0.00147	0	0.00147	0
Rayleigh	9	NA	9	0
TOTAL	40.83	20.31	14.15	6.37

[43] The EPA recognizes that situations in which all of the daily extinction associated with carbon or dust, after the threshold treatment for extreme events, is assigned to "natural (routine)" may indicate that the NC-II estimate of annual average light extinction due to natural sources is too high. We believe these overestimates, if present, are not frequent or severe enough to make the recommended approach problematic for SIP development. Nevertheless, we support the development of revised natural estimates that more accurately reflect natural contributions. As indicated in section 5.10, states continue to maintain the flexibility to develop and apply other values for natural light extinction.

[44] The anthropogenic light extinction budget may be useful to states when determining screening approaches (*see* section 6.3).

5.6. How does the EPA recommend selecting the 20 percent most impaired days?

Regional Haze Rule provisions

> 51.301 Definitions:
> *Most impaired days* means the twenty percent of monitored days in a calendar year with the highest amounts of visibility impairment.
> *Visibility impairment* means any humanly perceptible difference between actual visibility conditions and natural visibility conditions. Because natural visibility conditions can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured.

The 20 percent most impaired days should be selected as follows:

Step F: Calculate anthropogenic impairment for each day using the daily estimates of natural and anthropogenic light extinction, according to Eqn 5.1.

For each day at the Class I area of interest, calculate anthropogenic impairment according to Eqn 5.1. At MEVE1, for May 12, 2003, the anthropogenic impairment is calculated as:

$$dv_{anthropogenic\ impairment} = dv_{total} - dv_{natural}$$

$$= 10 * ln\frac{40.83}{10} - 10 * ln\frac{34.46}{10} = 1.70 \text{ dv}$$

Step G: Sort the days by the anthropogenic impairment and choose the 20 percent most impaired days based on this value.

Perform these calculations for each day at the Class I area of interest, then rank the days within each year from high to low by anthropogenic impairment where a rank of 1 is the most impaired day. At MEVE1, this day, May 12, 2003, with an anthropogenic impairment value of 1.70 deciview, is a relatively low impairment day and was ranked 99 out of 105 total days with complete observations. Therefore, based on anthropogenic impairment, this day is *not* one of the 20 percent most impaired days for 2003.[45] In contrast, if ranking this day based on either total light extinction or overall visibility conditions (the ranking would be the same with these two metrics), as the EPA's guidance for the first implementation period recommended, this day would be ranked 14 out of 105 days with complete observations, and would be one of the 20 percent of days with the worst overall visibility conditions. These rankings are summarized in Table 5.8.

[45] *See* TSD for more details and equations governing the number of days to be included in quintiles when the number of complete observations are not evenly divisible by 5. For example, if there are 111-115 days with complete IMPROVE observations, 23 days are averaged to get the 20 percent most impaired (and 22 days are averaged to get the 20 percent clearest).

Table 5.8. Summary of the ranking of May 12, 2003 at MEVE1 using anthropogenic impairment and total deciviews.

Day	$dv_{anthropogenic\ impairment}$	$dv_{anthropogenic\ impairment}$ Rank, from high to low, out of 105 days	dv_{total}	dv_{total} rank, from high to low, out of 105 days
May 12, 2003	1.70 deciview	99	14.1 deciview	14

Average the deciviews of haze on the 20 percent most impaired days for each year to obtain a single value for the visibility impairment for each year (for MEVE1 in 2003, which had 105 complete observations, 21 days will be in the 20 percent most impaired).

States may choose alternative approaches for estimating natural and anthropogenic contributions to light extinction, as stated in Section 5.3, but the Regional Haze Rule requires states to choose the 20 percent most impaired days based on anthropogenic impairment.[46] In other words, while Steps A through F described above are EPA recommendations and states are not precluded from using other approaches to determine the anthropogenic impairment on each day, the Regional Haze Rule requires states to follow Step G as described.

5.7. How do the 2016 Regional Haze Rule revisions require states to select the 20 percent clearest days?

Regional Haze Rule provisions

> 51.301 Definitions:
> *Clearest days* means the twenty percent of monitored days in a calendar year with the lowest values of the deciview index.

The 2016 Regional Haze Rule revisions require states to select the 20 percent clearest days for each year continue as the 20 percent of days with the lowest total light extinction. These will also be the days with the lowest values of the deciview index. It is unnecessary to split the data into "natural" and "anthropogenic" fractions. Sort the days of each year by total deciviews, and the 20 percent of days with the lowest deciviews are the 20 percent clearest days.[47]

We expect that the 20 percent clearest days (selection of which is based on visibility as affected by all types of sources) will not include any days with notable effects from wildland wildfires. Thus, we expect that wildland wildfires will not affect a state's ability to demonstrate that there

[46] Actually, the EPA has proposed in the alternative in the recent rule revisions NPRM to either require states to use a new approach for choosing the 20 percent most impaired visibility days or to allow each state to choose between the original (20 percent "worst" visibility days) and the new approach. For simplicity, this draft has been written as if all states are required to use the new approach. When finalized, the guidance will be written to be consistent with the final rule revisions.

[47] If instead the 20 percent of days with the lowest levels of anthropogenic impairment were selected, some days with very poor visibility due to natural sources such as wildfires might be included because with very high light extinction due to natural sources anthropogenic impairment calculated with Equation 5.1 will be low even if there is substantial light extinction due to anthropogenic sources. The EPA believes it better serves the purpose of tracking progress if the "20 percent best" set of days excludes such poor visibility days.

will be no deterioration in visibility on the 20 percent clearest days, which is a requirement for SIP approval.

5.8. How are current visibility conditions determined?

Regional Haze Rule provisions

> 51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:
>
> (iii) Current visibility conditions for the most impaired and clearest days. The period for calculating current visibility conditions is the most recent 5-year period for which data are available. Current visibility conditions must be calculated based on the annual average level of visibility impairment for the most impaired and clearest days for each of these 5 years. Current visibility conditions are the average of these annual values.

The revised Regional Haze Rule defines the period for calculating current visibility conditions as the most recent 5-year period for which data are available.[48] Due to the laboratory, data analysis, and quality assurance procedures of the IMPROVE program, there is some delay between the date of the filter collection and the date the data are ready for use in analyses. Current visibility conditions must be calculated based on the annual average level of visibility impairment for the most impaired (*see* more information on selecting the days in sections 5.5 and 5.6) and clearest days (section 5.7). Current visibility conditions are the average of the five most recent annual values available. Five years are averaged to account for variability in meteorology and emissions. Current visibility conditions should be expressed in deciviews.

5.9. How are baseline visibility conditions determined?

Regional Haze Rule provisions

> 51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:
>
> (i) Baseline visibility conditions for the most impaired and clearest days. The period for establishing baseline visibility conditions is 2000 to 2004. For purposes of calculating and displaying the uniform rate of progress needed to attain natural visibility conditions by the end of 2064, baseline visibility conditions must be associated with the last day of this period. Baseline visibility conditions must be calculated, using available monitoring data, by establishing the average deciview index for the most impaired and clearest days for each calendar year from 2000 to 2004. The baseline visibility conditions are the average of these annual values. For mandatory Class I Federal areas without onsite monitoring data for 2000-2004, the State must establish baseline values using the most

[48] The revised Regional Haze Rule does not specify the point in the development of a SIP at which this data availability is to be determined. The EPA expects that the appropriate point may vary from state to state, depending on the expected interval needed between retrieving the data for purposes of SIP development and submitting the SIP, given a state's technical and administrative procedures.

representative available monitoring data for 2000-2004, in consultation with the Administrator or his or her designee. For mandatory Class I Federal areas with incomplete data availability for 2000-2004, the State must establish baseline values using the closest 5 complete years of monitoring data.

The period for establishing baseline visibility conditions remains 2000 to 2004 in the second and future implementation periods.[49] Visibility conditions in these 5 baseline years are the starting point for calculating the URP and drawing the URP line for all implementation periods of the Regional Haze Rule. The annual average visibility on the 20 percent most impaired days and 20 percent clearest days in each of the 5 years from 2000 to 2004 are averaged to obtain baseline visibility conditions for the 20 percent most impaired days and 20 percent clearest days. The EPA's recommendations for selecting the 20 percent most impaired days based on the days with the highest anthropogenic impairment are given in sections 5.5 and 5.6. Guidance for selecting the 20 percent clearest days is given in section 5.7. The EPA recommends using these approaches for selecting the 20 percent most impaired and the 20 percent clearest days to establish baseline visibility conditions.

Because of the 2016 revisions to the Regional Haze Rule, the term "most impaired days" has a different meaning than EPA and states gave to that term in the first implementation period. The "baseline visibility condition (in deciviews) for the 20 percent most impaired days" in a state's SIP submission for the second implementation period will likely have a different value than the baseline values used in SIPs for the first implementation period, even if there have been no revisions to the IMPROVE data for the 2000-2004 period. The differences will be largest at Class I areas impacted by fire and dust events in the baseline period.

5.10. What natural visibility conditions estimates does the EPA recommend for use in the impairment-based approach for selecting the 20 percent most impaired days?

Regional Haze Rule provisions

51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:

(ii) Natural visibility conditions for the most impaired and clearest days. Natural visibility conditions must be calculated by estimating the deciview index existing under natural conditions for the most impaired and clearest days, based on available monitoring information and appropriate data analysis techniques;

[49] IMPROVE data from the 2000-2004 period may be revised after initially reported because of more recently revised methods for calculating ambient concentrations from measurements made on filters and because of revised methods for filling in missing or invalidated data. Such revisions are "backcasted" in order to maintain consistency in reported results across the years. Therefore, baseline visibility conditions should be recalculated for use in the second and subsequent implementation periods.

Overview of the recommended new approach to the natural visibility conditions estimate for the most impaired days

The URP framework requires states to determine a value for "natural visibility conditions" for the 20 percent most impaired days as the 2064 end point of the URP line (or glidepath) for each Class I area. Given the inherent day-to-day variability of natural processes (e.g., windblown dust, fire, volcanic activity, biogenic emissions, etc.), it follows that natural visibility conditions are not constant and may vary day-to-day. Also, natural visibility conditions on days in the past were not directly measured and therefore must be estimated. The steps for estimating natural and anthropogenic fractions of light extinction recommended in this guidance result in estimates of natural visibility conditions for each monitored day in the past, with a given past day having the potential for both routine and episodic contributions to natural conditions. The selection of the most appropriate single value to be used for "natural conditions on the 20 percent most impaired days" as the 2064 end point of the URP line is a separate question from estimating natural conditions for days in the past as part of determining which days are the 20 percent most impaired, but related.

Under the Regional Haze Rule, the single value of natural visibility conditions for the 20 percent most impaired days is to be used in several ways:

1. The value of natural visibility conditions is to be compared to "current conditions," i.e., the most recent 5-year average of actual visibility for the 20 percent most impaired days.
2. The URP is calculated as the difference between 2000-2004 baseline visibility conditions and natural conditions for the 20 percent most impaired days, divided by 60 years. In other words, the "glidepath" ends at natural conditions in 2064.
3. The 2028 RPG for the 20 percent most impaired days is compared to the 2028 point on the URP line, which uses the value of natural visibility conditions as its endpoint. This comparison determines an important aspect of the analysis required to support an approvable SIP revision, as described in section 10.

The third of these uses of the value for natural visibility conditions has implications for the analysis needed to support an approvable SIP revision. It is therefore important to maintain consistency when selecting the 20 percent most impaired days for estimating the value of "baseline conditions" for the 20 percent most impaired days (which is the starting point for the URP line) and the value of "current conditions" for the 20 percent most impaired days, and the approach for selecting the value of "natural visibility conditions" for the 20 percent most impaired days.[50] In particular, since the value for "current conditions" generally will not reflect conditions on days with very high, episodic natural impairment (because such days generally will not be among the days of highest anthropogenic impairment), the single value of "natural visibility conditions" should also not include the influence of high natural emissions from episodic events such as large wildfires and dust storms, even though these events may be natural. In addition, there may be seasonal or other temporal patterns affecting the level of non-episodic

[50] Current visibility conditions should be consistent because the 2028 RPGs will be forecasts that begin with the value of current conditions for whatever recent period is used as the base year for air quality modeling of the RPGs. This consistency is also important to avoid public misunderstanding of how close a SIP comes to providing progress equal to the URP.

natural conditions, and inconsistencies due to different samplings of these patterns would also be problematic. Therefore, natural visibility conditions estimates should be developed for the set of days that have levels of influence from natural sources that are consistent with the types of days that are selected as the 20 percent most impaired days for purposes of estimating "current conditions" (as selected using the impairment-based approach described in sections 5.5 and 5.6).

Because the "p90" NC-II Natural Haze estimate for a given Class I area was based on the 20 percent of days that have the worst overall visibility rather than the days with the worst impairment, it is not suitable for direct use as the "natural visibility condition for the 20 percent most impaired days" under the impairment-based approach. Instead, it is appropriate to use the average of the new estimates of natural visibility conditions estimated for the particular days that have been identified as the 20 percent most impaired days in past years.[51]

Specifics of the method used to develop the recommended values for the natural visibility condition for the 20 percent most impaired days

The EPA has produced revised natural visibility conditions estimates for the 20 percent most impaired days[52] that are more consistent with using anthropogenic impairment to select the most impaired days and that also consider all measured sea salt concentrations and extinction to be natural.[53] The method the EPA has used to do this takes advantage of the daily "natural (episodic)" and "natural (routine)" estimates produced in steps A through C (section 5.5). For each IMPROVE monitor, we averaged the daily natural (the sum of "episodic" and "routine") light extinction estimates on the 20 percent most impaired days in each year from 2000 to 2014 to determine new estimates of natural visibility conditions. The light extinction values in deciviews are used as the new natural visibility conditions estimates. These revised natural visibility conditions are generally lower in magnitude than the "p90" NC-II haze estimates (representing the average conditions for days between the 80th percentile and the 100th percentile) and higher in magnitude than the annual average NC-II haze estimates. More details about the methodology for producing these estimates and the estimates themselves can be found in the companion TSD to this guidance document.

Relationship between the recommended approach and prior estimates and rationale for the recommended approach

For the first implementation period SIPs, most states used the NC-II Natural Haze estimates developed by the Natural Haze Levels II Committee in 2007 as their natural visibility conditions. The NC-II estimates were improvements to the recommendations the EPA provided in the 2003

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[51] For some Class I areas, the natural visibility condition estimate for the 20 percent most impaired days may be *less* than the baseline visibility condition value for the 20 percent clearest days. This is due to several factors, such as the inclusion of anthropogenic impacts in the 20 percent clearest day value but not in the natural visibility value. As a result, the 2064 URP line endpoint for the 20 most impaired days and the 20 percent clearest days are not directly comparable. It should also be noted that even though the Regional Haze Rule only requires no degradation in visibility for the 20 percent clearest days, we expect visibility to improve on these days as a result of the LTS measures developed to address the 20 percent most impaired days.

[52] These revised estimates are included in Appendix E of the TSD.

[53] While some northern urban and suburban areas may experience relatively high ambient air salt concentrations attributable to the salting of roads, this is not expected to be an issue in Class I areas.

Natural Visibility Conditions Guidance,[54] and the revised NC-II estimates attempted to account for the variability in natural visibility conditions that existed in the baseline (2000-2004) period.

It is generally recognized that the "p90" NC-II estimates do not fully reflect the effects of extreme episodic natural events at all Class I areas.[55] This has been frequently cited as a problem in the context of the URP framework based on the 20 percent of days with the worst overall visibility that was used in the first implementation period, because it caused an inconsistency between "current conditions" (which reflected any such extreme episodic natural influences) and the 2064 endpoint of the URP line that was set equal to the "p90" NC-II value. However, as explained above, with the new impairment-based URP framework, it is not intended or appropriate for the 2064 "natural visibility conditions" value to include impacts from such extreme episodic natural events. When selecting the 20 percent most impaired days based on anthropogenic impairment, days with large impacts from extreme, episodic natural events such as fires and dust storms are no longer selected. Therefore, these extreme impacts should also not be included in estimates of natural visibility conditions that will be compared with the most impaired days. This addresses past concerns that the NC-II estimates fail to include effects from large episodic natural events because it will no longer be appropriate to include the days on which these events occur among the most impaired days.

In addition to avoiding selecting historical days dominated by extreme natural events when calculating the single value of natural visibility conditions that will be used in calculating the URP (or, in other terms, used as the 2064 endpoint of the URP line or glidepath), it is important to recognize that there are differences among the days that did not have extreme natural events. The natural visibility conditions value that will be used in calculating the URP should be based on the 20 percent most impaired historical days, rather than all the days without extreme events or the 20 percent haziest days. Otherwise, an error could occur in the value of the URP. The routine and episodic natural processes that form some PM species are expected to vary by season, and the 20 percent most impaired days may be distributed across seasons of the year in a particular way that differs from all non-extreme days and days with the worst haze.

Wildland wildfires and natural visibility conditions

Because wildland wildfires are natural events, emissions from wildland wildfires do not contribute to "visibility impairment" given that this term refers only to reductions in visibility attributable to anthropogenic sources. Under the new required approach of basing RPGs on the 20 percent most impaired days and our recommendations on how to estimate daily natural and anthropogenic light extinction,[56] we expect that days with large impacts from wildland wildfires will not be included in the 20 percent most impaired days in each year, and we expect that wildland wildfires will not significantly affect the estimate of "natural visibility conditions for

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[54] Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule. Available at: *https://www3.epa.gov/ttnamti1/files/ambient/visible/natural.pdf.*

[55] Tombach, I. 2008. Natural Haze Levels Sensitivity, Assessment of Refinements of Estimates of Natural Conditions. Prepared for the Western Governors Association. Available online at *http://www.wrapair.org/forums/aamrf/projects/NCS/Haze_Sensitivity_Report-Final.pdf* and *see* TSD, section 2.1.1.

[56] Note to reviewers of this draft guidance document: For clarity for purposes of comment and for ease in finalization, this draft version of this guidance document is written as if the revisions proposed in May 2016 have been finalized as proposed. If the final revisions to the Regional Haze Rule differ from this assumption, corresponding changes will be made in the final guidance document.

the 20 percent most impaired days." Thus, we expect that wildland wildfires with notable effects on visibility will not be a reason why a projected RPG for the 20 percent most impaired days would be above the URP line, simply because the URP line will be about visibility on days that have not been significantly affected by emissions from fires.

We also expect that wildland wildfires will not affect the value of "natural conditions on the 20 percent clearest days."

States may use alternative approaches with justification

States may use the revised natural visibility estimates contained in Appendix E of the TSD accompanying this guidance, or may choose to use alternative estimates with justification supporting that the alternative, refined approach is technically sound and provides regionally representative estimates of natural visibility conditions for the most impaired days. More guidance on developing alternatives is given in section 3 of the existing 2003 Natural Visibility Conditions Guidance. Appendix E of this document explains what portions of the 2003 document continue to be applicable.

5.11. What natural visibility conditions estimates does the EPA recommend for the 20 percent clearest days?

Regional Haze Rule provisions

> 51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:
>
> (ii) Natural visibility conditions for the most impaired and clearest days. Natural visibility conditions must be calculated by estimating the deciview index existing under natural conditions for the most impaired and clearest days, based on available monitoring information and appropriate data analysis techniques;

The Regional Haze Rule requires the establishment of RPGs which provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the clearest days over the same period. Consequently, for the clearest days, no URP line or glidepath is drawn, but the rule does require states to compare current visibility conditions with natural visibility conditions for the clearest days. 40 CFR 51.308(f)(1)(i-vi). For this comparison, the EPA continues to recommend the use of the NC-II ("p10") estimates for the 20 percent clearest days. States may use alternative natural visibility estimates for the clearest days if justified. This comparison is only for public information and transparency purposes. There are no regulatory requirements or consequences that depend on the values selected for natural visibility conditions on the 20 percent clearest days.

5.12. What are the associated values, equations and completeness criteria used in the calculations of visibility impairment on the most impaired and clearest days?

For purposes of the Regional Haze Rule, light extinction is estimated from measurements of PM and its chemical species, assumptions about relative humidity at the monitoring site, and the use of a commonly accepted algorithm. This subsection contains details about the algorithm, relative humidity (RH) values and data completeness criteria.

The EPA recommends the use of the revised IMPROVE algorithm[57] for estimating light extinction from IMPROVE speciation measurements (shown below). Many states used this algorithm in their SIPs covering the first implementation period. The revised IMPROVE algorithm for calculating light extinction (b_{ext}) is:

$$
\begin{aligned}
b_{ext} \approx\ & 2.2 \times f_S(RH) \times [\textit{Small Sulfate}] \\
& + 4.8 \times f_L(RH) \times [\textit{Large Sulfate}] \\
& + 2.4 \times f_S(RH) \times [\textit{Small Nitrate}] \\
& + 5.1 \times f_L(RH) \times [\textit{Large Nitrate}] \\
& + 2.8 \times [\textit{Small Organic Mass}] \\
& + 6.1 \times [\textit{Large Organic Mass}] \\
& + 10 \times [\textit{Elemental Carbon}] + 1 \times [\textit{Fine Soil}] \\
& + 1.7 \times f_{SS}(RH) \times [\textit{Sea Salt}] \\
& + 0.6 \times [\textit{Coarse Mass}] \\
& + \textit{Rayleigh Scattering (Site Specific)} \\
& + 0.33 \times [NO_2\ (ppb)]
\end{aligned}
$$

This algorithm includes separate estimates of light extinction (in Mm^{-1}) from small and large size modes of sulfate, nitrate and organic mass to better represent light extinction at low and high particulate matter concentrations. The fraction of particles estimated to be in the large size mode is estimated to increase as the concentration of the PM species increases and plateaus at a concentration of 20 $\mu g/m^3$ at which point all particles are treated as large size particles.[58] The algorithm also uses size-fraction specific f(RH) values for sulfate and nitrate to account for the dependence of light extinction on relative humidity for these species as detailed in Pitchford et al. (2007). We recommend the continued usage of the monthly, site-specific f(RH) values for subsequent implementation periods.[59] However, states may update these values as appropriate and with justification.

Data completeness recommendations as outlined in the 2003 tracking progress guidance[60] remain the recommended criteria:

> In order for a year of data from a site to be used to track progress in improving visibility, all four quarters of that year should be at least 50% complete, and overall, the year should

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[57] Pitchford, M.; Malm, W.; Schichtel, B.; Kumar, N.; Lowenthal, D.; Hand, J. Revised algorithm for estimating light extinction from IMPROVE particle speciation data; J. Air & Waste Manage. Assoc. 2007, 57, 1326-1336; doi: 3155/1047-3289.57.11.1326.

[58] The algorithm estimates the fraction of large size particles by dividing the total concentration of a species (i.e., sulfate, nitrate, or organic carbon) by 20, then the remaining mass is in the small size fraction. For example, if a sulfate concentration is 8 $\mu g/m^3$, then 8/20, or 2/5, of the mass is in the large size fraction (3.2 $\mu g/m^3$) and the remainder (4.8 $\mu g/m^3$) is in the small size fraction. If the total concentration of a species is higher than 20 $\mu g/m^3$, then all of the species is assumed to be in the large size fraction. More details are given in Pitchford et al. (2007) and references therein.

[59] These f(RH) values are included in past and current data summary files provided by IMPROVE data managers (*http://vista.cira.colostate.edu/datawareHouse/IMPROVE/Data/SummaryData/RHR_2014/*).

[60] Guidance for Tracking Progress Under the Regional Haze Rule, September 2003, *http://www3.epa.gov/ttnamti1/files/ambient/visible/tracking.pdf.*

be 75% complete. That is, complete data (including that filled in by substitution of averages), should be available for at least 50% of the sampling days in each quarter of the year and for 75% of all scheduled sampling days for the year. In addition, there should be no more than 10 missing sampling days in a row at any time during the calendar year. Given the every third day of sampling, this requirement means that a site should not be out of operation for any period of more than one consecutive month during the calendar year.

Annual data sets meeting these completeness criteria should be used in subsequent steps to calculate five-year average visibility results for tracking progress. Every attempt should be made to get five years of complete data within each five-year period. However, if maximum data recovery is not achieved, the EPA believes that a minimum of 3 years of data meeting these completeness requirements is sufficient to calculate the five-year averages within each five-year period.

If 3 years with complete data are not available, estimates for baseline or current conditions should be prepared in coordination with the EPA and the IMPROVE program.

5.13. Should each state perform these calculations for its Class I areas?

The EPA will work with the IMPROVE program to offer datasets containing the 20 percent most impaired days, selected based on anthropogenic impairment, and the 20 percent clearest days for use by states. These data files will contain the 20 percent most impaired days and the estimates of natural and anthropogenic contributions to light extinction by species. The 20 percent clearest days will also be included in these data files. We also expect that these data files will include natural and anthropogenic extinction budgets for each day, as shown in the example in Table 5.6 in section 5.5. These files are expected to be available at *http://vista.cira.colostate.edu/improve/Data/IMPROVE/summary_data.htm*.

The companion TSD to this guidance document contains much of this same information for each Class I area through 2014. Additionally, corresponding data files were included in the docket for this draft guidance document and are still available.[61]

5.14. Can states use another strategy for choosing the 20 percent most impaired days?

While Steps A through F described above are the EPA recommendations for estimating the anthropogenic impairment for each day before determining the 20 percent most impaired days, states are not precluded from using other reasonable approaches.[62] Whatever algorithm states use to estimate daily anthropogenic impairment as a step in calculating the 20 percent most impaired days, the same algorithm should be used consistently across the URP framework (i.e., states

[61] See Technical Support Document (TSD) Revised Recommendations for Visibility Progress Tracking Metrics for the Regional Haze Program, in Docket EPA-HQ-OAR-2016-0289 at *www.regulations.gov*.

[62] Note to reviewers of this draft guidance document: For clarity for purposes of comment and for ease in finalization, this draft version of this guidance document is written as if the revisions proposed in May 2016 have been finalized as proposed. If the final revisions to the Regional Haze Rule differ from this assumption, corresponding changes will be made in the final guidance document.

should use the same approach to determine baseline visibility conditions and current visibility conditions for the 20 percent most impaired days).

5.15. Can states continue to use the first-implementation period approach for selecting the haziest days as the most impaired days?

States may choose to include the first-implementation period approach that uses the haziest days as the most impaired days *in addition to* the new approach, but *not instead* of the new approach.[63] Consistent with the revised Regional Haze Rule, the EPA will evaluate a state's RPG and URP determinations based on the anthropogenic impairment approach. If states choose to also include the results of a "worst visibility days" approach for selecting the most impaired days for informational purposes, then such states will also have the choice of whether or not to project a second, supplemental RPG for the most impaired days based on the approach of using the 20 percent of days with the highest levels of overall haze. Such states will also have the choice of whether and how to treat the additional RPG in the subsequent progress report. For example, a state may choose to project the additional RPG for the 20 percent of days with the highest levels of overall haze, but include it in the SIP only for informational purposes (i.e., it would not be used in the 2025 progress report for purposes of determining whether the SIP is adequate to achieve the RPGs in the SIP).

5.16. Calculation of actual progress and difference between current and natural visibility conditions

Regional Haze Rule provisions

> 51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:
>
> (iv) Progress to date for the most impaired and clearest days. Actual progress made towards natural conditions since the baseline period, and actual progress made during the previous implementation period up to and including to the period for calculating current visibility conditions, for the most impaired and clearest days, must be calculated. (v) Difference between current visibility conditions and natural visibility conditions. The number of deciviews by which current visibility conditions exceed natural visibility conditions, for the most impaired and clearest days, must be calculated.

Actual progress made on the most impaired and clearest days toward natural visibility conditions since the baseline period

For SIPs for the second implementation period, the actual progress made on the most impaired days is calculated as the difference between the 5-year average of annual visibility conditions for the 20 percent most impaired days in 2000-2004 and the 5-year average of annual visibility conditions on these days for the most recent 5-year period of available data. The same applies for

[63] Note to reviewers of this draft guidance document: The EPA has proposed in the alternative in the recent rule revisions NPRM to either require states to use a new approach for choosing the 20 percent most impaired visibility days or to allow each state to choose between the original (20 percent "worst" visibility days) and the new approach. For simplicity, this draft has been written as if all states are required to use the new approach. When finalized, the guidance will be written to be consistent with the final rule revisions.

actual progress on the clearest days. *See* section 5.8 for discussion of the most recent period of available data.

Actual progress made on the most impaired and clearest days toward natural visibility conditions in the previous implementation period

For SIPs for the second implementation period, these parameters should be determined by taking the difference between the referenced visibility conditions for 2000-2004 (the start of the previous implementation period) and either (1) 2014-2018 (the end of the previous implementation period) or (2) the most recent period of available data if this period does not include 2018 as of the time the state prepares this part of its SIP.

5.17. How is the URP calculated and the URP line (or glidepath) drawn for each Class I area?

Regional Haze Rule provisions

> 51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:
>
> (vi) Uniform rate of progress. (A) The uniform rate of progress needed to attain natural visibility conditions by the end of 2064 for each mandatory Class I Federal area in the State must be calculated. To calculate this uniform rate of progress, the State must compare baseline visibility conditions to natural visibility conditions in the mandatory Class I Federal area and determine the uniform rate of visibility improvement (measured in deciviews of improvement per year) that would need to be maintained during each implementation period in order to attain natural visibility conditions by the end of 2064.

States must analyze and determine the URP needed to attain natural visibility conditions by the year 2064. The URP has units of deciviews per year or deciviews per decade. This rate of progress is commonly called the URP line or glidepath between the baseline conditions and 2064. The URP line has a slope equal to the URP. It is part of the analytic framework for the development of the LTS to achieve reasonable progress towards the goal of natural visibility conditions. *See* section 4.6.

The URP is calculated and the URP line is drawn for the most impaired days only. While states may estimate impairment for each day using an approach other than that recommended in this guidance, the revised Regional Haze Rule requires states to then select the 20 percent most impaired days. Additionally, the revised Regional Haze Rule clarified that the URP begins with the baseline period of 2000-2004 for all implementation periods. More specifically, the URP line is drawn starting from the value of 2000-2004 visibility conditions, with that value assumed to be associated with the specific date of December 31, 2004, and extends downward to reach the value of natural visibility conditions, with that value assumed to be associated with

December 31, 2064. For purposes of comparison to the URP line, the RPG is assumed to be associated with December 31 of the last year of an implementation period.[64]

It is possible that the IMPROVE program has revised some of its data from 2000-2004 subsequent to a state having submitted its first implementation period SIP; therefore, a state should recalculate the value of the 2000-2004 baseline visibility condition (or use an updated value provided by the EPA or the IMPROVE program) to ensure a consistent starting point for development of the URP, even apart from the change from focusing on the 20 percent haziest days to focusing on the 20 percent most impaired days. *See* section 5.9.

5.18. What are the results and implications of using the recommended methods to select the most impaired days?

The EPA has executed the recommended methods for every Class I area using IMPROVE data from 2000 to 2014 and has compared the results to the results using the approach nearly all states followed in the first implementation period. The companion TSD to this guidance document contains these detailed results for each Class I area, so results for only four example Class I areas will be presented here, along with maps showing results nationwide. Figure 5.3 shows results nationwide based on using the 20 percent worst visibility days; Figure 5.4 shows similar results but using the 20 percent most impaired days. The maps are colored by the deciview difference between the 2010-2014 5-year average and the URP in 2014; blue colors indicate Class I areas below the URP (which is differently determined in the two approaches).

For the Mesa Verde National Park Class I area, for example, the high deciview values in 2003 shown in Figure 5.3 were likely the result of the influence of wildfire. We used the new recommended approach to selecting the most impaired days shown in Figure 5.4. As a comparison of Figures 5.3 and 5.4 demonstrates, the level of visibility impairment in 2003 (and other years) on the 20 percent most impaired days is substantially less than for the twenty percent worst visibility days. In both cases, however, the most recent 5-year average of visibility conditions is below the URP line (by approximately 0.55 deciview when using the most impaired days and by approximately 1.3 deciview when using the worst visibility days). The largest percentage differences for other Class I areas (not displayed here but available in the TSD) occur in the intermountain west and in many cases also are the result of the influence of wildfire. More areas in the intermountain west are found to be "on or below the glidepath" as of 2010-2014 with the new recommended approach than with the approach used in the first implementation period. Differences for Class I areas in the eastern U.S., which is less subject to large wildfires, are minor in comparison and do not change the fact that these areas are "below the glidepath."

[64] The EPA's guidance for the first implementation period was not as explicit about associating the baseline visibility conditions, natural visibility conditions and the RPG with any particular date. The specifics given in this explanation were incorporated into the Regional Haze Rule as part of the 2016 revisions.

Figure 5.3. National map of differences between 2010-2014 5-year averages and the URP in 2014 based on the 20 percent worst visibility days (the approach used in the first implementation period). Blue colors indicate sites with recent visibility data below the URP.

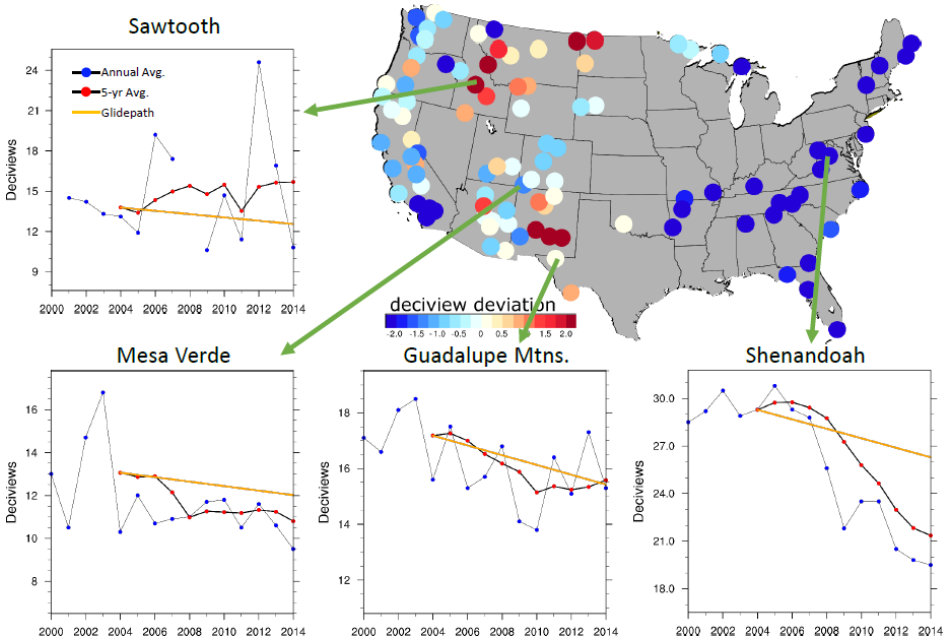
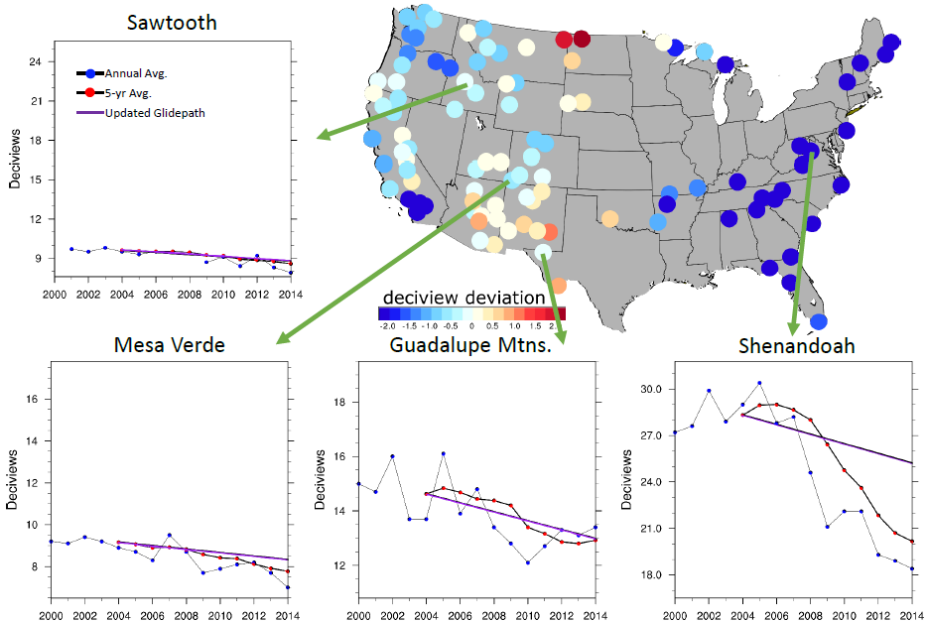


Figure 5.4. National map of differences between 2010-2014 5-year averages and the URP in 2014 based on the 20 percent most impaired days (the recommended approach for the second implementation period). Blue colors indicate sites with recent visibility data below the URP.



5.19. How can states account for international impacts in the URP framework?

Regional Haze Rule provisions

> 51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:
>
> (vi) Uniform rate of progress. (B) The State may submit a request to the Administrator seeking an adjustment to the uniform rate of progress for a mandatory Class I Federal area to account for impacts from (1) anthropogenic sources outside the United States and/or (2) wildland prescribed fires that were conducted under a multi-year land or resource management plan for a wildland area that has a stated objective to establish, restore, or maintain sustainable and resilient wildland ecosystems or to preserve endangered or threatened species through a program of prescribed fire and that provides for the use of appropriate basic smoke management practices. To calculate the proposed adjustment, the State must add the estimated impacts to natural visibility conditions and compare the resulting value to baseline visibility conditions. If the Administrator determines that the State has estimated the impacts from anthropogenic sources outside the United States or wildland prescribed fires using scientifically valid data and methods, the Administrator may approve the proposed adjustment to the uniform rate of progress for use in the State's implementation plan.

The EPA is aware of states' concern that visibility at certain Class I areas is impacted not only by natural and domestic anthropogenic emissions, but also by uncontrollable factors such as the transport of international emissions. The EPA expects that the revised approach to selecting days for purposes of defining RPGs and tracking progress, which focuses progress tracking on days not affected by large episodic natural events such as dust storms and wildfires, will also largely resolve issues stemming from the same types of natural emission sources in other countries.

However, the EPA does not believe it is appropriate to treat international anthropogenic impacts as "natural; thus, estimates of visibility on the 20 percent most impaired days will include these impacts. Given that it is appropriate for values for natural visibility conditions to not reflect international anthropogenic impacts yet international anthropogenic impacts will be reflected in "current conditions" and the 2028 RPGs, states have expressed concern that these international anthropogenic impacts may affect their SIP development, and may result in an impression on the part of some commenters that their SIPs do not show satisfactory progress towards natural visibility conditions.

The Regional Haze Rule acknowledges that international impacts should not require states to adopt more controls on their own sources in order to obtain EPA approval of their SIPs.[65] Further, because even if international impacts were the "but for" cause of the 2028 RPG being above the URP line and thus were to trigger the requirement for an additional demonstration (*see* section 10.3), the existence of international impacts does not change the considerations for

[65] The preamble to the 1999 Regional Haze Rule stated, "The EPA does not expect States to restrict emissions from domestic sources to offset the impacts of international transport of pollution." 64 FR 35736, July 1, 1999.

whether a particular additional measure for a particular source is reasonable and thus is necessary to make reasonable progress.

International impacts may affect a state's SIP element by influencing the slope of the URP line for a Class I area. The URP calculated according to the terms of the Regional Haze Rule, i.e., the downward slope of the line from baseline to natural visibility conditions, may be larger in value as a result of international impacts affecting the 2000-2004 starting point but not the 2064 end point. Whatever impacts were occurring in 2000-2004 due to anthropogenic sources outside the U.S. were included in the PM species concentrations measured by the IMPROVE program. In contrast, the NC-II estimates of natural conditions, and estimates of natural conditions that will be developed following the recommendations in this guidance document, will not reflect such impacts. The more strongly downward sloping URP line may make it more difficult for the state to develop an LTS that results in a 2028 RPG that is on or below the URP line. If international impacts make a "but for" difference in whether the RPG is above the URP line, this would result in an obligation for the state with the Class I area and any contributing state to conduct additional analyses to show that no further domestic controls are reasonable.

To avoid this additional burden on states, the revised Regional Haze Rule includes a provision that allows the Administrator to approve an adjustment to the URP to reflect the impacts of these causes of visibility impairment, if the adjustment has been developed through scientifically valid data and methods. The adjustment would be done by adding to the value of natural visibility conditions the estimate of the impact of one or both of these source types, only for the purposes of calculating the URP. The specific type of wildland fires that could be included in this adjustments are fires that were conducted with the objective to establish, restore and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied. Only an RPG that is above the adjusted URP would then trigger the requirement for the additional demonstration that there are no additional controls that would be reasonable to include in the state's LTS. This adjusted framework should also be helpful to the states when communicating with the public. *See* 40 CFR 51.308(f)(1)(vi)(B).

The requirement that states' proposed approaches be based on scientifically validated data and methods may be more easily achieved for impacts from sources in Mexico and Canada near the U.S. border than for more distant sources such as those across the Pacific Ocean. For sources in Mexico and Canada, modeling approaches are well established and can be applied once robust emission inventory information for anthropogenic sources is available. For more distant sources, there are issues concerning the appropriate modeling approach and model validation.

The revised Regional Haze Rule does not specify the method for estimating international impacts or the timeframe for which international impacts should be estimated. For the second implementation period, states proposing to adjust their URPs should consult with the EPA on how they will identify these particular impacts before they submit a request for approval of an approach to adjust the URP.

5.20. How can impacts from prescribed fire be accounted for in the URP framework?

Regional Haze Rule provisions

> 51.308(f)(1) Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress. For each mandatory Class I Federal area located within the State, the State must determine the following:
>
> (vi) Uniform rate of progress. (B) The State may submit a request to the Administrator seeking an adjustment to the uniform rate of progress for a mandatory Class I Federal area to account for impacts from (1) anthropogenic sources outside the United States and/or (2) wildland prescribed fires that were conducted under a multi-year land or resource management plan for a wildland area that has a stated objective to establish, restore, or maintain sustainable and resilient wildland ecosystems or to preserve endangered or threatened species through a program of prescribed fire and that provides for the use of appropriate basic smoke management practices. To calculate the proposed adjustment, the State must add the estimated impacts to natural visibility conditions and compare the resulting value to baseline visibility conditions. If the Administrator determines that the State has estimated the impacts from anthropogenic sources outside the United States or wildland prescribed fires using scientifically valid data and methods, the Administrator may approve the proposed adjustment to the uniform rate of progress for use in the State's implementation plan.

Generally, we do not expect the total acreage subject to prescribed fires on wildlands to decrease in the future because prescribed fire is needed for ecosystem health and to reduce the risk of catastrophic wildfires.[66] Thus, the occurrence of prescribed fire generally will not be projected to decline towards zero by 2064, nor to decline over any one implementation period at the proportional rate inherently assumed in the URP line. In fact, in many areas there may be reason to adopt policies that facilitate, and accordingly to forecast for purposes of setting the RPG, more use of prescribed fire and thus higher contributions to impairment on the 20 percent most impaired days. At this time, we do not know whether or where such a projected trend may affect whether the RPG for a Class I area will be above the URP line. However, we expect that if this is an issue, western Class I areas would be the more likely to be affected.

Section 51.308(f)(1)(vi) of the Regional Haze Rule allows states with Class I areas significantly impacted by emissions from wildland prescribed fires to make an adjustment to the URP with specific approval by the Administrator. The adjustment would consist of adding to the value of natural visibility conditions an estimate of wildland prescribed fire impacts, only for the purpose of calculating the URP and only for prescribed fires that were conducted with the objective to establish, restore and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied. FLMs prepare multi-year land and/or resource management plans for the areas they manage that document the objective of prescribed fire for a land area. We would also consider a fire management plan for state, tribal or private lands that has been reviewed and certified by the appropriate fire and/or resource management professionals and agreed to and followed by the land owner/manager to be sufficient to meet this restriction on the scope of the adjustment to the URP.[67] Other evidence of

[66] See the discussion of climate change effects on wildfire trends in the preamble to the proposed revisions of the Exceptional Events Rule. 80 FR 72866-72871, November 20, 2015.

[67] Examples of these plans include federal land or resource management plans, State Forest Action Plans, fire management plans, prescribed fire on wildland management plans or landscape management plans.

the objective of a prescribed fire would be considered on a case-by-case basis. This adjustment will be permitted only if such prescribed fire impacts have been estimated with methods and data that are scientifically valid.

The revised Regional Haze Rule does not specify the method for estimating prescribed fire impacts or the timeframe for which impacts from the specified types of prescribed fire should be estimated. For the second implementation period, states proposing to adjust their URPs should consult with the EPA on how they will identify these particular impacts before they submit a request for approval of an approach to adjust the URP.

6. Screening of sources (Step 2)

Regional Haze Rule provisions

> 51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.* Each State must submit a long-term strategy that addresses regional haze visibility impairment, and if necessary any reasonably attributable visibility impairment certified by the Federal Land Manager under §51.302(a), for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to achieve reasonable progress, as determined pursuant to (f)(2)(i) through (vi). In establishing its long-term strategy for regional haze, the State must meet the following requirements:
>
> (i) The State must consider and analyze emission reduction measures based on the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected major or minor stationary source or group of sources. The State must document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy.
>
> * * *
>
> (v) The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy and the criteria used to select the sources considered. The State should consider major and minor stationary sources, mobile sources, and area sources.

Section 4.1 explains the function of a screening analysis and why the EPA believes that states may use a screening step to select sources or groups of sources for a four-factor analysis. In the recommended approach and the second alternative approach to considering visibility, a state would use a screening step. In the first alternative approach, there would be no screening step and all sources would be subject to a four-factor analysis.

6.1. How should a state determine which Class I areas need to be considered when screening sources?

A state must develop an LTS that includes control measures necessary to make reasonable progress at each of its own Class I areas and each Class I area outside the state that may be affected by emissions from the state. In other words, a state's sources and its own Class I areas are automatically linked. States must also link their sources with Class I areas in other states that those sources may affect.

A variety of technical, quantitative approaches exist to assess which Class I areas are affected by emissions from a given state. These approaches include, but are not limited to, emissions divided by distance, emissions-weighted back trajectory analyses and the use of photochemical transport models to track the contribution of specific sources or areas to specific Class I areas. Section 6.2 discusses these approaches in more detail. We also recommend that a state compare its linkages for the purpose of developing its LTS for the second implementation period with the contribution

linkages it acknowledged in its SIP for the first implementation period, and specifically explain why any previous linkage has been dropped.

Once contributions by sources, groups of sources or geographic areas have been quantified in some manner, the EPA recommends that states adopt a conservative (more protective approach of visibility) approach to determining whether their sources may affect visibility at out-of-state Class I areas. For example, states could consider all Class I areas for which the state contributes at least one percent to anthropogenic light extinction from all U.S. sources on any day within the 20 percent most impaired days. States may choose a different threshold to determine which out-of-state Class I areas may be affected by the States sources, but must provide an adequate explanation of why the threshold is sufficiently protective of visibility.

6.2. How should a state estimate visibility impacts for screening purposes?

The role of estimates of visibility impact

This section assumes that a state will use an air quality model to develop estimates of the visibility impacts of individual sources or groups of sources. With this assumption in mind, this section offers recommendations on developing these visibility impact estimates, while section 6.3 offers recommendations on applying these estimates in a screening process that compares the estimates to a threshold. However, the Regional Haze Rule does not require states to use an air quality model to develop estimates of visibility impacts. Many, but not all, of the concepts and recommendations in sections 6.2 and 6.3 can be applied to a screening analysis based on surrogate metrics.

Applying these recommendations to estimate visibility benefits

Estimates of the visibility benefits of possible control measures for particular sources are not relevant to the screening step. However, a state following the second alternative approach described in section 4.2 will need to estimate the visibility benefits of possible control measures. The visibility benefit of applying an emission control measure is the difference between the source's visibility impact without that measure and the source's visibility impact with the measure in place. While the recommendations in this section are primarily directed at estimating source *impacts* on visibility using an air quality model, except where noted these recommendations are also relevant to the estimation of visibility *benefits* from additional emission control measures. Depending on the quality of a particular surrogate for visibility impact, it may or may not be appropriate to treat the difference in the value of the surrogate metric (without versus with an additional control) as a useful estimate of the visibility benefit of the controls, for the purpose of weighing visibility benefits along with the four statutory factors in the second alternative approach.

Should current or 2028 emission limits be used to estimate baseline emissions and visibility impacts for screening purposes?

At the time of SIP development and submission, there may be enforceable emission limits that have not yet affected source emissions, but that will affect source emissions before 2028. This raises the question of whether baseline[68] emissions used in screening should be based on the

[68] "Baseline" here refers to the source conditions assumed to be the starting point for the analysis of additional measures based on the four statutory factors and possibly visibility benefits.

emission limits that apply at the time of SIP submission or the emission limits that will apply in 2028. The EPA generally recommends that if source-specific modeling of visibility impacts is performed for screening purposes, it should be based on projected 2028 baseline emissions assuming source compliance with emission limits that have been adopted and are enforceable.

The screening process may recognize current levels of emission control that are not enforceable

In projecting future baseline emissions, typical past actual emission rates may be assumed even if lower than permitted emission rates, assuming there is no evident basis for assuming a change in emission rates.[69]

Should the recent/current or a predicted 2028 level of source operation be used to estimate visibility impacts for screening purposes?

Reasonable activity growth rates should be applied to area source categories, in which sources are not individually represented in the emissions inventory. Available information on the future levels of operation of individually inventoried sources should also be incorporated.

Generally, the assumed level of future operation for any type of source should not be less than a recent period of actual operation that can reasonably be taken as representative of future operation, unless there is strong reason to expect a reduction. Uncertain predictions of market-driven changes in source operation or predictions of voluntary emission reductions should not result in a source being excluded for full analysis if it would otherwise qualify for full analysis.

A state should explicitly identify any sources not selected in the screening step because of enforceable future operating limitations, including enforceable shutdowns, and explain the applicable future requirement and the enforcement mechanism for that requirement. As for newly adopted emission limits, we recommend that operating restrictions (that are not requirements for shutdown) that are being incorporated into the EPA-approved SIP for the first time via the regional haze SIP revision should not be applied when estimating source impacts for screening purposes unless those operating restrictions are effective by July 31, 2021.

States may but are not required to use the EPA projections of future emissions, e.g., IPM-based projections of source-specific EGU emissions, from a national rulemaking analysis. An IPM-based projection that an EGU will cease operation is not a sufficient basis for a state to assume such shutdown when developing its LTS. The EPA projections for national rulemaking analysis will also include projections for other major and minor stationary sources and area source types, but these projections vary in the level of their sophistication and the actual data supporting them; states may be able to make better projections for these source types. A state's use of estimates previously used by or provided by the EPA does not ensure SIP approval in that regard, as any contrary information in the record will bear on the EPA's decision.

[69] However, if the source is retained through the screening step and the current (or a better) level of emission control is determined to be necessary to make reasonable progress, which generally should be the case unless there is an unusual reason to conclude that continued performance at that level cannot be reasonably required, an emission limit should be set based on that level of emission control.

Daily emissions

The temporal pattern of emissions during the year, not just annual total emissions, is important in the consideration of modeling-based estimations of visibility impacts and benefits. When available, states should use historical information on emissions patterns to inform the creation of seasonal and diurnal emission patterns for purposes of air quality modeling. States should divide annual emissions by 365 days per year and 24 hours per day only if no better information is available. Unlike for BART analyses, states do not need to assume that maximum daily emissions recur every day.

Models and methods for estimating visibility impacts

The Regional Haze Rule does not require states to use air quality modeling with source apportionment to identify which sources or source categories should be subject to a four-factor analysis, but modeling can be very useful to identify which geographic areas, individual sources or source sectors, and pollutants are most responsible for impairment at a given Class I area. The EPA recommends that states or multi-state organizations planning to conduct source contribution modeling make their study plan for the modeling available (before beginning the modeling) for review by the EPA.

Air quality models can be used to estimate source's contributions to primary and secondary $PM_{2.5}$ using source apportionment and source sensitivity approaches.[70] These techniques allow for source differentiation by country, state or county boundaries,[71] broad source sectors,[72] and even specific facilities.[73] Regional photochemical grid models can also be used to estimate the contribution of lateral boundary chemical inflow of speciated $PM_{2.5}$ using both reactive and unreactive tracers.[74] Source-based apportionment approaches implemented in air quality models can be limited by deficiencies in model inputs (e.g., emissions or meteorology) and formulation

[70] Cohan, D.S., Napelenok, S.L., 2011. Air quality response modeling for decision support. Atmosphere 2, 407-425.

[71] U.S. Environmental Protection Agency, 2005. Technical Support Document for the Final Clean Air Interstate Rule Air Quality Modeling. *http://archive.epa.gov/airmarkets/programs/cair/web/pdf/finaltech02.pdf*, Research Triangle Park, North Carolina; U.S. Environmental Protection Agency, 2011; Air Quality Modeling Final Rule Technical Support Document. *http://www3.epa.gov/airtransport/CSAPR/pdfs/AQModeling.pdf*, Research Triangle Park, North Carolina.

[72] Fann, N., Fulcher, C.M., Baker, K., 2013. The Recent and Future Health Burden of Air Pollution Apportioned Across US Sectors. Environmental Science & Technology 47, 3580-3589.

[73] Baker, K.R., Kelly, J.T., 2014. Single source impacts estimated with photochemical model source sensitivity and apportionment approaches. Atmospheric Environment 96, 266-274; Bergin, M.S., Russell, A.G., Odman, M.T., Cohan, D.S., Chameldes, W.L., 2008. Single-Source Impact Analysis Using Three-Dimensional Air Quality Models. Journal of the Air & Waste Management Association 58, 1351-1359; Zhou, W., Cohan, D.S., Pinder, R.W., Neuman, J.A., Holloway, J.S., Peischl, J., Ryerson, T.B., Nowak, J.B., Flocke, F., Zheng, W.G., 2012. Observation and modeling of the evolution of Texas power plant plumes. Atmospheric Chemistry and Physics 12, 455-468.

[74] Baker, K.R., Emery, C., Dolwick, P., Yarwood, G., 2015. Photochemical grid model estimates of lateral boundary contributions to ozone and particulate matter across the continental United States. Atmospheric Environment 123, 49-62; Dolwick, P., Akhtar, F., Baker, K.R., Possiel, N., Simon, H., Tonnesen, G., 2015. Comparison of background ozone estimates over the western United States based on two separate methodologies. Atmospheric Environment 109, 282-296.

(e.g., chemistry and deposition) approaches.[75] In some situations where primary PM is most important, other types of air quality models, such as Gaussian dispersion (e.g., AERMOD) models may provide useful information. And where demonstrated appropriate, other types of chemical transport models that treat gas and aerosol chemistry (e.g., SCICHEM) may be an option for screening analysis.

Chemical transformations can play an important role in defining the concentrations and properties of certain air pollutants such as PM and haze. Where this is a factor, it is thus important that models used for screening and to assess visibility benefits take into account chemical reactions and physical processes of various pollutants (including precursors) in determining the current state of air quality, as well as predicting and projecting the future evolution of these pollutants. It is important that a modeling system provide a realistic representation of chemical and physical processes leading to secondary pollutant formation and removal from the atmosphere. Chemical transport models treat atmospheric chemical and physical processes such as deposition and motion. There are two types of chemical transport models, Eulerian (grid based) and Lagrangian. These types of models differ in their frame of reference. Eulerian models are based on a fixed frame of reference, and Lagrangian models use a frame of reference that moves with parcels of air between the source and receptor point.[76]

Some Lagrangian models treat in-plume gas and particulate chemistry. These models require time and space varying oxidant concentrations, and in the case of $PM_{2.5}$ also neutralizing agents such as ammonia, as important secondary impacts happen when plume edges start to interact with the surrounding chemical environment.[77] These oxidant and neutralizing agents are not routinely measured, but can be generated with a three dimensional photochemical grid model. Photochemical grid models are three-dimensional Eulerian grid-based models that treat chemical and physical processes in each grid cell and use diffusion and transport processes to move

[75] Kwok, R., Baker, K., Napelenok, S., Tonnesen, G., 2015. Photochemical grid model implementation of VOC, NO x, and O 3 source apportionment. Geoscientific Model Development 8, 99-114; Kelly, J.T., Baker, K.R., Napelenok, S.L., Roselle, S.J., 2015. Examining single-source secondary impacts estimated from brute-force, decoupled direct method, and advanced plume treatment approaches. Atmospheric Environment 111, 10-19.
[76] McMurry, P.H., Shepherd, M.F., Vickery, J.S., 2004. Particulate matter science for policy makers: A NARSTO assessment. Cambridge University Press.
[77] Baker, K.R., Kelly, J.T., 2014. Single source impacts estimated with photochemical model source sensitivity and apportionment approaches. Atmospheric Environment, 96: 266-274; ENVIRON, 2012. Evaluation of Chemical Dispersion Models using Atmospheric Plume Measurements from Field Experiments. ENVIRON International, Corp., Novato, CA. Prepared under contract No. EP-D-07-102 for U.S. Environmental Protection Agency, Research Triangle Park, NC. *https://www3.epa.gov/ttn/scram/reports/Plume_Eval_Final_Sep_2012v5.pdf.*

chemical species between grid cells.[78] These types of models are appropriate for assessment of near-field and regional scale reactive pollutant impacts from specific sources[79] or all sources.[80]

Even though single source emissions are injected into a grid volume, photochemical grid models have been shown to adequately capture single source impacts when compared with downwind in-plume measurements.[81] Where set up appropriately for the purposes of assessing the contribution of single sources or groups of sources to primary and secondarily formed pollutants, photochemical grid models could be used with a variety of approaches to estimate these impacts. These approaches generally fall into the category of source sensitivity (how air quality changes due to changes in emissions) and source apportionment (what air quality impacts are related to certain emissions). Source apportionment has been used to differentiate the contribution from single sources on model predicted ozone and $PM_{2.5}$.[82] The direct decoupled method has also been used to estimate O_3 and $PM_{2.5}$ impacts from specific sources as well as the simpler brute-force sensitivity approach.[83] Limited comparison of single source impacts between models and approaches to differentiate single source impacts[84] show generally similar downwind spatial gradients and impacts.

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[78] McMurry, P.H., Shepherd, M.F., Vickery, J.S., 2004. Particulate matter science for policy makers: A NARSTO assessment. Cambridge University Press. Available at http://narsto.org/pm_science_assessment.

[79] Baker, K.R., Foley, K.M., 2011. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM2.5. Atmospheric Environment, 45: 3758-3767; Baker, K.R., Kelly, J.T., 2014. Single source impacts estimated with photochemical model source sensitivity and apportionment approaches. Atmospheric Environment, 96: 266-274; Bergin, M.S., Russell, A.G., Odman, M.T., Cohan, D.S., Chameldes, W.L., 2008. Single-Source Impact Analysis Using Three-Dimensional Air Quality Models. Journal of the Air & Waste Management Association, 58: 1351-1359; Zhou, W., Cohan, D.S., Pinder, R.W., Neuman, J.A., Holloway, J.S., Peischl, J., Ryerson, T.B., Nowak, J.B., Flocke, F., Zheng, W.G., 2012. Observation and modeling of the evolution of Texas power plant plumes. Atmospheric Chemistry and Physics, 12: 455-468.

[80] Chen, J., Lu, J., Avise, J.C., DaMassa, J.A., Kleeman, M.J., Kaduwela, A.P., 2014. Seasonal modeling of PM 2.5 in California's San Joaquin Valley. Atmospheric Environment, 92: 182-190; Russell, A.G., 2008. EPA Supersites program-related emissions-based particulate matter modeling: initial applications and advances. Journal of the Air & Waste Management Association, 58: 289-302; Tesche, T., Morris, R., Tonnesen, G., McNally, D., Boylan, J., Brewer, P., 2006. CMAQ/CAMx annual 2002 performance evaluation over the eastern US. Atmospheric Environment, 40: 4906-4919.

[81] Baker, K.R., Kelly, J.T., 2014. Single source impacts estimated with photochemical model source sensitivity and apportionment approaches. Atmospheric Environment, 96: 266-274; Zhou, W., Cohan, D.S., Pinder, R.W., Neuman, J.A., Holloway, J.S., Peischl, J., Ryerson, T.B., Nowak, J.B., Flocke, F., Zheng, W.G., 2012. Observation and modeling of the evolution of Texas power plant plumes. Atmospheric Chemistry and Physics, 12: 455-468.

[82] Baker, K.R., Kelly, J.T., 2014. Single source impacts estimated with photochemical model source sensitivity and apportionment approaches. Atmospheric Environment, 96: 266-274; Baker, K.R., Foley, K.M., 2011. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM 2.5. Atmospheric Environment, 45: 3758-3767.

[83] Baker, K.R., Kelly, J.T., 2014. Single source impacts estimated with photochemical model source sensitivity and apportionment approaches. Atmospheric Environment, 96: 266-274; Bergin, M.S., Russell, A.G., Odman, M.T., Cohan, D.S., Chameldes, W.L., 2008. Single-Source Impact Analysis Using Three-Dimensional Air Quality Models. Journal of the Air & Waste Management Association, 58: 1351-1359; Zhou, W., Cohan, D.S., Pinder, R.W., Neuman, J.A., Holloway, J.S., Peischl, J., Ryerson, T.B., Nowak, J.B., Flocke, F., Zheng, W.G., 2012. Observation and modeling of the evolution of Texas power plant plumes. Atmospheric Chemistry and Physics, 12: 455-468.

[84] Baker, K.R., Kelly, J.T., 2014. Single source impacts estimated with photochemical model source sensitivity and apportionment approaches. Atmospheric Environment, 96: 266-274; Baker, K.R., Kelly, J.T., Fox, T., 2013.

The Regional Haze Rule does not prescribe or recommend any particular air quality model or modeling approach for estimating visibility impacts or benefits for purposes of determining what measures are necessary to make reasonable progress. In 2015, the EPA proposed revisions to 40 CFR Part 51 Appendix W, Guideline on Air Quality Models.[85] As part of this proposal, the EPA has proposed that photochemical grid models should be the generally preferred approach for estimating source impacts on secondary PM concentrations. Photochemical grid models include all emissions sources and have realistic representations of formation, transport, and removal processes of the PM that causes visibility degradation. We recommend states consult with their EPA regional office to determine the appropriate use of an air quality model for the purpose of evaluating source-specific or source group-specific visibility impacts, consistent with existing EPA technical guidance.

Development of the requisite meteorological and emissions databases that are necessary to use photochemical grid models to estimate visibility impacts should conform to recommendations on those specific topics in the 2015 proposed revisions to the Guideline on Air Quality Modeling (40 CFR part 51 appendix W) and the recommendations outlined in the EPA's Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze ("Modeling Guidance").[86]

The Modeling Guidance also outlines a procedure where model estimates at Class I areas projected for the future year scenario, defined by the meteorological and emissions inputs, are used to develop Class I area-specific relative response factors. The estimated relative response factor for each PM species is multiplied by the corresponding historical concentration metric for that species to project future year PM conditions and thus visibility. This relative response factor approach has been part of the EPA's guidance for many years and is familiar to state air quality modelers. The new development is in the selection and grouping of days prior to the calculation of the relative response factors. In the first implementation period, the 20 percent haziest days and the 20 percent clearest days (using those terms as meant in this document) were grouped and averaged. In the second implementation period, the relative response factors will be averaged over the 20 percent most impaired days and 20 percent clearest days to generate relative response factors for these sets of days, consistent with the 2016 revision of the Regional Haze Rule and the recommendations in section 5.[87]

Estimating second pollutant impacts from single sources (control #27). *http://aqmodels.awma.org/conference-proceedings*.

[85] 80 FR 45340, July 29, 2015.

[86] The most recent finalized version of this "SIP Modeling Guidance" was issued in 2007. *See https://www3.epa.gov/ttn/scram/guidance/guide/final-03-pm-rh-guidance.pdf*. A draft of a revised version of the SIP Modeling Guidance was made available for public comment in 2014. The 2014 revisions concerned section of the document relevant to ozone and $PM_{2.5}$ SIPs. *See https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf*. The SIP Modeling Guidance will be issued as a new final version shortly. On the specific topics of meteorology and emissions inputs, we expect that new version to be stable for an extended period. After this new guidance on the Regional Haze SIPs is finalized, the EPA expects to seek public comment on a further revision of the SIP Modeling Guidance, to make it consistent with this guidance.

[87] The EPA expects to seek public comment on a further revision of the SIP Modeling Guidance with respect to other aspects of a complete modeling analysis, including this selection of days aspect, to make it fully consistent with this guidance document on Regional Haze SIPs.

States can demonstrate the adequacy of air quality modeling fields through appropriate diagnostic and statistical performance evaluations consistent with recommendations provided in the Modeling Guidance. If there are doubts about whether an element of the Modeling Guidance is applicable to the development of a regional haze SIP in the second implementation period, a state should consult with its EPA regional office.

Though the Modeling Guidance focuses on the process for calculating RPGs based on the aggregate effect of emission controls for diverse sources, the same relative reduction approach can be used to determine the improvement in visibility as a result of emission controls at a specific source or for a source sector. This information would not be relevant at the screening step, but could be used subsequently by a state following the second alternative approach. One approach to estimating such visibility benefits would be to run two emission scenarios through the complete modeling process, and take the difference. Another approach would be to make a single source apportionment modeling run. The latter would involve several post-processing steps. First, the modeled contribution estimates to each PM species in the IMPROVE light extinction equation for the particular source or source sector of interest should be subtracted from the total contribution estimated from all sources in the future year baseline to create an "alternative scenario" that is simply the projected future year visibility without the source(s) of interest. Second, relative response factors should be estimated for each PM species that comprises the constituents in the IMPROVE light extinction equation using the "alternative scenario" as the numerator and future year scenario with all sources as the denominator consistent with procedures detailed in the Modeling Guidance for purposes of calculating RPGs. Third, these relative response factors should be applied to estimate the portion of projected future year visibility contributed by the source(s) tracked for source attribution. The difference between the scenario with all emissions sources and the "alternative scenario" represent the contribution from the source(s) of interest. This difference in visibility attributed to the source(s) of interest should then be compared to natural background estimates.

Selecting days for estimating and considering visibility impacts

Variations in the operation of sources, transport/dispersion influences (e.g., wind direction and atmospheric stability), and photochemistry typically combine to change the visibility impact from a source (and the benefit of an emission control measure) on different days of the year, in some cases with a strong seasonal pattern.[88] As explained in section 5, the URP framework focuses on baseline, current, natural and projected future visibility conditions on the 20 percent most impaired days in each year. Therefore, the EPA recommends that states focus on estimating and considering source impacts on the 20 percent most impaired days when conducting their screening analyses. Sections 4.3 and 6.2 discuss this topic in more detail.[89]

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[88] Variations in emission control performance from day-to-day or across a year may also be a factor contributing to variability in the benefit of an emission control.

[89] The following information is provided as background, to avoid possible confusion about how this recommendation relates to analysis of visibility impacts (and benefits) in the first implementation period. In the first implementation period, analysis of whether a BART-eligible source was subject to BART was based on assessing the 98th percentile daily visibility impact assuming maximum historical daily emissions from the source, which may or may not have occurred on one of the 20 percent haziest days. This approach was also used in some cases to

Considering source impacts on the 20 percent most impaired days will focus attention on improving visibility on the days that currently are furthest from having natural visibility conditions. The EPA also recommends that a state following the second alternative approach consider the whole of the distribution of the individual visibility benefits on the 20 percent most impaired days, specifically including both the maximum benefit and other values at the high end of this distribution, in addition to the average benefit across each of this set of days. People may visit a Class I area only for one day, and the highest daily impacts and benefits will affect some visitors. Measures adopted because they are judged necessary to make reasonable progress and prevention of degradation on these days will have benefits on other days of the year also.

While the Regional Haze Rule does not require states to generate information on visibility impacts or benefits on days other than the 20 percent most impaired days, states may nonetheless choose to do so. Such information may also become available during the SIP development process. In these cases, states should consider visibility impacts and benefits on days outside the 20 percent most impaired days if they are significant and would affect the state's decision making.

A state or multi-state organization may also present in its SIP the median light extinction impact from a source or group of sources, or the impact on an annual average basis. This information may help identify sources or groups of sources with unusual contribution patterns and help public understanding of how contributions by sources and groups of sectors to visibility impairment vary with meteorological and other conditions.

Use of a "clean" background when assessing source-specific visibility impacts

Importantly, states must consider source impacts (and, for states following the second alternative approach, the potential visibility benefits of additional measures) on the 20 percent most impaired days relative to a light extinction level that represents a clean/natural background, rather than the visibility conditions existing at the time a SIP revision is developed.[90]

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consider the expected visibility impact and potential benefits of individual reasonable progress sources, as well as to evaluate whether an alternative to BART provided "greater reasonable progress" towards natural visibility conditions than would implementation of source-specific BART. The CALPUFF model was used for this purpose. In other cases, a comparison of benefits on the 20 percent haziest and 20 percent clearest days was the basis for determining whether an alternative to BART provided greater reasonable progress, under section 51.308(e)(3).A photochemical grid model was used for this purpose. While CALPUFF was considered adequate for predicting a source's largest potential impacts in a Class I area during a year, it was not recognized as being able to predict concentration impacts on particular days. Therefore, the EPA and state could not have drawn conclusions from CALPUFF modeling about impacts on days within the set of the 20 percent most impaired days.

[90] This approach to the treatment of background air quality when quantifying source impacts (and potential benefits from additional measures) is different than the approach to background air quality when projecting how all emission reductions measures combined will affect visibility conditions at the end of the implementation period for purposes of setting the RPGs. In the first implementation period, some stakeholders argued that is appropriate to consider only the amount by which a potential measure or combination of measures would change the projected overall deciview index value as of the end of the implementation period, i.e., the degree by which the RPGs would differ with and without the controls being included in the LTS. We do not agree. The RPGs are values that will be compared in a progress report to actual visibility conditions, and of course accordingly must represent the expected actual overall visibility conditions. In contrast, estimates of source impacts and measure benefits have a different purpose, which is to help guide decisions on the control of individual sources.

The logic of considering visibility impacts and benefits relative to clean/natural conditions was articulated, in the context of BART, in the preamble to the final rule that established the BART Guidelines:

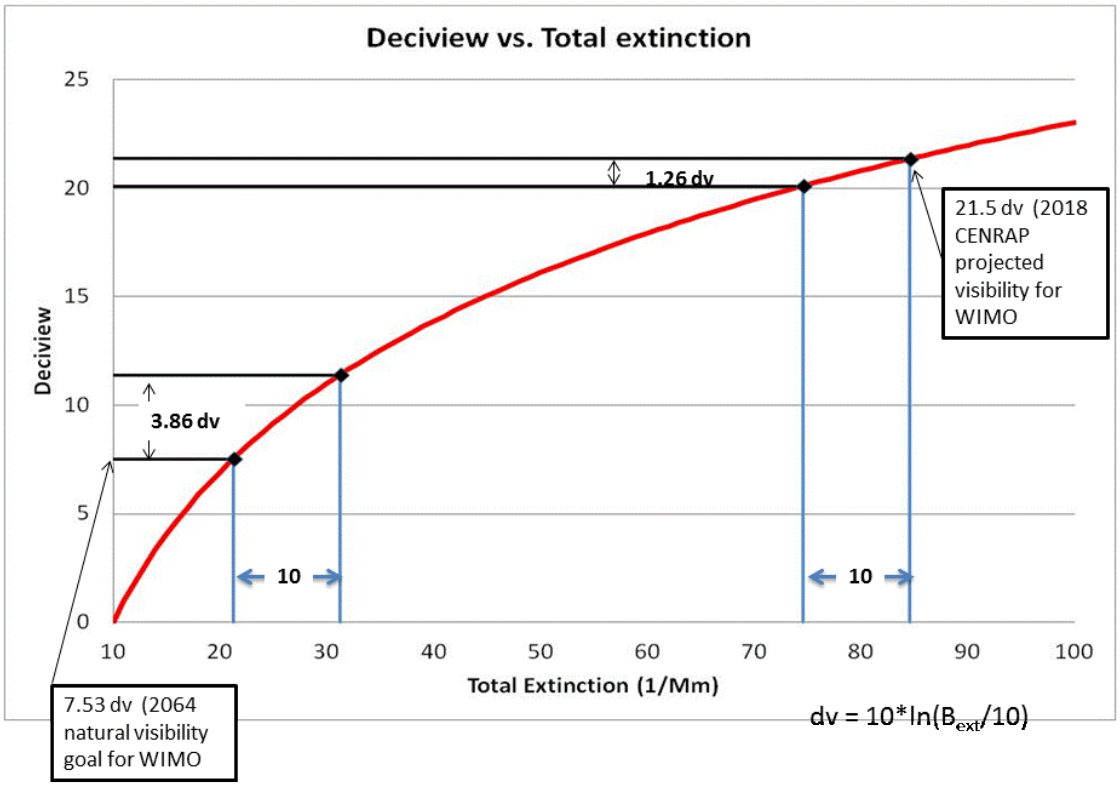
> Using existing conditions as the baseline for single source visibility impact determinations would create the following paradox: the dirtier the existing air, the less likely it would be that any control is required. This is true because of the nonlinear nature of visibility impairment. In other words, as a Class I area becomes more polluted, any individual source's contribution to changes in impairment becomes geometrically less. Therefore the more polluted the Class I area would become, the less control would seem to be needed from an individual source. … Such a reading would render the visibility provisions meaningless, as EPA and the States would be prevented from assuring "reasonable progress" and fulfilling the statutorily-defined goals of the visibility program. Conversely, measuring improvement against clean conditions would ensure reasonable progress toward those clean conditions. 70 FR 39124, July 6, 2005.

The same logic applies to the evaluation of visibility impacts and benefits of non-BART sources. Accordingly, the EPA has used clean background conditions in evaluating the benefits of controls on individual reasonable progress sources and has disapproved reasonable progress decisions by states that relied on modeling employing dirty background conditions.[91] This approach has been upheld by the Eighth Circuit.[92]

Because of the logarithmic deciview scale, the use of natural background conditions will result in higher values for "delta deciview" impacts on visibility from sources than otherwise. This result is illustrated in Figure 6.1. The figure shows that an increment in light extinction of 10 Mm^{-1} causes a deciview scale increment of only 1.26 when the light extinction increment is assumed to be "on top of" an extinction level of 75 Mm^{-1} from other sources. However, if the same light extinction increment is assumed to be "on top of" the natural light extinction value for this example Class I area, the deciview scale increment or "delta deciview" is 3.86.

[91] The EPA has followed this logic in the North Dakota (77 FR 20894, April 6, 2012), Montana (77 FR 57864, September 18, 2012), Arizona (79 FR 52420, September 3, 2014), and Texas (81 FR 296, January 5, 2016) FIPs and partial disapprovals of North Dakota (77 FR 20894, April 6, 2012) and Texas (81 FR 296, January 5, 2016) SIPs.
[92] *North Dakota v. EPA*, 730 F.3d 750, 764-766 (8th Cir. 2013). ("Although the State was free to employ its own visibility model and to consider visibility improvement in its reasonable progress determinations, it was not free to do so in a manner that was inconsistent with the CAA. Because the goal of § 169A is to attain natural visibility conditions in mandatory Class I Federal areas, *see* 42 U.S.C. § 7491(a)(1), and EPA has demonstrated that the visibility model used by the State would serve instead to maintain current degraded conditions, we cannot say that EPA acted in a manner that was arbitrary, capricious, or an abuse of discretion by disapproving the State's reasonable progress determination based upon its cumulative source visibility modeling.")

Figure 6.1. Illustration of the different "delta deciview" values, depending on whether projected conditions or natural background conditions are used as the starting point. ("WIMO" means the Wichita Mountains Class I area. "Mm" means megameters.)



Natural visibility conditions vary from day to day, and the condition on a particular day or group of days can be estimated in the manner recommended in section 5 or in some other way justified by a state. If PM species impacts by a source have been estimated to allow each estimate of daily impacts to be associated with a particular day of IMPROVE data, this allows the option of using a day-specific estimate of natural PM species concentrations to develop the corresponding value of natural visibility condition to use as the background value for calculating the visibility impact in deciviews. In other cases, it may only be possible to use the estimate of natural visibility conditions across the 20 percent most impaired days as the background for impacts on those days. It is also acceptable to use the estimate of annual average natural visibility conditions as the background for estimating all daily values of source impact. As a simple and conservative approach, the EPA recommends that the background PM species concentrations should be assumed to be equal to the value of annual average natural visibility conditions.

The visibility benefit of a potential additional emission control measure is the difference between the baseline visibility impact in deciviews and the reduced visibility impact assuming that the additional measure is in place. This means that estimates of visibility benefits will also be influenced by this approach to using natural background conditions.

If a state also quantifies and presents visibility impacts and benefits in deciview units based on an assumption of current conditions as background, the state should clearly state that this

information is presented only for context and that it is not the basis for its decisions on what measures are necessary to make reasonable progress.[93]

Aggregation of sources during the screening step

A state may aggregate sources and show that even the aggregate visibility impact (or benefit) is below an appropriate screening threshold, such that none of the sources needs to be selected for full analysis. This is a logical application of conservative screening.

Continued relevance of the BART Guidelines

Many of the statements in the BART Guidelines continue to be relevant as recommendations for how a state should assess facts related to visibility impacts and visibility benefits. Appendix D indicates which parts of the BART Guidelines continue to be relevant in this way.

Contrasting the above recommendations to typical visibility analysis for the purpose of BART

The following paragraphs provide more detail on how states typically conducted BART and individual reasonable progress source assessments during the first planning period, and on how the details of those assessments differ from an approach using a chemical transport model and the recommendations in this guidance. This information is presented to provide clarity for air agencies so that they do not approach the development of regional haze SIPs based on impressions and expectations formed in the first implementation period that will not carry over to the second implementation period.

Single-source air quality modeling for BART assessments during the first implementation period was typically done using the CALPUFF modeling system, using maximum emission rates (24-hr maximum mass emission rates during the baseline period) and consideration of the maximum or near-maximum modeled visibility impact from the source. [94]

Effect of the air quality model: The 2005 BART Guidelines established the appropriateness of CALPUFF for the purposes of BART analysis.[95] (States and the EPA also used CALPUFF for

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[93] The EPA presented this type of information in the TSD for the reasonable progress FIP for Texas, but only for transparency in how we had derived the estimates of visibility benefits relative to the natural conditions background. Our decisions on what measures are necessary to make reasonable progress were not based on an assumption of current conditions as background.

[94] The BART Guidelines allowed the use of the 98th percentile modeled impact rather than the highest modeled impact in light of uncertainty regarding the accuracy of the very highest modeled impacts in a year. Thus, the highest modeled impacts were not typically compared directly to visibility thresholds, recognizing some uncertainty exists in the modeling system and abnormal meteorology may result in an unusually high source contribution.70 FR 39121 and 39124. Note, however, that in some cases in which a state's modeling did not adhere to the BART Guideline with respect to the meteorology inputs for CALPUFF modeling, we approved the use of the maximum modeled impact instead of the 98th percentile impact as a compensating adjustment.

[95] In the BART Guidelines, the EPA addressed the question of how states could best predict a single source's contribution to visibility impairment. At the time, the EPA recognized that CALPUFF had not yet been fully evaluated for secondary pollutant formation, but the EPA still considered CALPUFF to be the best application for assessing a single source's impact on visibility in a Class I area for purposes of the regional haze program. The EPA took note of the limitations of CALPUFF for this purpose but concluded that CALPUFF was the best modeling application for use in evaluating BART, especially given how the modeling results would be used. Based on this assessment, the EPA recommended that the states use CALPUFF. The EPA also made clear, however, that states could use other alternative approaches, including photochemical grid models, if done in consultation with the appropriate EPA regional office. *See* 70 FR 39104, 39122-23 (July 6, 2005).

evaluating visibility impacts and potential control benefits for individual reasonable progress sources during the first implementation period.) In 2015, the EPA proposed revisions to 40 CFR Part 51 Appendix W, Guideline on Air Quality Models. As part of this proposal, the EPA proposed that photochemical grid models should be the generally preferred approach for estimating source impacts on secondary PM concentrations. Photochemical grid models include all emissions sources and include representations of formation, transport, and removal processes of the PM that causes visibility degradation. Therefore, if a state chooses to conduct single source modeling for the purpose of evaluating source-specific or source group-specific visibility impacts or benefits from emissions controls for reasonable progress and LTS development, the state should utilize photochemical grid models (with appropriate post-processing to apply natural visibility conditions as the background for assessing deciview impacts, to estimate potential future year visibility benefits from controls).

Single source impacts estimated for reasonable progress assessments using photochemical grid modeling and single source impacts estimated for prior BART and reasonable progress assessments using CALPUFF will be different due to fundamental differences between photochemical grid models and puff dispersion models such as CALPUFF. Photochemical grid models include all emissions sources and provide a dynamic chemical and physical environment to estimate source emission impacts. The CALPUFF model uses fixed uniform concentrations of important oxidants such as ozone and neutralizing agents such as ammonia and does not perform key thermodynamic transformations that can strongly influence atmospheric residence time and thus transport.[96] CALPUFF's representation of these important chemical species and $PM_{2.5}$ chemistry will result in different estimated source impacts than a photochemical grid model even if the exact same source emissions and release characteristics are used in both modeling systems. Additionally, Lagrangian puff models such as CALPUFF allow the project source full access to oxidants (e.g., ozone) and neutralizing agents (e.g., ammonia) while the same source in a photochemical model competes for oxidants and neutralizing agents, which may result in different and possibly lower modeled impacts.

Because of these differences in modeling approach, states should expect that many of the estimates of daily visibility impacts within the set of the 20 percent most impaired days using the photochemical modeling approach will be smaller than the single value of visibility impact from a CALPUFF modeling assessment.

Effect of differences in the approach to emissions inputs: To whatever extent realistic estimates of daily emissions are used to estimate visibility impacts for a screening analysis (see *Daily Emissions*, above), some of the estimates of daily visibility impacts will be lower than the estimates derived in a BART analysis, all other factors being the same. The degree of difference will depend on each source's temporal pattern of emissions. However, it is also possible that the estimate of the maximum 24-hour impact derived from a reasonable progress analysis done according to the recommendations in this document will be close to the estimate that would be derived with a BART-like approach.

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[96] Karamchandani, P., Chen, S.-Y., Seigneur, C., 2008. CALPUFF Chemistry Upgrade. Prepared for American Petroleum Institute, 1220 L Street NW, Washington, DC 20005. Document CP277-07-01; Karamchandani, P., Lohman, K., Seigneur, C., 2009. Using a sub-grid modeling approach to simulate the transport and fate of toxic air pollutants. Environmental Fluid Mechanics, 9: 59-71.

Effect of the selection of day or days: BART determinations are intended to provide information about the high end of the distribution of impacts and potential benefits for a single facility at Class I areas, to supplement other relevant emissions control information. In a BART analysis, states typically evaluated the 98th percentile visibility impact (which will be the 8th highest modeled estimate when 365 days are modeled) at Class I areas from each year modeled to provide a single-value estimate of source impacts.[97] This estimate of source impact was often used to determine whether a BART-eligible source was also subject to BART. The difference between 98th percentile impacts with and without a potential additional control was typically used as the metric for consideration of visibility benefits, which was a statutory factor for BART. A similar approach was also used in some cases to evaluate visibility impacts of individual reasonable progress sources during the first implementation period.

In the second implementation period, we recommend in this guidance document that the highest daily visibility impact among the 20 percent most impaired days, as well as the average source impact across this set of days multiplied by a constant value, be used for purposes of screening sources and groups of sources to select those that will be subject to four-factor analysis.[98] For a state following the second alternative approach, we recommend that in the four-factor analysis, the whole of the distribution of the individual visibility benefits on the 20 percent most impaired days, specifically including the maximum benefit among these days be weighed along with the four statutory factors.

In summary, a BART determination or a single source reasonable progress determination using CALPUFF is based on a "high end" single-source impact scenario, while a reasonable progress assessment using a photochemical grid model is intended to provide projections of the whole of the distribution of future visibility impacts during two sets of days, or an entire year. The differences in the types of models, the inputs to the models and the focus on particular days mean that the single visibility impact (or benefit) result from a BART determination (or any similar modeling using CALPUFF) will differ from, and should not be directly compared to, the maximum visibility impact or any other particular point on the distribution (or the average) of estimated visibility impacts (or benefits) on the 20 percent most impaired days from a reasonable progress analysis that uses a photochemical grid model and follows the recommendations in this guidance document. Reasonable progress analysis results that have been based on the recommendations in this guidance will likely be lower in magnitude than visibility impact results from BART determinations in the first planning period. These different visibility impact results, which result from a combination of different inputs, models and visibility metrics, do not conflict with BART determinations from the first planning period.

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[97] As previously noted, however, in some cases in which a state's modeling did not adhere to the BART Guideline with respect to the meteorology inputs for CALPUFF modeling, we approved the use of the maximum modeled impact instead of the 98th percentile impact as a compensating adjustment.

[98] Note to reviewers of this draft guidance document: See a footnote in section 4.3 inviting comment on the subject of using the average impact across the 20 percent most impaired days multiplied by a constant value.

6.3. How should a state select sources for four-factor analysis based on visibility impacts?

Screening based on PM species contributions to anthropogenic light extinction

It is possible using the methods recommended in section 5 of this guidance to develop an extinction budget specifically for anthropogenic impairment at a Class I area for each day based on IMPROVE data, and to then calculate an average anthropogenic "extinction budget" for the 20 percent most impaired days.[99] Typically, the state with a Class I area should take the lead on developing the extinction budget for the Class I area (if a multistate organization or a federal agency has not already provided this information), but the implications of the budget apply to all states with sources that contribute to impairment at the area. If a PM species makes only a small absolute and relative contribution to overall anthropogenic light extinction at a Class I area on each of the 20 percent most impaired days, and if there is no reason for concern about degradation on the 20 percent most impaired or 20 percent clearest days due to future increases in that PM species, in general each contributing state may justify screening out sources of that PM species and its precursors for purposes of reasonable progress at that Class I area for the second implementation period. However, a contributing state should retain such a PM species in its screening step if a there are only a small number of sources responsible for the PM species and some of those sources are in-state, because each of those sources could be making a contribution to impairment that is comparable to the contributions of the more numerous sources of other PM species. The EPA recommends that states not exclude PM species representing more than 10 percent of current anthropogenic light extinction at the Class I area on the 20 percent most impaired days, and that excluded PM species should not total more than 20 percent of current anthropogenic light extinction.

As noted, the state should make its screening decision based on the absolute light extinction and the percentage contribution to *anthropogenic* light extinction on these days, rather than on the contribution to overall light extinction. For example, while OMC accounts for a high fraction of light extinction at many western Class I areas on the days with the worst *overall* haze, it may not account for a high fraction of light extinction on the most impaired days.

The size of the light extinction contribution from an ambient PM species should be compared to estimated natural visibility conditions (in light extinction units of Mm^{-1}) as well as to overall current anthropogenic light extinction. For example, if current anthropogenic light extinction is dominated by sulfate with a relatively small percentage due to nitrate, but current anthropogenic nitrate concentrations are nevertheless sizable compared to natural conditions, this indicates that natural conditions cannot be reached or approached without nitrate reductions.

IMPROVE data can be used directly to develop an extinction budget only for historical period. When IMPROVE data and photochemical models are combined, it may be possible to construct light extinction budgets that have a 2028 perspective, and apply these same concepts using those rather than the extinction budgets based on past IMPROVE data.

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[99] The EPA recognizes that for some Class I areas there is considerable uncertainty regarding the portion of some PM species that is due to anthropogenic sources. Accordingly, it may be appropriate to consider the weight of evidence bearing on this issue, rather than only the estimate of the anthropogenic portion of the PM species that results from the calculation steps described in section 5 of this guidance.

The remainder of this section applies to sources of PM species that have not been eliminated from further consideration.

Selecting a screening threshold level for air quality impacts

A state may define a visibility impact level to serve as a threshold below which no further analysis of additional control measures will be undertaken in its first analysis of sources and measures required for reasonable progress.[100] At the screening step, we recommend that states using a visibility-impact threshold compare the selected threshold to both (1) the maximum source impact within the 20 percent most impaired days and (2) the average source impact across this set of days multiplied by a constant value.[101] If either metric exceeds the state's chosen visibility-impact threshold, then the state should bring forward the source for a full four-factor analysis. This will ensure that states analyze those sources that have relatively large impacts on at least one of the 20 percent most impaired days, as well as those sources with more chronic impacts on such days.

Regardless of how it has selected its screening threshold for visibility impacts, the state should demonstrate that its threshold, in combination with other aspects of its screening approach, results in the screening process selecting for full analysis and decision a combination of major stationary sources, minor stationary sources and minor/area stationary source categories that collectively account for a reasonably large fraction of all the in-state major, minor and area stationary source emissions contributing to any PM species that is a significant portion of the anthropogenic extinction budget. To show that this coverage has been achieved, a state could first determine the aggregate light extinction impact of all in-state stationary sources averaged over the 20 percent most impaired days,[102] for example through source apportionment modeling, and then compare the sum of the impacts from the sources being brought forward from the screening process to this aggregate impact. Alternatively, a state could assess the individual impact of each source or group of sources in the state, and compare the sum of the impacts of the sources being brought forward from screening to the sum of the impacts from the sources not being brought forward. This demonstration process should be repeated from the perspective of each Class I area to which sources in the state are linked. The EPA considers 80 percent to be a reasonably large fraction for this purpose in the second planning period. If an approach does not reach this 80 percent inclusion level, the threshold for major stationary sources, minor stationary sources and/or categories of area stationary sources should be reassessed for reasonableness.[103] A more refined approach to demonstrating that a state's screening threshold has brought forward a

[100] A second analysis of sources and measures will be required if the initially determined RPG for the most impaired days is above the URP line. *See* section 10.

[101] Note to reviewers of this draft guidance document: See a footnote in section 4.3 inviting comment on the subject of using the average impact across the 20 percent most impaired days multiplied by a constant value.

[102] This aggregate impact of in-state sources will be a portion of the overall extinction budget at the given Class I area.

[103] This recommendation based on 80 percent of the aggregate light extinction impacts may not be fully applicable when Q/d is used as a surrogate for visibility impacts. Mechanically, it is possible to compare the sum of the individual Q/d values for the "above threshold sources" to the sum of the Q/d values for all in-state sources, but this may not give a good indicator of what fraction of in-state light extinction impacts are attributable to the first set of sources. A state planning on relying on Q/d, or another surrogate, for screening purposes should consult with its EPA regional office about the specifics of its planned screening approach.

reasonably inclusive set of sources is to count in the "capture" assessment only sources that in 2028 will not already have the most effective control technology under other enforceable requirements. In this refined approach, there would be a sharper focus on the sources with potential for visibility benefits.

We recommend that the threshold for visibility impact from a source or group of sources be quantified in units of deciviews (based on a background of natural visibility conditions as described in section 6.2). However, a state may instead use units of light extinction. A state may also use a threshold based on a percentage of current aggregate anthropogenic light extinction from all sources or all in-state sources, or a percentage of the aggregate deciview impacts from all sources or all in-state sources, rather than an absolute light extinction or deciview threshold.

The EPA recommends, with one exception, that major stationary sources be compared to a threshold individually, but that minor sources of a similar type be grouped.[104] The exception is that for sources that are clustered geographically near a Class I area, all sources including major sources should be grouped and aggregated. In discussing with their Regional office which sources to group and aggregate, states should consider factors such as relative proximity of the sources, distance to the nearest Class I areas and whether emissions from such sources are likely to comingle before impacting the nearest Class I area. The EPA recommends that sources that have been aggregated under the general recommendation or the exception should be screened by comparing their combined visibility impact to the threshold developed for individual major sources of the same type, or a lower threshold if needed to reach a sufficient degree of inclusiveness. For example, combustion engines that drive pumps and compressors that are minor sources should be aggregated and their impact compared to a threshold no higher than the one that a state uses for larger individual sources in the same industrial category. Where there is a basis for separating categories of minor or area sources into geographic subgroups with clearly different visibility impacts, a state may do so. This may be the case in states with large dimensions such that sources differ markedly in their distance to relevant Class I areas, or states with complex transport patterns.

The EPA recommends that a state treat units at one facility in the aggregate.[105] Because there may be numerous small sources that are aggregated with the primary emission units when a state follows this recommendation, we believe it would be reasonable for a state to choose to not bring forward from the screening process every unit or piece of emitting equipment at a facility whose total visibility impact is above the selected screening threshold, provided that the units that are

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[104] If a threshold for visibility impacts, or for a surrogate for visibility impacts, is applied to individual minor sources, the threshold selected should be low enough to be consistent with the principle that the overall screening approach should select for full analysis and decision sources and/or source categories that can reasonably be concluded to collectively account for a reasonably large fraction of all the in-state emissions contributing to visibility impairment. Thus, any threshold value needs to be chosen with consideration of how many individual sources will be tested against it. If there are many sources with small impacts that add up to a "significant" impact, the threshold should not be so high that each small source is screened out.

[105] If instead of following this recommendation a state "breaks up" facilities into their separate units for screening purposes, the individual units may "screen out" while some of the facilities treated as a whole would not. If this causes the number of sources that are brought forth for four-factor analysis to be less than necessary to account for a reasonably large fraction of all the in-state stationary source emissions contributing to any PM species that is a significant portion of the anthropogenic extinction budget, the screening threshold should be reduced and the process repeated.

brought forward account for 80 percent of the visibility impairment from the facility as a whole, with respect to each affected Class I area.

If a state is following the recommended approach and will not be estimating and considering visibility benefits along with the four factors, it should demonstrate in its SIP that its screening threshold has brought forward a reasonably large and prioritized set of sources for four-factor analysis, in the context of the series of five remaining required periodic SIP revisions. The state should not select screening thresholds that would exclude sources from four-factor analysis on the basis that the visibility benefits are outweighed by the cost of compliance.

If the state intends to follow the second alternative approach described in section 4.2, a screening threshold that "captures" an even higher percentage of aggregate source impacts is appropriate. The four-factor analysis will consider whether an additional measures for a source that has relatively small baseline impacts also has a relatively low compliance cost. Sources that have low baseline impacts because they are physically small or have low (but steady) throughput are likely to have relatively low costs of compliance in dollar terms. Therefore, a state taking the second alternative approach should retain sources with relatively small baseline impacts in order to consider whether additional measures for these sources are necessary to make reasonable progress, when their possibly small visibility impact is considered along with their possibly small cost of compliance.

Any threshold justified by comparison to thresholds used by states or the EPA in the past, or by comparison to visibility benefits from emission control measures that were or were not incorporated into other SIPs or FIPs, needs to take into consideration differences in the modeling approaches and metrics used to quantify baseline visibility impacts or visibility benefits (Lagrangian versus photochemical grid modeling, for example, and differences in the selection of days). Also, a state should consider that in the second and successive planning periods, achieving reasonable progress logically should involve examination of sources making smaller individual impacts than in the first implementation period.

A state should not carry into the second implementation period pre-conceptions formed in the first implementation period regarding what level of estimated visibility impact is cause for concern and action. The BART guidelines allowed states to use a deciview value of 0.5 for visibility impacts (specifically, the 98th percentile impacts predicted by the CALPUFF air quality model) as the upper limit for a state-selected threshold for subject-to-BART, and most states used this value. However, there is no similar provision the Regional Haze Rule with respect to reasonable progress requirements, and this value should not be used as a screening threshold for reasonable progress purposes. The EPA expects that visibility impacts and available benefits from many individual sources estimated with the methods and metrics recommended in this guidance will be notably lower than 0.5 deciview, yet additional control of some of those will be necessary to make reasonable progress.[106] *See* "*Contrast to visibility analysis for the purpose of*

[106] For example, the EPA analysis for the Texas FIP used photochemical modeling to estimate visibility benefits from the scrubber upgrades and retrofits on the 20 percent worst visibility days when compared to average natural visibility conditions, averaged across these days. At the most impacted Class I areas, the individual scrubber upgrades were estimated to improve visibility by 0.135 to 0.312 dv. The finalized scrubber retrofits were estimated to improve visibility, when compared to average natural visibility conditions, at the most impacted Class I areas by

BART" in section 6.2 for a detailed explanation of the differences between the approach to air quality modeling and decision making in the context of a BART assessment and the approach to the same steps in a reasonable progress assessment.

A state should not justify its screening threshold based on it being the limit of what is humanly perceptible. Progress towards natural visibility conditions will require the accumulation of reductions in air pollution and associated light extinction that may not be individually perceptible.

Visibility impacts at multiple affected Class I areas

Air quality modeling will typically produce estimates of a source's impacts at each affected Class I area. Using this information, a state should repeat the screening step from the perspective of each source-linked Class I area. That is, the impacts from sources at one Class I area should be compared to the screening threshold for that area to select the sources that will be subject to four-factor analysis, and this process repeated for other Class I areas. A source identified for four-factor analysis based on the screening from the perspective of any of the Class I areas should be brought forth from the screening step.

If impacts at different areas are estimated using different approaches or if different thresholds are used for different Class I areas, this should be clearly explained in the presentation of the results, including the state's rationale for using different approaches or thresholds.

A state may also consider the suite of visibility impacts from one source across affected Class I areas as a supplement to considering the individual Class I area-specific impacts in this repetitive way. This may lead a state to bring forward a source that causes relatively small impacts on multiple Class I areas. The suite of visibility impacts may be summarized and considered by summing the individual impacts. However, (1) it is not necessarily appropriate to compare such a sum to the same threshold used in the area-by-area screening process, and (2) the state should explain to readers of the SIP that the sum of the deciview impacts across multiple Class I areas cannot be properly compared to any benchmark for whether a visibility effect is perceptible to people.[107]

0.087-0.438 dv. *See* the right-most columns of Tables A.6-2 a-c of the technical support document for this action (docket item EPA-R06-OAR-2014-0754-0007 at *http://www.regulations.gov*). Note that this guidance document recommends consideration of the both the average benefit across the 20 percent most impaired days and the maximum benefit among these days, which are both different from the specific metric that Is the basis for the values quoted here. The quoted values are the average visibility benefits across the 20 percent haziest days. The maximum benefits among these days were about three times higher.

[107] In the preamble to the 1997 proposal for the Regional Haze Rule, the EPA stated: "Due to the broad variety of scenic, atmospheric, and lighting conditions at the mandatory Class I Federal areas across the country, at any specific time a given area may contain vistas for which slightly more or less than one deciview above background conditions represents a perceptible impact for the components of the scene. For example, a view of a snow-capped mountain may be more sensitive to changes in air quality than a view of a forest with the result that less than a 1.0 deciview change is perceptible for that portion of the scene. Conversely, in another scene a deciview change slightly greater than 1.0 may not be perceptible." 62 FR 41148. The preamble to the 2005 BART Guidelines final rule included a more extensive discussion of the perceptibility of deciview increments, and that final rule established 0.5 deciview as the upper limit on any threshold a state may establish for purposes of determining that a BART-eligible

BART-eligible sources should be considered for selection

States should treat BART-eligible sources the same as other reasonable progress sources going forward. States undertook the BART determination process during the first implementation period. The BART requirement was a one-time requirement. Although the BART process is not repeated in subsequent implementation periods, states must include BART-eligible sources in the screening process and subsequent steps, as part of the requirement to provide for reasonable progress as described later. The potential re-assessment of BART-eligible sources under reasonable progress has always been a requirement of the Regional Haze Rule.[108] As a practical matter, the BART process sometimes resulted in minor or no controls on sources, and while this does not necessarily mean that BART-eligible sources will need to install additional controls for purposes of reasonable progress, it makes sense to re-assess these sources.

Screening based on an emissions-divided-by-distance (Q/d) threshold

A state may use annual emissions in tons divided by distance in kilometers between a source and the nearest Class I area, or Q/d, as a surrogate for baseline visibility impact, with appropriate recognition that this metric is only a rough indicator of actual visibility impact because it does not consider transport direction/pathway and dispersion and photochemical processes. Before relying on Q/d as a surrogate for screening purposes, a state should investigate how well Q/d relates to visibility impacts for the 20 percent most impaired and 20 percent clearest days, in terms of both the central tendency of the relationship (e.g., the regression line) and the variability of the relationship (e.g., the error of the regression). This understanding should be developed through relevant modeling of some actual cases or model plant scenarios, or another appropriate approach. This understanding is important because if Q/d is a poor surrogate for a particular set of sources and a Class I area, the results of the screening step may appear to, but not actually, bring forward for four-factor analysis a set of sources that actually accounts for a large majority of the in-state impairment at the Class I area. Even if widely accepted for its original purposes, any Q/d threshold that was used in the past for purposes of screening of sources in the first implementation period or for possible impacts on air quality related values should not be used in the screening step without more justification.

Thresholds may be defined on the basis of the sum or weighted sum of emissions of multiple pollutants if that approach is justified based on the contributions of those pollutants to current impairment and on how emissions of each pollutant differently translate to ambient impacts. Thresholds may also be pollutant-specific, with any pollutant able to cause a source to be selected for four-factor analysis.

When applying a screening step to a group of minor or area sources spread over a large geographic area, the state may consider the fact that a given quantity of emissions may have a

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sources is not subject to BART. 70 FR 39120. The important point for states to make clear in their SIPs, if they in any refer to a perceptibility benchmark, is that such benchmarks apply to perceptions of a single scenic vista. A deciview value that is the sum of deciview changes at multiple areas should not be compared to this range or to any single value within the range.

[108] 40 CFR 51.308(e)(5), promulgated in 1999 and not revised since then states that "After a State has met the requirements for BART or implemented emissions trading program or other alternative measure that achieves more reasonable progress than the installation and operation of BART, BART-eligible sources will be subject to the requirements of paragraph (d) of this section in the same manner as other sources."

smaller impact on a particular Class I area when distributed among such sources than when emitted by a hypothetical single point source located at the centroid of the group. On the other hand, the group of widely distributed sources may affect more Class I areas.

Screening analysis based on emissions combined with wind patterns

In the first implementation period, some states, through their RPOs, selected sources for four-factor analysis using an approach that gave each point source a score that took into account the source's emissions of a PM species or precursor, the daily values of PM species concentrations at a Class I area as measured by the IMPROVE monitoring site, the distance between the source and a Class I area and the relative frequency with which each source was linked to the IMPROVE monitoring site by a wind trajectory.[109] Large sources of pollutants contributing more to light extinction that are near the Class I area and frequently upwind of the Class I area got higher scores. The score was not in units of light extinction or deciviews. Even so, the EPA believes that this surrogate approach can be more informative than the Q/d approach. As recommended above for the Q/d metric, selection of a threshold for use with this sort of scoring system should be based on knowledge of how the scoring metric relates to visibility impacts for the 20 percent most impaired days, for example through relevant modeling of some actual cases or model plant scenarios.

6.4. What other factors may be considered when selecting sources for four-factor analysis?

Screening based on an existing requirement to use the most effective control technology

A source subject to a federally enforceable emission limit that effectively requires it to apply the most effective control technology for a given PM species or precursor may be screened out of further analysis for that pollutant. For such a source, a four-factor analysis is unnecessary because no additional measures are available for inclusion in the LTS. This concept is essentially the same as the abbreviated BART analysis option that was available for BART-eligible sources in the first implementation period. *See* section IV.D, Step 1, paragraph 9 of the BART Guidelines, which is reprinted in Appendix D.

The EPA also believes that in certain limited situations, in the second implementation period, it may be reasonable for a state to screen a source out of further consideration without determining that the emission control technology employed by a source is the most effective available. If an EGU has been modified (or newly constructed) with highly effective control technology within the 5 years prior to submission of the SIP, such as year-round operation of flue gas desulfurization (FGD) with an effectiveness of at least 90 percent or year-round operation of selective catalytic reduction with an effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), the state may choose to not bring the source forward from the screening step. Before doing so, however, the state should obtain and reference solid information documenting the current level of effectiveness of the existing emission control system, rather than relying only on its type or unsupported claims about its effectiveness. The SIP should explicitly list any sources that have

[109] VISTAS narrowed its focus to sulfate impacts prior to this step of its analysis, and consequently considered only the pattern of sulfate concentrations along with SO_2 emissions.

been removed from further consideration on this basis and document the technology employed and the regulatory requirement for that technology.[110]

Screening based on the four factors

Remaining useful life – If a source is certain to close by 2028 under an enforceable requirement, a state may consider that to be sufficient reason to remove the source from further analysis and reasonable progress consideration. This is a recommendation that applies to the second planning period, in light of the shorter-than-normal interval between the 2021 and 2028 SIP submission deadlines. As stated in section 8.10, it is acceptable for a state to "start the clock" on the reasonable time for compliance at the date of EPA approval of the SIP. When this delay, the reasonable time required to come into compliance and the 7.5-year interval from the SIP due date of July 31, 2021 to the end of the second implementation period on December 31, 2028, are considered, the time period in which additional controls could provide a visibility benefit prior to shutdown of the source would be limited compared to other implementation periods.

Cost of compliance – At the screening step, states are unlikely to have sufficient cost data (and visibility benefit information) for additional emission reduction measures to be able to conclude that there is no measure for the source that would be reasonable based on the four statutory factors alone (and reasonable based on weighing visibility benefits along with the four statutory factors, for a state following the second alternative approach). Therefore, we recommend that cost of compliance not be used as a factor in the screening step.

Time necessary for compliance – The time necessary for compliance should not be used for screening.

Energy impacts – States should generally monetize energy impacts and consider them as part of the cost factor during the four-factor analysis, so energy impacts should not be used as a separate screening factor.

Non-air impacts – Non-air impacts, if present, are likely to be complex and should be considered in the context of the other statutory factors and (if applicable) visibility benefits. States therefore should not use any threshold for non-air impacts in the screening step.

6.5. Special considerations for particular types of sources

Sources presenting special implementation challenges

A state may have a source category consisting of many small sources, such that inspections and enforcement on an ongoing basis may appear to be impracticable for technical reasons or would reasonably be expected to be beyond agency resources during the second implementation period. We note, however, that many states have successfully addressed some types of small sources, including wood-burning appliances and construction sites. A state should not screen out a source type that another state has demonstrated can be practicably regulated.

[110] Note to reviewers of this draft guidance document: The EPA requests comment on whether to include this additional screening mechanism and if so, then what criteria may be appropriate for its inclusion.

Sources not within state authority

A state does not need to perform a reasonable progress analysis for sources/controls over which the state does not have regulatory authority. For example, with respect to emission limits on new mobile sources prior to introduction into commerce, a state may not go beyond adopting California emission standards and may do that only under certain conditions specified in the CAA. If a state has sovereign authority to regulate a type of source, the SIP submission may not simply rely on the fact that no particular state agency has regulatory authority as its justification for not performing a four-factor analysis for a source.

A state agency submitting a SIP revision on behalf of a state may also not rely on the fact that its authorizing legislation prohibits it from adopting controls more stringent than required by federal law or regulation, as a reason for not considering whether additional measures for some sources are necessary to make reasonable progress.[111]

Under section 118 of the CAA, federal agencies must comply with all federal, state and interstate requirements related to the control and abatement of air pollution in the same manner and to the same extent, as any nongovernmental entity. Thus, federal agencies must follow state-imposed requirements related to the control and abatement of air pollution, including requirements related to visibility impairment within Class I areas, "in the same manner, and to the same extent as any nongovernmental entity." The following discussion of wildland fires, and sections 7.1 and 8.8, provide specific information about state obligations to consider programs and practices to address emissions from wildland fires that occur on federally managed (and other) lands.

Wildland fire

For ease of understanding for the reader, this section provides a comprehensive discussion of how the provisions of the Regional Haze Rule, and other considerations, shape the way a state should address fires in wildland in its SIP submission for the second implementation period, going beyond the single topic of screening and addressing both wildland wildfire and wildland prescribed fire. Later sections of this guidance document on topics other than screening refer to this discussion.

Fires on wildlands within the U.S. can significantly impact visibility in some Class I areas on some days and have lesser impacts on a greater number of days. Fires on wildland play an important ecological role across the globe, benefiting those plant and animal species that depend upon natural fires for propagation, habitat restoration and reproduction. Wildland can include forestland, shrubland, grassland and wetlands. Fires on wildland can be of two types: wildfire (unplanned) and prescribed fire (intentionally ignited for management purposes including ecosystem health and to reduce the risk of catastrophic wildfires). The EPA anticipates that wildfires will become more frequent on wildlands in the future due to the natural accumulation of fuels in the absence of fire, and due to climate change that is leading to increased incidence of

[111] The CAA requires states to adopt a LTS that includes emission limitation and such other measures as are necessary to achieve the national goal of remedying all anthropogenic visibility impairment although a state has discretion in deciding what controls are necessary for that purpose.

wildfire, which may necessitate land managers employing prescribed fire more frequently to manage fuel loads and achieve other benefits as described below.[112]

Wildfire emissions account for a large portion of direct $PM_{2.5}$ emissions nationally and can contribute to periodic high levels of $PM_{2.5}$ and PM_{10} levels that reduce visibility. Wildfires also emit volatile organic compounds and NOx, which are precursors to $PM_{2.5}$ and PM_{10}. Besides their effect on air quality, wildfires pose a direct threat to public safety. Changes in wildfire risk and occurrence are closely associated with the lack of periodic fire in fire-dependent ecosystems, demographic changes and associated infrastructure investment at the margins of wildland and, as already noted, climate change and climate variability. The threat from wildfires can be mitigated through management of wildland vegetation. Attempts to suppress wildfires have resulted in unintended consequences, especially the buildup of fuel loads, which can create a lingering fire liability that will eventually find resolution, unplanned or planned. Unplanned fires in areas with high fuel loads present high risks to both humans and ecosystems.

Because wildland wildfires are considered natural events, emissions from wildfires are natural emissions that contribute to natural reductions in visibility. Thus, the Regional Haze Rule does not obligate states to select wildland wildfires for four-factor analysis and to then consider whether measures to reduce emissions from such wildfires are necessary to make reasonable progress towards natural visibility conditions. Because a state is not required to consider measures to reduce the visibility impact of wildland wildfires, this document does not include any recommendations for how the four statutory factors could be applied when considering the use of prescribed fire to reduce impacts from wildfires. However, the EPA encourages states to consider that use of prescribed fire may reduce the incidence and severity of wildfires, and thereby improve the experience of Class I area visitors who visit during a day or a period in which visibility would otherwise be very adversely affected by a wildfire. In thinking about how prescribed fire can reduce emissions from wildfires, states may also consider how the use of prescribed fire can benefit ecosystem health, protect public health from the air quality impacts of catastrophic wildfires and protect against other risks from catastrophic wildfires. The Regional Haze Rule gives states the flexibility to provide and plan for the use of prescribed fire, with basic smoke management practices[113] applied, to an extent and in a manner that states believe appropriate. The EPA is committed to working with states, tribes, FLMs, other federal agencies and other stakeholders concerning the use of prescribed fire, as appropriate, to reduce the impact of wildland fire emissions on visibility.

With respect to wildland prescribed fire, as explained below the Regional Haze Rule does not specifically require regional haze SIPs to include measures to limit emissions from prescribed fire. By describing the paths that may result in a state not including such measures in its SIP, it is not our intention to in any way discourage federal, state, local or tribal agencies or private land owners from taking situation-appropriate steps to minimize emissions from prescribed fires on wildland, or other types of land. The EPA joins the FLMs in encouraging all land owners and managers to apply appropriate basic smoke management practices to reduce emissions from

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[112] An extensive discussion of the background on wildland fire concepts, including actions that the manager of a prescribed fire can take to reduce the amount of smoke generated by a prescribed fire and/or to reduce public exposure to the smoke that is generated (i.e., smoke management practices), was presented in the proposed revisions to the Exceptional Events rule (80 FR 72840, November 20, 2015).

[113] Basic smoke management practices are described in Section 7.1.

prescribed fires. The EPA understands that the FLMs apply these measures routinely and will be available to consult with other agencies and private parties interested in doing the same. It is recommended that states consult with DOI, the USDA Forest Service, the USDA Natural Resources Conservation Service and state forestry agencies when considering requirements for specific basic smoke management practices. These agencies and other stakeholders can assist in addressing applicability of the measures in specific ecosystems and situations.

With respect to prescribed fire, section 51.308(f)(2)(iv)(E) of the Regional Haze Rule requires all states to consider basic smoke management practices. Also, if there is an existing smoke management program in the state the same section requires the state to consider smoke management programs, whether or not the rules for the smoke management program have been incorporated into the EPA-approved SIP.[114] The options for a state to meet one or both of these requirements related to prescribed fire depend on whether prescribed fires have a significant visibility impact in and downwind of the state.

If in-state prescribed fires do not contribute significantly to visibility impairment on the 20 percent most impaired and 20 percent clearest days at every Class I area to which the state's sources contribute (some or all of which may be in another state), the state may meet one or both requirements, as applicable, simply by making this observation. The state should describe in its SIP narrative the facts and analysis on which it has reached this conclusion. This can be done, for example, by observing that there is very little in-state prescribed fire activity and/or observing that light extinction at the Class I area(s) in question due to elemental and organic carbon has had a level and pattern in recent years that is not consistent with a significant impact from biomass burning generally or from prescribed fire specifically. In this situation, there would be no need to subject prescribed fire to any further screening step or to consider measures to reduce emissions from prescribed fire considering the four statutory factors. While a state in this situation could nevertheless continue to consider or adopt measures to reduce emissions from in-state prescribed fires this may not be an efficient use of air agency resources.

If in-state prescribed fires do contribute significantly to visibility impairment at one or more Class I areas that are linked to the sources in a state, the state may select prescribed fire as a category for four-factor analysis, but even in this situation it is not required to do so because there is an alternate path to meeting the requirement to consider basic smoke management practices and (if applicable) smoke management programs. The EPA is not offering a recommendation on this point, as the situations among the states and Class I areas are too varied for a general recommendation. A state may consult with the EPA regional office about its particular situation and its choice between the two paths described below.

First path. If such a state with a level of prescribed fire that contributes significantly to visibility impairment at one or more Class I areas *does not select* prescribed fire as a category for four-factor analysis, the state must nevertheless show it has considered basic smoke management

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[114] We do not consider the term smoke management program for the purposes of §51.308(f)(2)(v)(E) to mean programs that include only seasonal restrictions on burning because of fire safety concerns, voluntary educational programs designed to raise air quality awareness of potential prescribed fire users, voluntary programs in which land managers agree to coordinate their prescribed fire activities but are free to withdraw from the program at any time or some combination of the above. The EPA does support these latter types of programs. We note that the determining factor is the existence of a smoke management program or programs, not whether the program or programs have been incorporated into the SIP as enforceable measures or described in the narrative portion of the SIP.

practices in some reasonable way. The EPA recommends that states with prescribed fire levels that cause significant visibility impacts due to promote or require appropriate basic smoke management practices to be applied during prescribed fires on wildland (and other types of land also). If a state does so, it can show that it has considered basic smoke management practices by explaining that basic smoke management practices are promoted by state actions or required by state law. The state can also show that it has considered basic smoke management practices by explaining why it does not promote or require basic smoke management practices. For example, the state might document that the large majority of prescribed fire managers already employ these practices.

In addition, if such a state does not select prescribed fire as a category for four-factor analysis but there is an existing smoke management program (in the SIP or not) the state must consider smoke management programs in some reasonable way. The state can do this by explaining why it is or is not revising the existing smoke management program. A state may but is not required to include its smoke management program in the EPA-approved SIP. The EPA is not offering a general recommendation on whether states following this path should consider a smoke management program as a control measure for prescribed fire. It is recommended that states consult with DOI, the USDA Forest Service, the USDA Natural Resources Conservation Service, state forestry agencies and other wildland managers/owners when considering requirements for new or revised smoke management programs.

Second path. If a state with a level of prescribed fire that contributes significantly to visibility impairment at one or more Class I areas *does select* prescribed fire as a category for four-factor analysis, the state must conduct a four-factor analysis and a decision must be reached regarding what if any measures to limit emissions from prescribed fire are needed for reasonable progress. The requirement that a state consider basic smoke management practices as control measures for prescribed fire applies to such a state (as it does to all states) and in this situation this consideration logically should be given through the four-factor analysis, by deciding whether and which basic smoke management practices are needed for reasonable progress. If there is an existing smoke management program (in the SIP or not) then the state must also consider smoke management programs. Again, in this situation the required consideration of smoke management programs logically should be given through the four-factor analysis.

If a state conducts a four-factor analysis of basic smoke management practices and/or smoke management programs as measures to reduce the visibility impacts of prescribed fire, the EPA recommends that the state consider the remaining useful life factor by saying that this factor is not relevant to prescribed fire. The EPA recommends that the state consider the cost of compliance factor by considering the cost of implementing basic smoke management practices or a smoke management program. This consideration may be qualitative, especially if the state is concluding that basic smoke management practices or a smoke management program is needed for reasonable progress. The EPA recommends that the time required for compliance be considered by providing regulated parties a reasonable phase-in of any new requirement to apply basic smoke management practices or to comply with a smoke management program. The EPA recommends that the non-air quality environmental impacts factor for basic smoke management practices be considered by considering positive and negative (if any) non-air quality environmental impacts of applying basic smoke management practices during prescribed fire. EPA recommends that the non-air quality environmental impacts factor for smoke management

programs be considered by considering the higher (or lower) risk of ecosystem resource losses from wildfires that would result from more (or less) restriction on the use of prescribed fire.

If a state selects wildland prescribed fire as a source for four-factor analysis, the state must conclude this analysis by determining whether any additional measures to reduce emissions from wildland prescribed fire, such as use of certain basic smoke management practices or compliance with a smoke management program of a particular design, are necessary to make reasonable progress. Any such measures must be included in the LTS.

Because some of the basic smoke management practices are difficult to describe with the specificity needed to make them practically enforceable, it may not be appropriate to conclude that a SIP requirement for the use of each practice is necessary to make reasonable progress. For example, one basic smoke management practice is to monitor the effects on air quality due to the smoke plume from a prescribed fire. "Monitoring" could include ground-based visual observations, aircraft observations, meteorology-based modeling, fixed or portable air quality monitoring stations, hand-held monitors, etc. Because the most appropriate monitoring approach is often situation- and resource-specific, mandating a specific approach is inadvisable. Therefore, a SIP commitment for a state or local agency to include the use of basic smoke management practices could be more desirable than a SIP requirement for land managers to use each basic smoke management practice.

Other natural sources

A state has no obligation to consider controls on natural sources, and such sources do not need to be selected for four-factor analysis and decision. However, a state is expected to consider controls on human-influenced sources that are also affected by natural events, for example, windblown dust from soils that have been disturbed by human activity.

7. Source and emission control measure characterization (Step 3)

This section addresses how a state should research and document the facts about sources and emission control measures. Section 8 addresses how these facts should be taken into consideration in the development of the LTS.

Regional Haze Rule provisions

51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.* Each State must submit a long-term strategy that addresses regional haze visibility impairment, and if necessary any reasonably attributable visibility impairment certified by the Federal Land Manager under §51.302(a), for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to achieve reasonable progress, as determined pursuant to (f)(2)(i) through (vi). In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) The State must consider and analyze emission reduction measures based on the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected major or minor stationary source or group of sources. The State must document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy.

(ii) The State must consider the uniform rate of improvement in visibility, the emission reduction measures identified in (f)(2)(i), and additional measures being adopted by other contributing states in (f)(2)(iii) as needed to make reasonable progress towards natural visibility conditions for the period covered by the implementation plan.

(iii) The State must consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Federal area.

(A) *Contributing States*. Where the State has emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area located in another State or States, the State must consult with the other State(s) in order to develop coordinated emission management strategies. The State must demonstrate that it has included in its implementation plan all measures necessary to obtain its share of the emission reductions needed to provide for reasonable progress towards natural visibility conditions in the mandatory Class I Federal area located in the other State or States. If the State has participated in a regional planning process, the State must also ensure that it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(B) *States affected by contributing States*. A State with a mandatory Class I Federal area must consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in that area regarding the emission reductions needed in each State to provide for reasonable progress towards natural visibility conditions in that area. If the State has participated in a regional planning process, the State must

ensure it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(iv) The State must consider, at a minimum, the following factors in developing its long-term strategy:

(A) Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;

(B) Measures to mitigate the impacts of construction activities;

(C) Emissions limitations and schedules for compliance to achieve the reasonable progress goal;

(D) Source retirement and replacement schedules;

(E) Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs as currently exist within the State for these purposes;

(F) Enforceability of emissions limitations and control measures; and

(G) 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.

7.1. What emission control measures should states consider for sources selected for four-factor analysis?

In general

For sources brought forward from the screening step, a state should identify and consider all available control measures that are technically feasible for the source or source type in question.

Continued relevance of the BART Guidelines for stationary sources

Many of the statements in the BART Guidelines continue to be relevant as recommendations for how a state should evaluate and select emission control measures for stationary sources. Appendix D indicates which parts of the BART Guidelines continue to be relevant in this way. However, the BART Guidelines were not developed with any intention that they would address mobile sources or non-industrial sources, such as wildland prescribed fires.

Measures for a group of sources

For groups of sources, the potential control measures may vary for different sources within the group because of differences in source design or method of operation, existing controls or other factors. If a state does not identify potential control measures and establish facts relevant to the four factors on a source-specific basis within the group, it should nevertheless give appropriate consideration to the range of circumstances at the individual sources. Subdividing the larger group and analyzing a representative source from each subgroup, or using a model plant approach, may be useful.

Work practices

In considering what emission control measures may be necessary to make reasonable progress, states should not overlook the potential for emission reductions through improved work

practices. States should give emission limits first preference for achieving better emission control performance. However, a state should consider mandatory work practices if there is evidence that current source operations can be revised for better emission control that cannot be achieved via numerical limits on emissions or emissions-related operating parameters. Work practices can also supplement numerical limits on emissions.[115]

Replacement and retrofit

A state should consider early replacement of emissions-generating equipment with newer, cleaner versions of that equipment, as well as the option of applying retrofit emission controls to such old equipment. In addition, a state should consider requiring the replacement of emission controls that have exceeded the original expectation for their useful life with more effective controls. This is particularly the case with older internal combustion engines, including older combustion turbines, for which emission standards have recently been made more stringent.

Fuels

For sources that are capable of using multiple fuels, reasoned decision making requires states to consider increasing or mandating the fuel with inherently lower SO_2, NOx and/or PM emissions. The EPA recognizes that there can be a variety of valid reasons why mandating the use of one fuel may be unreasonable, such as possible fuel supply emergencies, but a state should consider more restrictions or conditions on the use of fuels with higher emissions. The EPA strongly recommends that states consider tighter restrictions on the sulfur content of primary and back-up fuels.

Year-round operation of controls

For any NOx source brought forward from screening, a state should consider requiring year-round operation of any installed SCR and SNCR units (e.g., those that currently operate only during the ozone season). A state following the recommended or the second alternative approach to consideration of visibility will have considered whether nitrate significantly contributes to visibility impairment; see section 6.3. A state following the second alternative approach will also weigh visibility benefits from continuous operation of the SCR or SNCR units with the four statutory factors, see section 8.2.

Operating restrictions, including shutdowns

The Regional Haze Rule permits but does not require states to consider operating restrictions (e.g., limits on the hours of operation, fuel input or product or service output) as potential control measures that are necessary to make reasonable progress. Although the EPA and states have generally not imposed restrictions on source operation in regional haze implementation plans, we recognize that some plans included such restrictions. This generally occurred when a source owner/operator elected to curtail or eliminate the source's operation rather than comply with a technology-based measure. If a state chooses, it may adopt a similar approach this implementation period by including an enforceable limit on source operations in the SIP rather

[115] The FIP for Arizona included work practices for several affected sources, in addition to emission limits. 79 FR 52420, September 3, 2014.

than an enforceable emission limit that would require the installation and use of a control technology.

Energy efficiency and renewable energy measures

Energy efficiency and renewable energy programs can reduce emissions that contribute to visibility impairment at Class I areas by reducing the need for energy generated by sources that emit visibility-impairing pollutants. We encourage states to consider adopting or strengthening such programs, to make use of available EPA guidance when doing so and to consult with their EPA regional offices on this subject. The Regional Haze Rule does not require a state to incorporate its energy efficiency or renewable energy program into the SIP in enforceable form. Section 9.3 discusses whether the effects of such programs should be incorporated into the RPGs for 2028.

Redefinition of the source

A state may conclude that it would be unreasonable to require changes in the design or operation of an existing source that are so fundamental to source design and operation that, in the context of pre-construction permitting, the changes would constitute "redefining the source." For example, the Regional Haze Rule does not require states to consider retrofitting an existing coal-fired boiler so that it can combust natural gas or replacing an existing coal-fired boiler with a stationary combustion turbine.

Separable control measures

A state should not reject a bundle of control measures that have the potential to be implemented independently. For example, if there is a fuel switching option and an after-treatment option, a state should assess each option individually, as well as the combination of the two, to determine whether they are necessary to make reasonable progress.

Control efficiency and emission limits

In order to define a control measure with sufficient specificity to assess its cost and potential for emission reductions, the state should specify and consider the range of control efficiencies that the measure is capable of achieving. For example, when evaluating a flue gas desulfurization system to reduce SO_2 emissions, the state should consider both a system capable of achieving a 90 percent reduction in SO_2 emissions as well as a more advanced system capable of achieving a 97 or 98 percent reduction. The state should not limit its analysis to either an unrealistically high and prohibitively expensive control efficiency or to a control efficiency that is substantially lower than has been achieved at other sources. In addition to considering a range of control efficiencies, the state may need to evaluate an emission limit or averaging period to have sufficient information to conclude whether or not the control measure is necessary to make reasonable progress. In such a case, the parameters of the emission limit that inform the four-factor analysis and control selection should be the same as those that are ultimately adopted into the LTS.

Prescribed fire as a measure to moderate the impact of wildland wildfires

See the discussion of wildland fire in Section 6.5.

Basic smoke management practices for wildland prescribed fires

See the discussion of wildland fire in Section 6.5.

Basic smoke management practices are types of actions that the manager of a prescribed fire can take to reduce the amount of smoke generated by a prescribed fire and/or to reduce public exposure to the smoke that is generated. These practices are described in more detail in a publication issued by federal agencies that use prescribed fire as part of their land management programs.[116] Table 7-1 provides a summary of six common basic smoke management practices.

Table 7.1. Summary of Basic Smoke Management Practices, benefit achieved with the practice and when it is applied[a]

Basic Smoke Management Practice	**Benefit Achieved with the Basic Smoke Management Practice**	**When the Basic Smoke Management Practice is Applied – Before/During/After the Burn**
Evaluate Smoke Dispersion Conditions.	Minimize smoke impacts.	Before, During, After.
Monitor Effects on Air Quality.	Be aware of where the smoke is going and degree it impacts air quality.	Before, During, After.
Record-Keeping/Maintain a Burn/Smoke Journal.	Retain information about the weather, burn and smoke. If air quality problems occur, documentation helps analyze and address air regulatory issues.	Before, During, After.
Communication – Public Notification.	Notify neighbors and those potentially impacted by smoke, especially sensitive receptors.	Before, During.
Consider Emission Reduction Techniques.	Reduce emissions through mechanisms such as reducing fuel loading can reduce downwind impacts.	Before, During, After.
Share the Airshed – Coordination of Area Burning.	Coordinate multiple burns in the area to manage exposure of the public to smoke.	Before, During, After.

[a] Elements of these basic smoke management practices could also be beneficial to apply to wildfires for areas likely to experience recurring wildfires.

Smoke management programs for wildland prescribed fire

See the discussion of wildland fire in Section 6.5.

[116] USDA Forest Service and Natural Resources Conservation Service, Basic Smoke Management Practices Tech Note, October 2011, *http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046311.pdf.*

One of the distinguishing elements of a smoke management program is a provision for periodic program evaluation. We recommend that every smoke management program include a plan for this periodic assessment by the responsible authorities that provides for input from federal, state and private land managers, affected communities and other stakeholders. This evaluation should include an assessment of whether the program is meeting its goals regarding improving ecosystem health and reducing the damaging effects of catastrophic wildfires. Section 51.308(g) of the Regional Haze Rule requires the periodic progress report on a state's regional haze program to include a summary of the most recent periodic assessment of any smoke management program that is part of the LTS including conclusions that were reached in the assessment as to whether the program is meeting its goals regarding improving ecosystem health and reducing the damaging effects of catastrophic wildfires.

7.2. Statutory Factor #1 – The cost of compliance

Annualizing compliance costs

The first step in any cost analysis is to estimate the capital and annual operating and maintenance (O&M) costs of the control measure in light of the design parameters of the source. States should combine and annualize these costs over the expected life of the source or the control equipment, whichever is shorter.

States should calculate O&M costs for new emission controls on an incremental basis, i.e., by comparing them to current O&M costs. This will matter, for example, if the installation of a new control will involve the discontinuation of a current operating cost or an increase in the operating cost of existing equipment at the source.

In some instances, the installation of a new control may require the removal or discontinuation of existing emission controls for engineering reasons or business reasons. Such situations present special issues regarding the annualization of capital costs. States should consult with their EPA regional offices for advice.

Air Pollution Control Cost Manual accounting principles

The BART Guidelines require states to make cost estimates for large coal-fired EGUs based on the EPA Air Pollution Control Cost Manual (Control Cost Manual) where possible.[117] For purposes of the second implementation period, the EPA strongly recommends that states adhere to the accounting principles and generic factors from the Control Cost Manual, in particular those presented below. These principles and generic factors are explained in more detail in the chapter 2 of section 1 of the Control Cost Manual. We also recommend the Control Cost Manual as a source of generic cost estimates and algorithms. As of the date of this guidance, the EPA is engaged in a 3-year process to update the Control Cost Manual.[118]

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[117] EPA Air Pollution Control Cost Manual, Sixth Edition, EPA/452/B-02-001, January 2002. The EPA is in the process of updating portions of the Control Cost Manual. As draft or final updated chapters are available, states should follow the recommendations in those rather than in the 6th Edition. *See http://www3.epa.gov/ttn/ecas/costmodels.html*.

[118] *http://www3.epa.gov/ttn/ecas/models/Timeline11-18-2014.pdf* describes the scope and schedule for this update effort.

- Use of the OMB-approved discount rate to annualize costs, rather than a market interest rate or "real" interest rate. The discount (or interest) rate in this case can act as a proxy of the opportunity cost of capital, though this rate is adjusted for inflation to be consistent with the Control Cost Manual methodology as mentioned below in this section.
- Inclusion/exclusion of certain types of costs as capital and annual costs. *See* chapter 2 of section 1 of the Control Cost Manual for a complete list.
- Exclusion of income tax effects from the costs of control.
- Exclusion of owners' costs from the costs of control.
- Exclusion of allowance for funds used during construction (AFUDC), i.e., the borrowing or opportunity cost of the funds being invested, from the costs of control. AFUDC is not allowed under the methodology for estimating costs found in the Control Cost Manual because the Control Cost Manual methodology requires estimates of costs expressed in constant dollars for the base year of estimation. This methodology is called an "overnight" methodology because capital costs estimated in such an approach do not include escalation of costs during construction nor interest costs from financing. Thus, financing costs during construction such as AFUDC are not part of the cost of control.
- Values for the useful life of particular types of emission control equipment unless source-specific circumstances clearly indicate that a different value is more appropriate.
- Use of real (or inflation adjusted) cost values. Including inflation in control cost estimates is not consistent with the methodology for estimating costs in the Control Cost Manual. Costs should be estimated indexed to the base year of estimation, which should be a year close to when the analysis takes if at all possible. Discussion and the rationale behind this issue can be found in chapter 2 of section 1 of the Control Cost Manual (either current or newly revised version).

The EPA strongly recommends that states adhere to these aspects of the Control Cost Manual to ensure that apples-to-apples comparisons of different controls options for the same source, and similar control options across different sources, can be made. This type of consistency is necessary to support informed public comment and reasoned decision making. Also, state-level review of source-prepared cost estimates and EPA review of SIPs will be more efficient if states use these familiar principles and generic factors. States that wish to deviate from these principles and factors must explain their reasons for doing so and adequately justify any alternative approaches.

Use of generic cost estimates for particular types of control equipment

States may reduce the time and effort required to quantify control costs, with some loss of precision, by using generic cost estimates or estimation algorithms for particular types of control equipment.

The Control Strategy Tool, or CoST, is a software tool that states can use as a source of cost estimates primarily for non-EGUs. CoST replaces AirControlNet, which the EPA previously used to estimate the costs of some national rules affecting non-EGUs, including the 1999 Regional Haze Rule. CoST is best applied for estimates of average or typical control costs rather than costs for a particular source. Even so, the cost estimates for individual control measures, which are found in the control measure documentation for CoST, may be useful as range-finding or preliminary estimates. The cost equations and control measure database documentation reports for CoST at *http://www3.epa.gov/ttn/ecas/cost.htm* are useful references.

Use of source-specific cost estimates, such as vendor quotes

Source-specific estimates prepared by knowledgeable engineering professionals provide more reliable information than generic cost estimates, As a result, states should exercise caution before rejecting controls based on generic cost estimates. In addition, when considering source-specific estimates, states should place greater weight on vendor quotes that represent an offer to enter a contract at that price than estimates without an offer to enter a contract. States should limit their consideration of vendor- or expert-supplied cost estimates (those that are not quotes) to those endorsed by a licensed professional engineer. However, significant care should be used when using a vendor-supplied cost estimate to ensure that its treatment of costs related to planning, outages, installation and additional operation and maintenance activities is consistent with the principles in the Control Cost Manual; adjustments or exclusions may be needed to achieve this consistency. If a quote or opinion prepared for one source is adopted or adapted to another source, the source for which the original cost estimate was made must be representative/relevant to the source in question. States may be able to require sources to provide confidential information that will allow better source-specific cost analyses, similar to the EPA's CAA section 114 authority.

When using source-specific cost estimates not prepared in accordance with the Control Cost Manual, states should review and adjust the estimates as necessary to achieve as much consistency as possible with the accounting principles and generic factors identified above. Examples of such adjustments can be found in the EPA's cost analyses for a number of FIP actions during the first implementation period.[119]

Every source-specific cost estimate used to support a four-factor analysis must be well documented for purposes of public comment and EPA review.

Calculating emission reduction for use in calculating cost/ton

The emission reduction used as the denominator for the cost/ton metric should be the annual tons of reduction from implementation of the additional measure.

The recommendations in section 6.2 regarding emission values to be used in estimating visibility impacts and visibility benefits apply as well to the emissions values to be used in calculating the cost/ton metric.

Differences within a group of sources

The cost of compliance expressed in dollars per ton may vary for different sources within a group of relatively small but well-characterized sources in the same market or industry sector due to age or design differences. For example, within a group of stationary source internal combustion engines, replacing 5-year old engines with cleaner models may have a relatively high cost/ton value compared to replacing 20-year old engines because the owners of the older engines face replacement costs fairly soon in any case. In other situations, factors other than

[119] *See* the EPA's Wyoming regional haze action, 79 FR 5032, January 30, 2014, NO_x BART and RP analyses, Tables 2 through 17, pp. 5039-5044, docket number EPA-R08-OAR-2012-0026, Cost of NO_x Controls on Wyoming EGUs, document number EPA-R08-OAR-2012-0026-0241.

remaining useful life could create cost/ton differences that states should consider in a reasonable manner.

7.3. Statutory Factor #2 – Time necessary for compliance

For stationary sources, the provisions of the BART Guidelines regarding this factor are relevant to reasonable progress analyses. Prior experiences with the planning and installation of new emission controls is the best guide to how much time a particular source will reasonably need for compliance. However, source-specific factors should also be considered. Sections 8.1and 8.2 discuss how a state should give consideration to the time necessary for compliance, once that time is determined.

7.4. Statutory Factor #3 – Energy and non-air environmental impacts

Energy impacts

For stationary sources, the provisions of the BART Guidelines regarding this factor are relevant to reasonable progress analyses. The energy impacts of an emission control measure are a matter of engineering, so prior experience at similar sources will be informative. The Control Cost Manual provides advice on estimating energy requirements or savings for some situations. States may consider energy impacts in terms of kilowatt-hours or mass of fuels used. States should focus their analysis on direct energy consumption at the source rather than indirect energy inputs needed to produce raw materials for the construction of control equipment.

Non-air environmental impacts

For stationary sources, the provisions of the BART Guidelines regarding this factor are relevant to reasonable progress analyses. When there are significant potential non-air environmental impacts, characterizing those impacts will usually be very source-specific, so no general guidance is offered in this document. Other guidance intended for use in assessments under the National Environmental Policy Act may be relevant.

The EPA considers GHG emissions to be an air impact. Therefore, a state is not required to consider GHG emission impacts, or climate change effects, in the development of its LTS. However, we encourage states to consider GHG impacts. Some measures that would reduce emissions that contribute to visibility impairment will also reduce GHG emissions, such as measures that reduce the use of energy produced from combusting fossil fuels with relatively high GHG emissions. Where a measure necessary to make reasonable progress towards natural visibility conditions would increase GHG emissions, we encourage states to work to harmonize visibility and climate change objectives, such as by identifying GHG emission offsets that can be implemented as well.

7.5. Statutory Factor #4 – Remaining useful life of the source

Stationary sources

For stationary sources, the provisions of the BART Guidelines regarding this factor are relevant to reasonable progress analyses. Generally, the remaining useful life of the source itself will be longer than the useful life of the emission control measure under consideration unless there is an enforceable requirement for the source to cease operation sooner. Thus, states should normally use the useful life of the control measure to calculate emission reductions, amortized costs and

cost per ton. However, if there is an enforceable requirement for the source to cease operation by a date before the end of what would otherwise be the useful life of the control measure under consideration, then states should use the enforceable shutdown date to calculate remaining useful life.

The Control Cost Manual provides guidance on typical values for the useful life of various emission control systems used at stationary sources. The EPA recommends that states use these values rather than relying on the values used in the first implementation period. The EPA is reviewing these values as part of the update to the Control Cost Manual.

Engines

Some types of mobile and stationary internal combustion engines are typically replaced at specific intervals that depend on their type and application. For these sources, states may rely on a reasonable estimate of when the engine will be replaced in the normal course of business (or personal use) instead of an enforceable requirement to cease operation. The shorter the remaining useful life of an engine, the higher the cost per ton of a control measure will be. However, some types of engines typically are rebuilt or reconditioned rather than being completely replaced. For such engines, states should take care when calculating the useful life of control measures. For some measures, such as exhaust after treatment systems that are not closely integrated with the engine, the useful life of the measure may extend beyond the next engine rebuild or reconditioning.

7.6. Reliance on previous analysis and previously approved approaches

It may be appropriate for a state to rely on the results of a previous analysis of a factor, for example information developed in the first planning period on the availability, cost and effectiveness of controls for categories of sources, if the previous analysis was sound and no significant new information is available. If doing so, the state should explain why it concludes that no important facts have changed in a way that would require an update. The state should also consider whether newly available or newly recommended analytical approaches would affect the characterization of the factual situation. In other words, not all conclusions on factual matters and approaches to determining factual matters used in the first implementation period can be presumed to be appropriate for the development of SIPs in the second implementation period. A state relying on previously developed information must adequately address any adverse comments on the state's previous factual information that were made during the state's public comment process for the SIP for the first implementation period, during the public comment process on the EPA's proposed action on that SIP, during the public review of a subsequent progress report or during the public comment process on the EPA action on the subsequent progress report.

A state should apply a still-valid result of a previous analysis of a factor consistently with the requirements of the 2016 Regional Haze Rule and the recommendations in this guidance document, which may be different than the way the state or another state applied that result in the first implementation period. For example, some states noted that the EPA chose a benchmark cost/ton value of $500/ton for the purpose of setting state-wide emission allowances for EGUs under a FIP to address the CAA requirement regarding interstate transport affecting NAAQS attainment and maintenance. In the second implementation period, under the recommendations provided in Section 8.1 and 8.2 of this document, a state could use this value to establish that a

measure for EGUs with the same cost/ton was within the range of reasonableness for the cost of compliance and thus cannot be eliminated as a measure needed for reasonable progress based on the cost of compliance. A state should not rely on this value to conclude that a measure for EGUs with a higher cost/ton value should be rejected as not needed for reasonable progress.

7.7. Continued relevance of the BART Guidelines

Many of the statements in the BART Guidelines continue to be relevant as recommendations for how a state should assess facts related to the four statutory factors. Appendix D indicates which parts of the BART Guidelines continue to be relevant in this way.

7.8. Consideration of information provided through interagency consultation and public comments

Prior to the opening of a public comment period on the draft SIP revision, states should document that they have considered EPA and FLM comments on the factual information they developed and previously shared with the EPA and the FLM(s). This will assure the public that the state has received and considered this input and help establish a record showing that a state has used reasoned decision making. Also, states should consider public comments containing relevant factual data and recommendations regarding available control measures. Public comments may present data developed in ways that depart from the guidance in this document. States should not dismiss such publicly provided data simply because they were not developed according to this guidance document. Rather, states should consider what aspects of the data are relevant and valid, following the concepts presented in this guidance document.

8. Decisions on the content of the LTS (Step 4)

Regional Haze Rule provisions

51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.* Each State must submit a long-term strategy that addresses regional haze visibility impairment, and if necessary any reasonably attributable visibility impairment certified by the Federal Land Manager under §51.302(a), for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to achieve reasonable progress, as determined pursuant to (f)(2)(i) through (vi). In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) The State must consider and analyze emission reduction measures based on the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected major or minor stationary source or group of sources. The State must document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy.

(ii) The State must consider the uniform rate of improvement in visibility, the emission reduction measures identified in (f)(2)(i), and additional measures being adopted by other contributing states in (f)(2)(iii) as needed to make reasonable progress towards natural visibility conditions for the period covered by the implementation plan.

* * *

(vi) The State must consider, at a minimum, the following factors in developing its long-term strategy:

(A) Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;

(B) Measures to mitigate the impacts of construction activities;

(C) Emissions limitations and schedules for compliance to achieve the reasonable progress goal;

(D) Source retirement and replacement schedules;

(E) Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs as currently exist within the State for these purposes;

(F) Enforceability of emissions limitations and control measures; and

(G) 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.

8.1. How should a state that is not considering visibility benefits select measures for inclusion in the LTS?

Note on applicability of this subsection

Section 8.1 applies to states that are following either the recommended approach or the first alternative approach to developing a LTS described in section 4.2. Under both approaches, states do not weigh the visibility benefits of potential emission control measures along with the four statutory factors. While some of the guidance in this section is identical to the guidance in section 8.2, which applies to states that are following the second alternative approach, other issues discussed in this section differ from the second alternative approach in important ways.

See section 4.2 for the EPA's recommendations regarding the consideration of visibility in developing the LTS.

8.1.1. The meaning of "necessary to make reasonable progress"

CAA section 169A(b)(2) requires states to develop a SIP that includes "emission limits, compliance schedules and other measures as may be necessary to make reasonable progress toward meeting the national goal." As stated in section 4.4, the EPA recognizes that determining whether a measure is necessary to make reasonable progress is ultimately a fact-specific inquiry regarding a particular source or source category and the affected Class I areas that takes place in the context of legal requirements, input from stakeholders, and reasoned judgment. In our actions on SIPs and FIPs in the first implementation period, we did not apply any general formula or bright-line test to evaluate state decisions or reach our own decisions as to what measures are necessary to make reasonable progress, and we are not recommending any such formula in this guidance. This does not mean, however, that a state has unbounded flexibility or discretion in its decision making. States must use reasoned decision making and give due consideration to well-developed factual information and public comments.

We recommend that for each source, group of sources or source category that has been selected for four-factor analysis, a state following the recommended approach or the first alternative approach include in its LTS the most effective measures that are reasonable to require in light of the four factors alone. This recommendation has two important features. First, we recommend that a state following the recommended approach reject a control measure only when one of the four statutory factors, or some combination of the four factors, makes it unreasonable to require the control. The state should not use the information regarding a source's visibility impacts developed at the screening state in evaluating the four factors. Second, we recommend that the state select *the most effective emission reduction measure for each source that is within a range of reasonableness*.

We expect that the outcome of this decision-making process will most often depend on the costs of compliance. States should consider the remaining useful life of a source by annualizing the costs of compliance over the useful life of the control or the remaining useful life of the source, whichever is shorter. States should consider the time necessary for compliance by setting a compliance deadline that provides a reasonable amount of time for the source to implement the measure. States should consider energy and non-air quality impacts primarily as components of the costs of compliance. Only in unusual situations will energy or non-air environmental impacts be such significant considerations that they influence the decision for or against the control

measure under consideration. As a result, the discussion in this section focuses on providing guidance regarding when the state should consider the costs of compliance to be within a range of reasonableness. The other three statutory factors are explicitly discussed in sections 8.3 (time necessary for compliance), 8.4 (energy impacts), 8.5 (non-air environmental impacts) and 8.6 (remaining useful life). These discussions apply to all states regardless of the approach taken to considering visibility.

To determine whether a control measure is reasonable, we recommend that states compare the costs of compliance with the measure (using the cost/ton metric) to the costs that other similar sources have had to bear (using the same metric) in other regulatory actions. Consistent with the guidance in this section, states may determine in the second implementation period that the costs of compliance associated with a given control measure are unreasonable and not include the measure in the LTS without contradicting the national goal. In future implementation periods, newer technology may reduce the costs of compliance for certain sources or sources that are expensive to control may retire.

8.1.2. Recommendation to rely on the cost/ton (cost-effectiveness) metric and comparisons to past regulatory actions

We recommend that a state consider the costs of compliance by comparing the cost/ton metric for a control measure to the same metric from other regulatory actions, in the manner explained in this section. If the cost/ton of a measure under consideration is about the same as for a measure that has been previously required for a similar source, then the state should conclude that measure under consideration has a reasonable cost of compliance and should not eliminate the measure as being needed for reasonable progress based on the cost of compliance.[120] If the measure under consideration has a cost/ton higher than any measure that has been previously required, the state should do a deeper and more source-specific assessment of whether the cost of compliance is nevertheless within the reasonable range. The fact that a previous regulatory action rejected a measure with a similar cost/ton should not by itself be taken as sufficient support for a conclusion that the cost of compliance for the measure is outside the reasonable range; the rejection by the regulatory authority may have considered factors other than the cost of compliance and/or there may be other past actions that would support a conclusion that the cost of compliance is reasonable. If a state chooses to use another approach to assessing the reasonableness of the costs of compliance, it should explain and document why its chosen method is more appropriate than relying on the cost/ton metric and comparisons to other regulatory actions in this way.

The absolute capital and annual operating and maintenance costs of compliance of available emission control measures vary with a source's operating scale. Therefore, it is more meaningful to compare the cost-effectiveness (cost/ton) of a potential control measure to the cost/ton of measures required in the past for other sources than to compare absolute costs of compliance across sources because the cost/ton metric helps to normalize for differences in operating scale. The EPA believes that comparisons with regulatory actions on other sources on the basis of the cost/ton metric is an appropriate and reasonable way to evaluate potential new control measures.

[120] In comparing the cost/ton of a measure under consideration to past regulatory actions affecting a group of sources, a state should consider the cost/ton of the past action for individual sources, not the average cost/ton across the group. There typically will have been some affected sources with a higher cost/ton than the average.

Specifically, if the cost/ton of a potential control measure is less than or comparable to the cost/ton values from previous regulatory actions, states should consider the costs of compliance to be reasonable. This concept is further discussed in section 8.1.3.

However, the cost/ton metric may not always be sufficient to put the costs of compliance into perspective relative to the operating scale of a source. For example, when a source is already operating emission controls with an intermediate or high degree of effectiveness, the potential emission reduction from applying better control technology may be relatively small. In these cases, the cost/ton may be relatively high, even if the absolute cost of the control is not unreasonable in light of the operating scale of the source. Therefore, in situations where the cost/ton is outside the range of previous regulatory actions, states should also consider the absolute cost of control compared to the operating scale of the source to determine whether the costs of compliance are actually unreasonable.

Another situation that may result in a high cost/ton value is where an uncontrolled or lightly controlled source operates relatively few hours per year or with a relatively low hourly throughput compared to its capacity. In such a situation, the cost/ton value inherently accounts for the actual operating scale of the source and can be relied upon to reach a conclusion regarding reasonableness, unless other considerations prevent such reliance.

Most retrofit controls that states will consider in the second implementation period will reduce a single pollutant that affects visibility. For example, switching to a lower sulfur coal or fuel oil will predominantly reduce emissions of SO_2. In these cases, the cost/ton metric for the measure only needs to reflect the emission reductions of the predominantly affected pollutant. However, other control measures may significantly reduce multiple pollutants that affect visibility. Examples include operating restrictions, source closures, engine replacement or switching from coal to natural gas. When a control measure reduces multiple pollutants that affect visibility, states must allocate the costs of control between pollutants or sum dissimilar pollutants to calculate the scalar cost/ton metric. In these situations, states should clearly describe the approach to allocation or summing in the SIP and at a minimum provide a qualitative analysis of how other allocation approaches would change the analysis.

Once a state has estimated the cost/ton of a measure under consideration, it should consider past conclusions that the state itself, other states and the EPA have made regarding whether the costs of compliance would be unreasonable. If the state determines that that the costs of compliance would be unreasonable despite a cost/ton value that falls within the general range of previous regulatory decisions by the same state, other states and the EPA for sources with sufficiently similar features (other than differences in size), then the state must explain how important distinguishing factors influenced its determination.

For states following the recommended approach or the first alternative approach, the environmental objective of the control measure is not relevant to whether the costs of control can reasonably be borne by the source. Therefore, states should not limit their consideration to previous state and EPA actions within the regional haze program. States should also consider

past state and EPA decisions about the reasonableness of certain cost/ton levels in other CAA programs.[121]

The EPA may separately provide states with information on the costs of compliance of control measures previously required by states and the EPA in the regional haze program to assist states in making comparisons. Meanwhile, Appendix B of this document provides citations to EPA actions on SIPs in the first implementation period and can be used to research specific past examples of how states and the EPA have treated the costs of compliance factor. In addition, the EPA's RACT/BACT/LAER Clearinghouse contains information on the cost/ton associated with many past regulatory actions that imposed a cost of compliance.

In comparing cost/ton values associated with past regulatory actions and cost/ton values developed more recently for measures under consideration for the second implementation period, a state should consider whether each value reflects the principles in the Control Cost Manual and how changes in capital and operating and maintenance costs in the period between the dates on which the two values were developed affects the comparison.

In summary, when the cost/ton of a measure would be in the range of cost/ton values that have been incurred multiple times by sources in generally similar situations, states should presume that the costs of compliance are not an obstacle to the measure being considered necessary to make reasonable progress. Where a comparison to the cost/ton metric for other regulatory actions does not clearly indicate that the costs of compliance with a measure is within the range of reasonableness, however, states should not automatically assume that the costs are unreasonable. Rather, states may need to conduct further investigation before a conclusion can be reached as to whether unreasonable impacts would result from requiring the particular measure at the particular source.

8.1.3. The "worth" of emission reductions is not material

A state that has chosen not to consider visibility benefits after the screening analysis should avoid effectively treating emission reductions as a surrogate for visibility benefits by arguing that a certain cost is unreasonable because the cost is not "worth" the quantity of emission reductions that the measure will achieve. For states following the recommended approach described in section 4.2, comparisons to the cost/ton value of controls imposed on other sources allow states to determine whether there would be unreasonably negative impacts to the source, not whether the emission reductions achieved are "worth" the cost. States that wish to weigh visibility improvements with the four statutory factors should do so explicitly by following the second alternative approach. Section 8.2 provides recommendations for states following the second alternative approach.

8.1.4. Separable sources and emission units

It can be efficient for a state to consider a group of similar sources when determining what measures are necessary to make reasonable progress. Assuming that it is feasible to distinguish

[121] The issue being addressed in the development of an LTS for a regional haze SIP is the reasonableness of the cost impacts of complying with a certain measure. The environmental objective of a control measure required under another CAA provision in a previous example is not relevant to whether the cost impacts of a similar measure that might be adopted for regional haze purposes are unreasonable, assuming a state is following the recommended approach or the first alternative approach.

among sources to select and enforce different requirements, the entire group of sources should not be excused from additional control because the costs of control for some of the sources would be unreasonable. If such a distinction is not possible, however, the decision on what common control to require for all sources in the group should be based on consideration of the costs of compliance and emission reductions in the aggregate.

For source sectors in which sources are smaller and more numerous or for which specific information on the design and operation of each source is not available, it may not be possible to give separate consideration to the specifics of each source. The only practical choice may be to subject all the sources to a common requirement or to exclude them as a group. Similarly, for a source sector where there is only one practical method of enforcement, it may be necessary to treat all sources in the sector in a common way in terms of costs incurred and emissions reduced. For example, a fuel-oil sulfur-content requirement may be practically enforceable only at the distributor level such that all customers will be affected the same way. In such situations, states should conduct an aggregate assessment of the four statutory factors.

At a single source, the same concept applies at the unit or process level for facilities that include multiple units or processes that emit separately and could be controlled separately, i.e., states should assess units that can be controlled with separate equipment separately. States should not combine two potential emission control systems that have significantly different cost/ton values as if there were only the option of requiring both together. The combination of the two systems might have a cost/ton value that casts doubt as to its reasonableness, while one of the systems alone may be very reasonable based on a cost/ton comparison to other actions and consideration of the other three statutory factors.

8.1.5. Multiple control alternatives, including combinations of controls

When multiple control options are available for one source (e.g., low-NOx burners can be applied separately or combined with either SNCR or SCR), states following the preferred approach or the first alternative approach should select the most effective control (or combination of controls) that can be considered reasonable in light of the costs of compliance and include that control in the LTS. States should not consider the incremental differences in cost between the alternatives. As explained above, the cost/ton metric helps to put absolute costs into perspective with the operating scale of the source. The incremental cost/ton of one possible control option versus another, on the other hand, does not bear any close relation to the operating scale of a source. Finally, the EPA notes that sources must bear the full compliance costs of a control measure regardless of what other alternatives might exist. In other words, the incremental cost/ton between the most effective control measure and the next most effective alternative is not relevant to determining whether the costs of compliance for the most effective measure would have unreasonable impacts at the source.

In light of the above, the EPA recommends that states following the recommended approach or the first alternative approach use a top-down sequence to analyzing multiple control options. Under this method, states (1) identify available control measures; (2) eliminate those that are technically infeasible; (3) rank the remaining measures in terms of their effectiveness; (4) analyze the most effective measure using the four statutory factors to determine whether it is necessary to make reasonable progress; and (5) establish an enforceable emission limit and other requirements for the selected measure. In step 4, states should consider the next most effective control measure only if the first measure is rejected based on consideration of the four factors.

This approach is efficient because states can avoid gathering facts and analyzing the four factors for control measures less stringent than the one selected for the LTS. For example, a state that determines SCR would not have any unreasonable impacts based on the four statutory factors would not need to estimate the costs, energy, or non-air quality impacts of an SNCR system.

8.1.6. Viability of continued plant operations

Even when the cost/ton of a control measure is within the range of previous regulatory actions, in unusual cases the costs of compliance may raise issues regarding the viability of continued plant operations. The BART Guidelines address this possibility (*see* section IV.E.3.2 of the BART Guidelines, which are reproduced in Appendix D), and we recommend that states follow the same approach in the context of reasonable progress.

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 economic effects, such as the effect on product prices and the market share and profitability of the source. Where these effects are judged to have a severe impact on plant operations, a state may consider them when determining whether the measure will have unreasonable impacts overall, but the state should provide an economic analysis that demonstrates, in sufficient detail for public review, the specific economic effects, parameters and reasoning. We recognize that this review process must preserve the confidentiality of any sensitive business information. The analysis may also consider whether other competing plants in the same industry have been required to install similar-cost controls if this information is available.

At the same time, in a robust competitive market for a product or service with many producers, it is often the case that one or more producers may be only marginally competitive, with a small margin of operating profit. Therefore, it is not unsurprising that the additional cost of complying with a newly required emission control measure may make marginal producers uncompetitive. We believe that in requiring states to have an LTS that contains measures necessary to make reasonable progress, Congress did not intend to indefinitely protect the market position of marginal producers by shielding them from the costs of additional emission controls that have already been put in place on similar sources in other locations or markets. Accordingly, states should not consider a control measure to be unreasonable on the sole basis that one or a small number of marginal producers would be at risk of leaving the market.

In future implementation periods, if the facts surrounding the economic effects change in the case of a source for which a measure was excluded from consideration during the second implementation period because of issues regarding the viability of continued plant operations, then that measure should be reconsidered.

8.2. How should a state that is considering visibility benefits along with the four factors select measures for inclusion in the LTS?

Note on applicability of this subsection

Section 8.2 applies to states that are following the second alternative approach to developing a LTS described in section 4.2. Under this approach, states consider the visibility benefits of emission controls measures for individual sources or groups of sources along with the four statutory factors. While some of the guidance in this section is identical to the guidance in

section 8.1, which applies to states that are following the preferred and first alternative approaches, other issues discussed in this section differ in important ways.

See section 4.2 for the EPA's recommendations regarding the consideration of visibility in developing the LTS. Developing the type of robust information on visibility benefits that we believe is necessary for reasoned decision making can be very resource intensive. In addition, given the complexity of assessing the import of visibility modeling, it can be very difficult for states to make logical and consistent decisions regarding the appropriate weight to give visibility benefits when weighing them against the four statutory factors. Consequently, we recommend that states considering the second alternative approach seek input from the EPA, FLMs and public on a draft analytical work plan and proposed decision-making criteria before committing to this approach.

8.2.1. The meaning of "necessary to make reasonable progress"

CAA section 169A(b)(2) requires states to develop a SIP that includes "emission limits, compliance schedules and other measures as may be necessary to make reasonable progress toward meeting the national goal." As stated in section 4.4, the EPA recognizes that determining whether a measure is necessary to make reasonable progress is ultimately a fact-specific inquiry regarding a particular source or source category and the affected Class I areas that takes place in the context of legal requirements and input from stakeholders. In our actions on SIPs and FIPs in the first implementation period, we did not apply any general formula or bright-line test to evaluate state decisions or reach our own decisions as to what measures are necessary to make reasonable progress, and we are not recommending any such formula in this guidance. This does not mean, however, that a state has unbounded flexibility or discretion in its decision making. States must use reasoned decision making and give due consideration to well-developed factual information and public comments.

We recommend that for each source, group of sources or source category that has been selected for four-factor analysis, a state following the second alternative approach include in its LTS the most effective measures that are (part 1 of the reasonableness assessment) reasonable to require in light of the four factors alone[122] and (part 2 of the reasonableness assessment) reasonable to require when weighing visibility benefits along with the four factors.

We expect that the outcome of this decision-making process will most often depend on the outcome of weighing the costs of compliance and visibility benefits. States should consider the remaining useful life of a source by annualizing the costs of compliance over the useful life of the control or the remaining useful life of the source, whichever is shorter. States should consider the time necessary for compliance by setting a compliance deadline that provides a reasonable amount of time for the source to implement the measure. States should consider energy and non-air quality impacts primarily as components of the costs of compliance. Only in unusual situations will energy or non-air environmental impacts be such significant considerations that they influence the decision for or against the control measure under consideration. As a result, the discussion in this section focuses on providing guidance regarding on weighing the costs of compliance and visibility benefits. The other three statutory factors are explicitly discussed in

[122] States following this approach should refer to the guidance in Section 8.1 regarding when a measure should be considered reasonable or unreasonable based on the four statutory factors alone.

sections 8.3 (time necessary for compliance), 8.4 (energy impacts), 8.5 (non-air environmental impacts) and 8.6 (remaining useful life). These discussions apply to all states regardless of the approach taken to considering visibility.

To determine whether a control measure is reasonable, we recommend that states following the second alternative approach consider the whole distribution of visibility benefits on the 20 percent most impaired days, including the maximum visibility benefit and other values at the high end of the distribution, as well as the average benefit across the distribution. Consistent with the guidance in this section, states may determine *in the second implementation period* that the costs of compliance associated with a given control measure outweigh the visibility benefits of that measure and not include the measure in the LTS without contradicting the national goal. In future implementation periods, newer technology may reduce the costs of compliance for certain sources or sources that are expensive to control may retire. However, states should also consider how control determinations they make in the second and subsequent implementation periods will affect their progress in relation to the URP. Ultimately, we expect that states will find in later implementation periods that additional controls are necessary to make reasonable progress. A state should also recognize that progress towards natural visibility conditions will require the accumulation of reductions in air pollution and associated light extinction that may not be individually perceptible.

8.2.2. Consideration of past decisions regarding reasonable progress

A state should consider how it, other states and the EPA made BART and reasonable progress decisions during the first implementation period. Consultation between states on the development of their SIPs will also allow states to understand how other states are contemplating making decisions on how to weigh costs and visibility benefits in the second implementation period. States should consider the decisions made by other states (or being made by other states) and the EPA because Class I areas are national treasures visited by people from all states; they are valued even by people who have not yet visited them or who do not plan to visit them. Moreover, the costs of controlling sources that affect visibility in a given Class I area may ultimately be borne by residents of many states due to the interwoven nature of the national economy, including the broadly distributed ownership of many of the corporations owning the sources. Thus, states should not view the weighing of costs and visibility benefits as an in-state issue, and the preferences of the state's own decision makers should not be the only determinant of how decisions are made on what additional measures are necessary to make reasonable progress at a Class I area. Any state decisions that fall outside the general range of previous decisions by the same state, other states and the EPA should be based on important distinguishing factors. However, a state should not conclude that a measure is sufficient for reasonable progress only on the basis that the measure is in the range of previous decisions, without also considering whether a reasonable weighing of visibility benefits would indicate that a measure that is even more protective of visibility also is in that range.

When comparing situations, states should consider how different analytical methods may have influenced the facts on which past decisions were based. For example, states should consider whether visibility benefits in a past case were estimated using an air quality modeling approach that is similar to or different than the one the state is using to develop its SIP for the second implementation period. States conducted BART determinations by considering 98th percentile visibility impacts modeled using CALPUFF and maximum actual daily emissions. Therefore,

states should not compare past BART determinations to average or maximum visibility benefits on the 20 percent most impaired days, which are estimated using actual daily emissions and a different air quality modeling approach.

Additionally, past regulatory decisions aimed at improvements in other environmental endpoints such as NAAQS attainment, PSD increment protection or reduction in the exposure to hazardous air pollutants are not directly relevant. However, states may find such past decisions to be useful benchmarks for the value given to avoiding air pollution and its effects in a very broad sense.

8.2.3. Considering visibility benefits does not require "cost/benefit" analysis

States following the second alternative approach should not base their decisions on a "cost/benefit analysis" that monetizes the value of visibility benefits and other co-benefits and then compares that value to the costs of compliance. Monetizing the value of visibility benefits would be extremely difficult. More importantly, conducting a cost/benefit analysis would be inconsistent with the recommendations in this guidance regarding visitation and the importance of less heavily visited Class I areas, like wilderness areas. If a state chooses to conduct a cost/benefit analysis for public information purposes rather than decision purposes, as the EPA does for many national rules, the state should follow the relevant guidance of the U.S. Office of Management and Budget.

8.2.4. Changes in the number of days above a visibility impact benchmark

The BART Guidelines allow states to consider the number of days on which a source's modeled visibility impacts at a Class I area remain above 0.5 or 1.0 deciviews when considering visibility benefits. For reasonable progress determinations in the second implementation period, the EPA recommends that states give little weight to this type of metric. Whereas the BART requirements targeted the impacts of single sources that cause or contribute to visibility impairment, the reasonable progress requirements are intended to remedy visibility impairment from all sources on all days, with a focus on the 20 percent most impaired days. While the number of days on which a single source has impacts above a certain threshold says something about the magnitude of that source's impacts, the metric does not capture the magnitude of the visibility benefit of controls. Even a small visibility benefit could change the number of days a source has impacts below a threshold if the source's baseline impacts were already close to that threshold.

8.2.5. Consideration of visibility benefits at multiple affected Class I areas

In many cases, the control measures considered by a state for its LTS will have visibility benefits at multiple Class I areas. When a state following the second alternate approach considers whether an emission control measure is necessary to make reasonable progress, it must give appropriate weight to the visibility benefits at all Class I areas affected by the source. During the first implementation period, most states followed this approach, and the EPA disapproved the SIPs of states that considered benefits only at the most impacted Class I area. Considering visibility benefits at only the most impacted area is inconsistent with the CAA's goal of "remedying . . . impairment of visibility in mandatory class I Federals *areas*." 42 USC 7491(a)(1) (emphasis added).

States should consider the individual visibility benefits at multiple Class I areas and present to the public for comment a set of the individual values for each area. For each Class I area, states should consider the whole distribution of visibility benefits on the 20 percent most impaired

days, including the maximum visibility benefit and other values at the high end of the distribution, as well as the average benefit (in delta deciviews) for that area. States should consider all of this information when weighing costs and visibility benefits to decide whether an emission control measure is necessary to make reasonable progress. If a state estimates visibility benefits at different Class I areas using different approaches, the state should clearly explain the differences in its SIP.

We recommend that states also sum the visibility benefits across affected Class I areas, present this information in their SIPs as a supplement to the information for individual Class I areas and consider this sum as well as the several individual values of visibility benefit. This practice is be a useful way to help characterize the number of affected areas and the magnitude of the cumulative visibility benefits. However, states should explain that this cumulative sum does not represent the perceptible effect of the benefits at any one Class I area.[123]

8.2.6. Considerations when weighing costs and visibility benefits

States following the recommended approach or the first alternative approach can rely on a comparison of the cost/ton metric for an emission control measure to the same metric from previous regulatory actions to show that the costs of compliance with the measure are reasonable, as explained in Section 8.1.2. States following the second alternative approach should not rely on such a comparison and should provide a reasoned and logical explanation for how it considered costs, assessed visibility benefits, and weighed costs and visibility benefits in deciding what measures are necessary to make reasonable progress.

To begin, states following the second alternative approach need not adopt a measure for which the costs of compliance considered alone or in combination with the other statutory factors are unreasonable. Thus, states following the second alternative approach should perform the same "part 1" reasonableness assessment mentioned in section 8.2.1 as being part of the recommended approach, before proceeding to weigh visibility benefits.

With regard to the "part 2" assessment mentioned in section 8.2.1, in which visibility benefits are weighed along with the cost of compliance, the EPA notes that regional haze is "visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area." 40 CFR 51.301. At any given Class I area, hundreds or even thousands of individual sources may contribute to regional haze. Thus, it is not appropriate to reject a control

[123] In the preamble to the 1997 proposal, the EPA stated: "Due to the broad variety of scenic, atmospheric, and lighting conditions at the mandatory Class I Federal areas across the country, at any specific time a given area may contain vistas for which slightly more or less than one deciview above background conditions represents a perceptible impact for the components of the scene. For example, a view of a snow-capped mountain may be more sensitive to changes in air quality than a view of a forest with the result that less than a 1.0 deciview change is perceptible for that portion of the scene. Conversely, in another scene a deciview change slightly greater than 1.0 may not be perceptible." 62 FR 41148. The preamble to the 2005 BART Guidelines final rule included a more extensive discussion of the perceptibility of deciview increments, and that final rule established 0.5 deciview as the upper limit on any threshold a state may establish for purposes of determining that a BART-eligible sources is not subject to BART. 70 FR 39120. The important point for states to make clear in their SIPs, for good public understanding, is that the cited deciview values of 0.5 and 1.0 apply to perceptions of a single scenic vista. A deciview value that is the sum of deciview changes at multiple areas should not be compared to this range or to any single value within the range.

measure for a single emission unit, a single source, or even a group of sources on the basis of the associated visibility benefits being imperceptible to the human eye. (Note, however, that we do expect that a given Class I area will generally experience perceptible visibility improvements due to the cumulative effect of LTS' in upwind states.)

With this overarching principle in mind, the EPA offers the following recommendations as to how states should weigh costs and visibility benefits. As a general matter, the larger the visibility benefit, the larger the costs of compliance that will be justified. However, for extremely cost-effective controls, states should strongly consider requiring controls if an appropriate analytical approach indicates a visibility benefit.

For more expensive controls, states may find it useful to develop thresholds or some other metric to organize and guide their initial decision making. As the Ninth Circuit explained in *NPCA v. EPA*, 788 F.3d 1134, 1142 (9th Cir. 2015),[124] the Regional Haze Rule does not prevent states from implementing "bright line" rules, such as thresholds, when weighing costs and visibility benefits. For example, a state could require all control measures that cost less than $X/ton and that result in either (1) a visibility benefit greater than Y deciview at the most impacted Class I area or (2) cumulative visibility benefits across multiple affected Class I areas greater than Z deciview. In establishing such thresholds, however, states should determine whether the thresholds selected will result in a LTS that provides sufficient emission reductions to achieve the URP. If not, states should be mindful that they will be required to demonstrate that there are no additional measures that would be reasonable to include in the LTS. *See* section 10.3. States will need to consider the progress needed at each affected Class I area and the sources contributing to visibility impairment to determine appropriate thresholds.

States must also ensure that their control decisions are consistent among sources. A state should not reject a control measure for a source if that measure would result in similar costs and benefits to measures required at other sources unless there are distinguishing factors. States should also consider the decisions that are being made by other states following the second alternative approach, for the reasons given above. Absent a thorough explanation, inconsistent control determinations are "the hallmark of arbitrary action." *NPCA*, 788 F.3d at 1145 (citation omitted).

Finally, in its consideration of visibility under the second alternative approach, states should take into account the deciview metric, as well as the reduction in total light extinction and the reduction in a source's percent contribution to light extinction before making a final control determination. *See* 79 FR 74882 (The EPA's proposed FIP for Texas). If a source is one of the largest contributors to anthropogenic light extinction at a Class I area, then the state should strongly consider including cost-effective measures for the source in its LTS in order to help meet Congress' national visibility goal.

8.2.7. Separable sources and emissions units

It can be efficient for a state to consider a group of similar sources when determining what measures are necessary to make reasonable progress. Assuming that it is feasible to distinguish among sources to select and enforce different requirements, the entire group of sources should not be excused from additional control because the costs of control for some of the sources

[124] *See* Appendix C for a list of all relevant circuit court decisions on regional haze in the first implementation period.

would be unreasonable. If such a distinction is not possible, however, the decision on what common control to require for all sources in the group should be based on consideration of the costs of compliance and emission reductions in the aggregate.

Similarly, sources within a sector will typically have different visibility impacts depending on their geographic proximity to affected Class I areas. Where it is feasible to discern among the sources to select and enforce different requirements, the entire group of sources should not be excused from additional control because the visibility benefits for some of the sources are deemed insufficient in comparison to the costs of control. If such distinction is not possible, however, the decision on what common control to require for all sources in the group should be based on consideration of the costs of compliance, emission reductions, and visibility benefits in the aggregate.

For source sectors in which sources are smaller and more numerous or for which specific information on the design and operation of each source is not available, it may not be possible to give separate consideration to the specifics of each source. The only practical choice may be to subject all the sources to a common requirement or to exclude them as a group. Similarly, for a source sector where there is only one practical method of enforcement, it may be necessary to treat all sources in the sector in a common way in terms of costs incurred, emissions reduced, and visibility benefits achieved. For example, a fuel-oil sulfur-content requirement may be practically enforceable only at the distributor level such that all customers will be affected the same way. In such situations, states should conduct an aggregate assessment of the four statutory factors and visibility benefits.

At a single source, the same concept applies at the unit or process level for facilities that include multiple units or processes that emit separately and could be controlled separately, i.e., states should assess units that can be controlled with separate equipment separately. States should not combine two potential emission control systems that have significantly different cost/ton values as if there were only the option of requiring both together. The combination of the two systems might have a cost/ton value that casts doubt as to its reasonableness, while one of the systems alone may be very reasonable based on a cost/ton comparison to other actions and consideration of the other three statutory factors and visibility benefits.

8.2.8. Concerns with use of the cost/deciview metric

The cost/deciview metric directly compares the costs of compliance with the visibility benefits of compliance. The EPA recommends that states not use the cost/deciview metric in their SIPs because it has the potential for being misunderstood by the public and state decision makers who are more familiar with the cost/ton metric. Moreover, the cost/deciview metric does not allow for apples-to-apples comparisons between sources because it does not adequately capture the magnitude of visibility benefits at multiple Class I areas or the fact that different sources impact different numbers of Class I areas.

8.2.9. Visitation

States should give equal consideration to visibility benefits at every Class I area and for every visitor. It is not appropriate to give less weight to protecting visibility in Class I areas with lower visitation. Some Class I areas, such as national parks, are intended by their authorizing legislation to be visited by many people and are managed towards that purpose, while others,

such as wilderness areas, are intended to be protected from most types of human disturbances and correspondingly do not host nearly as many visitors per year. The EPA does not believe that Congress intended there to be disparities in protection of visibility across these types of areas, as might result if states put more value on visibility protection in highly visited Class I areas or put less value on visibility protection in less visited areas. In addition, we do not believe that a state should give less weight to protecting visibility in a given Class I area during times of the year with lower visitation because we believe Congress intended the goal of eliminating visibility impairment to benefit all visitors.[125]

8.2.10. Viability of continued plant operations

Even when the cost/ton of a control measure is within the range of previous regulatory actions, in unusual cases the costs of compliance may raise issues regarding the viability of continued plant operations. The BART Guidelines address this possibility (*see* section IV.E.3.2 of the BART Guidelines, which are reproduced in Appendix D), and we recommend that states follow the same approach in the context of reasonable progress.

In unusual circumstances, states may investigate and take into consideration the conditions of the plant and the economic effects of requiring the use of a given control measure. These effects could include effects on product prices and the market share and profitability of the source. Where such unusual circumstances are judged to affect plant operations, a state may take into consideration the conditions of the plant and the economic effects of requiring the use of a control technology. Where these effects are judged to have a severe impact on plant operations, a state may consider them when determining whether the measure will have unreasonable impacts overall, but the state should provide an economic analysis that demonstrates, in sufficient detail for public review, the specific economic effects, parameters and reasoning. We recognize that this review process must preserve the confidentiality of any sensitive business information. The analysis may also consider whether other competing plants in the same industry have been required to install similar-cost controls if this information is available.

At the same time, in a robust competitive market for a product or service with many producers, it is often the case that one or more producers may be only marginally competitive, with a small margin of operating profit. Therefore, it is not unsurprising that the additional cost of complying with a newly required emission control measure may make marginal producers uncompetitive. We believe that in requiring states to have an LTS that contains measures necessary to make reasonable progress, Congress did not intend to indefinitely protect the market position of marginal producers by shielding them from the costs of additional emission controls that have already been put in place on similar sources in other locations or markets. Accordingly, states should not consider a control measure to be unreasonable on the sole basis that one or a small number of marginal producers would be at risk of leaving the market.

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[125] The 2005 BART rule preamble stated, "Other ways that visibility improvement may be assessed to inform the control decisions would be to examine distributions of the daily impacts, determine if the time of year is important (e.g. high impacts are occurring during tourist season), consideration of the cost-effectiveness of visibility improvements (i.e. the cost per change in deciview), using the measures of deciview improvement identified by the State, or simply compare the worst case days for the pre- and post-control runs." This is no longer our position on the subject of considering visitation.

8.3. Time necessary for compliance

While the CAA and the Regional Haze Rule require states to consider the four statutory factors when selecting emission control measures for the LTS, we believe that the time necessary for compliance factor should enter the decision-making process in a different way than the other three factors. Whereas high compliance costs, adverse energy or non-air quality impacts or a short remaining useful life may weigh in the direction of not including a particular control measure in the LTS, the time necessary for compliance does not present the same type of barrier because the long time perspective of the regional haze program extends well beyond the time required to install and "shake down" any emission control system. Therefore, the EPA believes that states should consider the time necessary for compliance by setting reasonable compliance deadlines for selected control measures rather than when deciding whether to adopt the control measures in the first instance. In other words, the other three factors determine *how much* progress is reasonable, while the time necessary for compliance factor determines *when* that progress is reasonable.

8.4. Energy impacts

The EPA recommends that states consider energy impacts by accounting for any increase or decrease in energy use at the source as part of the costs of compliance. Upstream energy impacts, like the energy used to produce construction materials, are already be reflected in the price of those materials and should not be double counted.

8.5. Non-air quality environmental impacts

The EPA recommends that states consider ordinary non-air quality environmental impacts, such as water usage or waste disposal of spent catalyst or reagent, by accounting for them as part of the costs of compliance. In rare location-specific cases, the installation of a control measure may lead to adverse non-air quality environmental impacts that are extreme or unusual for a particular type of source. In these cases, states may consider such impacts separately from the costs of compliance when determining whether the measure is necessary to make reasonable progress. States should also consider any beneficial non-air quality environmental impacts, which could result in the adoption of an emission control measure that otherwise would seem less attractive or reasonable.

Air deposition effects on water, soils and vegetation are air impacts. The CAA does not require states to consider air impacts when determining reasonable progress. Therefore, states may but are not required to consider such impacts. Generally, when visibility-impairing emissions are reduced, reductions in the deposition of substances that have adverse effects on the environment will also occur. Greenhouse gas emissions and climate change impacts are also air impacts, so states may but are not required to consider such impacts.

8.6. Remaining useful life

Section 7.5 discusses how states should determine the remaining useful life of a source and the useful life of new emission control systems. States should consider remaining useful life to calculate emission reductions, amortized costs and cost/ton values.

If a source is certain to close by 2028 under an enforceable requirement, states may consider that to be a sufficient reason not to require any additional controls at the source in the LTS. This is a

recommendation that applies only to this implementation period in light of the shorter-than-normal interval between the 2021 and 2028 SIP submission deadlines. See the discussion in section 6.4 of this situation in the context of the screening step.

8.7. What special considerations apply in selecting additional controls for minor stationary sources, area stationary sources and mobile sources?

Regional Haze Rule provision

> (2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.*
>
> * * *
>
> (v) The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy and the criteria used to select the sources considered. The State should consider major and minor stationary sources, mobile sources, and area sources.

Minor stationary sources and area stationary sources may be important contributors to anthropogenic visibility impairment, and present significant opportunity for visibility improvements in the second implementation period for some Class I areas. The Regional Haze Rule recommends that states consider minor stationary sources, area sources and mobile sources in addition to major stationary sources, and that the state identify which of these source types it has considered. Some of the statements in this guidance about decision making logically apply to these sources or may be logically adapted and extended to them. Other sections of this document contain information or recommendations specific to minor stationary sources, area stationary sources and/or mobile sources. The EPA regional offices are available to discuss how information and advice from EPA may bear on particular situations.

One recommendation for screening is that sources in these categories be aggregated for purposes of any screening step based on visibility impacts or surrogates for visibility impacts, so that the individual sources in a group or category with substantial aggregate impacts will be selected four-factor analysis. However, the EPA recommends that differences among the sources in a group of small sources with respect to the four CAA-specified factors should be taken into account in the four-factor analysis the four-factor analysis when determining whether and what additional emission controls are needed for reasonable progress, to the extent practicable. For example, in a group of internal combustion engines there may be considerable variation in their vintage, existing emission controls and remaining useful life that would affect some of the four factors.

Generally, the EPA does not recommend that states use their analytical and decision making resources to consider new emissions standards for highway vehicles, locomotives, non-road vehicles, hand-held and self-propelled equipment, or turbine-powered aircraft, given that new vehicles and engines in these categories are subject to stringent EPA or California emission standards.[126]

[126] Federal and California emissions standards have generally become more closely aligned in the past decade or so, and California versions are often sold in other states.

Some engines used at major or minor stationary sources are regulated as mobile sources by virtue of being moved at least once per year. As mobile sources, emissions from these engines are not counted in determining whether a source is subject to major source new source review, and even if a source is subject to such review due to emissions that are considered to be stationary source emissions, these mobile engines are not subject to BACT, LAER, or emission offsets. Depending on age, an engine of this type at the time of first sale or installation may have been subject to new engine emission standards that were lenient compared to emission standards applying to engines sold more recently. Aggregate emissions of such mobile source engines in some areas may be considerable, particularly when they provide mechanical or electrical power in the absence of service from an electric grid. Replacement of such engines with newer engines, or retrofit with engine modifications or after treatment systems, may provide emission reductions that would contribute to reasonable progress towards natural visibility conditions. States where this type of situation occurs should not remove these engines at the screening step, and should evaluate potential emission reductions measures with respect to the four factors.

8.8. How should a state set emission limits, averaging periods and monitoring and record keeping requirements?

Regional Haze Rule provisions

51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.*

* * *

(vi) The State must consider, at a minimum, the following factors in developing its long-term strategy:

* * *

(C) Emissions limitations and schedules for compliance to achieve the reasonable progress goal;

8.8.1. General CAA requirements and EPA guidance

The Regional Haze Rule requires SIPs to include enforceable emission limits including averaging times, monitoring and record keeping and reporting requirements for each measure included in the LTS. This requirement is in common with many other parts of the air program, and there is a considerable body of applicable EPA rules, EPA guidance and EPA and state practice on these topics.

Generally, limits should initially be determined in terms of pounds per input or output (or per hour of operation), so that they can be clearly related to the technology or other emission control measure that has been determined to be needed for reasonable progress. Then, these limits may be replaced with time-based limits (e.g., a cap on 30-day or annual emissions) that would allow operating changes to be used for compliance.

8.8.2. Current emissions rates versus enforceable limits

In the BART process, a state was generally required to establish emission limits reflecting the capability of currently installed control technology if that technology was determined to be BART for a source. For reasonable progress purposes, the same requirement applies. That is, if a

state determines that the in-place emission controls at a source are necessary to make reasonable progress, the state is required to adopt an LTS that includes those controls if those controls are not already federally enforceable. The LTS can be said to include those controls only if it includes emission limits (with associated averaging periods and other compliance program elements) that effectively require the use of the controls, or a more effective control. If the currently enforceable emission limits are not stringent enough to ensure the continued use of that technology (and good operating practices), then they must be revised in order for the LTS to meet this requirement.[127]

8.8.3. EPA's Startup, Shutdown and Malfunction Policy

The EPA's June 12, 2015, restatement of its SSM Policy for SIPs applies to regional haze SIPs.[128] SSM exemptions, director's discretion (unless narrowly constrained), SIP provisions that impinge on federal enforceability and affirmative defenses for federal enforcement are not allowed. As discussed in section 8.9.4, alternative emissions limitations may be appropriate during startup, shutdown and other periods of normal operation during which compliance with the emission limit applicable during most source operation is not feasible or is unreasonable to require.

8.8.4. Averaging periods

To avoid possible confusion, we address here a difference in how averaging periods should be considered in the context of reasonable progress in a regional haze SIP and in the context of programs oriented towards protecting the NAAQS.[129] The NAAQS and PSD increments are "hard limits" on ambient air quality that are not to be violated, and if violations occur they are to be corrected. For these requirements, it is appropriate to consider the possibility that a source (or group of nearby sources) subject to an emission limit with an averaging period longer than the averaging period of the NAAQS (or PSD increment) might have a period of emissions high enough to cause an exceedance of the NAAQS, and the issues that would exist if those emissions could not be treated as a violation of the source's emission limit. Such high emissions might occur due to a malfunction, a startup or shutdown period, a period of improper source operation or a period of normal source operation but a high level of source activity. EPA rules and policies aim to avoid this situation in order to protect the NAAQS and PSD increments. Towards this end, the EPA's SSM Policy for SIPs, consistent with a fundamental CAA requirement, requires any emission limitation in a SIP to apply continuously including periods of startup, shutdown and malfunction. However, the specific numerical limit that applies during startup or shutdown may be different than during other periods of operation, in which case the limit is referred to as

[127] This situation is not the same as a situation in which via a screening process a state has decided not to advance a source to a full reasonable progress analysis. In such a situation, the state is not determining that the existing controls on the source are necessary and sufficient for reasonable progress and is not including those controls in its LTS revision. Rather, it is deferring a decision on that source until a later implementation period. Thus, it is not true that a state must revise every sources' emission limits to reflect the capability of the control technology in use at the source.

[128] State Implementation Plans: Response to Petition for Rulemaking; Restatement and Update of EPA's SSM Policy Applicable to SIPs; Findings of Substantial Inadequacy; and SIP Calls To Amend Provisions Applying to Excess Emissions During Periods of Startup, Shutdown and Malfunction; Final Rule, 80 FR 33840, June 12, 2015.

[129] This discussion also has relevance to protection of PSD increments.

an alternative emission limit. Also, in certain situations, the emission limitation during startup or shutdown may take the form of a work practice instead of a numerical limit.

In contrast, the reasonable progress component of the regional haze program is not based on any "hard limits" for actual visibility conditions. Rather, it is based on requiring the implementation of emission reduction measures necessary to make reasonable progress by establishing enforceable emission limits on sources, and by implication also requiring the proper operation of those controls on a continuous basis. The visibility conditions that would be achieved by such implementation (in addition to other measures required under other CAA provisions), whatever those conditions are, is by definition the goal of the program at a particular point in time.

In this context, it is still important to the goal of the regional haze program that there be appropriate emission limits during startup and shutdown, as required by the CAA and the EPA's SSM policy for SIPs. It is also still important that malfunctions and improper source operation constitute violations that can be subject to enforcement; this can be achieved if emission limits and averaging periods are coordinated so that the combination of the two does not have so much "slack" that malfunctions and improper source operation do not constitute violations.[130] It is not always necessary to have a short averaging period to achieve this effect.

While it is important that the combination of emission limit and averaging period not have so much "slack" that malfunctions and improper source operation do not constitute violations, there is not the same concern about a source (or group of sources) subject to a long averaging period operating at a high level of throughput or output for a period of one or a few days and as a result having a relatively high impact on visibility at a Class I area during that period. Rather, the need is for sources with high and variable operating levels to have effective emission controls in operation at all times. While our recommendations in section 6 regarding screening could have the effect that a source that contributes substantially to impairment on as few as one of the 20 percent most impaired days would be brought forward from screening to assess what emission control is necessary to make reasonable progress, this does not mean that such a source should be expected to reduce its operations. We do not interpret the Regional Haze Rule as requiring states to consider restricting the level or timing of source operation. Therefore, a state may adopt an averaging period longer than 24 hours without demonstrating that the combination of emission limit and averaging period will prevent a source from having a particularly high visibility impact on one day due to a high level of activity. We note that under requirements flowing from other CAA provisions and EPA rules, sources may be subject to emission limits for pollutants that contribute to visibility that have averaging periods as short as 1 hour.

8.8.5. Intermittent controls

If it can be reasonably anticipated that a source will only operate during certain times of the year, for example wood-burning home heating units, measures may be explicitly limited to those times of the year. Otherwise, any state considering adoption of a measure that would set an emission limitation that only applies during specified portions of a year or during specified conditions should consult with its EPA regional office, as the requirements of the CAA on the subject of

[130] As previously noted, if the pattern of future source operation is too variable to set a single emission limit for a single averaging period, more complicated approaches are available to ensure that malfunctions and improper source operation will trigger enforcement.

intermittent controls require situation-specific interpretation. We note that even if the 20 percent most impaired day together fall only in some of the four seasons, the CAA goal of achieving natural visibility conditions is not restricted to those days.

8.8.6. Continued relevance of the BART Guidelines

Many of the statements in the BART Guidelines continue to be relevant as recommendations for how a state should address emission limits, averaging periods and monitoring and record keeping requirements. Appendix D indicates which parts of the BART Guidelines continue to be relevant in this way.

8.9. How should a state set compliance deadlines?

The state should set a compliance deadline that provides reasonable time for the source to come into compliance in an efficient manner, without unusual amounts of overtime, above-market wages and prices, or premium charges for expedited delivery of control equipment. The CAA and Regional Haze Rule provide that compliance deadlines for BART requirements be as expeditiously as practicable but in no case later than 5 years from EPA approval of the SIP containing a new BART requirement. There is no similar provision for controls adopted for purposes of reasonable progress. While a state may be able to demonstrate that in some cases a reasonable compliance deadline is later than a deadline that is "as expeditiously as practicable," we expect such cases to be very unusual. The EPA believes that only in an unusual situation would a reasonable compliance deadline be more than 5 years after EPA approval of the SIP.

It is reasonable for a state to tie the compliance deadline for a new requirement to EPA approval of the specific SIP provision containing that new requirement, as otherwise a source might have to make investments that would be at risk if the EPA disapproves the SIP provision. However, the language a state uses to establish this link should not make the compliance date dependent on full EPA approval of the SIP revision. It should be sufficient if the EPA approves the particular emission limit as adequate for purposes of the LTS for that particular source, even if the LTS is not fully approved overall.

The RPGs for the second implementation period are to be based only on the combined effect of the controls with compliance dates on or before December 31, 2028 (the end of the second implementation period). Given the July 31, 2021, SIP revision submission deadline and the CAA deadline of 1 year for EPA action on a submitted and complete SIP revision, we expect that all measures included in the SIP for the second implementation period to be implementable by December 31, 2028, even if the compliance date is tied to EPA approval. Thus, the RPGs generally should reflect all measures in the LTS.

The time necessary for compliance generally should be considered to be a source-by-source question, with each source required to comply by the soonest date that can be considered reasonable. The EPA does not expect that in the second implementation period there will be a situation in which the time necessary for compliance at one source is increased because available design, construction, general project management or financing resources are oversubscribed due to an unusually large number of similar projects needing to move forward about the same time. However, a state may set a compliance schedule that appropriately takes into account the risks of

taking multiple electrical generating units serving the same market off line at the same time if these risks have been well researched and documented.[131]

[131] In the first implementation period, the EPA considered and invited public comment on the question in Wyoming of whether requiring multiple EGUs to install SCR units (as BART) close in time would be overly risky to power system reliability, or would cause unreasonable additional cost to purchase replacement power, given that each unit would have to be taken off line during construction.

9. Regional scale modeling of the LTS to set the RPGs for 2028 (Step 5)

Regional Haze Rule provisions

51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.* Each State must submit a long-term strategy that addresses regional haze visibility impairment, and if necessary any reasonably attributable visibility impairment certified by the Federal Land Manager under §51.302(a), for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to achieve reasonable progress, as determined pursuant to (f)(2)(i) through (vi). In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) The State must consider and analyze emission reduction measures based on the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected major or minor stationary source or group of sources. The State must document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy.

(ii) The State must consider the uniform rate of improvement in visibility, the emission reduction measures identified in (f)(2)(i), and additional measures being adopted by other contributing states in (f)(2)(iii) as needed to make reasonable progress towards natural visibility conditions for the period covered by the implementation plan.

* * *

(3) *Reasonable progress goals.* (i) A state in which a mandatory Class I Federal area is located must establish reasonable progress goals (expressed in deciviews) that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of all enforceable emissions limitations, compliance schedules, and other measures required under paragraph (f)(2) and the implementation of other requirements of the CAA. The long-term strategy and the reasonable progress goals must provide for an improvement in visibility for the most impaired days and ensure no degradation in visibility for the clearest days since the baseline period.

* * *

(iii) The reasonable progress goals established by the State are not directly enforceable but will be considered by the Administrator in evaluating the adequacy of the measures in the implementation plan in providing for reasonable progress towards achieving natural visibility conditions at that area.

(iv) In determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions, the Administrator will also evaluate the demonstrations developed by the State pursuant to paragraphs (f)(2) and (f)(3)(ii)(A) of this section and the demonstrations provided by other States pursuant to paragraphs (f)(2) and (f)(3)(ii)(B) of this section.

9.1. Overview

After a state has used reasoned decision making to determine an emissions control scenario that reflects reasonable progress at Class I areas affected by sources in the state (step 4, section 8), the state must use this control scenario and the measures adopted by any contributing states into their LTSs, along with recent visibility conditions (i.e., the conditions in the year chosen as the base year for the air quality modeling), to project visibility conditions on the 20 percent most impaired and 20 percent clearest days at Class I areas within the state as of the end of the implementation period.[132] These visibility projections (in deciviews) are the RPGs and are the visibility outcomes projected to occur at the end of the implementation period. If some contributing states have not yet determined the measures that will be included in their LTSs, then the state with the Class I area is to set RPGs based on confirmed measures.

The state's goals must provide for an improvement in visibility for the most impaired days and ensure no degradation in visibility for the clearest days over the implementation period. After a state projects an RPG for the most impaired days based on the components of the LTS, the state must compare the RPG for the end of the implementation period with the same year on the URP line (for the second implementation period this year is 2028), and if the RPG provides for a slower rate of progress (i.e., the RPG is above the line), the state has additional obligations to provide justification for the reasonableness of the RPG. This analysis is described more in section 10 (step 6).

9.2. EPA modeling guidance

Many of the details associated with the modeling process for projecting RPGs are carefully explained in the EPA's Modeling Guidance, section 4.8 of which directs states through the steps required to apply base period and future year air quality model simulation results to ambient data, resulting in calculations of RPGs.

9.3. Recognition of emission limits in the LTS and other emission reductions when projecting the RPGs

A state's RPGs for the end of each implementation period should only reflect the benefits of controls in the LTS that will be enforceable as of the last day of the implementation period. (For example, for the second implementation period, RPGs should reflect only the controls in the LTS that will be enforceable as of December 31, 2028. If some measures are to take effect during 2028, we recommend that daily emission values for days in 2028 used in air quality modeling reflect the emission limits that are effective as of each day.) Other enforceable emission limits should be recognized in the emissions projections as well.

The recognition of factors that may be limiting emissions but are not enforceable measures, such as voluntary and incentive-based programs (include energy efficiency and renewable energy programs) and market price conditions that might change in the future, is a complex topic. States should consult with their EPA regional offices on this topic if they do not find clear guidance in available EPA guidance on this topic.

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[132] States with no Class I areas do not set RPGs, but must consult with states affected by their emissions.

9.4. Recommendations regarding adjustment of RPGs when the LTS in the SIP(s) is not the same as assumed in an available photochemical modeling run

While in concept every contributing state's LTS should be determined and then air quality modeling should translate those strategies into the projected RPGs, the EPA realizes that in practice this sequence may not hold entirely. At the time the air quality modeling is performed, it may be necessary to assume the outcome of final decisions by some states on the content of their LTS. Also, subsequent SIP revisions or FIPs may alter the content of the LTS in one or more states contributing to visibility impairment at a Class I area. Because the air quality modeling to calculate RPGs is resource intensive and time consuming, we do not expect it to be repeated after each change in the content of an LTS. Nevertheless, the revised Regional Haze Rule requires the RPGs and the LTS to be consistent. An RPG may be adjusted to reflect a difference between the final LTS and the assumptions used in the initial projection of the RPGs without re-running the air quality modeling if time and resources to do so are not reasonably available. States in this situation should consult with the EPA about an appropriate method for doing so, which may depend on the specifics of the case and information that is available. Any such adjustment should be clearly documented in the SIP submission.

10. Progress, Degradation and Glidepath Checks (Step 6)

10.1. How should a state demonstrate that there will be improvement in visibility for the most impaired days?

Regional Haze Rule provisions

> 51.308(f)(3) *Reasonable progress goals.* (i) ... The long-term strategy and the reasonable progress goals must provide for an improvement in visibility for the most impaired days …

The 2028 RPG for the 20 percent most impaired days is to be compared to the 2000-2004 "baseline conditions" for the same days. The "baseline conditions" are determined from IMPROVE data, using the approach recommended in section 5 of this document or another method justified by the state.

10.2. How should a state demonstrate that its 2028 RPG for the 20 percent clearest days shows no degradation?

Regional Haze Rule provisions

> 51.308(f)(3) *Reasonable progress goals.* (i) ... The long-term strategy and the reasonable progress goals must … ensure no degradation in visibility for the clearest days since the baseline period.

The 2028 RPG for the 20 percent clearest days is to be compared to the 2000-2004 "baseline conditions" for the same days. The "baseline conditions" are determined from IMPROVE data, using the approach recommended in section 5 of this document or another method justified by the state.

We expect that the RPG for the end of the second implementation period will be predicted by air quality modeling that is based on meteorology from a year in the range of 2011 to 2017 depending on SIP submittal date and the timing of SIP development (and a base emissions inventory from a year within the same range and close to the year of the meteorology). It is conceivable for there to be differences between the meteorology in the 2000-2004 period and the meteorology for the base year for the air quality modeling that would introduce some positive or negative increment into this comparison, unrelated to emission changes between 2000-2004 and 2028, particularly because only a single year of meteorology will be used in the air quality modeling. A state may develop a technically valid adjustment for such a difference, but should consult with EPA and the FLMs before incorporating that adjustment into its SIP.

10.3. How should a state with an RPG that is not on the glidepath demonstrate that there are no additional measures that are necessary to make reasonable progress?

Regional Haze Rule provisions

> 51.308(f)(3) *Reasonable progress goals.*
>
> * * *
>
> (ii)(A) If a State in which a mandatory Class I Federal area is located establishes a reasonable progress goal for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress calculated under paragraph

(f)(1)(vi) of this section, the State must demonstrate, based on the analysis required by paragraph (f)(2)(i) of this section, that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the long-term strategy. The State must provide a robust demonstration, including documenting the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy…

(B) If a State contains sources which are reasonably anticipated to contribute to visibility impairment in a mandatory Class I Federal area in another State for which a demonstration by the other State is required under (f)(3)(ii)(A), the State must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in its own long-term strategy. The State must provide a robust demonstration, including documenting the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy.

The Regional Haze Rule includes a requirement that the state with a Class I area compare its 2028 RPG for the 20 percent most impaired days to the 2028 point on the URP line. This comparison determines whether the state, and any contributing upwind states, must submit an additional demonstration that its LTS provides for reasonable progress.

Thus, if a state in which a mandatory Class I Federal area is located establishes an RPG for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress calculated under paragraph (f)(1)(vi) of this section, that state and any contributing states must demonstrate, based on the factors in paragraph (f)(2)(i) of this section, that there are no additional emission reduction measures for any of its own anthropogenic sources or source categories that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS.

A state's response in this situation should include, but not necessarily be limited to, the following steps:

- For any sources for which additional technically feasible controls were rejected because the cost/ton for the measure was higher than for a prior regulatory requirement at a similar source, consider whether there are distinguishing features of the specific source that would make the cost of compliance with the measure reasonable for that source.
- Compare the visibility impact threshold (or threshold for a surrogate for visibility impacts) it has used in screening to the thresholds used by other states that contribute to visibility impairment at the same Class I area. If the state's threshold is significantly higher than used by other states, the screening should be repeated with a more similar threshold.
- Bring forward for four-factor analysis sources in any sector that has recently experienced, or may reasonably be expected to experience, emissions growth that is higher than the overall economic growth rate in the state.

- If the Class I area is one which is currently relatively close to natural visibility conditions compared to more impaired Class I areas affected by sources in the state, repeat the screening step using a percentage of impairment threshold rather than an absolute visibility impact threshold. The percentage used as the threshold can be set equal to or similar to the percentage that corresponds to the absolute impact threshold at the more impaired Class I area.
- Review the sources and source categories that still are not brought forward from the revised screening step and assess whether any of them are of a type and size for which more effective emission control measures are in place, or will be required by the LTS as it has been formulated so far, at similar sources in the same or other states.[133]

10.4. Calculation of the number of years it would take to attain natural visibility conditions

Regional Haze Rule provisions

51.308(f)(3) *Reasonable progress goals.*

* * *

(ii)(A) If a State in which a mandatory Class I Federal area is located establishes a reasonable progress goal for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress calculated under paragraph (f)(1)(vi) of this section, the State … must provide to the public for review as part of its implementation plan an assessment of the number of years it would take to attain natural visibility conditions if visibility improvement were to continue at the rate of progress selected by the State as reasonable for the implementation period.

If the RPG for the 20 percent most impaired days for a Class I area is above the URP line, the state with the Class I area must provide to the public for review as part of its implementation plan an assessment of the number of years it would take to attain natural visibility conditions for the 20 percent most impaired days if visibility improvement continues at the rate of progress selected by the State as reasonable.[134]

[133] The EPA's approach in developing a FIP for reasonable progress for sources in Texas is an example of estimating visibility impacts at each Class I area, in both absolute terms (relative to a natural/clean background) and as a percentage of overall impairment at the Class I area. We removed from four-factor analysis some sources that were responsible for only very small fractions of overall impairment. We then estimated visibility benefit from potential controls at the remaining sources and weighed these benefits against the four factors.

[134] Note to reviewers of this draft guidance document: The recommendation here in essence makes a projection of the number of years needed to reach natural visibility conditions based on the rate of progress achieved since the baseline period of 2000-2004 as of 2028. An alternative approach would make this projection by starting with "current visibility conditions," typically representing a period shortly before SIP submission. From this point, the number of years needed to reach natural visibility conditions would be calculated based on the rate of progress between the current visibility condition period and the 2028 RPG in the SIP revision. Comment is invited on which approach would be most useful to public understanding, as such public understanding is the goal of this requirement of the Regional Haze Rule. We note that no consequences to a state or to approval of the SIP would be based on this projection of the number of years that would be required to reach natural visibility conditions.

The number of years (N) should be calculated as follows.

$$N = \frac{(Baseline\ visibility\ conditions - Natural\ visibility\ conditions)}{[(Baseline\ visibility\ conditions - RPG_{2028})/24]}$$

11. What are the additional requirements for a regional haze SIP?

11.1. Additional requirements of Regional Haze Rule section 308(f)(2)(ii) for long-term strategies

Regional Haze Rule provisions

> 51.308(f)(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.* Each State must submit a long-term strategy that addresses regional haze visibility impairment, and if necessary any reasonably attributable visibility impairment certified by the Federal Land Manager under §51.302(a), for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to achieve reasonable progress, as determined pursuant to (f)(2)(i) through (vi). In establishing its long-term strategy for regional haze, the State must meet the following requirements:
>
> (i) The State must consider and analyze emission reduction measures based on the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected major or minor stationary source or group of sources. The State must document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy.
>
> (ii) The State must consider the uniform rate of improvement in visibility, the emission reduction measures identified in (f)(2)(i), and additional measures being adopted by other contributing states in (f)(2)(iii) as needed to make reasonable progress towards natural visibility conditions for the period covered by the implementation plan.

The state must consider the uniform rate of improvement in visibility.

A state with a Class I area gives adequate consideration to this factor by determining the uniform rate of visibility improvement per the requirement of section 308(f)(1) and comparing its RPG for the 20 percent most impaired days to the URP line and, if applicable, providing the additional demonstration per the requirement of section 308(f)(3)(ii)(A).

A state with sources that may be reasonably anticipated to contribute to impairment at a Class I area in another state gives sufficient consideration to the first of these items by being aware of the outcome of the comparison of the RPG for the 20 percent most impaired days to the URP line and providing the additional demonstration per the requirement of section 308(f)(3)(ii)(B).

The state must consider the emission reduction measures identified in (f)(2)(i).

This requirement applies in the same way to all states affecting a given Class I area. Section (f)(2)(i) contains two references to "measures." The first sentence refers to measures that a state considers and analyzes. The second sentence refers to measures that the state has selected for inclusion in its LTS. Section (f)(2)(ii) refers to the first sentence, i.e., all the measures that the state has chosen for four-factor analysis, because it would not be logical to say that in selecting measures for the LTS a state should consider the measures it has already selected for such

inclusion. A state gives adequate consideration to the emission reduction measures it is analyzing by comparing them to measures being considered (or already adopted) by other contributing states and by meeting the other requirements of the Regional Haze Rule.

The state must consider the additional measures being adopted by other contributing states in (f)(2)(iii) as needed to make reasonable progress towards natural visibility conditions for the period covered by the implementation plan.

This requirement applies in the same way to all states affecting a given Class I area. A state gives adequate consideration to this factor by consulting with other contributing states to learn what additional measures they are considering or plan to adopt and how they are taking the CAA-specified factors, and visibility benefits if applicable, into consideration when determining what additional measures are necessary to make reasonable progress. A state should not fail to adopt a measure for a source within its own boundaries solely on the rationale that sufficient progress is being provided by measures adopted by another state, regardless of the known or anticipated position of the RPG relative to the URP line. If a state is applying an explicit decision rule with respect to one of the CAA-specified factors, or to visibility benefits that is less protective of visibility than other contributing states, the state should explain in its SIP why it is reasonable to take that approach for its own sources.

11.2. Other requirements in Regional Haze Rule section 308(f)(2)(iv)

Section 308(f)(2)(iv) of the revised Regional Haze Rule requires that when developing its LTS, a state must consider seven listed factors. A state necessarily gives consideration to some of these factors as it meets other requirements of the Regional Haze Rule. Some of the listed factors are associated with requirements that apply to all SIPs but are not explicitly repeated in the text of the Regional Haze Rule. Particular EPA guidance on each of these factors is provided below. In general, the EPA believes that these factors can be adequately considered without consuming substantial state resources in terms of research, deliberation or documentation in the SIP revision submittal.

308(f)(2)(iv)(A) - Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment.

This factor is considered by taking into account the existing and to-be-installed emission controls at each source that is subject to a screening analysis or considered for a new requirement for additional controls. It is also considered when the RPGs are determined via air quality modeling that uses baseline and projected emission inventories that reflect these ongoing programs, and then the RPGs are compared to the URP line to determine whether additional analysis of measures for possible inclusion in the LTS is needed.

308(f)(2)(iv)(B) - Measures to mitigate the impacts of construction activities.

The SIP submission for the second planning period should refer to the section of the regional haze SIP submission for the first implementation period that showed that the state had considered this issue, indicate that the EPA has approved that portion of the previous SIP submission, and qualitatively describe any significant changes including any large positive or negative change in construction activity and significant measure to mitigate impacts of construction activity adopted since the previous SIP revision. The state is not required to incorporate such measures into the SIP.

308(f)(2)(iv)(C) - Emissions limitations and schedules for compliance to achieve the RPG.

It is a general requirement that SIPs include emissions limitations and schedules for compliance with required measures, so a state will adequately consider these by meeting that requirement for additional measures included in the LTS as necessary to make reasonable progress.

308(f)(2)(iv)(D) - Source retirement and replacement schedules.

The state will adequately consider this factor as part of adequately considering the remaining useful life of sources subject to full reasonable progress analysis.

308(f)(2)(iv)(E) - Basic smoke management practices for prescribed fire used for agricultural and forestry management purposes and smoke management programs as currently exist within the state for these purposes.

The recommendations in sections 6.5 and 7.1 address this requirement.

308(f)(2)(iv)(F) - Enforceability of emissions limitations and control measures.

It is a general requirement that measures incorporated into a SIP be enforceable.

308(f)(2)(iv)(G) - The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the LTS.

The state gives adequate consideration to this factor when it determines the RPGs that reflect measures in its own and contributing states' LTS.

11.3. Requirement for elements to make the SIP serve as a progress report on emission reductions

Regional Haze Rule provisions

> 40 CFR 51.308(f)(5) So that the plan revision will serve also as a progress report, the State must address in the plan revision the requirements of paragraphs (g)(1), (g)(2), (g)(4), and (g)(5) of this section. However, the period to be addressed for these elements shall be the period since the past progress report.
>
> 40 CFR 51.308(g) …Periodic progress reports must contain at a minimum the following elements:
>
> (1) A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the State.
>
> (2) A summary of the emissions reductions achieved throughout the State through implementation of the measures described in paragraph (g)(1) of this section.
>
> (4) An analysis tracking the change over the period since the period addressed in the most recent plan required under paragraph (f) of this section in emissions of pollutants contributing to visibility impairment from all sources and activities within the State. Emissions changes should be identified by type of source or activity. With respect to all sources and activities, the analysis must extend at least through the most recent year for which the state has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of subpart A of this part. With

respect to sources that report directly to a centralized emissions data system operated by the Administrator, the analysis must extend through the most recent year for which the Administrator has provided a State-level summary of such reported data or an internet-based tool by which the State may obtain such a summary. The State is not required to backcast previously reported emissions to be consistent with more recent emissions estimation procedures, and may draw attention to actual or possible inconsistencies created by changes in estimation procedures.

(5) An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred since the period addressed in the most recent plan required under paragraph (f) of this section including whether or not these changes in anthropogenic emissions were anticipated in that most recent plan and whether they have limited or impeded progress in reducing pollutant emissions and improving visibility.

For a SIP for the second implementation period, the "period since the past progress report" will be the period since submission of the first progress report for the first implementation period, since the 2016 revisions to the Regional Haze rule eliminated the requirement for any other progress report that would otherwise have been due before 2025. Many of these first progress reports were submitted late, and may not have described implementation activities during the few years prior to their actual submission. Consequently, the interval between when this first progress report was submitted and when the SIP for the second implementation period is submitted may not include some historical years that would still be of public interest. To avoid a gap in the reporting of past implementation activities, we recommend that the SIP for the second implementation period cover the period starting with the first year that was not actually covered by the first progress report through a year that is as close as possible to the point of submission of the SIP.

The EPA issued general principles for the first progress reports in 2013.[135] Except where these guidelines for progress reports are not consistent with the current provisions of the Regional Haze Rule as revised in 2016,[136] these guidelines may be applied to the "progress report" aspect of the SIP due in 2021.

11.4. Monitoring strategy elements

Regional Haze Rule provisions

40 CFR 51.308(f)

* * *

(4) If the Administrator, Regional Administrator, or the affected Federal Land Manager has advised a State of a need for additional monitoring to assess reasonably attributable visibility impairment at a mandatory Class I Federal area in addition to the monitoring currently being conducted, the State must include in the plan revision an appropriate

[135] General Principles for the 5-Year Regional Haze Progress Reports for the Initial Regional Haze State Implementation Plans (Intended to Assist States and EPA Regional Offices in Development and Review of the Progress Reports), April 2013. *https://www.epa.gov/sites/production/files/2016-03/documents/haze_5year_4-10-13.pdf.*

[136] The 2016 revisions to the Regional Haze Rule provided more specificity as to the most recent year for which emissions must be reported than was stated in the General Principles.

strategy for evaluating reasonably attributable visibility impairment in the mandatory Class I Federal area by visual observation or other appropriate monitoring techniques.

* * *

(6) *Monitoring strategy and other implementation plan requirements*. The State must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State. Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network. The implementation plan must also provide for the following:

(i) The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.

(ii) Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas both within and outside the State.

(iii) For a State with no mandatory Class I Federal areas, procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.

(iv) The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.

(v) A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

At the time this document was prepared, the EPA is not expecting that any state will need to address these requirements in a manner differently than in its SIP for the first implementation period. States with questions or concerns, or that receive public comments that raise issues related to these requirements, should consult with their EPA regional office and with the FLMs for affected Class I areas.

APPENDIX A

Key Steps and Tasks in Developing a Regional Haze SIP

Reference Number	Step or Task	Relevant Regional Haze Rule Provisions	Relevant Document Section
1	Take inventory of information resources available for SIP development.	Not explicitly addressed.	Not explicitly addressed.
2	Determine Class I areas in other states that may be reasonably anticipated to be affected by emission sources in the state.	51.308(f)(2)	6.1
3	Determine which other states have sources that may be reasonably anticipated to affect in-state Class I areas.	51.308(f)(2)	Not explicitly addressed.
4	Consult with these states on an ongoing basis, through multi-state organizations and directly.	51.308(f)(2)	4.8
5	Consult with FLMs for these in-state and out-of-state Class I areas on an ongoing basis.	51.308(i)	4.8
6	Determine baseline, current and natural visibility conditions for the 20 percent most impaired days and the 20 percent clearest days, for each in-state and out-of-state Class I area.	51.308(f)(1)	5.9, 5.8, 5.11
7	Develop current extinction budgets for each Class I area.	Not explicitly addressed.	*See* the TSD.
8	Identify significant future trends in emissions.	51.308(f)(4)	Not explicitly addressed.
9	(Optional) Conduct source apportionment modeling and/or review available results from such modeling by other parties.	Not explicitly addressed.	6.2
10	(Optional) Estimate visibility impacts for screening purposes.	Not explicitly addressed.	6.2
11	Select sources for four-factor analysis.	51.308(f)(2)	6.3
12	Identify emission control measures to be considered for these sources.	51.308(f)(2)	7.1
13	Quantify the four factors for these sources and measures.	51.308(f)(2)(i)	7.2 – 7.5
14	(Optional) Quantify visibility benefits for these sources and measures.	Not explicitly addressed.	6.2
15	Select measures for inclusion in the LTS	51.308(f)(2)	8
16	Set emission limits, averaging periods and monitoring and record keeping requirements.	51.308(f)(2)(vi)(C)	7.1
17	Set compliance deadlines.	51.308(f)(2)(i)	7.3
18	Project the 2028 RPGs for the 20 percent most impaired and 20 percent clearest days.	51.308(f)(3)	9
19	Compare 2028 RPG for the 20 percent most impaired days to the 2028 point on the URP line and if above the line demonstrate that there are no additional measures that are necessary to make reasonable progress.	51.308(f)(3)(ii)	10

Reference Number	Step or Task	Relevant Regional Haze Rule Provisions	Relevant Document Section
20	Compare 2028 RPG for the 20 percent clearest days to the 2000-2004 conditions for the same days, and strengthen the LTS if there is degradation. Also, compare the 2028 RPG for the 20 percent most impaired days to the 2000-2004 conditions for the same days, and strengthen the LTS if the RPG does not show an improvement.	51.308(f)(3)(i)	10
21	Identify all anthropogenic sources of visibility impairment considered by the State in developing its LTS and the criteria used to select the sources considered.	51.308(f)(2)(v)	4.7
22	Document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its LTS.	51.308(f)(2)(iv)	4.7
23	Document the technical basis, including information on the four factors and modeling, monitoring and emissions information, on which the State is relying to determine the emission reductions from anthropogenic sources in the State that are necessary for achieving reasonable progress towards natural visibility conditions in each mandatory Class I Federal area it affects.	51.308(f)(2)(iv)	4.7
24	Identify the baseline emissions inventory on which its strategies are based.	51.308(f)(2)(iv)	6.2
25	Calculate the number of years it would take to reach natural conditions at the rate of progress provided by the SIP for the implementation period.	51.308(f)(3)(ii)(A)	10.4
26	Consider: The uniform rate of improvement in visibility. The emission reduction measures considered with respect to the four factors. Additional measures being adopted by other contributing states in (f)(2)(iii) as needed to make reasonable progress towards natural visibility conditions for the period covered by the implementation plan.	51.308(f)(2)(ii)	10.1
27	Consider, emission reductions due to ongoing air pollution control programs, including measures to address RAVI.	51.308(f)(2)(vi)(A)	10.1
28	Consider measures to mitigate the impacts of construction activities.	51.308(f)(2)(vi)(B)	10.1
29	Consider emissions limitations and schedules for compliance to achieve the RPG.	51.308(f)(2)(vi)(C)	10.1
30	Consider source retirement and replacement schedules.	51.308(f)(2)(vi)(D)	10.1
31	Consider smoke management techniques for agricultural and forestry management purposes including plans as currently exist within the State for these purposes.	51.308(f)(2)(vi)(E)	10.1
32	Consider enforceability of emissions limitations and control measures.	51.308(f)(2)(vi)(F)	10.1

Reference Number	Step or Task	Relevant Regional Haze Rule Provisions	Relevant Document Section
33	Consider the anticipated net effect on visibility due to projected changes in point, area and mobile source emissions over the period addressed by the LTS.	51.308(f)(2)(vi)(G)	10.1
34	Demonstrate that the state has included in its implementation plan all measures necessary to obtain its share of the emission reductions needed to provide for reasonable progress towards natural visibility conditions in the mandatory Class I Federal area located in the other state or states. If the state has participated in a regional planning process, the state must also ensure that it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.	51.308(f)(2)(iii)(A)	Not explicitly addressed.
35	Submit a monitoring strategy for measuring, characterizing and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State.	51.308(f)(6)	11.4
36	Provide for the establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.	51.308(f)(6)(i)	11.4
37	Provide for procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas both within and outside the State.	51.308(f)(6)(ii)	11.4
38	For a State with no mandatory Class I Federal areas, provide for procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.	51.308(f)(6)(iii)	11.4
39	Provide for reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.	51.308(f)(6)(iv)	11.4
40	Provide for a statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.	51.308(f)(6)(v)	11.4
41	Provide other elements, including reporting, recordkeeping and other measures, necessary to assess and report on visibility.	51.308(f)(6)(vi)	11.4
42	Commit to submit the January 31, 2025, progress report.	51.308(f) opening text	Not explicitly addressed.

APPENDIX B

EPA Actions on Regional Haze SIPs for the First Implementation Period

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Alabama, Georgia, Indiana, Iowa, Louisiana, Michigan, Mississippi, Missouri, North Carolina, Ohio, Pennsylvania, South Carolina, Virginia and Texas EGU BART and LTS for NOx and SO_2	Final Limited Disapprovals of SIPs	Limited disapproval of these states SIPs due to their reliance on CAIR to satisfy the BART and LTS requirements. In the same action (*see* next entry), the EPA finalized partial FIPs relying on CSAPR to remedy this deficiency for certain of these states.	Proposed Rule - Regional Haze: Revisions to Provisions Governing Alternatives to Source-Specific Best Available Retrofit Technology (BART) Determinations, Limited SIP Disapprovals, and Federal Implementation Plans, 76 FR 82219 (Dec. 30, 2011). Notice Of Extension Of Public Comment Period - Regional Haze: Revisions to Provisions Governing Alternatives to Source-Specific Best Available Retrofit Technology (BART) Determinations, Limited SIP Approvals, and Federal Implementation Plans, 77 FR 4735 (Jan. 31, 2012). Final Rule - Regional Haze: Revisions to Provisions Governing Alternatives to Source-Specific Best Available Retrofit Technology (BART) Determinations, Limited SIP Disapprovals, and Federal Implementation Plans, 77 FR 33642 (June 7, 2012).
Georgia, Indiana, Iowa, Kentucky, Michigan, Missouri, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia and West Virginia	Final Partial FIPs	FIPs rely on CSAPR to address the deficiencies in the SIPs of the listed states. (*See* above entry).	Proposed Rule - Regional Haze: Revisions to Provisions Governing Alternatives to Source-Specific Best Available Retrofit Technology (BART) Determinations, Limited SIP Disapprovals, and Federal Implementation Plans, 76 FR 82219 (Dec. 30, 2011). Notice Of Extension Of Public Comment Period - Regional Haze: Revisions to Provisions Governing Alternatives to Source-Specific Best Available Retrofit Technology (BART) Determinations, Limited SIP Approvals, and Federal Implementation Plans, 77 FR 4735 (Jan. 31, 2012).

[137] Some of the listed *Federal Register* notices also contain EPA actions on SIP elements that address the CAA section 110 "infrastructure SIP" requirement regarding interstate visibility transport, but this table does not capture all such actions.

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
EGU BART and LTS for NOx and SO_2			Final Rule - Regional Haze: Revisions to Provisions Governing Alternatives to Source-Specific Best Available Retrofit Technology (BART) Determinations, Limited SIP Disapprovals, and Federal Implementation Plans, 77 FR 33642 (June 7, 2012).
Alabama Remaining elements	Final Limited Approval	Limited approval of remaining elements of regional haze SIP.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Alabama; Regional Haze State Implementation Plan, 77 FR 11937 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Alabama; Regional Haze State Implementation Plan, 77 FR 38515 (June 28, 2012).
Alaska All BART elements	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Alaska; Regional Haze State Implementation Plan, 77 FR 11022 (Feb. 24, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Alaska; Regional Haze State Implementation Plan, 78 FR 10546 (Feb. 14, 2013).
Alaska All remaining elements	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Alaska; Regional Haze State Implementation Plan, 77 FR 11022 (Feb. 24, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Alaska; Regional Haze State Implementation Plan, 78 FR 10546 (Feb. 14, 2013).
Albuquerque/Bernalillo County All elements	Final Approval		Proposed Rule - Approval and Promulgation of State Implementation Plans; City of Albuquerque-Bernalillo County, NM; Interstate Transport Affecting Visibility and Regional Haze Rule Requirements for Mandatory Class I Areas, 77 FR 24767 (Apr. 25, 2012). Final Rule - Approval and Promulgation of State Implementation Plans; City of Albuquerque-Bernalillo County, New Mexico; Interstate Transport Affecting Visibility and Regional Haze Rule Requirements for Mandatory Class I Areas, 77 FR 71119 (Nov. 29, 2012).
Arizona BART for Cholla, Apache, and Coronado EGUs	Final Partial Approval/Partial Disapproval and Partial FIP	Disapproval of NOx BART and FIP requiring NOx controls at these EGUs.	Proposed Rule - Approval, Disapproval and Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze State and Federal Implementation Plans, 77 FR 42833 (July 20, 2012). Proposed Rule; Notice Of Additional Public Hearings And Extension Of Comment Period - Approval, Disapproval and Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze State and Federal Implementation Plans, 77 FR 45326 (July 31, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
			Final Rule - Approval, Disapproval and Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze State and Federal Implementation Plans, 77 FR 72511 (Dec. 5, 2012).
Arizona All remaining BART and regional haze SIP elements	Final Partial Approval/Partial Disapproval	Disapproval of remaining elements.	Proposed Rule - Partial Approval and Disapproval of Air Quality Implementation Plans; Arizona; Regional Haze and Visibility Impacts of Transport, Ozone and Fine Particulates, 77 FR 75703 (Dec. 21, 2012). Notice; Extension of Comment Period - Partial Approval and Disapproval of Air Quality Implementation Plans; Arizona; Regional Haze and Visibility Transport; Extension of Comment Period, 78 FR 7702 (Feb. 4, 2013). Proposed Rule - Partial Approval and Partial Disapproval of Air Quality State Implementation Plans; Arizona; Regional Haze Requirements, 78 FR 29292 (May 20, 2013). Final Rule - Approval and Disapproval of Air Quality State Implementation Plans; Arizona; Regional Haze and Interstate Transport Requirements, 78 FR 46141 (July 30, 2013). Final Rule; Correction - Approval and Disapproval of Air Quality State Implementation Plans; Arizona; Regional Haze and Interstate Transport Requirements, 78 FR 49684 (Aug. 15, 2013).
Arizona Section 309 SO_2 Program	Final Partial Disapproval	Disapproval of prior SIP submittal because it does not satisfy requirements of 40 CFR 51.309(d)(4).	Proposed Rule - Partial Disapproval of State Implementation Plan; Arizona; Regional Haze Requirements, 78 FR 8083 (Feb. 5, 2013). Final Rule - Partial Disapproval of State Implementation Plan; Arizona; Regional Haze Requirements, 78 FR 48326 (Aug. 8, 2013).
Arizona Hayden and Miami copper smelters Sundt Unit 4 and Chemical Lime (two kilns).	Final Partial FIP	FIP requiring controls to address the BART requirements at these sources.	Proposed Rule - Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze and Interstate Visibility Transport Federal Implementation Plan, 79 FR 9317 (Feb. 18, 2014). Final Rule - Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze and Interstate Visibility Transport Federal Implementation Plan, 79 FR 52419 (Sept. 3, 2014).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Arizona Revisions to FIP for some sources Apache Generating Station Nelson Lime Plant (two kilns) Coronado Generating Station	Several revisions of previously adopted FIP requirements for specific sources	Revision of FIP for these sources on the request of the owners of the sources.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze State and Federal Implementation Plans; Reconsideration, 79 FR 56322 (Sept. 19, 2014) [Steam Units 1-3 at Arizona Electric Power Cooperative's (AEPCO) Apache Generating Station (Apache)]. Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze State and Federal Implementation Plans; Reconsideration, 80 FR 19220 (Apr. 10, 2015) [Steam Units 1-3 at Arizona Electric Power Cooperative's (AEPCO) Apache Generating Station (Apache)]. Proposed Rule - Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze Federal Implementation Plan; Reconsideration, 80 FR 1608 (Jan. 13, 2015) [Kilns 1-2 at Nelson Lime Plant]. Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze Federal Implementation Plan; Reconsideration, 80 FR 21176 (Apr. 17, 2015) [Kilns 1-2 at Nelson Lime Plant]. Proposed Rule: Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze Federal Implementation Plan; Reconsideration, 80 FR 17010 (March 31, 2015). (Coronado Generating Station) Final Rule: Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze Federal Implementation Plan; Reconsideration 81 FR 21735 (April 13, 2016). (Coronado Generating Station)
Arkansas All elements	Final Partial Approval/Partial Disapproval	Disapproval of BART determinations for some EGUs and industrial boilers and reasonable progress analysis/LTS.	Proposed Rule - Approval and Promulgation of Implementation Plans; Arkansas; Regional Haze State Implementation Plan; Interstate Transport State Implementation Plan To Address Pollution Affecting Visibility and Regional Haze, 76 FR 64185 (Oct. 17, 2011). Proposed Rule; Extension of Comment Period - Extension of Public Comment Period for Proposed Action on Arkansas Regional Haze State Implementation Plan and Interstate Transport State Implementation Plan To Address Pollution Affecting Visibility and Regional Haze, 76 FR 70952 (Nov. 16, 2011).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
			Final Rule - Approval and Promulgation of Implementation Plans; Arkansas; Regional Haze State Implementation Plan; Interstate Transport State Implementation Plan To Address Pollution Affecting Visibility and Regional Haze, 77 FR 14603 (Mar. 12, 2012).
Arkansas Proposed FIP to address previously disapproved elements	Proposed partial FIP		Proposed Rule - Promulgation of Air Quality Implementation Plans; State of Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan, 80 FR 18943 (Apr. 8, 2015). Proposed Rule; Extension Of Comment Period; Availability Of Supplemental Information - Approval and Promulgation of Implementation Plans; Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan; Extension of Comment Period and Notice of Availability, 80 FR 24872 (May 1, 2015). Proposed Rule; Reopening of Comment Period - Approval and Promulgation of Implementation Plans; Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan; Reopening of Comment Period, 80 FR 43661 (July 23, 2015).
California All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of California; Regional Haze State Implementation Plan and Interstate Transport Plan; Interference With Visibility Requirement, 76 FR 13944 (Mar. 15, 2011). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; State of California; Interstate Transport, 76 FR 34608 (June 14, 2011).
Colorado All elements	Final Approval (Re-issued to more adequately respond to public comments)		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Colorado; Regional Haze State Implementation Plan, 77 FR 18051 (Mar. 26, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Colorado; Regional Haze State Implementation Plan, 77 FR 76871 (Dec. 31, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Colorado; Regional Haze State Implementation Plan, 80 FR 29953 (May 26, 2015).
Connecticut All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Connecticut; Regional Haze, 77 FR 17367 (Mar. 26, 2012). Supplemental Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Connecticut; Regional Haze, 78 FR 5158 (Jan. 24, 2013).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
			Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Connecticut; Regional Haze, 79 FR 39322 (July 10, 2014).
Delaware All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Delaware; Regional Haze State Implementation Plan, 76 FR 27973 (May 13, 2011). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Delaware; Regional Haze State Implementation Plan, 76 FR 42557 (July 19, 2011).
District of Columbia All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; District of Columbia; Regional Haze State Implementation Plan, 76 FR 70929 (Nov. 16, 2011). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; District of Columbia; Regional Haze State Implementation Plan, 77 FR 5191 (Feb. 2, 2012).
Florida BART for Big Bend 1, 2, 3; Purdom Unit 7; Port Everglades 3, 4; and Cemex, White Spring SR/SC Complex	Final Partial Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Florida; Regional Haze State Implementation Plan, 77 FR 31240 (May 25, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Florida; Regional Haze State Implementation Plan, 77 FR 71111 (Nov. 29, 2012).
Florida Remaining elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Florida; Regional Haze State Implementation Plan, 77 FR 73369 (Dec. 10, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Florida; Regional Haze State Implementation Plan, 78 FR 53250 (Aug. 29, 2013).
Florida Subsequent SIP revision	Final Approval	Approval of a SIP revision addressing the NO_x BART requirements. This revision sets a new emission limit to better reflect the capability of	Proposed Rule - Approval and Promulgation of Implementation Plans; Florida; Regional Haze Plan Amendment-Lakeland Electric C.D. McIntosh, 80 FR 50591 (Aug. 20, 2015). Final Rule - Approval and Promulgation of Implementation Plans; Florida; Regional Haze Plan Amendment-Lakeland Electric C.D. McIntosh, 80 FR 64344 (Oct. 23, 2015).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Unit 1 at the Lakeland Electric-C.D. McIntosh Power Plant		the BART approach previously approved.	
Georgia Remaining elements	Final Limited Approval/ Limited Disapproval	Limited disapproval due to reliance on CAIR.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Georgia; Regional Haze State Implementation Plan, 77 FR 11452 (Feb. 27, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Georgia; Regional Haze State Implementation Plan, 77 FR 38501 (June 28, 2012).
Hawaii All elements	Final FIP	The state chose not to submit a SIP.	Proposed Rule - Approval and Promulgation of Implementation Plans; State of Hawaii; Regional Haze Federal Implementation Plan, 77 FR 31691 (May 29, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Hawaii; Regional Haze Federal Implementation Plan, 77 FR 61477 (Oct. 9, 2012).
Idaho All BART elements	Final Partial Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Idaho; Regional Haze State Implementation Plan and Interstate Transport Plan, 76 FR 1579 (Jan. 11, 2011). Final Rule - Approval and Promulgation of Implementation Plans; State of Idaho; Regional Haze State Implementation Plan and Interstate Transport Plan, 76 FR 36329 (June 22, 2011).
Idaho All remaining elements	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Idaho; Regional Haze State Implementation Plan, 77 FR 30248 (May 22, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Idaho; Regional Haze State Implementation Plan, 77 FR 66929 (Nov. 8, 2012).
Idaho Subsequent SIP revision for BART alternative for TASCO Amalgamated Sugar	Final approval of revised BART for PM and alternative control for SO_2 BART		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Idaho Amalgamated Sugar Company Nampa BART Alternative, 78 FR 38872 (June 28, 2013). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Idaho Amalgamated Sugar Company Nampa BART Alternative, 79 FR 23273 (Apr. 28, 2014).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Illinois All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Illinois; Regional Haze, 77 FR 3966 (Jan. 26, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Illinois; Regional Haze, 77 FR 39943 (July 6, 2012).
Illinois Subsequent SIP revision for Ameren Multi-Pollutant Standard Group	Proposed Approval	Proposed approval of Illinois SIP variances for certain EGUs.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Illinois; Illinois Power Holdings and AmerenEnergy Medina Valley Cogen Variance, 80 FR 21681 (Apr. 20, 2015). Final Rule - Air Quality Implementation Plan Approval; Illinois; Illinois Power Holdings and AmerenEnergy Medina Valley Cogen Variance, 80 FR 79261 (Dec. 21, 2015).
Illinois Subsequent SIP revision for Midwest Generation, LLC facilities)	Final Approval	Final approval of Illinois SIP variances for certain EGUs.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Illinois; Midwest Generation Variances, 80 FR 22662 (Apr. 23, 2015). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Illinois; Midwest Generation Variances, 80 FR 42726 (July 20, 2015).
Indiana Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Indiana; Regional Haze, 77 FR 3975 (Jan. 26, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Indiana; Regional Haze, 77 FR 34218 (June 11, 2012).
Iowa Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Implementation Plans; State of Iowa Regional Haze State Implementation Plan, 77 FR 11974 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Iowa: Regional Haze, 77 FR 38006 (June 26, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Kansas All elements	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Kansas Regional Haze State Implementation Plan, 76 FR 52604 (Aug. 23, 2011). Final Rule - Approval and Promulgation of Implementation Plans; State of Kansas: Regional Haze, 76 FR 80754 (Dec. 27, 2011).
Kentucky All elements	Final Limited Approval/ Limited Disapproval	Limited disapproval due to reliance on CAIR.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Commonwealth of Kentucky; Regional Haze State Implementation Plan, 76 FR 78194 (Dec. 16, 2011). Final Rule - Approval and Promulgation of Implementation Plans; Commonwealth of Kentucky; Regional Haze State Implementation Plan, 77 FR 19098 (Mar. 30, 2012). Final Rule; Correcting Amendment - Approval and Promulgation of Implementation Plans; Commonwealth of Kentucky; Regional Haze State Implementation Plan; Correction, 77 FR 27626 (May 11, 2012).
Louisiana Remaining elements	Final Partial Approval/Partial Disapproval	Partial disapproval of BART determination for four non-EGU sources.	Proposed Rule - Approval and Promulgation of Implementation Plans; Louisiana; Regional Haze State Implementation Plan, 77 FR 11839 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Implementation Pans; Louisiana; Regional Haze State Implementation Plan, 77 FR 39425 (July 3, 2012).
Maine All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Maine; Regional Haze, 76 FR 73955 (Nov. 29, 2011). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Maine; Regional Haze, 77 FR 24385 (Apr. 24, 2012).
Maryland All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Maryland; Regional Haze State Implementation Plan, 77 FR 11827 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Maryland; Regional Haze State Implementation Plan, 77 FR 39938 (July 6, 2012).
Massachusetts	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Massachusetts; Regional Haze, 77 FR 30932 (May 24, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
All elements			Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Massachusetts; Regional Haze, 78 FR 57487 (Sept. 19, 2013).
Michigan All remaining elements except BART for taconite plants	Final Limited Approval/ Limited Disapproval and Partial FIP	Final limited approval of SIP and partial disapproval of NO_X and SO_2 BART determinations. Partial FIP.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Michigan; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 77 FR 46911 (Aug. 6, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Michigan; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 77 FR 71533 (Dec. 3, 2012).
Michigan Taconite BART FIP	Final Partial FIP		Proposed Rule - Approval and Promulgation of Implementation Plans; States of Minnesota and Michigan; Regional Haze Federal Implementation Plan, 77 FR 49307 (Aug. 15, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; States of Minnesota and Michigan; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 78 FR 8705 (Feb. 6, 2013).
Michigan Taconite BART SIP	Final Partial Disapproval	Disapproval of BART determination for taconite plants	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; States of Michigan and Minnesota; Regional Haze, 78 FR 8478 (Feb. 6, 2013). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; States of Michigan and Minnesota; Regional Haze, 78 FR 59825 (Sept. 30, 2013),
Michigan Taconite BART FIP	Reconsideration of taconite BART FIP		Proposed rule: Air Plan Approval; Minnesota and Michigan; Revision to Taconite Federal Implementation Plan, 80 FR 64159 (October 22, 2015) Final Rule - Air Plan Approval; Minnesota and Michigan; Revision to 2013 Taconite Federal Implementation Plan Establishing BART for Taconite Plants. 81 FR 21671 (April 12, 2016)
Minnesota All SIP elements except BART for 6 taconite facilities	Final Partial Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Minnesota; Regional Haze, 77 FR 3681 (Jan. 25, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Minnesota; Regional Haze, 77 FR 34801 (June 12, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Minnesota Taconite BART FIP	Final FIP	FIP obligation arose from the failure of the state to submit a SIP on time. The later EPA action on the SIP is listed in the next entry.	Proposed Rule - Approval and Promulgation of Implementation Plans; States of Minnesota and Michigan; Regional Haze Federal Implementation Plan, 77 FR 49307 (Aug. 15, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; States of Minnesota and Michigan; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 78 FR 8705 (Feb. 6, 2013).
Minnesota Taconite BART SIP	Final Partial Disapproval	Disapproval of BART for taconite plants	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; States of Michigan and Minnesota; Regional Haze, 78 FR 8478 (Feb. 6, 2013). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; States of Michigan and Minnesota; Regional Haze 78 FR 59825 (Sept. 30, 2013).
Minnesota Taconite BART FIP	Reconsideration of taconite BART FIP		Proposed rule: Air Plan Approval; Minnesota and Michigan; Revision to Taconite Federal Implementation Plan, 80 FR 64159 (October 22, 2015) Final Rule - Air Plan Approval; Minnesota and Michigan; Revision to 2013 Taconite Federal Implementation Plan Establishing BART for Taconite Plants. 81 FR 21671 (April 12, 2016)
Minnesota	Final FIP	FIP implements a settlement agreement related to a FLM RAVI certification for the Northern States Power Company's (NSP's) Sherburne County Generating Station (Sherco)	Proposed Rule - Air Plan Approval; Minnesota; Revision to Visibility Federal Implementation Plan, October 27, 2015 (80 FR 65675) Final rule - Air Plan Approval; Minnesota; Revision to Visibility Federal Implementation Plan, March 7, 2016 (81 FR 11668)
Mississippi Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Mississippi; Regional Haze State Implementation Plan, 77 FR 11879 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Mississippi; Regional Haze State Implementation Plan, 77 FR 38191 (June 27, 2012).
Missouri	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Missouri; Regional Haze State Implementation Plan, 77 FR 11958 (Feb. 28, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Remaining elements			Final Rule - Approval and Promulgation of Implementation Plans; State of Missouri: Regional Haze, 77 FR 38007 (June 26, 2012).
Montana All elements	Final FIP	Montana did not submit a SIP.	Proposed Rule - Approval and Promulgation of Implementation Plans; State of Montana; State Implementation Plan and Regional Haze Federal Implementation Plan, 77 FR 23987 (Apr. 20, 2012). Proposed Rule; Corrections - Approval and Promulgation of Implementation Plans; State of Montana; State Implementation Plan and Regional Haze Federal Implementation Plan, 77 FR 29270 (May 17, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Montana; State Implementation Plan and Regional Haze Federal Implementation Plan, 77 FR 57863 (Sept. 18, 2012).
Nebraska All elements	Final Limited Approval/ Limited Disapproval and FIP	The EPA approved the state's SIP, except for the portion regarding SO_2 EGU BART at Gerald Gentleman Station. This deficiency is addressed through a FIP relying on CSAPR.	Proposed Rule - Approval, Disapproval and Promulgation of Implementation Plans; Nebraska; Regional Haze State Implementation Plan; Federal Implementation Plan for Best Available Retrofit Technology Determination, 77 FR 12770 (Mar. 2, 2012). Proposed Rule; Extension of Public Comment Period and Opportunity for Public Hearing - Approval, Disapproval and Promulgation of Implementation Plans; Nebraska; Regional Haze State Implementation Plan; Federal Implementation Plan for Best Available Retrofit Technology Determination; Extension of Public Comment Period, 77 FR 20333 (Apr. 4, 2012). Final Rule - Approval, Disapproval and Promulgation of Implementation Plans; State of Nebraska; Regional Haze State Implementation Plan; Federal Implementation Plan for Best Available Retrofit Technology Determination, 77 FR 40149 (July 6, 2012).
Nevada All elements except for Reid Gardner BART	Final Partial Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Nevada; Regional Haze State Implementation Plan, 76 FR 36450 (June 22, 2011). Proposed Rule; Extension of Public Comment Period - Regional Haze State Implementation Plan; State of Nevada; Extension of Comment Period, 76 FR 43963 (July 22, 2011). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Nevada; Regional Haze State Implementation Plan, 77 FR 17334 (Mar. 26, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Nevada Reid Gardner BART	Final Partial approval/Partial disapproval and Partial FIP	Disapproval of two aspects of the SIP in regards to NO_X BART for Reid Gardner Generating Station.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Nevada; Regional Haze State and Federal Implementation Plans; BART Determination for Reid Gardner Generating Station, 77 FR 21896 (Apr. 12, 2012). Announcement Of Second Public Hearing And Extension Of Public Comment Period - State of Nevada; Regional Haze State and Federal Implementation Plans; BART Determination for Reid Gardner Generating Station, 77 FR 25660 (May 1, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Nevada; Regional Haze State and Federal Implementation Plans; BART Determination for Reid Gardner Generating Station, 77 FR 50936 (Aug. 23, 2012).
New Hampshire All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; New Hampshire; Regional Haze, 77 FR 11809 (Feb. 28, 2012). Proposed Rule; Reopening Of Comment Period - Approval and Promulgation of Air Quality Implementation Plans; New Hampshire; Regional Haze; Reopening of Comment Period, 77 FR 22550 (Apr. 16, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; New Hampshire; Regional Haze, 77 FR 50602 (Aug. 22, 2012).
New Jersey All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of New Jersey; Regional Haze State Implementation Plan, 76 FR 49711 (Aug. 11, 2011). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; State of New Jersey; Regional Haze State Implementation Plan, 77 FR 19 (Jan. 3, 2012).
New Mexico NOx and SO_2 BART for San Juan Generating Station	Final FIP	FIP obligation arose from the disapproval of the state's infrastructure SIP for visibility transport.	Proposed Rule - Approval and Promulgation of Implementation Plans; New Mexico; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination, 76 FR 491 (Jan. 5, 2011). Notice of Public Hearing - Approval and Promulgation of Implementation Plans; New Mexico; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination, 76 FR 1578 (Jan. 11, 2011).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
			Proposed Rule; Extension of Comment Period - Extension of Public Comment Period for Proposed Action on Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination for New Mexico, 76 FR 12305 (Mar. 7, 2011). Final Rule - Approval and Promulgation of Implementation Plans; New Mexico; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination, 76 FR 52387 (Aug. 22, 2011). Final Rule - Stay of the Effectiveness of Requirements; Approval and Promulgation of Implementation Plans; New Mexico; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination, 77 FR 41697 (July 16, 2012). Final Rule - Extension of Administrative Stay; Approval and Promulgation of Implementation Plans; New Mexico; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determination, 77 FR 64908 (Oct. 24, 2012).
New Mexico All remaining SIP elements	Final Partial Approval		Proposed Rule - Approval and Promulgation of State Implementation Plans; New Mexico; Regional Haze Rule Requirements for Mandatory Class I Areas, 77 FR 36043 (June 15, 2012). Final Rule - Approval and Promulgation of State Implementation Plans; State of New Mexico; Regional Haze Rule Requirements for Mandatory Class I Areas, 77 FR 70693 (Nov. 27, 2012).
New Mexico Subsequent SIP revision to replace the FIP for San Juan Generating Station	Final Approval	The EPA withdrew its FIP and approved a SIP with alternative requirements preferred by the source owners.	Proposed Rule - Approval and Promulgation of Implementation Plans; New Mexico; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions; Withdrawal of Federal Implementation Plan for the San Juan Generating Station, 79 FR 26909 (May 12, 2014). Final Rule - Approval and Promulgation of Implementation Plans; New Mexico; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions; Withdrawal of Federal Implementation Plan for the San Juan Generating Station, 79 FR 60978 (Oct. 9, 2014). Final Rule - Approval and Promulgation of Implementation Plans; New Mexico; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions, 79 FR 60985 (Oct. 9, 2014).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
New York All elements	Final Partial Approval/Partial Disapproval and Partial FIP	The EPA found the SIP's BART provisions for two power plants were not approvable.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of New York; Regional Haze State Implementation Plan and Federal Implementation Plan, 77 FR 24793 (Apr. 25, 2012). Notice of Data Availability (Noda) - Notice of Data Availability Supporting Approval and Promulgation of Air Quality Implementation Plans; State of New York; Regional Haze State Implementation Plan and Federal Implementation Plan, 77 FR 27162 (May 9, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; State of New York; Regional Haze State Implementation Plan and Federal Implementation Plan, 77 FR 51915 (Aug. 28, 2012).
North Carolina Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of North Carolina; Regional Haze State Implementation Plan, 77 FR 11858 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of North Carolina; Regional Haze State Implementation Plan, 77 FR 38185 (June 27, 2012).
North Carolina EGU BART	Final Full Approval	EGU BART requirements for NOx and SO_2 are met by an alternative program	Proposed Rule - Air Plan Approval; North Carolina; Regional Haze, 81 FR 19519 (April 5, 2016). Final Rule - Air Plan Approval; North Carolina; Regional Haze, 81 FR 32652 (May 24, 2016).
North Dakota All elements	Final Partial Approval/Partial Disapproval and Partial FIP	Partial disapproval for EGU BART at Coal Creek Station and Antelope Valley Station.	Proposed Rule - Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Regional Haze, 76 FR 58569 (Sept. 21, 2011). Proposed Rule; Correction of Public Hearing - Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Proposed Rule; Correction of Public Hearing - Visibility and Regional Haze; Correction of Public Hearing, 76 FR 60777 (Sept. 30, 2011). Final Rule - Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Regional Haze, 77 FR 20893 (Apr. 6, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
North Dakota EPA reconsideration of approval of BART SIP for Milton R. Young Station and Leland Olds Station	Re-affirmation of prior partial approval	The EPA analyzed a petition to reconsider the prior approval of the SIP in regard to BART for Milton R. Young Station and Leland Olds Station, and decided that no change in the prior action is necessary.	Proposed Rule - Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Regional Haze; Reconsideration, 78 FR 16452 (Mar. 15, 2013). Notice of Public Hearings; Extension of Comment Period - Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Regional Haze; Reconsideration; Announcement of Public Hearings, 78 FR 24700 (Apr. 26, 2013). Notice of Final Action on Reconsideration - Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Regional Haze; Reconsideration, 80 FR 8550 (Feb. 18, 2015).
Ohio Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Ohio; Regional Haze, 77 FR 3712 (Jan. 25, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Ohio; Regional Haze, 77 FR 39177 (July 2, 2012).
Oklahoma BART for several EGUs	Final Partial Approval/Partial Disapproval and Partial FIP	Partial disapproval of the SIP in regards to BART SO_2 for several units.	Proposed Rule - Approval and Promulgation of Implementation Plans; Oklahoma; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determinations, 76 FR 16167 (Mar. 22, 2011). Announcement of Public Hearing - Approval and Promulgation of Implementation Plans; Oklahoma; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determinations, 76 FR 17584 (Mar. 30, 2011). Final Rule - Approval and Promulgation of Implementation Plans; Oklahoma; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Best Available Retrofit Technology Determinations, 76 FR 81727 (Dec. 28, 2011).
Oklahoma	Final Partial Approval/Partial Disapproval	The EPA disapproved Oklahoma's RPGs for the Wichita Mountains Class I area and	Proposed Rule - Approval and Promulgation of Implementation Plans; Texas and Oklahoma; Regional Haze State Implementation Plans; Interstate Transport State Implementation Plan To Address Pollution Affecting Visibility and Regional Haze; Federal Implementation Plan for

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Remaining elements		adopted a partial FIP setting new goals.	Regional Haze and Interstate Transport of Pollution Affecting Visibility, 79 Fed. Reg 74817 (Dec. 16, 2014). Proposed Rule; Extension of Comment Period - Approval and Promulgation of Implementation Plans; Texas and Oklahoma; Regional Haze State Implementation Plans; Interstate Transport State Implementation Plan To Address Pollution Affecting Visibility and Regional Haze; Federal Implementation Plan for Regional Haze and Interstate Transport of Pollution Affecting Visibility; Extension of Comment Period, 80 FR 3536 (Jan. 23, 2015). Final Rule - Approval and Promulgation of Implementation Plans; Texas and Oklahoma; Regional Haze State Implementation Plans; Interstate Visibility Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze; Federal Implementation Plan for Regional Haze, 81 FR 296 (Jan. 5, 2016).
Oklahoma Subsequent SIP revision to replace part of the FIP for two units at one power plant, with alternative requirements preferred by the source owners.	Final action to withdraw of BART FIP and approval of revised BART SIP for two EGUs		Proposed rule: Approval and Promulgation of Implementation Plans; Oklahoma; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions; Withdrawal of Federal Implementation Plan for American Electric Power/Public Service Company of Oklahoma, 78 FR 51686 (August 21, 2013) Final withdrawal of FIP: Approval and Promulgation of Air Quality Implementation Plans; Oklahoma; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions; Withdrawal of Federal Implementation Plan for American Electric Power/Public Service Company of Oklahoma, 79 FR 12954 (March 7, 2014) Final approval of SIP to replace FIP: Approval and Promulgation of Air Quality Implementation Plans; Oklahoma; Regional Haze and Interstate Transport Affecting Visibility; State Implementation Plan Revisions; Revised BART Determination for American Electric Power/Public Service Company of Oklahoma Northeastern Power Station Units 3 and 4, 79 FR 12944 (March 7, 2014)
Oregon	Final Partial Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Oregon; Regional Haze State Implementation Plan, 76 FR 12651 (Mar. 8, 2011).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
All BART elements			Final Rule - Approval and Promulgation of Implementation Plans; State of Oregon; Regional Haze State Implementation Plan and Interstate Transport Plan, 76 FR 38997 (July 5, 2011).
Oregon All remaining regional haze SIP elements	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Oregon; Regional Haze State Implementation Plan, 77 FR 30454 (May 23, 2012). Final Rule - Approval and Promulgation of Implementation Plans; State of Oregon; Regional Haze State Implementation Plan, 77 FR 50611 (Aug. 22, 2012).
Pennsylvania Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Commonwealth of Pennsylvania; Regional Haze State Implementation Plan, 77 FR 3984 (Jan. 26, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; Regional Haze State Implementation Plan, 77 FR 41279 (July 13, 2012).
Pennsylvania	Final Limited Approval	2012 final action re-issued with additional responses to comments	Final Rule; Correction- Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; Regional Haze State Implementation Plan; Correction, 77 Fed Reg. 48061 (Aug. 13, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; Regional Haze State Implementation Plan, 79 FR 24340 (Apr. 30, 2014).
Pennsylvania Subsequent SIP revision correcting PM BART requirements for one EGU	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; Pennsylvania; Pennsylvania Regional Haze State Implementation Plan Revision-Particulate Matter Best Available Retrofit Technology Limit for the Cheswick Power Plant in Allegheny County, 79 FR 64539 (Oct. 30, 2014). Final Rule - Approval and Promulgation of Implementation Plans; Pennsylvania; Pennsylvania Regional Haze State Implementation Plan Revision-Particulate Matter Best Available Retrofit Technology Limit for the Cheswick Power Plant in Allegheny County, 80 FR 2834 (Jan. 21, 2015).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Pennsylvania Subsequent SIP revision removing unintended source-specific SO_2 and NOx BART requirements for one EGU because those BART requirements are addressed by the FIP relying on CSAPR	Limited Approval/Disapproval	Limited disapproval due to reliance on CAIR.	Proposed Rule - Approval and Promulgation of Implementation Plans; Pennsylvania; Pennsylvania Regional Haze State Implementation Plan Revision: Sulfur Dioxide and Nitrogen Oxide Best Available Retrofit Technology Limits for the Cheswick Power Plant, 80 FR 2841 (Jan. 21, 2015). Final Rule - Approval and Promulgation of Implementation Plans; Pennsylvania; Pennsylvania Regional Haze State Implementation Plan Revision: Sulfur Dioxide and Nitrogen Oxide Best Available Retrofit Technology Limits for the Cheswick Power Plant, 80 FR 16286 (Mar. 27, 2015).
Rhode Island All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Rhode Island; Regional Haze, 77 FR 11798 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Rhode Island; Regional Haze, 77 FR 30214 (May 22, 2012).
South Carolina Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; South Carolina; Regional Haze State Implementation Plan, 77 FR 11894 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Implementation Plans; South Carolina; Regional Haze State Implementation Plan, 77 FR 38509 (June 28, 2012).
South Dakota All elements	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; South Dakota; Regional Haze State Implementation Plan, 76 FR 76646 (Dec. 8, 2011). Final Rule - Approval and Promulgation of Implementation Plans; South Dakota; Regional Haze State Implementation Plan, 77 FR 24845 (Apr. 26, 2012).
Tennessee	Final Limited Approval/ Limited Disapproval	Limited disapproval due to reliance on CAIR.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; State of Tennessee; Regional Haze State Implementation Plan, 76 FR 33662 (June 9, 2011). Proposed Rule; Limited Reopening of Comment Period - Approval and Promulgation of Air Quality Implementation Plans; Tennessee; Regional Haze State Implementation Plan; Limited Reopening of the Comment Period, 76 FR 44534 (July 26, 2011).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
All elements except Eastman Chemical BART			Final Rule - Approval and Promulgation of Implementation Plans; Tennessee; Regional Haze State Implementation Plan, 77 FR 24392 (Apr. 24, 2012).
Tennessee Eastman Chemical BART	Final Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; Tennessee; Regional Haze State Implementation Plan; Best Available Retrofit Technology for Eastman Chemical Company, 77 FR 51739 (Aug. 27, 2012). Final Rule - Approval and Promulgation of Implementation Plans; Tennessee; Regional Haze State Implementation Plan; Best Available Retrofit Technology Requirements for Eastman Chemical Company, 77 FR 70689 (Nov. 27, 2012).
Texas Remaining elements except for EGU BART	Final Partial Approval/Partial Disapproval and FIP for Reasonable Progress	Final partial disapproval of the SIP as not adequately addressing requirements of the regional haze program related to reasonable progress, the LTS, and the calculation of natural visibility conditions.	Proposed Rule - Approval and Promulgation of Implementation Plans; Texas and Oklahoma; Regional Haze State Implementation Plans; Interstate Transport State Implementation Plan To Address Pollution Affecting Visibility and Regional Haze; Federal Implementation Plan for Regional Haze and Interstate Transport of Pollution Affecting Visibility, 79 Fed. Reg 74817 (Dec. 16, 2014). Proposed Rule; Extension of Comment Period - Approval and Promulgation of Implementation Plans; Texas and Oklahoma; Regional Haze State Implementation Plans; Interstate Transport State Implementation Plan To Address Pollution Affecting Visibility and Regional Haze; Federal Implementation Plan for Regional Haze and Interstate Transport of Pollution Affecting Visibility; Extension of Comment Period, 80 FR 3536 (Jan. 23, 2015). Final Rule - Approval and Promulgation of Implementation Plans; Texas and Oklahoma; Regional Haze State Implementation Plans; Interstate Visibility Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze; Federal Implementation Plan for Regional Haze, 81 FR 295 (Jan. 5, 2016).
Tribal Four Corners Power Plant	Final FIP	No tribal plan was required or submitted. The EPA promulgated a source-specific FIP for the Four Corners Power Plant to achieve reductions in NO_x. The FIP provided an	Proposed Rule - Source Specific Federal Implementation Plan for Implementing Best Available Retrofit Technology for Four Corners Power Plant: Navajo Nation, 75 FR 64221 (Oct. 19, 2010). Supplemental Proposed Rule - Supplemental Proposed Rule of Source Specific Federal Implementation Plan for Implementing Best Available Retrofit Technology for Four Corners Power Plant: Navajo Nation, 76 FR 10530 (Feb. 25, 2011).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
		alternative compliance option, under which three of the five units were voluntarily shutdown in 2013.	Final Rule - Source Specific Federal Implementation Plan for Implementing Best Available Retrofit Technology for Four Corners Power Plant: Navajo Nation, 77 FR 51619 (Aug. 24, 2012).
Tribal Navajo Generating Station	Final FIP	No tribal plan was required or submitted. The EPA promulgated a source-specific FIP for the Navajo Generating Station to achieve reductions in NO_x. The FIP provides for alternative compliance approaches.	Proposed Rule - Approval of Air Quality Implementation Plans; Navajo Nation; Regional Haze Requirements for Navajo Generating Station, 78 FR 8273 (Feb. 5, 2013). Proposed Rule; Extension of Comment Period - Approval of Air Quality Implementation Plans; Navajo Nation; Regional Haze Requirements for Navajo Generating Station; Extension of Comment Period, 78 FR 16825 (Mar. 19, 2013). Notice of Intent to Hold Public Hearings - Approval of Air Quality Implementation Plans; Navajo Nation; Regional Haze Requirements for Navajo Generating Station; Notice of Intent To Hold Public Hearings, 78 FR 36716 (June 19, 2013). Proposed Rule; Notice of Extended Comment Period - Approval of Air Quality Implementation Plans; Navajo Nation; Regional Haze Requirements for Navajo Generating Station; Extension of Public Comment Period, 78 FR 41012 (July 9, 2013). Proposed Rule; Notice of Extended Comment Period - Approval of Air Quality Implementation Plans; Navajo Nation; Regional Haze Requirements for Navajo Generating Station; Extension of Public Comment Period, 78 FR 58987 (Sept. 25, 2013). Supplemental Proposed Rule And Notice Of Public Hearings - Approval of Air Quality Implementation Plans; Navajo Nation; Regional Haze Requirements for Navajo Generating Station; Supplemental Proposal, 78 FR 62509 (Oct. 22, 2013). Final Rule - Approval of Air Quality Implementation Plans; Navajo Nation; Regional Haze Requirements for Navajo Generating Station, 79 FR 46513 (Aug. 8, 2014).
Utah All elements	Final Partial Approval/Partial Disapproval	Disapproval of NOx and PM BART provisions for four PacifiCorp EGUs.	Proposed Rule - Approval, Disapproval and Promulgation of State Implementation Plans; State of Utah; Regional Haze Rule Requirements for Mandatory Class I Areas, 77 FR 28825 (May 16, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
			Final Rule - Approval, Disapproval and Promulgation of State Implementation Plans; State of Utah; Regional Haze Rule Requirements for Mandatory Class I Areas Under 40 CFR 51.309, 77 FR 74355 (Dec. 14, 2012). Final Rule; Correction - Approval, Disapproval and Promulgation of State Implementation Plans; State of Utah; Regional Haze Rule Requirements for Mandatory Class I Areas Under 40 CFR 51.309; Correction, 78 FR 4341 (Jan. 22, 2013).
Utah EGU BART – Revised SIP	Proposal in the alternative to approve the revised SIP or to disapprove it and promulgate a FIP to fill the gap	The EPA requested comment on whether the alternative program in the SIP is better-than-BART	Proposed Rule - Approval, Disapproval and Promulgation of Air Quality Implementation Plans; Partial Approval and Partial Disapproval of Air Quality Implementation Plans and Federal Implementation Plan; Utah; Revisions to Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 81 FR 2003 (Jan. 14, 2016). The final action on this proposed rule was signed on June 1, 2016.
Vermont All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Vermont; Regional Haze, 77 FR 11914 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Vermont; Regional Haze, 77 FR 30212 (May 22, 2012).
Virgin Islands All elements	Final FIP	The territory did not submit a SIP.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; United States Virgin Islands; Regional Haze Federal Implementation Plan, 77 FR 37842 (Dec. 25, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; United States Virgin Islands; Regional Haze Federal Implementation Plan, 77 FR 64414 (Oct. 22, 2012).
Virginia Remaining elements	Final Limited Approval	Remaining elements were approved.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Commonwealth of Virginia; Regional Haze State Implementation Plan, 77 FR 3691 (Jan. 25, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Virginia; Regional Haze State Implementation Plan, 77 FR 35287 (June 13, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Washington Transalta BART	Final Partial Approval		Proposed Rule - Approval and Promulgation of Implementation Plans; State of Washington; Regional Haze State Implementation Plan, 77 FR 30467 (May 23, 2012). Final Rule - Approval and Promulgation of State Implementation Plans: State of Washington; Regional Haze State Implementation Plan, 77 FR 72742 (Dec. 6, 2012).
Washington Non-BART EGU and all remaining regional haze SIP elements	Final Partial Approval/Partial Disapproval and Partial FIP	The EPA disapproved the SIP for BART at a refinery and two aluminum plants.	Proposed Rule - Approval and Promulgation of Implementation Plans; State of Washington; Regional Haze State Implementation Plan; Federal Implementation Plan for Best Available Retrofit Technology for Alcoa Intalco Operations and Tesoro Refining and Marketing, 77 FR 76173 (Dec. 26, 2012). Proposed Rule - Approval and Promulgation of Implementation Plans; State of Washington; Regional Haze State Implementation Plan; Federal Implementation Plan for Best Available Retrofit Technology for Alcoa Wenatchee, 78 FR 79344 (Dec. 30, 2013). Final Rule - Approval and Promulgation of Implementation Plans; State of Washington; Regional Haze State Implementation Plan; Federal Implementation Plan for Best Available Retrofit Technology for Alcoa Intalco Operations, Tesoro Refining and Marketing, and Alcoa Wenatchee, 79 FR 33438 (June 11, 2014). Direct Final Rule - Approval and Promulgation of Implementation Plans; State of Washington; Regional Haze State Implementation Plan; Federal Implementation Plan for Best Available Retrofit Technology for Alcoa Intalco Operations, Tesoro Refining and Marketing, and Alcoa Wenatchee, 79 FR 69767 (Nov. 24, 2014).
West Virginia All elements	Final Limited Approval/ Limited Disapproval	Limited disapproval due to reliance on CAIR.	Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; West Virginia; Regional Haze State Implementation Plan, 76 FR 41158 (July 13, 2011). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; West Virginia; Regional Haze State Implementation Plan, 77 FR 16937 (Mar. 23, 2012).
Wisconsin All elements	Final Approval		Proposed Rule - Approval and Promulgation of Air Quality Implementation Plans; Wisconsin; Regional Haze, 77 FR 11928 (Feb. 28, 2012). Final Rule - Approval and Promulgation of Air Quality Implementation Plans; Wisconsin; Regional Haze, 77 FR 46952 (Aug. 7, 2012).

State /Territory Required SIP Elements Addressed	Most Recent EPA Action	Additional Explanation	Hyperlinks to Federal Register Notices[137]
Wyoming All elements other than section 309 SO_2 Program	Final Partial Approval/Partial Disapproval and Partial FIP	The EPA disapproved the state's NOx determinations for certain EGUs, RPGs, monitoring and reporting requirements, and part of the LTS and RAVI program. EPA adopted a partial FIP to fill the resulting gaps.	Proposed Rule- Approval, Disapproval and Promulgation of Implementation Plans; State of Wyoming; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 77 FR 33021 (June 4, 2012). Proposed Rule - Approval, Disapproval and Promulgation of Implementation Plans; State of Wyoming; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 78 FR 34737 (June 10, 2013). Notice of Public Hearings; Extension of Comment Period - Approval, Disapproval and Promulgation of Implementation Plans; State of Wyoming; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze; Notice of Public Hearings, 78 FR 40654 (July 8, 2013). Final Rule - Approval, Disapproval and Promulgation of Implementation Plans; State of Wyoming; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 79 FR 5031 (Jan. 30, 2014).
Wyoming Section 309 SO_2 Program	Final Approval		Proposed Rule - Approval and Promulgation of State Implementation Plans; State of Wyoming; Regional Haze Rule Requirements for Mandatory Class I Areas, 77 FR 30953 (May 24, 2012). Final Rule - Approval and Promulgation of State Implementation Plans; State of Wyoming; Regional Haze Rule Requirements for Mandatory Class I Areas Under 40 CFR 51.309, 77 FR 73926 (Dec. 12, 2012).

APPENDIX C

Court Decisions on Regional Haze SIPs and FIPs for the First Implementation Period

Case Name	State(s)/Tribe Involved	Decision
Oklahoma v. EPA, 723 F.3d 1201 (10th Cir. 2013)	OK	Petitions for review denied.
North Dakota v. EPA, 730 F.3d 750 (8th Cir. 2013)	ND	Petitions granted in part and denied in part.
Utah v. EPA, 750 F.3d 1182 (10th Cir. 2014)	UT	Petitions for review denied.
Nat'l Parks Conservation Ass'n v. EPA, 759 F.3d 969 (8th Cir. 2014)	MN	Judgment reversed.
WildEarth Guardians v. EPA, 759 F.3d 1196 (10th Cir. 2014)	Navajo Nation	Petitions for review denied.
WildEarth Guardians v. EPA, 759 F.3d 1064 (9th Cir. 2014)	NV	Petitions for review was dismissed in part and denied in part.
Utah v. EPA, 765 F.3d 1257 (10th Cir. 2014) (rehearing en banc)	UT	Panel rehearing denied.
WildEarth Guardians v. EPA, 770 F.3d 919 (10th Cir. 2014)	NM, UT, WY	Petitions for review denied.
St. Marys Cement Inc. v. EPA, 782 F.3d 280 (6th Cir. 2015)	MI	Petition denied.
Nat'l Parks Conservation Ass'n v. EPA, 788 F.3d 1134 (9th Cir. 2015)	MT	Petitions for review granted in part and denied in part.
Nat'l Parks Conservation Ass'n v. EPA, 803 F.3d 151 (3rd Cir. 2015)	PA	Petitions for review granted in part and denied in part.
Nat'l Parks Conservation Ass'n v. McCarthy, 2016 U.S. App. LEXIS 977 (8th Cir. Jan. 21, 2016)	MN	Opinion and judgement vacated following petition for reconsideration.
Nat'l Parks Conservation Ass'n v. McCarthy, 2016 Mar. 14, 2016,	MN	Petitions for review denied (revised opinion).
Nebraska v. EPA, 2016 U.S. App. LEXIS 1773 (8th Cir. Feb. 3, 2016)	NE	Petitions for review denied.
Arizona ex rel. Darwin v. EPA, 2016 U.S. App. LEXIS 3196 (9th Cir. Feb. 24, 2016)	AZ	Petitions denied.

APPENDIX D

Identification of Provisions of the BART Guidelines[138] that Are Applicable as EPA Recommendations for Reasonable Progress Analysis and Determinations in the Second Implementation Period

BART Guideline Provisions	EPA Recommendation Regarding Applicability to Reasonable Progress Determinations in the Second Implementation Period
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	Explanation of Entries in this Column: *No comment necessary* – The statement in the BART Guidelines speaks for itself and needs no further interpretation. *Applies only to BART* – The statement in the BART Guidelines has no relevance to the development of an LTS for reasonable progress, except to the extent that BART for a BART-eligible source must be determined and thus becomes part of the LTS. *The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.* – This guidance document does not provide any additional recommendation on this topic that

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	would need to be considered along with the statement in the BART Guidelines. *Applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is not consistent with this answer*. – The statement in the BART Guidelines applies only to BART determinations. The general sense of that statement should not be applied to the development of the LTS for reasonable progress. *The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this, which is consistent with this answer*. – While the statement in the BART Guidelines applies only to BART determinations, the general sense of that statement should also be applied to the development of the LTS for reasonable progress but taking into consideration related statements in this document. While there are no points of disagreement between the BART Guidelines and this guidance document, there is additional relevant material in this guidance document, so the BART Guidelines should not be used alone.
I. Introduction and Overview A. What is the purpose of the guidelines? The Clean Air Act (CAA), in sections 169A and 169B, contains requirements for the protection of visibility in 156 scenic areas across the United States. To meet the CAA's requirements, we published regulations to protect against a particular type of visibility impairment known as "regional haze." The regional haze rule is found in this part at 40 CFR 51.300 through 51.309. These regulations require, in 40 CFR 51.308(e), that certain types of existing stationary sources of air pollutants install best	**No comment necessary.**

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available retrofit technology (BART). The guidelines are designed to help States and others (1) identify those sources that must comply with the BART requirement, and (2) determine the level of control technology that represents BART for each source.	
B. What does the CAA require generally for improving visibility? Section 169A of the CAA, added to the CAA by the 1977 amendments, requires States to protect and improve visibility in certain scenic areas of national importance. The scenic areas protected by section 169A are "the mandatory Class I Federal Areas * * * where visibility is an important value." In these guidelines, we refer to these as "Class I areas." There are 156 Class I areas, including 47 national parks (under the jurisdiction of the Department of Interior—National Park Service), 108 wilderness areas (under the jurisdiction of the Department of the Interior—Fish and Wildlife Service or the Department of Agriculture—U.S. Forest Service), and one International Park (under the jurisdiction of the Roosevelt-Campobello International Commission). The Federal Agency with jurisdiction over a particular Class I area is referred to in the CAA as the Federal Land Manager. A complete list of the Class I areas is contained in 40 CFR 81.401 through 81.437, and you can find a map of the Class I areas at the following Internet site: *http://www.epa.gov/ttn/oarpg/t1/fr_notices/classimp.gif*. The CAA establishes a national goal of eliminating man-made visibility impairment from all Class I areas. As part of the plan for achieving this goal, the visibility protection provisions in the CAA mandate that EPA issue regulations requiring that States adopt measures in their State implementation plans (SIPs), including long-term strategies, to provide for reasonable progress towards this national goal. The CAA also requires States to coordinate with the Federal Land Managers as they develop their strategies for addressing visibility.	No comment necessary.
C. What is the BART requirement in the CAA? 1. Under section 169A(b)(2)(A) of the CAA, States must require certain existing stationary sources to install BART. The BART provision applies to "major stationary sources" from 26 identified source categories which have the potential to emit 250 tons per year or more of any air pollutant. The CAA requires only sources which were put in place during a specific 15-year time interval to be subject to BART. The BART provision applies to sources that existed as of the date of the 1977 CAA amendments (that is, August 7, 1977) but which had not been in operation for more than 15 years (that is, not in operation as of August 7, 1962). 2. The CAA requires BART review when any source meeting the above description "emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility" in any Class I area. In identifying a level of control as BART, States are required by section 169A(g) of the CAA to consider: (a) The costs of compliance, (b) The energy and non-air quality environmental impacts of compliance, (c) Any existing pollution control technology in use at the source, (d) The remaining useful life of the source, and	Applies only to BART.

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(e) The degree of visibility improvement which may reasonably be anticipated from the use of BART. 3. The CAA further requires States to make BART emission limitations part of their SIPs. As with any SIP revision, States must provide an opportunity for public comment on the BART determinations, and EPA's action on any SIP revision will be subject to judicial review.	
D. What types of visibility problems does EPA address in its regulations? 1. We addressed the problem of visibility in two phases. In 1980, we published regulations addressing what we termed "reasonably attributable" visibility impairment. Reasonably attributable visibility impairment is the result of emissions from one or a few sources that are generally located in close proximity to a specific Class I area. The regulations addressing reasonably attributable visibility impairment are published in 40 CFR 51.300 through 51.307. 2. On July 1, 1999, we amended these regulations to address the second, more common, type of visibility impairment known as "regional haze." Regional haze is the result of the collective contribution of many sources over a broad region. The regional haze rule slightly modified 40 CFR 51.300 through 51.307, including the addition of a few definitions in §51.301, and added new §§51.308 and 51.309.	No comment necessary.
E. What are the BART requirements in EPA's regional haze regulations? 1. In the July 1, 1999 rulemaking, we added a BART requirement for regional haze. We amended the BART requirements in 2005. You will find the BART requirements in 40 CFR 51.308(e). Definitions of terms used in 40 CFR 51.308(e)(1) are found in 40 CFR 51.301. 2. As we discuss in detail in these guidelines, the regional haze rule codifies and clarifies the BART provisions in the CAA. The rule requires that States identify and list "BART-eligible sources," that is, that States identify and list those sources that fall within the 26 source categories, were put in place during the 15-year window of time from 1962 to 1977, and have potential emissions greater than 250 tons per year. Once the State has identified the BART-eligible sources, the next step is to identify those BART-eligible sources that may "emit any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility." Under the rule, a source which fits this description is "subject to BART." For each source subject to BART, 40 CFR 51.308(e)(1)(ii)(A) requires that States identify the level of control representing BART after considering the factors set out in CAA section 169A(g), as follows: —States must identify the best system of continuous emission control technology for each source subject to BART taking into account the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of visibility improvement that may be expected from available control technology.	Applies only to BART.

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3. After a State has identified the level of control representing BART (if any), it must establish an emission limit representing BART and must ensure compliance with that requirement no later than 5 years after EPA approves the SIP. States may establish design, equipment, work practice or other operational standards when limitations on measurement technologies make emission standards infeasible.	
F. What is included in the guidelines? 1. The guidelines provide a process for making BART determinations that States can use in implementing the regional haze BART requirements on a source-by-source basis, as provided in 40 CFR 51.308(e)(1). States must follow the guidelines in making BART determinations on a source-by-source basis for 750 megawatt (MW) power plants but are not required to use the process in the guidelines when making BART determinations for other types of sources. 2. The BART analysis process, and the contents of these guidelines, are as follows: (a) Identification of all BART-eligible sources. Section II of these guidelines outlines a step-by-step process for identifying BART-eligible sources. (b) Identification of sources subject to BART. As noted above, sources "subject to BART" are those BART-eligible sources which "emit a pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any Class I area." We discuss considerations for identifying sources subject to BART in section III of the guidance. (c) The BART determination process. For each source subject to BART, the next step is to conduct an analysis of emissions control alternatives. This step includes the identification of available, technically feasible retrofit technologies, and for each technology identified, an analysis of the cost of compliance, the energy and non-air quality environmental impacts, and the degree of visibility improvement in affected Class I areas resulting from the use of the control technology. As part of the BART analysis, the State should also take into account the remaining useful life of the source and any existing control technology present at the source. For each source, the State will determine a "best system of continuous emission reduction" based upon its evaluation of these factors. Procedures for the BART determination step are described in section IV of these guidelines. (d) Emissions limits. States must establish emission limits, including a deadline for compliance, consistent with the BART determination process for each source subject to BART. Considerations related to these limits are discussed in section V of these guidelines.	Applies only to BART.
G. Who is the target audience for the guidelines? 1. The guidelines are written primarily for the benefit of State, local and Tribal agencies, and describe a process for making the BART determinations and establishing the emission limitations that must be included in their SIPs or Tribal implementation plans (TIPs). Throughout the guidelines, which are written in a question and answer format, we ask questions "How do I * *	No comment necessary.

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*?" and answer with phrases "you should * * *, you must * * *" The "you" means a State, local or Tribal agency conducting the analysis. We have used this format to make the guidelines simpler to understand, but we recognize that States have the authority to require source owners to assume part of the analytical burden, and that there will be differences in how the supporting information is collected and documented. We also recognize that data collection, analysis, and rule development may be performed by Regional Planning Organizations, for adoption within each SIP or TIP. 2. The preamble to the 1999 regional haze rule discussed at length the issue of Tribal implementation of the requirements to submit a plan to address visibility. As explained there, requirements related to visibility are among the programs for which Tribes may be determined eligible and receive authorization to implement under the "Tribal Authority Rule" ("TAR") (40 CFR 49.1 through 49.11). Tribes are not subject to the deadlines for submitting visibility implementation plans and may use a modular approach to CAA implementation. We believe there are very few BART-eligible sources located on Tribal lands. Where such sources exist, the affected Tribe may apply for delegation of implementation authority for this rule, following the process set forth in the TAR.	
H. Do EPA regulations require the use of these guidelines? Section 169A(b) requires us to issue guidelines for States to follow in establishing BART emission limitations for fossil-fuel fired power plants having a capacity in excess of 750 megawatts. This document fulfills that requirement, which is codified in 40 CFR 51.308(e)(1)(ii)(B). The guidelines establish an approach to implementing the requirements of the BART provisions of the regional haze rule; we believe that these procedures and the discussion of the requirements of the regional haze rule and the CAA should be useful to the States. For sources other than 750 MW power plants, however, States retain the discretion to adopt approaches that differ from the guidelines.	Applies only to BART.
II. How To Identify BART-Eligible Sources This section provides guidelines on how to identify BART-eligible sources. A BART-eligible source is an existing stationary source in any of 26 listed categories which meets criteria for startup dates and potential emissions.	Applies only to BART.
A. What are the steps in identifying BART-eligible sources? Figure 1 shows the steps for identifying whether the source is a "BART-eligible source:" Step 1: Identify the emission units in the BART categories, Step 2: Identify the start-up dates of those emission units, and Step 3: Compare the potential emissions to the 250 ton/yr cutoff. Figure 1. How to determine whether a source is BART-eligible:	Applies only to BART.

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Step 1: Identify emission units in the BART categories Does the plant contain emissions units in one or more of the 26 source categories? → No → Stop → Yes → Proceed to Step 2	Applies only to BART.
Step 2: Identify the start-up dates of these emission units Do any of these emissions units meet the following two tests? In existence on August 7, 1977 AND Began operation after August 7, 1962 → No → Stop → Yes → Proceed to Step 3	Applies only to BART.
Step 3: Compare the potential emissions from these emission units to the 250 ton/yr cutoff Identify the "stationary source" that includes the emission units you identified in Step 2. Add the current potential emissions from all the emission units identified in Steps 1 and 2 that are included within the "stationary source" boundary. Are the potential emissions from these units 250 tons per year or more for any visibility-impairing pollutant? → No → Stop → Yes → These emissions units comprise the "BART-eligible source."	Applies only to BART.
1. Step 1: Identify Emission Units in the BART Categories 1. The BART requirement only applies to sources in specific categories listed in the CAA. The BART requirement does not apply to sources in other source categories, regardless of their emissions. The listed categories are: (1) Fossil-fuel fired steam electric plants of more than 250 million British thermal units (BTU) per hour heat input, (2) Coal cleaning plants (thermal dryers), (3) Kraft pulp mills, (4) Portland cement plants, (5) Primary zinc smelters, (6) Iron and steel mill plants, (7) Primary aluminum ore reduction plants, (8) Primary copper smelters, (9) Municipal incinerators capable of charging more than 250 tons of refuse per day, (10) Hydrofluoric, sulfuric, and nitric acid plants, (11) Petroleum refineries, (12) Lime plants, (13) Phosphate rock processing plants,	Applies only to BART.

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(14) Coke oven batteries, (15) Sulfur recovery plants, (16) Carbon black plants (furnace process), (17) Primary lead smelters, (18) Fuel conversion plants, (19) Sintering plants, (20) Secondary metal production facilities, (21) Chemical process plants, (22) Fossil-fuel boilers of more than 250 million BTUs per hour heat input, (23) Petroleum storage and transfer facilities with a capacity exceeding 300,000 barrels, (24) Taconite ore processing facilities, (25) Glass fiber processing plants, and (26) Charcoal production facilities.	
2. Some plants may have emission units from more than one category, and some emitting equipment may fit into more than one category. Examples of this situation are sulfur recovery plants at petroleum refineries, coke oven batteries and sintering plants at steel mills, and chemical process plants at refineries. For Step 1, you identify all of the emissions units at the plant that fit into one or more of the listed categories. You do not identify emission units in other categories. Example: A mine is collocated with an electric steam generating plant and a coal cleaning plant. You would identify emission units associated with the electric steam generating plant and the coal cleaning plant, because they are listed categories, but not the mine, because coal mining is not a listed category.	Applies only to BART.
3. The category titles are generally clear in describing the types of equipment to be listed. Most of the category titles are very broad descriptions that encompass all emission units associated with a plant site (for example, "petroleum refining" and "kraft pulp mills"). This same list of categories appears in the PSD regulations. States and source owners need not revisit any interpretations of the list made previously for purposes of the PSD program. We provide the following clarifications for a few of the category titles: (1) "Steam electric plants of more than 250 million BTU/hr heat input." Because the category refers to "plants," we interpret this category title to mean that boiler capacities should be aggregated to determine whether the 250 million BTU/hr threshold is reached. This definition includes only those plants that generate electricity for sale. Plants that cogenerate steam and electricity also fall within the definition of "steam electric plants". Similarly, combined cycle turbines are also considered "steam electric plants" because such facilities incorporate heat recovery steam generators. Simple cycle turbines, in contrast, are not "steam electric plants" because these turbines typically do not generate steam. *Example:* A stationary source includes a steam electric plant with three 100 million BTU/hr boilers. Because the aggregate capacity exceeds 250 million BTU/hr for the "plant," these boilers would be identified in Step 2.	Applies only to BART.

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(2) "Fossil-fuel boilers of more than 250 million BTU/hr heat input." We interpret this category title to cover only those boilers that are individually greater than 250 million BTU/hr. However, an individual boiler smaller than 250 million BTU/hr should be subject to BART if it is an integral part of a process description at a plant that is in a different BART category—for example, a boiler at a Kraft pulp mill that, in addition to providing steam or mechanical power, uses the waste liquor from the process as a fuel. In general, if the process uses any by-product of the boiler and the boiler's function is to serve the process, then the boiler is integral to the process and should be considered to be part of the process description. Also, you should consider a multi-fuel boiler to be a "fossil-fuel boiler" if it burns any amount of fossil fuel. You may take federally and State enforceable operational limits into account in determining whether a multi-fuel boiler's fossil fuel capacity exceeds 250 million Btu/hr. (3) "Petroleum storage and transfer facilities with a capacity exceeding 300,000 barrels." The 300,000 barrel cutoff refers to total facility-wide tank capacity for tanks that were put in place within the 1962-1977 time period, and includes gasoline and other petroleum-derived liquids. (4) "Phosphate rock processing plants." This category descriptor is broad, and includes all types of phosphate rock processing facilities, including elemental phosphorous plants as well as fertilizer production plants. (5) "Charcoal production facilities." We interpret this category to include charcoal briquet manufacturing and activated carbon production. (6) "Chemical process plants." and pharmaceutical manufacturing. Consistent with past policy, we interpret the category "chemical process plants" to include those facilities within the 2-digit Standard Industrial Classification (SIC) code 28. Accordingly, we interpret the term "chemical process plants" to include pharmaceutical manufacturing facilities. (7) "Secondary metal production." We interpret this category to include nonferrous metal facilities included within SIC code 3341, and secondary ferrous metal facilities that we also consider to be included within the category "iron and steel mill plants." (8) "Primary aluminum ore reduction." We interpret this category to include those facilities covered by 40 CFR 60.190, the new source performance standard (NSPS) for primary aluminum ore reduction plants. This definition is also consistent with the definition at 40 CFR 63.840.	
2. Step 2: Identify the Start-Up Dates of the Emission Units 1. Emissions units listed under Step 1 are BART-eligible only if they were "in existence" on August 7, 1977 but were not "in operation" before August 7, 1962.	Applies only to BART.

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What does "in existence on August 7, 1977" mean? 2. The regional haze rule defines "in existence" to mean that: "the owner or operator has obtained all necessary preconstruction approvals or permits required by Federal, State, or local air pollution emissions and air quality laws or regulations and either has (1) begun, or caused to begin, a continuous program of physical on-site construction of the facility or (2) entered into binding agreements or contractual obligations, which cannot be canceled or modified without substantial loss to the owner or operator, to undertake a program of construction of the facility to be completed in a reasonable time." 40 CFR 51.301. As this definition is essentially identical to the definition of "commence construction" as that term is used in the PSD regulations, the two terms mean the same thing. See 40 CFR 51.165(a)(1)(xvi) and 40 CFR 52.21(b)(9). Under this definition, an emissions unit could be "in existence" even if it did not begin operating until several years after 1977. *Example:* The owner of a source obtained all necessary permits in early 1977 and entered into binding construction agreements in June 1977. Actual on-site construction began in late 1978, and construction was completed in mid-1979. The source began operating in September 1979. The emissions unit was "in existence" as of August 7, 1977. Major stationary sources which commenced construction AFTER August 7, 1977 (i.e., major stationary sources which were not "in existence" on August 7, 1977) were subject to new source review (NSR) under the PSD program. Thus, the August 7, 1977 "in existence" test is essentially the same thing as the identification of emissions units that were grandfathered from the NSR review requirements of the 1977 CAA amendments.	Applies only to BART.
3. Sources are not BART-eligible if the only change at the plant during the relevant time period was the addition of pollution controls. For example, if the only change at a copper smelter during the 1962 through 1977 time period was the addition of acid plants for the reduction of SO_2 emissions, these emission controls would not by themselves trigger a BART review.	Applies only to BART.
What does "in operation before August 7, 1962" mean? An emissions unit that meets the August 7, 1977 "in existence" test is not BART-eligible if it was in operation before August 7, 1962. "In operation" is defined as "engaged in activity related to the primary design function of the source." This means that a source must have begun actual operations by August 7, 1962 to satisfy this test. Example: The owner or operator entered into binding agreements in 1960. Actual on-site construction began in 1961, and construction was complete in mid-1962. The source began operating in September 1962. The emissions unit was not "in operation" before August 7, 1962 and is therefore subject to BART.	Applies only to BART.
What is a "reconstructed source?" 1. Under a number of CAA programs, an existing source which is completely or substantially rebuilt is treated as a new source. Such "reconstructed" sources are treated as new sources as of the time of the reconstruction. Consistent with this overall approach to reconstructions, the definition of BART-eligible facility (reflected in detail in the definition of "existing stationary	Applies only to BART.

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facility") includes consideration of sources that were in operation before August 7, 1962, but were reconstructed during the August 7, 1962 to August 7, 1977 time period. 2. Under the regional haze regulations at 40 CFR 51.301, a reconstruction has taken place if "the fixed capital cost of the new component exceeds 50 percent of the fixed capital cost of a comparable entirely new source." The rule also states that "[a]ny final decision as to whether reconstruction has occurred must be made in accordance with the provisions of §§60.15 (f)(1) through (3) of this title." "[T]he provisions of §§60.15(f)(1) through (3)" refers to the general provisions for New Source Performance Standards (NSPS). Thus, the same policies and procedures for identifying reconstructed "affected facilities" under the NSPS program must also be used to identify reconstructed "stationary sources" for purposes of the BART requirement. 3. You should identify reconstructions on an emissions unit basis, rather than on a plantwide basis. That is, you need to identify only the reconstructed emission units meeting the 50 percent cost criterion. You should include reconstructed emission units in the list of emission units you identified in Step 1. You need consider as possible reconstructions only those emissions units with the potential to emit more than 250 tons per year of any visibility-impairing pollutant. 4. The "in operation" and "in existence" tests apply to reconstructed sources. If an emissions unit was reconstructed and began actual operation before August 7, 1962, it is not BART-eligible. Similarly, any emissions unit for which a reconstruction "commenced" after August 7, 1977, is not BART-eligible.	
How are modifications treated under the BART provision? 1. The NSPS program and the major source NSR program both contain the concept of modifications. In general, the term "modification" refers to any physical change or change in the method of operation of an emissions unit that results in an increase in emissions. 2. The BART provision in the regional haze rule contains no explicit treatment of modifications or how modified emissions units, previously subject to the requirement to install best available control technology (BACT), lowest achievable emission rate (LAER) controls, and/or NSPS are treated under the rule. As the BART requirements in the CAA do not appear to provide any exemption for sources which have been modified since 1977, the best interpretation of the CAA visibility provisions is that a subsequent modification does not change a unit's construction date for the purpose of BART applicability. Accordingly, if an emissions unit began operation before 1962, it is not BART-eligible if it was modified between 1962 and 1977, so long as the modification is not also a "reconstruction." On the other hand, an emissions unit which began operation within the 1962-1977 time window, but was modified after August 7, 1977, is BART-eligible. We note, however, that if such a modification was a major modification that resulted in the installation of controls, the State will take this into account during the review process and may find that the level of controls already in place are consistent with BART	Applies only to BART.
3. Step 3: Compare the Potential Emissions to the 250 Ton/Yr Cutoff The result of Steps 1 and 2 will be a list of emissions units at a given plant site, including reconstructed emissions units, that are within one or more of the BART categories and that were placed into operation within the 1962-1977 time window. The third	Applies only to BART.

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step is to determine whether the total emissions represent a current potential to emit that is greater than 250 tons per year of any single visibility impairing pollutant. Fugitive emissions, to the extent quantifiable, must be counted. In most cases, you will add the potential emissions from all emission units on the list resulting from Steps 1 and 2. In a few cases, you may need to determine whether the plant contains more than one "stationary source" as the regional haze rule defines that term, and as we explain further below.	
What pollutants should I address? Visibility-impairing pollutants include the following: (1) Sulfur dioxide (SO_2), (2) Nitrogen oxides (NOx), and (3) Particulate matter. You may use PM_{10} as an indicator for particulate matter in this initial step. [Note that we do not recommend use of total suspended particulates (TSP) as in indicator for particulate matter.] As emissions of PM_{10} include the components of $PM_{2.5}$ as a subset, there is no need to have separate 250 ton thresholds for PM_{10} and $PM_{2.5}$; 250 tons of PM_{10} represents at most 250 tons of $PM_{2.5}$, and at most 250 tons of any individual particulate species such as elemental carbon, crustal material, etc. However, if you determine that a source of particulate matter is BART-eligible, it will be important to distinguish between the fine and coarse particle components of direct particulate emissions in the remainder of the BART analysis, including for the purpose of modeling the source's impact on visibility. This is because although both fine and coarse particulate matter contribute to visibility impairment, the long-range transport of fine particles is of particular concern in the formation of regional haze. Thus, for example, air quality modeling results used in the BART determination will provide a more accurate prediction of a source's impact on visibility if the inputs into the model account for the relative particle size of any directly emitted particulate matter (i.e. PM_{10} vs. $PM_{2.5}$). You should exercise judgment in deciding whether the following pollutants impair visibility in an area: (4) Volatile organic compounds (VOC), and (5) Ammonia and ammonia compounds. You should use your best judgment in deciding whether VOC or ammonia emissions from a source are likely to have an impact on visibility in an area. Certain types of VOC emissions, for example, are more likely to form secondary organic aerosols than others.139 Similarly, controlling ammonia emissions in some areas may not have a significant impact on visibility. You need	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.

[139] Fine particles: Overview of Atmospheric Chemistry, Sources of Emissions, and Ambient Monitoring Data, Memorandum to Docket OAR 2002-006, April 1, 2005.

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not provide a formal showing of an individual decision that a source of VOC or ammonia emissions is not subject to BART review. Because air quality modeling may not be feasible for individual sources of VOC or ammonia, you should also exercise your judgement in assessing the degree of visibility impacts due to emissions of VOC and emissions of ammonia or ammonia compounds. You should fully document the basis for judging that a VOC or ammonia source merits BART review, including your assessment of the source's contribution to visibility impairment.	
What does the term "potential" emissions mean? The regional haze rule defines potential to emit as follows: "Potential to emit" means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable. Secondary emissions do not count in determining the potential to emit of a stationary source. The definition of "potential to emit" means that a source which actually emits less than 250 tons per year of a visibility-impairing pollutant is BART-eligible if its emissions would exceed 250 tons per year when operating at its maximum capacity given its physical and operational design (and considering all federally enforceable and State enforceable permit limits.) *Example:* A source, while operating at one-fourth of its capacity, emits 75 tons per year of SO_2. If it were operating at 100 percent of its maximum capacity, the source would emit 300 tons per year. Because under the above definition such a source would have "potential" emissions that exceed 250 tons per year, the source (if in a listed category and built during the 1962-1977 time window) would be BART-eligible.	Applies only to BART.
How do I identify whether a plant has more than one "stationary source?" 1. The regional haze rule, in 40 CFR 51.301, defines a stationary source as a "building, structure, facility or installation which emits or may emit any air pollutant."140 The rule further defines "building, structure or facility" as: all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities must be considered as part of the same industrial grouping if they belong to the same Major Group (i.e., which have the same two-digit code) as	Applies only to BART. The term "source" has particular meaning in the context of BART that should not be presumed to carry over to development of the LTS in the second implementation period where non-BART sources are concerned.

[140] Note: Most of these terms and definitions are the same for regional haze and the 1980 visibility regulations. For the regional haze rule we use the term "BART-eligible source" rather than "existing stationary facility" to clarify that only a limited subset of existing stationary sources are subject to BART.

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described in the Standard Industrial Classification Manual, 1972 as amended by the 1977 Supplement (U.S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0, respectively). 2. In applying this definition, it is necessary to determine which facilities are located on "contiguous or adjacent properties." Within this contiguous and adjacent area, it is also necessary to group those emission units that are under "common control." We note that these plant boundary issues and "common control" issues are very similar to those already addressed in implementation of the title V operating permits program and in NSR. 3. For emission units within the "contiguous or adjacent" boundary and under common control, you must group emission units that are within the same industrial grouping (that is, associated with the same 2-digit SIC code) in order to define the stationary source.141 For most plants on the BART source category list, there will only be one 2-digit SIC that applies to the entire plant. For example, all emission units associated with kraft pulp mills are within SIC code 26, and chemical process plants will generally include emission units that are all within SIC code 28. The "2-digit SIC test" applies in the same way as the test is applied in the major source NSR programs.142 4. For purposes of the regional haze rule, you must group emissions from all emission units put in place within the 1962-1977 time period that are within the 2-digit SIC code, even if those emission units are in different categories on the BART category list. *Examples:* A chemical plant which started operations within the 1962 to 1977 time period manufactures hydrochloric acid (within the category title "Hydrochloric, sulfuric, and nitric acid plants") and various organic chemicals (within the category title "chemical process plants"). All of the emission units are within SIC code 28 and, therefore, all the emission units are considered in determining BART eligibility of the plant. You sum the emissions over all of these emission units to see whether there are more than 250 tons per year of potential emissions.	

[141] We recognize that we are in a transition period from the use of the SIC system to a new system called the North American Industry Classification System (NAICS). For purposes of identifying BART-eligible sources, you may use either 2-digit SICS or the equivalent in the NAICS system.

[142] Note: The concept of support facility used for the NSR program applies here as well. Support facilities, that is facilities that convey, store or otherwise assist in the production of the principal product, must be grouped with primary facilities even when the facilities fall within separate SIC codes. For purposes of BART reviews, however, such support facilities (a) must be within one of the 26 listed source categories and (b) must have been in existence as of August 7, 1977, and (c) must not have been in operation as of August 7, 1962.

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A steel mill which started operations within the 1962 to 1977 time period includes a sintering plant, a coke oven battery, and various other emission units. All of the emission units are within SIC code 33. You sum the emissions over all of these emission units to see whether there are more than 250 tons per year of potential emissions.	
4. Final Step: Identify the Emissions Units and Pollutants That Constitute the BART-Eligible Source If the emissions from the list of emissions units at a stationary source exceed a potential to emit of 250 tons per year for any visibility-impairing pollutant, then that collection of emissions units is a BART-eligible source. *Example:* A stationary source comprises the following two emissions units, with the following potential emissions: Emissions unit A 200 tons/yr SO_2 150 tons/yr NOx 25 tons/yr PM Emissions unit B 100 tons/yr SO_2 75 tons/yr NOx 10 tons/yr PM For this example, potential emissions of $SO_2$are 300 tons/yr, which exceeds the 250 tons/yr threshold. Accordingly, the entire "stationary source", that is, emissions units A and B, may be subject to a BART review for SO_2, NOx, and PM, even though the potential emissions of PM and NOx at each emissions unit are less than 250 tons/yr each. Example: The total potential emissions, obtained by adding the potential emissions of all emission units in a listed category at a plant site, are as follows: 200 tons/yr SO_2 150 tons/yr NOx 25 tons/yr PM Even though total emissions exceed 250 tons/yr, no individual regulated pollutant exceeds 250 tons/yr and this source is not BART-eligible.	Applies only to BART.
Can States establish de minimis levels of emissions for pollutants at BART-eligible sources? In order to simplify BART determinations, States may choose to identify de minimis levels of pollutants at BART-eligible sources (but are not required to do so). De minimis values should be identified with the purpose of excluding only those emissions so minimal that they are unlikely to contribute to regional haze. Any de minimis values that you adopt must not be higher than the PSD applicability levels: 40 tons/yr for SO_2 and NOx and 15 tons/yr for PM_{10}. These de minimis levels may only be applied on a plant-wide basis.	Applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is not consistent with this answer.

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III. How To Identify Sources "Subject to BART" Once you have compiled your list of BART-eligible sources, you need to determine whether (1) to make BART determinations for all of them or (2) to consider exempting some of them from BART because they may not reasonably be anticipated to cause or contribute to any visibility impairment in a Class I area. If you decide to make BART determinations for all the BART-eligible sources on your list, you should work with your regional planning organization (RPO) to show that, collectively, they cause or contribute to visibility impairment in at least one Class I area. You should then make individual BART determinations by applying the five statutory factors discussed in Section IV below. On the other hand, you also may choose to perform an initial examination to determine whether a particular BART-eligible source or group of sources causes or contributes to visibility impairment in nearby Class I areas. If your analysis, or information submitted by the source, shows that an individual source or group of sources (or certain pollutants from those sources) is not reasonably anticipated to cause or contribute to any visibility impairment in a Class I area, then you do not need to make BART determinations for that source or group of sources (or for certain pollutants from those sources). In such a case, the source is not "subject to BART" and you do not need to apply the five statutory factors to make a BART determination. This section of the Guideline discusses several approaches that you can use to exempt sources from the BART determination process.	Applies only to BART.
A. What Steps Do I Follow To Determine Whether a Source or Group of Sources Cause or Contribute to Visibility Impairment for Purposes of BART? 1. How Do I Establish a Threshold? One of the first steps in determining whether sources cause or contribute to visibility impairment for purposes of BART is to establish a threshold (measured in deciviews) against which to measure the visibility impact of one or more sources. A single source that is responsible for a 1.0 deciview change or more should be considered to "cause" visibility impairment; a source that causes less than a 1.0 deciview change may still contribute to visibility impairment and thus be subject to BART. Because of varying circumstances affecting different Class I areas, the appropriate threshold for determining whether a source "contributes to any visibility impairment" for the purposes of BART may reasonably differ across States. As a general matter, any threshold that you use for determining whether a source "contributes" to visibility impairment should not be higher than 0.5 deciviews.	This answer applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which supersedes this answer.

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In setting a threshold for "contribution," you should consider the number of emissions sources affecting the Class I areas at issue and the magnitude of the individual sources' impacts.[143] In general, a larger number of sources causing impacts in a Class I area may warrant a lower contribution threshold. States remain free to use a threshold lower than 0.5 deciviews if they conclude that the location of a large number of BART-eligible sources within the State and in proximity to a Class I area justify this approach.[144]	
2. What Pollutants Do I Need To Consider? You must look at SO_2, NOx, and direct particulate matter (PM) emissions in determining whether sources cause or contribute to visibility impairment, including both PM_{10} and $PM_{2.5}$. Consistent with the approach for identifying your BART-eligible sources, you do not need to consider less than de minimis emissions of these pollutants from a source. As explained in section II, you must use your best judgement to determine whether VOC or ammonia emissions are likely to have an impact on visibility in an area. In addition, although as explained in Section II, you may use PM_{10} an indicator for particulate matter in determining whether a source is BART-eligible, in determining whether a source contributes to visibility impairment, you should distinguish between the fine and coarse particle components of direct particulate emissions. Although both fine and coarse particulate matter contribute to visibility impairment, the long-range transport of fine particles is of particular concern in the formation of regional haze. Air quality modeling results used in the BART determination will provide a more accurate prediction of a source's impact on visibility if the inputs into the model account for the relative particle size of any directly emitted particulate matter (i.e., PM_{10} vs. $PM_{2.5}$).	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this, which is consistent with this answer
3. What Kind of Modeling Should I Use To Determine Which Sources and Pollutants Need Not Be Subject to BART? This section presents several options for determining that certain sources need not be subject to BART. These options rely on different modeling and/or emissions analysis approaches. They are provided for your guidance. You may also use other reasonable approaches for analyzing the visibility impacts of an individual source or group of sources.	See entries on the sub-topics that follow.
Option 1: Individual Source Attribution Approach (Dispersion Modeling)	Applies only to BART. This guidance document provides new guidance on this topic in the

[143] We expect that regional planning organizations will have modeling information that identifies sources affecting visibility in individual class I areas.
[144] Note that the contribution threshold should be used to determine whether an individual source is reasonably anticipated to contribute to visibility impairment. You should not aggregate the visibility effects of multiple sources and compare their collective effects against your contribution threshold because this would inappropriately create a "contribute to contribution" test.

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You can use dispersion modeling to determine that an individual source cannot reasonably be anticipated to cause or contribute to visibility impairment in a Class I area and thus is not subject to BART. Under this option, you can analyze an individual source's impact on visibility as a result of its emissions of SO_2, NOx and direct PM emissions. Dispersion modeling cannot currently be used to estimate the predicted impacts on visibility from an individual source's emissions of VOC or ammonia. You may use a more qualitative assessment to determine on a case-by-case basis which sources of VOC or ammonia emissions may be likely to impair visibility and should therefore be subject to BART review, as explained in section II.A.3. above. You can use CALPUFF[145] or other appropriate model to predict the visibility impacts from a single source at a Class I area. CALPUFF is the best regulatory modeling application currently available for predicting a single source's contribution to visibility impairment and is currently the only EPA-approved model for use in estimating single source pollutant concentrations resulting from the long range transport of primary pollutants.[146] It can also be used for some other purposes, such as the visibility assessments addressed in today's rule, to account for the chemical transformation of SO_2 and NOx.	context of the development of the LTS in the second implementation period, which is not consistent with this answer. Specifically, EPA has recently proposed to remove CALPUFF as a preferred model for long-range transport assessments and to recommend its use as a screening technique along with other Lagrangian models for addressing PSD increment beyond 50 km from a new or modifying source.
There are several steps for making an individual source attribution using a dispersion model: 1. Develop a modeling protocol. Some critical items to include in the protocol are the meteorological and terrain data that will be used, as well as the source-specific information (stack height, temperature, exit velocity, elevation, and emission rates of applicable pollutants) and receptor data from appropriate Class I areas. We recommend following EPA's Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts147 for parameter settings and meteorological data inputs. You may use other settings from those in IWAQM, but you should identify these settings and explain your selection of these settings. One important element of the protocol is in establishing the receptors that will be used in the model. The receptors that you use should be located in the nearest Class I area with sufficient density to identify the likely visibility effects of the source. For other Class I areas in relatively close proximity to a BART-eligible source, you may model a few strategic receptors to determine whether effects at those areas may be greater than at the nearest Class I area. For example, you might chose to locate receptors at these areas at the closest point to the source, at the highest and lowest elevation in the Class I area, at the IMPROVE monitor, and at the approximate expected plume release height. If the highest modeled effects are observed at the nearest Class I area, you may choose not to analyze the other Class I areas any further as additional analyses might be unwarranted.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. See above entry regarding the status of the CALPUFF model.

[145] The model code and its documentation are available at no cost for download from *http://www.epa.gov/scram001/tt22.htm#calpuff*.
[146] The Guideline on Air Quality Models, 40 CFR part 51, appendix W, addresses the regulatory application of air quality models for assessing criteria pollutants under the CAA, and describes further the procedures for using the CALPUFF model, as well as for obtaining approval for the use of other, nonguideline models
[147] Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts, U.S. Environmental Protection Agency, EPA-454/R-98-019, December 1998.

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You should bear in mind that some receptors within the relevant Class I area may be less than 50 km from the source while other receptors within that same Class I area may be greater than 50 km from the same source. As indicated by the Guideline on Air Quality Models, 40 CFR part 51, appendix W, this situation may call for the use of two different modeling approaches for the same Class I area and source, depending upon the State's chosen method for modeling sources less than 50 km. In situations where you are assessing visibility impacts for source-receptor distances less than 50 km, you should use expert modeling judgment in determining visibility impacts, giving consideration to both CALPUFF and other appropriate methods. In developing your modeling protocol, you may want to consult with EPA and your regional planning organization (RPO). Up-front consultation will ensure that key technical issues are addressed before you conduct your modeling.	
2. With the accepted protocol and compare the predicted visibility impacts with your threshold for "contribution." You should calculate daily visibility values for each receptor as the change in deciviews compared against natural visibility conditions. You can use EPA's "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule," EPA-454/B-03-005 (September 2003) in making this calculation. To determine whether a source may reasonably be anticipated to cause or contribute to visibility impairment at Class I area, you then compare the impacts predicted by the model against the threshold that you have selected. The emissions estimates used in the models are intended to reflect steady-state operating conditions during periods of high capacity utilization. We do not generally recommend that emissions reflecting periods of start-up, shutdown, and malfunction be used, as such emission rates could produce higher than normal effects than would be typical of most facilities. We recommend that States use the 24 hour average actual emission rate from the highest emitting day of the meteorological period modeled, unless this rate reflects periods start-up, shutdown, or malfunction. In addition, the monthly average relative humidity is used, rather than the daily average humidity—an approach that effectively lowers the peak values in daily model averages. For these reasons, if you use the modeling approach we recommend, you should compare your "contribution" threshold against the 98th percentile of values. If the 98th percentile value from your modeling is less than your contribution threshold, then you may conclude that the source does not contribute to visibility impairment and is not subject to BART.	Applies only to BART.
Option 2: Use of Model Plants To Exempt Individual Sources With Common Characteristics Under this option, analyses of model plants could be used to exempt certain BART-eligible sources that share specific characteristics. It may be most useful to use this type of analysis to identify the types of small sources that do not cause or contribute to visibility impairment for purposes of BART, and thus should not be subject to a BART review. Different Class I areas may have different characteristics, however, so you should use care to ensure that the criteria you develop are appropriate for the applicable cases. In carrying out this approach, you could use modeling analyses of representative plants to reflect groupings of specific sources with important common characteristics. Based on these analyses, you may find that certain types of sources are clearly anticipated to cause or contribute to visibility impairment. You could then choose to categorically require those types of sources	Applies only to BART.

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to undergo a BART determination. Conversely, you may find based on representative plant analyses that certain types of sources are not reasonably anticipated to cause or contribute to visibility impairment. To do this, you may conduct your own modeling to establish emission levels and distances from Class I areas on which you can rely to exempt sources with those characteristics. For example, based on your modeling you might choose to exempt all NOx-only sources that emit less than a certain amount per year and are located a certain distance from a Class I area. You could then choose to categorically exempt such sources from the BART determination process. Our analyses of visibility impacts from model plants provide a useful example of the type of analyses that can be used to exempt categories of sources from BART.148 In our analyses, we developed model plants (EGUs and non-EGUs), with representative plume and stack characteristics, for use in considering the visibility impact from emission sources of different sizes and compositions at distances of 50, 100 and 200 kilometers from two hypothetical Class I areas (one in the East and one in the West). As the plume and stack characteristics of these model plants were developed considering the broad range of sources within the EGU and non-EGU categories, they do not necessarily represent any specific plant. However, the results of these analyses are instructive in the development of an exemption process for any Class I area. In preparing our analyses, we have made a number of assumptions and exercised certain modeling choices; some of these have a tendency to lend conservatism to the results, overstating the likely effects, while others may understate the likely effects. On balance, when all of these factors are considered, we believe that our examples reflect realistic treatments of the situations being modeled. Based on our analyses, we believe that a State that has established 0.5 deciviews as a contribution threshold could reasonably exempt from the BART review process sources that emit less than 500 tons per year of NOx or SO_2 (or combined NOx and SO_2), as long as these sources are located more than 50 kilometers from any Class I area; and sources that emit less than 1000 tons per year of NOx or SO_2 (or combined NOx and SO_2) that are located more than 100 kilometers from any Class I area. You do, however, have the option of showing other thresholds might also be appropriate given your specific circumstances.	
Option 3: Cumulative Modeling To Show That No Sources in a State Are Subject to BART You may also submit to EPA a demonstration based on an analysis of overall visibility impacts that emissions from BART-eligible sources in your State, considered together, are not reasonably anticipated to cause or contribute to any visibility impairment in a Class I area, and thus no source should be subject to BART. You may do this on a pollutant by pollutant basis or for all visibility-impairing pollutants to determine if emissions from these sources contribute to visibility impairment. For example, emissions of $SO_2$from your BART-eligible sources may clearly cause or contribute to visibility impairment while direct emissions of $PM_{2.5}$from these sources may not contribute to impairment. If you can make such a demonstration, then you	Applies only to BART.

[148] CALPUFF Analysis in Support of the June 2005 Changes to the Regional Haze Rule, U.S. Environmental Protection Agency, June 15, 2005, Docket No. EPA-HQ-OAR-2002-0076.

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may reasonably conclude that none of your BART-eligible sources are subject to BART for a particular pollutant or pollutants. As noted above, your demonstration should take into account the interactions among pollutants and their resulting impacts on visibility before making any pollutant-specific determinations. Analyses may be conducted using several alternative modeling approaches. First, you may use the CALPUFF or other appropriate model as described in Option 1 to evaluate the impacts of individual sources on downwind Class I areas, aggregating those impacts to determine the collective contribution of all BART-eligible sources to visibility impairment. You may also use a photochemical grid model. As a general matter, the larger the number of sources being modeled, the more appropriate it may be to use a photochemical grid model. However, because such models are significantly less sensitive than dispersion models to the contributions of one or a few sources, as well as to the interactions among sources that are widely distributed geographically, if you wish to use a grid model, you should consult with the appropriate EPA Regional Office to develop an appropriate modeling protocol.	
IV. The BART Determination: Analysis of BART Options This section describes the process for the analysis of control options for sources subject to BART	See entries on the sub-topics that follow.
A. What factors must I address in the BART review? The visibility regulations define BART as follows: Best Available Retrofit Technology (BART) means an emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by . . . [a BART-eligible source]. The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology. The BART analysis identifies the best system of continuous emission reduction taking into account: (1) The available retrofit control options, (2) Any pollution control equipment in use at the source (which affects the availability of options and their impacts), (3) The costs of compliance with control options, (4) The remaining useful life of the facility, (5) The energy and non-air quality environmental impacts of control options (6) The visibility impacts analysis.	Applies only to BART.
B. What is the scope of the BART review?	Applies only to BART.

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Once you determine that a source is subject to BART for a particular pollutant, then for each affected emission unit, you must establish BART for that pollutant. The BART determination must address air pollution control measures for each emissions unit or pollutant emitting activity subject to review. *Example:* Plantwide emissions from emission units within the listed categories that began operation within the "time window" for BART149 are 300 tons/yr of NOx, 200 tons/yr of SO_2, and 150 tons/yr of primary particulate. Emissions unit A emits 200 tons/yr of NOx, 100 tons/yr of SO_2, and 100 tons/yr of primary particulate. Other emission units, units B through H, which began operating in 1966, contribute lesser amounts of each pollutant. For this example, a BART review is required for NOx, SO_2, and primary particulate, and control options must be analyzed for units B through H as well as unit A.	
C. How does a BART review relate to Maximum Achievable Control Technology (MACT) Standards under CAA section 112, or to other emission limitations required under the CAA? For VOC and PM sources subject to MACT standards, States may streamline the analysis by including a discussion of the MACT controls and whether any major new technologies have been developed subsequent to the MACT standards. We believe that there are many VOC and PM sources that are well controlled because they are regulated by the MACT standards, which EPA developed under CAA section 112. For a few MACT standards, this may also be true for SO_2. Any source subject to MACT standards must meet a level that is as stringent as the best-controlled 12 percent of sources in the industry. Examples of these hazardous air pollutant sources which effectively control VOC and PM emissions include (among others) secondary lead facilities, organic chemical plants subject to the hazardous organic NESHAP (HON), pharmaceutical production facilities, and equipment leaks and wastewater operations at petroleum refineries. We believe that, in many cases, it will be unlikely that States will identify emission controls more stringent than the MACT standards without identifying control options that would cost many thousands of dollars per ton. Unless there are new technologies subsequent to the MACT standards which would lead to cost-effective increases in the level of control, you may rely on the MACT standards for purposes of BART. We believe that the same rationale also holds true for emissions standards developed for municipal waste incinerators under CAA section 111(d), and for many NSR/PSD determinations and NSR/PSD settlement agreements. However, we do not believe that technology determinations from the 1970s or early 1980s, including new source performance standards (NSPS), should be considered to represent best control for existing sources, as best control levels for recent plant retrofits are more stringent than these older levels. Where you are relying on these standards to represent a BART level of control, you should provide the public with a discussion of whether any new technologies have subsequently become available.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. However, the reference to technology determinations in the 1970s or early 1980s should be interpreted as now applying to technology determinations in the 1990s and early 2000s as well.

[149] That is, emission units that were in existence on August 7, 1977, and which began actual operation on or after August 7, 1962.

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D. What Are the Five Basic Steps of a Case-by-Case BART Analysis? The five steps are: STEP 1—Identify All150 Available Retrofit Control Technologies, STEP 2—Eliminate Technically Infeasible Options, STEP 3—Evaluate Control Effectiveness of Remaining Control Technologies, STEP 4—Evaluate Impacts and Document the Results, and STEP 5—Evaluate Visibility Impacts.	This answer applies only to BART.
1. STEP 1: How do I identify all available retrofit emission control techniques? 1. Available retrofit control options are those air pollution control technologies with a practical potential for application to the emissions unit and the regulated pollutant under evaluation. Air pollution control technologies can include a wide variety of available methods, systems, and techniques for control of the affected pollutant. Technologies required as BACT or LAER are available for BART purposes and must be included as control alternatives. The control alternatives can include not only existing controls for the source category in question but also take into account technology transfer of controls that have been applied to similar source categories and gas streams. Technologies which have not yet been applied to (or permitted for) full scale operations need not be considered as available; we do not expect the source owner to purchase or construct a process or control device that has not already been demonstrated in practice.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.
2. Where a NSPS exists for a source category (which is the case for most of the categories affected by BART), you should include a level of control equivalent to the NSPS as one of the control options.151 The NSPS standards are codified in 40 CFR part 60. We note that there are situations where NSPS standards do not require the most stringent level of available control for all sources within a category. For example, post-combustion NOx controls (the most stringent controls for stationary gas turbines) are not required under subpart GG of the NSPS for Stationary Gas Turbines. However, such controls must still be considered available technologies for the BART selection process.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

[150] In identifying "all" options, you must identify the most stringent option and a reasonable set of options for analysis that reflects a comprehensive list of available technologies. It is not necessary to list all permutations of available control levels that exist for a given technology—the list is complete if it includes the maximum level of control each technology is capable of achieving.

[151] In EPA's 1980 BART guidelines for reasonably attributable visibility impairment, we concluded that NSPS standards generally, at that time, represented the best level sources could install as BART. In the 20 year period since this guidance was developed, there have been advances in SO_2 control technologies as well as technologies for the control of other pollutants, confirmed by a number of recent retrofits at Western power plants. Accordingly, the EPA no longer concludes that the NSPS level of controls automatically represents "the best these sources can install." Analysis of the BART factors could result in the selection of a NSPS level of control, but you should reach this conclusion only after considering the full range of control options.

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3. Potentially applicable retrofit control alternatives can be categorized in three ways. • Pollution prevention: use of inherently lower-emitting processes/practices, including the use of control techniques (e.g., low-NOx burners) and work practices that prevent emissions and result in lower "production-specific" emissions (note that it is not our intent to direct States to switch fuel forms, e.g., from coal to gas), • Use of (and where already in place, improvement in the performance of) add-on controls, such as scrubbers, fabric filters, thermal oxidizers and other devices that control and reduce emissions after they are produced, and • Combinations of inherently lower-emitting processes and add-on controls.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
4. In the course of the BART review, one or more of the available control options may be eliminated from consideration because they are demonstrated to be technically infeasible or to have unacceptable energy, cost, or non-air quality environmental impacts on a case-by-case (or site-specific) basis. However, at the outset, you should initially identify all control options with potential application to the emissions unit under review.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
5. We do not consider BART as a requirement to redesign the source when considering available control alternatives. For example, where the source subject to BART is a coal-fired electric generator, we do not require the BART analysis to consider building a natural gas-fired electric turbine although the turbine may be inherently less polluting on a per unit basis.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
6. For emission units subject to a BART review, there will often be control measures or devices already in place. For such emission units, it is important to include control options that involve improvements to existing controls and not to limit the control options only to those measures that involve a complete replacement of control devices. Example: For a power plant with an existing wet scrubber, the current control efficiency is 66 percent. Part of the reason for the relatively low control efficiency is that 22 percent of the gas stream bypasses the scrubber. A BART review identifies options for improving the performance of the wet scrubber by redesigning the internal components of the scrubber and by eliminating or reducing the percentage of the gas stream that bypasses the scrubber. Four control options are identified: (1) 78 percent control based upon improved scrubber performance while maintaining the 22 percent bypass, (2) 83 percent control based upon improved scrubber performance while reducing the bypass to 15 percent, (3) 93 percent control based upon improving the scrubber performance while eliminating the bypass entirely, (this option results in a "wet stack" operation in which the gas leaving the stack is saturated with water) and (4) 93 percent as in option 3, with the addition of an indirect reheat system to reheat the stack gas above the saturation temperature. You must consider each of these four options in a BART analysis for this source.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
7. You are expected to identify potentially applicable retrofit control technologies that represent the full range of demonstrated alternatives. Examples of general information sources to consider include: • The EPA's Clean Air Technology Center, which includes the RACT/BACT/LAER Clearinghouse (RBLC);	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.

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• State and Local Best Available Control Technology Guidelines—many agencies have online information—for example South Coast Air Quality Management District, Bay Area Air Quality Management District, and Texas Natural Resources Conservation Commission; • Control technology vendors; • Federal/State/Local NSR permits and associated inspection/performance test reports; • Environmental consultants; • Technical journals, reports and newsletters, air pollution control seminars; and • The EPA's NSR bulletin board—http://www.epa.gov/ttn/nsr; • Department of Energy's Clean Coal Program—technical reports; • The NOx Control Technology "Cost Tool"—Clean Air Markets Division Web page—http://www.epa.gov/airmarkets/arp/nox/controltech.html; • Performance of selective catalytic reduction on coal-fired steam generating units—final report. OAR/ARD, June 1997 (also available at http://www.epa.gov/airmarkets/arp/nox/controltech.html); • Cost estimates for selected applications of NOx control technologies on stationary combustion boilers. OAR/ARD June 1997. (Docket for NOx SIP Call, A-96-56, item II-A-03); • Investigation of performance and cost of NOx controls as applied to group 2 boilers. OAR/ARD, August 1996. (Docket for Phase II NOx rule, A-95-28, item IV-A-4); • Controlling SO_2 Emissions: A Review of Technologies. EPA-600/R-00-093, USEPA/ORD/NRMRL, October 2000; and • The OAQPS Control Cost Manual. You are expected to compile appropriate information from these information sources.	
8. There may be situations where a specific set of units within a fenceline constitutes the logical set to which controls would apply and that set of units may or may not all be BART-eligible. (For example, some units in that set may not have been constructed between 1962 and 1977.)	Applies only to BART.
9. If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.
2. STEP 2: How do I determine whether the options identified in Step 1 are technically feasible? In Step 2, you evaluate the technical feasibility of the control options you identified in Step 1. You should document a demonstration of technical infeasibility and should explain, based on physical, chemical, or engineering principles, why	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.

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technical difficulties would preclude the successful use of the control option on the emissions unit under review. You may then eliminate such technically infeasible control options from further consideration in the BART analysis.	
In general, what do we mean by technical feasibility? Control technologies are technically feasible if either (1) they have been installed and operated successfully for the type of source under review under similar conditions, or (2) the technology could be applied to the source under review. Two key concepts are important in determining whether a technology could be applied: "availability" and "applicability." As explained in more detail below, a technology is considered "available" if the source owner may obtain it through commercial channels, or it is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is available and applicable is technically feasible.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
What do we mean by "available" technology? 1. The typical stages for bringing a control technology concept to reality as a commercial product are: • Concept stage; • Research and patenting; • Bench scale or laboratory testing; • Pilot scale testing; • Licensing and commercial demonstration; and • Commercial sales. 2. A control technique is considered available, within the context presented above, if it has reached the stage of licensing and commercial availability. Similarly, we do not expect a source owner to conduct extended trials to learn how to apply a technology on a totally new and dissimilar source type. Consequently, you would not consider technologies in the pilot scale testing stages of development as "available" for purposes of BART review. 3. Commercial availability by itself, however, is not necessarily a sufficient basis for concluding a technology to be applicable and therefore technically feasible. Technical feasibility, as determined in Step 2, also means a control option may reasonably be deployed on or "applicable" to the source type under consideration. Because a new technology may become available at various points in time during the BART analysis process, we believe that guidelines are needed on when a technology must be considered. For example, a technology may become available during the public comment period on the State's rule development process. Likewise, it is possible that new technologies may become available after the close of the State's public comment period and before submittal of the SIP to EPA, or during EPA's review process on the SIP submittal. In order to provide certainty in the process, all technologies should be considered if available before the close of the State's public comment period. You need not consider technologies that become available after this date.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.

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As part of your analysis, you should consider any technologies brought to your attention in public comments. If you disagree with public comments asserting that the technology is available, you should provide an explanation for the public record as to the basis for your conclusion.	
What do we mean by "applicable" technology? You need to exercise technical judgment in determining whether a control alternative is applicable to the source type under consideration. In general, a commercially available control option will be presumed applicable if it has been used on the same or a similar source type. Absent a showing of this type, you evaluate technical feasibility by examining the physical and chemical characteristics of the pollutant-bearing gas stream, and comparing them to the gas stream characteristics of the source types to which the technology had been applied previously. Deployment of the control technology on a new or existing source with similar gas stream characteristics is generally a sufficient basis for concluding the technology is technically feasible barring a demonstration to the contrary as described below.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
What type of demonstration is required if I conclude that an option is not technically feasible? 1. Where you conclude that a control option identified in Step 1 is technically infeasible, you should demonstrate that the option is either commercially unavailable, or that specific circumstances preclude its application to a particular emission unit. Generally, such a demonstration involves an evaluation of the characteristics of the pollutant-bearing gas stream and the capabilities of the technology. Alternatively, a demonstration of technical infeasibility may involve a showing that there are unresolvable technical difficulties with applying the control to the source (e.g., size of the unit, location of the proposed site, operating problems related to specific circumstances of the source, space constraints, reliability, and adverse side effects on the rest of the facility). Where the resolution of technical difficulties is merely a matter of increased cost, you should consider the technology to be technically feasible. The cost of a control alternative is considered later in the process. 2. The determination of technical feasibility is sometimes influenced by recent air quality permits. In some cases, an air quality permit may require a certain level of control, but the level of control in a permit is not expected to be achieved in practice (e.g., a source has received a permit but the project was canceled, or every operating source at that permitted level has been physically unable to achieve compliance with the limit). Where this is the case, you should provide supporting documentation showing why such limits are not technically feasible, and, therefore, why the level of control (but not necessarily the technology) may be eliminated from further consideration. However, if there is a permit requiring the application of a certain technology or emission limit to be achieved for such technology, this usually is sufficient justification for you to assume the technical feasibility of that technology or emission limit. 3. Physical modifications needed to resolve technical obstacles do not, in and of themselves, provide a justification for eliminating the control technique on the basis of technical infeasibility. However, you may consider the cost of such modifications in estimating costs. This, in turn, may form the basis for eliminating a control technology (see later discussion).	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.

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4. Vendor guarantees may provide an indication of commercial availability and the technical feasibility of a control technique and could contribute to a determination of technical feasibility or technical infeasibility, depending on circumstances. However, we do not consider a vendor guarantee alone to be sufficient justification that a control option will work. Conversely, lack of a vendor guarantee by itself does not present sufficient justification that a control option or an emissions limit is technically infeasible. Generally, you should make decisions about technical feasibility based on chemical, and engineering analyses (as discussed above), in conjunction with information about vendor guarantees. 5. A possible outcome of the BART procedures discussed in these guidelines is the evaluation of multiple control technology alternatives which result in essentially equivalent emissions. It is not our intent to encourage evaluation of unnecessarily large numbers of control alternatives for every emissions unit. Consequently, you should use judgment in deciding on those alternatives for which you will conduct the detailed impacts analysis (Step 4 below). For example, if two or more control techniques result in control levels that are essentially identical, considering the uncertainties of emissions factors and other parameters pertinent to estimating performance, you may evaluate only the less costly of these options. You should narrow the scope of the BART analysis in this way only if there is a negligible difference in emissions and energy and non-air quality environmental impacts between control alternatives.	
3. STEP 3: How do I evaluate technically feasible alternatives? Step 3 involves evaluating the control effectiveness of all the technically feasible control alternatives identified in Step 2 for the pollutant and emissions unit under review. Two key issues in this process include: (1) Making sure that you express the degree of control using a metric that ensures an "apples to apples" comparison of emissions performance levels among options, and (2) Giving appropriate treatment and consideration of control techniques that can operate over a wide range of emission performance levels.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
What are the appropriate metrics for comparison? This issue is especially important when you compare inherently lower-polluting processes to one another or to add-on controls. In such cases, it is generally most effective to express emissions performance as an average steady state emissions level per unit of product produced or processed. Examples of common metrics: • Pounds of SO_2 emissions per million Btu heat input, and • Pounds of NOx emissions per ton of cement produced.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
How do I evaluate control techniques with a wide range of emission performance levels?	The general sense of this answer applies as a recommendation for the development of the LTS

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1. Many control techniques, including both add-on controls and inherently lower polluting processes, can perform at a wide range of levels. Scrubbers and high and low efficiency electrostatic precipitators (ESPs) are two of the many examples of such control techniques that can perform at a wide range of levels. It is not our intent to require analysis of each possible level of efficiency for a control technique as such an analysis would result in a large number of options. It is important, however, that in analyzing the technology you take into account the most stringent emission control level that the technology is capable of achieving. You should consider recent regulatory decisions and performance data (e.g., manufacturer's data, engineering estimates and the experience of other sources) when identifying an emissions performance level or levels to evaluate. 2. In assessing the capability of the control alternative, latitude exists to consider special circumstances pertinent to the specific source under review, or regarding the prior application of the control alternative. However, you should explain the basis for choosing the alternate level (or range) of control in the BART analysis. Without a showing of differences between the source and other sources that have achieved more stringent emissions limits, you should conclude that the level being achieved by those other sources is representative of the achievable level for the source being analyzed. 3. You may encounter cases where you may wish to evaluate other levels of control in addition to the most stringent level for a given device. While you must consider the most stringent level as one of the control options, you may consider less stringent levels of control as additional options. This would be useful, particularly in cases where the selection of additional options would have widely varying costs and other impacts. 4. Finally, we note that for retrofitting existing sources in addressing BART, you should consider ways to improve the performance of existing control devices, particularly when a control device is not achieving the level of control that other similar sources are achieving in practice with the same device. For example, you should consider requiring those sources with electrostatic precipitators (ESPs) performing below currently achievable levels to improve their performance.	in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.
4. STEP 4: For a BART review, what impacts am I expected to calculate and report? What methods does EPA recommend for the impacts analysis? After you identify the available and technically feasible control technology options, you are expected to conduct the following analyses when you make a BART determination: Impact analysis part 1: Costs of compliance, Impact analysis part 2: Energy impacts, and Impact analysis part 3: Non-air quality environmental impacts. Impact analysis part 4: Remaining useful life. In this section, we describe how to conduct each of these three analyses. You are responsible for presenting an evaluation of each impact along with appropriate supporting information. You should discuss and, where possible, quantify both beneficial and adverse impacts. In general, the analysis should focus on the direct impact of the control alternative.	This answer applies only to BART. The statutory factors for reasonable progress are different.

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a. Impact analysis part 1: how do I estimate the costs of control? 1. To conduct a cost analysis, you: (1) Identify the emissions units being controlled, (2) Identify design parameters for emission controls, and (3) Develop cost estimates based upon those design parameters. 2. It is important to identify clearly the emission units being controlled, that is, to specify a well-defined area or process segment within the plant. In some cases, multiple emission units can be controlled jointly. However, in other cases, it may be appropriate in the cost analysis to consider whether multiple units will be required to install separate and/or different control devices. The analysis should provide a clear summary list of equipment and the associated control costs. Inadequate documentation of the equipment whose emissions are being controlled is a potential cause for confusion in comparison of costs of the same controls applied to similar sources. 3. You then specify the control system design parameters. Potential sources of these design parameters include equipment vendors, background information documents used to support NSPS development, control technique guidelines documents, cost manuals developed by EPA, control data in trade publications, and engineering and performance test data. The following are a few examples of design parameters for two example control measures:	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

Control device	Examples of design parameters
Wet Scrubbers	Type of sorbent used (lime, limestone, etc.). Gas pressure drop. Liquid/gas ratio.
Selective Catalytic Reduction	Ammonia to NOx molar ratio. Pressure drop. Catalyst life.

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4. The value selected for the design parameter should ensure that the control option will achieve the level of emission control being evaluated. You should include in your analysis documentation of your assumptions regarding design parameters. Examples of supporting references would include the EPA OAQPS Control Cost Manual (see below) and background information documents used for NSPS and hazardous pollutant emission standards. If the design parameters you specified differ from typical designs, you should document the difference by supplying performance test data for the control technology in question applied to the same source or a similar source. 5. Once the control technology alternatives and achievable emissions performance levels have been identified, you then develop estimates of capital and annual costs. The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual, Fifth Edition, February 1996, EPA 453/B-96-001).[152] In order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual, where possible.[153] The Control Cost Manual addresses most control technologies in sufficient detail for a BART analysis. The cost analysis should also take into account any site-specific design or other conditions identified above that affect the cost of a particular BART technology option.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

[152] The OAQPS Control Cost Manual is updated periodically. While this citation refers to the latest version at the time this guidance was written, you should use the version that is current as of when you conduct your impact analysis. This document is available at the following website: *http://www.epa.gov/ttn/catc/dir1/cs1ch2.pdf*.

[153] You should include documentation for any additional information you used for the cost calculations, including any information supplied by vendors that affects your assumptions regarding purchased equipment costs, equipment life, replacement of major components, and any other element of the calculation that differs from the Control Cost Manual.

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b. What do we mean by cost effectiveness? Cost effectiveness, in general, is a criterion used to assess the potential for achieving an objective in the most economical way. For purposes of air pollutant analysis, "effectiveness" is measured in terms of tons of pollutant emissions removed, and "cost" is measured in terms of annualized control costs. We recommend two types of cost-effectiveness calculations—average cost effectiveness, and incremental cost effectiveness.	Applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period.
c. How do I calculate average cost effectiveness? Average cost effectiveness means the total annualized costs of control divided by annual emissions reductions (the difference between baseline annual emissions and the estimate of emissions after controls), using the following formula: Average cost effectiveness (dollars per ton removed) =Control option annualized cost[154] Baseline annual emissions—Annual emissions with Control option Because you calculate costs in (annualized) dollars per year ($/yr) and because you calculate emissions rates in tons per year (tons/yr), the result is an average cost-effectiveness number in (annualized) dollars per ton ($/ton) of pollutant removed.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer
d. How do I calculate baseline emissions? 1. The baseline emissions rate should represent a realistic depiction of anticipated annual emissions for the source. In general, for the existing sources subject to BART, you will estimate the anticipated annual emissions based upon actual emissions from a baseline period. 2. When you project that future operating parameters (e.g., limited hours of operation or capacity utilization, type of fuel, raw materials or product mix or type) will differ from past practice, and if this projection has a deciding effect in the BART determination, then you must make these parameters or assumptions into enforceable limitations. In the absence of enforceable limitations, you calculate baseline emissions based upon continuation of past practice. 3. For example, the baseline emissions calculation for an emergency standby generator may consider the fact that the source owner would not operate more than past practice of 2 weeks a year. On the other hand, baseline emissions associated with a base-loaded turbine should be based on its past practice which would indicate a large number of hours of operation. This produces a significantly higher level of baseline emissions than in the case of the emergency/standby unit and results in more cost-effective controls. As a consequence of the dissimilar baseline emissions, BART for the two cases could be very different.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer. While this document recommends a focus on the baseline situation anticipated to exist in 2028 for screening purposes, consideration of costs and emission reductions in a four-factor analysis should not necessarily be limited to that single year.

[154] Whenever you calculate or report annual costs, you should indicate the year for which the costs are estimated. For example, if you use the year 2000 as the basis for cost comparisons, you would report that an annualized cost of $20 million would be: $20 million (year 2000 dollars).

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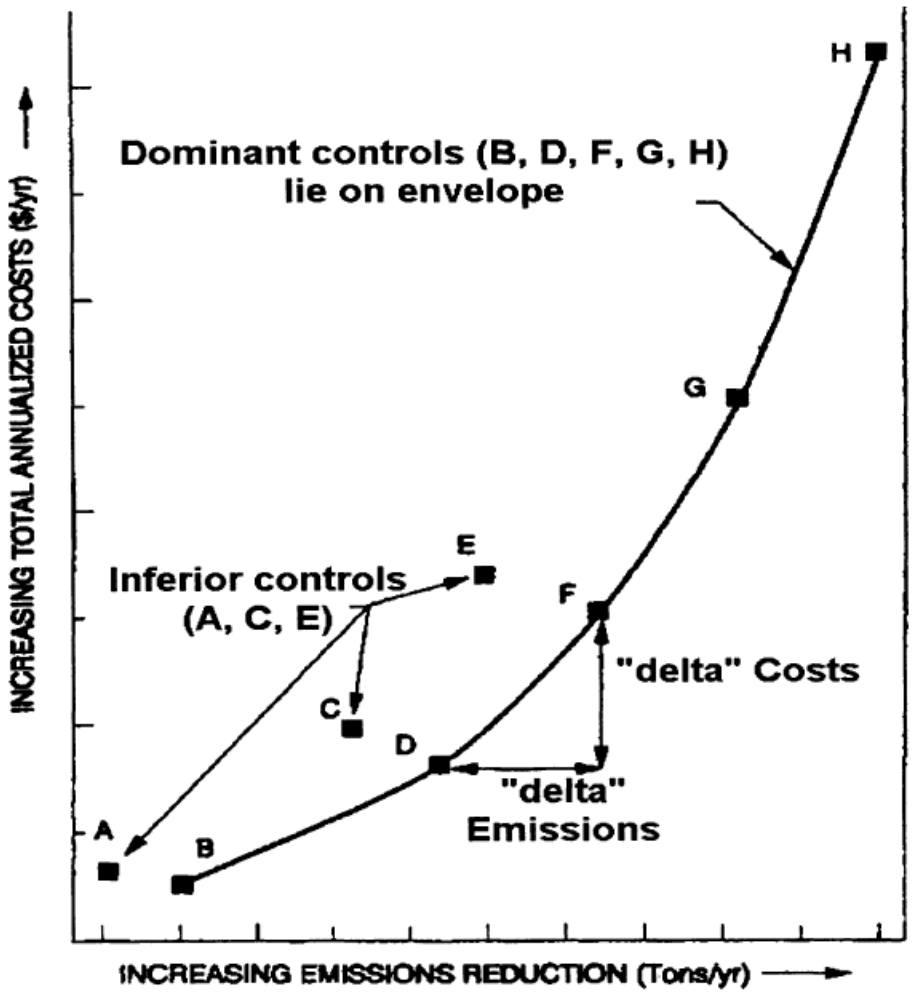
e. How do I calculate incremental cost effectiveness? 1. In addition to the average cost effectiveness of a control option, you should also calculate incremental cost effectiveness. You should consider the incremental cost effectiveness in combination with the average cost effectiveness when considering whether to eliminate a control option. The incremental cost effectiveness calculation compares the costs and performance level of a control option to those of the next most stringent option, as shown in the following formula (with respect to cost per emissions reduction): Incremental Cost Effectiveness (dollars per incremental ton removed) = (Total annualized costs of control option) − (Total annualized costs of next control option) ÷ (Control option annual emissions) − (Next control option annual emissions) *Example 1:* Assume that Option F on Figure 2 has total annualized costs of $1 million to reduce 2000 tons of a pollutant, and that Option D on Figure 2 has total annualized costs of $500,000 to reduce 1000 tons of the same pollutant. The incremental cost effectiveness of Option F relative to Option D is ($1 million − $500,000) divided by (2000 tons − 1000 tons), or $500,000 divided by 1000 tons, which is $500/ton. *Example 2:* Assume that two control options exist: Option 1 and Option 2. Option 1 achieves a 1,000 ton/yr reduction at an annualized cost of $1,900,000. This represents an average cost of ($1,900,000/1,000 tons) = $1,900/ton. Option 2 achieves a 980 tons/yr reduction at an annualized cost of $1,500,000. This represents an average cost of ($1,500,000/980 tons) = $1,531/ton. The incremental cost effectiveness of Option 1 relative to Option 2 is ($1,900,000 − $1,500,000) divided by (1,000 tons − 980 tons). The adoption of Option 1 instead of Option 2 results in an incremental emission reduction of 20 tons per year at an additional cost of $400,000 per year. The incremental cost of Option 1, then, is $20,000 per ton − 11 times the average cost of $1,900 per ton. While $1,900 per ton may still be deemed reasonable, it is useful to consider both the average and incremental cost in making an overall cost-effectiveness finding. Of course, there may be other differences between these options, such as, energy or water use, or non-air environmental effects, which also should be considered in selecting a BART technology. 2. You should exercise care in deriving incremental costs of candidate control options. Incremental cost-effectiveness comparisons should focus on annualized cost and emission reduction differences between "dominant" alternatives. To identify dominant alternatives, you generate a graphical plot of total annualized costs for total emissions reductions for all control alternatives identified in the BART analysis, and by identifying a "least-cost envelope" as shown in Figure 2. (A "least-cost envelope" represents the set of options that should be dominant in the choice of a specific option.)	The information on how to calculate incremental cost-effectiveness is applicable. This guidance document provides new guidance discouraging the consideration of incremental cost-effectiveness when determining whether the cost of compliance is reasonable.


INCREASING TOTAL ANNUALIZED COSTS ($/yr)
Dominant controls (B, D, F, G, H)
lie on envelope
H
G
E
Inferior controls
(A, C, E)
F
"delta" Costs
C
D
"delta"
Emissions
A
B
INCREASING EMISSIONS REDUCTION (Tons/yr)

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Example: Eight technically feasible control options for analysis are listed. These are represented as A through H in Figure 2. The dominant set of control options, B, D, F, G, and H, represent the least-cost envelope, as we depict by the cost curve connecting them. Points A, C and E are inferior options, and you should not use them in calculating incremental cost effectiveness. Points A, C and E represent inferior controls because B will buy more emissions reductions for less money than A; and similarly, D and F will buy more reductions for less money than C and E, respectively. 3. In calculating incremental costs, you: (1) Array the control options in ascending order of annualized total costs, (2) Develop a graph of the most reasonable smooth curve of the control options, as shown in Figure 2. This is to show the "least-cost envelope" discussed above; and (3) Calculate the incremental cost effectiveness for each dominant option, which is the difference in total annual costs between that option and the next most stringent option, divided by the difference in emissions, after controls have been applied, between those two control options. For example, using Figure 2, you would calculate incremental cost effectiveness for the difference between options B and D, options D and F, options F and G, and options G and H. 4. A comparison of incremental costs can also be useful in evaluating the viability of a specific control option over a range of efficiencies. For example, depending on the capital and operational cost of a control device, total and incremental cost may vary significantly (either increasing or decreasing) over the operational range of a control device. Also, the greater the number of possible control options that exist, the more weight should be given to the incremental costs vs. average costs. It should be noted that average and incremental cost effectiveness are identical when only one candidate control option is known to exist. 5. You should exercise caution not to misuse these techniques. For example, you may be faced with a choice between two available control devices at a source, control A and control B, where control B achieves slightly greater emission reductions. The average cost (total annual cost/total annual emission reductions) for each may be deemed to be reasonable. However, the incremental cost (total annual $cost_{A-B}$/total annual emission $reductions_{A-B}$) of the additional emission reductions to be achieved by control B may be very great. In such an instance, it may be inappropriate to choose control B, based on its high incremental costs, even though its average cost may be considered reasonable. 6. In addition, when you evaluate the average or incremental cost effectiveness of a control alternative, you should make reasonable and supportable assumptions regarding control efficiencies. An unrealistically low assessment of the emission reduction potential of a certain technology could result in inflated cost-effectiveness figures.	The information on how to calculate incremental cost-effectiveness is applicable. This guidance document provides new guidance discouraging the consideration of incremental cost-effectiveness when determining whether the cost of compliance is reasonable.

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f. What other information should I provide in the cost impacts analysis? You should provide documentation of any unusual circumstances that exist for the source that would lead to cost-effectiveness estimates that would exceed that for recent retrofits. This is especially important in cases where recent retrofits have cost-effectiveness values that are within what has been considered a reasonable range, but your analysis concludes that costs for the source being analyzed are not considered reasonable. (A reasonable range would be a range that is consistent with the range of cost effectiveness values used in other similar permit decisions over a period of time.) *Example:* In an arid region, large amounts of water are needed for a scrubbing system. Acquiring water from a distant location could greatly increase the cost per ton of emissions reduced of wet scrubbing as a control option.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
g. What other things are important to consider in the cost impacts analysis? In the cost analysis, you should take care not to focus on incomplete results or partial calculations. For example, large capital costs for a control option alone would not preclude selection of a control measure if large emissions reductions are projected. In such a case, low or reasonable cost effectiveness numbers may validate the option as an appropriate BART alternative irrespective of the large capital costs. Similarly, projects with relatively low capital costs may not be cost effective if there are few emissions reduced.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

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h. Impact analysis part 2: How should I analyze and report energy impacts? 1. You should examine the energy requirements of the control technology and determine whether the use of that technology results in energy penalties or benefits. A source owner may, for example, benefit from the combustion of a concentrated gas stream rich in volatile organic compounds; on the other hand, more often extra fuel or electricity is required to power a control device or incinerate a dilute gas stream. If such benefits or penalties exist, they should be quantified to the extent practicable. Because energy penalties or benefits can usually be quantified in terms of additional cost or income to the source, the energy impacts analysis can, in most cases, simply be factored into the cost impacts analysis. The fact of energy use in and of itself does not disqualify a technology. 2. Your energy impact analysis should consider only direct energy consumption and not indirect energy impacts. For example, you could estimate the direct energy impacts of the control alternative in units of energy consumption at the source (e.g., BTU, kWh, barrels of oil, tons of coal). The energy requirements of the control options should be shown in terms of total (and in certain cases, also incremental) energy costs per ton of pollutant removed. You can then convert these units into dollar costs and, where appropriate, factor these costs into the control cost analysis. 3. You generally do not consider indirect energy impacts (such as energy to produce raw materials for construction of control equipment). However, if you determine, either independently or based on a showing by the source owner, that the indirect energy impact is unusual or significant and that the impact can be well quantified, you may consider the indirect impact. 4. The energy impact analysis may also address concerns over the use of locally scarce fuels. The designation of a scarce fuel may vary from region to region. However, in general, a scarce fuel is one which is in short supply locally and can be better used for alternative purposes, or one which may not be reasonably available to the source either at the present time or in the near future. 5. Finally, the energy impacts analysis may consider whether there are relative differences between alternatives regarding the use of locally or regionally available coal, and whether a given alternative would result in significant economic disruption or unemployment. For example, where two options are equally cost effective and achieve equivalent or similar emissions reductions, one option may be preferred if the other alternative results in significant disruption or unemployment.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

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i. Impact analysis part 3: How do I analyze "non-air quality environmental impacts?" 1. In the non-air quality related environmental impacts portion of the BART analysis, you address environmental impacts other than air quality due to emissions of the pollutant in question. Such environmental impacts include solid or hazardous waste generation and discharges of polluted water from a control device. 2. You should identify any significant or unusual environmental impacts associated with a control alternative that have the potential to affect the selection or elimination of a control alternative. Some control technologies may have potentially significant secondary environmental impacts. Scrubber effluent, for example, may affect water quality and land use. Alternatively, water availability may affect the feasibility and costs of wet scrubbers. Other examples of secondary environmental impacts could include hazardous waste discharges, such as spent catalysts or contaminated carbon. Generally, these types of environmental concerns become important when sensitive site-specific receptors exist or when the incremental emissions reductions potential of the more stringent control is only marginally greater than the next most-effective option. However, the fact that a control device creates liquid and solid waste that must be disposed of does not necessarily argue against selection of that technology as BART, particularly if the control device has been applied to similar facilities elsewhere and the solid or liquid waste is similar to those other applications. On the other hand, where you or the source owner can show that unusual circumstances at the proposed facility create greater problems than experienced elsewhere, this may provide a basis for the elimination of that control alternative as BART. 3. The procedure for conducting an analysis of non-air quality environmental impacts should be made based on a consideration of site-specific circumstances. If you propose to adopt the most stringent alternative, then it is not necessary to perform this analysis of environmental impacts for the entire list of technologies you ranked in Step 3. In general, the analysis need only address those control alternatives with any significant or unusual environmental impacts that have the potential to affect the selection of a control alternative, or elimination of a more stringent control alternative. Thus, any important relative environmental impacts (both positive and negative) of alternatives can be compared with each other. 4. In general, the analysis of impacts starts with the identification and quantification of the solid, liquid, and gaseous discharges from the control device or devices under review. Initially, you should perform a qualitative or semi-quantitative screening to narrow the analysis to discharges with potential for causing adverse environmental effects. Next, you should assess the mass and composition of any such discharges and quantify them to the extent possible, based on readily available information. You should also assemble pertinent information about the public or environmental consequences of releasing these materials.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

BART Guideline Provisions	EPA Recommendation Regarding Applicability to Reasonable Progress Determinations in the Second Implementation Period
j. Impact analysis part 4: What are examples of non-air quality environmental impacts? The following are examples of how to conduct non-air quality environmental impacts: (1) Water Impact You should identify the relative quantities of water used and water pollutants produced and discharged as a result of the use of each alternative emission control system. Where possible, you should assess the effect on ground water and such local surface water quality parameters as pH, turbidity, dissolved oxygen, salinity, toxic chemical levels, temperature, and any other important considerations. The analysis could consider whether applicable water quality standards will be met and the availability and effectiveness of various techniques to reduce potential adverse effects. (2) Solid Waste Disposal Impact You could also compare the quality and quantity of solid waste (e.g., sludges, solids) that must be stored and disposed of or recycled as a result of the application of each alternative emission control system. You should consider the composition and various other characteristics of the solid waste (such as permeability, water retention, rewatering of dried material, compression strength, leachability of dissolved ions, bulk density, ability to support vegetation growth and hazardous characteristics) which are significant with regard to potential surface water pollution or transport into and contamination of subsurface waters or aquifers. (3) Irreversible or Irretrievable Commitment of Resources You may consider the extent to which the alternative emission control systems may involve a trade-off between short-term environmental gains at the expense of long-term environmental losses and the extent to which the alternative systems may result in irreversible or irretrievable commitment of resources (for example, use of scarce water resources). (4) Other Adverse Environmental Impacts You may consider significant differences in noise levels, radiant heat, or dissipated static electrical energy of pollution control alternatives. Other examples of non-air quality environmental impacts would include hazardous waste discharges such as spent catalysts or contaminated carbon.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

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k. How do I take into account a project's "remaining useful life" in calculating control costs? 1. You may decide to treat the requirement to consider the source's "remaining useful life" of the source for BART determinations as one element of the overall cost analysis. The "remaining useful life" of a source, if it represents a relatively short time period, may affect the annualized costs of retrofit controls. For example, the methods for calculating annualized costs in EPA's OAQPS Control Cost Manual require the use of a specified time period for amortization that varies based upon the type of control. If the remaining useful life will clearly exceed this time period, the remaining useful life has essentially no effect on control costs and on the BART determination process. Where the remaining useful life is less than the time period for amortizing costs, you should use this shorter time period in your cost calculations. 2. For purposes of these guidelines, the remaining useful life is the difference between: (1) The date that controls will be put in place (capital and other construction costs incurred before controls are put in place can be rolled into the first year, as suggested in EPA's OAQPS Control Cost Manual); you are conducting the BART analysis; and (2) The date the facility permanently stops operations. Where this affects the BART determination, this date should be assured by a federally- or State-enforceable restriction preventing further operation. 3. We recognize that there may be situations where a source operator intends to shut down a source by a given date, but wishes to retain the flexibility to continue operating beyond that date in the event, for example, that market conditions change. Where this is the case, your BART analysis may account for this, but it must maintain consistency with the statutory requirement to install BART within 5 years. Where the source chooses not to accept a federally enforceable condition requiring the source to shut down by a given date, it is necessary to determine whether a reduced time period for the remaining useful life changes the level of controls that would have been required as BART. If the reduced time period does change the level of BART controls, you may identify, and include as part of the BART emission limitation, the more stringent level of control that would be required as BART if there were no assumption that reduced the remaining useful life. You may incorporate into the BART emission limit this more stringent level, which would serve as a contingency should the source continue operating more than 5 years after the date EPA approves the relevant SIP. The source would not be allowed to operate after the 5-year mark without such controls. If a source does operate after the 5-year mark without BART in place, the source is considered to be in violation of the BART emissions limit for each day of operation.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this topic, which is consistent with this answer.

5. Step 5: How should I determine visibility impacts in the BART determination? The following is an approach you may use to determine visibility impacts (the degree of visibility improvement for each source subject to BART) for the BART determination. Once you have determined that your source or sources are subject to BART, you must conduct a visibility improvement determination for the source(s) as part of the BART determination. When making this determination, we believe you have flexibility in setting absolute thresholds, target levels of improvement, or de minimis levels since the deciview improvement must be weighed among the five factors, and you are free to determine the weight and significance to be assigned to each factor. For example, a 0.3 deciview improvement may merit a stronger weighting in one case versus another, so one "bright line" may not be appropriate. [Note that if sources have elected to apply the most stringent controls available, consistent with the discussion in section E. step 1. below, you need not conduct, or require the source to conduct, an air quality modeling analysis for the purpose of determining its visibility impacts.] Use CALPUFF,[155] or other appropriate dispersion model to determine the visibility improvement expected at a Class I area from the potential BART control technology applied to the source. Modeling should be conducted for SO_2, NOx, and direct PM emissions ($PM_{2.5}$ and/or PM_{10}). If the source is making the visibility determination, you should review and approve or disapprove of the source's analysis before making the expected improvement determination. There are several steps for determining the visibility impacts from an individual source using a dispersion model: • Develop a modeling protocol. Some critical items to include in a modeling protocol are meteorological and terrain data, as well as source-specific information (stack height, temperature, exit velocity, elevation, and allowable and actual emission rates of applicable pollutants), and receptor data from appropriate Class I areas. We recommend following EPA's Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts[156] for parameter settings and meteorological data inputs; the use of other settings from those in IWAQM should be identified and explained in the protocol. One important element of the protocol is in establishing the receptors that will be used in the model. The receptors that you use should be located in the nearest Class I area with sufficient density to identify the likely visibility effects of the source. For other Class I areas in relatively close proximity to a BART-eligible source, you may model a few strategic receptors to determine whether effects at those areas may be greater than at the nearest Class I area. For example, you might chose to locate receptors at these areas at the closest point to the source, at the highest and lowest elevation in the Class I area, at the IMPROVE monitor, and at the approximate expected plume release height. If the highest modeled effects are observed at the nearest Class I area, you may choose not to analyze the other Class I areas any further as additional analyses might be unwarranted. You should bear in mind that some receptors within the relevant Class I area may be less than 50 km from the source while other receptors within that same Class I area may be greater than 50 km from the same source. As indicated by the Guideline on Air Quality Models, this situation may call for the use of two different modeling approaches for the same Class I area and source, depending upon the State's chosen method for modeling sources less than 50 km. In situations where you are assessing visibility impacts for source-receptor distances less than 50 km, you should use expert modeling judgment in determining visibility impacts, giving consideration to both CALPUFF and other EPA-approved methods. In developing your modeling protocol, you may want to consult with EPA and your regional planning organization (RPO). Up-front consultation will ensure that key technical issues are addressed before you conduct your modeling. • For each source, run the model, at pre-control and post-control emission rates according to the accepted methodology in the protocol.	Applies only to BART.

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Use the 24-hour average actual emission rate from the highest emitting day of the meteorological period modeled (for the pre-control scenario). Calculate the model results for each receptor as the change in deciviews compared against natural visibility conditions. Post-control emission rates are calculated as a percentage of pre-control emission rates. For example, if the 24-hr pre-control emission rate is 100 lb/hr of SO_2, then the post control rate is 5 lb/hr if the control efficiency being evaluated is 95 percent. • Make the net visibility improvement determination. Assess the visibility improvement based on the modeled change in visibility impacts for the pre-control and post-control emission scenarios. You have flexibility to assess visibility improvements due to BART controls by one or more methods. You may consider the frequency, magnitude, and duration components of impairment. Suggestions for making the determination are: • Use of a comparison threshold, as is done for determining if BART-eligible sources should be subject to a BART determination. Comparison thresholds can be used in a number of ways in evaluating visibility improvement (e.g., the number of days or hours that the threshold was exceeded, a single threshold for determining whether a change in impacts is significant, or a threshold representing an x percent change in improvement). • Compare the 98th percent days for the pre- and post-control runs. Note that each of the modeling options may be supplemented with source apportionment data or source apportionment modeling.	

[155] The model code and its documentation are available at no cost for download from *http://www.epa.gov/scram001/tt22.htm#calpuff*.
[156] Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts, U.S. Environmental Protection Agency, EPA-454/R-98-019, December 1998.

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E. How do I select the "best" alternative, using the results of Steps 1 through 5? 1. Summary of the Impacts Analysis From the alternatives you evaluated in Step 3, we recommend you develop a chart (or charts) displaying for each of the alternatives: (1) Expected emission rate (tons per year, pounds per hour); (2) Emissions performance level (e.g., percent pollutant removed, emissions per unit product, lb/MMBtu, ppm); (3) Expected emissions reductions (tons per year); (4) Costs of compliance—total annualized costs ($), cost effectiveness ($/ton), and incremental cost effectiveness ($/ton), and/or any other cost-effectiveness measures (such as $/deciview); (5) Energy impacts; (6) Non-air quality environmental impacts; and (7) Modeled visibility impacts.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. The factors to be displayed in such a chart would be the four statutory factors for reasonable progress, and also visibility benefits for a state following the second alternative approach to considering visibility benefits.
2. Selecting a "best" alternative 1. You have discretion to determine the order in which you should evaluate control options for BART. Whatever the order in which you choose to evaluate options, you should always (1) display the options evaluated; (2) identify the average and incremental costs of each option; (3) consider the energy and non-air quality environmental impacts of each option; (4) consider the remaining useful life; and (5) consider the modeled visibility impacts. You should provide a justification for adopting the technology that you select as the "best" level of control, including an explanation of the CAA factors that led you to choose that option over other control levels. 2. In the case where you are conducting a BART determination for two regulated pollutants on the same source, if the result is two different BART technologies that do not work well together, you could then substitute a different technology or combination of technologies.	Applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is not consistent with this answer.

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3. In selecting a "best" alternative, should I consider the affordability of controls? 1. Even if the control technology is cost effective, there may be cases where the installation of controls would affect the viability of continued plant operations. 2. There may be unusual circumstances that justify taking into consideration the conditions of the plant and the economic effects of requiring the use of a given control technology. These effects would include effects on product prices, the market share, and profitability of the source. Where there are such unusual circumstances that are judged to affect plant operations, you may take into consideration the conditions of the plant and the economic effects of requiring the use of a control technology. Where these effects are judged to have a severe impact on plant operations you may consider them in the selection process, but you may wish to provide an economic analysis that demonstrates, in sufficient detail for public review, the specific economic effects, parameters, and reasoning. (We recognize that this review process must preserve the confidentiality of sensitive business information). Any analysis may also consider whether other competing plants in the same industry have been required to install BART controls if this information is available.	Applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is consistent with this answer.
4. Sulfur dioxide limits for utility boilers You must require 750 MW power plants to meet specific control levels for SO_2 of either 95 percent control or 0.15 lbs/MMBtu, for each EGU greater than 200 MW that is currently uncontrolled unless you determine that an alternative control level is justified based on a careful consideration of the statutory factors. Thus, for example, if the source demonstrates circumstances affecting its ability to cost-effectively reduce its emissions, you should take that into account in determining whether the presumptive levels of control are appropriate for that facility. For a currently uncontrolled EGU greater than 200 MW in size, but located at a power plant smaller than 750 MW in size, such controls are generally cost-effective and could be used in your BART determination considering the five factors specified in CAA section 169A(g)(2). While these levels may represent current control capabilities, we expect that scrubber technology will continue to improve and control costs continue to decline. You should be sure to consider the level of control that is currently best achievable at the time that you are conducting your BART analysis.	Applies only to BART.
For coal-fired EGUs with existing post-combustion SO_2controls achieving less than 50 percent removal efficiencies, we recommend that you evaluate constructing a new FGD system to meet the same emission limits as above (95 percent removal or 0.15 lb/mmBtu), in addition to the evaluation of scrubber upgrades discussed below. For oil-fired units, regardless of size, you should evaluate limiting the sulfur content of the fuel oil burned to 1 percent or less by weight. For those BART-eligible EGUs with pre-existing post-combustion SO_2controls achieving removal efficiencies of at least 50 percent, your BART determination should consider cost effective scrubber upgrades designed to improve the system's overall SO_2removal efficiency. There are numerous scrubber enhancements available to upgrade the average removal efficiencies of all types of existing scrubber systems. We recommend that as you evaluate the definition of "upgrade," you evaluate options that	Applies only to BART. The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.

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not only improve the design removal efficiency of the scrubber vessel itself, but also consider upgrades that can improve the overall SO_2 removal efficiency of the scrubber system. Increasing a scrubber system's reliability, and conversely decreasing its downtime, by way of optimizing operation procedures, improving maintenance practices, adjusting scrubber chemistry, and increasing auxiliary equipment redundancy, are all ways to improve average SO_2 removal efficiencies. We recommend that as you evaluate the performance of existing wet scrubber systems, you consider some of the following upgrades, in no particular order, as potential scrubber upgrades that have been proven in the industry as cost effective means to increase overall SO_2 removal of wet systems: (a) Elimination of Bypass Reheat; (b) Installation of Liquid Distribution Rings; (c) Installation of Perforated Trays; (d) Use of Organic Acid Additives; (e) Improve or Upgrade Scrubber Auxiliary System Equipment; (f) Redesign Spray Header or Nozzle Configuration. We recommend that as you evaluate upgrade options for dry scrubber systems, you should consider the following cost effective upgrades, in no particular order: (a) Use of Performance Additives; (b) Use of more Reactive Sorbent; (c) Increase the Pulverization Level of Sorbent; (d) Engineering redesign of atomizer or slurry injection system. You should evaluate scrubber upgrade options based on the 5 step BART analysis process.	
5. Nitrogen oxide limits for utility boilers You should establish specific numerical limits for NOx control for each BART determination. For power plants with a generating capacity in excess of 750 MW currently using selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for part of the year, you should presume that use of those same controls year-round is BART. For other sources currently using SCR or SNCR to reduce NOx emissions during part of the year, you should carefully consider requiring the use of these controls year-round as the additional costs of operating the equipment throughout the year would be relatively modest.	Applies only to BART. The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
For coal-fired EGUs greater than 200 MW located at greater than 750 MW power plants and operating without post-combustion controls (i.e. SCR or SNCR), we have provided presumptive NOx limits, differentiated by boiler design and type of coal burned. You may determine that an alternative control level is appropriate based on a careful consideration of the statutory factors. For	Applies only to BART.

BART Guideline Provisions	EPA Recommendation Regarding Applicability to Reasonable Progress Determinations in the Second Implementation Period
coal-fired EGUs greater than 200 MW located at power plants 750 MW or less in size and operating without post-combustion controls, you should likewise presume that these same levels are cost-effective. You should require such utility boilers to meet the following NOx emission limits, unless you determine that an alternative control level is justified based on consideration of the statutory factors. The following NOx emission rates were determined based on a number of assumptions, including that the EGU boiler has enough volume to allow for installation and effective operation of separated overfire air ports. For boilers where these assumptions are incorrect, these emission limits may not be cost-effective.	
Table 1 (below)	Applies only to BART.

Table 1—Presumptive NOx Emission Limits for BART-Eligible Coal-Fired Units.[19]

Unit type	Coal type	NOx presumptive limit (lb/mmbtu)[20]
Dry-bottom wall-fired	Bituminous	0.39
	Sub-bituminous	0.23
	Lignite	0.29
Tangential-fired	Bituminous	0.28
	Sub-bituminous	0.15
	Lignite	0.17
Cell Burners	Bituminous	0.40
	Sub-bituminous	0.45
Dry-turbo-fired	Bituminous	0.32
	Sub-bituminous	0.23
Wet-bottom tangential-fired	Bituminous	0.62

[19]No Cell burners, dry-turbo-fired units, nor wet-bottom tangential-fired units burning lignite were identified as BART-eligible, thus no presumptive limit was determined. Similarly, no wet-bottom tangential-fired units burning sub-bituminous were identified as BART-eligible.

[20]These limits reflect the design and technological assumptions discussed in the technical support document for NOx limits for these guidelines. See Technical Support Document for BART NOx Limits for Electric Generating Units and Technical Support Document for BART NOx Limits for Electric Generating Units Excel Spreadsheet, Memorandum to Docket OAR 2002-0076, April 15, 2005.

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Most EGUs can meet these presumptive NOx limits through the use of current combustion control technology, i.e. the careful control of combustion air and low-NOx burners. For units that cannot meet these limits using such technologies, you should consider whether advanced combustion control technologies such as rotating opposed fire air should be used to meet these limits. Because of the relatively high emission rates of cyclone units, SCR is more cost-effective than the use of current combustion control technology for these units. The use of SCRs at cyclone units burning bituminous coal, sub-bituminous coal, and lignite should enable the units to cost-effectively meet NOx rates of 0.10 lbs/mmbtu. As a result, we are establishing a presumptive NOx limit of 0.10 lbs/mmbtu based on the use of SCR for coal-fired cyclone units greater than 200 MW located at 750 MW power plants. As with the other presumptive limits established in this guideline, you may determine that an alternative level of control is appropriate based on your consideration of the relevant statutory factors. For other cyclone units, you should review the use of SCR and consider whether these post-combustion controls should be required as BART.	Applies only to BART.
For oil-fired and gas-fired EGUs larger than 200MW, we believe that installation of current combustion control technology to control NOx is generally highly cost-effective and should be considered in your determination of BART for these sources. Many such units can make significant reductions in NOx emissions which are highly cost-effective through the application of current combustion control technology.[157]	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.

[157] *See* Technical Support Document for BART NOx Limits for Electric Generating Units and Technical Support Document for BART NOx Limits for Electric Generating Units Excel Spreadsheet, Memorandum to Docket EPA-HQ-OAR 2002-0076, April 15, 2005.

BART Guideline Provisions	EPA Recommendation Regarding Applicability to Reasonable Progress Determinations in the Second Implementation Period
V. Enforceable Limits/Compliance Date To complete the BART process, you must establish enforceable emission limits that reflect the BART requirements and require compliance within a given period of time. In particular, you must establish an enforceable emission limit for each subject emission unit at the source and for each pollutant subject to review that is emitted from the source. In addition, you must require compliance with the BART emission limitations no later than 5 years after EPA approves your regional haze SIP. If technological or economic limitations in the application of a measurement methodology to a particular emission unit make a conventional emissions limit infeasible, you may instead prescribe a design, equipment, work practice, operation standard, or combination of these types of standards. You should consider allowing sources to "average" emissions across any set of BART-eligible emission units within a fenceline, so long as the emission reductions from each pollutant being controlled for BART would be equal to those reductions that would be obtained by simply controlling each of the BART-eligible units that constitute BART-eligible source. You should ensure that any BART requirements are written in a way that clearly specifies the individual emission unit(s) subject to BART regulation. Because the BART requirements themselves are "applicable" requirements of the CAA, they must be included as title V permit conditions according to the procedures established in 40 CFR part 70 or 40 CFR part 71. Section 302(k) of the CAA requires emissions limits such as BART to be met on a continuous basis. Although this provision does not necessarily require the use of continuous emissions monitoring (CEMs), it is important that sources employ techniques that ensure compliance on a continuous basis. Monitoring requirements generally applicable to sources, including those that are subject to BART, are governed by other regulations. See, e.g., 40 CFR part 64 (compliance assurance monitoring); 40 CFR 70.6(a)(3) (periodic monitoring); 40 CFR 70.6(c)(1) (sufficiency monitoring). Note also that while we do not believe that CEMs would necessarily be required for all BART sources, the vast majority of electric generating units potentially subject to BART already employ CEM technology for other programs, such as the acid rain program. In addition, emissions limits must be enforceable as a practical matter (contain appropriate averaging times, compliance verification procedures and recordkeeping requirements). In light of the above, the permit must: • Be sufficient to show compliance or noncompliance (i.e., through monitoring times of operation, fuel input, or other indices of operating conditions and practices); and • Specify a reasonable averaging time consistent with established reference methods, contain reference methods for determining compliance, and provide for adequate reporting and recordkeeping so that air quality agency personnel can determine the compliance status of the source; and • For EGUs, specify an averaging time of a 30-day rolling average, and contain a definition of "boiler operating day" that is consistent with the definition in the proposed revisions to the NSPS for utility boilers in 40 CFR Part 60, subpart Da.22 You should consider a boiler operating day to be any 24-hour period between 12:00 midnight and the following midnight during which any fuel is combusted at any time at the steam generating unit. This would allow 30-day rolling average emission rates to be calculated consistently across sources.	Applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period.

APPENDIX E

Identification of Provisions of the Previous Guidance Documents on Natural Conditions and Progress Tracking that Are Applicable as EPA Recommendations for Reasonable Progress Analysis and Determinations in the Second Implementation Period

Guidance for Tracking Progress Under the Regional Haze Rule (September 2003), available at: https://www3.epa.gov/ttnamti1/files/ambient/visible/tracking.pdf	
Section	Topic
1.1, 1.4	Background on regional haze and the statutory and regulatory basis for the program
1.6	Explanation of the haze index and deciview scale
1.10	Acceptability of progress goals that provide for visibility degradation
1.13	History of the IMPROVE visibility monitoring program
2.2	Assessing data completeness and data substitution for missing values (Steps 1-7 remain applicable) (Though IMPROVE program data managers typically conduct this work, the steps outlined here remain the approach the data managers use).
2.3	Guidance for the inclusion of incomplete data years (provided the user substitutes *most impaired days* for *worst days*)
4.5, 4.6	Recommendations for states if changes to the IMPROVE monitoring site and location occur
4.7	Advantages of analyzing trends in individual extinction species

Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule, (September 2003), available at: https://www3.epa.gov/ttn/caaa/t1/memoranda/rh_envcurhr_gd.pdf	
Section	Topic
1.1, 1.5	Background on regional haze and the statutory and regulatory basis for the program
1.6	Explanation of the haze index and deciview scale
1.10	Natural visibility conditions should reflect current development patterns and levels without human impacts (This 2016 guidance document implements this principle to the best of our current scientific understanding).
3.1	Why might states choose to use a refined approach to estimating natural visibility conditions?
3.4	If states choose to use an alternative approach to estimating natural visibility conditions, what supporting information and justification should be included?

APPENDIX F

Identification of Answers in the September 27, 2006, Q&A Document that Are Applicable as EPA Recommendations for Reasonable Progress Analysis and Determinations in the Second Implementation Period

Q&A	Relevance to the Second Implementation Period
BART	**Explanation of Entries in this Column:** *Applies only to BART* – The statement in the Q&A has no relevance to the development of an LTS for reasonable progress, except to the extent that BART for a BART-eligible source must be determined and thus becomes part of the LTS. *The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period*. – This guidance document does not provide any additional recommendation on this topic that would need to be considered along with the statement in the Q&A. *Applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is not consistent with this answer*. – The statement in the Q&A applies only to BART determinations. The general sense of that statement should not be applied to the development of the LTS for reasonable progress. *The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. This guidance document provides new guidance on this, which is consistent with this answer*. – While the statement in the Q&A applies only to BART determinations, the general sense of that statement should also be applied to the development of the LTS for reasonable progress but taking into consideration related statements in this document.
1. Should a State promulgate a BART rule? Should a State's BART rule declare that VOC (and possibly ammonia) is/are not visibility impairing pollutant(s), or can this declaration be part of the SIP narrative?	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation

Q&A	Relevance to the Second Implementation Period
The regional haze rule (RHR) does not require that States promulgate BART rules. States are, however, required under 40 CFR 51.230 to show they have the legal authority to carry out the SIP. To the extent a BART rule can aid in this requirement, then it should be considered. A State's regional haze (RH) SIP submittal must include source- specific BART emission limits and compliance schedules for each source subject to BART. *See* 40 CFR 51.308(e). All regulatory requirements must be approved into the SIP. A State's BART rule should not declare that VOCs or ammonia are not visibility- impairing pollutants unless the State has evidence that VOCs (or ammonia) from its BART-eligible sources are not significant contributors to particle formation. Such a declaration must be substantiated in the SIP documentation. This declaration may be placed in the SIP narrative, which will be approved into the non-regulatory portion of the SIP following an opportunity for public review and comment on the State's conclusion. Furthermore, we recommend that prior to SIP submittal that collaboration between and among States and RPOs and Federal Land Managers (FLMs) occur such that the application of exemptions or other principles used by a State/RPO is done with full knowledge among the affected States/RPOs/FLMs	period. While there are no points of disagreement between the Q&A and this guidance document, there is additional relevant material in this guidance document, so the Q&A should not be used alone.
2. At sources that require BART but that have PTEs of less than 250 TPY for VOCs and ammonia, must the BART proposal analyze controls for VOCs and ammonia? States must use their judgment to determine whether VOC or ammonia emissions from individual sources in their State are likely to have an impact on visibility in an area. For a source such as the one you have described, the State must consider whether its VOC or ammonia emissions are likely to have an impact on visibility at a Class I area. If so, the BART proposal must analyze controls for such VOCs and/or ammonia.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
3. Should a State declare the exemption threshold value is 0.5 dv (or some other value) in their rule? EPA has simply set an upper bound. The exemption threshold value selected by the State in determining whether a BART- eligible source can reasonably be anticipated to cause or contribute to visibility impairment must be specified in the SIP documentation, as must the basis for the States' selection of this threshold. The appropriateness of the threshold used by the State will be subject to public review and comment, and States should consult with the affected States/RPOs/FLMs in establishing this value.	This answer applies only to BART. This guidance document provides new guidance on the topic of screening thresholds in the context of the development of the LTS in the second implementation period.
4. How should a State document in the SIP that BART controls will be installed and in operation as expeditiously as practicable, but no later than 5 years after approval of the SIP? Must BART controls be housed in a Title V permit modification? As specified in 40 CFR 51.308(e)(1)(v), States are required to ensure each source subject to BART install and operate BART as expeditiously as practicable, but in no event later than 5 years after approval of the implementation plan revision. States should ensure that BART requirements in a SIP are written in a way that clearly specifies the individual emission unit(s) subject to BART regulation and the time by which the emission unit(s) must begin to comply with the BART limit. Because the BART requirements are ''applicable'' requirements of the CAA, they must be included as title V permit conditions according to the procedures established in 40 CFR part 70 or 40 CFR part 71. Under 70.7(f)(1)(i) Title V permits must be	This answer applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period.

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reopened and revised to include new applicable requirements if the permit has three or more years of life. The reopening must be completed within 18 months after promulgation of the new applicable requirement and the reopening must follow the same procedures (public comment, etc) as apply to initial permit issuance. This may require that States provide commitments in the SIPs to ensure that all applicable construction permits under Title 1, and the operating permits under Title V are revised in time. The following elements, at a minimum, must be addressed to ensure the BART controls are adopted into the State's SIP. These elements are discussed in detail with other circumstances in 40 CFR Part 51, Appendix Y – Section V. • Name of source facility and the specific emission units and pollutants being controlled. (40 CFR 51.308(e)(1)(i) & (ii)). • Specifics of the controls, control efficiency(ies), emissions reductions expected • Enforceable emission limitations representing BART (40 CFR 51.308(d)(3);(e)) • Schedules for compliance with BART (40 CFR 51.308(d)(3);(e)) • A requirement that each source subject to BART maintains the control equipment and establish procedures to ensure such equipment is properly operated and maintained. (40 CFR 51.308(e)(v)) • Reporting, monitoring, and recordkeeping requirements adequate to determine the source's compliance (40 CFR Part 51, Appendix Y – V). • Averaging times and reference methods to determine compliance (40 CFR Part 51, Appendix Y – V).	
5. In the BART guidelines under step 4 of a BART determination is a discussion of average cost effectiveness, yet we don't see anything being averaged. If one were to average all the individual annual cost effectiveness over the remaining life of a plant, then we could see that we were averaging something. Can you explain this? The term "average cost effectiveness" is a term that the Agency has long used to describe one method of looking at the costs of control when considering economic impacts. See e.g,. New Source Review Draft Manual (Oct. 1990) at B. 36 describing the process for making best available control technology determinations (BACT). The Appendix at the end of this document contains equations that can be used for determining average cost effectiveness and should help you to understand how to estimate the "average cost effectiveness" of various control measures.	The explanation of the term "average cost effectiveness" continues to apply.
6. Is there a guideline on how to "annualize" costs (capital recovery factors and levelizing inflation adjusted operation & maintenance costs)? Yes. The EPA Control Cost Manual, referenced in the final BART rule (see 70 FR 39104, 39163-39167 (July 6, 2005). As noted in the Guidelines, the Control Cost Manual is updated periodically. This document is available at the following Web site: *http://www.epa.gov/ttn/catc/products.html*.	The current version of the EPA Control Cost Manual applies.
7. In the BART guidelines under step 4 of a BART determination, "how do I calculate baseline emissions?" it would help if a method were suggested to depict anticipated annual emissions from the source. Otherwise, sources will do this in many different ways. Should States suggest facilities use a method similar to PSD - the highest 12 consecutive months in the past 120 months (or whatever it is for PSD)? If so, should it be different for EGUs as it is for PSD? Or, should a facility take the highest 24-hour actual rate and multiply it times their	This answer applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period.

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average utilization rate for the highest 2 of the past 5 years? In either case, if these cost effectiveness numbers are compared to the BACT/RACT/LAER clearinghouse, it will make a difference. The BART Guidelines state that the baseline emissions used for estimating the average cost effectiveness of a control technology should represent a realistic depiction of anticipated annual emissions for the source. The approach for making BACT determinations in the PSD program is similar. The methodology of looking at the annual average of the highest 24 consecutive months in the past 120 months is one approach that has been used in PSD when determining if there has been an emissions increase as a result of a modification. In some cases, this approach could a reasonable method of estimating anticipated annual emissions for a source.	
8. How do you address an issue in which the installation of a BART control causes an increase in another pollutant? In some cases, the installation of controls to reduce emissions of a pollutant can result in collateral increases in another pollutant. For example, the use of low NOx burners can result in an increase in CO emissions. If the increase in emissions of a collateral pollutant would trigger other requirements under the Clean Air Act, such as New Source Review, the State may include the costs, if any, of controlling emissions of a collateral pollutant to meet these other requirements in considering the economic impacts of a technology under consideration for BART.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
9. How will EPA address the cost effectiveness of control options? If an option reduces more than one pollutant, how is that addressed? If an option reduces more than one visibility-impairing pollutant, it could be justified in terms of the greater overall emission reduction. The State will need to evaluate the cost- effectiveness of controlling both pollutants in light of its evaluation of the other BART factors. In general, the greater the overall emissions from multiple pollutants, the more closely the State should consider controls on multiple pollutants.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period.
10. It is unclear in the responses to the BART Q and A the meaning of some terms. Some appear to be interchangeable. It would be helpful to have definitions for source, site, unit, and plant-wide (as they pertain to BART). General terms not defined in the BART Guidelines should be given the same plain language meaning that they have under other Clean Air Act programs. Terms which are defined in this and other CAA regulations, and in the statute, should retain those definitions; note however that the "BART-eligible source" refers only to stationary sources built within the BART time period (1962-77) comprised of the emissions units meeting all three BART-eligibility criteria. See 40 CFR 51.301 for definitions of "stationary source" and "BART-eligible source." "Plantwide" means across the entire geographic entity, or across all "BART-eligible" sources at the geographic entity (depending on the context).	The term "source" has particular meaning in the context of BART that should not be presumed to carry over to development of the LTS in the second implementation period where non-BART sources are concerned.
11. In the BART rule, are we to assume that de minimis levels for pollutants are only based on BART-eligible sources, even when the term "plant-wide" is used? Generally yes. The approach used by EPA in the BART Guidelines for identifying a BART-eligible source begins with the identification of those emissions units at a plant that fall within one or more BART categories and that were put into operation within the 1962-1977 timeframe. In 2004, after proposing that States be	This answer applies only to BART.

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allowed to establish de minimis levels for pollutants at BART-eligible sources, EPA received comments suggesting that de minimis levels be applied on a unit by unit basis. EPA rejected this suggestion in the final rule; the regulations allow States to establish de minimis levels that apply to a BART-eligible source. In light of the comments received requesting that the de minimis exemption be applied on a unit by unit basis and its decision to reject this approach, EPA made the statement in the BART Guidelines that "[these de minimis levels may only be applied on a plant-wide basis." This statement was intended to clarify that the State should consider the cumulative emissions from the units at a plant that comprise the BART-eligible source in determining whether the BART-eligible source meets the de minimis exemption requirements. Note, however, that for category one (fossil fuel fired steam electric plants >250 million Btu/hour), our interpretation of the source category title is that the State should add all EGU emissions at a plant together when determining plant capacity, in order to see if the plant falls within category one. Once you have determined that the plant does fall within the category, the State would only consider those EGUs built within the 1962-77 timeframe to actually be BART-eligible.	
12. If a State determines that a recent BACT determination on an emission unit is BART, then is a BART emission limit created that is the same as the BACT limit, and is the Title V permit changed so that BART is also listed as a basis for that emission limit? Yes, if a State makes such a determination and includes it in its SIP, then a BART emission limit is created that is the same as the BACT limit. The Title V permit must be amended to "specify and reference the origin of and authority for" the emission limit. 40 CFR 70.6(a)(1)(ii).	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
13. Is EPA presuming a level of control for BART eligible sources in guidance to consider CAIR plus BART plus other "reasonable" measures? Guidance on the level of BART controls is not being developed. BART can only be determined on a case-by-case-basis and source-by-source-basis using the modeling and statutory factors listed in 40 CFR 51.308(e)(1)(ii)(A). Sources have expressed concern that reasonable progress guidance might be interpreted to override BART guidance. The BART assessment is a separate requirement from the reasonable progress test. It may be that to meet reasonable progress, more controls are needed from certain sources which may or may not include those sources previously controlled under BART. There is no way for EPA or the States to determine the final strategy to comply with the reasonable progress demonstration until the BART assessment is completed and the suite of controls that are needed for RH is determined. There could also be additional controls that may be identified as needed to demonstrate compliance for the 8-hour ozone and PM2.5 NAAQS. This may or may not affect the control identified under BART or CAIR. The States have flexibility in determining the type, pollutants and mix of sources that could be used in developing a strategy for attaining a NAAQS per the modeling guidance and implementation policy.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. The Cross State Air Pollution Rule has replaced the Clean Air Interstate Rule.
14. Can a source avoid BART by taking synthetic minor limits on the PTE of visibility- impairing pollutants? If so, by when do those limits need to be in place? What kind of mechanism must be in place to ensure those limits are met? For how long?	This answer applies only to BART.

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Yes, a source can opt to revise its Title I permit to provide for synthetic minor limits so that it falls under the BART eligibility threshold. The limitations of a source's potential to emit should be in place prior to the start of the State's public comment period on its proposed Regional Haze SIP to EPA and a description of the State's action should be included in the SIP narrative. To prevent circumvention of the BART requirements, it may be necessary to include a permit term or SIP provision that provides that changes at the BART-eligible source or in its permit that allow for increases in emissions would subject the source to BART review.	
15. If the unit is already controlled (e.g., under MACT or BACT) and it is the best, the latest control technology, does the source still need to conduct a full blown BART analysis and control technology evaluation including the installed control device? Or, can the source just describe the control device on their BART-eligible source unit and make the case that it qualifies as BART, without having to evaluate other technologies? If the unit has "best, latest…", then the source can just describe the control device on their BART-eligible source unit and make the case that it qualifies as BART, without having to evaluate other technologies. The streamlining of BART analyses in this situation is addressed in Section IV.C of the BART Guidelines, "How does a BART review relate to [MACT] Standards under CAA section 112, or to other emission limitations required under the CAA?"	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
16. A source is built prior to 1962. Between 1962 and 1977, it builds a new emission unit that otherwise meets BART eligible requirements. Is the new unit subject to BART? If a State is following the approach for identifying BART-eligible units described in the BART Guidelines, the unit built between 1962 and 1977 is considered to be BART- eligible.	This answer applies only to BART.
17. Although the rule in the Federal Register (FR), July 6, 2005 page 39107 and elsewhere indicates that the max 24 hour emissions should be used, would EPA approve using double the actuals instead for CALPUFF BART modeling? As noted in the final BART rule, emissions from a source can vary widely on a day to day basis and the "24-hour actual emission rate could be more than double the daily average. See 70 FR at 39129. We recommend that States use the highest 24-hour average actual emission rate for the most recent three or five year period of meteorological data in the CALPUFF model. As EPA explained, "[t]he emission estimates used in the models are intended to reflect steady-state operating conditions during periods of high capacity utilization." Id. Given the potential variability in actual emissions, use of actual emissions (even double actual emissions) does not necessarily represent this.	This answer applies only to BART.
18. If a State participates fully in CAIR, and satisfies its BART obligation for EGUs for NOx and SO2, must the PM BART eligibility analysis consider whether all visibility impairing pollutants, summed across a facility, exceed 250 tpy, or must only the PM emissions be considered? If at the final step of identifying the emission units that constitute a BART-eligible source, the State finds that a potential BART-eligible source has the potential to emit 250 tpy of any visibility-impairing pollutant, then the source is considered BART-eligible.	This answer applies only to BART. The Cross State Air Pollution Rule has replaced the Clean Air Interstate Rule.

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For example, if a potential BART-eligible source has emissions of more than 250 tpy of SO2 and meets the other applicable requirements, then it may be subject to BART review for its emissions of PM. However, if the source's emissions of PM10 are less than 15 typ (assuming the State has established a de minimis level of 15 tpy), then the source's PM10 emissions need not be addressed in a BART determination.	
19. An EGU has three boilers: a) coal boiler (5500 mmbtu/hr); and b) two auxilliary boilers (181.6 mmBtu/hr each). The State has determined the coal boiler to meet the first test for BART-eligibility. Since the two auxilliary [sic] boilers do not appear to fall under any of the 26 BART categories, would they pass the first test for BART-eligibility because they contribute to the "steam electric plant"? As a general matter, all the emission units, including any auxiliary boilers, at a fossil-fuel fired steam electric plant of more than 250 million BTU/hour heat input would be considered part of the same stationary source. Under the RH regulations, BART applies to certain existing stationary sources; stationary sources, in turn, are defined to include "all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control)." 50 CFR 51.301. The regulations further provide that "[p]ollutant-emitting activities must be considered part of the same industrial grouping if they belong to the same Major Group (i.e. which have the same two-digit [SIC] code)." For most plants on the BART list, there will be only one 2-digit SIC code that applies to the entire plant. As you have described the source in your question, the auxilliary boilers would fall within the same 2-digit SIC code as the coal boiler; these units accordingly are part of the same stationary source as the coal boiler. Note, however, that if the auxiliary boilers are only used during startup, then since we do not model startup conditions, those boilers would not contribute any emissions to the modeled visibility impact from the source; therefore those particular boilers may be exempted.	This answer applies only to BART.
Reasonable Progress	
1. Is there a metric for determining if controls required for PM2.5, O3, CAIR, or BART are "reasonable" without defining benefit of controls? Unlike the technical demonstration for CAIR or BART, the reasonable progress demonstration involves a test of a strategy. The strategy includes a suite of controls that has been identified through the identification of pollutants and source categories of pollutants for visibility impairment - the possible controls for these pollutants (and their precursors) and source categories - the application of four statutory factors and how much progress is made with a potential strategy with respect to the glide path. Modeling occurs with a strategy and is not a source-specific demonstration like the BART assessment.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which supersedes this answer. The EPA does not consider a reasonable progress demonstration to only involve "a test of a strategy," i.e., a collection of measures affecting multiple sources. Rather, each source selected for four-factor analysis, or each group of sources, should be subject to a separate analysis of what additional measures for that source or group of sources are necessary to make reasonable progress towards natural visibility conditions. Sections 6.3, 7.1, 7.2, 8.1.5 and 8.2.7 address screening and the four-factor analysis of a group of sources. As stated in this Q&A, air quality modeling does occur "with a strategy" for purposes of setting the RPG that corresponds to the LTS, but not necessarily only at that point in SIP

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	development. Air quality modeling of the visibility impact from the source or group of sources may also be done at the screening step as part of determining whether to bring the source or group of sources forward for four-factor analysis and (for a state following the second alternative approach) to estimate visibility benefits of specific measures. The Cross State Air Pollution Rule has replaced the Clean Air Interstate Rule.
2. How can States demonstrate benefits of controls from a single source for RH without doing single source impact modeling, e.g. CALPUFF? Reasonable progress is not required to be demonstrated on a source-by-source basis. It is demonstrated based on a control strategy developed from a suite of controls that has been assessed with the four statutory factors and the uniform rate of progress.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period that supersedes this answer. The EPA does not consider a reasonable progress demonstration to only involve a test of a strategy affecting multiple sources. Rather, each source selected for four-factor analysis, or each group of sources, should be subject to a separate analysis of what additional measures for that source are necessary to make reasonable progress towards natural visibility conditions. In addition, the 2028 RPG for the 20 percent most impaired days corresponding to the LTS is to be compared to the 2028 point on the URP line as described in this document. As discussed in Sections 4.2, 6.2 and 8.1, single-source impact modeling is not specifically required.
3. What if a State is on the glidepath, but can still install cost effective controls? Is it obligated to install those controls? From the preamble to the Regional Haze Rule (64 FR 35732), EPA explained: "If the State determines that the amount of progress identified through the analysis is reasonable based upon the statutory factors, the State should identify this amount of progress as its reasonable progress goal for the first long-term strategy, unless it determines that additional progress beyond this amount is also reasonable. If the State determines that additional progress is reasonable based on the statutory factors, the State should adopt that amount of progress as its goal for the first long-term strategy." The statutory factors must be applied before determining whether given emission reduction measures are reasonable. For example, even if emissions reductions from one source category are projected to be enough to achieve the uniform rate of progress towards natural background in 60 years, States should not forego an analysis of what degradation is being caused by pollutants from other source categories, or what improvements could be made by controlling them.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is consistent with this answer.

Q&A	Relevance to the Second Implementation Period
4. A. What type of demonstration is acceptable to justify a reasonable progress goal (RPG) that is less than the glidepath? B. What if controls needed for other programs (e.g., PM2.5, ozone, CAIR) are installed? A. If after applying the four statutory reasonable progress factors, the rate of visibility improvement is still less than the uniform glide path, States may adopt the calculated RPGs, provided that they explain in the SIP how achieving the uniform glide path is not reasonable based on the application of the factors. States must demonstrate why the slower rate is reasonable, and state the projected date for achieving natural background under this alternative rate of progress. B. Existing controls that are installed as a result of other existing CAA programs can contribute to a State's ability to satisfy its RPG. However, the statutory factors must be applied before determining whether given emission reduction measures are reasonable. In particular, the State should adopt a rate of progress greater than the glidepath if this is found to be reasonable according to the statutory factors. See in particular the directive in the preamble to the RHR at 64 FR 35732	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is supersedes this answer in part. The sentence, "Existing controls that are installed as a result of other existing CAA programs can contribute to a State's ability to satisfy its RPG." presumes that RPGs are set first and the LTS must be designed to meet them. The 2016 revisions to the Regional Haze Rule clarified that the LTS is developed first, and the RPGs are predictions of the overall benefit from the LTS along with other enforceable measures. The Cross State Air Pollution Rule has replaced the Clean Air Interstate Rule.
5. Can a source commit to extra control of one visibility-impairing pollutant in exchange for doing less to control a less significant pollutant (inter-pollutant trading)? The regulations require the States to adopt measures that will make reasonable progress toward the national goal. States have the flexibility in developing these measures to focus on those pollutants that have the most significant impact on visibility. A State could conclude that after application of the four statutory reasonable progress factors, it is "reasonable" to control one pollutant to a higher level than another pollutant. In the context of BART, the RHR does not provide for inter-pollutant trading where the source is installing controls based on the State's BART determination. The regulations, however, do allow States to adopt alternative measures in lieu of BART, so long as the alternative measures provides for greater reasonable progress than would BART. Inter- pollutant trading is not allowed in a trading program alternative to BART, -- see 64 FR at 35743. In addition, States may allow sources to "average" emissions across any set of BART- eligible emission units within a fenceline, so long as the emission reductions from each pollutant being controlled for BART would be equal to those reductions that would be obtained by simply controlling each of the BART-eligible units that constitute BART- eligible source (70 FR 39172).	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
Coordination with RPOs, States, and FLMs	
1. What are EPA's expectations and the basis for consultation requirements regarding formal consultative procedures? What constitutes effective FLM communication? Can it be assumed that if the FLM attends the RPO meetings and calls and doesn't raise any concerns it has no problems with a State's SIP? 40 CFR 51.308(i) requires that States consult with FLMs before adopting and submitting their RH SIPs. These requirements are summarized as follows:	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. In addition, changes were made to the FLM consultation requirements as part of the 2016 revisions to the Regional Haze Rule. See Section 4.8 of this document.

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States must provide the FLM an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on the SIP. The State must also provide the opportunity for the FLMs to discuss their: (i) assessment of impairment of visibility in any Class I area; and, (ii) recommendations on the development of the RPG and on the development and implementation of strategies to address visibility impairment. Further, the State must include in the SIP a description of how it addressed any comments provided by the FLMs. Lastly, the SIP must provide procedures for continuing consultation between the State and FLMs on the implementation of 51.308, including development and review of SIP revisions and 5-year progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in Class I areas. This is a formal consultative process. The basis for requiring written consultation procedures is 40 CFR 51.308(i)(4). To satisfy this requirement, States should contact the FLMs to ensure their input to the RH SIP process is solicited and documented. While effective FLM consultation relies on both parties (States and FLMs) communicating early and often, the State is only required to meet the provisions of 40 CFR 51.308(i) and is not responsible if a FLM chooses not to participate in the either the RPO activities or the SIP development and review process. In such cases, the State should document its outreach efforts to the FLM.	
2. Is there a protocol for resolving disputes between States and RPOs regarding technical differences between upwind and downwind States on EI, modeling, natural background, apportionment, controls, etc.? How will EPA address States/RPOs adopting different IMPROVE algorithms (old vs. new) to look at the same Class I area? EPA is developing a State and Federal Protocol which will describe the goals and objectives, consultation requirements, principles of collaboration, and process for collaboration for the RH process. While conceptual in nature, this document will be designed to form the basis for a common understanding, approach, process and expectations for consultation and consistency in developing the 308 Regional Haze SIPs. EPA is encouraging the early identification of any potential disputes. This will allow all parties ample opportunity to address and document any disagreements	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period. The EPA has not issued a protocol as described in the answer.
3. We understand that EPA is requiring each State with a Class I area to submit a SIP that addresses its obligations relative to that Class I area including establishment of a uniform rate of progress, imposition of requirements to install controls on sources in that State that are considered reasonable, documentation of its collaborative efforts with other States impacting that Class I area, and also documentation of interactions with surrounding States regarding that State's contributions to Class I areas in other States. The question is, "When is a State no longer obligated to consult with another State?" States are required under 40 CFR 51.308(d)(3), to collaborate and develop coordinated emission management strategies to address RH visibility impairment not only for Class I areas within their own borders, but also for each Class I areas located outside their borders which may be affected by their emissions. The obligation for States to consult with each other ultimately remains in place for the period of time covered by 40 CFR 51.308. In practice, States will satisfy this obligation mainly during the preparation of the RH SIPs for the first planning period (2018), due by 12/17/07, and in the preparation of the ten-year periodic revisions, and the five-year periodic reports described in 40 CFR 51.308(f) and (g), respectively.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is consistent with this answer.

Q&A	Relevance to the Second Implementation Period
4. A. Does a State have obligations under the RHR for reasonable progress to initiate discussions with another State whose sources impact one of its Class I areas if the projected interim visibility improvement in 2018 falls directly on the uniform rate of progress line for that area? Or can the State focus on defining reasonable progress for its sources without engaging other States with contributing sources in discussions? B. Conversely, do States have obligations under the RHR to evaluate whether their sources are contributing to Class I areas in surrounding States even though the Class I areas surrounding it are achieving the uniform rate of progress? A. Yes, a State must consult with States having sources reasonably anticipated to cause or contribute to visibility impairment in a Class I area to develop their RPGs pursuant to 40 CFR 51.308(d)(1)(iv) regardless of the uniform rate of progress for an area. B. Yes, States must evaluate whether their sources are contributing to Class I areas in surrounding States even though the Class I areas surrounding it are achieving the uniform rate of progress as noted in answer 4.A. Note also that 40 CFR 51.308(d)(3)(i) specifically requires that States with emissions that are reasonably anticipated to contribute to visibility impairment in another State's Class I area consult with that State to develop coordinated emission management strategies.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is consistent with this answer.
5. For Class I areas that span two or more States, is there a requirement for establishing a "lead" State? There is no requirement in the RH regulations nor in guidance documents to identify a "lead" State for shared Class I areas. However, states may choose to establish a "lead" state if it facilitates their collaboration and consultation. The RH rule relies on States collaborating and using the consultation process (RPOs) to address shared Class I areas. Also, we assume the technical work that is used as the basis would be the same for all SIPs. One may also want to take a look at where the IMPROVE monitor is located that "represents" the Class I area in question, as that location may also help define the "lead" State. Another option is the State with the largest portion of the Class I area in their State to be the "lead" State. These are ideas that could be used, but it is up to the States to work this out as part of the collaboration and consultation process. We view shared Class I areas similar to interstate NAAQS nonattainment areas. The States involved would collaborate to set one RPG for the area, and work together to define a consistent, coordinated approach to develop the long-term strategy for the area. As with interstate NAAQS nonattainment areas, each State has lead responsibility for developing, adopting and submitting its own SIP revisions affecting their portion of the Class I area.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which supersedes this answer in part. The sentence, "The States involved would collaborate to set one RPG for the area, and work together to define a consistent, coordinated approach to develop the LTS for the area." presumes that RPGs are set first and the LTS must be designed to meet them. The 2016 revisions to the Regional Haze Rule clarified that the LTS is developed first, and the RPGs are predictions of the overall benefit from the LTS along with other enforceable measures. In a case of multiple states impacting the same Class I area, the state with the Class I area sets an RPG reflecting the combined effect of all the relevant LTSs. If some contributing states have not yet determined the measures they will include in their LTSs, then the state with the Class I area is to set RPGs based on confirmed measures.
6. What if one State with the Class I area sets an RP goal that requires an upwind State to make reductions that it won't make? If a State with a Class I area determines that a contributing State is not doing what is reasonable to meet the RPG set for the area, and has attempted to resolve this issue, the State with the Class I area should notify EPA and document this issue in its initial RH SIP. For all revisions to the initial RH SIP revision, 40 CFR 51.308(h)(2) requires that the State with the Class I area provide notification to EPA and to the other States which participated in the regional planning process. This subsection further requires the State with the Class I	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which supersedes this answer. The 2016 revisions to the Regional Haze Rule clarified that the LTS is developed first, and the RPGs are predictions of the overall benefit from the LTS along with other enforceable measures. In a case of multiple states impacting the same Class I area, the state with the Class I area sets an RPG reflecting the combined

Q&A	Relevance to the Second Implementation Period
area to collaborate with those States in the regional planning process to develop additional strategies. It is EPA's expectation that issues of communication/collaboration problems such as this be brought to our attention as early in the process as possible.	effect of all the relevant LTSs. If some contributing states have not yet determined the measures they will include in their LTSs, then the state with the Class I area is to set RPGs based on confirmed measures.
7. If State A is at or below the glide path for an area, and a neighboring State (State B) impacting State A's Class I area does not do all it can to meet that area's RPGs, what happens? Is State A responsible to file a 126 petition or other action? Could State A's Regional Haze SIP be disapproved because of State B? Are the answers to these questions any different if State A's RPG is above the glide path? In summary, if consultation does not work what happens and who is responsible? State A is responsible for establishing RPGs for its Class I areas based on its consideration of the factors set forth in the statute and implementing regulations, in consultation with State B and other States that may be contributing to impairment in the area. See 40 CFR 51.308(d)(1). Each State, including State B, is required to submit a SIP with a long-term strategy that includes measures as necessary to achieve the RPGs established for the Class I areas. Where States have participated in a regional planning process, the State must ensure that its SIP includes all measures needed to achieve its share of emissions reductions agreed upon through that process. If there is a disagreement among States as to what constitutes reasonable progress, the question of whether State A's or State B's RH SIP could be disapproved will depend on the specific of the situation. Each State is also responsible for documenting its good faith attempt to consult with State B, as outlined in 40 CFR 51.308(d)(1)(iv). EPA will take this information into account in determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions. States are under no obligation to file petitions under Section 126 of the CAA to satisfy the reasonable progress requirement under the RH program.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which supersedes this answer. The 2016 revisions to the Regional Haze Rule clarified that the LTS is developed first, and the RPGs are predictions of the overall benefit from the LTS along with other enforceable measures. In a case of multiple states impacting the same Class I area, the state with the Class I area sets an RPG reflecting the combined effect of all the relevant LTSs. If some contributing states have not yet determined the measures they will include in their LTSs, then the state with the Class I area is to set RPGs based on confirmed measures.
8. What is necessary in a SIP/template to demonstrate "continuing consultation" under 51.308(i)(4)? Most States are currently consulting with other States and with the FLMs by participating in an RPO. EPA anticipates that most States will address their future FLM consultation requirements by continuing to participate in an RPO that is engaged in an ongoing assessment of visibility issues. If a State demonstrates that it has met current consultation requirements through participation in an RPO that is engaging in the necessary consultations, and if the State intends to satisfy future consultation requirements (for periodic comprehensive SIP revisions or for other issues that arise) by continued participation in their RPO, then such a State need only commit to such participation. For a State that has not fully engaged in the RPO process, the State must provide a description of the process by which it intends to consult with the FLMs in preparing future submittals and addressing issues that arise. Similarly, if a State has participated in an RPO but intends to discontinue this participation, the State must provide extensive description of the alternative means by which the State will engage in the required consultations.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is consistent with this answer.
9. To what extent does EPA expect RPOs to motivate States to communicate directly with and engage the FLMs, particularly for Class I areas where those FLMs have not been participating in the RPO's work?	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period.

Q&A	Relevance to the Second Implementation Period
EPA expects that the RPOs will serve as the coordinating entities to facilitate State-to- State and State-FLM consultation. To that end, EPA recommends that RPOs individually set up a formal process to encourage State-to-State and State-FLM consultation to take place, perhaps in the form of a coordinating workgroup. Through managing this process, RPO's can help identify areas where more FLM participation may be needed. However, RPO's are not responsible if a FLM opts not to participate in these consultation opportunities. Ultimately, it is the State's responsibility to ensure the FLM consultation requirements housed in 40 CFR 51.308(i) are satisfied	
10. What are EPA's expectations of an RPO for written consultation procedures with the other RPOs/States outside its jurisdiction? Given limited funds and much technical and policy work needed, it is suggested this be made as simple and straightforward as possible. EPA expects that RPOs will serve as the facilitating entities for State-to-State resolution of issues relating to State apportionment of visibility impairment at Class I areas. RPOs should also assist States in the resolution of disputes over the levels of control required by upwind States that contribute to visibility impairment of downwind States' Class I areas. This process should begin by each RPO identifying Class I areas for which their member States individually cause or contribute to visibility impairment. Following this, the RPOs should meet to broker consensus between the States on the technical approaches to these issues. There is no requirement for an RPO to establish written consultation procedures with the other RPOs/States outside its jurisdiction. EPA expects RPOs to facilitate and/or establish procedures in any format (informal or formal) as needed that works best for the parties involved	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is supersedes this answer in part. The sentences, "EPA expects that RPOs will serve as the facilitating entities for State-to-State resolution of issues relating to State apportionment of visibility impairment at Class I areas. RPOs should also assist States in the resolution of disputes over the levels of control required by upwind States that contribute to visibility impairment of downwind States' Class I areas." could be read as being based on the premise that RPGs are set first and the LTS must be designed to meet them, such that there may be disagreements among states on how much each state should contribute to the necessary emission reductions. The 2016 revisions to the Regional Haze Rule clarified that the LTS is developed first, and the RPGs are predictions of the overall benefit from the LTS along with other enforceable measures.
11. Does section 169A(c)(3) of the CAA require a State to obtain FLM concurrence with a State's proposal to exempt sources from being subject to BART in its Regional Haze SIP submitted to EPA? No. The CAA requires States to make BART determinations for BART-eligible sources that may reasonably be anticipated to cause or contribute to any impairment of visibility in a Class I area. In the BART Guidelines, we provides States with an approach for exempting potential BART sources from BART by demonstrating that a source does not meet this threshold. In contrast, under section 169A(c)(1) of the CAA, the Administrator has the authority to exempt most sources from BART if he determines that the source is not reasonably anticipated to cause or contribute to significant impairment of visibility. Section 169A(c)(2) contains a similar provision for certain powerplants. The exemptions under section 169A(c), however, are effective only on concurrence by the FLM. In sum, while States must consult with FLMs as part of the SIP process, they are not required to obtain FLM concurrence with their determination that a BART-eligible source does not cause or contribute to any impairment.	This answer applies only to BART.
Miscellaneous	
1. On December 20, 2005, the IMPROVE Steering Committee approved a new algorithm for calculating current and natural background visibility. If states use the new equation in BART and reasonable progress analyses, will EPA accept it?	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period. The approaches recommended in Section 5 are based on the revised IMPROVE algorithm.

Q&A	Relevance to the Second Implementation Period
Yes, either the new IMPROVE extinction equation as recommended in 2005 by the IMPROVE Steering Committee or the original equation recommended by EPA in the "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule" (September 2003, EOA-454/B-03-005) may be used to develop Regional Haze SIPs. Regardless of which algorithm is used for a Class I area, that methodology should be applied in a consistent manner. Consistency should be maintained across Regional Haze applications (i.e., BART and Reasonable Progress), across time (e.g., baseline and future calculation for natural conditions), and among the stakeholders involved who need to be consulted on the development of a LTS for a Class I Area (i.e., FLMs, states, industry). Specifically, we recommend that the same version of the IMPROVE equation be used by States/sources which are impacting the same Class I area to calculate visibility conditions for that area.	
2. Instead of a single value, can the RPG be satisfied using a natural conditions range that captures the variability in year-year emissions of natural events? The 1999 RHR states that in comparing "current conditions" against "natural conditions," natural conditions means "[t]he level of visibility (in deciviews) for the 20 percent most- impaired days, and for the 20 percent least-impaired days, that would exist if there were no manmade impairment." 64 FR at 35730. EPA issued a guidance document concerning this entitled, "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule." Under this guidance, a single value for natural visibility for each class I area is calculated for each of the 20 percent most-impaired days and the 20 percent least- impaired days. This guidance document describes "default" and "refined" approaches for estimating natural conditions. The EPA methodology that allows for the 20% best days and 20% worst days to calculate natural and background levels is designed to avoid a single value (i.e., the single best day or the single worst day). The single value that represents the 20% best days is considered representative of the range. Consequently, it would be redundant and unnecessary to further consider ranges of visibility values in determining natural and background levels.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which supersedes this answer.
3. What obligation does a downwind State have if it conducts modeling based on an upwind State's emission inventory, and the upwind States subsequently changes its inventory? What is EPA's expectation here? EPA expects that States will continue to work together in addressing the problem of RH, both inside and outside the RPO context and that States will share pertinent aspects of their SIP planning with other States, as appropriate. Upwind States should use their best efforts to provide potentially relevant information, such as changes in emissions inventories, to downwind States in timely fashion. We are relying on the RPOs, in large part, to ensure this coordination takes place.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period. Section 9.4 addresses this specific issue.
4. How does the CAIR substitute for BART? States subject to and participating in the CAIR cap and trade program for SO2 and NOx may treat the CAIR requirements for EGUs as a substitute for the application of BART controls for these pollutants. States do not need to require BART-eligible EGUs subject to the CAIR to install, maintain, and operate BART per 40 CFR 51.308(e)(4). In addition, a State which is only subject to CAIR for NOx, but which also chooses to participate in the CAIR trading program for both SO2 and NOx, may consider BART to be satisfied for both SO2 and NOx from EGUs. Because EPA modeled these States as controlling for both SO2 and NOx in the CAIR NFR, the better	This answer applies only to BART. The Cross State Air Pollution Rule has replaced the Clean Air Interstate Rule.

Q&A	Relevance to the Second Implementation Period
than BART demonstration presented in that action would be valid in that scenario. Conversely, if such States choose to participate only in the ozone season NOx trading program, the updated projections presented in the BART rule (70 FR 39104) demonstrate that BART would be satisfied for NOx, but such States would still need to address BART for SO2 emissions from EGUs (70 FR 39143). Also, EPA's assessment that the CAIR cap and trade programs can substitute for BART controls does not extend to cases where a State has identified source-specific BART requirements as a result of a reasonable attribution determination. In such cases, the source-specific BART requirements must be met at the source. Finally, the CAIR does not address other potential visibility impairing pollutants such as PM, VOCs, and ammonia. Also, the determination that the CAIR makes greater reasonable progress than BART for EGUs is not a determination that the CAIR satisfies all reasonable progress requirements in CAIR affected States.	
5. If a CAIR facility is found to be exempt from BART for SO2 and NOx, and the State does exemption modeling on PM10 and concludes there is no impact on a Class I area, can the State totally exempt the utility from BART? States subject to and participating in the CAIR cap and trade program for SO2 and NOx are allowed to treat the CAIR requirements for EGUs as a substitute for the application of BART controls per 40 CFR 51.308(e)(4). This does not mean EGUs are exempt for SO2 and NOx, only that CAIR satisfies the BART requirement for those pollutants. The remaining visibility pollutants to consider for determining BART-eligible sources are PM, and, using judgment, VOCs, and ammonia. For PM, the July 6, 2005, final BART rule at 70 FR 39160 notes PM10 may be used an indicator for PM in this step of the determination and thus, PM10 can be used for the exemption modeling.	This answer applies only to BART. The Cross State Air Pollution Rule has replaced the Clean Air Interstate Rule.
6. What is the relationship of CAIR to reasonable progress? Does CAIR satisfy reasonable progress requirements for EGUs for NOx and SO2? As discussed in the answer to the previous question, participation in the CAIR can substitute for a State's BART obligation in certain narrowly defined areas. However, for the purpose of satisfying the RPG, CAIR has no more applicability than does BART – it is a control that can be part of a State's RPG. The preamble to the 2005 BART Rule states that EPA's determination that participation in the CAIR trading program would provide for greater reasonable progress from EGUs than would BART "is not a determination that CAIR satisfies all reasonable progress requirements in CAIR affected States." (70 FR 39143). In other words, although EPA has determined that the CAIR trading program would provide greater reasonable progress than source specific BART controls for affected EGUs for SO2 and NOx, a State's reasonable progress analyses may indicate that additional controls beyond CAIR may be necessary to meet the RPGs set for one or more the Class I areas.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is consistent with this answer. The Cross State Air Pollution Rule has replaced the Clean Air Interstate Rule.
7. What is the relationship of RH BART to RAVI BART? RAVI BART (Part I of the visibility program) is a separate regulatory requirement from RH BART (Part II of the visibility program). RAVI BART treats visibility impacts from one source or a small group of sources, as	The RAVI provisions were revised and explained as part of the 2016 rulemaking to revise the Regional Haze Rule. States should rely on statements in those proposed and final actions instead of this answer.

Q&A	Relevance to the Second Implementation Period
opposed to RH BART, which treats visibility impacts over a wide geographic area. EPA promulgated regulations addressing "reasonably attributable visibility impairment" or RAVI in 1980. Under these regulations, the requirement for a BART analysis is triggered where the FLM certifies there exists reasonable attributable impairment of visibility. You may find this document a useful guide to understanding the RAVI process: http://www.wrapair.org/forums/mtf/documents/ravi_bart/Final_RA_BART_Report.pdf Once a State has met the requirements in the RH regulations for BART or implemented an alternative measure, then the BART requirements of the Act have been met and BART sources will be subject to regulation under the RH program in the same manner as other sources. 40 CFR 51.308(e)(3). Therefore, even though a State may satisfy BART via a 308 SIP, an FLM may still certify RAVI, thus triggering a RAVI BART attribution determination.	
8. What happens if RH SIPs are late? Section 110(m) of the CAA provides discretionary authority for EPA to impose sanctions for failure to submit a required plan.	This answer still applies.
9. What is EPA's position on the need to treat VOCs and ammonia as visibility-impairing pollutants? If a State wishes to address VOCs and/or ammonia as visibility impairing pollutants, what tools are available to do this? The BART Guidelines direct that States should look at SO2, NOx, and direct PM emissions in determining whether sources cause or contribute to visibility impairment, including both PM10 and PM2.5. As stated in the BART Guidelines (70 FR 39160), "States should exercise their judgment in deciding whether [VOCs or ammonia] impair visibility in an area … and in deciding whether VOCs or ammonia emissions from a source are likely to have an impact on visibility in an area." A formal showing of an individual decision that a source of VOC or ammonia emissions is not subject to BART review is not necessary.	The general sense of this answer applies as a recommendation for the development of the LTS in the second implementation period.
10. 51.308(d)(3)(v)(B) requires that the State, in developing its LTS, consider measures to mitigate the impacts of construction activities. What should this include? States should include construction activities in their emission inventories that are used for long-term strategy development. When EPA promulgated the RHR in 1999, emissions from construction activities, such as emissions from non-road diesel equipment, and large scale wind-blown dust from rapidly growing areas like Las Vegas and Phoenix, were a major concern. Subsequently, EPA has promulgated rules for on-road and non-road heavy duty diesel engines. States should include the emission reductions from those rules in their SIP planning. If States have areas where wind blown dust from human activities contributes to a reduction in visibility at Class I areas, they should consider measures to mitigate this source of visibility-impairment. The Western Regional Air Partnership (WRAP) has a number of products related to dust that can be downloaded from their site at: *http://www.wrapair.org*.	This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period, which is consistent with this answer.
11. What is EPA's expectation for filling missing data in the IMPROVE record? How many years are required to determine the baseline visibility if data is missing in the 2000-2004 record? Are 3 years sufficient (IMPROVE expectation)? Need to create 5 years? The "Guidance for Tracking Progress Under the Regional haze Rule" addresses this question in several areas. Five (5) years of data from the 2000-2004 period should be used. However, because of the deployment of	This guidance document provides new guidance on this topic for the second implementation period, which supersedes this answer.

Q&A	Relevance to the Second Implementation Period
monitors this length of data may not be available for all Class I areas. The Tracking guidance recognizes this and recommends that a minimum of three years of data should be used if more years do not exist (see pages 1-4, and 2-8). All five years should be used if available and suitable per guidance recommendations. If not, then a minimum of three years is recommended. You should not recreate data for years that the monitor was not operational because of the further uncertainty that this data adds. If less than three years of complete data are not available, consultation with EPA is recommended. The Tracking guidance suggests that a case-by-case proposal on how this data should be processed should be developed in consultation with EPA OAQPS (and the Regional Office).	
12. How are international emissions and natural events addressed in the RH SIPs? EPA addressed the treatment of international emissions in the 1999 RHR in a discussion of the long-term strategy for making reasonable progress in section III.G of the preamble to the final regional haze rule as follows: "The EPA agrees that the projected emissions from international sources will in some cases affect the ability of States to meet reasonable progress goals. The EPA does not expect States to restrict emissions from domestic sources to offset the impacts of international transport of pollution. We believe that States should evaluate the impacts of current and projected emissions from international sources in their regional haze programs, particularly in cases where it has already been well documented that such sources are important. At the same time, EPA will work with the governments of Canada and Mexico to seek cooperative solutions on transboundary pollution problems." 64 FR 35714, 35736 (July 1, 1999). EPA provided additional clarification in the preamble to the 1999 RHR on how States should properly evaluate international emissions, when we discussed the States' obligation to submit five-year reports evaluating progress toward the RPG for each Class I area: "If the State finds that international emissions sources are responsible for a substantial increase in emissions affecting visibility conditions in any Class I area or causing a deficiency in plan implementation, the State must submit a technical demonstration to EPA in support of its finding. If EPA agrees with the State's finding, EPA will take appropriate action to address the international emissions through available mechanisms. Appropriate mechanisms for addressing visibility-impairing emissions from international sources are further discussed in unit III.G on the long-term strategy." 64 FR at 35747. Both in explaining RPGs and in assessing whether current implementation plan strategies are achieving them, States can take into account the nature of international emissions. For instance, after having applied the four statutory factors and calculated their RPGs, states can at their discretion, quantify the effects of international emissions on their ability to reach RPGs. However, States should not directly consider the effects of international emissions when calculating their uniform rates of progress by either adding the effects of international emissions to their estimates of natural conditions, or by subtracting international emissions from current conditions. Either of these approaches conflicts with the basic definitions of "current conditions"	This guidance document provides new guidance on these topics for the second implementation period, which supersedes this answer.

Q&A	Relevance to the Second Implementation Period
(baseline conditions for the first SIP) and "natural conditions," as described in the 1999 RHR. 64 FR 35728, (July 1, 1999). Those natural events most commonly linked to RH are wind blown dust and emissions from biomass burning. EPA has long recognized the natural role of fire in the ecosystem. Consequently, in determining natural background for a Class I area, EPA believes States should be permitted to consider some amount of fire in the calculation. If a State finds during the five year period review that an unusual natural event such as a large wildfire is affecting progress, this can be taken into account in its assessment of whether the current SIP are sufficient to meet the RPGs. The State should submit a technical demonstration showing its estimate of the wildfires' contribution to visibility impairment to support its conclusion.	
September 27, 2006, Revision:	
Q: Can a State determine that a BART-eligible source is not subject to BART if the source's potential to emit is limited such that the source meets the applicable model plant criteria? Can a State make the same determination if a BART-eligible source's potential to emit is limited such that based on air quality modeling, the source's predicted impacts on any Class I area are less than 0.5 dv above natural background? If the answer to these questions is yes, can a State limit a source's emissions through the following methods: (a) Requiring installation of a control device. A change in the maximum actual emissions may occur as a result of additional controls or from changes in work practice (e.g., operational hours) that limit the total annual emissions. Where emissions controls are installed and operational by December 2007, reductions will be achieved earlier than the BART control deadline of 2013 and reductions will be certain. (b) Changing permitted potential emissions. A permit change without a change in maximum actual emissions would mean that a BART-eligible source is willing to take a federally enforceable permit limit that restricts them from emitting above a certain amount. This type of change would only be made in cases where the existing potential emissions are clearly not reflective of actual maximum emissions and the state permitting authority is assured that the new, lower permit limit is achievable and enforceable. A: Yes, a State can determine that a BART-eligible source is not subject to BART if the source's potential to emit is limited such that the source meets the applicable model plant criteria as described below. For example, a State that has selected 0.5 dv as its contribution threshold, (see 70 FR 39163, July 6, 2005) and is using EPA's model plant analyses, could exempt a BART-eligible source from BART if the source's potential to emit is less than 500 tons per year of SO2 and/or NOx, and the plant is located at a distance from a Class I area of at least 50 km. If a change in emissions is required to meet the model plant criteria, either of the methods described in Q(a) and Q(b) to limit a source's potential to emit would be appropriate. The limitations of a source's potential to emit should be in place prior to the start of the State's public comment period on its proposed Regional Haze SIP to EPA and a description of the State's action should be included in the SIP narrative. To prevent circumvention of the BART requirements, it may be necessary to include a permit term or SIP provision that provides that changes at the BART-eligible source or in its permit that allow for increases in emissions would subject the source to BART review.	This answer applies only to BART. This guidance document provides new guidance on this topic in the context of the development of the LTS in the second implementation period.

Q&A	Relevance to the Second Implementation Period
Similar to the approach described in the preceding paragraph, a State may allow a BART-eligible source to reduce its emissions such that individual source dispersion modeling shows the source's impact falls below the contribution threshold established by the State. As discussed in the BART Guidelines, when modeling a source's predicted impacts on visibility, States should use emissions estimates that reflect steady-state operating conditions during periods of high capacity utilization. As a result, EPA recommends that States use the 24-hour average actual emission rate from the highest emitting day of the meteorological period modeled. In cases where the State has limited information on the source's potential to emit, the State will need to develop a reliable and technically supportable estimate of the source's highest future 24-hour actual emission rate based on its allowable emission rate, or use the new potential to emit limit for the modeling. As with the case above, the mechanism containing these enforceable limits would need to be in place prior to the date that the Regional Haze SIP is submitted to EPA, and other measures may be necessary to avoid circumvention of the BART requirement. Please remember that States must provide an explanation for selection of the contribution threshold, whether it is 0.5 dv or some other threshold. As described in the BART Guidelines contained in 40 CFR Part 51, Appendix Y, consideration for establishing the threshold should include the number of emission sources affecting the Class I areas at issue, the magnitude of the sources' impacts, and the location of the sources. (See 70 FR 39161-39162, July 6, 2005.)	

APPENDIX G

Relevant Provisions of the Regional Haze Rule (40 CFR Part 51) as Revised in 2016

51.301 Definitions.

For purposes of this subpart:

Adverse impact on visibility means, for purposes of section 307, visibility impairment which interferes with the management, protection, preservation, or enjoyment of the visitor's visual experience of the Federal Class I area. This determination must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments, and how these factors correlate with (1) times of visitor use of the Federal Class I area, and (2) the frequency and timing of natural conditions that reduce visibility. This term does not include effects on integral vistas.

* * *

Building, structure, or *facility* means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities must be considered as part of the same industrial grouping if they belong to the same Major Group (i.e., which have the same two-digit code) as described in the Standard Industrial Classification Manual, 1972 as amended by the 1977 Supplement (U.S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0 respectively).

Clearest days means the twenty percent of monitored days in a calendar year with the lowest values of the deciview index.

Deciview is the unit of measurement on the deciview index scale for quantifying in a standard manner human perceptions of visibility.

Deciview index means a value for a day that is derived from calculated or measured light extinction, such that uniform increments of the index correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to very obscured. The deciview index is calculated based on the following equation (for the purposes of calculating deciview using IMPROVE data, the atmospheric light extinction coefficient must be calculated from aerosol measurements and an estimate of Rayleigh scattering):

Deciview index = 10 ln (b_{ext}/10 Mm^{-1}).

b_{ext} = the atmospheric light extinction coefficient, expressed in inverse megameters (Mm−1).

End of the applicable implementation period means December 31 of the year in which the next periodic comprehensive implementation plan revision is due under §51.308(f).

* * *

Federal Class I area or *Class I Federal area* means any Federal land that is classified or reclassified Class I. Mandatory Federal Class I areas are identified in part 81, subpart D. Other Federal Class I areas are identified in part 52 of this title.

Federal Land Manager means the Secretary of the department with authority over the Federal Class I area (or the Secretary's designee) or, with respect to Roosevelt-Campobello International Park, the Chairman of the Roosevelt-Campobello International Park Commission.

Federally enforceable means all limitations and conditions which are enforceable by the Administrator under the Clean Air Act including those requirements developed pursuant to parts 60 and 61 of this title, requirements within any applicable State Implementation Plan, and any permit requirements established pursuant to §52.21 of this chapter or under regulations approved pursuant to part 51, 52, or 60 of this title.

Fixed capital cost means the capital needed to provide all of the depreciable components.

* * *

Implementation plan means, for the purposes of this part, any State Implementation Plan, Federal Implementation Plan, or Tribal Implementation Plan.

Indian tribe or *tribe* means any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village, which is federally recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

* * *

Installation means an identifiable piece of process equipment.

* * *

Least impaired days means the twenty percent of monitored days in a calendar year with the lowest amounts of visibility impairment.

Major stationary source and *major modification* mean major stationary source and major modification, respectively, as defined in §51.166.

Mandatory Class I Federal Area or *Mandatory Federal Class I Area* means any area identified in part 81, subpart D of this title.

Most impaired days means the twenty percent of monitored days in a calendar year with the highest amounts of visibility impairment.

Natural conditions includes naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast, or coloration.

Natural visibility conditions means visibility (contrast, coloration, and texture) that would have existed under natural conditions. Natural visibility conditions vary with time and location, and are estimated or inferred rather than directly measured.

* * *

Prescribed fire means any fire intentionally ignited by management actions in accordance with applicable laws, policies, and regulations to meet specific land or resource management objectives.

Reasonably attributable means attributable by visual observation or any other appropriate technique.

Reasonably attributable visibility impairment means visibility impairment that is caused by the emission of air pollutants from one, or a small number of sources.

* * *

Regional haze means visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area. Such sources include, but are not limited to, major and minor stationary sources, mobile sources, and area sources.

Secondary emissions means emissions which occur as a result of the construction or operation of an existing stationary facility but do not come from the existing stationary facility. Secondary emissions may include, but are not limited to, emissions from ships or trains coming to or from the existing stationary facility.

* * *

State means "State" as defined in section 302(d) of the CAA.

Stationary Source means any building, structure, facility, or installation which emits or may emit any air pollutant.

Visibility means the degree of perceived clarity when viewing objects at a distance. Visibility includes perceived changes in contrast, coloration, and texture elements in a scene.

Visibility impairment means any humanly perceptible difference between actual visibility conditions and natural visibility conditions. Because natural visibility conditions can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured.

Visibility in any mandatory Class I Federal area includes any integral vista associated with that area.

Wildfire means any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has been declared to be a wildfire. A wildfire that predominantly occurs on wildland is a natural event.

Wildland means an area in which human activity and development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

* * *

51.308 Regional haze program requirements

(a) *What is the purpose of this section?* This section establishes requirements for implementation plans, plan revisions, and periodic progress reviews to address regional haze.

(b) *When are the first implementation plans due under the regional haze program?* Except as provided in §51.309(c), each State identified in §51.300(b) must submit, for the entire State, an implementation plan for regional haze meeting the requirements of paragraphs (d) and (e) of this section no later than December 17, 2007.

(c) *What is the relationship between requirements for regional haze and requirements for reasonably attributable visibility impairment?* A State must address any reasonably attributable visibility impairment certified by a Federal Land Manager under §51.302(a) in its regional haze implementation plan, as required by §51.302(b)-(d). A State must also meet the requirements of §51.305 if the Administrator, Regional Administrator, or the Federal Land Manager has advised

a State under §51.305 of a need for additional monitoring to assess reasonably attributable visibility impairment at a mandatory Class I Federal area.

* * *

(f) *Requirements for periodic comprehensive revisions of implementation plans for regional haze.* Each State identified in §51.300(b) must revise and submit its regional haze implementation plan revision to EPA by July 31, 2021, July 31, 2028, and every 10 years thereafter. The plan revision due on or before July 31, 2021 must include a commitment by the State to meet the requirements of paragraph (g). In each plan revision, the State must address regional haze in each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State that may be affected by emissions from within the State. To meet the core requirements for regional haze for these areas, the State must submit an implementation plan containing the following plan elements and supporting documentation for all required analyses:

(1) *Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress.* For each mandatory Class I Federal area located within the State, the State must determine the following:

(i) *Baseline visibility conditions for the most impaired and clearest days*. The period for establishing baseline visibility conditions is 2000 to 2004. For purposes of calculating and displaying the uniform rate of progress, baseline visibility conditions must be associated with the last day of this period. Baseline visibility conditions must be calculated, using available monitoring data, by establishing the average deciview index for the most impaired and clearest days for each calendar year from 2000 to 2004. The baseline visibility conditions are the average of these annual values. For mandatory Class I Federal areas without onsite monitoring data for 2000-2004, the State must establish baseline values using the most representative available monitoring data for 2000-2004, in consultation with the Administrator or his or her designee. For mandatory Class I Federal areas with incomplete data availability for 2000-2004, the State must establish baseline values using the closest 5 complete years of monitoring data.

(ii) *Natural visibility conditions for the most impaired and clearest days*. Natural visibility conditions must be calculated by estimating the deciview index existing under natural conditions for the most impaired and clearest days, based on available monitoring information and appropriate data analysis techniques; and

(iii) *Current visibility conditions for the most impaired and clearest days*. The period for calculating current visibility conditions is the most recent 5-year period for which data are available. Current visibility conditions must be calculated based on the annual average level of visibility impairment for the most impaired and clearest days for each of these 5 years. Current visibility conditions are the average of these annual values.

(iv) *Progress to date for the most impaired and clearest days*. Actual progress made towards natural conditions since the baseline period, and actual progress made during the previous implementation period up to and including to the period for calculating current visibility conditions, for the most impaired and clearest days, must be calculated.

(v) *Difference between current visibility conditions and natural visibility conditions*. The number of deciviews by which current visibility conditions exceed natural visibility conditions, for the most impaired and clearest days, must be calculated.

(vi) *Uniform rate of progress*. (A) The uniform rate of progress for each mandatory Class I Federal area in the State must be calculated. To calculate this uniform rate of progress, the State must compare baseline visibility conditions to natural visibility conditions in the mandatory Class I Federal area and determine the uniform rate of visibility improvement (measured in deciviews of improvement per year) that would need to be maintained during each implementation period in order to attain natural visibility conditions by the end of 2064.

(B) The State may submit a request to the Administrator seeking an adjustment to the uniform rate of progress for a mandatory Class I Federal area to account for impacts from (1) anthropogenic sources outside the United States and/or (2) wildland prescribed fires that were conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied. To calculate the proposed adjustment, the State must add the estimated impacts to natural visibility conditions and compare the resulting value to baseline visibility conditions. If the Administrator determines that the State has estimated the impacts from anthropogenic sources outside the United States or wildland prescribed fires using scientifically valid data and methods, the Administrator may approve the proposed adjustment to the uniform rate of progress for use in the State's implementation plan.

(2) *Long-term strategy for regional haze and reasonably attributable visibility impairment.* Each State must submit a long-term strategy that addresses regional haze visibility impairment, and if necessary any reasonably attributable visibility impairment certified by the Federal Land Manager under §51.302(a), for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to achieve reasonable progress, as determined pursuant to (f)(2)(i) through (vi). In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) The State must consider and analyze emission reduction measures based on the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected major or minor stationary source or group of sources. The State must document the criteria used to determine which sources or groups of sources were evaluated, and how these four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy.

(ii) The State must consider the uniform rate of improvement in visibility, the emission reduction measures identified in (f)(2)(i), and additional measures being adopted by other contributing states in (f)(2)(iii) as needed to make reasonable progress towards natural visibility conditions for the period covered by the implementation plan.

(iii) The State must consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Federal area.

(A) *Contributing States*. Where the State has emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area located in another State

or States, the State must consult with the other State(s) in order to develop coordinated emission management strategies. The State must demonstrate that it has included in its implementation plan all measures necessary to obtain its share of the emission reductions needed to provide for reasonable progress towards natural visibility conditions in the mandatory Class I Federal area located in the other State or States. If the State has participated in a regional planning process, the State must also ensure that it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(B) *States affected by contributing States*. A State with a mandatory Class I Federal area must consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in that area regarding the emission reductions needed in each State to provide for reasonable progress towards natural visibility conditions in that area. If the State has participated in a regional planning process, the State must ensure it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.

(C) In any situation in which a State cannot agree with another State or group of States on the emission reductions needed for reasonable progress towards natural visibility conditions in any mandatory Class I Federal area, each involved State must describe in its submittal the actions taken to resolve the disagreement. In reviewing the State's implementation plan submittal, the Administrator will take this information into account in determining whether the State's implementation plan provides for reasonable progress towards natural visibility conditions at each mandatory Class I Federal area that is located in the State or that may be affected by emissions from the State. All substantive interstate consultations must be documented.

(iv) As part of the demonstration required by (f)(2)(i), the State must document the technical basis, including information on the factors listed in (f)(2)(i) and modeling, monitoring, and emissions information, on which the State is relying to determine the emission reductions from anthropogenic sources in the State that are necessary for achieving reasonable progress towards natural visibility conditions in each mandatory Class I Federal area it affects. The State may meet this requirement by relying on technical analyses developed by a regional planning process and approved by all State participants. The State must identify the baseline emissions inventory on which its strategies are based. The baseline emissions inventory year shall be the most recent year for which the State has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of subpart A of this part unless the State adequately justifies the use of another inventory year.

(v) The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy and the criteria used to select the sources considered. The State should consider major and minor stationary sources, mobile sources, and area sources.

(vi) The State must consider, at a minimum, the following factors in developing its long-term strategy:

(A) Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;

(B) Measures to mitigate the impacts of construction activities;

(C) Emissions limitations and schedules for compliance to achieve the reasonable progress goal;

(D) Source retirement and replacement schedules;

(E) Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs as currently exist within the State for these purposes;

(F) Enforceability of emissions limitations and control measures; and

(G) 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.

(3) *Reasonable progress goals.* (i) A state in which a mandatory Class I Federal area is located must establish reasonable progress goals (expressed in deciviews) that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of all enforceable emissions limitations, compliance schedules, and other measures required under paragraph (f)(2) and the implementation of other requirements of the CAA. The long-term strategy and the reasonable progress goals must provide for an improvement in visibility for the most impaired days and ensure no degradation in visibility for the clearest days since the baseline period.

(ii)(A) If a State in which a mandatory Class I Federal area is located establishes a reasonable progress goal for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress calculated under paragraph (f)(1)(vi) of this section, the State must demonstrate, based on the analysis required by paragraph (f)(2)(i) of this section, that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the long-term strategy. The State must provide a robust demonstration, including documenting the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy. The State must provide to the public for review as part of its implementation plan an assessment of the number of years it would take to attain natural visibility conditions if visibility improvement were to continue at the rate of progress selected by the State as reasonable for the implementation period.

(B) If a State contains sources which are reasonably anticipated to contribute to visibility impairment in a mandatory Class I Federal area in another State for which a demonstration by the other State is required under (f)(3)(ii)(A), the State must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in its own long-term strategy. The State must provide a robust demonstration, including documenting the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy.

(iii) The reasonable progress goals established by the State are not directly enforceable but will be considered by the Administrator in evaluating the adequacy of the measures in the implementation plan in providing for reasonable progress towards achieving natural visibility conditions at that area.

(iv) In determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions, the Administrator will also evaluate the demonstrations developed by the State pursuant to paragraphs (f)(2) and (f)(3)(ii)(A) of this

section and the demonstrations provided by other States pursuant to paragraphs (f)(2) and (f)(3)(ii)(B) of this section.

(4) If the Administrator, Regional Administrator, or the affected Federal Land Manager has advised a State of a need for additional monitoring to assess reasonably attributable visibility impairment at a mandatory Class I Federal area in addition to the monitoring currently being conducted, the State must include in the plan revision an appropriate strategy for evaluating reasonably attributable visibility impairment in the mandatory Class I Federal area by visual observation or other appropriate monitoring techniques.

(5) So that the plan revision will serve also as a progress report, the State must address in the plan revision the requirements of paragraphs (g)(1), (g)(2), (g)(4), and (g)(5) of this section. However, the period to be addressed for these elements shall be the period since the past progress report.

(6) *Monitoring strategy and other implementation plan requirements*. The State must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State. Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network. The implementation plan must also provide for the following:

(i) The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.

(ii) Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas both within and outside the State.

(iii) For a State with no mandatory Class I Federal areas, procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.

(iv) The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.

(v) A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

* * *

(i) *What are the requirements for State and Federal Land Manager coordination?* (1) By November 29, 1999, the State must identify in writing to the Federal Land Managers the title of the official to which the Federal Land Manager of any mandatory Class I Federal area can submit any recommendations on the implementation of this subpart including, but not limited to:

(i) Identification of impairment of visibility in any mandatory Class I Federal area(s); and

(ii) Identification of elements for inclusion in the visibility monitoring strategy required by §51.305 and this section.

(2) The State must provide the Federal Land Manager with an opportunity for consultation, in person at a point early enough in the State's technical and policy analyses of its long-term strategy emission reduction obligation and prior to development of reasonable progress goals so that information and recommendations provided by the Federal Land Manager can meaningfully inform the State's development of the long-term strategy. The opportunity for consultation will be deemed to have been early enough if the consultation has taken place at least 120 days prior to holding any public hearing or other public comment opportunity on an implementation plan (or plan revision) or progress report for regional haze required by this subpart. The opportunity for consultation must be provided no less than 60 days prior to said public hearing or public comment opportunity. This consultation must include the opportunity for the affected Federal Land Managers to discuss their:

(i) Assessment of impairment of visibility in any mandatory Class I Federal area; and

(ii) Recommendations on the development of the reasonable progress goal and on the development and implementation of strategies to address visibility impairment.

(3) In developing any implementation plan (or plan revision) or progress report, the State must include a description of how it addressed any comments provided by the Federal Land Managers.

(4) The plan (or plan revision) must provide procedures for continuing consultation between the State and Federal Land Manager on the implementation of the visibility protection program required by this subpart, including development and review of implementation plan revisions and progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in mandatory Class I Federal areas.

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