Arkansas Department of Environmental Quality

Appendices for the
State of Arkansas
Regional Haze Rule
State Implementation Plan

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Appendix 1.1
Regional Haze Regulations –Final Rule

Federal Register

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Part II

Environmental Protection Agency

40 CFR Part 51

Regional Haze Regulations; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 51

[FRL–6353–4]

RIN 2060–AF32

[Docket No A–95–38]

Regional Haze Regulations

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Section 169A of the Clean Air Act (CAA) sets forth a national goal for visibility which is the ''prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.'' There are 156 Class I areas across the country, including many well-known national parks and wilderness areas, such as the Grand Canyon, Great Smokies, Shenandoah, Yellowstone, Yosemite, the Everglades, and the Boundary Waters. Regional haze is visibility impairment caused by the cumulative air pollutant emissions from numerous sources over a wide geographic area. The EPA promulgated regulations in 1980 to address visibility impairment that is ''reasonably attributable'' to one or a small group of sources, but EPA deferred action on regional haze regulations until monitoring, modeling, and scientific knowledge about the relationship between pollutants and visibility effects improved. In 1993, the National Academy of Sciences (NAS) concluded that ''current scientific knowledge is adequate and control technologies are available for taking regulatory action to improve and protect visibility.''

On July 31, 1997 (62 FR 41138), EPA published proposed amendments to the 1980 regulations to set forth a program to address regional haze visibility impairment. The EPA also published a notice of availability of additional information on the proposed regional haze regulation on September 3, 1998. This notice took comment specifically on new implementation plan timelines set forth in the Transportation Equity Act for the 21st Century, Public Law 105–178, and on a proposal from the Western Governors' Association (WGA) for addressing the recommendations of the Grand Canyon Visibility Transport Commission (GCVTC) in the final rule. The EPA received more than 1300 comments overall on the proposal and notice of availability.

Today's final rule calls for States to establish goals and emission reduction strategies for improving visibility in all 156 mandatory Class I national parks and wilderness areas. Specific provisions are included in the rule allowing nine western States to implement the recommendations of the GCVTC within the framework of the national regional haze program. In addition, EPA encourages States to work together in regional partnerships to develop and implement multistate strategies to reduce emissions of visibility-impairing fine particle pollution.

DATES: The regulatory amendments announced herein take effect on August 30, 1999.

ADDRESSES: *Docket.* The public docket for this action is available for public inspection and copying between 8:00 a.m. and 5:30 p.m., Monday through Friday excluding legal holidays, at the Air and Radiation Docket and Information Center (6102), Attention: Docket A–95–38, Room M–1500, 401 M Street, SW, Washington, DC 20460, phone 202–260–7548, fax 202–260–4400, email: A-and-R-Docket@epamail.epa.gov. A reasonable fee for copying may be charged. The regional haze regulations are subject to the rulemaking procedures under section 307(d) of the CAA. The documents relied on to develop the regional haze regulations have been placed in the docket.

FOR FURTHER INFORMATION CONTACT: For general questions regarding this notice, contact Richard Damberg, U.S. EPA, MD–15, Research Triangle Park, NC 27711, telephone (919) 541–5592, email: damberg.rich@epa.gov.

SUPPLEMENTARY INFORMATION:

Electronic Availability

The official record for this rulemaking, as well as the public version, has been established under docket number A–95–38 (including comments and data submitted electronically as described below). A public version of this record, including printed, paper versions of electronic comments, which does not include any information claimed as Confidential Business Information, is available for inspection from 8:00 a.m. to 5:30 p.m., Monday through Friday, excluding legal holidays. The official rulemaking record is located at the address in **ADDRESSES** at the beginning of this document. World Wide Web sites have been developed for overview information on visibility issues and related programs. These web sites can be accessed from Uniform Resource Locator (URL): http://www.epa.gov/airlinks/.

Table of Contents

I. Overview of Today's Final Rule

This preamble provides the details and rationale for the final regional haze rule. Unit II includes background information on regional haze and on the legal and scientific basis for today's action. Unit III describes the provisions of the national requirements for regional haze and includes a discussion of the comments received on the July 1997 proposal. Unit IV discusses specific regional provisions for 16 western Class I areas that were the subject of a 1996 report by the GCVTC. Unit V is a discussion of issues related to implementation of the rule by Indian tribes. Unit VI summarizes several technical amendments to existing visibility regulations in order to coordinate those requirements with the requirements of today's final rule. Unit VII discusses how today's final rulemaking is in compliance with the requirements of various executive orders and statutes.

II. Background Information on the Regional Haze Program

A. Regional Haze

Regional haze is visibility impairment that is produced by a multitude of sources and activities which emit fine particles and their precursors and which are located across a broad geographic area.[1] Twenty years ago, when initially adopting the visibility protection provisions of the CAA, Congress specifically recognized that the ''visibility problem is caused primarily by emission into the atmosphere of SO_2, oxides of nitrogen, and particulate matter, especially fine particulate matter, from inadequate[ly] controlled sources.'' [2] The fine particulate matter (PM) (e.g., sulfates, nitrates, organic carbon, elemental carbon, and soil dust) that impairs visibility by scattering and absorbing light can cause serious health effects and mortality in humans, and contribute to environmental effects such as acid deposition and eutrophication. Data from the existing visibility monitoring network show that visibility impairment caused by air pollution occurs virtually all the time at most national park and wilderness area monitoring stations.[3] Average visual range in many Class I areas [4] in the Western United States is 100–150 kilometers (13.6–9.6 deciviews), [5] or about one-half to two-thirds of the visual range that would exist without manmade air pollution. In most of the east, the average visual range is less than 30 kilometers (25 deciviews or more), or about one-fifth of the visual range that would exist under estimated natural conditions. The role of regional transport of fine particles in contributing to elevated PM levels and regional haze impairment has been well documented by many researchers [6] and recognized as a significant issue by policymakers from Federal, State and local agencies, industry and environmental organizations.

B. How Today's Final Rule Responds to the CAA

The visibility protection program under sections 169A, 169B, and 110(a)(2)(J) of the CAA is designed to protect Class I areas [7] from impairment due to manmade air pollution. Congress adopted the visibility provisions in the CAA to protect visibility in these ''areas of great scenic importance.'' [8] The current regulatory program addresses visibility impairment in these areas that is ''reasonably attributable'' [9] to a specific source or small group of sources. In adopting section 169A, the core visibility provisions adopted in the 1977 CAA Amendments, Congress also expressed its concern with visibility problems caused by pollutants that ''emanate from a variety of sources.'' It noted the problem of ''hazes'' from ''regionally distributed sources,'' [10] and concluded that additional provisions were needed to remedy ''the growing visibility problem.'' The purpose of today's final rule is to revise the existing visibility regulations [11] in order to integrate provisions addressing regional haze impairment. Today's final rule establishes a comprehensive visibility protection program for Class I areas. Figure 1 is a map indicating the locations of the Class I areas.

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[1] U.S. EPA. Air Quality Criteria for Particulate Matter. Office of Research and Development, National Center for Environmental Assessment. EPA/600/P–95/001bF. Research Triangle Park, NC. 1996.

[2] H.R. Rep. No. 95–294 at 204 (1977).

[3] National Park Service. Air Quality in the National Parks: A Summary of Findings from the National Park Service Air Quality Research and Monitoring Program. Natural Resources Report 88–1. Denver, CO, July 1988.

[4] Areas designated as mandatory Class I Federal areas are those national parks exceeding 6000 acres, wilderness areas and national memorial parks exceeding 5000 areas, and all international parks which were in existence on August 7, 1977. Visibility has been identified as an important value in 156 of these areas. See 40 CFR part 81, subpart D. The extent of a Class I area includes subsequent changes in boundaries, such as park expansions. (CAA section 162(a)). States and tribes may designate additional areas as Class I, but the requirements of the visibility program under section 169A of the CAA apply only to ''mandatory Class I Federal areas,'' and they do not directly address any additional areas.

[5] ''Deciview'' is a visibility metric discussed further in unit III.C. of today's notice, and defined in section 51.301(bb) of the rule. Higher deciview values indicate greater levels of visibility impairment.

[6] See National Acid Precipitation Assessment Program. Acid Deposition: State of Science and Technology. Report 24, Visibility: Existing and Historical Conditions—Causes and Effects, Table 24–6. Washington, DC 1991. See also U.S. EPA. Air Quality Criteria for Particulate Matter. Office of Research and Development, National Center for Environmental Assessment. EPA/600/P–95/001bF. Research Triangle Park, NC. 1996.

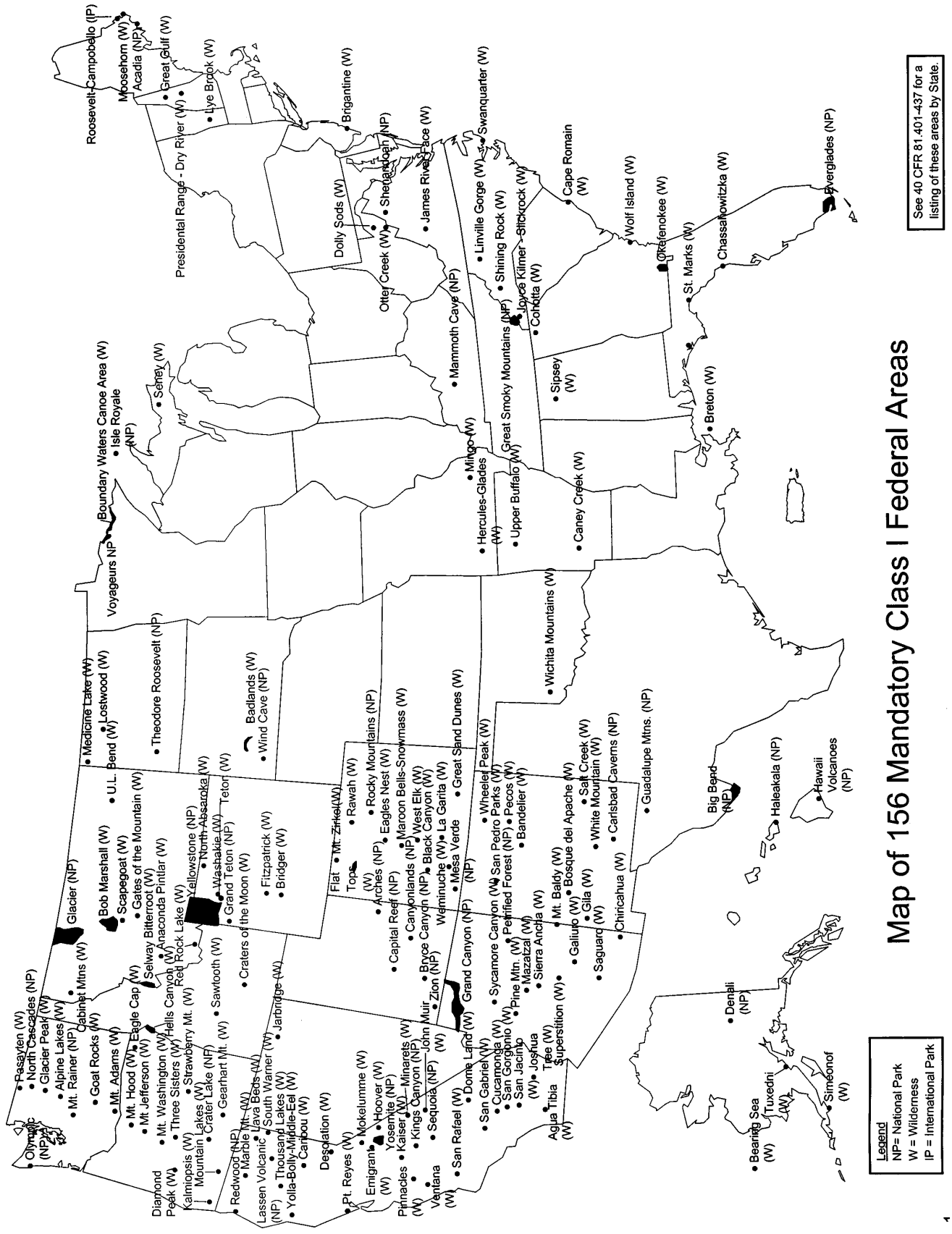
[7] For the purposes of this preamble, the term ''Class I area'' will be used to describe the 156 mandatory Class I Federal areas identified in section 51.301(o) and in part 81, subpart D of this title.

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

[9] ''Reasonably attributable'' visibility impairment, as defined in section 51.301(s), means ''attributable by visual observation or any other technique the State deems appropriate.'' It includes impacts to Class I areas caused by plumes or layered hazes from a single source or small group of sources.

[10] H.R. Rep. No. 95–294 at 204 (1977).

[11] 45 FR 80084 (December 2, 1980) and section 51.300–307.



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C. The 1980 Visibility Regulation—Commitment to a Regional Haze Program

Section 169A of the CAA, established in the 1977 Amendments, sets forth a national visibility goal that calls for ''the prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.'' The EPA's initial visibility regulations, developed in 1980, address visibility impairment that is ''reasonably attributable'' to a single source or small group of sources. Under the 1980 rules, the 35 States and 1 territory containing Class I areas [12] are required to:

(1) Revise their SIPs to assure reasonable progress toward the national visibility goal;

(2) Determine which existing stationary facilities should install the best available retrofit technology (BART) for controlling pollutants which impair visibility;

(3) Develop, adopt, implement, and evaluate long-term strategies for making reasonable progress toward remedying any existing and preventing any future impairment in the Class I areas;

(4) Adopt certain measures to assess potential visibility impacts due to new or modified major stationary sources, including measures to notify Federal land managers (FLMs) of proposed new source permit applications, and to consider visibility analyses conducted by FLMs in their new source permitting decisions; and

(5) Conduct visibility monitoring in Class I areas.

The 1980 rules addressing ''reasonably attributable'' visibility impairment were designed to be the first phase in EPA's overall program to protect visibility. The EPA explicitly deferred national rules addressing regional haze impairment until some future date:

* * * when improvement in monitoring techniques provides more data on source-specific levels of visibility impairment, regional scale models become refined, and our scientific knowledge about the relationships between emitted air pollutants and visibility impairment improves.[13]

The EPA believes that the technical tools and our scientific understanding of visibility impairment are now sufficiently refined to move forward with a national program addressing regional haze in Class I areas. The EPA's position is supported by the NAS 1993 report, Protecting Visibility in National Parks and Wilderness Areas. One of the principal conclusions of this report is that ''current scientific knowledge is adequate and control technologies are available for taking regulatory action to improve and protect visibility.'' [14] Section II.D. describes a number of other studies and information now available which provide the technical basis to move forward with a regional haze program.

In addition, EPA finds the visibility protection provisions of the CAA to be quite broad. Although EPA is addressing visibility protection in phases, the national visibility goal in section 169A calls for addressing visibility impairment generally, including regional haze.[15]

Further, Congress added section 169B as part of the 1990 Amendments to the CAA to focus attention on regional haze issues; it calls for EPA to issue regional haze rules within 18 months of receipt of the final report from the GCVTC. In addition, section 169B includes provisions for EPA to conduct visibility research with the National Park Service and other Federal agencies, to develop an interim findings report on the visibility research,[16] to develop a Report to Congress on expected visibility improvements due to implementation of other air pollution programs,[17] and to provide periodic reports to Congress on trends in visibility improvements. Section 169B also provides the authority to the Administrator to establish visibility transport commissions in response to a petition from two or more States, or on her and/or his own motion. To date, EPA has not received any petitions from groups of States requesting formation of a visibility transport commission.

Section 169B(f) called for EPA to establish a visibility transport commission for the region affecting visibility of the Grand Canyon National Park. The purpose of this commission was to assess scientific and technical information pertaining to adverse impacts on visibility at the Park from existing emissions and projected growth in emissions. The statute specifically called for a report to EPA recommending measures to remedy such impacts and to address long-term strategies for addressing regional haze.[18] In 1991, EPA established the GCVTC,[19] and the GCVTC issued its final report in June 1996.[20] The recommendations of the GCVTC and their incorporation as potential SIP requirements into the final rule, are discussed in greater detail in unit IV of the preamble.

Finally, section 169B(e) calls for the Administrator to consider past research and the recommendations of visibility transport commissions in carrying out the ''regulatory responsibilities under section 169A, including criteria for measuring 'reasonable progress' toward the national goal.'' [21] The EPA is required by the CAA to meet these regulatory responsibilities within 18 months of receiving the GCVTC report. Today's final rule fulfills EPA's responsibility under section 169A, pending since 1980, to put in place a national regulatory program that addresses both reasonably attributable and regional haze visibility impairment. Today's action is also EPA's response to the GCVTC report as anticipated by section 169B.

D. Sources of Scientific Information and Policy Recommendations on Regional Haze

In developing today's revisions to the visibility regulations, EPA has taken into account a significant body of scientific information and policy recommendations on visibility issues that have been developed over more than 20 years. This unit highlights key sources of information upon which the final regional haze rule is based.

For many years, visibility impairment has been considered the ''best understood and most easily measured

[12] The States and one territory having at least one Class I area are listed in section 51.300(b)(2). These States and one territory are as follows: Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Georgia, Hawaii, Idaho, Kentucky, Louisiana, Maine, Michigan, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Virgin Islands, Washington, West Virginia, and Wyoming. For a specific list of Class I areas located in each state or territory, see 40 CFR 81.401–437.

[13] 45 FR 80086.

[14] National Research Council Committee on Haze in National Parks and Wilderness Areas, Protecting Visibility in National Parks and Wilderness Areas, National Academy Press, 1993, p. 11.

[15] *State of Maine* v. *Thomas,* 874 F.2d 883, 885 (1st Cir. 1989) (''EPA's mandate to control the vexing problem of regional haze emanates directly from the CAA, which 'declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.' '') (citation omitted).

[16] U.S. EPA, Interim Findings on the Status of Visibility Research, Office of Research and Development, EPA/600/R–95/021, February 1995. See also 60 FR 8659 notice announcing the report availability and how to obtain copies (Feb. 15, 1995.

[17] U.S. EPA, Effects of the 1990 CAA Amendments on Visibility in Class I Areas: An EPA Report to Congress, October 1993 (EPA–452/R–93–014).

[18] CAA section 169B(d)(2)(C).

[19] 56 FR 57522, November 12, 1991.

[20] Grand Canyon Visibility Transport Commission, Recommendations for Improving Western Vistas, Report to the U.S. EPA, June 10, 1996 (hereafter referred to as ''GCVTC Report'').

[21] CAA section 169B(e)(1).

effect of air pollution.'' [22] Visibility degradation has also been recognized as an indicator of multiple human-health effects and environmental effects resulting from air pollution all over the world.[23] Visibility conditions have been monitored and evaluated for many years, using airport visibility data collected from the 1940's to the present.[24]

In October 1979, EPA published a Report to Congress describing the state of the science on visibility.[25] The report, required under section 169A(a)(3), described available methods for visibility monitoring, modeling, and assessment of strategies to make progress toward the national goal. This report was developed in advance of the 1980 visibility regulations. As noted above, EPA deferred action on regional haze until monitoring techniques, modeling capabilities, and the understanding of the pollutants affecting visibility were improved. In 1986, the IMPROVE (Interagency Monitoring of Protected Visual Environments) visibility monitoring program was initiated in 30 Class I areas. The IMPROVE program has been coordinated through a cooperative, multiagency approach with participation by EPA, the FLMs, and States. Through the IMPROVE program, significant progress has been made in understanding the effect of various pollutants on current visibility conditions and trends, in developing well-accepted monitoring protocols, and in developing a sound approach for calculating light extinction values from aerosol and humidity data. The IMPROVE program has issued two major reviews of the monitoring data collected to date,[26] and numerous technical papers have been developed using data collected by the network.

In addition, in 1996 EPA began to include a chapter on visibility trends, based on data collected throughout the IMPROVE network, in the National Air Quality and Emissions Trends Report in 1996.[27] Data from 1988 to the present are analyzed for the best 20 percent, middle 20 percent, and worst 20 percent days of the annual distribution, and aggregated for eastern and western sites. Annual summary data are also presented for each individual site in an appendix.

Visibility research continued throughout the 1980's and is documented in many published articles and the proceedings of three major visibility conferences.[28] In addition, the NAPAP completed a comprehensive review of the state of the science of visibility in 1991.[29] This peer-reviewed report reached a number of important conclusions, including: (1) Light scattering is dominated by fine particles; (2) sulfates are the dominant source of light extinction in the east, and one of several major sources of extinction in the west; (3) rural visibility varies significantly between the east and west; (4) average natural visibility conditions are 150 kilometers visual range (9.6 deciviews) in the east and 230 kilometers visual range (5.3 deciviews) in the west; and (5) haze trends in the eastern United States have been dominated by sulfur emission trends since the late 1940's.

The NAS formed a Committee on Haze in National Parks and Wilderness Areas in 1990 to address a number of regional haze-related issues, including methods for determining anthropogenic source contributions to haze and methods for considering alternative source control measures. The 1993 report by this Committee contributed significantly to the state of the science regarding regional haze visibility impairment.[30] The Committee issued several important conclusions in the report, including: (1) Current scientific knowledge is adequate and control technologies are available for taking regulatory action to address regional haze; (2) progress toward the national goal will require regional programs that operate over large geographic areas and limit emissions of pollutants that can cause regional haze; (3) a program to address regional haze visibility impairment that focuses solely on determining the contributions of individual emission sources to such visibility impairment is likely to fail, and instead, strategies should be adopted to consider simultaneously the effect of many sources on a regional basis; (4) visibility impairment can be attributed to emission sources on a regional scale through the use of several kinds of models; (5) visibility and control policies might need to be different in the west than the east; (6) efforts to improve visibility within Class I areas will benefit visibility outside these areas and could help alleviate other types of air quality problems as well; (7) achieving the national visibility goal will require a substantial, long-term program; and (8) continued progress toward this goal will require a greater commitment toward atmospheric research, monitoring, and emissions control research and development.

Also in 1993, EPA developed its Report to Congress on the projected effects on visibility in Class I areas due to implementation of the 1990 CAA Amendments. [31] The report concluded that conditions on the worst visibility days are expected to improve by approximately 3 deciviews by 2010 across the most impaired portions of the Eastern United States. Most of this improvement is expected in the 1995–2005 timeframe due to sulfur dioxide reductions under the acid rain program. In the Southwestern United States, the visibility change was predicted to be less than 1 deciview in most Class I areas except San Gorgonio Wilderness (which is located downwind of Los Angeles), for which a 1–2 deciview improvement is expected.

[22] Council on Environmental Quality, Visibility Protection for Class I Areas: The Technical Basis, Washington, DC, 1978.

[23] National Research Council, NAS Committee on Haze in National Parks and Wilderness Areas, Protecting Visibility in National Parks and Wilderness Areas, National Academy Press, 1993, p. 23.

[24] National Acid Precipitation Assessment Program (NAPAP), Acid Deposition: State of Science and Technology. Report 24, Visibility: Existing and Historical Conditions—Causes and Effects, Washington, DC, 1991.

[25] U.S. EPA, Protecting Visibility: An EPA Report to Congress; Office of Air Quality Planning and Standards, EPA–450/5–79–008, October 1979.

[26] Sisler, J. et al., Spatial and Seasonal Patters and Long-Term Variability of the Chemical Composition of the Haze in the U.S.: An Analysis of Data from the IMPROVE Network, Fort Collins, CO, Cooperative Institute for Research in the Atmosphere, Colorado State University, 1996. See also Sisler, J., et al., Spatial and Temporal Patters and the Chemical Composition of the Haze in the United States: An Analysis of Data From the IMPROVE Network, 1988–1991, Fort Callins, CO, 1993.

[27] U.S. EPA, National Air Quality and Emissions Trends Report, 1996, Office of Air Quality Planning and Standards, EPA 454/R–97–013, January 1998. See also U.S. EPA, National Air Quality and Emissions Trends Report, 1997, Office of Air Quality Planning and Standards, EPA 454/R–98–016, January 1999.

[28] Atmospheric Environment, Proceedings of EPA Symposium on Plumes and Visibility—Measurements and Model Components, November 1980, Atmos. Environ., 15:1785–2646. See also Bhardwaja, P.J., ed., Visibility Protection: Research and Policy Aspects. Transactions of APCA Specialty Conference, September 1986, Grand Tetons National Park, WY. Air Pollution Control Assoc., Pittsburgh, PA, 1987. See also Mathai, C.V., ed., Visibility and Fine Particles. Transactions of AWMA specialty conference, October 1989, Estes Park, CO. Air and Waste Management Assoc., Pittsburgh, PA, 1990.

[29] National Acid Precipitation Assessment Program (NAPAP), Acid Deposition: State of Science and Technology, Report 24, Visibility: Existing and Historical Conditions—Causes and Effects, Washington, DC, 1991.

[30] National Research Council, NAS Committee on Haze in National Parks and Wilderness Areas, Protecting Visibility in National Parks and Wilderness Areas, National Academy Press, Washington, DC, 1993.

[31] U.S. EPA, Effects of the 1990 Clean Air Act Amendments on Visibility in Class I Areas: An EPA Report to Congress, Office of Air Quality Planning and Standards, EPA–452/R–93–014, October 1993.

As required by section 169B(a)(2) of the CAA, EPA issued a report in 1995 on interim findings on the status of visibility research completed since 1990.[32] This report reviewed four major visibility related reports published since 1990,[33] provided citations of published research papers, and summarized research under way by the GCVTC, four Federal agencies, and the Electric Power Research Institute. As noted above, the GCVTC issued a report in June 1996 containing recommendations for protecting visibility at 16 Class I areas on the Colorado Plateau. Based on EPA's discretionary authority under section 169B(c), it expanded the scope of the GCVTC:

* * * to include additional Class I areas in the vicinity of the Grand Canyon National Park—-what is sometimes referred to as the ''Golden Circle'' of parks and wilderness areas. This includes most of the national parks and national wilderness areas of the Colorado Plateau.[34]

The GCVTC was charged with assessing information about visibility impacts in the region and making policy recommendations to EPA to address such impacts. The CAA called for the GCVTC to assess studies conducted under section 169B as well as other available information ''pertaining to adverse impacts on visibility from potential or projected growth in emissions for sources located in the * * * Region,'' and to issue a report to EPA recommending what measures, if any, should be taken to protect visibility. [35] The CAA specifically provided for the GCVTC's report to address the following measures: (1) The establishment of clean air corridors, in which additional restrictions on increases in emissions may be appropriate to protect visibility in affected Class I areas; (2) the imposition of additional new source review requirements in clean air corridors; [36] and (3) the promulgation of regulations addressing regional haze.

In unit IV of the proposal, EPA discusses the major recommendations of the GCVTC. The GCVTC's recommendations have components that contemplate implementation through a combination of actions by EPA, other Federal agencies, States and tribes in the region, and voluntary measures on the part of public and private entities throughout the region. The GCVTC's recommendations also distinguish between recommended actions and policy or strategy options for consideration. Unit IV addresses how EPA took these recommendations, as well as the body of technical information developed by the GCVTC, into account in developing the final rule.

Response to comments. Some commenters on the regional haze proposal suggested that EPA had not provided an adequate scientific or legal justification for developing a regional haze program. The commenters asserted that the science of regional haze is not understood well enough to develop regulations at this time. In addition, some commenters claimed that EPA has not provided adequate technical guidance for implementation of the rule, and that providing such guidance is a legal prerequisite to promulgating a regional haze rule. The EPA does not agree with these claims.

First, EPA believes it has relied upon a substantial amount of scientific evidence to support development of the regional haze program. Many of the important studies, reports, and other scientific and technical information on which the regional haze rule is based are referenced earlier in this section. In particular, the NAS Committee on Haze in National Parks and Wilderness Areas concluded that ''Current scientific knowledge is adequate and control technologies are available for taking regulatory action to improve and protect visibility.'' [37] Thus, EPA believes that its decision to move forward with promulgation of the regional haze program is reasonable, particularly in light of the fact that the Agency's obligation to address regional haze originated more than 20 years ago with passage of the 1977 CAA Amendments.

Second, as discussed in the response to comments, today's final rule provides the States with the necessary guidelines to implement a regional haze program. The EPA believes that the supposition that all technical guidance associated with a program be developed before a rule can be promulgated is unfounded. The EPA recognizes the importance of timely implementation guidance and is committed to providing such guidance, as appropriate, for the regional haze program.

The EPA does not interpret sections 169A and 169B as requiring all technical guidance to be issued by the Agency before the rule is finalized. The EPA is committed to working closely with the States and other interested parties in developing effective guidance documents within a reasonable period of time after promulgation of the final regional haze rule.

E. Relationship to Secondary NAAQS for PM

Today's final rule is an important element in EPA's overall approach to protecting visibility under the CAA. In July 1997, EPA established national secondary ambient air quality standards (NAAQS) for particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$) as part of its final decision on revision of the existing NAAQS for particulate matter under section 109(d) of the CAA.[38] The secondary standards were based on EPA's determination that the levels selected were ''requisite to protect the public welfare'' against visibility impairment on a nationally uniform basis as provided in section 109(b). Consistent with the purposes of section 169A, however, EPA recognized that such nationally uniform standards would not eliminate all visibility impairment in all parts of the country.[39] The visibility impacts remaining in Class I areas are addressed by today's final rule.

Today's final rule has additional benefits, as EPA expects the regional strategies implemented as part of the regional haze program to improve visibility outside of Class I areas as well. Thus, the regional haze program should contribute to the improvement of local visibility impacts outside of Class I areas that may persist after attainment of the secondary standards.

F. Regional Planning and Integration With Programs to Implement the NAAQS for Ozone and Particulate Matter

The regional haze program is being promulgated in a manner that facilitates integration of emission management strategies for regional haze with the implementation of programs for new NAAQS for ozone and PM. This is being done because of the existing scientific evidence that these air quality problems have common precursor pollutants, emission sources, atmospheric processes, spatial scales for transport, and geographic areas of concern.

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[32] U.S. EPA, Interim Findings on the Status of Visibility Research, Office of Research and Development, EPA/600/R–95/021, February 1995.

[33] These repdorts have already been mentioned in this section: the 1993 NAS report, the 1993 IMPROVE report (Sisler et al.), the 1993 EPA Report to Congress, and the 1991 NAPAP Report to Congress.

[34] 56 FR 57523

[35] CAA Section 169B(d).

[36] A clean air corridor is defined as a region that generally brings clear air to a receptor region, such as the Class I areas of the Golden Circle.

[37] National Research Council, NAS Committee on Haze in National Parks and Wilderness Areas, Protecting Visibility in National Parks and Wilderness Areas, National Academy Press, Washington, DC, 1993, p. 11.

[38] 62 FR 38652 (July 18, 1997).

[39] See section 160(1); H.R. Rep. No. 95–294 at 205 (1977).

Because of the key role of regional pollutant transport in contributing to haze at Class I areas, most of which are in remote locations, the regional haze program recognizes the value of multistate coordination for regional haze program planning and implementation. Consistent with the recommendations of the Clean Air Act Advisory Committee, Subcommittee on Ozone, Particulate Matter, and Regional Haze Implementation Programs,[40] EPA strongly encourages States to undertake multistate regional planning efforts addressing regional haze in a way that coordinates technical analyses and strategy development with the NAAQS to the maximum extent possible. Examples of ongoing coordination among States to address visibility issues include the Western Regional Air Partnership (WRAP) and the Southern Appalachian Mountain Initiative.

The EPA believes that States (and tribes, at their discretion), in partnership with other interested stakeholders, should consider conducting future regional air quality planning efforts to address the implementation of the ozone and PM NAAQS and regional haze program. We encourage States to continue to work together to establish common protocols and approaches for emissions inventory development, emissions tracking, application of regional models, and development of effective emission reduction strategies.

The EPA plans to participate early and actively in regional planning efforts. The EPA recognizes that we must provide early input on issues and to make our views known as issues arise. The EPA has a responsibility to independently review the adequacy of implementation plans in the public rulemaking process and to consider all public comments received on a plan in determining if it meets applicable requirements. However, it is equally important that EPA be open in letting participants know of our views and concerns throughout the process.

The EPA will soon issue final guidance on such regional planning efforts for the purposes of implementing the ozone, particulate matter, and regional haze implementation programs.[41] Also, as a part of EPA's 1999 fiscal year budget, Congress provided $4 million dollars to support regional planning activities. EPA is currently involved with the States in a process to define the appropriate size and composition of regional planning bodies. The final planning guidance will provide a discussion of several important issues related to regional planning efforts. These issues include:

- Taking credit for emissions reductions in other States;
- Important principles for future regional planning efforts;
- The technical assessment process; and
- The strategy development process.

Some important principles discussed in the guidance for conducting regional planning efforts include the following points.

- Regional planning efforts should be a product of State (and, at the discretion of any tribe, tribal) leadership and, thus, should be led by States (and tribes), not EPA. Representatives should have the authority to speak for their organizations.
- States (and tribes at their discretion) should be prepared to make strong, early commitments to implementing the outcome of the regional process to ensure that SIP submittal dates are met.
- Participants in regional planning efforts should set up a work plan to carry out their work. The work plan should contain clearly stated products of the process, dates for completion of those products and mechanisms for funding the needed analyses.
- The technical assessment process should include steps for problem definition, development of emissions inventories, and development of tools to evaluate strategy alternatives.
- In the strategy development process, participants should strive to develop a consensus about (1) the set of regional emissions reductions strategies needed to attain the NAAQS or make ''reasonable progress'' toward the national visibility goal in Class I areas, and (2) the degree to which each State and relevant source category should be required to reduce emissions to implement the recommended strategies.

III. Discussion of National Program Requirements and Response to Comments

- *Scope of Rule—Extending Coverage to All States*

Proposed rule. In the regional haze proposal, EPA proposed to amend section 51.300(b)(3) to extend coverage to all States (excluding certain territories) for the purpose of addressing regional haze visibility impairment. This approach differed from the 1980 visibility regulations for ''reasonably attributable'' impairment, which required the 35 States and the Virgin Islands containing Class I areas to submit SIP revisions and to revise them periodically to assure reasonable progress toward the national visibility goal. Thus, under the proposal, the following additional States and the District of Columbia would be required to submit visibility SIPs: Nebraska, Kansas, Iowa, Wisconsin, Illinois, Indiana, Ohio, Mississippi, New York, Pennsylvania, Massachusetts, Rhode Island, Connecticut, and Maryland. The territories of Puerto Rico, Guam, American Samoa, and the Northern Mariana Islands were not included because their distance from any Class I area significantly exceed the distance that their emissions could be expected to be transported in order to contribute to visibility impairment in any Class I area. However, Hawaii, Alaska, and the Virgin Islands would be subject to the regional haze provisions because of the potential for emissions from sources within their borders to contribute to regional haze impairment in Class I areas also located within their own jurisdiction.

In the proposal, EPA also recommended that all States initially participate in regional planning efforts to more precisely characterize which States are contributing to visibility impairment in other States, as well as the magnitude of such contributions. States could then develop strategies for making reasonable progress in Class I areas throughout the region. The EPA noted that as a result of this process, all States may not have to adopt control strategies. At the same time, EPA cited the 1993 NAS report, which observed that the requirement for a State to revise its implementation plan if it ''may reasonably be anticipated'' to contribute to visibility impairment indicates that Congress intended that ''the philosophy of precautionary action should apply to visibility protection as it applies to other areas [such as the NAAQS].'' Thus, EPA proposed that, at a minimum, all States should be required to develop visibility SIPs in order to ''prevent any future impairment'' as called for by the national goal in section 169A(a)(1).

Contracts received. The EPA received a number of comments on the proposed applicability provisions. Many commenters approved of EPA's approach to require SIPs from all States. Those who did not agree with the scope of the program provided a number of reasons for their opposition. Some commenters recognized the need for a regional haze program, but stated that EPA must first conduct or review

[40] Subcommittee for Ozone, Particulate Matter, and Regional Haze Implementation Programs, Final Report on Subcommittee Discussions, May 1998.

[41] See the November 17, 1998 draft of Implementation Guidance for the Ozone and Particulate Matter NAAQS and Regional Haze Program. EPA's internet site for an electronic version of this guidance: http://www.epa.gov/ttn/oarpg/tlpgm.html.

additional scientific analyses in order to provide justification for requiring additional States to submit visibility SIPs. Other commenters felt that in the proposed applicability provisions, EPA exceeded its statutory authority by extending the regional haze program to States that have not been demonstrated to ''cause or contribute'' to visibility impairment. Some commenters suggested that EPA rely on States with Class I areas to engage nearby States, as appropriate, in regional planning efforts. Some commenters in States containing Class I areas suggested that, for their particular Class I areas, there was no demonstrated visibility problem. They asserted that because visibility levels should already be deemed acceptable, there was no need for a regional haze program in their States. Other commenters felt that EPA should include specific criteria (e.g., distance, emissions, and visibility impact cutoffs) for excluding States or geographic areas from consideration as contributing to regional haze visibility impairment.

Final rule. Consistent with the proposal, EPA has concluded in today's final rule that all States contain sources whose emissions are reasonably anticipated to contribute to regional haze in a Class I area and, therefore, must submit regional haze SIPs. The rationale for this finding is discussed in more detail below.

In making this finding, EPA considered three factors: (1) The specific statutory language in the CAA; (2) the weight of evidence demonstrating long-range transport of fine particulate pollution that affects visibility in Class I areas; and (3) current monitored conditions in Class I areas across the country. The EPA's consideration of each of these factors is discussed below.

Two key provisions in section 169A support EPA's finding that all States must develop SIPs for regional haze. Section 169A(b)(2) requires EPA to promulgate regulations to require SIPs from those States where the emissions ''may reasonably be anticipated to cause or contribute to any impairment of visibility'' in a mandatory Class I Federal area. The EPA believes that this provision does not require the Agency to provide absolute certainty regarding the effect of emissions from the State on visibility in a particular Class I area.

The Ninth Circuit has interpreted the language, ''may reasonably be anticipated to cause or contribute to any impairment of visibility,'' in a case involving identical language in section 169A(b)(2)(A) relating to BART.[42] The EPA believes that the court's interpretation of this phrase may be appropriately used in regard to program applicability as well. In its decision, the court found that the language ''may reasonably be anticipated to cause or contribute'' establishes an ''extremely low triggering threshold'' for requiring a source to control emissions, adding that ''the NAS correctly noted that Congress has not required ironclad scientific certainty establishing the precise relationship between a source's emission and resulting visibility impairment. * * *''[43] In considering whether additional States should be subject to the visibility program, EPA believes the court's reasoning supports adoption of the predicate requirement that States develop the necessary provisions in their implementation plans to determine whether and to what extent control of emissions from sources is needed. That is, given that the court believed this ''low triggering threshold'' was sufficient to require a source to control its emissions under BART, EPA believes it is reasonable that a similarly low or even lower threshold applies to whether States should be required to engage in air quality planning and analysis as a prerequisite to determining the need for control of emissions from sources within their State. The EPA believes this is particularly appropriate since the requirement for SIPs does not mandate the actual control of emissions from any source without further technical analysis by the State. Accordingly, EPA believes the concept of an ''extremely low triggering threshold'' can also apply in determining which States should submit SIPs for regional haze.

Section 169A(a)(1) sets forth a national goal of ''the prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.'' Thus, in addition to requiring a program to reduce existing impairment, the CAA requires SIPs to be established in order to prevent future impairment. This preventative component of the national goal requires that States have the framework in place to address future growth in emissions from new sources or other activities that could impair visibility. For this reason, the EPA does not believe that it is appropriate to establish criteria for excluding States or geographic areas from consideration as potential contributors to regional haze visibility impairment.

As noted in the proposal, EPA is not specifying in this final rule what specific control measures a State must implement in its initial SIP for regional haze. That determination can only be made by a State once it has conducted the necessary technical analyses of emissions, air quality, and the other factors that go into determining reasonable progress. As discussed in section II(F), because of the regional, multistate nature of visibility impairment in Class I areas,[44] EPA recommends that these analyses and the determination of the extent of emissions reductions needed from individual States be developed and refined through multistate planning efforts using the best available technical tools, such as regional-scale modeling. The EPA also recommends the coordination of resulting strategies for regional haze with strategies needed to attain the $PM_{2.5}$ NAAQS. The EPA anticipates that as a result of the more refined analyses required by this rule, some States may conclude that control strategies specifically for protection of visibility are not needed at this time because the analyses may show that existing measures are sufficient to meet reasonable progress goals. The EPA is requiring States to document their analyses, including any consultations with other States in support of their conclusions that further controls are not needed at this time. The EPA believes that there is more than sufficient evidence to support our conclusion that emissions from each of the 48 contiguous States may be reasonably anticipated to cause or contribute to visibility impairment in a Class I area.

As stated in EPA's proposal, a large body of evidence demonstrates that long-range transport of fine PM contributes to regional haze and other related effects such as acid rain. In the preamble to the proposal and in the relevant docket, EPA cited numerous studies that contribute to this body of evidence.[45] Indeed, EPA recognized the role of long-range transport in relation to visibility impairment 20 years ago in its 1979 Report to Congress on visibility.[46]

Among the more important studies on which EPA relied are the 1991 report from the NAPAP, the 1993 NAS report Protecting Visibility in National Parks

[42] *Central Arizona Water Conservation District* v. *EPA*, 990 F.2d 1531 (1993).

[43] 990 F.2d at 1541.

[44] Refer to unit II of this final rule for additional background on the long-range transport of pollution contributing to regional haze.

[45] See Unit II, Background Information. See also July 29, 1997 memorandum to regional haze docket A–95–38, ''Supporting Information for Proposed Applicability of Regional Haze Regulations,'' by Richard Damberg, EPA, Office of Air Quality Planning and Standards.

[46] U.S. EPA, Protecting Visibility: An EPA Report to Congress, Office of Air Quality Planning and Standards, EPA–450/5–79–008, October 1979.

and Wilderness Areas, EPA studies using the regional acid deposition model (RADM), the 1996 GCVTC report Recommendations for Improving Western Vistas, and two contractor reports prepared for EPA.[47] All of these reports are available in the docket. They were referenced and discussed in EPA's proposal and in an additional memorandum to the docket. The NAPAP report included a comprehensive technical review of historical visibility trends.[48] The NAS report found that the range of fine particle transport is on the order of hundreds or thousands of kilometers.[49] Analyses using the RADM have estimated that sulfate and nitrate deposition receptors are influenced by sources located up to 600–800 kilometers away.[50] In its deliberations and in its final report, the GCVTC acknowledged the role of long-range transport from sources and activities located across a very large geographic area, and its effect on the Class I areas on the Colorado Plateau.[51]

Finally, two contractor modeling reports prepared for EPA provided information that preliminarily demonstrated that each State not having a Class I area had emissions contributing to impairment in at least one downwind Class I area. Some State commenters asserted that the contractor reports referenced in the proposal show relatively low contributions from all or part of their States toward visibility impairment in a nearby Class I area. As a result, these commenters suggested that EPA had sufficient information to reach a conclusion that all or part of their States could be excluded from the regional haze program. The EPA disagrees with these comments for two reasons.

First, the EPA did not base its proposed applicability provisions only on the referenced contractor reports. The EPA based its decision on the assessments provided by these reports as well as a number of other studies and sources of information. Second, as explained above, EPA believes that all States must have a visibility SIP to prevent, at a minimum, future impairment of visibility. While EPA agrees that portions of some States may not need to implement additional measures, at this time, to improve visibility impairment in any Class I area, the EPA believes that more refined future assessments will be needed to support such a finding. Additionally, the EPA believes that a State wishing to demonstrate that it does not contribute to visibility impairment in any Class I area will need to provide information showing that it has consulted with other potentially affected States to assist EPA in assuring that the State's demonstration is not contradicted by evidence presented by other States.

Current monitoring information for Class I areas shows that all of the monitored sites in the central and eastern parts of the country have visibility impairment levels exceeding estimated natural conditions for the 20 percent most impaired days, some by more than 20 deciviews. Although the degree of impairment varies, the data demonstrate that no existing site has reached the goal in section 169A(a)(1) of the CAA for ''remedying * * * any existing impairment of visibility.'' [52]

In light of this finding, EPA disagrees with the commenter who asserted that because visibility levels in its State are already ''acceptable,'' there is no need for the State to implement a regional haze program. The section 169A national goal of the visibility program, a condition of no human-caused impairment, does not provide for judgments of acceptable visibility levels which are poorer than natural conditions in Class I areas. Through adoption of section 169A(a)(1), Congress established natural visibility conditions as the overall goal.

The data also show that in the monitored locations in the central and eastern United States, sulfate is the key contributor to visibility impairment, responsible for between 45–90 percent of light extinction due to aerosols on the 20 percent most impaired days. This fact is significant because the broad, regional scale of long-range transport of sulfate has already been acknowledged in many studies done for the acid rain program. Based on these data, it appears that although the acid rain program is expected to improve visibility by approximately 3 deciviews in the most impaired Class I areas in the Eastern United States by 2005,[53] further regional reductions in SO_2 emissions may be needed after the acid rain program is complete to assure continued visibility improvement toward the national goal. Thus, EPA finds it is reasonable to require SIPs from the States without Class I areas which are located in the central and eastern parts of the United States since many, if not all, are expected to have sources contributing to regional loadings of SO_2 emissions, even after implementation of the acid rain program is completed.

For all of the reasons stated above, EPA has concluded in today's final rule that EPA's statutory authority and scientific evidence are sufficient to require all States to develop regional haze SIPs to ensure the prevention of any future impairment of visibility, and to conduct further analyses to determine whether additional emission reduction measures are needed to ensure reasonable progress in remedying existing impairment in downwind Class I areas.

B. Timetable for Submitting the First Regional Haze State Implementation Plan (SIP)

This final rule establishes a schedule setting forth deadlines by which the States must submit their first regional haze SIPs and subsequent revisions to that first SIP. In this unit, we discuss the deadlines for the first regional haze SIP, the concerns raised in comments regarding these deadlines, and recent legislation affecting the deadlines. The requirements for periodic revisions to this first regional haze SIP are discussed below in unit III.J.

Proposed rule. The proposed rule, consistent with section 169B(e)(2) of the CAA, would have required States to submit revisions to their SIP to address regional haze within 12 months of the effective date of the rule. We had intended that these 12-month SIP

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[47] See Latimer and Associates, Particulate Matter Source—Receptor Relationships Between All Point and Area Sources in the United States and PSD Class I Area Receptors, Report prepared for EPA, Office of Air Quality Planning and Standards, September 1996. See also ENVIRON International Corporation, Development of Revised Federal Class I Area Groups in Support of Regional Haze Regulations, Report prepared for EPA, Office of Air Quality Planning and Standards, September 1996.

[48] National Acid Precipitation Assessment Program. Acid Deposition: State of the Science and Technology. Report 24, Visibility: Existing and Historical Conditions—Causes and Effects, Washington, DC, 1991.

[49] National Research Council, NAS Committee on Haze in National Parks and Wilderness Areas, Protecting Visibility in National Parks and Wilderness Areas, National Academy Press, Washington, D.C., 1993.

[50] Dennis, Robin L. ''Using the Regional Acid Deposition Model to Determine the Nitrogen Deposition Airshed of the Chesapeake Bay Watershed,'' in Atmospheric Deposition to the Great Lakes and Coastal Waters, edited by Joel Baker, 1996.

[51] GCVTC, Recommendations for Improving Western Vistas, Report to the U.S. EPA, June 1996.

[52] Sisler, J. *et al.*, Spatial and Seasonal Patterns and Long-Term Variability of the Chemical Composition of the Haze in the United States: An Analysis of Data from the IMPROVE Network, Fort Collins, CO, Cooperative Institute for Research in the Atmosphere, Colorado State University, 1996. See also Sisler, J., et al., Spatial and Temporal Patterns and the Chemical Composition of the Haze in the United States: An Analysis of Data from the IMPROVE Network, 1988–1991, Fort Collins, CO, 1993.

[53] U.S. EPA, Effects of the 1990 Clean Air Act Amendments on Visibility in Class I Areas: An EPA Report to Congress, Office of Air Quality Planning and Standards, EPA–452/R–93–014, October 1993.

submittals serve as program planning SIPs in which the States would review existing regulatory authorities and provide the framework for a number of future actions.

Comments received. Commenters expressed the view that 12 months was an insufficient time period to meet the proposed requirements for the program planning SIP. Moreover, commenters were concerned that the 12-month SIP requirement was not well coordinated with similar program planning for the new $PM_{2.5}$ standard.

Transportation Equity Act for the 21st Century (TEA–21). After the close of the comment period for the July 1997 proposal, Congress passed the Transportation Equity Act for the 21st Century (TEA–21), Public Law 105–178. The TEA–21 superseded the statutory requirement for a 12-month SIP deadline and established a specific schedule for regional haze SIP submissions. In a September 3, 1998 notice of availability, EPA provided the public with an opportunity to comment on how the regional haze rule should address the TEA–21 requirements.[54]

The TEA–21 provisions establish a timetable for the regional haze SIPs by first creating certain deadlines for $PM_{2.5}$ monitoring and area designations, and then by linking those deadlines to further deadlines for the regional haze program. The TEA–21 amendments, in section 4102(a), require EPA to fund a $PM_{2.5}$ monitoring network. In section 4102(b), EPA and States are required to put this network in place by no later than December 31, 1999.

Section 4102(c)(1) of TEA–21 establishes deadlines for States to use the data collected by the network for purposes of formally designating areas as attaining the $PM_{2.5}$ standard or as nonattainment or unclassifiable. Section 4102(c)(1) states:

> (1) The Governors shall be required to submit designations referred to in section 107(d)(1) of the CAA for each area following promulgation of the July 1997 $PM_{2.5}$ national ambient air quality standard within 1 year after receipt of 3 years of air quality monitoring data performed in accordance with any applicable Federal reference method for the relevant areas.

Section 4102(c)(2) of TEA–21 contains the following language which links the timing requirements for the visibility program to the $PM_{2.5}$ designation process:

> (2) For any area designated as nonattainment for the July 1997 $PM_{2.5}$ national ambient air quality standard in accordance with the schedule set forth in this section, notwithstanding the time limit prescribed in paragraph (2) of section 169B(e) of the CAA, the Administrator shall require State implementation plan revisions referred to in such paragraph (2) to be submitted at the same time as State implementation plan revisions referred to in section 172 of the CAA implementing the revised national ambient air quality standard for fine particulate matter are required to be submitted. For any area designated as attainment or unclassifiable for such standard, the Administrator shall require the State implementation plan revisions referred to in such paragraph (2) to be submitted 1 year after the area has been so designated. The preceding provisions of this paragraph shall not preclude the implementation of the agreements and recommendations set forth in the GCVTC Report dated June 1996.

To accompany the statutory changes contained in the TEA–21 law, Congress released a Conference Report. With respect to the visibility provisions of TEA–21, the Conference Report states:

> The Conferees recognize that the Regional Haze regulation has not been finalized and the Administrator of the Environmental Protection Agency (EPA) is still considering the views of various stakeholders. The Conferees agree with EPA's public statements that the schedule for the State Implementation Plan due pursuant to section 169B(e)(2) of the * * * [Clean Air] * * * CAA should be harmonized with the Schedule for State Implementation Plan submissions required for $PM_{2.5}$ ambient air quality standard promulgated in July, 1997.[55]

This new statutory language has two effects. First, it supersedes the section 169B requirement for EPA to require States to submit SIPs within 12 months of the promulgation of today's final rule. Second, it spells out a timetable for SIP revisions that is linked to the dates of attainment/nonattainment designations for $PM_{2.5}$. It is important to note that the timetable is based on the designation of areas within a State. Thus, under the legislation, one State could have multiple SIP submission deadlines depending on the dates of designation of each area within the State. This issue, and how EPA intends to address it, is further discussed later in this unit.

According to a Presidential memorandum dated July 16, 1997, the EPA and States must collect 3 years of monitoring data in order to have a sufficient basis for designations. This point is reiterated in TEA–21.[56] Routine collection of monitoring data begins in 1999. Hence, we expect the requirements of TEA–21, section 4102(c)(1), to result in the following:

Submissions of designation requests by States. States must submit designations within 1 year of the date that 3 years of $PM_{2.5}$ data are available. Because widespread monitoring for $PM_{2.5}$ is being implemented between January 1999 and December 31, 1999, we expect 3 years of data to be collected by December 31, 2001 for most areas and no later than December 31, 2002 for the remaining areas. Taking into account additional time (not more than 6 months) for quality assurance and certification of the data, we expect 3 years of data to be available for States to use for designations between July 2002 and July 2003. In the TEA–21 amendments, States have up to 1 year to submit designations. Thus, we expect that the required date for submittal of designations generally will occur between July 2003 and July 2004.[57]

EPA action on State designations. The EPA is required to act upon the designations no later than 1 year after the date States are required to submit the designations, but not later than December 31, 2005 in any case. If States submit their designations between July 2003 and July 2004, EPA would be required to designate areas between July 2004 and July 2005.

For areas designated as attainment or unclassifiable, the TEA–21 amendments require that States must submit SIPs for regional haze within 1 year after EPA publishes the designations. As a result, for these areas, regional haze SIPs are likely to be due generally between July 2005 and July 2006.

For areas designated as nonattainment for fine particulate matter, the TEA–21 amendments require States to submit SIP revisions addressing regional haze ''at the same time as States submit SIPs as required by section 172 of the CAA implementing the July 1997 revision to the national ambient air quality standard for fine particulate matter.'' Section 172(b) of the CAA requires SIPs no later than 3 years after EPA publishes the nonattainment designation. If EPA designates areas nonattainment between July 2004 and July 2005, the regional haze SIPs for areas designated as nonattainment and the $PM_{2.5}$ nonattainment SIPs would both be due no later than the July 2007 to July 2008 timeframe.

The date for startup of $PM_{2.5}$ monitoring may vary in different parts of a given State. Accordingly, the EPA expects that States may not be able to submit designation requests at the same time for the entire State. Rather, EPA

[54] 63 FR 46952.

[55] H.R. Conf. Rep. No. 550, 105th Cong., 2d. Sess. 519 (1998), reprinted in 1998 U.S.C.C.A.N., No. 6 at 196.

[56] See TEA–21, Section 4102(c)(1).

[57] We expect that some States will want to move expeditiously with some designations, leading to submissions and final action on some areas as early as late 2002 or early 2003. Where this is the case, this would lead to earlier regional haze SIP submittal deadlines as well.

expects that it is possible that individual ''areas'' within a given State may be designated at different times. Even if areas were all designated at the same time, in many States some areas will likely be designated attainment, with others designated nonattainment. In either case, the TEA–21 deadlines would require separate regional haze SIPs for each of these areas to be submitted at different times.

While the language in TEA–21 establishing the timetable for submission of regional haze SIPs is generally clear, the transportation legislation does not address the situation where States are participating in a regional planning effort that incorporates numerous areas. On its face, TEA–21 requires the submission of separate regional haze SIPs on an area-by-area basis with varying deadlines that could range over a period of several years. As noted above, however, regional haze is the result of emissions from a number of sources located over a broad geographic area. Because of the long-range transport of pollutants causing regional haze, EPA believes that well-coordinated regional planning efforts are needed to make progress toward natural visibility conditions. As EPA noted in the September 3, 1998 notice of availability, we do not believe that Congress intended to inhibit regional planning efforts by requiring area-by-area submittals. In light of this, EPA requested comment on incorporating an optional approach into the final rule to facilitate regional planning.

Notice of availability of additional information. The optional approach EPA described in the September 3, 1998 notice of availability would allow States which commit to participating in regional planning efforts to postpone addressing certain of the requirements of the regional haze program. Under this approach, States would have the option to first submit SIPs which contain commitments to specific integrated regional planning efforts but which do not set forth control strategies. States committing to regional planning would subsequently submit SIP revisions containing control strategies for attainment, unclassifiable, and nonattainment areas at the same time. This would allow multiple areas within a single planning region to have coordinated deadlines for regional haze control strategies. In the supplemental notice, we noted that this approach could have the effect of delaying control strategy plan submittal dates for some areas, but we believe that such an option will support more effective coordination between the $PM_{2.5}$ and regional haze programs, will support coordinated regional planning for both programs, and will be consistent with the statement of congressional intent.

Comments received. Some commenters argued that TEA–21 does not authorize EPA to defer implementation of the regional haze program in this way. The basis for this argument is the claim that the 1-year deadline in section 169B(e)(2) applies only to regulations promulgated pursuant to the report of a visibility transport commission. These commenters claim that EPA is obligated under section 169A to provide for more expedited implementation of measures to assure reasonable progress.

The final rule. The regulations made final today are issued under the authority of CAA sections 169A and 169B. As discussed in unit II.C above, EPA in 1980 explicitly deferred issuing regulations to address regional haze until our scientific and technical knowledge was better developed. In 1990, Congress amended the CAA by adding section 169B. This section authorizes the establishment of visibility transport commissions which, among other things, must issue a report addressing ''the promulgation of regulations under [section 169A] to address long range strategies for addressing regional haze.'' Section 169B further establishes explicit timeframes in which EPA must, taking into account any reports of visibility transport commissions, issue regulations under section 169A, and in which States must respond by submitting revised SIPs. Congress modified the timeframe for SIP submission in TEA–21 to ensure the ability of EPA to harmonize the implementation of today's final rule with the requirements for the new $PM_{2.5}$ NAAQS.[58] Today's final rule carries out EPA's obligation under sections 169A and 169B to issue regulations addressing regional haze according to the timeframe as set forth in section 169B as modified by TEA–21.

The final rule includes the deadlines for SIP submittals set forth in TEA–21 and incorporates an optional set of requirements for States which commit to participate in regional planning. Commenters generally agreed with EPA's view in the notice of availability that it is important to ensure that the $PM_{2.5}$ program and regional haze program are fully integrated. The EPA believes that the approach taken in the final rule supports effective coordination between these programs, while also facilitating regional planning.

In the final rule, the timetable for SIP submittals is set forth in section 51.308(b) and (c). Section 51.308(b) directly codifies the TEA–21 timetable. Section 51.308(c) provides States that have committed to participate with other States in a regional planning process the option of choosing to defer submittal of a SIP which addresses the substantive requirements of the regional haze program. States are not required to exercise the option provided by section 51.308(c), but those which do must meet the deadlines set forth in that section for submitting a SIP which addresses the distinct requirements in section 51.308(c) and a SIP revision which addresses the substantive requirements of the regional haze program.[59]

As a first step, States electing to participate in regional planning must submit a SIP demonstrating the State's ongoing participation in a regional planning process. This SIP must address all areas in the State and is due on the earliest date by which an implementation plan affecting any area within the State would be due under the TEA–21 deadlines. Unless an entire State is designated as nonattainment, this SIP will be due 1 year after EPA designates any area within the State as attainment or unclassifiable. This SIP submission must contain a number of specific elements to demonstrate the State's commitment to the regional planning process and to ensure that by the date of the SIP submittal, the States in the regional planning body have taken the necessary steps to initiate the regional planning process.

The following briefly summarizes the required elements of the first SIP submittal called for under the optional approach for regional planning:

Need for regional planning. In the SIP, the State must demonstrate the need for regional planning. The State must make this demonstration by showing that emissions from sources within the State contribute to visibility impairment in Class I areas in another State, or by showing that other States contribute to visibility impairment in the Class I areas in the State. The EPA does not intend for this to be an overly complex analysis.

Description of regional planning organization. The State must also submit a detailed description of the regional planning process. In its SIP, the State must show that the participating

[58] See H.R. Conf. Rep. No. 550, 105th Cong., 2d. Sess. 517.

[59] The option for regional planning provided by section 51.308(c) is not available for Alaska, Hawaii, and the Virgin Islands. Class I areas within their boundaries are not affected by emissions from any other State. As a result, regional planning will not be needed to develop regional haze SIPs for these areas.

States have a credible regional planning process in place which all parties are committed to follow. We have outlined general principles for regional planning organizations in a document entitled Implementation Guidance for the Revised Ozone and Particulate Matter (PM) National Ambient Air Quality Standards (NAAQS) and the Regional Haze Program, which discusses features of effective regional planning organizations, including a discussion of organization and representation issues, issues related to developing workplans and schedules, and issues related to ensuring that technical efforts are consistent. This document is available on the internet at http://www.epa.gov/ttn/oarpg/t1pgm.html.

Enforceable commitment to submit coordinated control strategy by 2008. The regional planning SIP must include provisions requiring the State to submit a SIP revision meeting all of the requirements of the regional haze rule. This SIP revision is due by the latest date an area within the planning region would be required to submit an implementation plan under TEA–21, but in no event any later than December 31, 2008. The SIP must require that the SIP revision is developed in coordination with the other States in the regional planning body and that it fully addresses the recommendations of that body.

List of BART-eligible sources. The State must identify those sources from one of 26 source categories and placed into operation between 1962 and 1977 that are potentially subject to BART. This information will enable the State and regional planning organization to begin evaluating options for meeting the BART requirement or for implementing an emissions trading program or alternative measure that achieves greater reasonable progress.

Summary of timetable for submission of the first regional haze SIPs. The following table is a summary of the deadlines for submitting the first regional haze SIPs.

For this case . . .	. . . States must submit the first regional haze SIPs no later than:	. . . and the SIP must meet . . .
Areas designated as attainment or unclassifiable for $PM_{2.5}$.	1 year after EPA publishes the designation (generally 2004–2006).	ALL requirements of section 51.308(d) and (e).
Areas designated as nonattainment for $PM_{2.5}$ ...	At the same time as $PM_{2.5}$ SIPs are due under section 172 of the CAA. (That is, 3 years after EPA publishes the designation, generally 2006–2008).	ALL requirements of section 51.308(d) and (e).
States participating in multistate regional planning efforts for combined attainment and nonattainment areas.	Two phases:	The regional planning requirements listed in section 51.308(c).
	Commitment to regional planning due 1 year after the EPA publishes the first designation for any area within the State, and.	
	Complete implementation plan due at the same time as $PM_{2.5}$ SIPs are due under section 172 of the CAA. (That is, 3 years after EPA publishes the designation).	The ''core requirements'' listed in section 51.308(d) and BART requirements in section 51.308(e).
States following the recommendations of the GCVTC, as contained in section 51.309 of the final rule.	December 31, 2003	SIPs must meet the specific provisions for Grand Canyon Transport Region States listed in section 51.309.

C. Tracking Deciviews and Emissions Reductions

Visibility impairment is caused by particles and gases in the atmosphere. Some particles and gases scatter light, while others absorb light. The net effect is called ''light extinction.'' The result of these processes is a reduction of the amount of light from a scene that is returned to the observer, creating a hazy condition.

Proposed rule. In the proposal, EPA established a regulatory framework by which a State would establish a ''reasonable progress target'' for each Class I area within its borders for the purpose of improving visibility on the worst visibility days over the next 10 or 15 years. The States would implement emission management strategies to improve visibility in these Class I areas. The proposal also called for the States to monitor progress in improving visibility over time. The EPA proposed that visibility targets and tracking of visibility changes over time be expressed in terms of the ''deciview'' haze metric. The proposal also called for the tracking of pollutant emissions to supplement the tracking of monitored visibility changes for use in periodically reviewing State progress in achieving visibility targets. The proposal included the definition of the deciview metric for tracking visibility. The proposal also called for a review of emissions reductions achieved as part of the long-term strategy.

Deciview. The proposal explained that the deciview is an atmospheric haze index that expresses changes in visibility. This visibility metric expresses uniform changes in haziness in terms of common increments across the entire range of visibility conditions, from pristine to extremely hazy conditions.[60] Because each unit change in deciview represents a common change in perception, the deciview scale is like the decibel scale for sound. The proposal also stated that ''A one deciview change in haziness is a small but noticeable change in haziness under most circumstances when viewing scenes in Class I areas.'' [61]

The proposal discussed that an advantage to using the deciview over other scales is that it can be used to express changes in visibility impairment in a way that corresponds to human perception in a linear, or one for one, manner. For example, this metric is designed such that a change of 3 deciviews in a highly impaired environment would be perceived as roughly the same degree of change as a 3 deciview change in a relatively clear environment. As noted in the preamble to the proposed regulation, the deciview is mathematically related to other common metrics used to describe visibility: the light extinction coefficient and visual range. However, the deciview metric can be used to compare changes in perception in a way that the other two metrics cannot. This feature makes the deciview a more useful metric for regulatory purposes. For example, a 5-

[60] Pitchford, M. and Malm, W., ''Development and Applications of a Standard Visual Index,'' Atmospheric Environment, v. 28, no. 5, March 1994.

[61] 62 FR 41145.

mile change in visual range can in some cases be very significant, such as from 5 to 10 miles in an impaired environment (equal to a change of 6.9 deciviews), whereas a 5-mile change may not be perceptible in a less impaired environment, such as from 95 to 100 miles (equal to a change of 0.5 deciviews). The following sections discuss the comments received on specific issues and how such issues are addressed in the final rule.

Tracking emissions versus visibility. Many commenters supported the use of the deciview metric to track changes in visibility improvement as a key aspect of the program. These commenters agreed with EPA's proposal that under a visibility-oriented program, progress in fact should be tracked in terms of a visibility-based metric. Others felt the program could be successfully implemented by tracking emissions only because this approach would not be greatly affected by meteorological variations as would an approach based on ambient monitoring.

The final rule provides for the tracking of both visibility improvement and emissions reductions.[62] The final rule presents visibility improvement and tracking of emissions as linked elements of the program. The EPA has retained the use of the deciview metric for tracking changes in visibility. The EPA believes the tracking of actual visibility improvements is necessary to be responsive to the goals of the CAA. Section 169A(a) of the CAA sets forth the national goal of the ''prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.'' The CAA also requires EPA to establish regulations to be implemented by the States to ensure that 'reasonable progress' is made toward the national goal. In addition, section 169B(e) of the CAA calls for EPA to carry out its ''regulatory responsibilities under section 169A, including criteria for measuring 'reasonable progress' toward the national goal.'' [63]

The EPA believes that tracking of emissions reductions is also an important component of the regional haze program. The mechanism for achieving improvements in visibility will be the implementation of enforceable emissions reduction measures that have been adopted as part of the SIP. Tracking emissions will provide a good indicator of whether adopted measures are reducing emissions and is thus a useful indicator of progress in reducing visibility impairment. The tracking of emissions without concurrently tracking changes in visibility, however, would be problematic because of the variable effect on visibility of each of the principal constituents of PM, the more significant light scattering efficiency of fine PM versus coarse PM, and the generally greater effect of nearby versus distant sources on visibility impairment.

Since the national goal is expressed in terms of air quality (i.e., visibility) rather than emissions, we believe that it is very important to require the quantitative tracking of visibility impairment as an integral element in measuring reasonable progress. Because ambient monitoring data are subject to meteorological fluctuations, EPA designs standards and requirements for analysis of monitoring data to limit the effects of unusual meteorological events. For regional haze, we have provided in this final rule for the tracking of visibility trends based on 5-year averages of annual deciview values for the most impaired and least impaired days. We believe that this approach responds to commenters' concerns about significant unusual fluctuations in annual average values for the best and worst days due to unusual meteorological conditions in any particular year. However, it is also important to note that EPA has long held that normal meteorological variations should be explicitly accounted for in air quality analyses and control strategy design. Air quality improvement plans should be able to assure protection of public health and welfare under the normal and foreseeable range of meteorological conditions.

Tracking visibility in deciviews. Some commenters disagreed with the use of the deciview to measure changes in visibility, claiming that the deciview metric has not been adequately reviewed for use in a regulatory program. The EPA disagrees with this assertion. The EPA believes the deciview metric has been adequately reviewed for use in the regional haze program. The deciview concept was introduced in 1994 in an article appearing in the peer-reviewed journal Atmospheric Environment.[64] It was presented in the 1996 Criteria Document for the PM NAAQS as a valid metric for characterizing visibility impairment.[65] The EPA also recognized the deciview as an appropriate metric for regulatory purposes in chapter 8 of the 1996 Staff Paper for the PM NAAQS review.[66] Both of these documents were reviewed and accepted by the Clean Air Scientific Advisory Committee. Visibility conditions at Class I areas have been characterized in terms of deciview in summary reports on the IMPROVE visibility monitoring network.[67]

The EPA also supports use of the deciview metric because it satisfies one of the recommendations of the NAS Committee on Haze in National Parks and Wilderness Areas. In its 1993 report on visibility, the NAS recommended the development of an index that takes into account both measurement of physical changes (i.e., changes in air quality) with elements of human perception.[68] Further, a report on the regional haze proposal by the Congressional Research Service found that the deciview index ''conforms closely'' [69] to the NAS recommendation cited above.

Some commenters stated that the final rule should not suggest that a one deciview change is the threshold of perception in all cases for all scenes. The EPA agrees with the comment that a one deciview change should not be considered the threshold of perception in all cases for all scenes. The EPA believes that visibility changes of less than one deciview are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution. The EPA also acknowledges the technical point made by some commenters that for other types of scenes with other site-specific

[62] Tracking of visibility is addressed in section 51.308(d) and 51.308(g). Tracking of emissions reductions is addressed in section 51.308(g).

[63] Section 169B(e)(1).

[64] Pitchford, M. and Malm, W., ''Development and Applications of a Standard Visual Index,'' Atmospheric Environment, V. 28, no. 5, March 1994.

[65] U.S. EPA, Air Quality Criteria for Particulate Matter, Research Triangle Park, NC, National Center for Environmental Assessment. Office of Research and Development, July 1996.

[66] U.S. Environmental Protection Agency. Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information. OAQPS Staff Paper. Office of Air Quality Planning and Standards. July 1996.

[67] Sisler, J., *et al.,* Spatial and Seasonal Patterns and Long-Term Variability of the Composition of the Haze in the United States: An Analysis of Data from the IMPROVE Network. Cooperative Institute for Research in the Atmosphere, Colorado State University, 1996. See also Sisler, J., et al., Spatial and Temporal Patterns and the Chemical Composition of the Haze in the United States: An Analysis of Data From the IMPROVE Network, 1988–1991, Fort Collins, CO, 1993.

[68] National Research Council, Protecting Visibility in National Parks and Wilderness Areas, 1993, p. 354.

[69] Congressional Research Service, Regional Haze: EPA's Proposal to Improve Visibility in National Parks and Wilderness Areas, November 17, 1997, p. 17.

conditions,[70] a change of more than 1 deciview might be required in order for the change to be perceptible. However, EPA wishes to emphasize that the overall goal of the regional haze program is not to track changes in visibility for only certain vistas at a specific Class I area. Rather, the program is designed to track changes in regional visibility for the range of possible views of sky and terrain found in any Class I area, and to assure progress toward the national goal. For this purpose, EPA supports the use of the deciview metric as calculated from ambient monitoring data for tracking changes in regional visibility. The monitoring network is not designed to track changes in visibility for specific views in each Class I area. Rather, the network is designed to characterize visibility conditions that, for each site, are representative of a fairly broad geographic region. The EPA believes this approach is consistent with the nature of regional haze, which is defined as a uniform haze caused by numerous sources covering a broad area. Thus, although a 1 deciview change may not be the threshold of perception in all situations, the fundamental advantage of using the deciview remains: the deciview metric expresses uniform changes in haziness in terms of common increments across the entire range of visibility conditions, from pristine to extremely hazy conditions. The metric provides a useful means of expressing changes in visibility caused by changes in air quality while also providing a scale that relates visibility to perception. The final rule maintains the deciview as the principle visibility metric used in establishing reasonable progress goals, in defining baseline, current, and natural conditions, and in tracking changes in visibility conditions over time. States may choose to express visibility changes in terms of other metrics, such as visual range or light extinction, as well as in terms of deciview. The definition in the final rule was modified slightly to provide additional clarity.

Light extinction calculated from aerosol data. Some other commenters did not support EPA's proposed approach to calculating light extinction based on monitored fine particle data (referred to as ''reconstructed light extinction'' in the proposal). These commenters preferred other methods, such as direct measurement of light scattering or light extinction with an optical device. While such methods are desired in comprehensively monitoring visibility impairment, the EPA supports the use of a common approach for calculating visibility changes based on monitored fine particle data as the primary monitoring method for tracking visual air quality.

Such an approach has been established and implemented for many years by the IMPROVE Steering Committee. The IMPROVE approach uses a set of standard assumptions,[71] which have been tested and found to be reasonable, in calculating light extinction and deciviews from changes in air quality. Two important aspects of the approach are: (1) Standard rates of light extinction per unit mass of visibility-impairing pollutants (e.g., sulfate, nitrate, organic carbon, elemental carbon, and crustal material); and (2) standard effects of humidity on sulfate and nitrate.

Through extensive analysis of empirical data, a value (or ''dry extinction coefficient'') has been developed for each aerosol component which represents the amount of light extinction (expressed in inverse megameters) caused by each microgram/m3 of that component. Light extinction is calculated by multiplying the aerosol mass for each component by its extinction coefficient and summing the products. Because sulfates and nitrates become more efficient at scattering light as humidity increases, the values for these two components are also multiplied by a relative humidity adjustment factor. It has been shown that annual and seasonal light extinction values developed according to this method correlate well with averages of optical measurements of light extinction for the same locations.[72] The EPA plans to issue future guidance describing the details of calculating visibility changes in this manner and tracking visibility over time.

Although light extinction can be measured directly by certain optical devices (i.e., transmissometers and nephelometers), EPA supports an approach based on the mass of PM components derived from ambient monitoring for calculating light extinction for two main reasons. First, this approach provides for the tracking of actual changes in the components of air pollution, and the information obtained from analysis of the chemical composition of PM is critical to the air quality modeling and strategy development processes. By understanding the chemical composition of particulate matter, we can better define the manmade and natural components contributing to overall light extinction. Second, direct measurements of visibility from some optical instruments (e.g., transmissometer) are more frequently disrupted by precipitation events (i.e., rain or snow) than are aerosol measurements.

For all of the reasons discussed above, the final rule provides for the tracking of visibility and emissions reductions. The deciview will be the principal visibility metric for use in implementing the regional haze program. The deciview will be used for expressing reasonable progress goals, defining baseline, current, and natural conditions, and tracking changes in visibility conditions over time. The definition of deciview in the final rule in section 51.301(bb) was modified slightly to provide additional clarity and state that deciview values are to be derived from calculated light extinction based on aerosol measurements in accordance with EPA guidance.

D. Regional Haze Implementation Plan Principles

Section 169A of the CAA calls for States to develop implementation plans ensuring reasonable progress toward the national goal, including emission limits, schedules of compliance and other measures as necessary. At a minimum, the CAA calls for SIPs to include a long-term strategy and provisions for BART for certain major stationary sources. We would like to emphasize several overarching themes for the specific implementation plan requirements in the final rule:

- Regional haze regulations and State implementation plans must address all of the statutory requirements outlined in 169A and 169B of the CAA. Regional haze requirements must address a number of specific statutory requirements, including ''criteria for reasonable progress,'' long-term strategies addressing all types of sources and activities, and best available retrofit technology for certain stationary sources. The implementation plan requirements in the final rule are designed to ensure that all of these statutory requirements will be met.
- Tracking ''reasonable progress'' should involve the tracking of both emissions and visibility improvement. Regional haze implementation plans must include provisions for tracking the implementation of enforceable emission management strategies designed to make reasonable progress toward the national

[70] For example, where the sight path to a scenic feature is less than the maximum visual range.

[71] See Sisler, *et al.*, Spatial and Seasonal Patterns and Long-Term Variability of the Composition of the Haze in the United States: An Analysis of Data from the IMPROVE Network. Cooperative Institute for Research in the Atmosphere, Colorado State University, 1996.

[72] Id.

visibility goal. Emission control measures will be the component that will be enforceable to ensure reasonable progress. Measuring reasonable progress should involve tracking the actual emissions achieved through implementation of such strategies, and the tracking of visibility for the most impaired and least impaired days using established monitoring and data analysis techniques.

- Strategies for improving visibility should address all types of sources. Section 169A provides for State long-term strategies to address all types of sources and activities emitting pollutants that contribute to visibility impairment in Class I areas, including stationary, mobile, and area sources. Implementation plans also must give specific attention to certain stationary sources built between 1962 and 1977 and provide for meeting the BART provisions for these sources.
- Successful implementation of the regional haze program will involve long-term regional coordination among States. Pollution affecting the air quality in Class I areas can be transported long distances, even hundreds of kilometers. Therefore, States will need to develop strategies in coordination with one another, taking into account the effect of emissions from one jurisdiction to air quality in another. In addition, as noted by the NAS study, ''achieving the national visibility goal will require a substantial, long-term program.'' [73] Accordingly, the regional haze program requires the periodic review by each State of whether ''reasonable progress'' is being achieved and revisions of implementation plans as needed to continue progress toward the national visibility goal.

E. Determination of ''Baseline,'' ''Natural'' and ''Current'' Visibility

Background. The fundamental goal of the visibility program, as provided by Congress, is the prevention of future visibility impairment and the remedying of existing impairment in Class I areas. Thus, the regional haze program must track progress toward the national goal.

In order to facilitate this tracking process, the proposed rule required each State having one or more Class I areas to establish, and update as necessary, three important visibility parameters for the best and worst visibility days at each Class I area within the State. Each parameter is discussed in detail below.

- Baseline conditions—Baseline conditions represent visibility for the best and worst days at the time the regional haze program is established. Baseline conditions are calculated using multiyear averaging.
- Natural conditions—As specified in the CAA, estimated natural conditions, or the visibility conditions that would be experienced in the absence of human-caused impairment, constitute the ultimate goal of the program. Under the regional haze program, natural conditions need to be estimated for the 20 percent best and worst days.
- Current conditions—Current conditions for the best and worst days are calculated from a multiyear average, based on the most recent years of monitored data. This value would be revised at the time of each periodic SIP revision, and would be used to illustrate: (1) The amount of progress made since the last SIP revision, and (2) the amount of progress made from the baseline period of the program.

Baseline Conditions

Proposed rule. The preamble to the proposal discussed an approach for determining baseline visibility conditions for the haziest 20 percent and clearest 20 percent of days that would allow using a minimum of 3 years of monitored data, and up to a maximum of 9 years of data.

Comments received. The EPA received some comments suggesting that it would be more equitable to use a standardized time period to establish baseline values for all Class I areas across the country. Other commenters supported the use of baseline values based on a varying number of years from site to site. Some commenters also supported the establishment of baseline conditions based on a period of time longer than 3 years because a 3-year period could be significantly influenced by unique meteorological circumstances.

Final rule. After considering public comments on the baseline issue, EPA has determined that the most appropriate ''baseline period'' would be a fixed, 5-year period extending from calendar year 2000 through calendar year 2004. The EPA concluded that a standard baseline period provides for greater national consistency in establishing this important value, and therefore, is preferable to a provision allowing the baseline period to be a variable number of years. Using a common number of years and data points to calculate the baseline value for each site is consistent with fundamental statistical principles and will provide for easy comparison of data from multiple sites as the program is implemented.

The EPA also concluded that it would be preferable to have a baseline value based on more than 3 years in order to establish a more robust baseline value. The EPA agrees with commenters that a 5-year period, rather than a 3-year period, provides for a more stable treatment of the inherent variability in emissions and meteorology. This approach decreases the probability that the baseline period will be unduly affected by unusual or nonrepresentative events.

In deciding upon the specific baseline period of 2000–2004, the Agency took into account the fact that EPA has obtained funding to provide several hundred monitors to the States for the purposes of characterizing $PM_{2.5}$ concentrations in urban and rural areas nationally. In accordance with the part 58 monitoring provision enabling IMPROVE protocol aerosol monitors to be used to characterize $PM_{2.5}$ conditions at background and transport sites, the IMPROVE network will be expanding from 30 to more than 100 sites by the end of 1999 in order to characterize both background $PM_{2.5}$ levels and visibility impairment levels in Class I areas. Thus, EPA concluded that the baseline period should begin in 2000, after monitoring coverage for Class I areas is expanded significantly.

The approach to calculating baseline values will also provide for more stable values because the frequency of monitoring samples in the IMPROVE network will increase in 1999 to one sample every 3 days. In this way, the frequency of sampling for IMPROVE will be consistent with the $PM_{2.5}$ monitoring approach. Thus, annual values should become more robust since 17 percent more samples will be collected each year. Baseline conditions must be determined in terms of deciviews for the years 2000–2004 for the ''most impaired days'' and the ''least impaired days.'' The final rule defines these values as the average of the 20 percent of monitored days with the highest or lowest light extinction values, expressed in deciviews. The EPA will issue guidance for calculating baseline visibility conditions based on ambient monitoring data. The baseline value is determined by calculating the average deciview value for the 20 percent most (or least) impaired days for each of the 5 years (2000 through 2004), and by averaging those five values.

The final rule also calls for baseline conditions to be established by the State for any Class I area without on-site monitoring by using ''representative'' monitoring data for the site. In the SIP, the State will need to provide an adequate demonstration supporting the

[73] National Research Council, Committee on Haze in National Parks and Wilderness Areas, Protecting Visibility in National Parks and Wilderness Areas, National Academy Press, 1993.

use of any ''representative'' data. The EPA will issue guidance to help the States address this issue. The IMPROVE Steering Committee (comprised of representatives from EPA, States, and FLMs) is working to develop acceptable criteria to configure the expanded visibility monitoring network in such a way that virtually all Class I areas will either have an aerosol monitor or will be characterized by a ''representative'' site. The IMPROVE Steering Committee, including State representatives, will complete the process for identifying representative sites before monitoring for the expanded network begins in the year 2000. For this reason, it is expected that most States needing to rely on representative data from another site will be able to meet the requirement of section 51.308(d)(4) by referencing the Visibility Monitoring Guidance Document, which will be released shortly after promulgation of this rule, and other technical support materials developed by the IMPROVE Steering Committee to support the determination of representative sites.

Finally, States that submit SIPs for regional haze by 2003 under section 51.309 (further discussion in unit IV) must determine baseline conditions based on the most recent 5-year period for which monitoring data are available for the Class I area. For an area without monitoring data, the State may use data from another representative Class I area.

Natural Visibility Conditions

Proposal. The proposed rule called for each State having a Class I area, in consultation with the appropriate FLMs, to: (1) Develop a procedure to estimate natural conditions for the 20 percent most impaired and least impaired days at each Class I area within the State; and (2) provide this estimate with the State's first SIP revision for regional haze (in the 2003–2005 timeframe as stated in the proposal). The estimates for natural conditions would be expressed in deciviews. The preamble cited as a default annual average, estimates of natural visibility that were included in the 1991 NAPAP chapter on visibility. When converted to deciview values, these annual average estimates are 9.6 deciviews in the Eastern United States and 5.3 deciviews in the Western United States.

Comments received. A number of commenters noted that there are several factors which can make the determination of natural conditions difficult. For example, organic aerosols resulting from biogenic sources, windblown dust, and natural causes of fire all contribute to natural visibility conditions. Several commenters emphasized the difficulty in determining the estimated contribution of naturally-caused fire to natural conditions. Some commenters suggested that EPA provide guidance on how to estimate natural conditions.

Final rule. The EPA understands that estimating natural visibility conditions can involve many technically complex issues. The EPA is committed to working with the States, tribes, and FLMs on this issue to develop technical guidance on estimating natural visibility conditions. The EPA expects that these estimates may be refined over time. In addition, after the regional haze rule is promulgated, and in advance of SIP due dates, EPA plans to revise the Interim Air Quality Policy on Wildland and Prescribed Fires [74] to address a number of issues, including the contribution of fire to natural visibility conditions.

Consistent with the proposal, the final rule retains the requirement that each State provide an adequate estimate of natural visibility conditions for best and worst visibility days in each Class I area within the State. These estimates will be due at the time the State submits its initial control strategy SIP for regional haze. However, because the requirement for a SIP revision within 12 months of promulgation has been overridden by the provisions of TEA–21, there no longer is a requirement for States to separately submit to EPA recommended procedures for estimating natural conditions in advance of their control strategy SIPs.[75]

The EPA recommends that the States work closely with the FLMs, tribes, and EPA in developing and documenting in their SIPs appropriate methods for estimating natural conditions. Estimates of natural visibility conditions are needed to aid all interested parties, including the general public, in understanding how ''close'' or ''far'' a particular Class I area is in relation to the ultimate goal of the program. Understanding the estimated relative contributions of natural PM constituents (such as organic carbon and crustal material) also can help the States and tribes in understanding the extent of the contribution from manmade components, and thus can help in designing appropriate emission management strategies in the future. With each subsequent SIP revision, the estimates of natural conditions for each Class I area may be reviewed and revised as appropriate as the technical basis for estimates of natural conditions improve.

The EPA believes that, as a starting point, it will be appropriate to derive regional estimates of natural visibility conditions by using estimates of natural levels of visibility-impairing pollutants [76] in conjunction with the IMPROVE methodology for calculating light extinction from measurements of the five main components of fine particle mass (sulfate, nitrate, organic carbon, elemental carbon, and crustal material). By using this approach with appropriate assumptions for annual average relative humidity, EPA estimates natural conditions for the worst visibility days to be approximately 11–12 deciviews in the east and 8 deciviews in the west. The EPA supports use of these estimating techniques as a valid starting point because they rely on peer-reviewed estimates of the natural composition of fine particle mass,[77] and analysis of data from the IMPROVE program's well-established approach, refined over the past 10 years or more, for calculating light extinction from monitored PM constituents.

Because these values are expressed in regional terms only, further refinement of these estimates will need to take place in the future on a site-specific basis. However, because current conditions at most Class I areas with existing IMPROVE monitoring exceed the above estimates by at least several deciviews (with some of the more impaired Class I areas having values that exceed estimated natural conditions by 20 deciviews or more), EPA does not believe that such refined values are necessary for the initial 10-year program implementation period. As the difference between current and natural conditions for a particular Class I area becomes smaller, it will be important to develop more precise techniques for estimating natural conditions.

Current Conditions

Proposal. The proposed rule required the State to revise its long-term strategy every 3 years and to compare current conditions to the visibility conditions existing at the time of its previous long-term strategy revision. Current conditions would be established for the most impaired and least impaired days, and would be expressed in deciviews.

[74] Interim Air Quality Policy on Wildland and Prescribed Fires, U.S. EPA, Office of Air Quality Planning and Standards, May 1998.

[75] See unit III.B. for a detailed discussion of the TEA–21 provisions and their affect on the timing for implementation of the regional haze program.

[76] See National Acid Precipitation Assessment Program. Acid Deposition: State of Science and Technology. Report 24, Visibility: Existing and Historical Conditions—Causes and Effects, Table 24–6. Washington, DC. 1991.

[77] The NAPAP estimates were cited in both the Criteria Document and EPA Staff for the PM NAAQS.

Comments received. Many commenters supported EPA's approach to periodic tracking of changes in visibility to determine reasonable progress. Some commenters felt that averaging 5 years of data, rather than 3, would be preferable.

Final rule. Section 51.308(f)(1) of the final rule retains the requirement for each State, at the time of any SIP revision, to determine the current visibility conditions for the most impaired and least impaired days for each Class I area within the State. Current conditions are to be based on the 5 most recent years of monitoring data available at the time a SIP revision or progress report is submitted. The approach for calculating current conditions is similar to the approach for calculating baseline conditions discussed above: the value is determined by calculating the average for the 20 percent most impaired days for each of the 5 most recent years for which quality-assured data are available, and then by calculating the average of those five values.[78]

Sections 51.308(f)(1) and 51.308(g)(3) of the final rule also require the State to calculate the difference between current conditions and several other parameters so that this information can be taken into account when the State is revising its SIP and considering new reasonable progress goals. A discussion of these calculations is provided in unit III.J of this preamble addressing periodic SIP revisions and progress reports.

Summary

The following summary table further illustrates the uses of ''baseline,'' ''natural,'' and current conditions in the regional haze program.

Term	What does it mean?	How is it used in the regional haze program?
''Baseline conditions''	Visibility (in deciviews) for the 20 percent most-impaired days, and for the 20 percent least-impaired days, for the years 2000 through 2004.	''Baseline'' conditions are used in two ways: (1) For the first regional haze SIPs, due in about 2006–2008, baseline conditions are the reference point against which visibility improvement is tracked. (2) For subsequent SIP updates (in the year 2018 and every 10 years thereafter), baseline conditions are used to calculate progress from the beginning of the regional haze program.
''Natural conditions''	The 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..	''Natural conditions'' represents the absence of visibility impairment due to human-caused emissions, the ultimate goal of the regional haze program.
''Current conditions''	''Visibility (in deciviews) for the 20 percent most-impaired days, and for the 20 percent least-impaired days, for the most recent 5-year period.	For the initial planning SIPs, ''current'' and ''baseline'' conditions are the same. For subsequent 5-year progress reports, ''current conditions'' describe the amount of progress that has been made at the mid-course review point halfway through an implementation cycle. For subsequent comprehensive regional haze SIPs (beginning in 2018 and every 10 years thereafter), ''current conditions'' will be used to show how much progress has been made relative to the ''baseline,'' and will serve as the reference point for tracking progress for the next implementation period.

F. Reasonable Progress Goals

The previous section discussed three important visibility parameters for tracking ''reasonable progress'' toward the national visibility goal. In this section, EPA describes the requirements of section 51.308(d)(1) of the final rule for States to establish ''reasonable progress goals'' for each Class I area within the State. In addition, this section also discusses important analyses and other factors for States to take into consideration in setting these goals.

Proposed rule. In the proposed rule, EPA presented a framework for a long-term program under which continued progress would be achieved in Class I areas toward the national visibility goal. The EPA proposed presumptive ''reasonable progress targets,'' expressed in terms of deciviews, for the purposes of improving visibility on the 20 percent worst days and allowing no degradation of visibility on the 20 percent best days. Two options were presented for the presumptive target for the most impaired days: (1) A rate of improvement equivalent to 1.0 deciview over a 10-year period, and (2) a rate of improvement equivalent to 1.0 deciview over a 15-year period. For the least impaired days, EPA proposed a target of no degradation, defined as less than a 0.1 deciview increase.

The EPA noted that the 10- and 15-year time periods for tracking improvement were consistent with section 169A(b)(2)(B), which calls for States to develop long-term strategies covering 10 to 15 years. The EPA also emphasized the importance of achieving a perceptible change in visibility over the time period of a long-term strategy. In addition, EPA stated that gradual improvements in visibility as defined by reasonable progress targets were consistent with the GCVTC definition of reasonable progress, which is ''achieving continuous emissions necessary to reduce existing impairment and attain steady improvement of visibility in mandatory Class I areas.

[78] See the section on Baseline Conditions for a discussion of the rationale for selecting a 5-year period.

* * *'' [79] As noted in unit III.C., EPA also proposed to track progress in relation to the targets through the use of monitored air quality data and calculation of light extinction values from this aerosol data.

The proposal also provided a process by which a State could establish alternate reasonable progress targets, expressed in deciviews, provided the State justified the alternate target based on a review of the relevant statutory factors.[80] These factors are:

- The costs of compliance;
- The time necessary for compliance;
- The energy and nonair quality environmental impacts of compliance; and
- The remaining useful life of any existing source subject to such requirements.

Comments received. A number of commenters advocated a faster rate of improvement than the proposed presumptive rate of 1 deciview every 10 or 15 years since, as proposed, they claimed it could take more than 200 years to reach the national visibility goal in some eastern locations. They felt that this rate of progress should not be considered ''reasonable.'' Many of these commenters supported a rate of improvement for the worst days equal to 10–20 percent of the current deciview value (i.e., 3–6 deciviews per 10 years in an average eastern location with a worst day value of 30 deciviews, and 1.5–3.0 deciviews for an average southwestern location with a worst day value of 15 deciviews). A number of other commenters interpreted the proposed rule as requiring an inflexible visibility ''standard'' of 1 deciview improvement every 10 or 15 years. They maintained that such a standard would be infeasible to achieve in some areas of the country, and that EPA had failed to justify such a presumption through an analysis of the statutory factors in section 169A(g). These commenters wanted the States to have greater flexibility in setting visibility goals. Some commenters stated that 1 deciview is not the threshold of perception in all situations, and that for this reason the one deciview presumptive target in the proposal should be dropped. Other commenters asserted that the no degradation target for the best visibility days would prevent new source growth in some areas. Some commenters also opposed the presumptive target because of the concern that a State could be subject to a citizen lawsuit for not meeting a reasonable progress target.

Final rule. In considering how to address the reasonable progress target issue in the final rule, EPA was mindful of the balance that must be maintained between the need for strategies that will achieve meaningful improvements in air quality and the need to provide appropriate flexibility for States in designing strategies that are responsive to both air quality and economic concerns. After considering the comments on the ''presumptive target'' issue, EPA has revised the rule to eliminate ''presumptive targets.'' There is no presumptive target that States are required to meet to achieve reasonable progress. States have flexibility in determining their reasonable progress goals based on consideration of the statutory factors. However, as discussed below, the final rule requires States to conduct certain analyses to ensure that they consider the possibility of setting an ambitious reasonable progress goal, one that is aimed at reaching natural background conditions in 60 years.

The final rule calls for States to establish ''reasonable progress goals,'' [81] expressed in deciviews, for each Class I area for the purpose of improving visibility on the haziest days and not allowing degradation on the clearest days over the period of each implementation plan or revision. The EPA believes that requiring States to establish such goals is consistent with section 169A of the CAA, which gives EPA broad authority to establish regulations to ''ensure reasonable progress,'' and with section 169B of the CAA, which calls for EPA to establish ''criteria for measuring reasonable progress'' toward the national goal.

This approach is designed to address the concerns of those commenters interested in greater State flexibility in setting visibility goals, as well as the concerns of those commenters who believed that the presumptive 1 deciview target approach could actually provide a disincentive for some States to pursue more ambitious rates of progress, particularly for the most impaired Class I areas in the East. The EPA has taken this approach in the final rule because the CAA national visibility goal and ''reasonable progress'' provisions do not mandate specific rates of progress, but instead call for ''reasonable progress'' toward the ultimate goal of returning to natural background conditions. Today's final rule requires the States to determine the rate of progress for remedying existing impairment that is reasonable, taking into consideration the statutory factors, and informed by input from all stakeholders.

Required analysis of rate of progress which would attain natural conditions in sixty years. The EPA received numerous comments expressing the concern that a rate of progress that would result in reaching the national goal in 200 years should not be considered ''reasonable.'' These comments are based on the fact that the most impaired Eastern United States Class I areas have current conditions for the worst days (around 26–31 deciviews) that exceed estimated natural conditions (approximately 10–12 deciviews) by 16–20 deciviews or more. At the proposed presumptive rate of progress of 1 deciview per 10 years, it would take 200 years or more to reach the national visibility goal in many Eastern Class I areas. In addition, several commenters felt that rates of progress should vary between the east and the west because many parts of the western United States have much lower levels of visibility impairment than the east. For example, they asserted that a 1 deciview improvement over 10 years may not be very ambitious in an eastern location, whereas it could be very ambitious in some of the least impaired Class I areas in the west.

In order to address the diverse concerns of commenters on the proposal, EPA is establishing an analytical requirement that takes into account the varying levels of visibility impairment in Class I areas around the country while ensuring an equitable approach nationwide. To determine an equitable analytical approach, we considered the CAA amendments of 1990, which require actions to attain air quality health standards over a 20-year period for the 1-hour ozone standard, depending on the severity of the area's problem, and over a 10-year period for new standards, such as the new 8-hour ozone standard and the $PM_{2.5}$ standards. The CAA also requires reductions over the same time period to address acid rain. In the eastern United States, EPA's analyses show that the reductions from these and other CAA programs will result in a rate of improvement estimated at approximately 3 deciviews over the period from the mid-1990's to about 2005.[82] The EPA calculated that if this rate of improvement could be sustained, these areas would reach the national goal in 60 years.[83] The EPA

[79] GCVTC Report, June 1996, p. x.

[80] See CA A section 169A(g)(1) and 169A(g)(2). See also 62 FR 41145–41148.

[81] See section 51.308(d)(1).

[82] U.S. EPA, Effects of the 1990 Clean Air Act Amendments on Visibility in Class I Areas: An EPA Report to Congress. Office of Air Quality Planning and Standards, EPA–452/R–93–014, 1993.

[83] Calculated by dividing 3 deciviews (per 10 years) into an average of 18 deciviews away from

Continued

concluded that it would be reasonable to establish an analytical requirement based on this rate of progress given that this rate of improvement is expected to be achieved due to emissions under CAA programs.

The EPA also believes that the analytical requirement of the rate of improvement needed to reach natural conditions in 60 years is reasonable because in the near-term, cost-effective controls will continue to be available to reduce emissions that contribute to visibility impairment in Class I areas across the country. Recent analyses for other air quality programs show that significant emissions can be achieved through cost-effective control measures.

In addition, in the longer term, it can be expected that continued progress in visibility will be possible as industrial facilities built in the latter half of the 20th century reach the end of their ''useful lives'' and are retired and/or replaced by cleaner, more fuel-efficient facilities. Significant improvements in pollution prevention techniques, emissions control technologies, and renewable energy have been made over the past 30 years, and continue to be made. History strongly suggests that further innovations in control technologies are likely to continue in future decades, leading to the ability of new plants to meet lower emissions rates.

In light of this analysis of progress that could potentially be achieved, EPA has established in section 51.308(d)(1)(i)(B) an analytical requirement for setting reasonable progress goals that should provide for greater equity between goals set for the more impaired Eastern United States and the less impaired Western United States. This analytical requirement has the following four steps.

First, the State (or regional planning group) must compare the baseline visibility conditions in the years 2000–2004 (in deciviews) for the most impaired days with the natural background conditions, for each relevant Class I area. From this comparison, the State must determine the amount of progress needed to reach natural background conditions in 60 years, that is, by the year 2064. For example, if the baseline visibility is 30 deciviews, and the natural background is 12 deciviews, then this step would show the need for an 18 deciview improvement between 2004 and 2064.

Second, the State must identify the uniform rate of progress over the 60 year period that would be needed to attain natural background conditions by the year 2064. For the example case noted above, where 18 deciviews is the amount for the 60-year period, this would result in a uniform rate of progress for each year of (18/60), or 0.3 deciviews for a year.

Third, the State must identify the amount of progress that would result if this uniform rate of progress were achieved during the period of the first regional haze implementation plan. For example, if the first implementation plan covers a 10-year period, then for the above example, the State would identify a 3 deciview amount of progress over that time period.

Fourth, the State must identify and analyze the emissions measures that would be needed to achieve this amount of progress during the period covered by the first long-term strategy, and to determine whether those measures are reasonable based on the statutory factors. These factors are the costs of compliance with the measures, the time necessary for compliance with the measures, the energy and nonair quality environmental impacts of the compliance with the measures, and the remaining useful life of any existing source subject to the measures.

In doing this analysis, the State must consult with other States which are anticipated to contribute to visibility impairment in the Class I area under consideration. Because haze is a regional problem, States are encouraged to work together to develop acceptable approaches for addressing visibility problems to which they jointly contribute. If a contributing State cannot agree with the State establishing the reasonable progress goal, the State setting the goal must describe the actions taken to resolve the disagreement.

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.

If the State determines, based on the statutory factors, that the identified uniform rate of progress needed to reach natural conditions is not reasonable, the State must provide in its plan submission the analysis and rationale supporting this determination. The State then must provide a demonstration as part of its SIP submission showing why a less ambitious goal is reasonable, based on the statutory factors. The EPA intends to issue guidance interpreting the statutory factors and providing examples of ways in which they may be applied.

The State must also provide to the public, in accordance with section 51.308(d)(1)(ii), an assessment of the number of years it would take to reach natural conditions if the State continued to make progress at the alternative rate of progress it selected. For example, if average worst day visibility at the class I area is 18 deciviews from estimated natural conditions, the uniform rate of progress needed to reach natural conditions is 3 deciviews per 10 years. If the State determined that 3 deciviews is not reasonable but 2 deciviews is, then the State would have to include a statement in its SIP that it would take 90 years to reach natural conditions if this rate is maintained.

It should be noted that in developing the first regional haze implementation plan (and subsequent revisions), there is a time period of several years between the time period for which data are available and the date of plan submission. The first regional haze implementation plans for most of the United States will use the years 2000 through 2004 as the baseline for monitoring and emission inventories, while the first implementation plan for much of the country will not be due until a deadline that occurs between 2006 to 2008. In identifying the amount of progress needed by the end of the implementation period (the third step described above), States must account for this time period. Assume, for example, for the case discussed above (i.e., a 30 deciview baseline, and a uniform rate of progress of 0.3 deciviews per year to reach natural conditions in 60 years) that the first regional haze SIPs covers the years 2009 through the year 2018. For this case, there would thus be a 4-year period (2005 through 2008) that would occur between the baseline and the date of SIP submission. The uniform rate of progress of 0.3 deciviews per year over this time period would result in 1.2 deciviews of improvement before the plan submission. Hence, for this example, in identifying the amount of progress needed between the baseline and the end of the implementation period (i.e., the year 2018), the State must evaluate strategies that provide for a total of 4.2 deciviews: 1.2 deciviews between the last year of the baseline period and plan submission, and 3 deciviews for the implementation

natural conditions, and multiplying 6 increments by 10 years, assuming 10 years to achieve each increment.

period. The effect of this provision is that States must be mindful of the expected activities that take place before plan submission. Generally, we expect for the first plan submission period that progress in visibility improvement will continue to occur during the 2004 to 2008 period due to implementation of other CAA programs.

Rationale for the required 60-year analysis. The EPA has adopted this analytical requirement for two reasons. First, a common analytical framework that recognizes regional differences meets the concerns of several commenters by providing greater equity between the Eastern United States and Western United States.

Second, EPA believes this analysis will provide important additional information for the public to consider as States establish progress goals. The EPA believes this analysis will provide for a more informed and equitable decision making process by giving the public information about the level of emissions needed, related costs, and other factors associated with improvements in visibility. The EPA recommends that as part of this process, the States use computer-based scene optics modeling tools to present to the general public the anticipated change in Class I area visibility that would result from one reasonable progress goal versus another.

Consideration of other CAA measures. In determining the emissions and visibility improvement achieved during each implementation period, States should include all air quality improvements that will be achieved by other programs and activities under the CAA and any State air pollution control requirements. Therefore, any reasonable progress goal for a Class I area should reflect at least the rate of visibility improvement expected from the implementation of other ''applicable requirements'' under the CAA during the period covered by the long-term strategy. Consequently, States must take into account, at a minimum, the effect of measures to meet the NAAQS, the national mobile source program, and other applicable requirements under the CAA on Class I area visibility.

While, as noted above, based on our current understanding, EPA expects in the eastern United States that the reductions from measures implementing the CAA requirements will provide the visibility improvement and emissions needed for reasonable progress during the first regional haze implementation plan, EPA also recognizes that States will not be submitting their regional haze plans for several years. In developing its submittal, each State will need to conduct analyses to support its reasonable progress goals according to information available at the time the plan is submitted about benefits from the existing CAA programs. Each State should set its goal(s) taking into consideration input from its stakeholders and based on the statutory factors described above. In addition, the State must also conduct a BART determination for each source subject to BART as required in section 51.308(e) of the rule and described in section III.H. of the preamble. In considering whether reasonable progress will continue to be maintained, States will need to consider during each new SIP revision cycle whether additional control measures for improving visibility may be needed to make reasonable progress based on the statutory factors.

Some commenters expressed concern that the State would be subject to sanctions or enforcement actions in the event that a State fails to meet a reasonable progress target. As noted above, the reasonable progress goal is a *goal* and not a mandatory standard which must be achieved by a particular date as is the case with the NAAQS. Once a State has adopted a reasonable progress goal and determined what progress will be made toward that goal over a 10-year period, the goal itself is not enforceable. All that is ''enforceable'' is the set of control measures which the State has adopted to meet that goal. If the State's strategies have been implemented but the State has not met its reasonable progress goal, the State could either: (1) revise its strategies in the SIP for the next long-term strategy period to meet its goal, or (2) revise the reasonable progress goals for the next implementation period. In either case, the State would be required to base its decisions on appropriate analyses of the statutory factors included in section 51.308(d)(1)(i)(A) and (B) of the final rule.

If a State fails to submit an approvable SIP, or if it fails to implement and enforce strategies adopted into its SIP, the State could be subject to sanctions under the CAA. If the State continues to fail in meeting its obligations, EPA could be required to develop and implement a Federal implementation plan (FIP).

Allowing no degradation for the best days. Some commenters supported the goal of no degradation at a minimum, but they asserted that in many Class I areas, particularly in the east, the ''best days'' are in fact still quite impaired. In their view, a rule requiring only preservation of existing clean days would not meet the national goal.[84] Other commenters stated that a ''no degradation'' target for the clearest days could result in limitations to economic growth.

The final rule maintains the approach used in the proposed rule, which established a goal of no degradation for the best visibility days. The EPA believes this approach is consistent with the national goal in that it is designed to prevent future impairment, a fundamental concept of section 169A of the CAA. The EPA recognizes that the best days are still impaired in many Class I area locations, particularly in the east. The EPA encourages States to evaluate monitoring data to determine whether the same types of sources are affecting both the clear days and the hazy days. If the relative contribution of different particle types to light extinction is similar for both clear and hazy days, as it is for many sites currently monitored, then by developing strategies to improve conditions on the worst visibility days, the States will likely improve the entire distribution of hazy and clear days. Thus, under the final rule, the clean days for most Class I areas are expected to improve over time. Indeed, recent analyses of visibility trends have shown that at many Class I areas, deciview values for the 20 percent least impaired days are declining.

If at a Class I area the average conditions for clear days degrades over time, the State must provide in the next plan revision an explanation of why this happened, a set of measures designed to reverse this trend, and a plan for implementation during the next 10-year period. The State should review the effectiveness of these measures in subsequent 5-year progress reviews.

Integral vistas. The scenic vistas enjoyed by visitors to many parks often extend to important natural features outside these parks. The 1980 rules included a provision whereby the States could identify specific vistas for protection. For this reason, EPA solicited comment on whether the integral vistas concept should be extended to the regional haze program.

Some commenters supported reopening the vista identification program because such vistas are a significant resource of a Class I area. Several others opposed extending the program for a variety of reasons.

[84] Data from the IMPROVE network show that for several sites in the Eastern United States, the deciview values for the best days are greater than 14 deciviews, which is higher than even the NAPAP estimate of annual average conditions in the Eastern United States (9.6 deciviews).

The final regional haze rule does not extend the integral vista concept to the regional haze program. As noted earlier in the background section of this preamble, regional haze is caused by a multitude of sources across a broad geographic area, and it can create a uniform haze in all directions. The regional haze program is designed to bring about improvements in regional visibility for the range of possible views of sky and terrain found in any Class I area. Accordingly, the program does not protect only specific views from a Class I area. To address haze, regional strategies will be needed, and emissions resulting from these strategies are expected to improve visibility across a broad region, not just within a Class I area. Thus, although the regional haze program does not include a specific provision regarding integral vistas, the long-term strategies developed to meet reasonable progress goals would also serve to improve scenic vistas viewed from and within Class I areas.

Use of 20 percent most-impaired days and 20 percent least-impaired days. The final rule maintains the approach discussed in the proposal of improving the most-impaired visibility days (i.e., the average of the 20 percent most impaired days over an entire year), and allowing no degradation in the ''cleanest'' or least impaired days (i.e., the average of the 20 percent least impaired days over an entire year). In deciding upon an appropriate characterization of the ''most'' and ''least'' impaired days, EPA considered the typical frequency of aerosol monitoring in the IMPROVE network[85] (once every 3 days), and the number of samples that would be available for analysis annually (122 possible samples per year). The EPA believes that calculating annual ''best'' and ''worst'' conditions on the basis of an average of the 20 percent best and worst visibility days represents a reasonable approach to characterizing the typical best and worst conditions without having these values unduly influenced by a single anomalous data point.

The EPA's basis for maintaining the proposed approach is supported by the CAA and its legislative history, and by the approach used by the GCVTC in its technical assessment work and in its definition of reasonable progress. The EPA believes that a rule that requires strategies for improving the worst days and allowing no degradation on the clean days is consistent with the national visibility goal in section 169A of the CAA, which calls for preventing any future impairment (protecting clearest days) and remedying any existing impairment (improving the already impaired days). This approach is also supported by the legislative history of the 1990 CAA and the reasonable progress definition. The legislative history provides that, ''At a minimum, progress and improvement must require that visibility be perceptibly improved compared to periods of impairment, and that it not be degraded or impaired during conditions that historically contribute to relatively unimpaired visibility.''[86] The GCVTC interpreted ''reasonable progress'' to be ''achieving continuous emissions reductions necessary to reduce existing impairment and attain a steady improvement in visibility in mandatory Class I areas, and managing emissions growth so as to prevent perceptible degradation of clear air days.''[87] In today's final rule, EPA is similarly providing for ''attaining a steady improvement in visibility'' and ''preventing degradation of clean air days'' through the requirement to improve the haziest days and prevent degradation of the clearest days.

Tracking progress based on 5-year averages. To determine whether reasonable progress in improving visibility is being achieved, States will need to collect and analyze air quality data each year and review progress at 5-year intervals. Because the regional haze program represents a long-term effort to improve visibility in Class I areas, EPA believes that monitoring and assessments of progress should not be unduly influenced by short-term events or unusual meteorological conditions, but should reflect trends in air quality which are robust and insensitive to minor fluctuations. For this reason, the final rule calls for measuring progress by tracking changes in 5-year average deciview values for the haziest and clearest days, and comparing these current conditions against baseline conditions as well as impairment levels at the time of the last SIP revision. (See unit III.E above for further discussion about establishing baseline and current conditions based on 5-year averages.)

G. Long-Term Strategy

Proposed rule. Under Section 169A(b)(2) of the CAA, EPA's visibility regulations must require States to include in their SIPs ''such emission limitations schedules of compliance and other measures as may be necessary to make reasonable progress toward meeting the national goal specified in * * * [section 169A(a)] * * *'' In section 169A(b)(2)(B), the CAA requires that these SIPs must include a ''long-term (ten to fifteen years) strategy for making reasonable progress toward meeting the national goal.'' The EPA interprets the term ''long-term strategy'' as the control measures that are needed to ensure reasonable progress, together with a demonstration that those measures will provide for reasonable progress during the 10 to 15 year period. The proposed rule required the State to develop a long-term strategy for regional haze with the initial regional haze SIP, and to provide for regular updates. (Issues regarding updates of the long-term strategy are discussed below in unit III.J).

The proposal also required States to consider a specific list of factors when they developed their long-term strategies for regional haze. Under the proposal, in developing long-term strategies for regional haze, States would be required to consider the six items listed in section 51.306(e) of the 1980 rule, and the five items listed in section 51.306(g) of the 1980 rule. We proposed to add a seventh item to section 51.306(e), ''the anticipated effect on visibility due to projected changes in point, area and mobile source emissions over the next 10 years.''

Comments received. Public commenters on the long-term strategy requirement expressed concerns that the proposed rule had over-emphasized stationary source contributions, and had under-emphasized contributions from minor sources, area sources, mobile sources and prescribed fires. Other commenters expressed concerns that control strategies would be ineffective in cases where contributions from international sources were causing visibility impairment. Commenters also emphasized that States be able to take credit in their long-term strategies for the effects of existing CAA programs. We did not receive any comments on the specific list of factors to consider in developing long-term strategies.

Final rule. As discussed further below in unit III.J of today's notice, the final rule requires control strategies to cover an initial implementation period extending to the year 2018, with a reassessment and revision of those strategies, as appropriate, every 10 years. The final rule, in section 51.308(d)(3), includes a requirement for regional haze SIPs to include a long-term strategy. The long-term strategy must include specific enforceable measures that are sufficient to meet the ''reasonable progress goals'' for all Class

[85] The IMPROVE network is described in unit III.I. of the preamble.

[86] 136 Cong. Rec. S2878 (daily ed. March 21, 1990) (statement of Sen. Adams).

[87] GCVTC Report, p. x.

I areas affected by emissions from the State.

Multistate contributions—requirements for consultation and apportionment. As noted in section 51.308(d)(3)(i), when a State's emissions are reasonably anticipated to cause or contribute to impairment in a Class I area located in another State or States, the rule requires that the State consult with the other State or States in order to develop coordinated emission management strategies. Regarding the Class I areas within the State, section 51.308(d)(3)(i) also requires States to consult with any other State having emissions that are reasonably anticipated to contribute to impairment in any Class I area within the State.

For Class I areas where the State and other States cause or contribute to impairment in a mandatory Class I area, section 51.308(d)(3)(ii) requires that the State must demonstrate that it has included in its implementation plan all measures necessary to obtain its share of the emissions needed to meet the progress goal for the area. Section 51.308(d)(3)(iii) requires that States must document the technical basis, including modeling, monitoring and emissions information, that it uses to determine its apportionment of emission reduction obligations for the Class I areas the State affects. It is important that EPA and stakeholders understand the modeling, monitoring and emission information that the State used to support its conclusion that the long-term strategy provides for reasonable progress.

The EPA expects that much of the consultation, apportionment demonstrations, and technical documentation will be facilitated and developed by regional planning organizations. We expect, and encourage, these efforts to develop a common technical basis and apportionment for long-term strategies that could be approved by individual State participants, and translated into regional haze SIPs for submission to EPA. While States are not bound by the results of a regional planning effort, nor can the content of their SIPs be dictated by a regional planning body, we expect that a coordinated regional effort will likely produce results the States will find beneficial in developing their regional haze implementation plans. Any State choosing not to follow the recommendations of a regional body would need to provide a specific technical basis that its strategy nonetheless provides for reasonable progress based on the statutory factors. At the same time, EPA cannot require States to participate in regional planning efforts if the State prefers to develop a long-term strategy on its own. We note that any State that acts alone in this regard must conduct the necessary technical support to justify their apportionment, which generally will require regional inventories and a regional modeling analysis. Additionally, any such State must consult with other States before submitting its long-term strategy to EPA.

Consideration of all anthropogenic sources. In the final rule, we have clarified in section 51.308(d)(3)(iv) that the State should consider all types of anthropogenic sources including stationary, minor, mobile, and area sources in developing its long-term strategy. The State should review all such sources in identifying the emission reduction measures to be included in the strategy. In addition, we provide the following points of clarification:

Minor sources. Because of the focus of the BART provision on major stationary sources, EPA believes that commenters may have the impression that EPA has concluded that minor sources with emissions, below the BART cutoff of 250 tons per year, are not significant contributors to regional haze. This is not the case. The EPA believes that States should take the cumulative emissions from minor sources into account in developing their regional haze long-term strategies. For example, if growth in minor source emissions for a particular category had a substantial impact on emission trends and a corresponding effect on regional haze in a given geographic area, States should consider emission control strategies for such source categories as part of their long-term strategies.

Mobile sources. In cases where pollutants emitted by mobile sources contribute to regional haze, States must include in their SIPs mobile source emissions inventories representing current conditions, as well as comparisons of those emissions with future emissions projected for the end of the covered by the long-term strategy. It will be particularly important for States to address the effects of population growth and accompanying increases in vehicle miles traveled on their ability to provide for reasonable progress. The EPA agrees with commenters that national mobile source emission standards also will be an important factor in projecting mobile source emissions. The EPA intends to support States in their efforts to estimate mobile source emissions (including the effects of Federal rules) of pollutants that lead to regional haze.

Area sources. States also need to develop emission inventories and conduct analyses to understand the importance of area sources. For example, the GCVTC report cited emissions from road dust as a possible contributor to impairment. Depending on the nature of the visibility problem, road dust and other area sources may at times make a significant contribution to visibility impairment. States should include area sources in emission inventories and control strategy analyses as warranted.

Fire. Commenters expressed a number of concerns with respect to the appropriate consideration of emissions from fire in the development of long-term strategies.

The EPA notes that fire emissions have both a natural and a manmade component. In addressing fire emissions in long-term strategies, EPA believes that States must take into account the degree to which fire emissions cause or contribute to ''manmade'' visibility impairment and its contribution to natural background conditions. Reducing ''manmade'' visibility impairment is the focus of sections 169A and 169B of the CAA. The EPA recognizes the natural role of fire in forest ecosystems, and the fact that forest fuels have built up over many years due to past management practices designed to protect public health and safety through fire suppression. Research has shown that these practices have led to an increased risk of catastrophic wildfire as well as reduced forest health. In response to this situation, the Federal land management agencies, as well as some States and private landowners, have recommended the increased use of prescribed fire in order to return certain forest ecosystems to a more natural fire cycle and to reduce the risk of adverse health and environmental impacts due to catastrophic wildfire.

The EPA also recognizes that fire of all kinds (wildfire, prescribed fire, etc.) contributes to regional haze, and that there is a complex relationship between what is considered a natural source of fire versus a human-caused source of fire. For example, the increased use of prescribed fire in some ecosystems may lead to PM emissions levels lower than those that would be expected from catastrophic wildfire. Given that the purpose of prescribed fire in many instances is to restore natural fire cycles to forest ecosystems, it would be appropriate to consider some portion of prescribed fire as ''natural.'' 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 to reflect the fact that some

prescribed fire effects serve merely to offset what would be expected to occur naturally. The EPA will work with the FLMs, States and other stakeholders to develop guidance on ways in which fire can be considered in the determination of natural background, and in the determination baseline and current conditions.

Commenters asserted that in the proposed rule, EPA ignored the contribution of fires and thus overlooked the most important haze-contributing emission source in many Class I areas. The EPA agrees that fire is an important emission source to include in the analysis, but current data do not show that fire is the predominant source of visibility impairment in any Class I area. Annual data from the IMPROVE network show that elemental carbon (which we generally use as the main indicator of emissions from fire and other combustion sources such as diesel emissions), accounts for only about 3–7 percent of $PM_{2.5}$ mass on the worst visibility days in eastern sites. In western sites, elemental carbon accounts for about 4–7 percent of total $PM_{2.5}$ mass on the worst days. The contribution from fires can be substantial over short-term periods, but fires occur relatively infrequently and thus have a lower contribution to long-term averages. Fire events making substantial contributions to haze in a given Class I area have occurred relatively infrequently, and as a practical matter will contribute less than sources for which emissions are more continuous. As noted previously, the final rule requires States to develop long-term strategies for regional haze that address 5-year averages of the 20 percent worst days. These 5-year averages will also be used in evaluating monitoring results. The frequency with which fires occur will effect the importance of their emissions on predicted future 5-year averages for visibility conditions on the 20 percent worst days.

Commenters expressed concerns with the expected increase in emissions from prescribed burning on Federal lands. Specifically, the commenters asserted that States would not be able to address emission increases from these prescribed burns, and that stationary sources would be required to compensate for the increased amount.

The EPA believes these commenters are mistaken in their view of State's authority to address emissions from prescribed Federal burns. Pursuant to section 118 of the CAA, when States impose requirements on sources, Federal agencies must comply with those requirements in the same manner, and to the same extent, as any nongovernmental entity. States therefore have the authority to address emissions from prescribed Federal burns in the same manner, and to the same extent, they regulate prescribed fires generally. Additionally, to the degree that States determine in the development of long-range strategies that the manmade component of fire is a significant contributor to regional haze, States have a substantial degree of flexibility under the CAA and in the final rule. The final rule provides States flexibility in determining the amount of progress that is ''reasonable'' in light of the statutory factors, and also provides flexibility to determine the best mix of strategies to meet the reasonable progress goal they select. Nothing in the final rule requires States to develop long-term strategies that reduce emissions from other sources by amounts equivalent to any increases from the manmade fraction of prescribed fires. We do expect that States consider and analyze the full range of available control measures and that they consider the causes of visibility impairment when evaluating the potential measures to include in their long-term strategies.

The EPA encourages the development of smoke management programs between air regulators and land managers as a means to manage the impacts of wildland and prescribed burning. The sources of information described above, as well as other developmental efforts currently underway, provide effective, flexible approaches to smoke management. Where smoke impacts from fire are identified as an important contributor to regional haze, smoke management programs should be a key component of regional and State regional haze planning efforts and long-term strategies.

There are a number of sources of information on mitigation approaches for fire emissions, including: (1) The EPA Interim Air Quality Policy on Wildland and Prescribed Burning, (2) fire-related strategies developed by the GCVTC and (3) the best available control methods (BACM) document for prescribed burning. In the Interim Air Quality Policy on Wildland and Prescribed Burning, EPA, in collaboration with a national stakeholder group comprised of Federal, State, and private land managers, State air regulators, environmental groups, tribes, and others, developed a framework for managing the impacts of smoke from increased prescribed fire programs across the country. This policy describes the elements and process of smoke management planning that air regulators and land managers can use to reach agreement on development of smoke programs. The GCVTC included a number of long-term strategies for fire in its report and recommendations, including emissions tracking and emission goals for fire, smoke management programs, and full consideration for alternatives to fire. The GCVTC's strategy is illustrative of the available mitigation approaches for emissions from fire that other States may consider. The GCVTC's approach is contained in section 51.309(d)(6) of the final rule and discussed further in unit IV.C of this notice. The BACM document, Prescribed Burning Background Document and Technical Information Document, EPA–450/2–92–003, is organized to discuss various aspects of State smoke management programs. The document includes information on how States administer and enforce programs for burn/no-burn days, and information on various topics including emission inventories, cost estimation, and public information programs.

Transboundary emissions from sources outside the United States. Some Class I areas located near international borders are particularly prone to influence by emissions beyond the United States border. Commenters expressed concerns that EPA should take into account that States are not able to control international sources in reviewing a State's proposal for a reasonable progress target. Additionally, commenters urged EPA to work with Mexico and Canada to reduce emissions from sources that States determine to be significant contributors to regional haze in their Class I areas.

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.

Factors to consider for long-term strategies. In section 51.308(d)(3)(v) (A) through (G) in the final rule, we have incorporated a list of seven factors that States must consider in developing long-term strategies. The final rule

includes six factors in the July 1997 proposal that are derived from section 51.306(e) of the existing rule, and the additional item, ''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'' that was specifically added by the July 1997 proposal. We have decided not to include the five proposed items that are derived from section 51.306(g), because four of these items are included on the list of ''reasonable progress'' factors in section 51.308(d)(1)(i)(A) of the final rule, and because we believe that the fifth factor ''effect of new sources'' is part of ''projected changes in point source emissions.''

In their regional haze SIP submissions, States must describe how each of these seven factors is taken into account in developing long-term strategies. We believe it is useful to clarify several of these factors, and EPA's expectations on how SIPs can address them.

Item (A): Emissions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment.

It is expected that for some areas of the country, such as parts of the eastern United States, emissions achieved for the acid rain program and for meeting the $PM_{2.5}$ NAAQS, will lead to substantial improvements in visibility as well. Item (A) makes clear that States must take these other emissions into account in developing their long-term strategies for regional haze. We expect that some States may be able to demonstrate reasonable progress based on these emissions alone, particularly for the first 10-year period.

Item (B): Measures to mitigate the impacts of construction activities.

Item (B) requires that in developing long-term strategies, States must consider the impacts of construction activities. States, for example, should include these activities in emission inventories used for long-term strategy development.

Item (C): Additional measures and limitations and schedules for compliance to achieve the reasonable progress goal.

Where emissions from ongoing requirements, addressed by item (A), are not sufficient to achieve the reasonable progress goal, States must identify additional measures that will ensure that the goal will be met. Schedules for compliance for these additional measures must be included in the SIP, and measures considered for inclusion must be identified in the SIP submission.

Item (D): Source retirement and replacement schedules.

Item (D) requires the consideration of source retirement and replacement schedules in developing the long-term strategies, particularly, where these schedules would have a significant impact on regional emission loadings and on a State's ability to achieve reasonable progress.

Item (E): Smoke management techniques for agricultural and forestry management purposes including plans as they currently exist within the State for these purposes.

Item (E) highlights the widely recognized importance of prescribed burning programs on regional haze. Issues related to fire and forestry management practices are discussed above.

Item (F): Enforceability of emissions limitations and control measures.

States must ensure that control measures are written in a way that EPA and citizens may enforce as a practical matter. Guidance on practical enforceability issues is readily available in EPA policy guidance memoranda, for example Guidance on Limiting Potential to Emit in New Source Permitting, June 13, 1989.

Item (G): The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the next 10 years.

Item (G) requires that States must address the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the next 10 years when developing emissions strategies that will meet the reasonable progress requirements. In some areas, these changes in emissions would be expected primarily from population growth, while in others, emissions changes may result from potential new industrial, energy, natural resource development, or land management activities. These changes in emissions would also include the changes due to measures developed specifically for the regional haze program.

Relationship to long-term strategies under the existing rule. The final rule provides for coordination of the long-term strategies to address regional haze impairment with any existing long-term strategies under the 1980 visibility rule. Some long-term strategies are already in place to address reasonably attributable visibility impairment under the existing 1980 regulation. Coordination of the two programs is addressed in section 51.306(c) of the final rule. This section clarifies two points. First, that the provisions of existing long-term strategies will continue to apply until regional haze strategies are in place. Second, once the first regional haze strategy is in place, the final rule, in section 51.306(c) requires the State to develop a coordinated long-term strategy which address both reasonably attributable impairment and regional haze.

H. Best Available Retrofit Technology (BART)

Background. One of the principal elements of the visibility protection provisions of the CAA is the provision in section 169A addressing the installation of BART for certain existing sources. The conference committee report accompanying the 1977 CAA amendments indicates that a major concern motivating the adoption of the visibility provisions was ''the need to remedy existing pollution in the Federal mandatory class I areas from existing sources.'' [88] The BART provision in section 169A(b)(2)(A) demonstrates Congress' intention to focus attention directly on the problem of pollution from a specific set of existing sources. This provision provides that EPA's regulations to protect visibility must require States to revise their SIPs to contain such measures as may be necessary to make reasonable progress toward the national visibility goal, including a requirement that certain existing stationary sources procure, install, and operate the ''best available retrofit technology.''

The CAA defines the sources potentially subject to BART as major stationary sources, including reconstructed sources, from one of 26 identified source categories which have the potential to emit 250 tons per year or more of any air pollutant, and which were placed into operation between August 1962 and August 1977.[89] This set of sources potentially subject to BART was defined in the 1977 CAA and will not be modified by rule. The 26 source categories are:

(1) Fossil-fuel fired steam electric plants of more than 250 million British thermal units 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,

[88] H.R. Rep. No. 564, 95th Cong., 1st Sess. at 155 (1977) (emphasis added).

[89] See CAA sections 169A (b)(2)(A) & (g)(7).

(10) Hydrofluoric, sulfuric, and nitric acid plants,
(11) Petroleum refineries,
(12) Lime plants,
(13) Phosphate rock processing plants,
(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 British thermal units 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.

In section 51.301(e) of the 1980 visibility regulations, a source meeting the above criteria was defined as an ''existing stationary facility.'' In today's regional haze rule, EPA has added the definition of a ''BART-eligible source'' in section 51.301(hh) that is identical to the definition of ''existing stationary facility.'' This new definition is used throughout the regional haze rule and preamble in order to avoid the potential misinterpretation of the ''existing stationary facility'' definition as representing a collection of sources broader than the subset of sources potentially subject to BART.

The regulations issued in 1980 define BART as ''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 facility.[90] The BART emission limitation must be established, on a case-by-case basis, taking into consideration the following factors:

- The technology available,
- The costs of compliance,
- The energy and nonair environmental impacts of compliance,
- Any pollution control equipment in use at the source,
- The remaining useful life of the source, and
- The degree of improvement in visibility which may reasonably be anticipated from the use of such technology.[91]

The EPA published guidelines in 1980 which outline the general procedures for States to follow in analyzing sources and establishing BART emission limits.[92] These guidelines apply to situations in which visibility impairment in the Class I area is determined to be ''reasonably attributable'' to a single source or a small group of sources.

Proposed rule. The proposed regional haze rule discussed a process for addressing BART in the context of regional haze and requested comment on how the requirement should be implemented. The first step in this process was a requirement that the State identify all sources potentially subject to BART early in the planning process. The second step required the State to submit a plan and schedule for evaluating BART and the corresponding potential emissions for those existing sources which may reasonably be anticipated to contribute to regional haze visibility impairment. The notice proposed to provide 3 years for completing this evaluation so that the results could be taken into consideration by States as they develop coordinated strategies for attaining the $PM_{2.5}$ and ozone NAAQS.

In setting out the proposed approach to the BART requirement, EPA proposed that the test for determining whether a BART-eligible source ''may reasonably be anticipated to contribute'' to regional haze should be evaluated in the context of the overall emissions reduction strategy. The EPA also noted that it believed that a similar approach should be taken in addressing ''the degree of improvement in visibility which may reasonably be anticipated'' from the imposition of BART controls. The EPA proposed a cumulative approach because of the nature of the regional haze problem (i.e., the cumulative product of emissions from many sources over a broad area) and because of the time and expense necessary to try to determine, one source at a time, the percentage contribution of each BART-eligible source to regional haze. In addition, EPA noted the substantial technical difficulties associated with estimating the degree of visibility improvement resulting from a single source. The EPA broadly requested comments on effective approaches for States and sources to meet the BART requirement under the regional haze program in the most appropriate manner, and in particular how BART, once determined, should be implemented.

Comments received. Commenters identified a number of issues concerning how EPA should address the BART requirement under the regional haze program. Some commenters asserted that the BART requirement simply should not apply under the regional haze program. These commenters argued that the procurement, installation, and operation of BART is not explicitly required under section 169B, and that section 169B is the primary statutory authority for the regional haze program. Other opponents of the BART requirement contended that the proposal placed too much emphasis on stationary sources, and on BART sources in particular, as opposed to other sources of visibility-impairing pollutant emissions, such as mobile and area sources. The commenters contended that BART should not be the principal control strategy employed under the regional haze program.

Another group of commenters supported EPA's proposed approach for addressing the BART requirement. Some pointed out that while existing stationary sources are not the only contributors to regional haze, controlling these sources is an essential element of a national regional haze program. These commenters also supported the approach of evaluating BART-eligible sources collectively to determine their overall contribution to visibility impairment within a given airshed. Several commenters recommended that BART be equivalent to, or more stringent than, new source performance standards (NSPS) for sulfur dioxide and nitrogen oxides. Some commenters suggested allowing an emissions cap-and-trade program to meet the BART requirement. One commenter described a process whereby States would conduct an assessment of the availability of retrofit controls for all BART-eligible sources in a region, calculate the cumulative emissions possible from application of BART to eligible sources, establish a cap for each visibility-reducing pollutant, and implement a 10-year program to achieve emissions equivalent to the emissions cap.

Response to comments. The EPA disagrees with the commenters who argued that the BART requirements should not apply to the regional haze program. The statutory authority for developing a regional haze program emanates from section 169A of the CAA, and any SIPs that are to be developed under a regional haze program must include provisions that meet the requirements of this section, including the requirement that certain sources procure, install, and operate BART.

[90] Section 51.301(c).
[91] *Id.*
[92] See EPA, Office of Air Quality Planning and Standards, Guidelines for Determining Best Available Retrofit Technology for Coal-Fired Power Plants and Other Existing Stationary Facilities, EPA–450/3–80–009b, November 1980.

Since 1977, section 169A of the CAA has authorized EPA to address regional haze. Section 169A(a)(1) of the CAA establishes as the national visibility protection goal ''the prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.'' Visibility impairment is defined broadly in the CAA and includes that caused by regional haze.[93] This language does not distinguish between reasonably attributable impairment and regional haze, but provides for visibility protection generally. This reading of the statute is consistent with the legislative history; in adopting section 169A, Congress evinced its intent to address impairment caused by ''hazes'' and the potential corresponding need to control a ''variety of sources'' and ''regionally distributed sources.''[94] While EPA deferred addressing regional haze in 1980 when it promulgated the first phase of visibility regulations, it did so because of technical obstacles, not because of a limitation on its legal authority.[95] Indeed, in the 1980 rule, EPA expressed its intent to address regional haze in a future rulemaking under section 169A. Thus, EPA's decision to address visibility impairment in separate phases does not change the fact that the BART requirement is an integral part of the statutory scheme in section 169A.

The provisions in section 169B of the CAA, adopted in 1990, do not override EPA's statutory authority to require State plans to remedy regional haze. These provisions grew out of Congress' frustration that EPA had not more expeditiously addressed regional haze under its section 169A delegated rulemaking authority. Thus, section 169B(e) explicitly requires EPA to carry out its ''regulatory responsibilities under section [169A]'' within a set time period. The legislative history confirms that Congress did not intend section 169B to impinge upon EPA's long-standing authority to address regional haze visibility impairment,[96] including the authority to require BART.

The EPA believes that commenters asserting that EPA overemphasized the control of stationary sources and, in particular, the role of BART in the regional haze program misinterpreted the proposal. The EPA did not intend to emphasize controls on BART-eligible sources over, or to the exclusion of, other sources. While the BART requirement is limited to a specified population of major stationary sources, States will need to consider measures addressing a wide range of sources and activities, including mobile sources, area sources, activities involving fire, and other major and non-major stationary point sources in their long-term strategies. The unit on long-term strategies includes further discussion of this point.

Final Rule. The final rule requires each implementation plan to be revised to contain two basic elements related to BART. The first is the requirement that the States submit a list of the ''BART-eligible sources'' in the State. Second, the State must determine and include in the plan the ''best available retrofit technology,'' taking into account certain factors identified in section 169A(g)(2) of the CAA, for each BART-eligible source in the State reasonably anticipated to cause or contribute to any impairment of visibility.

In recognition of the control and cost efficiencies that can be achieved through trading programs and other alternative measures, EPA is providing States with the opportunity to adopt alternative measures in lieu of BART where such measures would achieve even greater reasonable progress toward the national visibility goal. The overarching requirement of the visibility protection provisions of section 169A is to make reasonable progress toward the national goal of eliminating visibility impairment. If greater reasonable progress can be made through an approach that does not require source specific application of BART, EPA believes that approach would comport with this statutory goal. The EPA reached this conclusion in determining the appropriate measures to address visibility impairment in the Grand Canyon National Park resulting from the Navajo Generating Station.[97] In that case, EPA ultimately chose not to adopt the emission control limits indicated by its BART analysis.[98] Instead, as explained by the Ninth Circuit in upholding EPA's final decision, EPA acted within its discretion in adopting an alternative emission control standard ''that would produce greater visibility improvement at a lower cost. Congress's use of the term 'including' in [section 169A(b)(2)] prior to its listing BART as a method of attaining 'reasonable progress' supports EPA's position that it has the discretion to allow States to adopt implementation plan provisions other than those provided by source-specific BART analyses in situations where the agency reasonably concludes that more 'reasonable progress' will thereby be attained.''[99] Under today's final rule, States may elect to adopt an emissions trading program or other alternative measures in lieu of BART so long as greater reasonable progress is made.

List of BART-eligible sources. To ensure adequate time for developing long-term strategies to ensure reasonable progress, we recommend that States begin identifying and evaluating the list of potential BART sources as soon as possible after promulgation of the final rule. Identifying the BART-eligible sources will require States to collect information as to the dates that emission units at stationary sources were placed into operation, the pollutants emitted, and the potential to emit of these units. We suggest that, at the same time that they begin refining their emissions inventories for $PM_{2.5}$ and its precursors, States request that stationary sources provide them with these dates. While such information is generally available for electric utilities through data bases maintained by the Energy Information Administration, this information is not normally maintained in national data bases for the other 25 source categories subject to BART. However, EPA believes that much of this information is likely to be available in States permitting data bases or other inventories. To assist the States in this task, we will continue efforts to identify other helpful sources of information.

Determination of sources subject to BART. After the State has identified the BART-eligible sources, the next step is determining whether these sources emit any air pollutant ''which may reasonably be anticipated to cause or contribute'' to any visibility impairment in a Federal Class I area. As noted in the proposal, EPA believes that this determination should not require extremely costly or lengthy studies of the contribution of specific sources to regional haze. Unlike the 1980 regulatory program, which addresses the

[93] *See* CAA section 169A(g)(6); see *also Maine* v. *Thomas,* 874 F.2d.883, 885 (1st Cir. 1989) (''EPA's mandate to control the vexing problem of regional haze emanates directly'' from CAA section 169A).

[94] H.R. Rep. No. 294, 95th Cong., 1st Sess. 204 (1977).

[95] 45 FR 80084 (Dec. 2, 1980).

[96] *See* 136 Cong. Rec. S2878 (daily ed. March 21, 1990) (statement of Sen. Adams) (''[t]he authority to establish visibility transport regions and commissions is a supplement to the administrators [sic] obligation under current law. * * * The Administrator may not delay requirements under section 169A because of the appointment of a commission for a region under section 169B'') (daily ed. Oct. 26, 1990) (statement of Rep. Wyden) (''[n]either the original House language nor the Senate language adopted in conference repealed or lessened EPA's obligations under the 1977 law'').

[97] See *Central Arizona Water Conservation District* v. *EPA,* 990 F.2d 1531, 1543 (1993).

[98] See 56 FR at 50178.

[99] Central Arizona Water Conservation District v. *EPA,* 990 F.2d 1531, 1543 (1993).

visibility impairment that is reasonably attributable to a specific source or small group of sources, today's final rule addresses the problem of visibility impairment resulting from emissions from a multitude of sources located across a wide geographic area. As the regional haze rule is not limited to addressing visibility impairment that can be attributed to a specific source or small group of sources, EPA believes it would be inappropriate to focus on the contribution of one source or a small group of sources. First, the States will not face the same need to define the precise contribution from one particular source to the visibility problem. Second, establishing the contribution from one particular source to the problem of regional haze would require lengthy and expensive studies and pose substantial technical difficulties. The EPA has thus concluded that a detailed source-receptor analysis would not be appropriate in determining whether a source ''may reasonably be anticipated to contribute'' to regional haze in a Class I area.

In implementing today's final rule, a State should find that a BART-eligible source is ''reasonably anticipated to cause or contribute'' to regional haze if it can be shown that the source emits pollutants within a geographic area from which pollutants can be emitted and transported downwind to a Class I area. The EPA believes that this test is an appropriate one for determining whether a source can reasonably be anticipated to cause or contribute to the problem of regional haze. As the Ninth Circuit stated in considering this language:

> Congress mandated an extremely low triggering threshold, requiring the installment of stringent emission controls when an individual source ''emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility'' in a Class I Federal area. 42 U.S.C. sec. 7491(b)(2)(A). The NAS correctly noted that Congress has not required ironclad scientific certainty in establishing the precise relationship between a source's emission and resulting visibility impairment.* * *[100]

The approach taken here is consistent with that taken in the programs for acid rain and ozone, programs which also address regional air quality problems caused by transported pollutants. These programs do not require a specific demonstration of each source's contribution to the overall problem, but instead focus efforts on developing cost-effective solutions to reducing emissions over a broad area that is regional or national in scope. For example, in the recent NO_X SIP call addressing the regional transport of NO_X emissions (an ozone precursor) in the Eastern United States, EPA adopted a ''collective contribution'' approach to determining whether sources ''contribute'' to ozone nonattainment in downwind areas. In this rulemaking, EPA concluded that because ozone nonattainment results from the collective contribution of many entities over a broad geographic area, even relatively small (in an absolute sense) contributions from upwind entities should be considered to be ''significant.''[101]

The EPA has concluded that a similar approach in the regional haze program is appropriate. Where emissions from a region are considered to contribute to regional haze in a Class I area, any emissions from BART-eligible sources in that region should also be considered to cause or contribute to the regional haze problem. The EPA will issue and update guidance, including EPA modeling guidelines,[102] to assist the States in analyzing whether sources contribute to regional haze.

Establishing source-specific BART emission limits. The second element of the BART requirement is for the States to establish emission limitations for those BART-eligible sources which may reasonably be anticipated to cause or contribute to regional haze. To meet this requirement, the State must develop source-specific emission limits which reflect the application of the best system of continuous emission reduction for each pollutant which is emitted by a source subject to BART.[103] As stated above, the State can also choose to develop an emissions trading program, or other alternative measure, that achieve greater reasonable progress rather than require source specific BART emission limits on each source subject to BART.

In developing source specific emission limits for BART, the State must take into consideration the technology available and a number of specific factors set forth in the statute. These factors are the costs of compliance, the energy and nonair environmental impacts of compliance, any existing pollution control technology in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated from the use of such technology. Taking these factors into account, the State may conclude that BART is the best level of emissions reduction that can be achieved by available retrofit technology or some other level of control. In some cases, the State may determine that a source has already installed sufficiently stringent emission controls for compliance with other programs (e.g., the acid rain program), such that no additional controls would be needed for compliance with the BART requirement. In establishing BART for a particular facility, the State must make available during public review of the SIP at the State level the materials supporting its BART determination. The State must also include this documentation in the technical support materials accompanying the SIP.

In establishing source specific BART emission limits, the State should identify the maximum level of emission reduction that has been achieved in other recent retrofits at existing sources in the source category. As noted above, the visibility regulations define BART as ''an emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction.'' Recent retrofits at existing sources provide a good indication of the current ''best system'' for controlling emissions. Thus, for example, recent retrofits for large utility sources (e.g., sources under the acid rain program and the Navajo Generating Station) have commonly achieved a 90 percent or better rate of SO_2 emissions (at an average cost of $265 per ton of SO_2 removed).[105] For source categories with recently promulgated NSPS, that standard may also provide a good indication of the current ''best system'' for controlling emissions. In addition, current information concerning control technology performance for many source categories is available from EPA's Clean Air Technology Center, http://www.epa.gov/ttn/catc. EPA plans to issue revised BART guidance to provide updated guidance to the States on how to calculate BART for purposes of regional haze within a year of promulgation of this rule. The EPA will be developing this guidance through a national stakeholder process.

Once the State has identified the retrofit technology that provides the maximum degree of continuous

[100] *Central Arizona Water Conservaiton District* v. *EPA*, 990 F.2d 1531, 1541 (9th Cir. 1993).

[101] 63 FR 57356, 57376 (Oct. 27, 1998).

[102] See 40 CFR part 51, appendix W for information on EPA's modeling guideline for conducting regional-scale modeling for particulate matter and visibility.

[103] See section 51.301(c).

[104] See CAA section 169A(g)(2).

[105] Ellerman A. Danny et al., Emissions Trading Under the U.S. Acid Rain Program: Evaluation of Compliance Costs and Allowance Market Performance, Massachusetts Institute of Technology, Center for Energy and Environmental Policy Research, 1997.

emission reduction, it should take into consideration the costs of compliance, the energy and nonair quality environmental impacts of compliance, any existing pollution control equipment in use at the source, and the remaining useful life of the source. Taking these factors into account allows the State to arrive at an estimate of the ''best system'' of retrofit control technology for a particular source and a corresponding estimate of the likely emissions which would be achieved by the imposition of BART. These factors should be taken into account for each source subject to BART in order to compare tradeoffs between the control efficiencies and costs associated with various control alternatives.

The remaining factor which the States must take into account in determining BART is ''the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.'' In applying this factor in the context of the regional haze program, a State should use the degree of improvement in visibility that would be expected at each Class I area as a result of imposing BART, as determined through the application of the factors discussed above, on all sources subject to BART. For the same reasons that the determination of whether a BART-eligible source may be reasonably anticipated to cause or contribute to a visibility problem should be made on a cumulative basis, EPA believes that a regional analysis is appropriate for determining the degree of visibility improvement that can be achieved through application of BART. Moreover, the statute requires the States to consider ''the degree of improvement in visibility which may reasonably be anticipated to result *from the use of such technology*.'' [106] EPA interprets the language ''from the use of such technology'' to refer to the application of BART level controls to all sources subject to BART. As a result, EPA believes that it is reasonable to interpret this provision as requiring the State to consider, as part of its source-specific analysis, the cumulative impact of applying retrofit controls to all sources subject to BART to estimate the degree of visibility improvement which may reasonably be anticipated to result from the use of BART.

The EPA also believes that such a regional analysis provides important information to the State and to the public about the magnitude of potential emissions from sources subject to BART. This information could be used to help inform the public debate in developing reasonable progress goals, in setting a regional emissions target for a trading program, and in developing the overall long-term strategies for making reasonable progress.

To calculate the degree of improvement in visibility that would be expected at each Class I area as a result of imposing BART on all sources subject to BART, the State should estimate the possible emissions reductions resulting from the application of BART at all subject sources located within the region that contributes to visibility impairment in the Class I area. The State should work on its own or in conjunction with other States, such as in a regional planning body, to determine the geographic scope of the region that contributes to each Class I area. The States should consult with one another to determine the emission reductions achievable from sources subject to BART in other States.

The estimate of possible emission reductions from sources subject to BART should be based on the application of the technology, cost, time for compliance, energy and nonair environmental impacts, and remaining useful life factors discussed above. Using this estimate, the State will then need to calculate the resulting degree of visibility improvement that would be achieved at Class I areas. The EPA expects that this exercise will be in the form of a regional modeling analysis. The State should use this estimated degree of visibility improvement in determining the appropriate BART emission limitations for specific sources.

Unless a State commits to regional planning, a State must include its source-specific BART determinations in its initial SIP revision for the area in which the source is located.[107] Where the State commits to regional planning, a State may defer submitting its source-specific BART determinations consistent with the timing requirements described in unit III.B. However, the State must submit its list of BART-eligible sources at the same time it submits its committal SIP.

The SIP revision must include the emission limitations determined to be BART for sources subject to BART and a compliance schedule for each source. Each source subject to the BART requirement will have to meet the BART emission limitation within 5 years of SIP approval, as required under the CAA. As noted above, within a year, EPA will be issuing revised BART guidance to provide States with assistance in determining BART for regional haze.

Alternative Measures in Lieu of BART. In today's final rule, States may elect to adopt alternative measures, such as a regional emissions trading program, in lieu of BART so long as the alternative measures achieve more reasonable progress than would application of source-specific BART. The EPA believes that a regional emissions trading program would be the most efficient means of achieving BART-level emission reductions and the emission reductions needed to meet the States' reasonable progress goals as implemented through the States' long-term strategies.

The EPA believes that this approach is consistent with the Ninth Circuit's decision in *Central Arizona Water Conservation District* v. *EPA*.[108] In this case, the court upheld EPA's exercise of discretion to adopt an alternative emission standard that achieved greater reasonable progress than would have been achieved through the imposition of BART. Allowing States to adopt alternative measures such as an emissions trading program rather than to require BART will provide the States with the flexibility to achieve greater reasonable progress towards the national goal at a lower cost, while still addressing the Congressional concern that existing sources contributing to visibility impairment be required to control emissions appropriately. The EPA believes that this best fulfills the overarching statutory requirement in section 169A(b) that States make reasonable progress toward the national visibility goal, but also ensures that, at a minimum, the degree of visibility impairment attributable to BART sources is addressed by the States during the first long-term strategy. Moreover, while an appropriately designed alternative might result in differing levels of control at particular sources than a source-by-source BART requirement, the environment will benefit through the achievement of greater reasonable progress.

As noted above, to take advantage of the flexibility offered by this provision, the State must demonstrate that the alternative measures adopted in lieu of meeting the BART requirements achieve greater reasonable progress than would result from the installation of source-specific BART. One way of making this showing is for a State to show in its SIP demonstration that the alternative

[106] CAA section 169A(g)(2) (emphasis added).

[107] For areas designated attainment or unclassifiable for $PM_{2.5}$, this SIP will be due 12 months after the areas are designated. For areas designated as nonattainment, this SIP will be due no later than 3 years after the area is designated nonattainment.

[108] 990 F.2d 1531, 1543 (1993).

measures will achieve greater emission reductions and visibility improvement than would result from meeting the BART requirements.

In making this showing, States may rely on the assessments and analyses developed by regional planning groups that are formed to address regional haze. To compare the emissions reductions and visibility improvement that would result from application of source specific BART to that resulting from implementation of alternative measures, such as a regional emissions trading program, the State must estimate the emissions reductions that would result from the use of BART-level controls. To do this, the State could undertake a source-specific review of the sources in the State subject to BART, or it could use a modified approach that simplifies the analysis.

To simplify the process of arriving at an estimate of emissions, EPA believes that one approach that would be acceptable in place of a source by source BART analysis would be to consider some of the BART factors on a category-wide basis. For example, the average cost per ton of complying with alternate control technologies and associated energy and nonair environmental impacts could be considered on a category-wide basis. It may be more appropriate to consider other factors on a source-by-source basis. For example, the State could identify the current control technology in operation at each source and calculate the emissions that would be achieved at each source with a given retrofit control technology or determine and consider the remaining useful life of individual sources.

Alternatively, EPA believes it may be appropriate for the State to combine a category-wide BART assessment with a source-specific assessment for certain sources. For example, if a State can verify that a source will be retired within a short period of time, it could take this into account in determining BART-level emissions reductions for that facility while assessing the remaining sources subject to BART on a category-wide basis.

The States accordingly have flexibility in developing a method to determine the emission reductions that could be achieved through the application of BART. Whatever methodology is chosen by the State to evaluate possible emissions reductions from BART, the estimate must reflect at least the minimum level of emissions reductions that can be expected. This estimate becomes the point of comparison for determining whether an alternative measure, such as an emission trading program, achieves greater reasonable progress toward visibility improvement. Once the State has arrived at an estimate of the emissions that would result from application of source-specific BART, it should then compare the degree of visibility improvement expected to be achieved in Class I areas through the application of BART to the degree of visibility improvement projected to be achieved by the alternative measures proposed by the State.[109] It is not necessary to go through an additional analysis of the BART factors in considering the effects of alternative measures.

The EPA believes that the most likely alternative measures adopted by the States will be an emissions trading program. There are several advantages associated with a regional trading approach in lieu of meeting a source-specific BART requirement. First, it provides flexibility to participating sources in deciding whether to purchase credits or to implement on-site emission reduction strategies, while being designed to achieve an equivalent level of emissions. Many commenters felt the proposal did not provide this type of flexibility. Second, trading allows sources to assess the costs of control technology, alternative fuels, and process changes across a broad array of sources and source categories. Thus, a trading program typically will result in lower cost per ton of pollutant reduced than a program which mandates plant-specific technological control. For example, EPA's experiences in the acid rain program have shown that sulfur dioxide reductions achieved through market-based programs within the electric utility sector continue to be quite cost effective, in the $170—320 per ton range.[110] A program which allows broader trading among sources in other industrial categories as well would likely lead to even greater cost effectiveness for individual sources.

In designing emissions trading programs that will achieve the requisite improvement in visibility, States must ensure that such programs meet several criteria. First, as noted above, the legislative history demonstrates Congress' recognition of the need to control emissions from a specific set of existing sources. Because of the Congressional focus on control of these sources, any emissions trading program must include, at a minimum, the sources within the trading region subject to BART. The one exception to this is where a source has already installed BART-level pollution control technology and the emission limit is a federally-enforceable requirement. In that case, States may elect to allow a source the option of not participating in the trading program.

Second, a trading program adopted in lieu of BART must be fully implemented within the period of the first long-term strategy. To ensure this, States must provide schedules for implementing emissions trading programs with their SIP submittal. While EPA is allowing States to fully implement a trading program within the period addressed by the State's first long-term strategy, under section 169A, BART emission limits are to be implemented within 5 years. To provide States with the additional flexibility they may need to implement a trading program, EPA has concluded that it is appropriate for States to have the full period of the long-term strategy to achieve the full measure of necessary emissions. The basis for allowing this longer implementation period is the provision that the trading program achieve greater reasonable progress than would be achieved by source-specific application of BART within 5 years of plan submittal. The EPA will consider the estimated period of time to implement the program in determining whether the alternative measures ''achieve more reasonable progress.'' In any event, a trading program adopted in lieu of BART must be implemented during the period of the first long-term strategy.

Third, the reductions in emissions required of BART sources must be surplus to other Federal requirements as of the baseline date of the SIP, that is, the date of the emissions inventories on which the SIP relies. In addition, sources must be required to monitor their emissions in a way that allows States and EPA to assure that the reductions are being achieved. The basic concept of an emission trading program is to allow for alternative, cost-effective ways of achieving equal or greater overall emissions. To ensure that the trading program does achieve a greater overall emission reduction, it is important that the emission credits are created by genuine reductions in emissions. We will be issuing further guidance to assist States in designing

[109] The State should be able to compare the degree of visibility improvement through modeling. For example, for an emissions trading program, the State may undertake a regional modeling analysis that simulates least-cost market trades to predict the geographic distribution of the emission reductions that could be achieved through a market trading program and the resultant improvement in visibility at different Class I areas.

[110] U.S. Department of Energy, Energy Information Administration, ''The Effects of Title IV of the Clean AIr Act Amendments of 1990 on Electric Utilities: An Update,'' DOE/EIA–0582(97), March 1997.

their trading programs to ensure that programs provide such accountability.

Fourth, the regional trading program may include sources not subject to BART. Inclusion of such sources provides for a more economically efficient and robust trading program. The EPA believes the program can include diverse sources, including mobile and area sources, so long as the reductions from these sources can be accurately calculated and tracked.

Fifth, EPA encourages States wishing to develop such programs to consider the emission reduction requirements of other air quality programs. To implement reductions in a fully integrated fashion, the State should consider the extent to which some sources should be limited in their ability to trade. Examples of such factors include the significant contribution to a local nonattainment situation and the extent to which trading may assist or undermine the achievement of greater progress toward attainment of the NAAQS or the national visibility goal.

A related issue is the connection between determinations of BART under the reasonably attributable regulations and a trading program adopted in lieu of BART. The EPA has adopted a provision in the final rule that allows States to include a geographic enhancement in such a trading program to accommodate reasonably attributable BART. The purpose for including this provision is to address concerns regarding ''hot spots''—the concern that some part of visibility impairment in a specific Class I area is attributable or uniquely attributable to a single source or small group of sources because of the nature and location of the pollution from the source(s). Should action be taken by a State (or EPA) to address reasonably attributable impairment, these provisions would allow the State to incorporate methods, procedures, or processes in a market-based strategy to accommodate such action.

Sixth, interpollutant trading should not be allowed until the technical difficulties associated with ensuring equivalence in the overall environmental effect are resolved. Some other emissions trading programs (e.g., trading under the acid rain program) prohibit emission trades between pollutants. An emissions trading program for regional haze might also need to restrict trades to common pollutants. Each of the five pollutants which cause or contribute to visibility impairment has a different impact on light extinction for a given particle mass, making it therefore extremely difficult to judge the equivalence of interpollutant trades in a manner that would be technically credible, yet convenient to implement in the timeframe needed for transactions to be efficient. This analysis is further complicated by the fact that the visibility impact that each pollutant can have varies with humidity, so that control of different pollutants can have markedly different effects on visibility in different geographic areas and at different times of the year. Despite the technical difficulties associated with interpollutant trading today, EPA would be willing to consider such trading programs in the future that demonstrate an acceptable technical approach.

Application for Exemption from BART. Even where a source may reasonably be anticipated to cause or contribute to visibility impairment, section 169A(c) allows for the exemption of any source from the BART requirements if it can be demonstrated that the source, by itself or in combination with other sources, is not reasonably anticipated to cause or contribute to significant visibility impairment. In addition, as specified in section 169A(c)(2) of the CAA, any fossil-fuel fired power plant with a total generating capacity of 750 megawatts or more may receive an exemption only if the owner demonstrates that the power plant is located at such distance from all Class I areas that it does not, or will not, in combination with other sources, emit any pollutant which may be reasonably anticipated to contribute to significant visibility impairment.

As with the question of whether a source can be reasonably anticipated to cause or contribute to any visibility impairment, EPA believes that the question of whether a source causes or contributes to significant visibility impairment requires an analysis of the cumulative effects of emission sources on a region. Regional modeling will be one appropriate method to determine whether a source could qualify for the exemption from the BART requirements. If a significant cumulative impact is demonstrated from the sources across the relevant regional modeling domain, then any BART-eligible source in the region would most likely be found to be reasonably anticipated to cause or contribute to significant visibility impairment.

The proposed regional haze rule was structured such that the BART exemption provisions in section 51.303 of the existing visibility regulations would also apply to sources subject to BART under the regional haze regulation. In the final rule, EPA has taken the same approach. Consistent with section 51.303, a source may apply to EPA for an exemption from the BART requirement. The EPA will grant or deny an application after providing notice and opportunity for a public hearing. Any exemption granted by EPA must have the concurrence from all affected Federal land managers.

Timing for Submittal of BART Elements. Because TEA–21 changed the schedule for submittal of visibility SIPs, EPA is not requiring States to submit a list of BART-eligible sources to EPA within 12 months, as proposed. Under the final rule, the emission limits or other measures to address BART under the regional haze program must be included in the State's initial SIP submittal(s), as discussed further in unit III.B of this notice, except where the State commits to regional planning. In the case where a State opts to work with other States to develop a coordinated approach to regional haze by participating in a regional planning process, SIP revisions containing the BART emission limits or alternative measures in lieu of BART will be due generally at the time $PM_{2.5}$ nonattainment SIPs are submitted, but in no case later than December 31, 2008. As discussed in unit III.B, States that submit a commitment to participate in regional planning are required to submit the list of BART-eligible sources as part of that submittal.

I. Monitoring Strategy and Other Implementation Plan Requirements

Monitoring Strategy

Proposed rule. In the proposed rule, we included a requirement for States to develop a monitoring strategy. We believe that actual monitoring data are a critical component of any air quality management approach to visibility impairment. Data on individual components of PM (nitrates, sulfates, elemental carbon, organic carbon, crustal material) are crucial to understanding the causes of visibility impairment at a given location, and accordingly are necessary for long-term strategy development. Reviewing these data with time, and additional data provided by monitoring sites, are necessary to understand whether the long-term strategies are effective.

Under the proposed rule, an initial monitoring strategy was due 12 months after promulgation, with periodic updates every 3 years thereafter. Requirements for visibility monitoring are authorized under section 110(a)(2)(B), requiring SIPs to provide for the monitoring of ambient air quality, and under section 169A(b)(2), which authorizes EPA to establish regulations requiring SIPs to address ''other measures as may be necessary.''

Four separate provisions were included in the monitoring strategy requirement: (1) a requirement for States to provide for additional that is monitoring ''representative of all Class I areas,'' (2) a requirement for States with Class I areas to assess the relative contributions of sources within and outside the State to any Class I area within the State, (3) requirements for States without Class I areas to include a procedure by which monitoring data will be used to determine the contribution of emissions from within the State to Class I areas outside the State, and (4) a requirement to report all visibility monitoring data to EPA at least annually, in accordance with EPA guidance.

Comments received. Commenters on this requirement raised a number of concerns. One concern raised by State and local agencies was that the costs of monitoring could be substantial and urged EPA to provide funding. Other commenters urged EPA to exercise flexibility in determining the degree to which monitors in one Class I area could be considered representative of other nearby areas. Other commenters raised concerns about the feasibility of monitoring in remote areas and for areas with difficulty in gaining access to monitors during the winter. Commenters also expressed concerns over the timetable for the monitoring plan and the requirement for updating the strategy.

Final rule. Section 51.308(d)(4) of the final rule includes the requirement for a monitoring strategy. Under the final rule, this monitoring strategy is due with the first regional haze SIP, and it must be reviewed every 5 years.

Additional sites. Since the 1980's, EPA has cooperatively managed and funded the IMPROVE network with FLMs and States. Today, the IMPROVE network of 30 Class I sites (and an additional network of about 40 sites that use the IMPROVE methods) collects data on fine particle concentrations and on individual particle species. These individual species (sulfates, nitrates, elemental carbon, organic carbon, crustal material) are important for understanding causes and trends of visibility impairment at a given location. The network also employs optical monitoring methods for the direct measurement of light extinction, and scene monitoring methods using 35 millimeter photography.

The EPA is funding the deployment of several hundred $PM_{2.5}$ monitors by the end of calendar year 1999. In order to meet the requirements for some monitors to characterize background conditions and transport patterns, as well as to more broadly characterize visibility impairment in Class I areas for implementation of the regional haze program, EPA is funding the deployment of an additional 78 IMPROVE sites for Class I areas by the end of 1999. As a result of this anticipated network expansion, we expect that few, if any, State-funded monitors will be needed in implementing today's final rule. The IMPROVE Steering Committee is coordinating closely with the States on the selection of sites for the expanded network to help ensure that the new sites will meet States' needs for SIP development. The EPA expects that as a result of the IMPROVE Steering Committee process, the expanded network should provide for data that can be considered representative of most if not all Class I areas.

The monitoring strategy must, however, provide for additional monitoring sites if the IMPROVE network is not sufficient to determine whether reasonable progress goals will be met. This provision requires States with Class I areas to work with EPA and the FLMs to ensure that monitoring networks provide monitoring data that are representative of visibility conditions in each affected Class I area within the State. We want to clarify that this provision does not require a monitor in each Class I area, only that a monitor be representative of a Class I area. Accordingly, a monitor in or adjacent to one Class I area can be representative of one or more other Class I areas, based on certain criteria. Additionally, EPA agrees with commenters that a few Class I areas may have severe accessibility problems for which monitoring may not be feasible.

Use of Monitoring Data to Understand Contributions to Class I Areas. States with Class I areas are required to include in the regional haze SIP a monitoring strategy that is tailored to a given representative site. The strategy must identify the ways that the visibility monitoring and chemical composition analysis will be used to understand the emission sources that contribute to visibility impairment at a given monitoring site. Additionally, the monitoring strategy should identify the procedures for reviewing monitoring data and coordinating with other technical experts. We believe that continued coordination of visibility monitoring and chemical composition analysis among States, FLMs, and EPA will be important for future regional planning activities. Analysis of trends in emissions of those constituents can assist States in the development of long-term strategies for making reasonable progress.

The rule also requires monitoring strategies for States without Class I areas. We believe it is equally important for those States to understand and describe the implications of monitoring data. First, it is important for those States to review monitoring information, including data on the chemical composition of individual species concentrations, to help understand the relative contribution of emissions from their State to Class I areas in other States. Second, it is important for these States to understand and describe how they will use the monitoring data to review progress and trends.

Periodic Updates to Strategy. The rule requires an initial monitoring strategy and periodic updates. The initial monitoring strategy is due with a State's first SIP submission. Additionally, the rule requires that the monitoring strategy be reviewed every 5 years. We believe that when progress is reviewed and control strategies are updated, it will be important to review the monitoring strategy. For the periodic updates, States should review the existing monitoring strategy with the FLMs and other participating agencies to assess the need for additional monitoring sites or modifications to existing sites, as well as the need for updated guidance on monitoring protocols.

Monitoring Guidance. The EPA plans to issue a visibility monitoring guidance document soon after promulgating this rule that will be designed to assist the States in developing monitoring strategies. The document will include technical criteria and procedures for conducting aerosol, optical, and scene monitoring of visibility conditions in Class I areas. The protocols of the IMPROVE network will be included in this guidance.

Reporting of Monitoring Data

Proposed Rule. The proposed rule required States to report all visibility monitoring at least annually for each Class I area having such monitoring. We proposed that States report data in accordance with EPA guidance and through electronic data transfer techniques to the extent possible. There were no adverse comments on this reporting requirement.

Final Rule. We have retained a general requirement in section 51.308(d)(4) that States submit as part of the SIP a monitoring strategy that addresses the reporting of visibility monitoring data to EPA. As noted above, EPA expects that few, if any, additional State-funded sites will be necessary to

fully implement the regional haze rule. Where States do choose to fund additional sites, however, EPA believes it is important for the States to make data from these sites available to EPA and other agencies.

For monitoring sites in the IMPROVE network, the IMPROVE Steering Committee oversees network contractors who quality assure and consolidate data from chemical composition analysis of filter samples. Such data are made available to all interested parties through various electronic formats and online websites. Assuming this practice continues with the IMPROVE Steering Committee, States will experience little or no burden in meeting this requirement for reporting to EPA.

Annual consolidation of these data will serve several purposes. First, a central data base will allow the States and other interested parties to track progress over time in relation to reasonable progress goals. It will also assist the States in understanding current visibility conditions as well as past trends. Consolidation of the data will assist EPA, the State, other agencies, and the public in reviewing the effectiveness of the State's long-term strategy for regional haze. Additionally, consolidation of the data will enable EPA to better characterize national and regional visibility trends in its annual air quality trends report. Finally, a centralized data base will provide for the integration of monitoring data from the new $PM_{2.5}$ monitoring network and the visibility monitoring network, both of which will include $PM_{2.5}$ and PM_{10} mass, as well as compositional analysis by aerosol species. Class I area particle mass and chemical composition data can fill important data gaps in defining regional concentrations for air quality modeling analyses.

Requirements Under Section 110(a)(2) of the CAA. Visibility SIP submittals must document certain program infrastructure capabilities consistent with the requirements of section 169B(e)(2) and section 110(a)(2) of the CAA. Section 169(B)(e)(2) requires States to revise their section 110 SIPs to ''contain such emission limits, schedules of compliance, and other measures as may be necessary'' to carry out regulations promulgated pursuant to this section. The EPA believes that this language authorizes EPA to ensure that States review their existing program infrastructures to ensure that the types of elements required by section 110(a)(2) for programs addressing the NAAQS are also sufficient for adoption and implementation of SIP measures for regional haze. The final rule does not include specific provisions addressing all elements of section 110(a)(2). However, section 51.308(d)(4)(iv) of the final rule requires the State to maintain and update periodically a statewide inventory of emissions of pollutants that contribute to visibility impairment.

Where a State is also revising its SIP to incorporate changes to address the $PM_{2.5}$ NAAQS, many of these revisions may be sufficient to address both $PM_{2.5}$ and regional haze. The EPA encourages States to consider the needs of both programs when updating the provisions required by section 110 of the CAA to minimize any administrative burdens.

J. Periodic SIP Revisions and 5-year Progress Reports

Proposed Rule. The proposed rule required States to periodically review and revise their SIPs every 3 years. The preamble to the proposal stated that ''[t]he EPA believes that a requirement for regular SIP revisions will result in a more effective program over time and provide a focus for demonstrating ongoing progress and making mid-course corrections in emission strategies.'' [111] Each SIP revision would include a comprehensive review of the long-term strategy, and a review of emissions reductions estimates relied on in the previous plan if the State does not achieve any reasonable progress target.

The proposal also requested comment on whether SIP revisions should instead be required every 5 years. Regarding this option, EPA also took comment on whether it should revise the existing requirement in the ''reasonably attributable'' regulations for long-term strategy reviews from every 3 years to every 5 years, such that SIP revision schedules for both regional haze and reasonably attributable impairment would be coordinated.

Public Comments. Some commenters stated that the CAA does not allow EPA to require periodic SIP revisions. Several commenters felt that a requirement to submit comprehensive SIP revisions every 3 years would be overly burdensome, and would not provide enough time to properly evaluate changes in air quality and emissions resulting from implementation of strategies to meet reasonable progress targets. For this reason, a number of commenters supported a 5-year period between SIP revisions. Several participants in the GCVTC supported a 5-year review of progress that meets the procedural requirements of a SIP revision, but that also allows for the State to make a negative declaration if current strategies are deemed adequate for making reasonable progress at that time.

Other commenters supported SIP revisions every 3 years, citing EPA's preamble language, which noted that implementing mid-course corrections after the 5-year mark may in fact be too late to correct situations where impairment is steadily increasing. Some of these commenters also supported the 3-year cycle for regional haze SIPs since it would be consistent with the requirement for 3-year reviews of long-term strategies in the existing 1980 visibility rules.

Authority for Periodic Updates. The EPA does not agree with commenters that it lacks the authority to require periodic SIP revisions. Section 110(a)(2)(F) of the CAA provides that SIPs are to require ''periodic reports on the nature and amounts of emissions and emissions-related data'' and ''correlation of such reports * * * with any emission limitations or standards established pursuant to this chapter.'' Moreover, section 110(a)(2)(H) requires SIPs to provide for revision when found to be substantially inadequate to ''comply with any additional requirements established under * * * [the CAA].'' Both of these provisions provide EPA with the authority to require periodic SIP revisions.

The CAA calls for regulations to protect visual air quality in the Class I areas in a way that assures prevention of future impairment in addition to remedying existing impairment. A one-time review of impairment and development of strategies to address that impairment cannot provide such continuing assurance and, at best, can only focus on remedying currently known manmade visibility impairment within the limits of resources and technology. A program that did not anticipate and provide for the need for future periodic review and revisions, would not be responsive to the national goal of preventing any future manmade visibility impairment.

The requirement for periodic review of SIP measures also directly responds to the CAA goal for States to develop strategies to ensure reasonable progress toward the national goal of no human-caused impairment. Given that the statutory factors which States must consider in determining a reasonable progress goal include costs of control and availability of controls, among others, and given that technology changes can affect costs and availability of controls over time, EPA believes that the requirement for a periodic SIP revision is appropriate. The periodic revisions will assure that the statutory requirement for reasonable progress will

[111] 62 FR 41151.

continue to be met. The EPA believes that the need for periodic updates is also clear from the NAS conclusion that ''achieving the national visibility goal will require a substantial *long-term* (emphasis added) program.'' [112]

Three-year versus 5-year period. In considering the public comments, EPA also took into account the body of evidence indicating a need for multistate regional planning efforts under the regional haze program. Past experience with regional air quality planning efforts, such as the GCVTC or the Ozone Tranport Assessment Group (OTAG), has shown that regional air quality planning efforts often take 2 or more years to complete, with additional time needed for State adoption of measures and for review and approval by EPA.

After consideration of the comments described above, and the timeframes needed for regional planning, EPA concluded that a 5-year progress review and SIP revision cycle is more appropriate than a 3-year cycle. The EPA determined that the States will be better able to assess the effectiveness of emission management strategies by considering 5 years of data rather than 3 years since a 5-year period provides for more stable trend lines for emissions and air quality changes than a 3-year period. The EPA also concluded that a 5-year period should result in significantly less administrative burden on the States than a 3-year period.

Final rule requirements for comprehensive plan revisions and progress reports. The EPA has included in the final rule, two main requirements for comprehensive periodic plan revisions (section 51.308(f)) and progress reviews (section 51.308(g)). Section 51.308(f) requires the States to submit a comprehensive SIP revision in 2018 and every 10 years thereafter. It must meet all of the core requirements of section 51.308(d). The BART provisions of section 51.308(e), as noted above, apply only to the first implementation period. Section 51.308(g) requires progress reports for each Class I area in the State in the form of SIP revisions every 5 years.

Requirements for comprehensive periodic plan revisions. Comprehensive SIP revisions under section 51.308(f) must include all of the implementation plan elements found in section 51.308(d) of the final rule. These elements include, but are not limited to, the following: (1) reasonable progress goals for the next 10-year implementation period, (2) determination of current conditions and review of estimates for natural conditions, (3) a revised long-term strategy, as necessary to achieve the reasonable progress goal for the next 10-year implementation period, and (4) revised emission inventories, technical analyses and monitoring strategies. The EPA wishes to clarify the following points with respect to the basic core provisions of section 51.308(d) for the purpose of periodic comprehensive plan updates.

Reasonable progress goals. For purposes of the periodic plan revisions, the State must select a reasonable progress goal based upon the statutory factors discussed above in unit III.F. In determining the goal for the next implementation cycle, the State must include an analysis of the rate of improvement needed to reach natural conditions by the year 2064 as an analytical framework for the plan revision. To conduct this required analysis, the State must follow the same four steps discussed in unit II.F for the initial plan revision, that is (1) identification of the difference between baseline conditions and natural conditions (noting any updates to the estimate of natural conditions based upon technical refinements), (2) identification of the uniform rate of progress over the 60-year period that would be needed to attain natural conditions by the year 2064, (3) identification of the amount of progress that would result if this uniform rate of progress were achieved during the period of the regional haze implementation plan,[113] and (4) identification of reasonable progress goals in light of the statutory factors, taking the 60-year analysis into account. The State must also calculate the number of years it would take to attain natural conditions if visibility improvement continues at the rate of progress selected by the State as required in section 51.308(d)(1)(ii).

Reporting of Baseline and natural visibility conditions. In the SIP submission for the comprehensive periodic plan updates, the State must identify (1) the visibility change from baseline conditions, (2) the visibility change since the last SIP revision 10 years ago, and (3) the difference between current and natural conditions.

Visibility Change from Baseline Conditions. Section 51.308(f) calls for States to consider, at the time of any future SIP revision after the initial implementation plan, the amount of visibility improvement achieved from baseline visibility conditions (established over the period 2000-2004) in developing future reasonable progress goals and associated strategies. The final rule requires the State to do this by comparing ''current conditions'' for the 5 years of most recent visibility data with baseline conditions. (See discussion in unit III.E on definition of ''current.'') Any lack of progress in improvement of visibility from baseline conditions will need to be explained in the SIP revision and considered by the State in the establishment and/or revision of new reasonable progress goals and/or emission management strategies. Similarly, greater than expected improvements should be considered by the State in setting new visibility goals and emission management strategies.

If little or no perceptible visibility improvement has occurred in comparison to baseline conditions, or if conditions have actually degraded, then the State will need to explain the reason for this degradation in the SIP, and should seriously consider establishing more ambitious goals and additional enforceable measures to achieve these goals. The EPA will take into account the amount of progress achieved to date from the baseline period in determining whether any future strategy would ensure ''reasonable progress.'' If significant visibility improvement has occurred from baseline conditions, then EPA can also take this into account in reviewing future reasonable progress goals and strategies.

Visibility Change Since Last SIP Revision. Section 51.308(f) also calls for States, in developing reasonable progress goals for the next 10 years, to take into account how visibility conditions have actually changed since establishment of the previous reasonable progress goal. (This provision would apply beginning in the second SIP revision cycle under the regional haze program.) If conditions degraded or failed to meet reasonable progress goals, the State would be required to analyze the cause of the shortfall, and address it as appropriate in future strategies. If the State has failed to achieve its reasonable progress goal for the prior implementation period, the State would be required to include in its revision a comparison of the visibility improvement the State

[112] National Research Council, NAS Committee on Haze in National Parks and Wilderness Areas, Protecting Visibility in National Parks and Wilderness Areas, National Academy Press, 1993, page 10.

[113] Referring to the example in unit III.F, if the second implementation plan covers a 10-year period from 2019 through 2028, then the State would identify a 3 deciview rate of improvement, and the amount of visibility improvement that must be analyzed for the year 2028 would be the 3 deciview improvement for the years 2019 through 2028, plus the 4.2 deciviews of improvement for the years 2004 through 2018.

expected to achieve to the visibility improvement the State actually achieved.

Difference between current and natural conditions. Section 51.308(f) of the final rule requires the State, at the time of any comprehensive SIP revision, to calculate the difference between current conditions and natural conditions for the most impaired and least impaired days. ''Current conditions'' means the conditions for the most recent 5-year period preceding the required date of the implementation plan submittal. This calculation is needed to determine the total amount of improvement that States will ultimately need to address in their long-term strategies.

Long-term strategies. As for the first implementation plan, subsequent comprehensive updates must identify the enforceable emissions reductions that will provide for meeting the reasonable progress goal for Class I areas within the State and for Class I areas outside the State which may be affected by emissions from the State. Unit III.G provides additional detail on the requirements of the long-term strategies.

Update of monitoring strategies and other requirements. The comprehensive updates are also required to meet the requirements of section 51.308(d)(4) for updated monitoring strategies, updated emission inventories, and other required technical analyses.

Requirements for 5-year progress reports. Section 51.308(g) describes the required elements for progress reports due every 5 years. For States that participate in regional planning and submit initial SIPs in 2008, the first progress report will be due in 2013. If a State submits its initial SIP in the 2004–2008 timeframe, its first progress report would be due before 2013. These progress reports must follow the same procedural requirements required for implementation plan revisions, and the State must provide the opportunity for public review and comment. However, the rule also allows the State to submit this progress report in the form of a negative declaration if the State finds that emission management measures in the SIP are being implemented on schedule, and visibility improvement appears to be consistent with existing reasonable progress goals. The EPA intends for progress reports to involve significantly less effort than a comprehensive SIP revision.

Each 5-year progress report must contain the following elements as specified in section 51.308(g):

- The status of implementation, and summary of the emissions reductions achieved, for all emission management measures implemented within the State in order to achieve reasonable progress goals for Class I areas within and outside the State.
- For each Class I area located in the State, the report must include calculations of the following parameters:

—Current visibility conditions for the most impaired and least impaired days.
—The difference between current conditions and baseline conditions for the most impaired and least impaired days.
—The change in visibility for the most impaired and least impaired days over the past 5 years.

- An emissions tracking report that analyzes the change over the past 5 years in emissions of pollutants contributing to visibility impairment, disaggregated by source category and emissions activity, for significant categories of sources or activities.
- An assessment of whether current implementation plan strategies are sufficient for the State or affected States to meet their reasonable progress goals.

Based on the required calculations and assessments in the progress report, the State must take one of four actions as specified in section 51.308(h). If the State finds that an additional substantive SIP revision is not required, then it may submit a ''negative declaration'' to EPA after opportunity for public review and comment. The EPA anticipates that if the State is implementing a reasonable set of strategies according to the schedule as developed in the previous comprehensive SIP revision, and that visibility trends show that reasonable progress goals should be achieved over the 10-year long-term strategy period, then the State should be able to certify, through a negative declaration, that no additional control measures are needed at the time of this mid-course review.

If the State finds that over the past 5 years there has been a substantial increase in emissions by intrastate sources, or there has been a deficiency in plan implementation, the final rule requires the State to revise the SIP within 1 year, rather than waiting for the next 10-year comprehensive review. Such a mid-course correction would be designed to achieve the existing reasonable progress goal for the relevant Class I area. The EPA believes that it is appropriate for the State to take prompt action to address intrastate problems since they would not need to participate in further regional planning.

If the State finds that there is a substantial increase in emissions or a deficiency in plan implementation resulting primarily from interstate emissions, section 51.308(h)(2) calls for the State to re-initiate the regional planning process with other States so that the deficiency can be addressed in the next comprehensive SIP revision due in 5 years. 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.

If EPA finds that the State has not been implementing certain measures adopted into its SIP, or that the State has submitted a SIP that is not approvable, or that the State has failed to submit any required progress report or SIP revision at all, the State could be subject to sanctions in accordance with sections 179(b) and 110(m) of the CAA. If the State does not resolve the situation expeditiously, EPA may be obligated to take further appropriate action to resolve the situation, including promulgation of a FIP within 2 years in accordance with section 110(c) of the CAA. The EPA believes that in this regionally-oriented program, it will be important for States to implement measures designed to improve visibility for Class I areas outside of their State, as well as to improve visibility within the State. The EPA will exercise its FIP authority as appropriate and necessary to ensure that States fulfill their obligations such that Class I areas make reasonable progress toward the national visibility goal.

K. Coordination With Federal Land Managers

Section 51.308(i) of the final rule requires that States consult with FLMs before adopting and submitting their regional haze SIPs. This requirement is consistent with the proposed regional haze rule and the 1980 regulation for ''reasonably attributable'' visibility impairment. A number of commenters expressed a concern that this provision was not equitable, in that States are required to consult with FLMs, but the rule does not require FLMs to consult with States before they take action, even when actions such as prescribed burning could have a significant impact

on a State's visibility program. These commenters recommended that the proposed rule be amended to mandate a two-way communication.

The EPA agrees that it is important and necessary for FLMs to consult with States on visibility-related issues. Land-use activities on Federal lands can have impacts on nearby areas of a State, and there have been significant air quality issues related to these activities. In recent years, FLMs have undertaken activities to improve communications with States. There are a number of examples of these efforts. The IMPROVE steering committee, the group that oversees FLM efforts to monitor visibility in Class I areas, includes representation from State agencies. Recently, State representation on this committee was expanded by adding two more State members. Another example are the memoranda of understanding that FLMs have entered into with States to coordinate prescribed burning activities. The EPA believes that the FLM agencies generally recognize the importance of involving States in the development and implementation of land use policies and other actions that affect States' abilities to make air quality improvements.

The EPA believes that it is unnecessary to impose an administrative requirement on another agency of the sort requested by commenters in a Federal rule, because Federal agencies are already subject to compliance with SIP requirements in the same manner, and to the same extent as any nongovernmental entity through section 118, as discussed below. The EPA will, however, be working with FLMs and States to assist in their communications over air quality issues.

Commenters also expressed concerns that emissions from Federal agencies are beyond their jurisdiction. These commenters felt that if States were not able to regulate such emissions, then other sources within the State would be treated inequitably under the final rule. The EPA does not agree that Federal sources are beyond a State's jurisdiction. As required by section 118 of the CAA, if a State air quality regulation affects a given type of source within its jurisdiction, Federal facilities having that type of source must comply with the State regulations in the same manner, and to the same extent as any nongovernmental entity. Thus, FLMs having emission sources of the type that are covered by State air quality regulations are subject to the same extent as private sector entities.

IV. Treatment of the GCVTC Recommendations

A. Background

The EPA established the GCVTC on November 13, 1991.[114] The purpose of the GCVTC was to assess information about the adverse impacts on visibility in and around 16 Class I areas on the Colorado Plateau region and to provide policy recommendations to EPA to address such impacts. Section 169B of the CAA called for the GCVTC to evaluate visibility research as well as other available information ''pertaining to adverse impacts on visibility from potential or projected growth in emissions from sources located in the region.''

The GCVTC was required to issue a report to EPA recommending what measures, if any, should be taken to protect visibility.[115] The CAA required that, at a minimum, this report was to consider: (1) The establishment of clean air corridors,[116] (2) the need to impose additional new source review requirements in any clean air corridors, and (3) additional restrictions on increases in emissions which may be appropriate to protect visibility in affected Class I areas. The GCVTC was also required to address the promulgation of regulations addressing long-range strategies to address regional haze in the region. In June 1996, the GCVTC issued its recommendations to EPA.

The GCVTC recommendations covered a wide range of control strategy approaches, planning and tracking activities, and technical findings. The primary recommendations of the GCVTC covered nine categories of activities: [117]

- Air pollution prevention and reduction of per capita pollution as a high priority, including non-binding targets on production of electricity from renewable energy sources;
- Tracking the effect of new sources of emissions on clean air corridors;
- Closely monitoring stationary source emissions, establishment of regional targets for sulfur dioxide emissions for the year 2000 and the year 2040 with interim targets to be established in the future, exploration of a similar tracking system for other pollutants, and the development of market-based regulatory programs if emissions targets are not met;
- Emissions reductions in and near Class I areas;
- Capping of mobile source emissions for areas contributing to visibility impairment, and State support for national measures aimed at further reducing tailpipe emissions;
- Further assessment of the contribution of road dust to visibility impairment;
- Future binational collaboration to resolve technical and policy concerns about contributions to visibility impairment on the Colorado Plateau resulting from emissions from pollution sources in Mexico;
- Implementation of smoke management programs to minimize effects of all fire activities on visibility; and
- The need for a future regional coordinating entity to follow through on implementing the recommendations.

Proposed rule. In the July 31, 1997 proposal of the regional haze rule, EPA included an extensive review of the recommendations of the GCVTC.[118] The preamble discussed how several concepts from the GCVTC's recommendations were incorporated into the proposed framework for the national regional haze program. For example, EPA proposed an approach for tracking reasonable progress, based on improving conditions on the worst visibility days and not allowing conditions on the best days to degrade, that was consistent with both the GCVTC's definition of ''reasonable progress'' and with the CAA national visibility goal of remedying any existing impairment and preventing any future impairment. The proposal also called for tracking of continuous emissions to inform State control strategy decisions on a periodic basis.[119]

However, in its proposal, EPA chose not to incorporate the GCVTC's specific emission management strategies as direct requirements for SIPs. The EPA followed this approach because the proposed rule was designed to establish a national framework for development of SIPs to remedy regional haze visibility impairment in all Class I areas nationwide. In addition, it was not clear how the various elements of the GCVTC's report were to be translated into SIP requirements. The EPA noted in the proposal that the ''Commission's recommendations have components that contemplate implementation through a combination of actions by EPA, other Federal agencies, States and Tribes in the region, and voluntary measures on the part of the public and private

[114] See 56 FR 57522, Nov. 12, 1991.

[115] CAA Section 169B(d).

[116] A Clean air corridor is defined as a region that generally brings clear air to a receptor region, such as the Class I areas of the Golden Circle.

[117] See GCVTC Report, pp. i–iii.

[118] 62 FR 41141.

[119] 62 FR 41146.

entities throughout the region.'' [120] The EPA indicated that such a mixture of activities made it difficult for EPA to directly require States to implement all of these measures in their SIPs. Instead, the EPA specifically sought public comment on the manner in which the national regional haze program framework, as proposed, would allow for implementation of the GCVTC's recommendations.[121] The EPA also solicited comment on whether to adopt the GCVTC's stationary source strategies with or without modification.[122]

The EPA also reiterated its position in testimony before the United States Congress, stating that ''we specifically designed the regional haze rule to allow for implementation of the GCVTC's recommendations to address the environmental goal of improving visibility.'' [123]

In public meetings and written comments following the proposal, interested parties expressed concern that the proposed rule did not specifically endorse or incorporate the GCVTC's recommendations. Some commentors asserted that the rule ''ignored'' the recommendations. The EPA also received numerous comments that supported adoption of the GCVTC recommendations as part of the national regional haze rule. In particular, several commentors who believed that EPA's proposed rule did not adequately support the GCVTC's recommendations asserted that EPA's participation in the GCVTC implied that strategies developed to address visibility in Class I areas of the Colorado Plateau would be taken into account within the structure of the rule. Commentors also noted that EPA's proposal of a visibility target and requirements to address BART left a high degree of uncertainty as to whether the GCVTC recommendations could form the basis for SIPs.

On June 29, 1998, after the close of the public comment period on the proposed regulations, the WGA sent to EPA additional comments on the proposed regional haze rules. These comments contained specific new language for addressing the recommendations of the GCVTC. The comments offered provisions to be included in the national regional haze rule to allow certain western States to submit SIPs to assure reasonable progress in addressing regional haze impacts on the Colorado Plateau based upon the technical work and policy recommendations of the GCVTC.[124] The transmittal letter signed by Michael O. Leavitt, Governor of the State of Utah, reemphasized the commitment of Western governors to the GCVTC recommendations, and requested that EPA take public comment on their suggested preamble and rule language as part of the EPA process in reaching decisions on a final regional haze rule. In response to this submittal, on September 3, 1998, EPA published a notice of availability in the **Federal Register**.[125] The notice solicited public comment on the contents of the WGA letter and EPA's translation of the letter's requirements for SIPs into draft regulatory language. The comment period for the notice of availability closed on October 5, 1998 and EPA received approximately 125 comments. In summary, most of the commentors supported the adoption of provisions to directly address the GCVTC recommendations in the national rule, although many requested changes to the draft regulatory language. Some commentors expressed concern over how these provisions would relate to the national rule, in particular to the national provisions for BART. Other commentors addressed the way in which the WGA letter and EPA's draft regulatory language translated the GCVTC's recommendations. In addition, some commentors expressed concern over the timing of the SIP submittals both over the linkage to timing of SIP submittals for ozone and $PM_{2.5}$ SIPs and the requirements of TEA–21. Commentors also requested EPA to commit to consider the national transportation measures noted by the GCVTC as part of EPA's responsibility toward helping the States make reasonable progress.

In the final rule, EPA is establishing specific SIP requirements which may be used by the States and tribes that participated in the GCVTC to satisfy the national regional haze rule. These SIP requirements will form a basis for these States to meet the CAA requirements for reasonable progress in the 16 Class I areas addressed by the GCVTC Report. These SIP requirements acknowledge and give effect to the substantial body of work already completed by the States and tribes participating in the GCVTC. The Agency, therefore, and for reasons explained in more detail below, provides these SIP requirements as an optional way for these States and tribes to implement the national rule based on the merits of the work of the GCVTC completed before establishment of the national framework. The EPA finds that the GCVTC actions to date address, or provide a mechanism to address, the statutory factors for assessing reasonable progress required by the CAA. The EPA is satisfied that the GCVTC's strategies as set forth in section 51.309, when supplemented by the annex process discussed below, will provide for ''reasonable progress'' toward the national visibility goal for the 16 parks and wilderness areas addressed by the GCVTC. Consequently, if a State submits a plan that addresses the requirements of section 51.309, including the requirements related to the annex, as described below, that plan will be considered to comply with the national rule's requirement for reasonable progress for the period from plan approval to 2018.

Today's final rulemaking, including section 51.309, is directly responsive to the western States' and tribes' comments calling for recognition of the policy development efforts of the GCVTC. At the same time, the rule allows for future cooperative efforts among the GCVTC States, so that the national requirements for ensuring reasonable progress are fully addressed. This action exemplifies how the regional haze protection provisions can be flexible and allow for a broad range of emissions control strategies tailored to a specific region. This action fully recognizes the GCVTC and its follow-up body, the WRAP, as a valid regional planning process to address, at a minimum, the 16 Class I areas that were the focus of the GCVTC. Section 51.309 provides for continued work of the GCVTC, which may be accomplished through the WRAP, to establish a complete framework which can be adopted in the SIPs for addressing all sources of visibility impairment in the 16 Class I areas. The section also sets forth provisions for addressing additional Class I areas that were not directly addressed in the GCVTC report.

Section 51.309 does not preclude States from developing and adopting their own control strategies. Rather, it provides an expedited process whereby a State choosing to follow the GCVTC's recommendations in its SIP can rely fully on the technical analyses, policy recommendations, and agreements reached by the GCVTC members, thereby significantly reducing the effort required to establish federally approvable SIPs. A State remains free to develop and submit a SIP to EPA which does not rely on the GCVTC's work or

[120] 62 FR 41142.

[121] 62 FR 41143.

[122] 62 FR 41143.

[123] Written Testimony of John S. Seitz, Director, Office of AIr Quality Planning and Standards, U.S. Environmental Protection Agency, before the Subcommittee on Forest and Public Land Management of the Committee on Energy and Natural Resources, United States Senate, October 28, 1997.

[124] Docket A–95–38, Item # VIII–G–76.

[125] 63 FR 46952.

section 51.309. Such a State will be fully subject to the requirements and schedules set forth in section 51.308, in the same manner and to the same extent as the States and tribes throughout the United States that did not participate in the GCVTC process.

B. General Requirements of Section 51.309

Section 51.309 requires specific emissions control strategies for a broad region of the Western United States and includes measures which address different types of emissions sources, including stationary, area and mobile sources. Some of these strategies are already in place while others, such as mobile source provisions and the structure of a market trading system to assure compliance with stationary source emissions goals, will require development of additional regulatory measures. A review of each element of section 51.309 is found in unit IV.C below.

The GCVTC recommended emission reduction targets from stationary sources of SO_2 for the years 2000 and 2040. The GCVTC did not recommend quantitative interim targets between the years 2000 and 2040. Therefore, in addition to provisions for specific emissions strategies, section 51.309 allows for an annex to the GCVTC report which will be considered in establishing specific targets for SO_2 emissions from stationary sources in the region between 2003 and 2018. This annex process and EPA's approval of acceptable interim emissions targets for SO_2 will be key in completing a series of strategies that can be deemed by EPA as meeting reasonable progress for the Class I areas on the Colorado Plateau.

The provisions for adoption of strategies consistent with the GCVTC recommendations do not preclude the States and tribes from developing additional control strategies for achieving reasonable progress in other Class I areas. Nor do they preclude States and tribes which did not participate in the GCVTC, but which may benefit from its strategies due to the geographic proximity of their Class I areas to the State where strategies will be implemented and regional transport throughout the west, from building on these strategies to address reasonable progress for their Class I areas. However, for all Class I areas not on the Colorado Plateau, the States and tribes would need to demonstrate, through the required analyses, that implementation of these strategies would contribute to meeting the requirements of section 51.308. By focusing first on implementation strategies for the 16 Class I areas based on the recommendations of the GCVTC, all western States may reduce the technical and administrative costs of addressing the remaining Class I areas by building on the outcome of existing programs rather than requiring the development of two programs in parallel.

In the national rule, EPA is requiring States to analyze the rate of progress in visibility improvement that would be needed to reach natural conditions within 60 years. The analyses must assess what strategies are available to meet that rate for the period of the long-term strategy. The GCVTC reviewed the period from 1990 to 2040 to assess what strategies were reasonable to achieve visibility improvement in the 16 Class I areas. The GCVTC's Alternatives Assessment Committee developed a modeling system linking emissions control strategies, the costs of such strategies and the degree of visibility improvement that would result from those strategies. While not specifically attempting to reach natural conditions within 60 years, a key emissions control scenario assessed in the GCVTC process was a ''maximum management alternative.'' The GCVTC looked at many source types and their impacts on visibility. This specific assessment applied all known and anticipated control strategies over the time period as an indicator of the maximum amount of improvement in visibility possible in the region. The results of this analysis did not show sufficient emissions to reach natural conditions in any mandatory Class I area by 2040. The analysis of this scenario did, however, demonstrate that the ''maximum management alternative'' is not likely to be achievable based on technological, economic and policy choices made by the Alternates Assessment Committee due to costs, degree of visibility improvement and other factors. Consequently, EPA finds this analysis, plus the management alternatives chosen (i.e., market-based emissions reductions, specific source-sector reductions, etc.) to be an acceptable basis for approvable SIP strategies for the 16 Class I areas for the first long-term strategy period since, in effect, reaching natural conditions by 2040 was shown not to be reasonable in this transport region at this time. In making this finding, EPA concludes that the GCVTC analyses and process provide for an assessment comparable to that called for by section 51.308.

In promulgating section 51.309, EPA is establishing specific SIP requirements for the time period 2003 through 2018 based on demonstrations by the GCVTC. The EPA finds the GCVTC demonstrations satisfy requirements for review of the statutory factors as provided for under subsection 51.308(d).

While the GCVTC's assessment included projections to the 2040, EPA feels that the strategies incorporated in section 51.309 must be re-evaluated in 2018 to assure that they will continue to achieve reasonable progress after a thorough review of the CAA factors. As discussed elsewhere in today's notice, this periodic review and revision of regional haze SIPs is needed because of technological changes and economic factors which are likely to significantly alter both the rate of emissions growth within a region, and the degree to which new technologies can more effectively reduce emissions, both of which can affect the rate of visibility improvement. In addition, the requirement for periodic revisions is consistent with the statutory provisions governing long-term strategies.

The EPA agrees with commentors who noted certain benefits to following the pathway provided through section 51.309 for addressing regional haze impairment. First, there is the benefit that the mixture of required strategies for the 16 Class 1 areas has already been through public comment as part of the GCVTC deliberations and subject to review by many stakeholders. This previous public debate should help ensure broader public support for the State's plans as they are adopted and implemented. As pointed out by commentors, one of the benefits of the GCVTC recommended strategies is that they are aimed at developing cost-effective control strategies and ensuring compliance flexibility for affected sources. For example, the strategy to address emissions from stationary sources uses a milestone and backstop emissions trading program mechanism. This rewards voluntary emissions reductions since a regional emissions trading program would only become effective if regional milestones are exceeded. Given that the provisions for the milestone and backstop emissions trading system may be approvable in lieu of BART, depending on the milestones developed in the annex, full compliance with BART emissions limitations would not be required within 5 years of plan submittal, as would be required of States which submit plans under section 51.308 requiring source-specific BART. In addition, the economies of scale offered by the work of the WRAP in conducting coordinated assessment activities, such as economic and air quality modeling, could be substantial in aiding States in meeting their planning obligations.

Finally, EPA's provisional view that SIPs which meet section 51.309 would satisfy the requirement for reasonable progress minimizes the analyses required of States which adhere to the requirements of section 51.309, compared to States making an independent submittal under section 51.308.

C. Elements of the GCVTC-Based State and Tribal Implementation Plans

1. Time Period

Section 51.309(d)(1) establishes the time period of the plan to cover the 16 parks and wilderness areas for the period 2003 through 2018. The GCVTC's recommended emissions reduction strategies, including the emission reduction approach for stationary sources of SO_2, establish the long-term strategy requirements for plan submittals to EPA until the year 2018. This time period is consistent with the submittals required under section 51.308 which will be due between 2004 and 2008 depending on the classification of State areas with respect to attainment of the recently promulgated NAAQS for $PM_{2.5}$. The time period covered by the plan revision due under section 51.309, 2003–2018, is somewhat different from the timeframe for long-term strategies required by section 51.308 for the Class I areas not on the Colorado Plateau. The differences that exist acknowledge the substantial early work of the GCVTC, on the 16 Class I areas, while at the same time making the strategy review cycle consistent with the timetable established in section 51.308.

The EPA received comment that it should allow the GCVTC recommendations to be the basis of all future strategies to address regional haze for the 16 Class I areas on the Colorado Plateau permanently. The EPA disagrees. No given set of emissions strategies can be determined reliably to achieve reasonable progress into the distant future. While the GCVTC strategies adopted by the States under the provisions of section 51.309 may well continue to be adequate to meet the future long-term strategy requirement, a full review of emissions strategies for all Class I areas of the region is appropriate to assure that ''reasonable progress'' is being achieved and will continue to be achieved during the periods of subsequent long-term strategies. As noted above, the relevant facts concerning costs of controls, availability of control strategies, and other statutory factors will change over time. Advancements in technology and changes in economic factors will likely provide opportunities for implementation of new cost-effective control measures to assure reasonable progress. The structure of EPA's rule is designed to require States, through the SIP process, to review the statutory factors on a periodic basis and determine appropriate changes to their strategies based on that review.

2. Projection of Visibility Improvement

Section 51.309(d)(2) requires the plan to contain a projection of the visibility conditions expected through the year 2018 and to take into account the measures required in the GCVTC report and the provisions of section 51.309. This projection must, at a minimum, be expressed in units of deciview.

The Agency received comment that the GCVTC States should not be required to estimate visibility conditions using the deciview metric, but should be permitted simply to track emissions over time. While EPA encourages States to track emissions in order to evaluate the emission reduction effectiveness of adopted control measures, it is equally important that changes be translated into visibility improvements in order to be responsive to the national goal. As noted earlier in unit III.C of this notice on the deciview metric, EPA's selection of the deciview scale is an appropriate way to do this. The Agency also included this provision to ensure that the public understands the relationship of the SIP to visibility conditions at the Class I areas and to the national goal of no manmade impairment in visibility in these areas. The Agency thus feels that it is appropriate to inform the public on the relationship between chosen emissions control measures and their effect on visibility by requiring States to report on actual and expected changes in visibility to be achieved through implementation of section 31.309. Those changes can be based on monitored data as well as estimated for future conditions based on implementation of emissions strategies. Moreover, the requirement for use of the deciview metric does not prevent the States from using other indicators, in addition to the deciview, for describing regional haze conditions, such as standard visual range or atmospheric light extinction.

3. Treatment of Clean Air Corridors

Section 51.309(d)(3) requires the States to identify a geographic region or regions which will be subject to a comprehensive emissions tracking strategy. The purpose of such comprehensive emissions tracking is to ensure that the frequency of clear days, or days with good visibility, increases or does not decrease at any of the 16 Class I areas addressed by the GCVTC. This section of the rule is designed to make the review of emissions, and their resulting impact on the clear days at the Class I areas, part of the public record through the SIP approval process. It does not mandate any emissions control strategies specifically aimed at improving clear days, but provides for the State to periodically review the need for such strategies. If anthropogenic emissions create visibility impairment above natural conditions, and if overall annual human-caused emissions reductions take place in a region, it is likely that visibility will improve for both the most impaired days and the least impaired days.

The geographic area (or areas) to be covered by the emissions tracking strategy is to be determined initially based on the GCVTC Meteorology Subcommittee's report entitled Clean Air Corridors: A Framework for Identifying Regions that Influence Clean Air on the Colorado Plateau. The geographic area (or areas) can be further refined based on new technical findings over time. The requirement to track emissions will enable States to quickly determine if changes in patterns of emissions will reduce the number of clean air days (defined as the average of the 20 percent clearest days) in any of the 16 Class I areas. The State must analyze the effects of the emissions changes and implement additional measures to protect the clean days if necessary. The States may include the tracking of emissions for the clean air corridors with tracking of emissions for other purposes such as compliance with stationary source emissions targets, if appropriate. The EPA notes that clean air corridors will be protected by other implementation plan requirements, such as other SIP measures that may apply to existing stationary sources. States may wish to rely on technical cooperation now beginning under the WRAP as an efficient means to consolidate efforts on emission inventories and projections needed to monitor clean air corridor emissions and their effects on clear air days.

4. Implementation of Stationary Source Reductions

To achieve the reductions in emissions for stationary sources projected in the GCVTC's strategies, subsection 51.309(f)(1)(i) requires the establishment of SO_2 emission reduction milestones as part of the development of an annex to the GCVTC report. Section 51.309(d)(4) requires monitoring and reporting of stationary

source emissions of SO_2 in order to assess compliance with these milestones during the period 2003 to 2018. The SIP must contain criteria and procedures for implementing a market trading program or other program documented in the SIP, consistent with section 51.309(f)(1)(i), if triggered by emissions exceeding the emissions reduction milestones. In particular, the SIPs must provide for implementation of the market-based program or other emissions control strategy as called for by an assessment of SO_2 emissions for the years 2003, 2008, 2013, and 2018. States must fully activate the market system or other program within 1 year after an assessment showing the excessive emissions. In addition, the implementation plan must provide for all affected sources to comply with the market system or other programs allocating emissions within 5 years after the date the program is triggered. The rule also requires States to report on actual emissions reductions and compare them to the established milestones. If a market trading program or other program is triggered, the rule requires States to report whether all sources covered by the market trading or other programs are in compliance with applicable requirements.

In addition to requirements for control of emissions of SO_2, the rule requires the State to explore emission management options for stationary source emissions of PM and NO_X. The States are required to report by 2003 on their consideration of the need for emissions targets for these pollutants to prevent growth in emissions of these pollutants in the region as a whole. The EPA believes that the States should base their decisions on the need for, and levels of, emissions targets for these pollutants on the degree to which such pollutants contribute to regional haze impairment in the Class I areas addressed by their SIPs. The States must report to EPA by 2003 on their decisions whether to develop targets and additional control strategies for PM and NO_X emissions from stationary sources. If the States determine that such targets and controls are needed, they must submit a plan revision to EPA not later than December 31, 2008 containing any necessary long-term strategies and BART or other requirements for stationary sources of PM and NO_X.

In adopting the requirements for stationary source emission reduction milestones in this manner, EPA is indicating that the State's adoption of approvable SO_2 milestones and a backstop market trading program as set forth in section 51.309(f) in addition to the other requirements in section 51.309 would provide for reasonable progress for the 16 Class I areas for the implementation period from 2003 to 2018. The emissions reductions provided for by the milestones and trading program must address the BART provisions in section 51.308(e). For the reasons discussed in the portion of this preamble concerning BART requirements, EPA believes that the GCVTC's adoption of a market based alternative to source-by-source BART will permit the GCVTC States to meet the provisions of the national rule which allow the use of alternative measures in lieu of BART. Implementation of the framework established by subsections 51.309 (d)(4) and (f) will thus satisfy the provisions for an alternative measure in lieu of BART for regional haze impairment set forth in section 51.308(e)(2), provided the interim milestones called for in the annex assure greater reasonable progress than would be achieved by application of BART. The EPA will supplement its actions on the stationary source strategy with future rulemaking on the States' submission of interim milestones for SO_2 emissions as part of the annex. In reviewing the interim milestones, EPA will be informed by the annex to the GCVTC report provided for in section 51.309(f) to be discussed later.

5. Mobile Sources

Section 51.309(d)(5) requires implementation plans to address the contribution to regional haze by emissions from mobile sources. This mobile source provision is based on the finding in the GCVTC Report that reducing total mobile source emissions is an essential part of any long-term strategy for management of visibility on the Colorado Plateau.[126] The GCVTC found that some urban areas will already be developing mobile source emissions budgets and programs to meet other CAA requirements. To the extent that mobile source emissions in these or other areas are found to contribute significantly to visibility impairment in the Class I areas of the Colorado Plateau, the GCVTC recommended that an emissions budget be established for any area with a significant contribution to the regional mobile source emissions total. The GCVTC called for the budgets to be established beginning in the approximate year in which emissions from mobile sources are projected to be at their lowest point during the planning period of 2003 to 2018, which is expected to be in 2005. The emissions budget should serve both as a planning objective and a performance indicator for that area.

Accordingly, today's final rule requires all plans to provide for an inventory of current and projected emissions (VOC, NO_X, SO_2, elemental carbon, organic carbon, and direct fine particles) from mobile sources for the 2003 to 2018 period. Because, as noted in the GCVTC Report, the inventory for the year 2005 is expected to represent the expected lowest total emissions from mobile sources in the planning period, that inventory must be included in the SIP. Once State inventories have been compiled and evaluated, the States with urban areas found to contribute significantly to visibility impairment in the 16 Class I areas must establish and document their mobile source emissions budgets for any such area. In addition, the States must establish SIP components which limit VOC, SO_2, NO_X, elemental and organic carbon and direct fine particulate mobile source emissions to their projected lowest levels for the period 2003 to 2018. The State plans must also provide for the implementation of measures to achieve the mobile emissions budget, and for demonstrations of compliance with any such budget. The demonstrations must include a tracking system to evaluate and demonstrate the State is meeting its share of the regional mobile source emissions budget.

The GCVTC report also noted that the Federal government has a role in addressing mobile source emissions. The GCVTC report identified several national mobile source-related emissions reduction strategies under consideration by EPA that are important to visibility conditions in the Class I areas on the Colorado Plateau. The GCVTC agreed to promote these initiatives on a national level. With regard to ongoing development of policies and regulations on emissions from mobile sources, the June 29 letter from the WGA requests that EPA ''make a binding commitment in its final regional haze rule to fully consider the GCVTC's recommendations' on several national mobile source emissions control strategies. Comment on the regional haze rule specifically requested that EPA commit to consider development of a list of very specific national mobile source emissions control strategies.

The EPA agrees with the GCVTC's conclusion that emissions from mobile sources can be significant contributors to regional haze visibility impairment. The EPA is currently working on a number of the strategies the GCVTC requested us to ''fully consider'' and the

[126] GCVTC Report, pp. 38–46.

summary below indicates the status of activities under way.

No.	Measure	Status of EPA efforts to fully consider the measure
1	Adoption of the 49-State LEV standard in 2001 and Tier II vehicle emission standards in year 2004 (if determined to be more effective).	Combined Tier II/gasoline sulfur NPRM is being drafted, with publication expected in early to mid-1999.
2	Support of EPA's current proposal for new on-road, heavy-duty vehicles emission standards that reduce NO_x emissions by at least 50 percent over the 1998 requirements in the CAA, while maintaining current stringent PM emission limits.	Finalized 2004 standards for on-road heavy-duty in 10/97 [62 FR 54693]; reductions in NO_x emissions and secondary PM.
3	Pursue additional PM reductions from on-road vehicles	Potential actions being evaluated.
4	Pursue additional engine emission standards for new off-road vehicles (heavy-duty, construction-type) that provide reasonably achievable reductions.	Finalized standards in 8/98 [63 FR 56967]. Also planning a technology review by December 2001 to evaluate feasibility standards and additional reductions.
5	Explore broader application of and additional reductions in the sulfur content of both gasoline and diesel fuel.	Gasoline sulfur control-rulemaking underway. Considering regulation of diesel fuel sulfur.
6	Promotion of cleaner-burning fuels	In first year of implementing clean-fuel fleets program. The Office of Mobile Sources presented a series of fleet manager workshops during May, June and July of '98. Clean Fuel Fleet Program Implementation Guidance was issued in August '98. We have a team within OMS working on promoting clean fuels efforts.
7	Pursue fuel standards and control strategies for diesel locomotives, marine vessels/pleasure craft, airplanes, and Federal vehicles as described in the GCVTC's Report.	Study of these issues is ongoing, but no specific actions have been scheduled.
8	Support requirements for effective refueling vapor recovery systems that capture evaporative emissions.	On-board re-fueling standards for cars and trucks finalized October 1996. We may consider refueling systems for on-road, heavy-duty gasoline in future.

The EPA will continue to work with States and regional planning entities to help them assess how national mobile source emissions strategies will affect other strategies needed to ensure reasonable progress toward the national visibility goal during the implementation of the regulations promulgated today. The EPA will also grant States full credit for implementation of future national mobile source programs in emissions strategies needed to attain reasonable progress goals.

6. Emissions Related to Fire

Section 51.309(d)(6) requires documentation that all prescribed fire programs within the State consider and address the effects of smoke on visibility when planning and issuing permits for prescribed fires. The GCVTC Report stated that ''fire has played a major role in the development of and maintenance of most ecosystems in the West.'' [127] In addition, the report notes ''emissions from fire (wildfire and prescribed fire) are an important episodic contributor to visibility-impairing aerosols, including organic carbon, and particulate matter ($PM_{2.5}$)''. Agricultural burning emissions and their effects have been identified as a concern by the GCVTC but have not been quantified due to lack of data. The GCVTC concluded that all types of fire (prescribed fire, wildfire, and agricultural burning) must be addressed equitably as part of a visibility protection strategy.[128]

The EPA agrees with the GCVTC's conclusions and is including in this section of the rule a requirement for the States to address all types of fire in fulfilling the requirements of this section and in submitting SIPs for approval by EPA. Section 51.309(d)(6) requires each State to establish an emissions inventory and tracking system (spatial and temporal) for VOC, NO_X, elemental carbon and organic carbon, and direct fine particulate emissions from prescribed fire, wildfire, and agricultural burning. The EPA believes that such information could be developed on a regional basis and could be accomplished through mechanisms such as recording acres experiencing fire and calculating emissions based on vegetation type and soil moisture. Most importantly, the rule requires the establishment of enhanced smoke management programs for fire that consider visibility effects, in addition to health and nuisance objectives, and calls for programs to be based on the criteria of efficiency, economics, law, emissions reduction opportunities, land management objectives, and reduction of visibility impacts. The comprehensive approach envisioned by the rule will allow States to plan a smoke management program that minimizes visibility impacts but also fully recognizes the ecological role of fire.

The smoke management plans must address all sources of fire used for land management purposes. The provisions of this section also provide for establishment of annual emissions goals for fire (excluding wildfire) that will minimize increases in emissions to the maximum extent feasible. These goals are to be established cooperatively by States, tribes, State and Federal land management agencies, and their private sector counterparts, considering factors similar to those identified for enhanced smoke management plans.

7. Dust From Roads

Section 51.309(d)(7) requires States to assess the impact of dust emissions on regional haze visibility in the 16 Class I areas. If such dust emissions are determined to be a significant contributor to visibility impairment, the State must implement emissions management strategies to address their impact. In the technical work of the GCVTC, road dust was not shown to be a major contributor to regional haze impairment based on current monitoring data. However, work on future emissions projections of road dust emissions was directly tied to growth in vehicle miles traveled (VMT). The large increase projected for the west in VMT over the planning period of the GCVTC report resulted in initial

[127] GCVTC Report, p. 47.

[128] See Id.

predictions of a very large contribution of road dust to regional haze.[129] This technical result was addressed in the GCVTC report and the GCVTC discounted the predictions of the future impacts from road dust. However, the GCVTC recommended that its policy conclusion that distant road dust is not likely to play an important role in regional haze should be confirmed through further tracking of road dust emissions. The GCVTC also emphasized that road dust control should be considered in locations ''in and near'' Class I areas.[130] The EPA agrees with this approach and has included the assessment of road dust as a requirement of the SIP. In addition, today's action requires appropriate SIP measures over time based on the contribution of road dust to regional haze.

8. Pollution Prevention

This section addresses the GCVTC's recommendations on pollution prevention and renewable energy. The GCVTC goal recommended that renewable energy comprise 10 percent of the regional power needs by 2005 and 20 percent by 2015. The Administration has recently offered legislation proposing a national mandate of 7.5 percent by 2010. The Commission's goal represents the outcome of its consensus process and is a more aggressive goal than what the Administration has proposed as a national mandate. As with other GCVTC recommendations, the EPA has included this provision in this rule in recognition of the overall body of the GCVTC's work and believes it is consistent with the provisions of the national rule. Section 51.309(d)(8) requires the State to summarize all pollution prevention plans currently in place, inventory the current and expected energy generation capacity through 2002, the total energy generation capacity and production for the State, the State's percentage of total energy generation and capacity that comes from renewable energy sources, and the State's anticipated contribution toward the GCVTC's goal that renewable energy comprise 10 percent of the regional power needs by 2005, and 20 percent by 2015.

The GCVTC found that to prevent further degradation of vistas in the west, it would be necessary to combine cost-effective pollution control strategies with a greater emphasis on pollution prevention, including low or zero emission technologies and energy conservation. It further found that there was a high potential for renewable energy production, especially electrical energy, and that the relative cost of renewable energy production is declining over time. The GCVTC cited forecasts of renewable energy production by the Western Systems Coordinating Council and by the Land and Water Fund of the Rockies in support of its adoption of the goal that 10 percent of regional power needs be served by renewable energy sources by the year 2005 and 20 percent by the year 2015.[131]

In establishing assessment and reporting requirements for the States, EPA is supporting the GCVTC Report's promotion of renewable power production. Such production will likely be based on emerging renewable energy technologies such as wind, solar, biomass, and geothermal. The EPA also supports tracking annual goals for increases in renewable power generation in the transport region.[132] The GCVTC identified strategies which the States could rely on to help achieve this regional renewable energy goal, including, but not limited to, focusing research funding for renewables, financial incentives, and requiring new power generation projects to include a portion of the generation from renewable energy sources. The EPA notes that the WRAP is committed to following through on the GCVTC's recommendations and can assist the States in developing strategies they can rely on to achieve regional renewable energy goals contained in the GCVTC Report.

In response to the GCVTC's recommendations on pollution prevention, section 51.309(d)(8) calls for each SIP to provide for incentives to reward efforts that go beyond compliance and/or achieve early compliance with air pollution related requirements. The plan also must identify specific areas where renewable energy has the potential to supply power where it is not now provided by current service systems and where renewable energy systems are most cost effective. The plan must contain projections of the short-term and long-term emissions reductions, visibility improvements, costs savings, and secondary benefits associated with renewable energy goals, energy efficiency and pollution prevention activities. The plan must also contain a description of the programs being relied on to achieve the State's contribution toward the GCVTC's renewable energy goals.

The State must provide a demonstration of its progress toward achieving the renewable energy goals in 2003, 2008, 2013 and 2018. The demonstration must include documentation describing the potential for renewable energy resources, the percentage of renewable energy associated with new power generation projects implemented or planned, and the renewable energy generation capacity and production in use or planned within the State. Where a State cannot feasibly meet its planned contribution to the regional renewable energy goals, the State must identify the measures implemented to achieve its contribution and explain why meeting the State's contribution was not feasible.

Commentors on EPA's September 3, 1998 notice of availability stated that incorporation of language from the WGA letter on renewable energy restricts State and local energy planning since a SIP is federally enforceable under the CAA. Commentors also expressed the opinion that the requirements for SIPs to address renewable energy goals may overstep EPA's legal authorities which are limited to emissions limitation and pollution performance standards.

The EPA disagrees that the provisions of section 51.309(d)(8) impermissibly restrict State and local energy planning or that these provisions exceed EPA's authority under the CAA. As stated previously, the requirements of section 51.309 are provided to GCVTC States as an alternative to the general provisions of section 51.308 as a means of giving effect to the policy and technical work of the GCVTC. The goals themselves are not enforceable and States are not required to meet the renewable energy goals. However, as the WGA letter and the GCVTC provide, these provisions are not severable. States which wish to take advantage of the GCVTC's efforts and EPA's acceptance thereof are obligated to meet all of the requirements of section 51.309.

Rather, EPA is setting enforceable requirements for the States to assess progress toward goals established by the GCVTC with respect to renewable energy production as a means for reducing dependence on more polluting forms of energy production. States participating in the GCVTC strategy are responsible for explaining why they cannot meet the GCVTC goals. The required reporting by the States will inform the public of air quality improvements that would result from that goal had it been realized. It is the relationship between renewable energy production and associated environmental effects (direct and

[129] GCVTC Report, p. 46.

[130] See id.

[131] GCVTC Report, p. 28.

[132] GCVTC Report, p. 7.

indirect) that is the thrust of the assessment and reporting effort under the SIP.

9. Implementation of Additional Requirements

In section 51.309(d)(9), EPA requires SIPs to provide for implementation of other GCVTC Report policy and strategy options that can be practicably included as enforceable emissions limits, schedules of compliance or other enforceable measures to make reasonable progress toward the national visibility goal for the 16 Class I areas.

The GCVTC's recommendations included items that are not appropriate to directly translate to SIP requirements for every State. The EPA supports State choice of appropriate actions on other options and measures identified by the GCVTC and has, therefore, established a general provision for SIPs calling for them to consider and adopt additional measures as necessary and appropriate. The rule further requires States to report to EPA in 2003, 2008, 2013, and 2018 on what measures have been adopted and the status of implementation of those measures.

10. International Transport of Pollution

One of the additional areas of concern noted in the GCVTC report, for instance, relates to effects of emissions from sources outside of the territory of the United States. As stated elsewhere in this notice, the EPA will not hold States responsible for developing strategies to ''compensate'' for the effects of emissions from foreign sources. However, the States should not consider the presence of emissions from foreign sources as a reason not to strive to ensure reasonable progress in reducing any visibility impairment caused by sources located within their jurisdiction. The States retain a duty to work with EPA in helping the Federal government use appropriate means to address international pollution transport concerns. Indeed, such efforts are under way. The EPA and other Federal officials are working with representatives of the Mexican government to complete a study which will assess the contribution of fossil-fuel fired electric generation stations in northern Mexico to haze in Big Bend National Park. These efforts and funding of work to establish emissions inventories in Mexico will help address concerns raised by the GCVTC. In addition to activities directly related to visibility effects, there are other efforts underway related to the United States-Mexico border health issues. Given that emissions contributing to health effects and those contributing to visibility impairment are generally the same, the border studies and emissions inventories will help support assessment of regional visibility conditions. In addition to work with Mexico, EPA routinely meets with representatives of the Canadian government on issues related to transport of air pollutants, particularly focusing on emissions affecting acidic deposition. The EPA intends to continue to work through appropriate channels in building technical information and addressing policy concerns related to international pollution transport.

11. Periodic Implementation Plan Revisions

Section 51.309(d)(10) requires the States to periodically assess their progress in implementing measures for protection of visibility. This includes a review of how the measures implemented under section 51.309 are consistent with the national rule's provisions for long-term strategies and BART. The assessments must be completed by 2008, 2013, and 2018 and must be submitted to EPA as SIP revisions that comply with the procedural requirements of sections 51.102 and 51.103. As with any other review and revision of SIP requirements, States will be expected to use the most current available technical methods and procedures in conducting their assessments.

The provisions of section 51.309(d)(10) further require that where a State concludes that planning adjustments are necessary as a result of emissions occurring within the State, it revise its implementation strategies to include rule revisions that are effective within 1 year after the State makes such a conclusion in order to assure reasonable progress at any of the 16 Class I areas on the Colorado Plateau. States may also conclude, based on their assessments, that no changes to the plan are needed, and the plan revision requirement can be met by submitting a ''negative declaration'' as an implementation plan revision to EPA. This revision must provide the State's basis for finding that no changes are needed. This submission will provide the public with necessary information and an opportunity to comment on the State's findings.

The EPA views the requirement of section 51.309(d)(10) as a periodic check on progress rather than a thorough revision of regional strategies. The State interim assessments should focus on significant failures or shortfalls in implementing adopted strategies and on emissions from in-State or out-of-State sources which may be causing degradation in regional haze visibility but were not anticipated in the development of the original plan and will, therefore, not be addressed by currently-adopted programs. If a State makes such findings with respect to in-State sources, EPA expects the State to revise its SIP, reducing emissions to be consistent with the regional planning effort reflected in the reasonable progress SIPs due in 2003. If transport of emissions from out of State is suspected of impairing reasonable progress, the State should identify this to EPA and should initiate cooperative efforts with upwind States so the emissions can be more fully evaluated and, as needed, addressed in the next mandatory full SIP revision. This requirement is virtually identical to the provisions for periodic review under sections 51.308(g) and (h).

12. State Planning and Interstate Coordination

Section 51.309(d)(11) provides flexibility to a State to address its contribution to visibility impairment through the regional emissions control strategies discussed above. The SIP strategies to protect the 16 Class I areas on the Colorado Plateau can thus be developed through interstate coordination in a regional planning process. Such regional planning can help a State develop documentation of the technical and policy basis for the individual State apportionment of emissions and visibility impairment, the contribution to emissions addressed by the State's plan, coordination in the analysis of interstate transport and control of pollution with other States, and compliance with other criteria for approval of SIPs under CAA sections 110 and 169A and B. Therefore, under today's final rule and EPA policy, States may rely on regional entities' efforts to develop and document technical and policy support for the SIPs required by this rule. For the purposes of implementing the requirements of section 51.309, EPA recognizes the WRAP as a regional planning group for purposes of interstate consultation under section 51.308(c).

As indicated in the introduction to the section of today's notice addressing the WGA and GCVTC recommendations, States retain the right to develop their own programs with or without reliance on the work products of a regional entity. In the case where a State chooses to develop a SIP without reliance on a regional planning process, however, the State will need to show how it accounted for the effect of its emissions on Class I areas which may be

located beyond the State's borders, as well as the effect of upwind emissions from other States on the Class I areas within its borders.

The regional haze SIP for a State choosing not to implement the requirements of section 51.309, including the SIP submittal deadlines, would be governed by the national rules provided in section 51.308. Any State choosing not to adopt a SIP in accordance with the GCVTC strategy and optional approach in section 51.309, but wishing to use the WRAP mechanism for regional cooperation in developing its SIP requirements, would need to comply with all of the requirements outlined in the national rule in section 51.308.

13. Tribal Implementation Plans

The WGA called for EPA's final rule to permit tribes within the GCVTC Transport Region to implement visibility programs, or reasonably severable elements, in the same manner as States, regardless of whether such tribes have participated as members of a visibility transport GCVTC. The EPA has not included the WGA's recommended rule provision in today's action because the necessary authority for tribal organizations has already been provided in a previous EPA rulemaking.[133] The EPA does, however, agree with the position expressed in the WGA recommendation. The EPA wishes to clarify that tribes may directly implement the requirements of this section of the regional haze rule in the same manner as States. The Tribal Authority Rule provides for this, as discussed further in unit V of today's notice. The independence of tribes means that a tribal visibility program is not dependent on strategies selected by the State or States in which the tribe is located. If tribes within the Transport Region decline to implement visibility programs and EPA finds that emissions management strategies are needed to assure reasonable progress, EPA will work with the appropriate tribes directly to provide for Federal implementation of appropriate emissions reduction strategies. This is based on the government to government principles of Federal-Tribal relations.

D. Requirements for States Electing Not To Follow All Provisions of the Section 51.309(e)

The EPA notes that the provisions for allowing the Transport Region States to adopt SIPs based on the GCVTC recommendations requires that States endorse the range of strategies recognized by the GCVTC. A State electing not to implement the GCVTC recommendations as set forth in section 51.309(d) must address all of its Class I areas and any Class I area to which its sources' emissions may contribute to impairment under the provisions of section 51.308. In addition, any Transport Region State must advise other States electing to comply with section 51.309 of the nature and effect of their program on visibility impairing emissions so that other States can use this information in developing programs under section 51.309. This provision assures that all components needed to address reasonable progress are part of SIPs either under the provisions of section 51.309 or section 51.308.

E. Annex to the GCVTC Report

1. Interim Milestones

Section 51.309(f) calls for an annex to the GCVTC Report for the purpose of completing the program requirements to meet reasonable progress under the CAA, including submission of a complete long-term strategy and addressing the BART requirement for the 16 Class I areas on the Colorado Plateau. The purpose of the annex is to develop interim emissions milestones for stationary source SO_2 interim targets between the year 2000 target and the target for the year 2040. Under section 51.309(f)(1)(i), the States must consider four specific factors in setting the interim emission milestones. The first factor affecting the selection of interim milestones is the GCVTC's definition of reasonable progress. The GCVTC notes in its report that the term ''reasonable progress'' refers to ''progress in reducing human-caused haze in Class I areas under the national visibility goal.'' [134] It goes on to note that ''the CAA indicates that 'reasonable' should consider the cost of reducing air pollution emissions, the time necessary for compliance, the energy and non-air quality environmental impacts of reducing emissions, and the remaining useful life of any existing air pollution source considered for these reductions.'' The discussion also includes the GCVTC's Public Advisory Committee definition that ''progress towards the national visibility goal is achieving continuous emissions reductions necessary to reduce existing impairment and attain steady improvement in visibility in mandatory Class I areas, and managing emissions growth so as to prevent perceptible degradation of clean air days.'' Together, these provisions call for the achievement of continuous emissions reductions and tracking the reductions to ensure visibility improvement in hazy days and visibility maintenance on clear days. To be consistent with and responsive to the guiding principles, recommendations and strategies adopted by the GCVTC, EPA expects any interim targets to demonstrate a significant continuous downward trend in emissions and not postpone significant progress to periods covered by future long-term strategies.

The second factor is the quantifiable target for 2040 to which interim targets must contribute. This target is a 50 to 70 percent reduction by 2040 in emissions from stationary source SO_2 emissions, based on the projection of the GCVTC's baseline forecast scenario from actual 1990 emission levels. Interim targets should reflect assessment of reasonable measures which reduce regional loadings of SO_2. Such assessments may include examination of interim targets based on costs per ton of reducing SO_2 in line with recently adopted control measures.

The third factor is the applicable requirements of the CAA for making reasonable progress and implementing BART. As noted previously in this preamble, the CAA requires a long-term strategy to ensure reasonable progress and the application of BART to certain large sources that are reasonably anticipated to cause or contribute to regional haze. The rule requires the annex to address the BART provisions of the national rule. As noted in the earlier discussion of BART, EPA will accept alternative measures, such as regional emissions trading programs, which achieve greater reasonable progress in lieu of meeting the source-specific BART requirement. As noted elsewhere in the preamble, EPA plans to issue revised BART guidance within a year. During the next year and a half, EPA also plans to issue new or revised guidance related to the design of emission trading programs, including guidance on the structure of economic incentive programs. Given this schedule, EPA intends to work closely with the WRAP as it develops the annex, its approach to meeting the rule's BART requirements and its backstop market-trading program. The EPA believes that its participation in the WRAP will help to ensure that the way in which the annex addresses BART and the market trading program will be compatible with EPA's revised BART guidance and any new or revised guidance EPA issues related to emissions trading programs.

In the event EPA finds that the annex does not meet the rule's BART provisions because it is inconsistent

[133] *See* 63 FR 7254 (Feb. 12, 1998).

[134] GCVTC Report, p. x–xi.

with EPA's revised BART guidance, the Transport Region States may submit a revised annex to address any deficiencies. The revision should be submitted as expeditiously as practicable but no later than 12 months from EPA's determination that the annex is deficient with respect to BART due to its inconsistency with the BART guidance. Similarly, if EPA finds the annex does not meet the provisions of any EPA guidance applicable to market-trading programs that is issued after promulgation of this rule, the Transport Region States may submit a revision to the annex to remedy any such deficiencies. These revisions should also be submitted no later than 12 months from EPA's determination that the annex cannot be incorporated in the SIP because of inconsistencies with the guidance. The EPA expects that the States and WRAP stakeholders will make every effort to address both the revised BART guidance and any new or revised emission trading program guidance within the timeframe established by section 51.309 for submittal of the annex. By providing for EPA participation in the WRAP, encouraging State and stakeholder efforts to respond expeditiously to new or revised guidance, and calling for any needed revisions to the annex to be submitted within a year from an EPA determination of deficiency, this approach will ensure compliance with the SIP submittal deadlines in section 51.309(c).

The fourth factor to be addressed in the setting of interim milestones is the timing of implementation plan assessments of progress and the identification of mechanisms to address cases where emissions exceed milestone levels for the reporting years 2003, 2008, 2013 and 2018. This schedule is designed to achieve eventual coordination of target years with assessments for regions affecting other Class I areas. Because these efforts call for continuing consultation and sharing of information between regions as well as between States, timetables for further work by the GCVTC States are designed to bring the GCVTC States' long-term strategy updates in line with the schedule for the next long-term strategy update required of all other States.

2. Documentation of Market Trading or Other Alternative Measures To Assure Reasonable Progress.

In addition to the interim targets, section 51.309(f)(1)(iii) requires the annex to contain final documentation of the market trading program or other programs to be implemented by the GCVTC States if current implementation plans and voluntary measures are not sufficient to meet the established interim milestones. This documentation must include model rules, memoranda of understanding, and other materials necessary to describe in detail and establish in enforceable fashion how emission reduction progress will be monitored, what conditions will require the market trading program to be activated, how allocations will be performed, and how the program will operate.

3. Additional Class I Areas

An additional provision, section 51.309(g) allows States to elect to demonstrate reasonable progress for other Class I areas within the Transport Region States beyond the original 16 areas addressed by the GCVTC's assessment, relying on the strategies recommended by the GCVTC. See the discussion in unit IV.F. of this preamble.

4. Geographic Enhancements

The EPA has also adopted provisions in subsections 51.309(b)(7) and 51.309(f)(4) that would allow the Transport Region States to establish a process as part of a broad regional strategy, such as backstop market-trading program, to accommodate the situation where a State takes action to address reasonably attributable BART under the provisions of section 51.306(c)(2). As noted elsewhere, the annex, if approved, will allow the Transport Region States to submit a SIP which adopts an alternative measure in lieu of BART. The purpose for including the provisions regarding geographic enhancement is to address the intersection between the existing reasonably attributable BART provision and regional haze BART, which may be met through an emissions trading program such as the milestone/backstop market-trading program which is to be included in the annex. Existing rules address ''hot spots'—those situations in which part of the visibility impairment in a specific national park or wilderness area is reasonably attributable to a single source or small group of sources in the airshed because of the nature and location of the pollution relative to the Class I area. Should action be taken by the State to address such reasonably attributable impairment through BART, the geographic enhancement provisions would allow the backstop market-based trading program to accommodate such action. These provisions parallel a similar allowance in subsections 51.301(ii) and 51.308(e)(2)(C)(v).

The EPA is repeating these provisions, with minor language changes, to be clear that they apply to both the milestones or backstop market-trading program provided for in the annex. Subsection 51.309(b)(7) defines the term geographic enhancement for the provisions governing the annex and section 51.309(f)(4) allows the annex to contain a geographic enhancement. Similar to the national program, these provisions will allow the market trading system included in the annex to accommodate situations where a State wishes to require BART control measures on sources or a small group of sources due to reasonably attributable impairment and that source has been included in the backstop market trading program under the annex. In this situation, the milestone or backstop market-trading program may include a level of reasonably attributable impairment which may require additional emissions reductions over and above those achieved under the quantitative emissions reductions milestones established for regional haze.

5. The EPA Responsibilities in Relation to the Annex

Section 51.309(f)(3) spells out EPA's responsibilities with respect to the annex and calls for EPA to publish the annex upon receipt. The EPA must then conduct a review and decide, after notice and opportunity for public comment, whether the annex meets the requirement of section 51.309(f)(1) and whether it assures reasonable progress. If EPA finds the interim targets and accompanying documentation meet the requirements of reasonable progress, then it will incorporate the interim targets into the stationary source SIP requirements in section 51.309(d)(4) within 1 year of receipt, after public notice and comment. If EPA decides that the annex does not meet SIP requirements for reasonable progress or if EPA does not receive an annex, it will notify the GCVTC States, who will then be subject to the general provisions of section 51.308 in the same manner as other States.

One commentor on the annex approach described in EPA's September 3 notice of availability noted that the WGA letter set forth a tight timetable for development of the market system and that it appears to violate the TEA–21 requirements. In response, EPA notes that these are the timetables established by the GCVTC in 1996 and which have been the basis for work by the follow-up body of the WRAP. With respect to TEA–21, the colloquy between Senator Allard and Senator Baucus in the Congressional Record on the conference report concerning implementation of GCVTC recommendations is instructive,

and EPA believes that it fully addresses the commentor's concern. Senator Baucus stated that ''[TEA–21] clarifies that it does not affect EPA's authority to provide for State implementation of the agreements and recommendations set forth in the June 1996 GCVTC Report on a schedule consistent with the GCVTC's Report. * * * The conferees added specific language so as not to preclude the Administrator from providing for earlier State implementation of the GCVTC's agreements and recommendations * * *.'' [135] That language states that:

> The preceding provisions of this paragraph shall not preclude the implementation of the agreements and recommendations set forth in the GCVTC Report dated June 1996.

TEA–21 section 4102(c)(2).

F. Additional Class I Areas

Section 51.309(g) calls for Transport Region States to identify in their 2003 plan submissions whether they elect to meet the provisions of section 51.308 or 51.309 in establishing their long-term strategy and BART requirements for additional Class I areas not covered by the original GCVTC effort. By no later than December 31, 2008 the States electing to use section 51.309 to address additional Class I areas must submit plan revisions which include a modeling demonstration establishing expected visibility conditions on the most-impaired and least-impaired days at the Class I areas for which they seek to demonstrate reasonable progress. These demonstrations may be conducted by the State or based on refined studies conducted by regional entities. The plan must include the analyses required in section 51.308(d)(1). The plan can build upon and take full credit for the strategies adopted for the 16 Class I areas. It must also contain any additional measures beyond those strategies that may be needed to demonstrate reasonable progress in those areas, in accordance with the provisions of section 51.308(d)(1) through (4). As provided for in section 51.309(g)(2), a Transport Region State may have until no later than December 31, 2008, to submit a plan for additional Class I areas, which is the date for submission that additional Class I areas under section 51.308. Transport Region States may well benefit by addressing the additional Class I areas under section 51.309, since using the same rule provision for both sets of Class I areas could facilitate coordination of the requirements for the areas as well as enabling consolidation of plans after 2008.

Furthermore, if the State can develop the necessary demonstration for other Class I areas before 2003, a Transport Region State could submit one implementation plan in 2003 covering both the 16 Class I areas and other Class I areas for which it must assure reasonable progress.

V. Implementation of the Regional Haze Program in Indian Country

This section discusses how the requirements of the regional haze rule relate to emissions released from Indian country.

A. Background on Tribal Air Quality Programs

Before discussing how the regional haze rule affects tribes, we believe it is useful to briefly describe EPA's overall policy and rulemaking efforts on tribal air quality programs.

On November 8, 1984, the EPA released a policy statement entitled ''EPA Policy for the Administration of Environmental Programs on Indian Reservations.'' This policy statement, available on the Internet at http://www.epa.gov/indian/1984.htm, stresses a number of themes. In particular, this policy stresses that EPA, consistent with overall Federal government policy, will pursue the principle of Indian ''self-government,'' and that it will work with tribal governments on a ''government-to-government'' basis. The policy statement also emphasizes EPA's desire to work with interested tribal governments in developing programs and in preparing to assume regulatory and environmental program management responsibility for Indian country. The EPA will retain responsibility for protecting tribal air quality until such time as tribes administer their own air quality protection programs.

The CAA, as amended in 1990, added a new section 301(d) which authorizes EPA to ''treat tribes as States'' for the purposes of administering CAA programs. Section 301(d) required that EPA promulgate regulations listing specific CAA provisions for which it would be appropriate to treat tribes as States and establishing the criteria that tribes must meet in order to be eligible for such treatment under the CAA. The EPA proposed these regulations on August 25, 1994 (59 FR 43956), and finalized the rule on February 12, 1998 (63 FR 7254). Much of the regulatory language in this rule is codified in the Code of Federal Regulations (CFR) as a new 40 CFR part 49. This rule is generally referred to as the Tribal Authority Rule or TAR.

The TAR includes general eligibility requirements for tribes interested in assuming program responsibilities that are codified in section 49.6 of the rule. These eligibility requirements are designed in part to ensure that such tribes have the infrastructure needed to successfully implement a tribal air quality program. Tribes may request a formal eligibility determination using administrative procedures contained in 49.7. Tribes may also use the administrative procedures in 49.7 to seek approval to implement CAA programs. The TAR authorizes EPA to review requests for eligibility determinations and program approvals simultaneously. As noted in 49.7(c), tribes that are interested in seeking EPA approval to implement air quality programs under the CAA may request approval to implement only partial elements of a CAA program, so long as the elements of the partial program are ''reasonably severable.''

Section 301(d)(4) of the CAA confers discretionary authority on EPA to provide, through regulation, alternative means to ensure air quality protection in cases where it determines that treating tribes as ''identical'' to States would be inappropriate. Accordingly, in promulgating the TAR, EPA provided flexibility to tribes seeking to implement the CAA. Some flexibility is established by virtue of EPA's decision, under 49.4 of the final rule, not to treat tribes as States for specified provisions of the CAA. The rationale for this approach is discussed on pages 7264 and 7265 of the preamble to the final rule, and in unit III.B of the preamble to the proposed rule. For example, unlike States, tribes are not required by the TAR to adopt and implement CAA plans or programs, thus tribes are not subject to mandatory deadlines for submittal of implementation plans. As discussed in the preamble sections identified above, EPA believes that it generally would not be reasonable to impose the same types of deadlines on tribes as on States. Among the CAA provisions for which EPA has determined it will not treat tribes as States is section 110(c)(1) of the CAA, which requires EPA to intervene and ensure air quality protection within 2 years after a State either fails to adopt a SIP or does not win EPA approval for a SIP that was determined to be deficient. The EPA did not apply this provision to tribes because the section 110(c) obligation on EPA to promulgate a FIP is based on failures with respect to required submittals, and, as noted above, tribal submissions under the TAR are voluntary, not mandatory.

[135] 144 Cong Rec. SS407 (daily ed. May 22, 1998).

Instead, pursuant to its section 301(d)(4) discretionary authority, EPA has provided in the TAR that, where necessary and appropriate, it will promulgate FIPs within reasonable timeframes to protect air quality in Indian country. See 40 CFR 49.11(a).

B. Issues Related to the Regional Haze Program in Indian Country

Today's final rule imposes requirements for revisions to SIPs. The rule requires States to develop SIP revisions to address regional haze, to update the SIP every 10 years, and to continue to evaluate progress toward the national visibility goal. The requirements of today's final rule are among those air quality programs for which tribes may be determined eligible and receive authorization to implement under the TAR. Tribes wishing to assume these regional haze program requirements and be ''treated as States'' may seek approval under 40 CFR 49, but are not required to do so. Where tribes do not take on this responsibility, EPA will ensure air quality protection in Indian country consistent with the provisions of 40 CFR 49.11(a).

We encourage tribes to participate in regional planning efforts for regional haze. A good example of tribal participation in regional haze planning is the efforts of tribal representatives on the GCVTC. These efforts are continuing with tribal participation on the WRAP. The EPA expects, as noted above, that additional regional planning groups will be formed in reaction to today's final rule. A number of tribes have indicated interest in participating in regional planning efforts, and we believe this is beneficial in many respects. Tribal participation can help provide emissions inventory information that can serve to better understand the importance of sources in Indian country to regional visibility impairment. Conversely, such participation can also help provide a forum for tribal participants to alert regional planning organizations as to concerns on how regional emissions are affecting air quality in Indian country.

As noted in the preamble to the TAR, we intend to work with tribes to identify air quality priorities and needs, to build communication and outreach to tribes on air quality issues, and to provide training to build tribes' technical capacity for implementing air quality programs. We recognize, however, that not all tribes will have the resources nor the expertise to participate in regional planning efforts for regional haze. An important EPA role in regional planning efforts will be to ensure that the overall objectives of the regional haze program are met where tribes are unable to participate.

In order to encourage tribes to develop self-sufficient programs, the TAR provides tribes with the flexibility of submitting programs as they are developed, rather than in accordance with statutory deadlines. This means that tribes that choose to develop programs, where necessary may take additional time to submit implementation plans for regional haze over and above the deadlines in the TEA–21 legislation as codified in today's final rule. (See unit III.B for a discussion of these deadlines.) The TEA–21 legislation changed the deadlines for State submission of SIP revisions to address regional haze, which were originally set out in section 169B(e)(2) of the CAA. Section 49.4(f) of the TAR provides that deadlines related to SIP submittals under section 169(B)(e)(2) do not apply to tribes. We encourage tribes choosing to develop implementation plans to make every effort to submit by the deadlines to ensure that the plans are integrated with and coordinated with regional planning efforts. In the interim, EPA will work with the States and tribes to ensure that achievement of reasonable progress is not delayed.

As noted previously in unit II of this notice, sections 169A and 169B of the CAA contain requirements for visibility protection in Class I areas, and do not require that States or tribes develop plans and control strategies for visibility protection for additional locations. These provisions of the CAA do not require implementation plans to address regional haze in other Class I areas, such as those designated as Class I by tribes or States under section 164 of the CAA. One commenter from a tribe expressed concerns that the scenic beauty and value of tribal areas should not be viewed by EPA as less important than the national parks and wilderness areas that have ''mandatory Class I'' status. While EPA believes that these tribal areas are not afforded the same legal protection under the CAA as Class I areas, it is important for tribes to understand that the regional haze control program for the Federal areas will help to protect scenic locations of interest to tribes. For example, EPA believes that modeling analyses aimed at addressing Class I areas can readily add receptor locations to analyze the visibility improvements at selected tribal locations. The EPA will work with regional planning bodies to ensure that tribal interests are represented and to foster communication between States and tribes, and we will encourage the consideration of impacts on visibility in tribal locations in regional planning efforts.

VI. Miscellaneous Technical Amendments to the Existing Rule

The rule includes the following changes to coordinate the requirements of today's regional haze rule with the 1980 visibility regulations for ''reasonably attributable'' visibility impairment:

Section 51.300. Purpose and Applicability

We have amended this section to clarify that subpart P includes provisions for regional haze as well as reasonably attributable visibility impairment.

Section 51.301. Definitions

We have added the following terms: reasonably attributable visibility impairment, regional haze, deciview, State, most-impaired days, least-impaired days, implementation plan, tribe, BART-eligible source, and geographic enhancement. The other definitions in this section apply to the program for reasonably attributable impairment as well as the new regional haze program, except where it is noted that they only apply to the program for reasonably attributable impairment.

Section 51.302. Implementation Control Strategies

We have changed references in section 51.302(a) to the administrative process requirements for public hearings and SIP submissions, which are now located in section 51.102 and 51.103. We have also amended this section to clarify that the implementation control strategies addressed in the section apply to reasonably attributable visibility impairment.

Section 51.305. Monitoring

We have amended this section to clarify that the monitoring requirements in this section apply to reasonably attributable visibility impairment.

VII. Administrative Requirements

In preparing any final rule, EPA must meet the administrative requirements contained in a number of statutes and executive orders. In this section of the preamble, we discuss how the final regional haze rule addresses these administrative requirements.

A. Regulatory Planning and Review by the Office of Management and Budget (OMB) (Executive Order 12866)

Under Executive Order 12866 (58 FR 51735, October 4, 1993,) the Agency

must determine whether the regulatory action is ''significant'' and, therefore, subject to OMB review and the requirements of the Executive Order. The Order defines ''significant regulatory action'' as one that is likely to result in a rule that may:

(1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) materially alter the budgetary impacts of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, it has been determined that this rule is a ''significant regulatory action'' and EPA has submitted it to OMB for review. The drafts of rules submitted to OMB, the documents accompanying such drafts, written comments thereon, written responses by EPA, and identification of the changes made in response to OMB suggestions or recommendations are available for public inspection at EPA's Air and Radiation Docket Information Center (Docket No. A–95–38).

The EPA has prepared and entered into the docket a Regulatory Impact Analysis (RIA) entitled Regulatory Impact Analysis for the Regional Haze Rule. This RIA assesses the costs, economic impacts, and benefits for four illustrative progress goals, two sets of control strategies, two sets of assumptions for estimating benefits, and systems of national uniform versus regionally varying progress goals. The RIA is a caveated and illustrative assessment of the potential consequences of the regional haze rule in 2015, a year near the end of the first long-term progress period, 2018. As a result of comments from the public as well as changes initiated by EPA staff, the RIA has a broader scope, improved data, and more realistic modeling than the analysis issued with the proposed rule.

Despite these improvements, the RIA is not a precise reflection of the actual costs, economic impacts, and benefits associated with the progress goals and emission management strategies developed as a result of the final regional haze rule. This is due to the fact that under the regional haze rule, the States bear the primary responsibility for establishing reasonable progress goals as well as emission management strategies for meeting these goals. Until such time as the States make those decisions, EPA can only speculate as to which goals may be established and what types of control requirements or emission limits might result from the associated emission management strategies.

According to the RIA, there is substantial visibility improvement due to emissions from other CAA programs such as those for the new O3 and PM NAAQS and the Tier 2 mobile sources rule. With illustrative goals ranging from 1.0 deciview improvement in 15 years to 10 percent deciview improvement in 10 years, the RIA finds that between 22 and 52 percent of the Class I area counties in the continental U.S. achieve or surpass the progress goals due to emissions reductions from other CAA programs. Furthermore, by looking at only partial attainment of the PM and O3 NAAQS and a modest (relative to the proposed rule) Tier 2 program, the RIA understated the visibility improvements from these and other CAA programs. Hence, if States established reasonable progress goals equivalent to the amount of visibility improvement which could be achieved by other CAA programs, the incremental control costs of the regional haze rule may be less than the costs estimated in the RIA, as noted below, for the first long-term strategy period. Under these conditions there could be costs associated with the planning, analysis, and BART control elements of the rule. Incremental annualized costs for those elements are estimated to be $72 million (1990 dollars).

However, if States all choose to establish the same illustrative progress goal, the RIA estimates incremental control costs ranging from $1 to $4 billion with associated benefits ranging from $1 billion to $19 billion. But, visibility is not the only monetized effects category. Many of the benefits which could be monetized are associated with improvements to human health and other welfare effects. This is because the emission control strategies targeted at improving visibility in Class I areas also generate air quality improvements in many other parts of the country. However, the estimated visibility benefits which are monetized are substantial, ranging, for example, from 86 to 111 percent of control costs for the 1 deciview improvement in 15 years illustrative progress goal and from 32 to 52 percent for the 10 percent deciview improvement in 10 years illustrative progress goal.

The RIA finds that the estimated net benefits (benefits minus costs) may increase and the potential for adverse economic impact would decrease if States exercise their discretion to establish State or region-specific reasonable visibility progress goals and emission-management strategies.

According to the RIA simulations, not all Class I areas achieve or surpass the illustrative visibility progress goals even after the simulation of two sets of control strategies. But, the visibility improvement is substantial with 84 to 94 percent of the 121 counties with 147 Class I areas in the continental U.S. achieving the 1.0 deciview in 15 years goal and 31 to 43 percent of the areas achieving 10 percent deciview improvement in 10 years goal. Furthermore, all areas have improved visibility. How much of the estimated progress shortfall is due to the failure of the RIA to fully account for the visibility progress due to other CAA programs and advances in control technology is unknown.

The RIA, although highly caveated and illustrative, represents an improvement over the analysis prepared for the proposed rule. Furthermore, the RIA demonstrates significant visibility progress in 121 counties with 147 Class I areas in the continental U.S. These improvements result from other CAA programs as well as those targeted at the illustrative progress goals. Despite incomplete coverage of effects and pollutants, the monetized benefits of strategies associated with illustrative nationally uniform goals are substantial, outweighing the control strategy costs under most conditions for the first long-term strategy period. However, higher net benefits may result and the potential for significant adverse impact may be mitigated if States exercise the discretion to establish reasonable progress goals and emission management strategies. The flexibility for State discretion is, of course, exactly what the regional haze rule provides.

B. Regulatory Flexibility Act

The EPA has determined that it is not necessary to prepare a regulatory flexibility analysis in connection with this final rule. The EPA has also determined that this rule will not have a significant impact on a substantial number of small entities because the rule does not establish requirements applicable to small entities.

The Regulatory Flexibility Act (5 U.S.C. §§ 601 et seq.) (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (Pub. L.

No.104–121) (SBREFA), provides that whenever an agency is required to publish a general notice of proposed rulemaking, it must prepare and make available an initial regulatory flexibility analysis, unless it certifies that the proposed rule, if promulgated, will not have ''a significant economic impact on a substantial number of small entities.'' 5 U.S.C. § 605(b). Courts have interpreted the RFA to require a regulatory flexibility analysis only when small entities will be subject to the requirements of the rule. See *Motor and Equip. Mfrs. Ass'n* v. *Nichols,* 142 F.3d 449 (D.C. Cir. 1998); *United Distribution Cos.* v. *FERC,* 88 F.3d 1105, 1170 (D.C. Cir. 1996); Mid-Tex Elec. Co-op, Inc. v. FERC, 773 F.2d 327, 342 (D.C. Cir. 1985) (agency's certification need only consider the rule's impact on entities subject to the rule).

As stated in the proposal, the regional haze rule will not establish requirements applicable to small entities. The rule applies to States, not to small entities. The rule requires States to develop, adopt, and submit SIP revisions that will ensure reasonable progress toward the national visibility goal, and would generally leave to the States the task of determining how to obtain those reductions, including which entities to regulate. In developing emission control measures, section 169A of the CAA requires States to address BART for a select list of major stationary sources defined by section 169A(g)(7) of the CAA. As noted in the proposal, however, the State's determination of BART for regional haze involves some State discretion in considering a number of factors set forth in section 169A(g)(2), including the costs of compliance. Further, the final rule allows States to adopt alternative measures in lieu of requiring the installation and operation of BART at these major stationary sources. As a result, the potential consequences of today's final rule at specific sources are speculative. Any requirements for emission control measures, including any requirements for BART, will be established by State rulemakings. The States will accordingly exercise substantial intervening discretion in implementing the final rule.

For the final rule, EPA is confirming its initial certification that the rule would not have a significant impact on a substantial number of small entities. The EPA notes, however, that the Agency did conduct a more general analysis of the potential impact on small entities of possible State implementation strategies. This analysis is documented in the RIA. In addition, as noted in the proposal, EPA undertook small-entity outreach activities on a voluntary basis. The EPA also has issued guidance, entitled ''Guidance on Mitigation of Impact to Small Business While Implementing Air Quality Standards and Regulations,'' which can be found on the internet at: http://ttnwww.rtpnc.epa.gov/implement/actions.htm1Other. This guidance outlines potential implementation strategies that would mitigate impacts on small sources and encourages States to make use of these strategies wherever possible and appropriate. The EPA did receive comments regarding the impact on the regional haze rule on small entities. These comments are addressed in the Response to Comments document.

C. Paperwork Reduction Act—Impact on Reporting Requirements

The information collection requirements in this rule relating to State requirements for the protection of visibility in Class I national parks and wilderness areas were submitted to OMB for review and approval under the Paperwork Reduction Act, 44 U.S.C. 3501, *et seq.* An Information Collection Request document was prepared by EPA (ICR No. 1813.02) and a copy may be obtained from Sandy Farmer, by mail at OPPE Regulatory Information Division, U.S. EPA (2137) 401 M Street, S.W.; Washington, DC 20460, by email at *farmer.sandy@epamail.epa.gov,* or by calling (202) 260–2740. A copy may also be downloaded off the internet at *http://www.epa.gov/icr.* The information requirements are not effective until OMB approves them.

This collection of information has an estimated reporting burden, for the fifty States and District of Columbia, of approximately 22,000 to 47,000 hours for a 3-year period between mid-1999 and mid-2002. The Agency expects the Federal burden will be approximately 1900 to 4000 hours for the 3-year period. The Agency anticipates States costs of about $980,000 to $2,064,000 for the 3-year period. The Agency estimates the annual Federal costs to be approximately $83,000 to $175,000 for the 3-year period. These estimates include time for reviewing requirements and instructions, evaluating data sources, gathering and maintaining data, and completing and reviewing the collection of information.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

D. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) (UMRA), establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under section 202 of the UMRA, 2 U.S.C. 1532, EPA generally must prepare a written statement, including a cost-benefit analysis, for any proposed or final rule that ''includes any Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100,000,000 or more * * * in any one year.'' A ''Federal mandate'' is defined under section 421(6), 2 U.S.C. 658(6), to include a ''Federal intergovernmental mandate'' and a ''Federal private sector mandate.'' A ''Federal intergovernmental mandate,'' in turn, is defined to include a regulation that ''would impose an enforceable duty upon State, local, or tribal governments,'' section 421(5)(A)(i), 2 U.S.C. 658(5)(A)(i), except for, among other things, a duty that is ''a condition of Federal assistance,'' section 421(5)(A)(i)(I). A ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector,'' with certain exceptions, section 421(7)(A), 2 U.S.C. 658(7)(A).

Before promulgating an EPA rule for which a written statement is needed under section 202 of the UMRA, section 205, 2 U.S.C. 1535, of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost effective, or least burdensome alternative that achieves the objectives of the rule.

The RIA prepared by EPA and placed in the docket for this rulemaking is consistent with the requirements of

section 202 of the UMRA. Furthermore, EPA is not directly establishing any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments. Thus, EPA is not obligated to develop under section 203 of the UMRA a small government agency plan. Further, as described in the proposal, EPA carried out consultations with the governmental entities affected by this rule in a manner consistent with the intergovernmental consultation provisions of section 204 of the UMRA.

The EPA also believes that because the rule provides States with substantial flexibility, the proposed rule meets the UMRA requirement in section 205 to select the least costly and burdensome alternative in light of the statutory mandate to issue regulations that make reasonable progress toward the national visibility protection goal. The rule provides States with the flexibility to establish reasonable progress goals and BART based on certain criteria, one of which is the costs of compliance. The rule also provides States with the flexibility to adopt alternatives, such as an emissions trading program, in lieu of requiring BART. Finally, the rule provides the States with the flexibility to develop long-term strategies. The regional haze rule, therefore, inherently provides for adoption of the least costly, most cost effective, or least burdensome alternative that achieves the objective of the rule.

The EPA is not reaching a final conclusion as to the applicability of the requirements of UMRA to this rulemaking action. It is questionable whether a requirement to submit a SIP revision constitutes a Federal mandate. The obligation for a state to revise its SIP that arises out of sections 110(a), 169A and 169B of the CAA is not legally enforceable by a court of law and, at most, is a condition for continued receipt of highway funds. Therefore, it is possible to view an action requiring such a submittal as not creating any enforceable duty within the meaning of section 421(5)(A)(i) of UMRA (2 U.S.C. 658(5)(A)(i)). Even if it did, the duty could be viewed as falling within the exception for a condition of Federal assistance under section 421(5)(A)(i)(I) of UMRA (2 U.S.C. 658(5)(A)(i)(I)). As noted earlier, however, notwithstanding these issues, the discussion in section 2 and the analysis in Chapter 8 of the RIA constitutes the UMRA statement that would be required by UMRA if its statutory provisions applied, and EPA has consulted with governmental entities as would be required by UMRA. Consequently, it is not necessary for EPA to reach a conclusion as to the applicability of the UMRA requirements.

E. Environmental Justice—Executive Order 12898

Executive Order 12898 requires that each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minorities and low-income populations. The requirements of Executive Order 12898 have been addressed to the extent practicable in the RIA cited above, particularly in chapters 2 and 9 of the RIA.

F. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the U.S. The EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the U.S. prior to publication of the rule in the **Federal Register**. A ''major rule'' cannot take effect until 60 days after it is published in the **Federal Register**. This action is a ''major rule'' as defined by 5 U.S.C. section 804(2). This rule will be effective August 30, 1999.

G. Protection of Children From Environmental Health Risks and Safety Risks—Executive Order 13045

Executive Order 13045: ''Protection of Children from Environmental Health Risks and Safety Risks'' (62 FR 19885, April 23, 1997) applies to any rule that: (1) is determined to be ''economically significant'' as defined under E.O. 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency. The EPA interprets E.O. 13045 as applying only to those regulatory actions that are based on health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. The regional haze rule is not subject to E.O. 13045 because it does not establish an environmental standard intended to mitigate health or safety risks.

H. Enhancing the Intergovernmental Partnership—Executive Order 12875

Under Executive Order 12875, EPA may not issue a regulation that is not required by statute and that creates a mandate upon a State, local or tribal government, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by those governments, or EPA consults with those governments. If EPA complies by consulting, Executive Order 12875 requires EPA to provide to the OMB a description of the extent of EPA's prior consultation with representatives of affected State, local and tribal governments, the nature of their concerns, copies of any written communications from the governments, and a statement supporting the need to issue the regulation. In addition, Executive Order 12875 requires EPA to develop an effective process permitting elected officials and other representatives of State, local and tribal governments ''to provide meaningful and timely input in the development of regulatory proposals containing significant unfunded mandates.''

Today's final rule does not create a mandate on State, local or tribal governments. As explained in the discussion of UMRA (unit VII.D), this rule does not impose an enforceable duty on these entities. Accordingly, the requirements of section 1(a) of Executive Order 12875 do not apply to this rule.

The EPA notes, however that considerable consultation has taken place with State, local and tribal government representatives in developing the final regional haze rule. In September 1995, EPA formed a subcommittee under the authority of the Federal Advisory Committee Act to advise the Agency on various issues related to implementation of the revised ozone and particulate matter NAAQS and the regional haze program. This group met a total of 13 times between September 1995 and completion of its duties in December 1997. Several State and local governmental representatives were on this subcommittee. The EPA received and reviewed comments from over 40 States and 1 tribal government on the July 1997 proposal. Tribes in the west have been active in discussion on regional haze, both as members of the GCVTC, and in the follow-on body, the WRAP. In addition, EPA has held

numerous meetings with State and local representatives.

I. Executive Order 13084: Consultation and Coordination With Indian Tribal Governments

Under Executive Order 13084, EPA may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian tribal governments, and that imposes substantial direct compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or EPA consults with those governments. If EPA complies by consulting, Executive Order 13084 requires EPA to provide to OMB, in a separately identified section of the preamble to the rule, a description of the extent of EPA's prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires EPA to develop an effective process permitting elected officials and other representatives of Indian tribal governments ''to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.''

Because the rule does not establish a visibility progress goal or emission management strategy, the rule does not impose control or other direct compliance requirements. Hence, the rule does not create a mandate on tribal governments. Accordingly, the requirements of 3(b) of Executive Order 13084 do not apply to this rule.

J. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Pub. L. No. 104–113, section 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This action does not involve technical standards. Therefore, EPA did not consider the use of any voluntary consensus standards.

List of Subjects in 40 CFR Part 51

Environmental protection, Administrative practice and procedure, Air pollution control, Carbon monoxide, Nitrogen dioxide, Particulate matter, Sulfur oxides, Volatile organic compounds.

Dated: April 22, 1999.

Carol M. Browner,

Administrator.

For the reasons set forth in the preamble, part 51 of chapter I of title 40 of the Code of Federal Regulations is amended as follows:

PART 51—REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS

1. The authority citation for Part 51 is revised to read as follows:

Authority: 42 U.S.C. 7410, 7414, 7421, 7470–7479, 7491, 7492, 7601, and 7602.

Subpart P—Protection of Visibility

2. Section 51.300 is amended by revising paragraphs (a), (b)(1) introductory text, and (b)(2), and by adding paragraph (b)(3) to read as follows:

§ 51.300 Purpose and applicability.

(a) *Purpose.* The primary purposes of this subpart are to require States to develop programs to assure reasonable progress toward meeting the national goal of preventing any future, and remedying any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution; and to establish necessary additional procedures for new source permit applicants, States and Federal Land Managers to use in conducting the visibility impact analysis required for new sources under § 51.166. This subpart sets forth requirements addressing visibility impairment in its two principal forms: ''reasonably attributable'' impairment (i.e., impairment attributable to a single source/small group of sources) and regional haze (i.e., widespread haze from a multitude of sources which impairs visibility in every direction over a large area).

(b) *Applicability.* (1) *General Applicability.* The provisions of this subpart pertaining to implementation plan requirements for assuring reasonable progress in preventing any future and remedying any existing visibility impairment are applicable to:

* * * * *

(2) The provisions of this subpart pertaining to implementation plans to address reasonably attributable visibility impairment are applicable to the following States:

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Georgia, Hawaii, Idaho, Kentucky, Louisiana, Maine, Michigan, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Virgin Islands, Washington, West Virginia, Wyoming.

(3) The provisions of this subpart pertaining to implementation plans to address regional haze visibility impairment are applicable to all States as defined in section 302(d) of the Clean Air Act (CAA) except Guam, Puerto Rico, American Samoa, and the Northern Mariana Islands.

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3. Section 51.301 is amended by removing the paragraph designations, placing the defined terms in alphabetical order, revising the definitions of *Federal Land Manager, Major stationary source, Natural conditions,* and *Visibility impairment,* and adding in alphabetical order definitions of *Reasonably attributable visibility impairment, Regional haze, Deciview, State, Most impaired days, Least impaired days, Implementation plan, Indian tribe* or *tribe, BART-eligible source,* and *Geographic enhancement for the purpose of § 51.308* to read as follows:

§ 51.301 Definitions.

* * * * *

BART-eligible source means an *existing stationary facility* as defined in this section.

* * * * *

Deciview means a measurement of visibility impairment. A deciview is a haze index derived from calculated light extinction, such that uniform changes in haziness correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to highly impaired. The deciview haze 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 haze index=10 $\ln_e$ (b_{ext}/10 Mm^{-1}).

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

* * * * *

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.

* * * * *

Geographic enhancement for the purpose of § 51.308 means a method, procedure, or process to allow a broad regional strategy, such as an emissions trading program designed to achieve greater reasonable progress than BART for regional haze, to accommodate BART for reasonably attributable impairment.

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.

* * * * *

Least impaired days means the average visibility impairment (measured in deciviews) for the twenty percent of monitored days in a calendar year with the lowest amount of visibility impairment.

Major stationary source and major modification mean major stationary source and major modification, respectively, as defined in § 51.166.

* * * * *

Most impaired days means the average visibility impairment (measured in deciviews) for the twenty percent of monitored days in a calendar year with the highest amount of visibility impairment.

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

* * * * *

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.

* * * * *

State means ''State'' as defined in section 302(d) of the CAA.

* * * * *

Visibility impairment means any humanly perceptible change in visibility (light extinction, visual range, contrast, coloration) from that which would have existed under natural conditions.

* * * * *

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4. Section 51.302 is amended by revising the section heading, paragraphs (a), (c) introductory text, (c)(1), (c)(2) introductory text, and (c)(4)(iv) to read as follows:

§ 51.302 Implementation control strategies for reasonably attributable visibility impairment.

(a) *Plan Revision Procedures.* (1) Each State identified in § 51.300(b)(2) must have submitted, not later than September 2, 1981, an implementation plan meeting the requirements of this subpart pertaining to reasonably attributable visibility impairment.

(2)(i) The State, prior to adoption of any implementation plan to address reasonably attributable visibility impairment required by this subpart, must conduct one or more public hearings on such plan in accordance with § 51.102.

(ii) In addition to the requirements in § 51.102, the State must provide written notification of such hearings to each affected Federal Land Manager, and other affected States, and must state where the public can inspect a summary prepared by the Federal Land Managers of their conclusions and recommendations, if any, on the proposed plan revision.

(3) Submission of plans as required by this subpart must be conducted in accordance with the procedures in § 51.103.

* * * * *

(c) *General plan requirements for reasonably attributable visibility impairment.* (1) The affected Federal Land Manager may certify to the State, at any time, that there exists reasonably attributable impairment of visibility in any mandatory Class I Federal area.

(2) The plan must contain the following to address reasonably attributable impairment:

* * * * *

(4) For any existing reasonably attributable visibility impairment the Federal Land Manager certifies to the State under paragraph (c)(1) of this section, at least 6 months prior to plan submission or revision:

* * * * *

(iv) The plan must require that each existing stationary facility required to install and operate BART do so as expeditiously as practicable but in no case later than five years after plan approval.

* * * * *

5. Section 51.305 is amended by revising the section heading and paragraph (a) to read as follows:

§ 51.305 Monitoring for reasonably attributable visibility impairment.

(a) For the purposes of addressing reasonably attributable visibility impairment, each State containing a mandatory Class I Federal area must include in the plan a strategy for evaluating reasonably attributable visibility impairment in any mandatory Class I Federal area by visual observation or other appropriate monitoring techniques. Such strategy must take into account current and anticipated visibility monitoring research, the availability of appropriate monitoring techniques, and such guidance as is provided by the Agency.

* * * * *

6. Section 51.306 is amended by revising the section heading, paragraph (a)(1), paragraph (c) introductory text, and paragraph (d) to read as follows:

§ 51.306 Long-term strategy requirements for reasonably attributable visibility impairment.

(a)(1) For the purposes of addressing reasonably attributable visibility impairment, each plan must include a long-term (10–15 years) strategy for making reasonable progress toward the national goal specified in § 51.300(a). This strategy must cover any existing impairment the Federal Land Manager certifies to the State at least 6 months prior to plan submission, and any integral vista of which the Federal Land Manager notifies the State at least 6 months prior to plan submission.

* * * * *

(c) The plan must provide for periodic review and revision, as appropriate, of the long-term strategy for addressing reasonably attributable visibility impairment. The plan must provide for such periodic review and revision not less frequently than every 3 years until the date of submission of the State's first plan addressing regional haze visibility impairment in accordance with § 51.308(b) and (c). On or before this date, the State must revise its plan to provide for review and revision of a coordinated long-term strategy for addressing reasonably attributable and

regional haze visibility impairment, and the State must submit the first such coordinated long-term strategy. Future coordinated long-term strategies must be submitted consistent with the schedule for periodic progress reports set forth in § 51.308(g). Until the State revises its plan to meet this requirement, the State must continue to comply with existing requirements for plan review and revision, and with all emission management requirements in the plan to address reasonably attributable impairment. This requirement does not affect any preexisting deadlines for State submittal of a long-term strategy review (or element thereof) between August 30, 1999, and the date required for submission of the State's first regional haze plan. In addition, the plan must provide for review of the long-term strategy as it applies to reasonably attributable impairment, and revision as appropriate, within 3 years of State receipt of any certification of reasonably attributable impairment from a Federal Land Manager. The review process must include consultation with the appropriate Federal Land Managers, and the State must provide a report to the public and the Administrator on progress toward the national goal. This report must include an assessment of:

* * * * *

(d) The long-term strategy must provide for review of the impacts from any new major stationary source or major modifications on visibility in any mandatory Class I Federal area. This review of major stationary sources or major modifications must be in accordance with § 51.307, § 51.166, § 51.160, and any other binding guidance provided by the Agency insofar as these provisions pertain to protection of visibility in any mandatory Class I Federal areas.

* * * * *

7. Section 51.307 is amended by revising paragraph (a) introductory text, (a)(2) and (c) to read as follows:

§ 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)(1)(D) or (E) of the CAA, the State plan must, in any review under § 51.166 with respect to visibility protection and analyses, provide for:

* * * * *

(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

* * * * *

(c) Review of any major stationary source or major modification under paragraph (b) of this section, shall be conducted in accordance with paragraph (a) of this section, and § 51.166(o), (p)(1) through (2), and (q). In conducting such reviews the State must ensure that the source's emissions will be consistent with making reasonable progress toward the national visibility goal referred to in § 51.300(a). The State may take into account the costs of compliance, the time necessary for compliance, the energy and nonair quality environmental impacts of compliance, and the useful life of the source.

* * * * *

8. A new § 51.308 is added to subpart P to read as follows:

§ 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 paragraph (c) of this section and § 51.309(c), each State identified in § 51.300(b)(3) must submit an implementation plan for regional haze meeting the requirements of paragraphs (d) and (e) of this section by the following dates:

(1) For any area designated as attainment or unclassifiable for the national ambient air quality standard (NAAQS) for fine particulate matter ($PM_{2.5}$), the State must submit a regional haze implementation plan to EPA within 12 months after the date of designation.

(2) For any area designated as nonattainment for the $PM_{2.5}$ NAAQS, the State must submit a regional haze implementation plan to EPA at the same time that the State's plan for implementation of the $PM_{2.5}$ NAAQS must be submitted under section 172 of the CAA, that is, within 3 years after the area is designated as nonattainment, but not later than December 31, 2008.

(c) *Options for regional planning.* If at the time the SIP for regional haze would otherwise be due, a State is working with other States to develop a coordinated approach to regional haze by participating in a regional planning process, the State may choose to defer addressing the core requirements for regional haze in paragraph (d) of this section and the requirements for BART in paragraph (e) of this section. If a State opts to do this, it must meet the following requirements:

(1) The State must submit an implementation plan by the earliest date by which an implementation plan would be due for any area of the State under paragraph (b) of this section. This implementation plan must contain the following:

(i) A demonstration of ongoing participation in a regional planning process to address regional haze, and an agreement by the State to continue participating with one or more other States in such a process for the development of this and future implementation plan revisions;

(ii) A showing, based on available inventory, monitoring, or modeling information, that emissions from within the State contribute to visibility impairment in a mandatory Class I Federal Area outside the State, or that emissions from another State contribute to visibility impairment in any mandatory Class I Federal area within the State.

(iii) A description of the regional planning process, including a list of the States which have agreed to work together to address regional haze in a region (i.e., the regional planning group), the goals, objectives, management, and decisionmaking structure of the regional planning group, deadlines for completing significant technical analyses and developing emission management strategies, and a schedule for State review and adoption of regulations implementing the recommendations of the regional group;

(iv) A commitment by the State to submit an implementation plan revision addressing the requirements in paragraphs (d) and (e) of this section by the date specified in paragraph (c)(2) of this section. In addition, the State must commit to develop its plan revision in coordination with the other States participating in the regional planning process, and to fully address the recommendations of the regional planning group.

(v) A list of all BART-eligible sources within the State.

(2) The State must submit an implementation plan revision addressing the requirements in paragraphs (d) and (e) of this section by the latest date an area within the planning region would be required to submit an implementation plan under paragraph (b) of this section, but in any event, no later than December 31, 2008.

(d) *What are the core requirements for the implementation plan for regional haze?* 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 which 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) *Reasonable progress goals.* For each mandatory Class I Federal area located within the State, the State must establish goals (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must 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 least impaired days over the same period.

(i) In establishing a reasonable progress goal for any mandatory Class I Federal area within the State, the State must:

(A) Consider 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 sources, and include a demonstration showing how these factors were taken into consideration in selecting the goal.

(B) Analyze and determine the rate of progress needed to attain natural visibility conditions by the year 2064. To calculate this rate of progress, the State must compare baseline visibility conditions to natural visibility conditions in the mandatory Federal Class I area and determine the uniform rate of visibility improvement (measured in deciviews) that would need to be maintained during each implementation period in order to attain natural visibility conditions by 2064. In establishing the reasonable progress goal, the State must consider the uniform rate of improvement in visibility and the emission reduction measures needed to achieve it for the period covered by the implementation plan.

(ii) For the period of the implementation plan, if the State establishes a reasonable progress goal that provides for a slower rate of improvement in visibility than the rate that would be needed to attain natural conditions by 2064, the State must demonstrate, based on the factors in paragraph (d)(1)(i)(A) of this section, that the rate of progress for the implementation plan to attain natural conditions by 2064 is not reasonable; and that the progress goal adopted by the State is reasonable. 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 conditions if visibility improvement continues at the rate of progress selected by the State as reasonable.

(iii) In determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions, the Administrator will evaluate the demonstrations developed by the State pursuant to paragraphs (d)(1)(i) and (d)(1)(ii) of this section.

(iv) In developing each reasonable progress goal, 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. In any situation in which the State cannot agree with another such State or group of States that a goal provides for reasonable progress, the 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 goal for visibility improvement provides for reasonable progress towards natural visibility conditions.

(v) 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 to achieve the progress goal adopted by the State.

(vi) The State may not adopt a reasonable progress goal that represents less visibility improvement than is expected to result from implementation of other requirements of the CAA during the applicable planning period.

(2) *Calculations of baseline and natural visibility conditions.* For each mandatory Class I Federal area located within the State, the State must determine the following visibility conditions (expressed in deciviews):

(i) Baseline visibility conditions for the most impaired and least impaired days. The period for establishing baseline visibility conditions is 2000 to 2004. Baseline visibility conditions must be calculated, using available monitoring data, by establishing the average degree of visibility impairment for the most and least impaired 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;

(ii) For an implementation plan that is submitted by 2003, the period for establishing baseline visibility conditions for the period of the first long-term strategy is the most recent 5-year period for which visibility monitoring data are available for the mandatory Class I Federal areas addressed by the plan. For mandatory Class I Federal areas without onsite monitoring data, the State must establish baseline values using the most representative available monitoring data, in consultation with the Administrator or his or her designee;

(iii) Natural visibility conditions for the most impaired and least impaired days. Natural visibility conditions must be calculated by estimating the degree of visibility impairment existing under natural conditions for the most impaired and least impaired days, based on available monitoring information and appropriate data analysis techniques; and

(iv)(A) For the first implementation plan addressing the requirements of paragraphs (d) and (e) of this section, the number of deciviews by which baseline conditions exceed natural visibility conditions for the most impaired and least impaired days; or

(B) For all future implementation plan revisions, the number of deciviews by which current conditions, as calculated under paragraph (f)(1) of this section, exceed natural visibility conditions for the most impaired and least impaired days.

(3) *Long-term strategy for regional haze.* Each State listed in § 51.300(b)(3) must submit a long-term strategy that addresses regional haze visibility impairment for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State which may be affected by emissions from the State. The long-term strategy must include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the reasonable progress goals established by States having mandatory Class I Federal areas. In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) 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 consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area within the State.

(ii) Where other States cause or contribute to impairment in a mandatory Class I Federal area, 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 meet the progress goal for the 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.

(iii) The State must document the technical basis, including modeling, monitoring and emissions information, on which the State is relying to determine its apportionment of emission reduction obligations necessary for achieving reasonable progress in each mandatory Class I Federal area it affects. The State may meet this requirement by relying on technical analyses developed by the regional planning organization 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 is presumed to be the most recent year of the consolidate periodic emissions inventory.

(iv) The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy. The State should consider major and minor stationary sources, mobile sources, and area sources.

(v) 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) Smoke management techniques for agricultural and forestry management purposes including plans 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.

(4) *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. This monitoring strategy must be coordinated with the monitoring strategy required in § 51.305 for reasonably attributable visibility impairment. 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.

(e) *Best Available Retrofit Technology (BART) requirements for regional haze visibility impairment.* The State must submit an implementation plan containing emission limitations representing BART and schedules for compliance with BART for each BART-eligible source that may reasonably be anticipated to cause or contribute to any impairment of visibility in any mandatory Class I Federal area, unless the State demonstrates that an emissions trading program or other alternative will achieve greater reasonable progress toward natural visibility conditions.

(1) To address the requirements for BART, the State must submit an implementation plan containing the following plan elements and include documentation for all required analyses:

(i) A list of all BART-eligible sources within the State.

(ii) A determination of BART for each BART-eligible source in the State that emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any mandatory Class I Federal area. All such sources are subject to BART. This determination must be based on the following analyses:

(A) An analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each BART-eligible source within the State subject to BART. In this analysis, the State must take into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, and the remaining useful life of the source; and

(B) An analysis of the degree of visibility improvement that would be achieved in each mandatory Class I Federal area as a result of the emission reductions achievable from all sources subject to BART located within the region that contributes to visibility impairment in the Class I area, based on the analysis conducted under paragraph (e)(1)(ii)(A) of this section.

(iii) If the State determines in establishing BART that technological or economic limitations on the applicability of measurement methodology to a particular source would make the imposition of an emission standard infeasible, it may instead prescribe a design, equipment, work practice, or other operational standard, or combination thereof, to

require the application of BART. Such standard, to the degree possible, is to set forth the emission reduction to be achieved by implementation of such design, equipment, work practice or operation, and must provide for compliance by means which achieve equivalent results.

(iv) A requirement that each source subject to BART be required to install and operate BART as expeditiously as practicable, but in no event later than 5 years after approval of the implementation plan revision.

(v) A requirement that each source subject to BART maintain the control equipment required by this subpart and establish procedures to ensure such equipment is properly operated and maintained.

(2) A State may opt to implement an emissions trading program or other alternative measure rather than to require sources subject to BART to install, operate, and maintain BART. To do so, the State must demonstrate that this emissions trading program or other alternative measure will achieve greater reasonable progress than would be achieved through the installation and operation of BART. To make this demonstration, the State must submit an implementation plan containing the following plan elements and include documentation for all required analyses:

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

(A) A list of all BART-eligible sources within the State.

(B) An analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each source within the State subject to BART. In this analysis, the State must take into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, and the remaining useful life of the source. The best system of continuous emission control technology and the above factors may be determined on a source category basis. The State may elect to consider both source-specific and category-wide information, as appropriate, in conducting its analysis.

(C) An analysis of the degree of visibility improvement that would be achieved in each mandatory Class I Federal area as a result of the emission reductions achievable from all such sources subject to BART located within the region that contributes to visibility impairment in the Class I area, based on the analysis conducted under paragraph (e)(2)(i)(B) of this section.

(ii) A demonstration that the emissions trading program or alternative measure will apply, at a minimum, to all BART-eligible sources in the State. Those sources having a federally enforceable emission limitation determined by the State and approved by EPA as meeting BART in accordance with § 51.302(c) or paragraph (e)(1) of this section do not need to meet the requirements of the emissions trading program or alternative measure, but may choose to participate if they meet the requirements of the emissions trading program or alternative measure.

(iii) A requirement that all necessary emission reductions take place during the period of the first long-term strategy for regional haze. To meet this requirement, the State must provide a detailed description of the emissions trading program or other alternative measure, including schedules for implementation, the emission reductions required by the program, all necessary administrative and technical procedures for implementing the program, rules for accounting and monitoring emissions, and procedures for enforcement.

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

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

(3) After a State has met the requirements for BART or implemented emissions trading program or other alternative measure that achieve 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.

(4) Any BART-eligible facility subject to the requirement under paragraph (e) of this section to install, operate, and maintain BART may apply to the Administrator for an exemption from that requirement. An application for an exemption will be subject to the requirements of § 51.303 (a)(2) through (h).

(f) *Requirements for comprehensive periodic revisions of implementation plans for regional haze.* Each State identified in § 51.300(b)(3) must revise and submit its regional haze implementation plan revision to EPA by July 31, 2018 and every ten years thereafter. In each plan revision, the State must evaluate and reassess all of the elements required in paragraph (d) of this section, taking into account improvements in monitoring data collection and analysis techniques, control technologies, and other relevant factors. In evaluating and reassessing these elements, the State must address the following:

(1) Current visibility conditions for the most impaired and least impaired days, and actual progress made towards natural conditions during the previous implementation period. The period for calculating current visibility conditions is the most recent five year period preceding the required date of the implementation plan submittal for which data are available. Current visibility conditions must be calculated based on the annual average level of visibility impairment for the most and least impaired days for each of these five years. Current visibility conditions are the average of these annual values.

(2) The effectiveness of the long-term strategy for achieving reasonable progress goals over the prior implementation period(s); and

(3) Affirmation of, or revision to, the reasonable progress goal in accordance with the procedures set forth in paragraph (d)(1) of this section. If the State established a reasonable progress goal for the prior period which provided a slower rate of progress than that needed to attain natural conditions by the year 2064, the State must evaluate and determine the reasonableness, based on the factors in paragraph (d)(1)(i)(A) of this section, of additional measures that could be adopted to achieve the degree of visibility improvement projected by the analysis contained in the first implementation plan described in paragraph (d)(1)(i)(B) of this section.

(g) *Requirements for periodic reports describing progress towards the reasonable progress goals.* Each State identified in § 51.300(b)(3) must submit a report to the Administrator every 5 years evaluating progress towards the reasonable progress goal for each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State which may be affected by

emissions from within the State. The first progress report is due 5 years from submittal of the initial implementation plan addressing paragraphs (d) and (e) of this section. The progress reports must be in the form of implementation plan revisions that comply with the procedural requirements of § 51.102 and § 51.103. 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.

(3) For each mandatory Class I Federal area within the State, the State must assess the following visibility conditions and changes, with values for most impaired and least impaired days expressed in terms of 5-year averages of these annual values.

(i) The current visibility conditions for the most impaired and least impaired days;

(ii) The difference between current visibility conditions for the most impaired and least impaired days and baseline visibility conditions;

(iii) The change in visibility impairment for the most impaired and least impaired days over the past 5 years;

(4) An analysis tracking the change over the past 5 years 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. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable 5-year period.

(5) An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred over the past 5 years that have limited or impeded progress in reducing pollutant emissions and improving visibility.

(6) An assessment of whether the current implementation plan elements and strategies are sufficient to enable the State, or other States with mandatory Federal Class I areas affected by emissions from the State, to meet all established reasonable progress goals.

(7) A review of the State's visibility monitoring strategy and any modifications to the strategy as necessary.

(h) *Determination of the adequacy of existing implementation plan.* At the same time the State is required to submit any 5-year progress report to EPA in accordance with paragraph (g) of this section, the State must also take one of the following actions based upon the information presented in the progress report:

(1) If the State determines that the existing implementation plan requires no further substantive revision at this time in order to achieve established goals for visibility improvement and emissions reductions, the State must provide to the Administrator a negative declaration that further revision of the existing implementation plan is not needed at this time.

(2) If the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another State(s) which participated in a regional planning process, the State must provide notification to the Administrator and to the other State(s) which participated in the regional planning process with the States. The State must also collaborate with the other State(s) through the regional planning process for the purpose of developing additional strategies to address the plan's deficiencies.

(3) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another country, the State shall provide notification, along with available information, to the Administrator.

(4) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources within the State, the State shall revise its implementation plan to address the plan's deficiencies within one year.

(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 and at least 60 days prior to holding any public hearing on an implementation plan (or plan revision) for regional haze required by this subpart. 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), 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 5-year progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in mandatory Class I Federal areas.

9. A new § 51.309 is added to subpart P to read as follows:

§ 51.309 Requirements related to the Grand Canyon Visibility Transport Commission.

(a) *What is the purpose of this section*? This section establishes the requirements for the first regional haze implementation plan to address regional haze visibility impairment in the 16 Class I areas covered by the Grand Canyon Visibility Transport Commission Report. For the years 2003 to 2018, certain States (defined in paragraph (b) of this section as Transport Region States) may choose to implement the Commission's recommendations within the framework of the national regional haze program and applicable requirements of the Act by complying with the provisions of this section, as supplemented by an approvable Annex to the Commission Report as required by paragraph (f) of this section. If a transport region State submits an implementation plan which is approved by EPA as meeting the requirements of this section, it will be deemed to comply with the requirements for reasonable progress for the period from approval of the plan to 2018.

(b) *Definitions.* For the purposes of this section:

(1) *16 Class I areas* means the following mandatory Class I Federal areas on the Colorado Plateau: Grand Canyon National Park, Sycamore Canyon Wilderness, Petrified Forest National Park, Mount Baldy Wilderness, San Pedro Parks Wilderness, Mesa Verde National Park, Weminuche Wilderness, Black Canyon of the Gunnison Wilderness, West Elk Wilderness, Maroon Bells Wilderness, Flat Tops Wilderness, Arches National Park, Canyonlands National Park, Capital Reef National Park, Bryce Canyon National Park, and Zion National Park.

(2) *Transport Region State* means one of the States that is included within the Transport Region addressed by the Grand Canyon Visibility Transport Commission (Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Wyoming).

(3) *Commission Report* means the report of the Grand Canyon Visibility Transport Commission entitled ''Recommendations for Improving Western Vistas,'' dated June 10, 1996.

(4) *Fire* means wildfire, wildland fire (including prescribed natural fire), prescribed fire, and agricultural burning conducted and occurring on Federal, State, and private wildlands and farmlands.

(5) *Milestone* means an average percentage reduction in emissions, expressed in tons per year, for a given year or for a period of up to 5 years ending in that year, compared to a 1990 actual emissions baseline.

(6) *Mobile Source Emission Budget* means the lowest level of VOC, NO_X, SO_2 elemental and organic carbon, and fine particles which are projected to occur in any area within the transport region from which mobile source emissions are determined to contribute significantly to visibility impairment in any of the 16 Class I areas.

(7) *Geographic enhancement* means a method, procedure, or process to allow a broad regional strategy, such as a milestone or backstop market trading program designed to achieve greater reasonable progress than BART for regional haze, to accommodate BART for reasonably attributable impairment.

(c) *Implementation Plan Schedule.* Each Transport Region State may meet the requirements of § 51.308(b) through (e) by electing to submit an implementation plan that complies with the requirements of this section. Each Transport Region State must submit an implementation plan addressing regional haze visibility impairment in the 16 Class I areas no later than December 31, 2003. A Transport Region State that elects not to submit an implementation plan that complies with the requirements of this section (or whose plan does not comply with all of the requirements of this section) is subject to the requirements of § 51.308 in the same manner and to the same extent as any State not included within the Transport Region.

(d) *Requirements of the first implementation plan for States electing to adopt all of the recommendations of the Commission Report.* Except as provided for in paragraph (e) of this section, each Transport Region State must submit an implementation plan that meets the following requirements:

(1) *Time period covered.* The implementation plan must be effective for the entire time period between December 31, 2003 and December 31, 2018.

(2) *Projection of visibility improvement.* For each of the 16 mandatory Class I areas located within the Transport Region State, the plan must include a projection of the improvement in visibility conditions (expressed in deciviews, and in any additional ambient visibility metrics deemed appropriate by the State) expected through the year 2018 for the most impaired and least impaired days, based on the implementation of all measures as required in the Commission report and the provisions in this section. The projection must be made in consultation with other Transport Region States with sources which may be reasonably anticipated to contribute to visibility impairment in the relevant Class I area. The projection may be based on a satisfactory regional analysis.

(3) *Treatment of clean-air corridors.* The plan must describe and provide for implementation of comprehensive emission tracking strategies for clean-air corridors to ensure that the visibility does not degrade on the least-impaired days at any of the 16 Class I areas. The strategy must include:

(i) An identification of clean-air corridors. The EPA will evaluate the State's identification of such corridors based upon the reports of the Commission's Meteorology Subcommittee and any future updates by a successor organization;

(ii) Within areas that are clean-air corridors, an identification of patterns of growth or specific sites of growth that could cause, or are causing, significant emissions increases that could have, or are having, visibility impairment at one or more of the 16 Class I areas.

(iii) In areas outside of clean-air corridors, an identification of significant emissions growth that could begin, or is beginning, to impair the quality of air in the corridor and thereby lead to visibility degradation for the least-impaired days in one or more of the 16 Class I areas.

(iv) If impairment of air quality in clean air corridors is identified pursuant to paragraphs (d)(3)(ii) and (iii) of this section, an analysis of the effects of increased emissions, including provisions for the identification of the need for additional emission reductions measures, and implementation of the additional measures where necessary.

(v) A determination of whether other clean air corridors exist for any of the 16 Class I areas. For any such clean air corridors, an identification of the necessary measures to protect against future degradation of air quality in any of the 16 Class I areas.

(4) *Implementation of stationary source reductions.* The first implementation plan submission must include:

(i) Monitoring and reporting of sulfur dioxide emissions. The plan submission must include provisions requiring the monitoring and reporting of actual stationary source sulfur dioxide emissions within the State. The monitoring and reporting data must be sufficient to determine whether a 13 percent reduction in actual stationary source sulfur dioxide emissions has occurred between the years 1990 and 2000, and whether milestones required by paragraph (f)(1)(i) of this section have been achieved for the transport region. The plan submission must provide for reporting of these data by the State to the Administrator. Where procedures developed under paragraph (f)(1)(ii) of this section and agreed upon by the State include reporting to a regional planning organization, the plan submission must provide for reporting to the regional planning body in addition to the Administrator.

(ii) Criteria and procedures for a market trading program. The plan must include the criteria and procedures for activating a market trading program or other program consistent with paragraph (f)(1)(i) of this section if an applicable regional milestone is exceeded, procedures for operation of the program, and implementation plan assessments and provisions for implementation plan assessments of the program in the years 2008, 2013, and 2018.

(iii) Provisions for activating a market trading program. Provisions to activate the market trading program or other program within 12 months after the emissions for the region are determined to exceed the applicable emission reduction milestone, and to assure that

all affected sources are in compliance with allocation and other requirements within 5 years after the emissions for the region are determined to exceed the applicable emission reduction milestone.

(iv) Provisions for market trading program compliance reporting. If the market trading program has been activated, the plan submission must include provisions requiring the State to provide annual reports assuring that all sources are in compliance with applicable requirements of the market trading program.

(v) Provisions for stationary source NO_X and PM. The plan submission must include a report which assesses emissions control strategies for stationary source NO_X and PM, and the degree of visibility improvement that would result from such strategies. In the report, the State must evaluate and discuss the need to establish emission milestones for NO_X and PM to avoid any net increase in these pollutants from stationary sources within the transport region, and to support potential future development and implementation of a multipollutant and possibly multisource market-based program. The plan submission must provide for an implementation plan revision, containing any necessary long-term strategies and BART requirements for stationary source PM and NO_X (including enforceable limitations, compliance schedules, and other measures) by no later than December 31, 2008.

(5) *Mobile sources.* The plan submission must provide for:

(i) Statewide inventories of current annual emissions and projected future annual emissions of VO_c, NO_X, SO_2, elemental carbon, organic carbon, and fine particles from mobile sources for the years 2003 to 2018. The future year inventories must include projections for the year 2005, or an alternative year that is determined by the State to represent the year during which mobile source emissions will be at their lowest levels within the State.

(ii) A determination whether mobile source emissions in any areas of the State contribute significantly to visibility impairment in any of the 16 Class I Areas, based on the statewide inventory of current and projected mobile source emissions.

(iii) For States with areas in which mobile source emissions are found to contribute significantly to visibility impairment in any of the 16 Class I areas:

(A) The establishment and documentation of a mobile source emissions budget for any such area, including provisions requiring the State to restrict the annual VOC, NO_X, SO_2, elemental and organic carbon, and/or fine particle mobile source emissions to their projected lowest levels, to implement measures to achieve the budget or cap, and to demonstrate compliance with the budget.

(B) An emission tracking system providing for reporting of annual mobile source emissions from the State in the periodic implementation plan revisions required by paragraph (d)(10) of this section. The emission tracking system must be sufficient to determine the States' contribution toward the Commission's objective of reducing emissions from mobile sources by 2005 or an alternate year that is determined by the State to represent the year during which mobile source emissions will be at their lowest levels within the State, and to ensure that mobile source emissions do not increase thereafter.

(iv) Interim reports to EPA and the public in years 2003, 2008, 2013, and 2018 on the implementation status of the regional and local strategies recommended by the Commission Report to address mobile source emissions.

(6) *Programs related to fire.* The plan must provide for:

(i) Documentation that all Federal, State, and private prescribed fire programs within the State evaluate and address the degree visibility impairment from smoke in their planning and application. In addition the plan must include smoke management programs that include all necessary components including, but not limited to, actions to minimize emissions, evaluation of smoke dispersion, alternatives to fire, public notification, air quality monitoring, surveillance and enforcement, and program evaluation.

(ii) A statewide inventory and emissions tracking system (spatial and temporal) of VOC, NO_X, elemental and organic carbon, and fine particle emissions from fire. In reporting and tracking emissions from fire from within the State, States may use information from regional data-gathering and tracking initiatives.

(iii) Identification and removal wherever feasible of any administrative barriers to the use of alternatives to burning in Federal, State, and private prescribed fire programs within the State.

(iv) Enhanced smoke management programs for fire that consider visibility effects, not only health and nuisance objectives, and that are based on the criteria of efficiency, economics, law, emission reduction opportunities, land management objectives, and reduction of visibility impact.

(v) Establishment of annual emission goals for fire, excluding wildfire, that will minimize emission increases from fire to the maximum extent feasible and that are established in cooperation with States, tribes, Federal land management agencies, and private entities.

(7) *Area sources of dust emissions from paved and unpaved roads.* The plan must include an assessment of the impact of dust emissions from paved and unpaved roads on visibility conditions in the 16 Class I Areas. If such dust emissions are determined to be a significant contributor to visibility impairment in the 16 Class I areas, the State must implement emissions management strategies to address the impact as necessary and appropriate.

(8) *Pollution prevention.* The plan must provide for:

(i) An initial summary of all pollution prevention programs currently in place, an inventory of all renewable energy generation capacity and production in use, or planned as of the year 2002 (expressed in megawatts and megawatt-hours), the total energy generation capacity and production for the State, the percent of the total that is renewable energy, and the State's anticipated contribution toward the renewable energy goals for 2005 and 2015, as provided in paragraph (d)(8)(vi) of this section.

(ii) Programs to provide incentives that reward efforts that go beyond compliance and/or achieve early compliance with air-pollution related requirements.

(iii) Programs to preserve and expand energy conservation efforts.

(iv) The identification of specific areas where renewable energy has the potential to supply power where it is now lacking and where renewable energy is most cost-effective.

(v) Projections of the short- and long-term emissions reductions, visibility improvements, cost savings, and secondary benefits associated with the renewable energy goals, energy efficiency and pollution prevention activities.

(vi) A description of the programs relied on to achieve the State's contribution toward the Commission's goal that renewable energy will comprise 10 percent of the regional power needs by 2005 and 20 percent by 2015, and a demonstration of the progress toward achievement of the renewable energy goals in the years 2003, 2008, 2013, and 2018. This description must include documentation of the potential for renewable energy resources, the

percentage of renewable energy associated with new power generation projects implemented or planned, and the renewable energy generation capacity and production in use and planned in the State. To the extent that it is not feasible for a State to meet its contribution to the regional renewable energy goals, the State must identify in the progress reports the measures implemented to achieve its contribution and explain why meeting the State's contribution was not feasible.

(9) *Implementation of additional recommendations.* The plan must provide for implementation of all other recommendations in the Commission report that can be practicably included as enforceable emission limits, schedules of compliance, or other enforceable measures (including economic incentives) to make reasonable progress toward remedying existing and preventing future regional haze in the 16 Class I areas. The State must provide a report to EPA and the public in 2003, 2008, 2013, and 2018 on the progress toward developing and implementing policy or strategy options recommended in the Commission Report.

(10) *Periodic implementation plan revisions.* Each Transport Region State must submit to the Administrator periodic reports in the years 2008, 2013, and 2018. The progress reports must be in the form of implementation plan revisions that comply with the procedural requirements of § 51.102 and § 51.103.

(i) The report will assess the area for reasonable progress as provided in this section for mandatory Class I Federal area(s) located within the State and for mandatory Class I Federal area(s) located outside the State which may be affected by emissions from within the State. This demonstration may be based on assessments conducted by the States and/or a regional planning body. The progress reports must contain at a minimum the following elements:

(A) 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.

(B) A summary of the emissions reductions achieved throughout the State through implementation of the measures described in paragraph (d)(10)(i)(A) of this section.

(C) For each mandatory Class I Federal area within the State, an assessment of the following: the current visibility conditions for the most impaired and least impaired days; the difference between current visibility conditions for the most impaired and least impaired days and baseline visibility conditions; the change in visibility impairment for the most impaired and least impaired days over the past 5 years.

(D) An analysis tracking the change over the past 5 years 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. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable 5-year period.

(E) An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred over the past 5 years that have limited or impeded progress in reducing pollutant emissions and improving visibility.

(F) An assessment of whether the current implementation plan elements and strategies are sufficient to enable the State, or other States with mandatory Federal Class I areas affected by emissions from the State, to meet all established reasonable progress goals.

(G) A review of the State's visibility monitoring strategy and any modifications to the strategy as necessary.

(ii) At the same time the State is required to submit any 5-year progress report to EPA in accordance with paragaph (d)(10)(i) of this section, the State must also take one of the following actions based upon the information presented in the progress report:

(A) If the State determines that the existing implementation plan requires no further substantive revision at this time in order to achieve established goals for visibility improvement and emissions reductions, the State must provide to the Administrator a negative declaration that further revision of the existing implementation plan is not needed at this time.

(B) If the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another State(s) which participated in a regional planning process, the State must provide notification to the Administrator and to the other State(s) which participated in the regional planning process with the States. The State must also collaborate with the other State(s) through the regional planning process for the purpose of developing additional strategies to address the plan's deficiencies.

(C) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another country, the State shall provide notification, along with available information, to the Administrator.

(D) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from within the State, the State shall develop additional strategies to address the plan deficiencies and revise the implementation plan no later than one year from the date that the progress report was due.

(11) *State planning and interstate coordination.* In complying with the requirements of this section, States may include emission reductions strategies that are based on coordinated implementation with other States. Examples of these strategies include economic incentive programs and transboundary emissions trading programs. The implementation plan must include documentation of the technical and policy basis for the individual State apportionment (or the procedures for apportionment throughout the trans-boundary region), the contribution addressed by the State's plan, how it coordinates with other State plans, and compliance with any other appropriate implementation plan approvability criteria. States may rely on the relevant technical, policy and other analyses developed by a regional entity (such as the Western Regional Air Partnership) in providing such documentation. Conversely, States may elect to develop their own programs without relying on work products from a regional entity.

(12) *Tribal implementation.* Consistent with 40 CFR Part 49, tribes within the Transport Region may implement the required visibility programs for the 16 Class I areas, in the same manner as States, regardless of whether such tribes have participated as members of a visibility transport commission.

(e) *States electing not to implement the commission recommendations.* Any Transport Region State may elect not to implement the Commission recommendations set forth in paragraph (d) of this section. Such States are required to comply with the timelines and requirements of § 51.308. Any Transport Region State electing not to implement the Commission recommendations must advise the other States in the Transport Region of the nature of the program and the effect of the program on visibility-impairing

emissions, so that other States can take this information into account in developing programs under this section.

(f) *Annex to the Commission Report.* (1) A Transport Region State may choose to comply with the provisions of this section and by doing so shall satisfy the requirements of § 51.308(b) through (e) only if the Grand Canyon Visibility Transport Commission (or a regional planning body formed to implement the Commission recommendations) submits a satisfactory annex to the Commission Report no later than October 1, 2000. To be satisfactory, the Annex must contain the following elements:

(i) The annex must contain quantitative emission reduction milestones for stationary source sulfur dioxide emissions for the reporting years 2003, 2008, 2013 and 2018. The milestones must provide for steady and continuing emission reductions for the 2003–2018 time period consistent with the Commission's definition of reasonable progress, its goal of 50 to 70 percent reduction in sulfur dioxide emissions from 1990 actual emission levels by 2040, applicable requirements under the CAA, and the timing of implementation plan assessments of progress and identification of deficiencies which will be due in the years 2008, 2013, and 2018. The emission reduction milestones must be shown to provide for greater reasonable progress than would be achieved by application of best available retrofit technology (BART) pursuant to § 51.308(e)(2) and would be approvable in lieu of BART.

(ii) The annex must contain documentation of the market trading program or other programs to be implemented pursuant to paragraph (d)(4) of this section if current programs and voluntary measures are not sufficient to meet the required emission reduction milestones. This documentation must include model rules, memoranda of understanding, and other documentation describing in detail how emission reduction progress will be monitored, what conditions will require the market trading program to be activated, how allocations will be performed, and how the program will operate.

(2) The Commission may elect, at the same time it submits the annex, to make recommendations intended to demonstrate reasonable progress for other mandatory Class I areas (beyond the original 16) within the Transport Region States, including the technical and policy justification for these additional mandatory Class I Federal areas in accordance with the provisions of paragraph (g) of this section.

(3) The EPA will publish the annex upon receipt. If EPA finds that the annex meets the requirements of paragraph (f)(1) of this section and assures reasonable progress, then, after public notice and comment, will amend the requirements of paragraph (d)(4) of this section to incorporate the provisions of the annex within 1 year after EPA receives the annex. If EPA finds that the annex does not meet the requirements of paragraph (f)(1) of this section, or does not assure reasonable progress, or if EPA finds that the annex is not received, then each Transport Region State must submit an implementation plan for regional haze meeting all of the requirements of § 51.308.

(4) In accordance with the provisions under paragraph (f)(1) of this section, the annex may include a geographic enhancement to the program provided for in paragraph (d)(4) of this section to address the requirement under § 51.302(c) related to Best Available Retrofit Technology for reasonably attributable impairment from the pollutants covered by the milestones or the backstop market trading program. The geographic enhancement program may include an appropriate level of reasonably attributable impairment which may require additional emission reductions over and above those achieved under the milestones defines in paragraph (f)(1)(i) of this section.

(g) *Additional Class I areas.* The following submittals must be made by Transport Region States implementing the provisions of this section as the basis for demonstrating reasonable progress for additional Class I areas in the Transport Region States. If a Transport Region State submits an implementation plan which is approved by EPA as meeting the requirements of this section, it will be deemed to comply with the requirements for reasonable progress for the period from approval of the plan to 2018.

(1) In the plan submitted for the 16 Class I areas no later than December 31, 2003, a declaration indicating whether other Class I areas will be addressed under § 51.308 or paragraphs (g)(2) and (3) of this section.

(2) In a plan submitted no later than December 31, 2008, provide a demonstration of expected visibility conditions for the most impaired and least impaired days at the additional mandatory Class I Federal area(s) based on emissions projections from the long-term strategies in the implementation plan. This demonstration may be based on assessments conducted by the States and/or a regional planning body.

(3) In a plan submitted no later than December 31, 2008, provide revisions to the plan submitted under paragraph (c) of this section, including provisions to establish reasonable progress goals and implement any additional measures necessary to demonstrate reasonable progress for the additional mandatory Federal Class I areas. These revisions must comply with the provisions of § 51.308(d)(1) through (4).

(4) The following provisions apply for Transport Region States establishing reasonable progress goals and adopting any additional measures for Class I areas other than the 16 Class I areas under paragraphs (g)(2) and (3) of this section.

(i) In developing long-term strategies pursuant to § 51.308(d)(3), the State may build upon the strategies implemented under paragraph (d) of this section, and take full credit for the visibility improvement achieved through these strategies.

(ii) The requirement under § 51.308(e) related to Best Available Retrofit Technology for regional haze is deemed to be satisfied for pollutants addressed by the milestones and backstop trading program if, in establishing the emission reductions milestones under paragraph (f) of this section, it is shown that greater reasonable progress will be achieved for these Class I areas than would be achieved through the application of source-specific BART emission limitations under § 51.308(e)(1).

(iii) The Transport Region State may consider whether any strategies necessary to achieve the reasonable progress goals required by paragraph (g)(3) of this section are incompatible with the strategies implemented under paragraph (d) of this section to the extent the State adequately demonstrates that the incompatibility is related to the costs of the compliance, the time necessary for compliance, the energy and no air quality environmental impacts of compliance, or the remaining useful life of any existing source subject to such requirements.

10. In the sections listed in the first column remove the reference listed in the middle column and add the reference listed in the third column in its place:

Section	Remove	Add
51.301(v)	Section 303	§ 51.303
51.302(c)(2)(i)	Section 305	§ 51.305
51.302(c)(2)(i)	Section 306	§ 51.306
51.302(c)(2)(i)	Section 300(a)	§ 51.300(a)
51.302(c)(4)(i)	Section 304(b)	§ 51.304(b)
51.303(a)(1)	Section 302	§ 51.302
51.303(c)	Section 303	§ 51.303
51.303(d)	Section 303	§ 51.303
51.303(g)	Section 303	§ 51.303
51.303(h)	Section 303	§ 51.303
51.304(c)	Section 306(c)	§ 51.306(c)
51.306(a)(1)	Section 300(a)	§ 51.300(a)
51.306(c)(6)	Section 303	§ 51.303
51.307(b)(1)	Section 304	§ 51.304
51.307(b)(1)	Section 304(d)	§ 51.304(d)
51.307(c)	Section 300(a)	§ 51.300(a)

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Appendix 1.2

Guide to Locating 40 CFR 51.308 Requirements

Guide To Locating 40 CFR 51.308 Requirements

Purpose:

This checklist has been prepared by EPA staff to use in reviewing regional haze SIPs to ensure that the SIPs have the necessary components. The checklist represents our best efforts to summarize the requirements of the regional haze rule but it is not a regulation and does not change or substitute for any legal requirements in the Clean Air Act (CAA) or the regional haze rule. Any decisions regarding the completeness of a particular SIP will be made based on the CAA and the relevant regulations. Therefore, interested parties are free to raise questions and objections to the checklist and its use in a particular situation.

Acronyms and Terms:

BART is Best Available Retrofit Technology
CAA is the Clean Air Act
CAIR is Clean Air Interstate Rule
EI is Emissions Inventory
FLM is Federal Land Manager
Glidepath is the linear rate of improvement sufficient to attain natural conditions by 2064
LTS is Long Term Strategy
RAVI is Reasonably Attributable Visibility Impairment
RHR is the Regional Haze Rule
RPO is Regional Planning Organization
RPG is Reasonable Progress Goal

Notes:

1. This checklist is based on Appendix V to 40 CFR Part 51, and 40 CFR 51.308, as updated by the BART Rule (70 FR 39104, July 6, 2005), and the trading rule, as proposed in 70 FR 44154, August 1, 2005. This checklist will be revised if necessary, should that be necessitated by the final version of the trading rule.
2. All boxes should either be "Y" or "N/A" or the SIP may be deficient.
3. This checklist assumes the State will not be participating in a trading program, or other alternative measure to BART. If this is not the case, then additional/alternative regulations that appear in 51.308(e)(2) and (3) apply.
4. Only the requirements from 51.308 pertaining to the *current* RH SIP submission, and not those pertaining to future revisions and/or reports required under 51.308(f), (g), and (h) (except for a SIP commitment to do them), were included.
5. The "1999 RHR" is 64 FR 35714, July 1, 1999.
6. The "2005 BART Rule" is 70 FR 39104, July 6, 2005.

7. The "BART Guidelines" is *Appendix Y to Part 51—Guidelines for BART Determinations Under the Regional Haze Rule*, 70 FR 39104, July 6, 2005.

8. The "Tracking Guidance" is the *Guidance for Tracking Progress Under the Regional Haze Rule*, EPA-454/B-03-004, September, 2003.
9. The "Attainment Guidance" is the *Draft Guidance for Demonstrating Attainment of Air Quality Goals for PM2.5 and Regional Haze*, January 2, 2001.
10. The "Natural Visibility Guidance" is the *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule*, EPA-454/B-03-005, September 2003.
11. The "Baseline Memo" is a memo, *2002 Base Year Emission Inventory SIP Planning: 8-Hour Ozone, PM2.5 and Regional Haze Programs*, dated 11/18/2002, from Lydia Wegman to the Regional Air Directors.
12. The "draft RPG Guidance" is the *Draft Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program*, dated November 28, 2005.
13. The "Visibility Monitoring Guidance" is Visibility Monitoring Guidance, EPA-454/R-99-003, June 1999.
14. The "EI Guidance" is the *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations*, EPA-454/R-05-001, dated August, 2005.
15. The "Interim Fire Policy" is the *Interim Air Quality Policy on Wildland and Prescribed Fires*, April 23, 1998.

* Requirements that do not apply to States without Class I areas are denoted by an asterisk.

Y / N or N/A	SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
	Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	Administrative Requirements from Appendix V to Part 51			
	2.1(a)	Has a letter of submittal from the governor / designee, requesting EPA approval of the SIP been received?	Page i	
	2.1(b)	Has the State provided evidence it has adopted the legally enforceable portions of the plan in the State code or body of regulations; or issued the necessary permits, orders, consent agreements in final form?	Chapter 9, Appendix 9.3d	
	2.1(c)	Has the State provided evidence it has the necessary legal authority under State law to adopt and implement the plan?	Appendix 2.1	
	2.1(d)	Has the official State regulation /document been signed/stamped/dated by the appropriate State official indicating that it is fully enforceable by the State?	Appendix 9c	
	2.1(e)	Has the State provided evidence it followed all of the procedural requirements of the State's laws and constitution in the adoption/issuance of the plan?	Appendix 2.1a	
	2.1(f)	Has the State provided evidence that public notice was given of the proposed change consistent with procedures approved by EPA, including the date of publication of such notice?	Chapter 2, Appendix 2.1b	
	2.1(g)	Has the State provided a certification that public hearings(s) were held in accordance with the information provided in the public notice and the State's laws and constitution, if applicable?	Appendix 2.1b	

		SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
		Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
		2.1(h)	Has the State provided a compilation of public comments and the State's response thereto?	Appendix 2.1c	
		Technical Requirements from 40 CFR 51.308			
		(b)	Was the SIP submitted no later than December 17, 2007?	No	
		(d)	Did the State provide a table identifying each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State affected by emissions from within the State?	Chapter 1.2	• Visibility Monitoring Guidance
	*	(d)(1)	Did the State establish RPGs for each Class I area that provide for an improvement in visibility for the most impaired days over the period of the SIP, and ensure no degradation in visibility for the least impaired days over the same period?	Chapter 10	• p. 35730 of the 1999 RHR • p. 1-6 of the Tracking Guidance • Attainment Guidance • draft RPG Guidance
	*	(d)(1)(i)(A)	In establishing RPGs for each Class I area, did the State consider 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 sources, and include a demonstration showing how these factors were taken into consideration in selecting the goal?	Appendix 10.1	• p. 35731-33 of the 1999 RHR • draft RPG Guidance
	*	(d)(1)(i)(B)	Did the State submit the glidepath (i.e., rate of progress needed to attain natural visibility conditions by 2064) for each Class I area?	Chapter 10, Figs. 10.5-10.8	• p. 35727-33, 35 of the 1999 RHR • Natural Visibility Guidance • p. 39124, 39143 of the 2005 BART rule • The Baseline Memo

		SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
		Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	*	(d)(1)(i)(B)	In establishing the RPG for each Class I area, did the State calculate the uniform rate of improvement in visibility and the emission reduction measures needed to achieve it for the period covered by the SIP?	Chapter 10, Tables 10.1& 10.2	• p. 35732 of the 1999 RHR • draft RPG Guidance
	*	(d)(1)(ii)	If the State establishes a RPG < the glidepath, has it demonstrated, based on the factors in (d)(1)(i)(A), the rate of progress for the SIP to attain natural conditions by 2064 is not reasonable, and its RPG is reasonable?	N/A	• p. 35732 of the 1999 RHR
	*	(d)(1)(ii)	If the State establishes a RPG < the glidepath, did it provide to the public for review as part of its SIP, an assessment of the number of years it would take to attain natural conditions using its RPG?	N/A	• p. 35732 of the 1999 RHR
		(d)(1)(iv)	In developing its RPG, has the State consulted with those States that may reasonably be anticipated to cause or contribute to visibility impairment in the Class I areas?	Chapter 5, Chapter 10.2, Appendix 10.2	• p. 35735 of the 1999 RHR
		(d)(1)(iv)	If the State cannot agree with another State(s) that a goal provides for reasonable progress, has the State described in its submittal the actions taken to resolve the disagreement?	N/A	• p. 35732 of the 1999 RHR
	*	(d)(1)(vi)	Has the State adopted RPGs that represents at least the visibility improvement expected from implementation of other CAA programs during the applicable planning period?	Chapter 11,	• p. 35733 of the 1999 RHR
	*	(d)(2)(i)	Has the State calculated baseline visibility conditions for each Class I area for the most impaired and least impaired days using 2000 to 2004 monitoring data?	Chapter 5.1	• p. 35728-30 of the 1999 RHR • Natural Visibility Guidance • Attainment Guidance • Tracking Guidance

		SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
		Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	*	(d)(2)(i)	In calculating the baseline visibility conditions, did the State estimate the average degree of visibility impairment for the most and least impaired days for each calendar year from 2000 to 2004, and then determine the average of these annual values?	Appendix 5.1	
	*	(d)(2)(i)	If the State has Class I areas without onsite monitoring data for 2000 - 2004, did the State use the most representative available monitoring data for 2000 - 2004 to establish baseline values, in consultation with the EPA Regional Office?	N/A	• p. 35728-29 of the 1999 RHR • Visibility Monitoring Guidance
	*	(d)(2)(iii)	Did the State calculate natural visibility conditions for the most impaired and least impaired days by estimating the degree of impairment based on available monitoring information and appropriate data analysis techniques?	Appendix 5.2	• p. 35764, 35729-30 of the 1999 RHR • Natural Visibility Guidance
	*	(d)(2)(iv)A	Did the State calculate the number of deciviews by which baseline conditions exceed natural visibility conditions for the most impaired and least impaired days for the first planning period?	Chapter 10.1	• p. 35732 of the 1999 RHR
		(d)(3)	Did the State submit a LTS that addresses visibility impairment for each Class I area, inside and outside the State, which may be affected by the State's emissions?	Chapter 11	• p. 35734-35 of the 1999 RHR
		(d)(3)	Does the LTS include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the RPGs established by States having Class I areas?	Chapter 11	• p. 35734-35 of the 1999 RHR

SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
(d)(3)(i)	In establishing its LTS, did the State consult with other State(s) to develop coordinated emission management strategies for cases in which it has emissions that are reasonably anticipated to contribute to visibility impairment in any Class I area located in those State(s)?	Chapter 10, Appendix 10.2	• p. 35735 of the 1999 RHR
(d)(3)(i)	In establishing its LTS, did the State consult with other State(s) to develop coordinated emission management strategies for cases in which those State(s) have emissions that are reasonably anticipated to contribute to visibility impairment in any Class I area located within the State?	Chapter 10, Appendix 10.2	
(d)(3)(ii)	In establishing its LTS, where multiple State(s) cause or contribute to impairment of the same Class I area, did the State include all measures necessary to obtain its share of the emission reductions needed to meet the RPG for the area?	Chapter 10, Appendix 10.2	• p. 35735 of the 1999 RHR
(d)(3)(ii)	In addressing (d)(3)(ii), above, if the State participated in a RPO, did it ensure it included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process?	N/A	• p. 35735 of the 1999 RHR
(d)(3)(iii)	In establishing its LTS, did the State document the technical basis, including modeling, monitoring and emissions information, on which it is relying to determine its apportionment of emission reduction obligations necessary for achieving reasonable progress in each Class I area it affects?	N/A	• p. 35735 of the 1999 RHR • EI Guidance

	SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
	Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	(d)(3)(iii)	In addressing (d)(3)(iii), above, did the State identify the baseline emissions inventory on which its strategies are based?	Chapter 7, Appendix 8.1	• p. 35728 of the 1999 RHR • Baseline Memo • EI Guidance
	(d)(3)(iv)	Did the State identify all anthropogenic sources of visibility impairment considered by it in developing its LTS, including consideration of major and minor stationary sources, mobile sources, and area sources?	Appendix 7.1, Appendix 8.1	• p. 35735 of the 1999 RHR • EI Guidance
	(d)(3)(v)(A)	In developing its LTS, did the State consider the emission reductions due to ongoing air pollution control programs, including measures to address RAVI?	Chapter 11,	• p. 35737 of the 1999 RHR
	(d)(3)(v)(B)	In developing its LTS, did the State consider measures to mitigate the impacts of construction activities?	Chapter 11.4.1.5	• p. 35737 of the 1999 RHR
	(d)(3)(v)(C)	In developing its LTS, did the State consider emissions limitations and schedules for compliance to achieve the reasonable progress goal?	Chapter 11.4.1.7	• p. 35737 of the 1999 RHR
	(d)(3)(v)(D)	In developing its LTS, did the State consider source retirement and replacement schedules?	Chapter 11.4.1.6	• p. 35737 of the 1999 RHR
	(d)(3)(v)(E)	In developing its LTS, did the State consider smoke management techniques for agricultural and forestry management purposes, including plans as currently exist within the State for these purposes?	Chapter 11.4.1.8	• p. 35736 of the 1999 RHR • Interim Fire Policy
	(d)(3)(v)(F)	In developing its LTS, did the State consider enforceability of emissions limitations and control measures?	Chapter 11.4.10	• p. 35737 of the 1999 RHR

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		Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
		(d)(3)(v)(G)	In developing its LTS, did the State 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?	Chapter 8.4	• p. 35737 of the 1999 RHR
	*	(d)(4)	Did the State submit with the SIP a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment representative of all Class I areas within the State?	Chapter 6	• p. 35744 of the 1999 RHR • Attainment Guidance • Tracking Guidance • Visibility Monitoring Guidance
	*	(d)(4)	Did the State coordinate the above monitoring strategy with the RAVI monitoring strategy in § 51.305?	Chapter 6, Appendix 6.2	• p. 35717, 37, of the 1999 RHR
	*	(d)(4)(i)	Did the SIP provide for the establishment of any additional monitoring sites or equipment needed to assess whether RPGs to address regional haze for all Class I areas within the State are being achieved?	Chapter 6	• p. 35744 of the 1999 RHR • Attainment Guidance • Tracking Guidance • Visibility Monitoring Guidance
	*	(d)(4)(ii)	Did the SIP establish 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 Class I areas both within and outside the State?	Appendix 6.2	• p. 35744 of the 1999 RHR • Attainment Guidance • Tracking Guidance • Visibility Monitoring Guidance
		(d)(4)(iii)	For a State with no Class I areas, did the SIP establish 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 Class I areas in other States?	N/A	• p. 35744 of the 1999 RHR • Attainment Guidance • Tracking Guidance • Visibility Monitoring Guidance
	*	(d)(4)(iv)	Did the SIP provide for the reporting of all visibility monitoring data to EPA at least annually for each Class I area in the State?	Chapter 6	• p. 35744-45 of the 1999 RHR • Visibility Monitoring Guidance

	SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
	Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	(d)(4)(v)	Did the SIP include a statewide EI of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any Class I area?	Chapter 7, Appendix 7.1	• Attainment Guidance
	(d)(4)(v)	Did the EI include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions?	Chapter 7, Appendix 8.1	• p. 35728-29 of the 1999 RHR • Visibility Monitoring Guidance • Attainment Guidance
	(d)(4)(v)	Did the SIP include a commitment to update the EI periodically?	Chapter 7	• EI Guidance
	(d)(4)(vi)	Did the SIP include other elements necessary to assess and report on visibility (e.g., reporting, recordkeeping, etc.)?	Chapter 6, Appendix 6.2	
	(e)	Did the State submit a SIP containing emission limitations representing BART, and schedules for compliance with BART, for each BART eligible source that may reasonably be anticipated to cause or contribute to any impairment of visibility in any Class I area?	Chapter 9, Section 9.3, Tables 9.3a – 9.3d, & Appendix 9.3c	• BART Guidelines
	(e)(1)(i)	Did the SIP include a list of all BART-eligible sources within the State with supporting documentation?	Chapter 9, Section 9.1, Fig 9.1,Table 9.1 and Appendices 9.1a, 9.1b, & 9.3b	• BART Guidelines
	(e)(1)(ii)	Did the SIP include a determination of BART for each BART-eligible source in the State that emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any Class I area?	Chapter 9, Section 9.3, Tables 9.3a – 9.3d, & Appendix 9.3c	• BART Guidelines

	SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
	Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	(e)(1)(ii)(A)	Did the SIP include a determination of BART based on an analysis of the best system of continuous emission control technology available, and associated emission reductions achievable for each source subject to BART within the State?	Appendices 9.2b – 9.2d	• BART Guidelines
	(e)(1)(ii)(A)	In the BART analysis, did the State take into consideration the technology available, the costs of compliance, the energy and nonair 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 improvement in visibility which may reasonably be anticipated to result from the use of such technology?	Appendices 9.3a, 9.3c, & 9.3d	• BART Guidelines • p 39107, 127 of the 2005 BART Rule
	(e)(1)(ii)(B)	Did the State determine BART for fossil-fuel fired power plants > 750 megawatts pursuant to the BART guidelines?	Chapter 9, Section 9.1, Fig. 9.1 & Table 9.1; Section 9.2 Table 9.2 & Fig 9.2; Appendix 9.3c	• BART Guidelines • p 39108 of the 2005 BART Rule
	(e)(1)(iii)	If the State has determined that technological or economic limitations on the applicability of measurement methodology to a particular source would make the imposition of an emission standard infeasible, has the State prescribed a design, equipment, work practice, or other operational standard, to require the application of BART, as an alternative to a BART emission standard?	Appendices 9.3a, 9.3c, & 9.3d	• BART Guidelines

	SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
	Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	(e)(1)(iii)	If the State adopted a design, equipment, work practice, or other operational standard alternative to BART, did the State, to the degree possible, set forth the emission reduction to be achieved, and provide for compliance by means which achieve equivalent results?	N/A	• BART Guidelines • p 39172 of the 2005 BART Rule
	(e)(1)(iv)	Has the State required each source subject to BART to install and operate BART as expeditiously as practicable, but no later than 5 years after approval of the SIP?	Chapter 9, Section 9.3 & Appendix 9.3c	• p 39158, 70, 72 of the 2005 BART Rule
	(e)(1)(v)	Has the State required each BART source to maintain the required control equipment and establish procedures to ensure such equipment is properly operated and maintained?	Appendix 9.3c	• p 39172 of the 2005 BART Rule
	(e)(4)	If the State is using its participation in CAIR to exempt BART-eligible EGU's from BART, has it included supporting documentation?	N/A	• p 39136-42 of the 2005 BART Rule
	(e)(4)	If the State is using its participation in CAIR to exempt BART-eligible EGU's from BART, did it include provisions for a geographic enhancement to the program to address RAVI BART under § 51.302(c)?	N/A	• p 39143, 57 of the 2005 BART Rule
	(e)(6)	If a facility is seeking an exemption under §51.303(a)(2)–(h) for any of its BART-eligible emission units, has the appropriate documentation been included in the SIP?	N/A	• §51.303(a)(2)–(h)
	(f)	Has the State included a commitment it will submit its SIP revision, as specified in 51.308(f), *by July 31, 2018,* and every ten years thereafter?	Chapter 12	• p 35745 of the 1999 RHR • Section 110(a)(2)(H) of the CAA

	SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
	Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	(g)	Has the State included a commitment it will submit its SIP report, as specified in 51.308(g), *by an exact date named*, that is within 5 years from submittal of the initial SIP?	Chapter 12	• p 35745 of the 1999 RHR • Section 110(a)(2)(F) of the CAA
	(h)	Has the State included a commitment it will, at the time of the submission of the SIP report, also submit a determination of the adequacy of its existing Regional Haze SIP revision, as specified in 51.308(h)?	Chapter 13	• p 35745 of the 1999 RHR • Section 110(a)(2)(F) of the CAA
	(i)(1)(i)-(ii)	Did the State, by November 29, 1999, identify in writing to the FLMs the title of the official to which any FLM can submit recommendations on the implementation 51.308 including, (i) identification of impairment of visibility in any Class I area(s); and (ii) identification of elements for inclusion in the visibility monitoring strategy required by §51.305 and 51.308?	Appendix 4.1	• p. 35747-48 of the 1999 RHR
	(i)(2)	Did the State provide the FLM an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on the SIP (or its revision)?	Chapter 4	• p. 35747-48 of the 1999 RHR
	(i)(2)(i)-(ii)	Did the above consultation include 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?	Chapter 4, Appendix 2.1c	• p. 35747-48 of the 1999 RHR
	(i)(3)	Did the State include in the SIP a description of how it addressed any comments provided by the FLMs?	Appendix 2.1c	• p. 35747-48 of the 1999 RHR

	SIP Submittal Checklist for Regional Haze SIPs Submitted under 40 CFR 51.308			
	Regulation Citation	**Regulation Summary (*not verbatim*)**	**Location in SIP**	**References**
	(i)(4)	Does the SIP 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?	Chapter 4	• p. 35747-48 of the 1999 RHR

Appendix 2.1

Summary of (a) legal authority; (b) public participation process; and, (c) public comments and responses (inclusive of FLMS comments and responses) on SIP draft.

Summary of (a) legal authority; (b) public participation process; and, (c) public comments and responses (inclusive of FLMS comments and responses) on SIP draft

a. Description of Legal Authority

Statutory authority for the Regional Haze Rule comes from sections 169A and 169B of the Clean Air Act (42 U.S.C. 7491 and 7492) which sets forth a national goal for visibility which is, 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.’’ These sections required the EPA to issue regulations that will require States to revise their state implementation plans (SIPs) to contain enforceable measures and strategies for reducing visibility-impairing pollution, and to ensure that reasonable progress is made towards the national visibility goals specified in section 169A. Pursuant to section 169A(a) and (b), the EPA promulgated the Regional haze program requirements codified in 40 CFR 51.308.

Pursuant to these Regional Haze Rule requirements, ADEQ proposed revisions to Regulation 19, *Regulations of the Arkansas Plan of Implementation for Air Pollution Control*. Reg.19.1501 et seq. revisions establish the Regional Haze Program provisions, which establish enforceable Best Available Retrofit Technology requirements. Changes to Regulation 19 were adopted by the Arkansas Pollution Control and Ecology Commission. The Commission’s authority to adopt rules and regulations that implement substantive statutes charged to the ADEQ is found in Arkansas Code Annotated 8-1-203(b)(1).

> *8-1-203. Powers and responsibilities of the Arkansas Pollution Control and Ecology Commission.*
>
> …
>
> *(b) The commission's powers and duties shall be as follows:*
>
> *(1)(A) Promulgation of rules and regulations implementing the substantive statutes charged to the Arkansas Department of Environmental Quality for administration.*
>
> …

Legal authority for the State of Arkansas to adopt and implement the Regional Haze SIP is found in Arkansas Code Annotated 8-4-311.

> *8-4-311 Powers generally*
>
> *(a) The Arkansas Department of Environmental Quality or its successor shall have the power to:*
>
> *(1) Develop and effectuate a comprehensive program for the prevention and control of all sources of pollution of the air of this state;*

(2) Advise, consult, and cooperate with other agencies of the state, political subdivisions, industries, other states, the federal government, and with affected groups in the furtherance of the purposes of this chapter;

(3) Encourage and conduct studies, investigations, and research relating to air pollution and its causes, prevention, control, and abatement as it may deem advisable and necessary;

(4) Collect and disseminate information relative to air pollution and its prevention and control;

(5) Consider complaints and make investigations;

(6) Encourage voluntary cooperation by the people, municipalities, counties, industries, and others in preserving and restoring the purity of the air within the state;

(7) Administer and enforce all laws and regulations relating to pollution of the air;

(8) Represent the state in all matters pertaining to plans, procedures, or negotiations for interstate compacts in relation to air pollution control;

(9)(A) Cooperate with and receive moneys from the federal government or any other source for the study and control of air pollution.

(B) The department is designated as the official state air pollution control agency for such purposes;

(10) Make, issue, modify, revoke, and enforce orders prohibiting, controlling, or abating air pollution and requiring the adoption of remedial measures to prevent, control, or abate air pollution;

(11) Institute court proceedings to compel compliance with the provisions of this chapter and rules, regulations, and orders issued pursuant to this chapter; and

(12) Exercise all of the powers in the control of air pollution granted to the department for the control of water pollution under sections 8-4-101 – 8-4-106 and 8-4-201 – 8-4-229.

b. Public Participation Process

Arkansas complied with requirements of the Regional Haze Regulation by passing changes to Arkansas's Regulation 19. Legal notice of the proposed regulation change and public hearing was given in the Arkansas Democrat Gazette, a newspaper with statewide circulation, on May 27 and 28, 2007. A public hearing on the proposed regulation change was held at the Arkansas Department of Environmental Quality headquarters on June 27, 2007, with the final date for public comment occurring July 12, 2007. Formal presentation of proposed final regulation changes to the Administrative Rules & Regulations Subcommittee of the Arkansas Legislative Council occurred August 2, 2007. Formal presentation to the Public Health & Welfare Committee of the Arkansas Legislative Council occurred August 28, 2007. The Arkansas

Pollution Control and Ecology Commission adopted the proposed changes on September 28, 2007.

Arkansas provided public notice of the opportunity to comment on the SIP on June 7, 2008 in a statewide newspaper, the Arkansas Democrat Gazette. Included in the notice to the public was an announcement that a public hearing was scheduled for July 7, 2008. A copy of the draft Regional Haze SIP was made available at the ADEQ Headquarters, Public Records Center, Room 127, 5301 Northshore Drive, North Little Rock, Arkansas 72218. Copies of these notices are provided in Appendix 2.1c.

Arkansas held a public hearing regarding the SIP on July 7, 2008. Public comments, inclusive of those made by the FLMS are addressed and are summarized in Appendix 2.1c

c. Public and FLM Comments:

Arkansas provided the FLMs a draft copy of the Regional Haze SIP and solicited comments on the draft SIP on February 22, 2008. FLM comments were summarized and included in the public notice of the proposed SIP. A photocopy of the legal ad follows and reads:

NOTICE OF PUBLIC HEARING, COMMENT PERIOD

The Arkansas Department of Environmental Quality (ADEQ) will hold a public hearing on the Arkansas Regional Haze Rule State Implementation Plan (SIP) on Monday July 7, 2008. The public hearing will begin at 2:00 p.m. in the Commission Room of the ADEQ headquarters, located at 5301 Northshore Drive, North Little Rock, AR 72218-5317. The hearing will allow comments on the SIP, and associated items.

On July 1, 1999, the U.S. Environmental Protection Agency (EPA) adopted the federal visibility requirements for the protection of visibility in Class I areas. The EPA promulgated these regulations in the Regional Haze Rule, codified in 40 CFR 51.308. Arkansas has two federal Class I areas within its borders. The SIP was developed to meet the requirements of EPA's Regional Haze Rule and includes a description of the consultation process used to develop the SIP, reasonable progress goals for achieving natural visibility conditions, a long-term strategy and other implementation plan requirements.

Class I areas in Arkansas affected by the rule are the Upper Buffalo Wilderness Area in the Ozark National Forest and the Caney Creek Wilderness Area in the Ouachita National Forest.

The Regional Haze SIP is available for inspection at the ADEQ office in North Little Rock. The Department will accept written or electronic mail comments for the record until 4:30 p.m. Monday July 21, 2008. The Department requests persons intending to give verbal presentations also provide a written copy of their testimony to the hearing officer at the time of the public hearing or by mail. Persons interested in viewing this SIP or giving comments should contact

Doug Szenher in the Public Outreach and Assistance Division: 5301 Northshore Drive, North Little Rock, AR 72218-5317; electronic mail: doug@adeq.state.ar.us; telephone: 501-682-0915.

The associated documents are also available for viewing and downloading on the ADEQ internet web site at the following link: ftp://listserv.adeq.state.ar.us/pub/regional_haze_sip.zip

The Regional Haze SIP provides a detailed description of consultations that were conducted with applicable Federal Land Managers (FLMs). A brief summary of the FLMs draft comments on the draft Regional Haze SIP follows, with a full version contained in the SIP. ADEQ does not expect significant changes in the final FLM comments. When the final FLM comments are available they will be included in the SIP. A response summary addressing these comments will also be included in the Regional Haze SIP.

The FLMs commented positively on Arkansas' Smoke Management Plan and fire emission related regional haze considerations. Comments on insufficiencies or needed clarifications were received on technical aspects of Best Available Retrofit Technology (BART) and Uniform Rate of Progress. Emission Inventory comments were received regarding a heavy dependence on appendices and a lack of Area of Influence graphics. FLMs comments stated a need to discuss the attribution of the haze causing pollution of neighboring states, and the potential for future point source sulfur emissions. Comments also stated that the State did not conduct a "four factor analysis" when making control decisions, or provide an adequate description of its long-term strategy.

The ADEQ will continue to coordinate and consult with the FLMs during the implementation of the Regional Haze SIP, as well as during the implementation of other programs having the potential to contribute to visibility impairment in the mandatory Class I areas of Arkansas.

Dated this 7th day of June, 2008,

Teresa Marks, Director,
Arkansas Department of Environmental Quality

Arkansas Democrat Gazette

STATEMENT OF LEGAL ADVERTISING

ADEQ
5301 NORTH SHORE DR
NORTH LITTLE ROCK AR 72118

REMIT TO:
ARKANSAS DEMOCRAT-GAZETTE, INC.
P.O. BOX 2221
LITTLE ROCK, AR 72203

ATTN: Doug Szenher
DATE : 06/07/08 INVOICE #: 2315613
ACCT #: L844316 P.O. #:

BILLING QUESTIONS CALL 378-3812

STATE OF ARKANSAS, }
COUNTY OF PULASKI, } ss.

I, Elizabeth Myers do solemnly swear that I am the Legal Billing Clerk of the Arkansas Democrat - Gazette, a daily newspaper printed and published in said County, State of Arkansas; that I was so related to this publication at and during the publication of the annexed legal advertisement in the matter of:

public hearing

pending in the Court, in said County, and at the dates of the several publications of said advertisement stated below, and that during said periods and at said dates, said newspaper was printed and had a bona fide circulation in said County; that said newspaper had been regularly printed and published in said County, and had a bona fide circulation therein for the period of one month before the date of the first publication of said advertisement; and that said advertisement was published in the regular daily issues of said newspaper as stated below.

DATE	DAY	LINAGE	RATE	DATE	DAY	LINAGE	RATE
06/07	Sat	149	1.25				

TOTAL COST ---------- 186.25
Billing Ad #: 51293171

Subscribed and sworn to me this_____
day of_____, 20_____

Notary Public

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PLEASE REMIT THIS COPY WITH PAYMENT

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The ADEQ will continue to coordinate and consult with the FLMs during the implementation of the Regional Haze SIP, as well as during the implementation of other programs having the potential to contribute to visibility impairment in the mandatory Class I areas of Arkansas.

Dated this 7th day of June, 2008.

Teresa Marks, Director,
Arkansas Department of
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Responsiveness Summary for Comments Received From Federal Land Managers in Regards to the Draft State of Arkansas Regional Haze Rule State Implementation Plan

Note: This document incorporates the complete set of comments that Federal Land Managers have submitted to date. Each comment, or portion thereof, is followed by ADEQ's response. Responses are numbered in a manner consistent with the numbered comments.

Overall Comment

The Fish & Wildlife Service has a significant concern that the information provided in the State of Arkansas' Draft Regional Haze SIP fails to describe or address content elements required by the Regional Haze Rule. Throughout the document, too little information is placed in the summary with little to no continuity. In this case, the lack of continuity results either in confusing reading that bounces from point to point, or in discussions with serious information gaps. In particular, the State relies on numerous appendixes in lieu sufficient summary description to adequately address the content areas identified by the Act or rule. In the end, the Draft SIP does not provide a reader with an understanding of the causes of haze at the Class I areas of concern, how that will change over the ten-year planning interval, and the strategies that the State will employ to provide for reasonable progress toward the goal of natural visibility conditions by the year 2064.

Response - ADEQ and some other CENRAP States used the CENRAP SIP/TIP Template and a checklist provided by EPA Region 6 as the framework for compiling a document that addresses all of the elements required to be included in a SIP. The assertion that Arkansas's draft Regional Haze SIP "fails to describe or address content elements required by the Regional Haze Rule" is unfounded. Concerns about the extent to which the document is readable or lacks continuity should not be a consideration in determining whether the SIP can be approved.

Two specific content areas are completely lacking sufficient analysis, description, or comparison to the mandatory factors identified by the Act and subsequent rules. These are the presentation of Best Available Retrofit Technology (BART) decisions made by Arkansas, as well as the treatment of Reasonable Progress and Long Term Strategy. Detailed discussions of these issues are explained in the technical comments that follow.

In addition, the information presented regarding BART evaluations for several facilities inappropriately seek to evaluate individual units on a per-pollutant basis to compare to the significance threshold. This erroneous application of the BART elimination provisions of EPA's

BART Guidelines[1] results in instances where air pollution sources are not evaluated for additional pollution controls properly in accordance with the regulations.

We are concerned that the apparent lack of sufficient summary and disregard for reasonable progress or analyses of the statutory factors may constitute this draft un-approvable. As such, the FWS respectfully requests that the State of Arkansas reconsider the Draft SIP in its present form before release to the public. We ask that the State review the eight elements identified by the Fish & Wildlife Service letter (August 2006) and expand its discussion in the document regarding how ADEQ approached, evaluated, and drew conclusions on these important rule elements.

The remaining comments provided here are organized according to the priorities that we presented in our August 1, 2006, letter. Many of the following comments will also provide direction towards building the narrative of the Draft SIP to satisfy the documentation and content area deficiencies noted above.

Response – Responses to these overall comments follow the detailed discussions provided in numbered comments below.

Baseline, Natural Conditions, Uniform Rate

1. Sections 5.1 states that baseline visibility conditions for the Caney Creek Wilderness Area were established using three years of IMPROVE data, and notes that this "does not meet EPA completeness criteria for the five year averaging period." Section 6 indicates that the Caney Creek IMPROVE site was installed between 2000 and 2003, which is the reason for not having five years of monitoring data at the time baseline was set. Please note that the Regional Haze Rule requires three of five years for baseline calculations, and thus the Caney Creek monitoring site does have sufficient years of valid data to meet the completeness criteria.

1. ADEQ acknowledges this comment and has revised Section 5.1 to address it in accordance with 40 CFR 51.308(d)(2). A three-year average (2002 to 2004) was calculated for each Caney Creek visibility metric, i.e. both best and worst days.

2. Figures 10.2 and 10.4 present a "Uniform Rate of Progress for the Twenty Percent Best Days" at the two Arkansas Class I areas. Table 10.2 presents the information from those figures in tabular form. We do not understand the purpose of this information. The Regional Haze Rule requires that a State develop a Long Term Strategy based on an assessment of control measures that would make progress towards natural visibility conditions on the worst 20% days over the 60 year timeframe; however, the Rule prevents a State from setting a

1 See 40 CFR Part 51, Appendix Y. The U.S. Environmental Protection Agency finalized it's BART Guidelines on June 15, 2005, and published the preamble and final rule text in the Federal Register on July 6, 2005. The rulemaking action added Appendix Y to Part 51, titled "Guidelines for BART Determinations Under the Regional Haze Rule." See Section II.A.3 and 4.

reasonable progress goal for the best days that is more impaired than the baseline condition. While the "Worst Day" concept is represented by the graphical glide-slope presentation used in figures 10.1 and 10.3, the graphs you provided in figures 10.2 and 10.4 for the "Best Days" (together with the data in table 10.2) are not representative of the best days provisions of the Regional Haze Rule. Rather, figures 10.6 and 10.8 showing the "Reasonable Progress Goals for the Twenty Percent Best Days," which appear in the following section, address the Regional Haze Rule Best-Days goal appropriately. If Figures 10.2, 10.4, and table 10.2 are the means be which Arkansas is setting it RP goals for the least-impaired days, that should be presented in a more direct manner. We agree that the best day goals should show any improvement from baseline expected from implementation of the Long-Term Strategy adopted by the State. (Please also see comment #17, below, which is related to this topic.)

2. ADEQ has made appropriate changes to Chapter 10 but notes that Comment #18, erroneously referenced as Comment #17 in the above paragraph, implies that RPGs are also required for the 20% best days. This appears to make Comment #2 and Comment #18 internally inconsistent. ADEQ understands the goal for the 20% least impaired days to be "no degradation" as depicted in Figs. 10.4 and 10.6.

The first sentence of Section 10.2 – Determination of Reasonable Progress Goals explicitly references Table 10.2 – Reasonable Progress Goals for Arkansas Class 1 Areas. This table contains numeric expressions of these goals. The table has been revised to more clearly express these goals.

Emission Inventories

3. Section 7.0 – Tables 7.1 and 7.2 list 2002 and 2018 emission estimates by basic source category, respectively. This very brief chapter provides reference to two appendices – the first is a lengthy technical report prepared by a contractor, and the second is a "Short Summary of the 2002 Emission Inventories Methodology Utilized by Arkansas." The chapter then indicates that the 2018 emissions inventory will be further discussed in the next chapter. Chapter 8 covers the modeling assessments conducted for this SIP development, with section 8.4.1 providing a one-paragraph description of the bases for the "2018 base case." Arkansas must declare its expected 2018 state-wide inventories after implementation of the components of its Long-Term Strategy, and, as part of the commitment to ongoing review of the SIP, explain how deviations from those emissions will be addressed in future SIP revisions.

   Throughout all of these discussions, there is too much burden placed on the reader to review large reports in the appendices, with no discussion or conclusions provided by ADEQ except for the unsupported numerical data in the chapter 7 tables. For instance, we were unable to determine whether the "2018 Emissions Inventory Summary" presented in Table 7.2 represents the future base case without additional controls, the future projection utilizing CAIR and/or BART controls, or possibly some other future control scenario. This chapter should identify and describe the differences between the various emissions scenarios that ADEQ employed for its Regional Haze SIP analyses and decisions, including

Base/Performance, Typical 2002, Base 2018, and any Alternate 2018, emissions inventories, and how it is utilizing each scenario.

3. All emission reductions associated with ADEQ's Long-Term Strategy (BART and "on the books and on the way control measures") are included in the CENRAP inventory and modeling. Any future-year deviations from current inventory estimates will be addressed at the appropriate 5 and 10-year intervals as required by the Rule. There is no requirement to devise a scheme for "mid-course" corrections at this time.

The Section on base-year and future-year emission inventories has been revised to reflect comments received.

4. There is inconsistent discussion of a variety of emission inventories starting with section 8.1 leading into section 8.4. Model performance should not use typical base or future emission inventory data. Section 8.3 provides non-related information emission development for other purposed in the middle of a performance discussion. No information is provided to describe the performance inventory. Section 8.4 also skips from one topic to another, with discussions of future inventory, typical inventory, and model performance intermingled.

4. The Section on base-year and future-year emission inventories has been revised to reflect comments received.

5. Section 8.4.2 presents the results of model performance evaluations for the Arkansas Class I areas. The discussion for both Caney Creek and Upper Buffalo suggest significant underestimation of impacts due to sulfur, in the range of 30%-50%. This data is simply stated, but its implications and ADEQ's conclusions based upon the information are not explained. RPO final projections are generally based of relative response factors (RRF) corrections, which allow that, while the model may be "off" in absolute terms, it still responds to increases or decreases in impact. There is no mention of RRFs or discussion of whether the model is responding properly for relative use.

5. The modeling conducted by CENRAP for its member states represents the best currently available approximation of future-year visibility conditions. As such, it is the basis for informed decision-making regarding the effectiveness of control strategies that are to be implemented. In the absence of modeled outcomes, there would be little, if any, ability to evaluate strategies for improvement in future visibility conditions.

6. As currently drafted, the SIP projects an overall increase in SO2 emissions between the baseline and 2018, despite inclusion of BART controls on a significant amount of current emissions. The SIP should commit the State to review and revise emissions projections from 2012 to 2018 as part of 5-year review required by the regional haze rule. This commitment will assure that the projected improvements represented by the reasonable progress goals set in Section 10 will be achieved. The commitment to review must include a commitment to seek further controls or adjust the reasonable progress goals though a SIP revision should the emissions projections vary substantially from those projected at this time. Those revisions may result in additional improvement in visibility if the current projection of new power

generation in Arkansas does not materialize, or if such generation does not yield the expected amount of new emissions.

Section 12 briefly provides a broad commitment to periodic review and revision of the SIP as a whole. The Emission Inventory sections should discuss the uncertainty and then point to the Section 12 commitment as ADEQ's plan of action on that front, and ensure that the statement provided in Section 12 adequately encompasses the scope described in this comment.

6. As pointed out in the comment itself, Section 12 contains ADEQ's commitment to submit periodic reports every five-years and comprehensive periodic revisions every ten-years that contain all elements required by 40 CFR 51.308(f) and 40 CFR 51.308(g). ADEQ understands reassessments of emission inventory projections, progress goals and control strategies to be explicit requirements of the rule and does not find it necessary to further elaborate on these regulatory commitments.

7. Section 8.5 presents a short discussion and a few figures about the "2018 Base G C1 Control Strategy" that CENRAP generated. This scenario involved examining the pollution sources within the "areas of influence" of the nearby Class I areas, and assuming that controls would be applied up to a cost of $5,000/ton level for all such facilities that had a ratio of emissions-to-distance-from-Class-I-area of 5 or more (tons per year/kilometers). Resulting reductions to visibility impacts are described as significant, yet nowhere does the Draft SIP explain whether Arkansas, or any other State identified in that scenario, has committed to or will benefit from such an inventory. Thus, we do not understand the context in which ADEQ is discussing the 2018 Base G C1 scenario.

7. ADEQ used the 2018 Base G scenario and did not rely on the separate 2018 Base G C1 Control Strategy scenario in its development of Uniform Rates of Progress or Reasonable Progress Goals. For purposes of clarification, the discussion of the 2018 Base G C1 Control Strategy scenario has been removed.

Best Available Retrofit Technology (BART)[2]

8. BART, although partially described, does not offer a sufficient summary of process, source identification, impacts, controls associated with exemption or subsequent determinations. In Arkansas's own statement, the Clean Air Interstate Rule (CAIR) does not constitute sufficient controls to be better than BART. This statement places an additional burden on Arkansas, as compared to a typical CAIR State, to develop and describe a BART process that clearly identifies, evaluates, and decides levels of control or exemption for eligible single sources. The State appears to have conducted much of the necessary steps. However, the SIP document does not adequately describe the analyses and how alternatives associated with controls were considered by the State.

2 BART-eligible sources are those sources that have the potential to emit 250 tons or more of a visibility-impairing air pollutant, were put in place or under construction between August 7, 1962 and August 7, 1977, and whose operations fall within one or more of 26 specifically listed source categories. Under CAA section 169A(b)(2)(A), BART is required for any BART-eligible source which "emits any air pollutant that may reasonably be anticipated to cause or contribute to any impairment of visibility in any such area."

8. ADEQ has revised Section 8 to address this comment.

9. EPA's BART Guidelines[3] provide thresholds for evaluating whether the BART-eligible units at a facility cause or contribute to Regional Haze at a Class I area. These thresholds are to be applied to the visibility impacts projected from the sum of all visibility affecting pollutants from the total of all BART-eligible units at a facility. However, the BART documentation for Arkansas Electric Cooperative Corporations Bailey and McClellan Stations, and for the AEP Southwestern Electric Power Company-Flint Creek Power Plant, instead apply this threshold on a per-pollutant basis to individual units in order to either exempt from being subject to BART or to justify not conducting engineering analyses of potential BART controls. This is inappropriate. This is further discussed in the attachment to these comments.

9. In its BART determination modeling, ADEQ modeled all pollutants from all BART-eligible sources at the facility. ADEQ followed EPA's BART Guidelines (page 41) which states, "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."

10. Specifically regarding the BART exemption process, we have the following comments:

    a. On page 46, at the end of section 9.2, Arkansas explains that, since its EGU sources are only required to participate in ozone-season NOx reductions under CAIR, that meeting CAIR requirements does not satisfy BART for these facilities. We concur with this decision. It would be helpful to the reader if this paragraph was relocated earlier in the chapter, prior to BART exemption discussions, to explain why so many EGU emission sources are included in the subsequent BART determination/exemption process in Arkansas.
    b. Section 9.2 does not provide sufficient summary of ADEQ's BART exemption process or results, including the reasons why remaining BART sources were not exempt.
    c. Section 9.2, says that the State will exempt BART-eligible through source-by-source evaluation (that is, in accordance with option 1 listed on page 42). Yet, the text that follows suggests that a cumulative visibility analysis was performed on the six remaining subject-to-BART sources. Readers are referred to Appendix 9.2C for description and methodology. Appendix 9.2C does not include information from

[3] See 40 CFR Part 51, Appendix Y. The U.S. Environmental Protection Agency finalized it's BART Guidelines on June 15, 2005, and published the preamble and final rule text in the Federal Register on July 6, 2005. The rulemaking action added Appendix Y to Part 51, titled "Guidelines for BART Determinations Under the Regional Haze Rule."

ENVIRON or Alpine, nor does it offer another cumulative analysis. It is not clear what purpose or application a cumulative analysis serves for the State.

10. While the federal courts ruled that a cumulative analysis could not be used to determine BART eligibility for a source category as a whole, cumulative analysis is an option that was exercised by ADEQ as a means of determining the overall improvements achieved through the application of source-specific BART in the State. The reference to Appendix 9.2C has been corrected to Appendix 9.2D

11. Section 9.4 (together with Appendix 9.2C) of the Draft SIP present a discussion relating to post-control visibility improvement at ten Class 1 areas as a result of BART controls on several subject-to-BART facilities. It demonstrates significant improvement which is to be commended, but also shows that very significant visibility impairment still exists after BART controls are in place. This issue is to be addressed in the Reasonable Progress portion of the Draft SIP. However, some consideration might be given as to whether some of the BART control technology chosen by the sources specifically to satisfy the BART requirements might preclude possibly more effective technology that could have been deployed in an overall more cost-effective manner as part of the Reasonable Progress phase. The ADEQ might determine if a much higher level of control (beyond BART) by a BART source at this time might allow the ADEQ to not require further controls from that particular source as part of it's Reasonable Progress determination.

    The attachment to this comment document provides source-specific recommendations regarding control technology options that ADEQ should consider for its six "subject-to-BART sources.

11. ADEQ is responsible for determining reasonable progress for its own Class 1 areas only and has no obligation to discuss reasonable progress goals for Class 1 areas located outside of the State. ADEQ does not accept the inference that BART sources are required to consider levels of control greater than those considered for application of BART. ADEQ does not intend to require sources it has determined to be subject to BART to go beyond the requirements of the Rule. ADEQ stands behind its BART determinations, has submitted a BART Rule in the form of a revision to Regulation 19, and does not find it necessary to reopen its rule in order to consider additional source-specific recommendations.

12. Specifically regarding the Draft SIP's presentation of BART control determinations, we have the following comments:

    a. Section 9.3 is where the Draft SIP should provide a summary of the BART determinations for the Subject-to BART sources. However, the few paragraphs and tables presented are insufficient. ADEQ should summarize, on a facility-by-facility basis, levels of controls considered, final control selected, and information on how the "five factors" were considered in making its decisions. Detailed information can be placed in Appendix, but company submitted BART information is not a substitute for State decision processes.
    b. The information presented in the tables 9.3a through 9.3d is difficult to follow. Earlier in this chapter, the BART-eligible units are identified by name, with Facility

ID, AFIN, and Unit ID noted (table 9.1). Subsequently, the Subject-to-BART source subset is listed, again by name with Facility ID and Emission Unit descriptions, but no AFIN numbers (table 9.2). But, tables 9.3a thru 9.3d omit the source names, list the units apparently with the AFIN number (but in the column titled "Source and Unit"), and include what appears to be a reference to a State-issued operating permit number that presumably contains the emission limits provided in those tables. It would be very helpful for the tables throughout this chapter to be consistent in the syntax of referencing the specific BART units. We suggest that the tables do include the source names to help those unfamiliar with the syntax of the air pollution source ID listings and ADEQ's permit number assignments.

c. Tables 9.3a thru 9.3d appear to have some errors, and/or information that may need further explanation:
   - Table 9.3a, sixth data row – we believe that this source AFIN number should be "30-00011," for the Entergy-Lake Catherine facility, instead of "30-00110." The latter does not appear on the BART-eligible list of Table 9.1. But, note that the unit listed for this entry in table 9.3a, "SN-03 *oil*" does not match any BART-eligible unit for the Entergy-Lake Catherine facility, per table 9-1; it does match the unit description for this facility in table 9-2.
   - We do not understand the information presented in these tables across the following columns: "Baseline Peak 24-hour Emissions (lb/hr)," "BART Level of Control %," and "Future Peak 24-hour Emission Rate (lb/hr)." For the first several entries in table 9.3a, the calculation of Future Peak 24-hour Emission Rate is consistent with applying the listed BART Level of Control to the Baseline Peak 24-hour Emissions values. But, the listings for three units with "0%" control are confusing. The footnote indicates that the BART Level of Control is "only listed if facility is adding controls or taking limits that will reduce emission per BART requirements. Facilities which are not adding controls or using controls which are already installed have a 0% BART control efficiency." Yet, one of these three units shows that, after applying a 0% BART control level, its emission will still be reduced by nearly half. In addition, there are two entries that state the BART Level of Control will be "up to 95%," but that only calculate a Future Peak 24-hour Emission Rate representing approximately 80% control each. Similar confusing data is presented in tables 9.3b (for the four units with 69% NOX BART control), and for the entries of table 9.3c. The single footnote under table 9.3a does not adequately explain the data that ADEQ includes in these tables. The added discussion of the BART determinations that we recommend earlier in this comment (see paragraph a, above) will help a lot, but ADEQ should ensure that the meaning of the data in the tables is clear to the reader.

d. Section 9.4 introduces a statistically based test (TTEST in Excel) as a way for the State to evaluate BART control significance. This test or cumulative modeling is not a substitute for 5 factor analysis.

12. (a) ADEQ does not feel the need to expand the discussion on the subject-to-BART sources. All information pertaining to BART sources is located in Chapter 9 appendices.

12. (b) ADEQ has added the information to Tables 9.3a – 9.3d as requested.

12. (c) ADEQ has corrected the percent BART level controls as requested in Table 9.3a. As stated in footnote 1 of Tables 9.3a – 9.3b, the percent **removal** is only listed if a source is taking limits that will reduce emissions per the BART requirements. Otherwise, the percent is shown as zero percent.

12. (d) In response to this comment, ADEQ has reviewed its BART determinations. The TTEST was not intended as a substitute to 5-factor analysis. ADEQ required each BART-eligible facility to submit a five-factor analysis as part of their engineering analysis and reviewed these submittals prior to approving the results.

Area of Influence

13. The Consultation Plan and associated information that is included as Appendix 10.2 to the Draft SIP contains a general AOI map for the combined Arkansas-Missouri Class I areas, and several assorted graphics for each Class I area of interest. However, the results of these studies, concepts, and graphics, are not presented in the Draft SIP text. They should be integral to the discussions of attribution of regional haze causing pollution, identification of reasonable progress goals, and development of long term strategies for this Regional Haze Plan.

Figures 9.1 and 9.2 of the Draft SIP present geographic representations of Arkansas' BART-eligible and BART-subject sources with relation to the Arkansas and Missouri Class I areas. However, instead of overlaying AOI information, the diagrams use "300 km buffers" about those Class I areas.

In contrast, CENRAP conducted extensive AOI analyses, and produced graphic representations for each of the Class I areas within and near to the CENRAP region. However, the Draft SIP does not provide any of these graphics for the local Class I areas of concern, nor does it discuss any of the work or results from those analyses.

Overall, the Draft SIP fails to utilize appropriate Area of Influence (AOI) information generated by CENRAP and the other RPOs in its analyses of both contributions of other States' sources to Arkansas' Class I areas visibility impairment as well as contributions of Arkansas' sources emissions to out-of-State Class I areas.

13. Since the Consultation Plan adequately addressed causes of haze for Class 1 areas affected by Arkansas sources, ADEQ did not find it necessary to elaborate on the causes of haze in the body of the SIP. Reasonable Progress Goals were established based on CENRAP-modeled future-year visibility projections that were indicative of reasonable progress and did not require additional AOI assessments. Additional AOI analyses would be of little benefit in developing a long-term strategy for those sources under the control of the State.

ADEQ used the CalPuff model to make BART determinations. The validity of CalPuff projections at a range beyond 300 km is highly questionable and has not been demonstrated.

AOI has been a subject of considerable analysis by CENRAP as a whole and CENRAP states individually. Missouri used the AOI information generated by CENRAP to develop a list of states that should be included in the interstate consultations that were held jointly by MDEQ and

ADEQ. This is further discussed in Appendix 10.2. The comment that "Overall the Draft SIP fails to utilize appropriate Area of Influence (AOI) information generated by CENRAP and the other RPOs in its analyses of both contributions of other States' sources to Arkansas' Class I areas visibility impairment as well as contributions of Arkansas' sources emissions to out-of-State Class I areas." is inaccurate.

While ADEQ acknowledges that emissions from various source categories within the State contribute, or potentially contribute to impacts in other States, these other States have not requested that Arkansas participate in their emission reduction strategies.

14. *Arkansas Sources' Impacts on Out-of-State Class I Areas:* Section 1.2 identifies Class I areas affected by visibility impairing emissions originating from the State of Arkansas. Specifically, two such Class I areas are located within Arkansas (the Caney Creek and Upper Buffalo Wilderness Areas, both managed by the Forest Service), and two are located in Missouri (the Mingo Wilderness Area managed by FWS, and the Hercules Glades Class I area managed by the Forest Service). Although this section states that emissions from Arkansas are likely to cause or contribute to regional haze in the identified out-of-State areas, little to no consideration is afforded to the Missouri Class I areas and Arkansas sources' impacts to visibility impairment in them, for the remainder of the Draft SIP.

    The documents provided with appendix 10.2 of the Draft SIP include an August 17, 2007, letter from ADEQ Air Division Chief Mike Bates to Oklahoma Department of Environmental Quality (ODEQ) Air Quality Division Director Eddie Terrill. This letter responds to ODEQ's initial consultation meeting regarding the Regional Haze planning for its Wichita Mountains Wilderness Area. In this letter, Arkansas disagrees with ODEQ's "assertion that sources in Arkansas contribute significantly to an inability to achieve reasonable progress [at Wichita Mountains]." It is unclear whether ODEQ has accepted Arkansas' opinion in this matter. As an additional note, while the discussion in Section 11.3 of Arkansas' Draft SIP (quoted below in comment #18) says that visibility projections for outside-of-Arkansas Class I areas will meet or exceed the uniform rate of progress, this letter to ODEQ indicates that the projections for Wichita Mountains "will not meet the glide path representing a return to natural conditions by 2064." In addition, one of the BART appendices identifies the Sipsey Wilderness Area (Forest Service managed) in Alabama as potentially being impacted by that company's two BART-eligible units' emissions (see appendix 9.3a, electronic file AECC BART Engineering Analysis.pdf, page 4).

    The State should discuss in more detail how analysis of its sources' impact became limited to only the Arkansas and Missouri Class I areas, and why the areas outside Arkansas itself did not appear to be part of the consideration when ADEQ evaluated emission controls for its sources.

14. As discussed in Section 11.3, Arkansas and Missouri co-hosted the interstate consultations that were a required element of SIP development. Arkansas relied heavily on the analyses that Missouri conducted as a means of establishing which States contained source regions impacting either Arkansas or Missouri Class I Areas. These analyses are further described in the Consultation Plan that is included as Appendix 10.2. Both Arkansas and Missouri anticipate being able to achieve their established RPGs through the application of BART and other

OTB/OTW control strategies. For these reasons, additional discussion of overall impacts on Missouri's Class 1 areas is unnecessary.

Disputes that might arise between states as part of the interstate consultations that the rule requires to be conducted do not have to be resolved prior to SIP submittal. They do have to be documented. As pointed out by the commenter, ADEQ has done so. As stated in Section 11.3, "Arkansas sources have not been shown to appreciably affect visibility in Class 1 areas other than the four located in Arkansas and Missouri." For this reason, the discussion regarding Oklahoma's inability to meet a glide path is irrelevant.

15. *Other States' Sources Impacts on Arkansas' Class I areas:* As an example, the data contained within both the Draft CENRAP TSD and ADEQ's Consultation Plan (appendices 8.1 and 10.2 to the Draft SIP, respectively), indicate that the areas of influence that affect the Arkansas and Missouri Class I areas extend across several surrounding States. In fact, the CENRAP "PSAT" source apportionment modeling results for the Upper Buffalo Class I area, show that sulfur emissions from elevated point sources in Illinois, Missouri, Indiana, Kentucky, and the collective States to the east beyond those, and all more significant than Arkansas' sulfate sources in contribution to the 2018 projected 20% worst visibility days. And, for the Caney Creek Wilderness Area, the impact of all pollutant emissions originating in Texas outweighs Arkansas' own impacts to visibility impairment in the 2018 worst 20% projections. The Draft SIP needs to discuss the attribution of haze-cause pollution and the results of ADEQ's consultations with neighboring States regarding achieving Reasonable Progress Goals at its local Class I areas.

15. The SIP is a regulatory document containing Arkansas' commitments to reduce regional haze. It is not intended to be an extensive technical analysis of the causes of haze. ADEQ has documented all consultations that it participated in. Since Arkansas expects to meet its RPGs, there is no need to further discuss the current impacts of other states. As required by the Rule, ADEQ will conduct reviews and submit any required SIP updates on five and ten-year intervals. This commitment is described in Section 13 of the SIP.

16. The Draft SIP narrative does not include discussion of the causes of visibility impairment that affect the Class I areas of interest. At a minimum, it should present to the reader a summary description of the primary pollutant species that are the biggest contributors to haze, and the primary source categories that generate those pollutants, both for the base year and the projections for the year 2018. A portion of this information can be dug out from various graphics included in supporting documents found in the appendices, but the Draft SIP narrative itself is silent on the topic.

16. The Regional Haze SIP is a regulatory document that describes ADEQ's commitments to administer the federal Regional Haze Rule within the State of Arkansas. It is not intended to be a dissertation on the science and technical aspects of Regional Haze. As noted by the commenter, much of this material is incorporated as appendices to the SIP. ADEQ does not find it necessary to include this information in the body of the SIP in order for the SIP to be considered a complete regulatory document.

Reasonable Progress Goals and Long Term Strategy

17. The Reasonable Progress discussion in the Draft SIP presents a major content deficiency. The SIP document does not identify any procedure to address single sources, or combinations of sources, that are predicted to continue to significantly impact visibility conditions in the future after implementing BART, CAIR, and any other on-the-books and on-the-way programs. Although the State concludes that additional controls are not necessary, Arkansas does not summarize or offer any level of clarity on what controls the CENRAP[4] Regional Planning Organization (RPO) utilized within Arkansas in its analyses. Model evaluation at the two Class I areas located within Arkansas (Caney Creek and Upper Buffalo Wilderness Areas, both managed by the Forest Service) indicates significant under predictions of visibility impacts with regard to sulfates, and fails to address any significance of 2002 to 2018 projections of increased point source sulfur emission within Arkansas. Although the model is used in a relative sense, no additional discussion or clarification is provided to address how model performance or model response is adequately addressing issues that may arise from impacts from sulfates.

    CENRAP (as well as the VISTAS RPO in the southeast United States) produced analyses to assist States in identifying geographic areas which may represent the source area most likely for a State to target additional controls for Reasonable Progress consideration. The State appears to have disregarded these supporting documents, and in spite of increasing sulfur emissions, did not discuss whether additional BART (beyond presumptive levels) for sources subject to BART, or other controls at non-BART pollution sources, may constitute a reasonable control. The SIP does not address the four statutory factors when making decisions to control or not control additional sources. Analysis of all control alternatives of potentially significant sources is necessary in order to fully evaluate reasonableness when looking at the factors. Although it is possible for the State to arrive at the same conclusions as presented in the draft SIP, there is no evidence that the State had sufficient information to conclude as to the reasonableness of its strategy to achieve the 2018 milestones.

17. Per EPA guidance on setting reasonable progress goals, in the case where modeled projections indicate that a rate of progress better that that represented by a uniform rate of progress can be achieved through the use of control measures such as BART, CAIR and other CAA programs, including the ozone and $PM_{2.5,}$ NAAQS, this "may be all that is necessary to achieve reasonable progress in the first planning period ---."[5]

The modeling conducted by CENRAP and other RPOs represents "state of the science". As such, it is difficult to provide a better estimate of future-year visibility conditions than that provided. Estimates of future-year emissions of sulfates and other visibility-related pollutants are contained in the inventory and were used in the model. Modeling science is constantly evolving. It is likely that future model runs will provide additional information that can be used to refine the understanding of the impacts of sulfates on visibility.

[4] Central Regional Air Planning Association CENRAP is an organization of states, tribes, federal agencies and other interested parties that identifies regional haze and visibility issues and develops strategies to address them. CENRAP is one of the five Regional Planning Organizations RPOs across the U.S. and includes the states and tribal areas of Nebraska, Kansas, Oklahoma, Texas, Minnesota, Iowa, Missouri, Arkansas, and Louisiana.

[5] Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program – USEPA, 06/01/07 – rev.

Arkansas does not consider "beyond BART" or additional controls on facilities that the Rule does not explicitly require emission reductions from to be necessary to achieve its reasonable progress goals at this time. If, in the future, it is determined that RPGs are not being attained for whatever reason, additional control programs will be considered. This commitment is expressed in Sections 12 and 13 of the SIP.

18. In Section 10, titled "Reasonable Progress Goals" the State does not specifically declare reasonable progress goals, in deciview, for the year 2018. Table 10.3, on page 59, speaks to an amount of improvement for the most impaired days from baseline conditions. The reasonable progress goals should be clearly stated as the projected 2018 average of the 20 percent most impaired days and as the 20 percent least impaired days. These numbers are included in Figures 10.5 through 10.8 but are not declared in the text. Please revise the text in Section 10 to clarify ADEQ's choice of the 2018 reasonable progress goal and revise Table 10.3 to include a column indicating the goals for the least impaired days, as required by the regional haze rule.

18. ADEQ has provided an explicit statement of the Reasonable Progress Goals for each of its Class 1 areas.

19. Section 11.3 is very confusing, switches back and forth between impacts at Arkansas' Class I areas and impacts beyond the State's borders, and declares that otherwise unspecified emission reductions will achieve the RPG goals across seemingly both geographic divisions of Class I areas.

    The section opens with a paragraph indicating that the section will cover Arkansas' demonstration that its SIP includes "all measures necessary to obtain its fair share of emission reductions needed to meet [reasonable progress goals] in other Class 1 areas." The next paragraph identifies the categories of technical material that Arkansas relied upon to conduct a gross identification of other States with emissions that influence Arkansas Class I areas, says that those identified States were included in the consultation process, and then asserts that "CENRAP-modeled visibility projections indicate that the emission reductions planned for these States are sufficient to achieve the [reasonable progress goals] for all Class I areas located in Arkansas and Missouri." Nowhere are the emission reductions further described or quantified. The next paragraph indicates that, since CENRAP and ADEQ analyses show that visibility projections for the Class I areas outside Arkansas and Missouri "will all be able to demonstrate a better than uniform rate of progress through the implementation of existing and forthcoming State and federal emission reduction programs…. The emission reductions described elsewhere herein are sufficient to constitute a fair share of emission reductions needed to meet RPGs in affected Class I areas."

    This is the bulk of Arkansas' evaluation of its Long Term Strategy to achieve Reasonable Progress towards visibility improvement both for its Class I areas and for those outside of the State to which Arkansas source emissions contribute. This discussion, both independently and in conjunction with the complete Draft SIP narrative, fails to provide the reader with an understanding of the causes of visibility impairment at either Arkansas' Class I areas or those

in nearby States, the control strategies that were considered and levels of control that ADEQ decided to require for this SIP, or the anticipated results of those controls.

19. ADEQ relied on the CENRAP Base G 2018 future-year modeling to establish its RPGs. This modeling included all known "on the books" and "on the way" control strategies such as BART, CAIR, federal fuel standards, etc. Since the RPGs are projected to be achieved without the need for additional control measures, a discussion of such measures is not required.

20. At the beginning of Section 10 of the Draft SIP, ADEQ outlines the four statutory factors that each State must consider in setting its Reasonable Progress Goals. These factors are intended to be applied holistically, across all contributing sources of visibility impairing pollutants, to inform the decision being made by the State. However, the remainder of the chapter never connects back to the four statutory factors, and in fact points to appendix 10.1, *"Analysis of Control Strategies and Determination of Reasonable Progress Goals,"* which argues that meeting the uniform rate of progress glide slope obviates any need for analyzing the four statutory factors for Reasonable Progress. Thus, the Draft SIP omits the required four-factor analysis for establishing the Reasonable Progress Goals.

20. Per EPA guidance on setting Reasonable Progress Goals, four factor analysis may not be required in those instances where an RPG that outperforms a URP can be achieved. ADEQ has taken what it considers to be a reasonable position regarding the level of effort required to demonstrate an ability to achieve its state-established RPGs.

21. In Section 11.4.1.6, the Draft SIP identifies "source retirement and replacement," saying that: "retirement and replacement will be managed in conformance with existing SIP requirements pertaining to PSD and New Source Review. Source retirement and replacement will be tracked through on-going point source inventories." Please elaborate on how the PSD and NSR permitting programs will be utilized by ADEQ as part of its Long Term Strategy for meeting Reasonable Progress Goals.

21. Both PSD and NSR are administered through the federal Title 5 Permit program. Five-year reviews for the purpose of incorporating any new federal requirements are inherent to this program and do not require further elaboration in the Regional Haze SIP.

<u>Fire</u>

22. The Arkansas Smoke Management Plan (SMP) and the summary discussion in section 11.4.1.8 of the Draft SIP properly identify Class I areas as being smoke-sensitive, and the SMP instructs prescribed burners to apply the appropriate smoke management techniques to minimize impacts. Overall, this is one of the best presentations of fire-emission-related Regional Haze considerations that we have seen to date.

22. ADEQ worked extensively with the State Forestry Commission, FLMs, prescribed-burn practitioners and other stakeholders to develop what it considers to be an effective SMP. ADEQ appreciates this acknowledgement of its efforts.

23. We recommend that ADEQ ensure that its Regional Haze SIP refers to the Arkansas SMP in a way that does not require SIP updates each time the SMP is updated. Also, please indicate whether Arkansas intends to "certify" its SMP as provided for by the 1998 EPA Interim Air Quality Policy on Wildland and Prescribed Fire.

23. The description of the Arkansas Smoke Management Plan (SMP) is provided in the Section describing elements of the States' long-term strategy. The SMP itself is included as an appendix. ADEQ has included the SMP as documentation of its efforts and does not consider its inclusion to constitute a commitment that would require a SIP revision if it is revised in the future. The question of whether or not Arkansas intends to certify its SMP is not relevant to the Regional Haze Rule.

Regional Consistency

24. Arkansas is situated geographically at the boundary between three multi-state Regional Planning Organizations (RPO): CENRAP running along the west of the Mississippi River from Minnesota south to Texas and Louisiana; VISTAS, comprised of the southeastern United States, and MWRPO, from the Ohio River Valley north through the Great Lakes region. As a member State of the CENRAP organization, Arkansas has utilized the technical products that were produced by the CENRAP efforts as the information upon which it has built its Regional Haze SIP. The VISTAS and MWRPO technical work also cover the Class I areas of concern to Arkansas, as several of their western member States may have emission sources that influence visibility at those Class I areas. The results indicated by each of the three regional planning organizations are different. While it is fully appropriate for Arkansas to rely upon the CENRAP work, ADEQ might consider highlighting the importance of the ongoing verification and contingency provisions in view of the varying results of the RPOs.

24. Section 12 contains ADEQ's commitment to conduct comprehensive periodic implementation plan provisions on the schedule required by the Rule.

Verification & Contingencies

25. Section 13 of the Draft SIP discusses the options for action following the five-year review. However, the document does not provide any criteria that ADEQ will use in evaluating the five-year progress report to decide which of the listed actions would be indicated. Please include discussion of the anticipated criteria that ADEQ will use to both evaluate the progress at the five-year review and to select the course of action that will be taken based upon that review.

25. The criteria are already spelled out in the list of possible actions. The review will be conducted according to the findings of the reports that are described in Section 12. The appropriate action to take will be based on a determination of whether established RPGs have been met and, if not, a determination of which factors are likely to have contributed to not meeting the RPG. This process does not require a discussion of the criteria that will be used for future reviews at this time.

Coordination & Consultation

26. The Draft SIP references to its Appendix 10.2 for documentation of the consultation process that Arkansas and Missouri jointly conducted for the four Class I areas in their two States. However, the Draft SIP lacks discussion of Arkansas's decisions based upon the results of those meetings.

26. ADEQ has added language to address this comment.

27. Chapter 4 of the Draft SIP explains past consultation with the Federal Land Management agencies, and commits to future consultation, saying: "ADEQ will continue to coordinate and consult with the FLMs during the development of future progress reports and plan revisions, as well as during the implementation of programs having the potential to contribute to visibility impairment in the mandatory Class I areas. The FLMs must be consulted in the following instances:
    - Development and review of implementation plan revisions
    - Review of 5-year progress reports
    - Development and implementation of other programs that may contribute to impairment of visibility in Class I areas."

    We appreciate ADEQ's acknowledgement of this ongoing consultation requirement, and look forward to working with you in the years to come.

27. No response required

TALKING POINTS – 4/17/08 Conference Call between FLM agency staff and ADEQ Regarding AR Draft Regional Haze SIP

Original draft April 1, 2008; REVISED April 14, 2008

This document is an attachment to the Fish and Wildlife Service's (FWS) comments on the Draft Regional Haze State Implementation Plan prepared by Arkansas and received by the FWS on February 25, 2008. It provides source-specific recommendations regarding the Best Available Retrofit Technology (BART) determinations contained within that package.

Entergy Services, Inc. BART Determination for the Lake Catherine Plant

Table 9.2 of the ADEQ RH SIP shows that the Lake Catherine Plant is a subject-to-BART source, but Tables 9.3 a-d do not include emission reductions from the 2002 Baselines for this source. Either the data for the Plant should be included or a reason for its exclusion should be noted.

Response: Tables 9.3a – 9.3d contains the emission reductions for Entergy – Lake Catherine Plant.

The low 10% plant utilization rate causes any capital equipment alternative to magnify the cost per ton or incremental cost per ton, thus eliminating standard alternatives available to other BART determinations. For this reason it is important to impose strict emission limitations commensurate with 10% plant utilization in the plant's permit.

Section 3.1 of the BART determination proposes that boiler tuning, BOOS and IFGR is NO_x BART for gas firing. The addition of overfire air to the above three controls results in an annual cost effectiveness of $1,700 per ton for NO_x control and a $1.3 million cost per deciview. This is not an unreasonable cost for BART and should be considered. The value of this step would be to decrease the visibility impact from 0.56 deciviews to 0.34 deciviews.

The Arkansas Regional Haze SIP acknowledges that BART requirements are applicable requirements of the Clean Air Act and they will be included as title V permit conditions. It would be desirable that systems be installed to automatically monitor and trim oxygen and fuels for peak performance. Emission limits reflecting the above BART should be met on a continuous basis. For a discussion of this topic please refer to EPA's BART Guidelines.[6]

[6] See 40 CFR Part 51, Appendix Y. The U.S. Environmental Protection Agency finalized it's BART Guidelines on June 15, 2005, and published the preamble and final rule text in the Federal Register on July 6, 2005. The rulemaking action added Appendix Y to Part 51, titled "Guidelines for BART Determinations Under the Regional Haze Rule." See Section V.

The costs of alternatives were stated by Entergy, but there was no documentation or detailed break-out of the 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 EPA OAQPS Control Cost Manual), where possible.[7] A discussion of amortization of costs is presented, but the actual amortization factors are not given.

Response: ADEQ has not officially approved the subject-to-BART sources' engineering analyses. These analyses will be reviewed and approved or rejected during the permit process.

Entergy Services, Inc. BART Determination for the White Bluff Steam Electric Station

Entergy proposes to install SO_2 and NO_x control equipment that will meet the presumptive requirements of the EPA's BART Guidelines. The Arkansas Regional Haze SIP acknowledges that BART requirements are applicable requirements of the Clean Air Act and they will be included as Title V operating permit conditions. Emission limits such as BART must 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. The only such reference found in the BART determination was in Section 3.1 relating to boiler tuning, so further discussion of meeting emission limits on a continuous basis should be included. For a discussion of this topic please refer to EPA's BART Guidelines.[8]

Though presumptive BART is met for both NO_x and SO_2 using the proposed emission controls, Table 5-1 shows that the White Bluff Station will still "cause" visibility impairment at the Caney Creek Class I area. In considering its Long Term Strategy in the Regional Haze SIP for Caney Creek, the State should hold discussions at this time with the source to determine the possible need for additional future controls. Entergy might consider an altered mix of capital expenditures for emission control at this time given that information.

Response: ADEQ has not officially approved the subject-to-BART sources' engineering analyses. These analyses will be reviewed and approved or rejected during the permit process.

Domtar Industries Inc. BART Determination for the Ashdown Mill

The costs of the NO_x control alternatives of low NOx burners (LNB) and overfire air (OFA) for boilers #1 and #2 are presented in Table 4-3, and the conclusion is that the average cost per ton of NO_x control is cost-prohibitive. Costs in Table 4-3 are derived from total costs shown in Appendix B. The total costs from Appendix B and the Total Annualized Cost for LNB and OFA shown in Table 4-3 seem excessive. For example, the total capital costs are not generally consistent with those presented in Appendix E of the National Council for Air and Stream Improvement (NCASI) paper entitled, "NO_x Control in Forest Products Industry Boilers: A

[7] See EPA's BART Guidelines, Section IV.D.Step 4.
[8] See EPA's BART Guidelines, Section V.

Review of Technologies, Costs, and Industry Experience."[9] Also, the amortization factors of 5% interest and 10 year life are not consistent with the 7% and 15 year life required by the OAQPS Control Cost Manual.[10] The basis for equipment cost estimates 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 EPA OAQPS Control Cost Manual), where possible.[11] More realistic figures may make LNB and OFA cost-effective BART alternatives.

Response: ADEQ has not officially approved the subject-to-BART sources' engineering analyses. These analyses will be reviewed and approved or rejected during the permit process.

Table 4-7 shows that the Ashdown Mill will still "cause" visibility impairment at the Caney Creek Class I area after implementation of controls. In considering its Long Term Strategy in the Regional Haze SIP for Caney Creek, the State should hold discussions at this time with sources to determine the need for additional future controls. The sources might consider an altered mix of capital expenditures for emission control at this time given that information.

Response: The Regional Haze Rule and the BART Rule does not specify the increment a subject-to-BART source must meet in its visibility improvement. Domtar's post-control emissions show improvement to visibility to Caney Creek Wilderness Area albeit not a significant improvement which is not the measure require by §51.308.

Arkansas Electric Cooperative Corporation BART Determination for Bailey and McClellan Stations

Pages 2 and 5 state that because pollutant-specific modeling for these facilities showed that NO_x did not cause or contribute to visibility impacts at any Class I areas and since the PM impact was less than NO_x, only SO2 BART controls would be considered. This is not correct.

BART exemption modeling uses emissions from facility-wide eligible units to evaluate significance against a State determined visibility threshold. In the case of Arkansas, that threshold was 0.5dv. Once a facility has been determined to be significant, each eligible unit is evaluated for reasonable controls. To determine what is reasonable, the State considers all possible control mechanisms by way of the five statutory factors. Each unit is not independently reevaluated for significance. Therefore, NO_x and PM should have been included in the BART determinations for the Bailey and McClellan Stations.

The SO_2 BART determination concluded that "a lower-sulfur fuel oil" should be considered as BART. Only a footnote to a table indicated that 1% low sulfur fuel oil was used for modeling the post-control scenario. First, the BART determination should have considered 1% sulfur fuel

[9] Report by the National Council For Air and Stream Improvement entitled, "NO_x Control in Forest Products Industry Boilers: A Review of Technologies, Costs, and Industry Experience", Special Report No. 03-04, August 2003, by Arun V. Someshwar, Ph.D. and Ashok K. Jain, NCASI Southern Regional Center, Gainsville, Florida, Appendix E.
[10] U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, OAQPS Control Cost Manual, Fifth Edition, February 1996, EPA 453/B-96-001.
[11] See EPA's BART Guidelines, Section IV.D.Step 4.a.5.

oil along with other ultra-low sulfur fuel oils in the analysis and then should have shown the economic viability of one fuel over the others. Serious consideration should be given to a lower-sulfur fuel. Second, a more definitive description of the chosen fuel should be stated and ADEQ should make it an enforceable permit condition.

Other BART determinations reviewed by the FWS contain more supporting documentation than the subject determination in terms of exemption modeling data (before and after controls), scrubber cost estimates, fuel alternatives and the Section 4.4 claim that ". . . high capital cost control of the scrubber alternative (emphasis added). . . may cause the retirement of these units." The EPA's BART Guidelines describe an analysis to be followed when viability of continued plant operations is an issue.[12]

Finally, since the Bailey plant is currently operated at only 20% of capacity and since the use of 1% sulfur fuel oil results in a continuing "contribution" to visibility impairment at Mingo; ADEQ should place a permit condition on the facility to operate with emission limitations reflecting 20% of capacity. Of course, if technology with higher emissions control efficiency can be provided, then such a permit condition can be relaxed.

Response: ADEQ has not officially approved the subject-to-BART sources' engineering analyses. These analyses will be reviewed and approved or rejected during the permit process.

AEP Southwestern Electric Power Company (SWEPCO) BART Discussions for the Flint Creek Power Plant

A two-page letter from SWEPCO to the Arkansas Department of Environmental Quality, dated October 26, 2006, is the only information we have available regarding the subject Plant's effort to meet BART. The RH SIP and/or appendices should contain all of the BART-related data so that they are available to third-party reviewers.

With reference to Item 1, electrostatic precipitators may be BART for particulate matter (PM), but not for the reason cited. For BART purposes it is inappropriate for a source to model for a single pollutant (e.g., PM) and if that single pollutant does not impact a Class I area by more than the threshold, to eliminate emission units which emit that pollutant from BART for that pollutant. As discussed in EPA's BART Guidelines, the total emissions (SO_2, NO_x and PM) from all emission units from the source should be summed.[13] If the potential to emit of any single visibility impairing pollutant exceeds 250 tons per year then that collection of emissions units is a BART-eligible source. Each emission unit is then subject to a BART review for each of the visibility impairing pollutants. Thus, a BART review should have occurred for the emission units that feed the electrostatic precipitators. It is acknowledged that on a cost basis, it is likely that no other control equipment would be required other than possibly adjustments to the ESPs.

Item 2 of the letter is not clear as to whether control equipment is already functioning at the presumptive limits of 0.15 lbs/mmBTU for SO_2 and 0.23 lbs/mmBTU for NO_x or whether such

[12] See EPA's BART Guidelines, Section IV.D.Step 4.k.
[13] See EPA's BART Guidelines, Section II.A.3 and 4.

equipment is proposed to be added to meet BART. The record should contain information that describes the control equipment that is already or will be installed, along with the data that demonstrates how it is deemed to meet BART. If BART is met by the *current* plant configuration then Item 3 referring to "post-control" CALPUFF modeling should not show visibility improvements.

Item 3 of the letter seems to imply (but does not state) that visibility impairment still exists at one or more Class 1 areas. In considering its Long Term Strategy in the Regional Haze SIP, the State should hold discussions at this time with sources to determine the need for additional future controls. The sources might consider an altered mix of capital expenditures for emission control at this time given that information.

Response: ADEQ has not officially approved the subject-to-BART sources' engineering analyses. These analyses will be reviewed and approved or rejected during the permit process.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

Tony Davis
Arkansas Department of Environmental Quality
8001 National Drive, P.O. Box 8913
Little Rock, AR 72210-8913

Dear Mr. Davis,

Thank you for the opportunity to comment on the draft revision of the Arkansas Regional Haze State Implementation Plan (SIP). I appreciate the tremendous effort that has gone into the preparation of this document.

My staff has identified a number of areas of concern in the SIP. In general, they include, but are not limited to, the level of control contemplated under BART, the approach to the reasonable progress and long term strategy requirements, and the requirement for state-to-state consultations in the development of the long term strategy. Unless addressed, these issues present approvability concerns. We stand ready to assist the Arkansas Department of Environmental Quality as you prepare the final document.

Recently, the United States Court of Appeals for the D.C. Circuit issued its ruling on the petitions for review of EPA's March 2005 Clean Air Interstate Rule (CAIR). The Court vacated the Rule and the associated federal implementation plan in its entirety, and sent both the rule and plan back to EPA for further proceedings. The United States is reviewing the opinion, and will determine an appropriate course of action once its review is complete. We will contact you as soon as we can offer any insight on how this situation may impact the Arkansas regional haze SIP.

We will work with your staff to set up a time to discuss these comments. In the meantime, if you have any questions concerning these comments, please feel free to call me at (214) 665-7242, or Joe Kordzi, of my staff at (214) 665-7186.

Sincerely yours,

Guy Donaldson, Chief
Air Planning Section (6PD-L)

Enclosure

EPA Region 6 Comments on the Arkansas Draft Regional Haze SIP
7/21/08

1. EPA has submitted these comments on the Arkansas draft Regional Haze State Implementation Plan SIP) with the intention of addressing the more significant issues that could be identified considering the review time available. Due to time and resource constraints, and the fact that that the ADEQ has elected not to submit a paper copy of the SIP (which consists of approx. 50 separate electronic files), it has not been possible to conduct a completely thorough review, particularly with regard to modeling. It is possible that additional concerns, not discovered during the review of this draft, will surface during the review of the final version of this SIP.

   Since the Environmental Protection Agency (EPA) will have to conduct an extensive review prior to eventual approval or denial of the Arkansas Regional Haze State Implementation Plan (the SIP), the Arkansas Department of Environmental Quality (ADEQ) does not understand the concern regarding the time available for EPA review of its draft SIP during the Public Comment period. It is also unclear why EPA would find its review to be hampered by documents submitted in electronic format. It should be noted that ADEQ has not yet made a formal submittal of the SIP package. Some of the documentation submitted as part of the SIP is in formats (model input and output files, spreadsheets, etc.) that are not particularly suited to traditional means of presentation such as bound documents. If EPA requires particular documents to be submitted as hard copies, this can be arranged. As an alternative, EPA could print copies of the electronic documents for review purposes.

2. ADEQ should ensure, with the submittal of the final SIP, it demonstrates it has followed the requirements of Appendix V to Part 51. EPA also suggests that ADEQ edit the paragraph "Public Notice" page 2.1 to include a reference to Appendix V of Part 51. Lastly, EPA suggests the documentation showing that ADEQ complied with Appendix V of Part 51 be included in SIP Appendix 2-1 ("Public Participation Process") of the SIP submittal.

   ADEQ accepted the EPA's comment and amended Chapter 2 to reference Section 2.1(f) of Appendix V to 40 CFR Part 51. ADEQ reviewed the contents of Appendix 2.1 and added a photocopy of public notice of the opportunity to comment on the Regional Haze SIP. Appendix 2.1 now contains the required documentation of compliance with the provisions of Appendix V to Part 51.

3. In general, ADEQ should ensure that it has specifically addressed each requirement of Section 51.308, even if it feels specific requirements don't apply or appear to be self evident.

   In the Regional Haze SIP package sent to the EPA, ADEQ inadvertently submitted an incomplete draft version of Appendix 1.2, Guide to Locating Section 308 Requirements. The final SIP package contains the completed Appendix 1.2. ADEQ asserts that all requirements of 40 CFR Section 51.308 have been addressed in its draft SIP and does

not find it necessary to elaborate further. Appendix 1.2, Guide to Locating Section 308 Requirements references the locations in the SIP where these requirements are located.

4. In the final SIP submission, all graphs and charts originally produced with color coded lines and bars should be reproduced in color, as black and white reproduction does not allow the identification of the individual items. This should be ensured in both printed and electronic versions of SIP, including all appendices.

   All material intended for reproduction in color will be so.

5. In section 10.3, ADEQ states that a description of the consultation process can be found in Appendix 10.2. However, Appendix 10.2 itself contains additional appendices that are named in the sequence from “Appendixe-1” to “Appendixe-11,” plus an additional directory entitled "Stakeholder Consultations," which itself contains an additional ten documents. It does not appear these appendices are discussed; therefore their significance is difficult to determine. Other examples exist in other appendices.

   The “additional appendices” contained in Appendix 10.2 were sequentially numbered one through ten. For clarification they have been combined into one document. Additionally, Appendix 10.2b, Stakeholder Consultations, has been changed to Appendix 10.3 Arkansas Consultation Letters.

   a. ADEQ should informatively and uniquely name all appendices and list all appendices (even the sub appendices) in the table of contents so the reader can easily determine what documents an appendix contains and where that document can be found.

      The format of the draft Arkansas Regional Haze SIP follows the CENRAP SIP template as applicable. Referenced appendices are listed at the end of each chapter.

   b. ADEQ should ensure each appendix is referenced within the body of the SIP text in the appropriate section, and its contents discussed and related to satisfying a particular aspect of the regional haze regulations.

      A revision was made to reference Appendix 5.3 in Chapter 5. All other appendices are discussed in their relevant chapters.

6. It appears the New IMPROVE equation on page 17 should be re-written as there are font problems and the equation is not clear.

   The new IMPROVE equation reflects the differences from the default IMPROVE algorithm by the use of bold-faced notation. The distinction in fonts was introduced in the original documentation, is faithfully reproduced and intentional.

7. On page 19, ADEQ states, regarding the natural visibility conditions, "Appendix 5.1 provides calculations and methodologies. Appendix 5.2 includes a demonstration of the

appropriateness of these values for Caney Creek WA and Upper Buffalo WA as well as a discussion of the reasons for the selection of the methodology." Appendix 5.1 does not appear to contain the stated material and instead contains a paper on the new IMPROVE equation. Appendix 5.2 is missing, as is Appendix 5.3, which is listed at the end of Chapter 5. It does not appear that ADEQ has provided the necessary data and calculations to enable Region 6 to assess whether it has satisfied the requirements in Section 5 1.308(d)(2) regarding the calculation of the natural visibility and baseline values. ADEQ should provide this information, including all data and calculations so that its calculations for natural visibility, current conditions, and consequently Arkansas' uniform rate of progress can be evaluated.

The natural background conditions were calculated by Scott Copeland, CIRA/USFS, and Rodger Ames, Colorado State University. The conditions were calculated using a SAS program. ADEQ does not have SAS capability; therefore, EPA can access all of Mr. Copeland and Mr. Ames' work on the following ftp site: ftp://vista.cira.colostate.edu/Public/Schichtel/ . The username is cira\guest and the password is orion. In addition, Mr. Copeland, Mr. Ames, and Mr. Pitchford wrote a paper detailing the methodology used in the development of the natural background conditions titled "Regional Haze Rule Natural Level Estimates Using the Revised IMPROVE Aerosol Reconstructed Light Extinction Algorithm". Therefore, ADEQ is submitting the afore-mentioned paper in Appendix 5.1. ADEQ is of the opinion the papers in Appendix 5.1 will satisfy the requirements in §51.308(d)(2).

8. In its consultation letter to ODEQ, dated 8/17/07, ADEQ responds to ADEQ's concern regarding the Future Fuel Chemical Facility. Additional information should be provided that explains why this facility was not considered for inclusion in ADEQ's reasonable progress strategy. This should include emission information and the levels of control currently employed at this facility on the more significant emission sources, and an evaluation of the potential of additional controls.

The Regional Haze Rule does not require ADEQ to single out non-BART sources for inclusion in its reasonable progress strategy. ADEQ determined that the subject facility was BART-Eligible, conducted modeling analyses and determined that it was not subject to BART. ADEQ's progress strategy does not include "beyond BART" controls at permitted facilities. Additional analysis and evaluation of the potential for additional controls is not required at this time. It should also be noted that ADEQ's BART determination modeling was a more conservative approach because the maximum impact rather than the 98th percentile was used to determine a subject-to-BART source. Using this conservative assumption, ADEQ determined that the subject facility is not a significant emission source.

9. Section 51.308(d)(4)(v) requires ADEQ to submit an emissions inventory that must include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions. ADEQ has supplied an inventory for the baseline year, and for 2018. EPA understands that ADEQ has emission inventory data available for 2005 and requests that it be included in the SIP. The preamble to the 1999

Regional Haze Rule (64 FR 35745) clarifies EPA authority for requiring the emission inventory of the "most recent year for which data are available," under 51.308(d)(4)(v):

> "Requirements Under Section 110(a) (2) of the CAA. Visibility SIP submittals must document certain program infrastructure capabilities consistent with the requirements of section 169B(e)(2) and section 110(a)(2) of the CAA. Section 169(B)(e)(2) requires States to revise their section 110 SIPS to "contain such emission limits, schedules of compliance, and other measures as may be necessary" to carry out regulations promulgated pursuant to this section.
>
> The EPA believes that this language authorizes EPA to ensure that States review their existing program infrastructures to ensure that the types of elements required by section 1 10(a)(2) for programs addressing the NAAQS are also sufficient for adoption and implementation of SIP measures for regional haze. The final rule does not include specific provisions addressing all elements of section 110(a)(2). However, section 5 1.308(d)(4)(iv) of the final rule requires the State to maintain and update periodically a statewide inventory of emissions of pollutants that contribute to visibility impairment. Where a State is also revising its SIP to incorporate changes to address the PM2.5 NAAQS, many of these revisions may be sufficient to address both PM2.5 and regional haze. The EPA encourages States to consider the needs of both programs when updating the provisions required by section 110 of the CAA to minimize any administrative burdens."

EPA requests that ADEQ contrast its 2005 emission inventory with that from its baseline year of 2002, and 201 8, in order to serve as a check of the EI projection methodology.

In a conversation with Guy Donaldson, of EPA Region 6, discussing this comment, Mr. Donaldson stated that ADEQ should have available the emission inventory for 2005. ADEQ has included in Appendix 7.1A the 2002 point source inventory, but not the on-road, off-road and nonpoint inventory, which will be developed by EPA Headquarters. ADEQ contacted Anne Pope, Environmental Engineer, in the Office of Air Quality Planning and Standards. She reported that the 2005 emission inventory will not be ready until the end of September 2008. Until the 2005 emission inventory is published, we will not be able to provide that information.

10. As required by Section 51.308(d)(4)(v), ADEQ should include in its SIP a commitment to update the emission inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in its Class I areas periodically. It is suggested this commitment be placed within the "Future Monitoring Strategy" section on page 23.

ADEQ's commitment to conduct on-going inventories is contained in Chapter 7 of the draft SIP, and reads, "the point source inventories will be updated on an annual basis and the nonpoint, on-road, nonroad mobile inventories will be updated every three years according to the Consolidated Emissions Reporting Rule."

11. ADEQ should confirm that all significant sources of PM, SO2 and NOx were included in its 2018 modeling projections, including those sources that will be online prior to 2018 (e.g., SWEPCO John W. Turk, Jr. Power Plant, Plum Point II). This is a requirement under Section 51.308(d)(3)(iv): "The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy. The State should consider major and minor stationary sources, mobile sources, and area sources."

To the best of ADEQ's knowledge, all currently operating facilities were included in the 2018 modeling projection. The specifically-referenced facilities are not currently under construction and have not received the air permits necessary to commence construction and operation. At such time as these and other facilities go "on-line" they will be considered as existing facilities and treated accordingly in future assessments.

12. Language on page 24, states the complete 2002 emissions inventory is contained in Appendix 7.1. However, the point source data is missing, and should be supplied, in accordance with the requirements of Section 51.308(d)(v).

ADEQ has amended Appendix 7.1A to include the point source data, see response to EPA comment number nine.

13. It does not appear that ADEQ has provided any information regarding its consultations with Texas, as required by Section 5 1.308(d)(l)(iv). As is noted in Appendixe-9 (and in the Texas regional haze SIP), TX contributes more SO4 to the visibility problem at Caney Creek than does any other state, including Arkansas. Region 6 would like to know what consultations occurred between Arkansas and Texas regarding this situation, and what attempts were made by ADEQ to secure commitments from Texas to reduce the emissions from its sources that are contributing to the visibility problems at its Class I areas.

As described in Chapter 10 and its appendices, Texas participated in the Interstate Consultations that were hosted jointly by Arkansas and Missouri. Arkansas also participated in the Interstate Consultations that have been hosted by Texas. Due to the fact that modeled visibility projections for Class 1 Areas in Arkansas showed a rate of progress exceeding that representing a uniform rate of progress, ADEQ did not find it necessary to "secure commitments from Texas" or other states as a means of reaching its progress goals. Additional documentation of consultations with Texas has been incorporated in the draft SIP Appendix 10.3.

14. It would be helpful if ADEQ listed the facility names in the BART emission reduction summaries in Tables 9.3 so the reader doesn't have to jump back and forth to Table 9.2 to get that information. In addition, a common method of referring to sources should be adopted between the tables and figures (e.g., SWEPCO, Fig 9.1 = 04-00107, Table 9.3a = AEP/Gentry, Table 9.1 = American Electric Power, Figure 4 BART modeling protocol).

The Tables and Figures have been reformatted as requested.

15. ADEQ should greatly expand its discussion of BART in the main body of the SIP. All of the many BART appendices should be individually addressed and their significance integrated into the Section 9. Each BART source should be individually discussed and the rational for its BART determination should be made clear.

ADEQ does not feel the need to expand the discussion on the subject-to-BART sources. All information pertaining to BART sources is located in Chapter 9 appendices. Each of Chapter 9's appendices are referenced in the text and discussed where applicable.

16. ADEQ should discuss why there is not exact correspondence between those sources identified as BART (presumably BART-eligible) in Table 9.1B-2 (spreadsheet) and the BART-eligible sources listed in Table 9.1, and Table 2 of the BART Modeling Protocol in Appendix 9.2a. (e.g., Entergy Blytheville and others). ADEQ should also explain why the sources included in the BART exemption modeling protocol in Appendix 9.2d do not seem to match the listing of BART eligibles in the above mentioned spreadsheet.

A new appendix, Appendix 9.4B, has been added to Chapter 9 to include correspondence between ADEQ and the subject-to-BART sources. Table 9.1B-2 has been corrected to reflect the removal of Entergy/Blytheville and Terra Nitrogen from the BART-eligible sources. Both facilities' permits were voided and the plants are no longer in operation. Entergy/Blytheville's permit was voided December 2, 2000 and Terra Nitrogen's was voided January 19, 2004. Tables 2, 3 C-1 and C-2 in the ADEQ BART Modeling Protocol have been corrected to reflect the name changes of the following BART-eligible sources: International Paper, Pine Bluff; Eastman Chemical, El Dorado. International Paper is now Evergreen, Pine Bluff and Eastman Chemical is now FutureFuel.

17. Section 5 1.308(e) requires "The State must submit an implementation plan containing emission limitations representing BART and schedules for compliance with BART for each BART eligible source that may reasonably [emphasis added] be anticipated to cause or contribute to any impairment of visibility in any mandatory Class I Federal area." As discussed in the BART rule (70 FR 39161):

"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. 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."

Although ADEQ mentions this on page 43, it does not discuss why, when performing BART modeling, it selected a threshold of 0.5 dv. The exemption threshold value selected by ADEQ 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 selection of this threshold. ADEQ should discuss why the selection of a 0.5 dv threshold was determined to be reasonable under Section 51.308(e). This is especially important in light of this statement on page 4-1 of the EVIRON BART modeling report in Appendix 9.2d: "Despite these apparent visibility improvements, the cumulative visibility impacts due to all Arkansas BART sources in the post-control case still exceed 1 del-dv at most Class I areas of interest." In light of this, Region 6 feels that ADEQ should give strong consideration to setting a lower threshold.

In accordance with the discussion in the BART Rule that describes how to establish an appropriate contribution threshold, ADEQ used the 0.5 dv value that is described as the highest appropriate threshold[14]. Since one deciview (1 dv) constitutes the lowest measurable degree of light extinction, ADEQ finds a threshold of 0.5 deciview (dv) to be more than reasonable. While model outputs may be expressed in decimal notation, this does not represent a measurable difference. ADEQ would be hard-pressed to justify a lower threshold if challenged to demonstrate the ability to measure the degree of change in light extinction. There is no requirement to provide a rationale for use of a particular threshold value of 0.5 dv or less.

18. On page 43, ADEQ briefly transitions from sources that were found to be BART-eligible, to those found to be subject to BART. However, very little information was presented that describes how the BART-eligible sources were examined to determine which were actually subject to BART. ADEQ should therefore greatly expand this section of its SIP. ADEQ states that Appendix 9.2B contains the modeling input and output files for each BART-eligible source. However, these files were not found in Appendix 9.2B. Appendix 9.2C contains zipped "Entergy" and "Trinity" files but these are not discussed and it is not apparent these files cover all BART exemption modeling.

ADEQ disagrees with the first part of EPA's comment number 18. The appropriate Information is provided in Appendix 9.2C, Subject-to-BART CALPUFF post-control modeling input and output files. The ADEQ BART Modeling Protocol located in Appendix 9.2A describes "how the BART-eligible sources were examined to determine which were actually subject to BART." Hence, ADEQ does not feel the need to "expand this section in of its SIP." ADEQ has added BART-exemption CALPUFF modeling input and output files to Appendix 9.2B that were inadvertently left out of the SIP package.

19. ADEQ should ensure that it includes in its regional haze SIP a five factor analysis for each source that undergoes a BART determination, in compliance with Section 51.308(e)(l)(ii)(A).

[14] 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. – 70 *FR* 39161

The five-factor analysis for each facility is contained in the Engineering Analysis that ADEQ required each facility to submit for subsequent BART reviews and determinations. These analyses are included as Appendix 9.3A.

20. ADEQ has not adequately addressed the requirements under Section 51.308(d)(l) to address reasonable progress towards achieving natural visibility conditions. On page 59, ADEQ refers the reader to Appendix 10.1 for its reasonable progress analysis. Appendix 10.1 consists of two pages that discuss why Arkansas should not have to address the four factors that States are required to take into consideration in determining reasonable progress under CAA § 169A(g)(l) and 40 CFR §51.308(d)(l)(i)(A). ADEQ seems to be arguing that because its rate of progress, if sustained, will result in a return to natural visibility prior to 2064, then consideration of the four statutory factors are moot. As Region 6 has consistently informed States throughout the regional haze SIP development process, this interpretation of the regional haze rule is incorrect. The glidepath is an analytical requirement; it is neither a target nor a safe harbor. As such, ADEQ cannot rely on meeting the glidepath to justify its reasonable progress goals. In fact, this subject is covered under Reasonable Progress Question 3 under the 9/27/06 Q and A document:

"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.

Considering the influence of neighboring states on the visibility at its two Class I areas, Region 6 emphasizes that it is very important that ADEQ not only revisit this process but also reopen its consultation process under Section 5 1.308(d)(l)(iv) and, where appropriate, aggressively negotiate emission reductions from those states whose sources cause or contribute to visibility impairment at its Class I areas.

From the preamble to the Regional Haze Rule (64 *FR* 35721), EPA explained "The EPA anticipates that as a result of the more-refined analyses required by this rule, some States may conclude that control strategies specifically for protection of visibility are not

needed at this time because the analyses may show that existing measures are sufficient to meet reasonable progress goals." ADEQ is not relying on the "glidepath" representing a uniform rate of progress to meet reasonable progress goals. ADEQ relied on the language of the Regional Haze Rule and interpretive guidance provided by the EPA Office of Air Quality Planning and Standards, Air Quality Policy Division when developing its approach to determining reasonable progress goals. Much of the guidance contained in the document cited in EPA's comment[15] was superseded by the EPA guidance that ADEQ followed when developing its reasonable progress goals[16]. Section 4.1 of this guidance indicates that reductions associated with the application of BART and other CAA programs "will be an important step in determining your RPG, and it may be all that is necessary to achieve reasonable progress in the first planning period for some States." ADEQ stands behind its assertion that it has established reasonable progress goals in an appropriate manner. ADEQ addressed the four-step analytical requirement described in the referenced Preamble and determined that its primary means of achieving visibility improvement goals would be through control of BART sources. The modeling assessments that were conducted by CENRAP on behalf of Arkansas and other CENRAP states project substantial visibility improvements at Arkansas's Class 1 Areas.

21. ADEQ devotes two sentences on page 64 to its consultation process and references Appendix 10.2. Region 6 does not regard this information as satisfying the consultation requirements under Section 5 1.308(d)(l)(iv). The following comments pertain to this:

a) As stated elsewhere, Appendix 10.2 contains many documents, none of which are discussed or related to the regional haze SIP. Region 6 regards the State consultation requirements under Section 5 1.308(d)(l)(iv) as being very important to the development of Arkansas' reasonable progress goal and ADEQ should greatly expand this part of its SIP.

As stated in ADEQs response to EPA comment number 5(a) above, the format of Appendix 10.2 has been modified for clarification. Appendix 10.2 is a description of the consultations that were hosted by Arkansas and Missouri, the document is entitled, "Interagency Consultation Process in Establishing Reasonable Progress Goals," and is directly related to the draft regional haze SIP. ADEQ has provided additional information regarding its consultations with other States in Chapter 10.3 of the draft Arkansas Regional Haze SIP.

b) Appendix E to the CENRAP modeling TSD in Appendix 8-1 indicates that the Class I areas in Arkansas are significantly impacted by other States. In fact, it appears that Texas sources contribute more to the visibility problem at Caney Creek than do Arkansas' own sources. Other States, both inside and outside of Region 6 and CENRAP also significantly

[15] Additional Regional Haze Questions – Sept. 27, 2006 Revision
[16] Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program, U.S. Environmental Protection Agency Office of Air Quality Planning and Standards – Air Quality Policy Division Geographic Strategies Group, June 1, 2007 - rev.

contribute to that visibility problem. However, it does not appear that ADEQ has taken any significant steps to attempt to obtain source reductions from these states.

> Since projected visibility improvements at Arkansas's Class I areas met the reasonable progress goals developed by ADEQ, there was no need to attempt to obtain specific source reductions from other States. It should be noted that other States will be achieving reductions that will benefit Arkansas Class I areas without ADEQ interference with their programs.

c) ADEQ states it consulted with the other states and Tribes which are reasonably anticipated to cause or contribute to visibility impairment in its Class I areas. In so doing, it references Appendix 10.2. However, this appendix only contains minimal documentation on the consultations and nothing from Texas and Oklahoma.

> Additional documentation regarding ADEQ's participation in interstate consultations has been provided. Both Texas and Oklahoma were participants in ADEQ-sponsored consultations and ADEQ participated in consultations hosted by these States. Tribal participation was also solicited. EPA staff participated in many of these consultations. ADEQ has committed to on-going consultations to the extent that they might be reasonably required in the future.

d) Appendix 10.2 includes a 7/23/2007 letter sent by ADEQ to participants in its consultation process. That letter apparently describes a position ADEQ adopted in which it determined that since it projects, it will meet its Uniform Rate of Progress goals, it did not need to pursue source reductions with States whose sources affect the visibility at its Class I areas. As indicated in the previous comment above, this is a flawed strategy and has fundamentally undermined Arkansas' consultation efforts.

> See (b) above. The Regional Haze Rule does not require a State to seek specific emission reductions from other States when its established reasonable progress goals can be met. The implication that "this is a flawed strategy and has fundamentally undermined Arkansas's consultation efforts" is without merit and demagogic. The interstate consultation requirement is described in the Regional Haze Rule at 51.308(d)(3)(i). This section 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 consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area within the State."
>
> As described elsewhere, Arkansas and Missouri hosted joint consultations with all States that were determined to have a reasonable potential for contributing to visibility impairment in their respective Class I areas and participated in consultations hosted by other States as well. These consultations included discussions of how each State

intended to achieve the emission reductions considered necessary for reasonable progress in each identified Class I area. There was general consensus that Arkansas would be able to achieve its goals without requiring other States to achieve specific reductions beyond those already planned for by those States.

22. It does not appear that ADEQ has included the Alpine Geophysical CENRAP Regional Haze Control Strategy Analysis Plan within its SIP. This document, along with the EnvironLJCR Technical Support Document which was included, should be featured in its SIP, broadly discussed along with any additional pertinent data, and used to inform ADEQ in the revision of its reasonable progress goal.

ADEQ did not use the Alpine Geophysics Control Strategy Analysis Plan in the development of its SIP. ADEQ does not intend to revise its reasonable progress goals.

23. ADEQ should greatly expand its reasonable progress section. In particular, ADEQ should provide documentation for the reasonable progress goals depicted in Table 10.3.

ADEQ's reasonable progress goals are based on CENRAP-modeled projections of the future-year base case run. As referenced in Chapter 10, a discussion of this approach is included in Appendix 10.2.

24. ADEQ should demonstrate, as required by Section 5 1.308(D)(l)(vi) that its reasonable progress goal does not represent less visibility improvement than is expected to result from implementation of other requirements of the CAA.

ADEQ relied on the modeling assessments conducted by CENRAP. This modeling included all reductions associated with all federal "on the books" control strategies. Since this modeling also included the reductions associated with implementation of BART at selected Arkansas facilities, it represents more visibility improvement than would be recognized through implementation of other federal CAA requirements.

25. ADEQ should discuss the PSAT Source Apportionment results of the CAMx runs (Appendix E of the TSD) in the context of the development of its reasonable progress strategy and long term strategy. Region 6 also considers this a valuable tool in the consultation process for informing ADEQ of the potential emissions impact on neighboring states.

The referenced PSAT Source Apportionment results, while informative to some extent, were not useful for determining reasonable progress and not discrete enough to use for long-term strategy development. These results were useful in the determination of which states,

based on modeled contributions, Arkansas and Missouri decided to include in their interstate consultations.

26. Region 6 does not believe that ADEQ has adequately addressed the requirements under Section 5 1.308(d)(3) regarding its obligation to construct a long term strategy for regional haze. As stated above, Arkansas' Class I areas are significantly impacted by sources in other States. Section 51.308(d)(3)(i) requires that Arkansas consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area within the State. It does not appear that ADEQ has conducted that consultation for all the States that significantly affect the visibility at its Class I areas (e.g., Texas) nor does it appear that ADEQ has attempted to secure emissions reductions from those States as part of its long term strategy.

ADEQ has conducted interstate consultations to the extent that it found appropriate. Texas did participate in consultations co-hosted by Arkansas and Missouri and, conversely, ADEQ participated in consultations conducted by Texas. EPA staff also participated in these consultations. There is no obligation for ADEQ to seek reductions from other states. The comment fails to acknowledge that emission reductions from other States will be realized through actions being taken by those states and that the consultation process that was conducted included discussions of expected control measures on a state-by-state basis.

27. On page 66, ADEQ states that CENRAP and ADEQ analyses indicate that the impact of anthropogenic emissions from Arkansas sources has not been shown to appreciably affect visibility in Class 1 areas, other than the four located in Arkansas and Missouri. However, although Appendix E to the CENRAP modeling TSD in Appendix 8-1 discusses Arkansas' contribution to Class I areas to its north and west, it does not address those directly to its northeast or East (e.g., Sipsey). ADEQ should quantify the effect of its sources on the visibility of these Class I areas.

ADEQ has quantified Arkansas’s subject-to-BART source cumulative contribution of visibility degradation at ten Class I areas of interest, including Sipsey. ADEQ has also quantified Arkansas’s individual subject-to-BART source visibility impacts across the 5 primary Class I areas of interest, Caney Creek, Hercules Glade Mingo, Upper Buffalo, and Sipsey Wilderness Areas. This information is contained in Appendix 9.2D, ENVIRON Final Report, and is consistent with the ADEQ’s subject-to-BART CALPUFF modeling.

28. Regarding its consideration of the need to mitigate the impacts of construction activities on page 68, ADEQ states: "Due to certain limitations on regulatory authorities that are included in the Arkansas Water and Air Quality Control Act, the opportunities to mitigate air emissions from construction activities are limited." ADEQ should provide more information on these limitations and how they impact its ability to address this requirement.

Section 8-4-305 of The Arkansas Water and Air Pollution Control Act states that "The provisions of this subchapter do not apply to: ---; (4) Land clearing operations or land grading; (5) Road construction operations and the use of mobile and portable equipment and machinery incident thereto; ---." It would require legislative action for these exceptions to be removed from the Act and to give ADEQ explicit regulatory authority over these activities. A footnote referencing this regulatory citation has been added to Section 11.4.1.5.

29. On pages 69 and 71, ADEQ evaluates the need for additional control measures as part of its Long Term Strategy. Considering the above comments on Arkansas' reasonable progress goals, ADEQ should:

a) Reconsider its response on page 69 to the requirement in Section 5 1.308(d)(3)(v)(C) to consider emissions limitations and schedules for compliance to achieve its reasonable progress goal.

b) Correct the language on page 71 :

> "Since Arkansas has demonstrated that it can meet or exceed established URPs, it is not necessary to evaluate the emission reductions potential of point sources other than those BART-eligible sources that are specifically regulated in accordance with the requirements of the Regional Haze Rule."

As stated above, the statutory factors must be evaluated before a State can conclude that additional control measures are not necessary.

ADEQ asserts that it has addressed the statutory factors and does not find it necessary to make the suggested changes.

30. ADEQ should indicate where in its SIP it addressed the requirement under Section 51.308(d)(3)(v)(G) to consider 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. Region 6 is particularly interested in information that would confirm the 2018 projections summarized in Table 7.2.

Changes in the emission inventory for all anthropogenic source categories were projected as described in Section 7 of the SIP. Figures 7.1, and 7.2 show the relationship between 2002 and 2018 emissions by anthropogenic source category. The net effect of emissions from all source categories was modeled and shown to result in significant visibility improvement.

31. ADEQ should indicate where in its SIP it addressed the requirement under Section 51.308(d)(3)(v)(A) to consider emission reductions due to ongoing air pollution control

programs, *including measures to address reasonably attributable visibility impairment* [emphasis added].

ADEQ's current Visibility Protection SIP was promulgated on September 24, 2007. As required by this SIP, ADEQ's latest three-year review was submitted on July 17, 2007. Until such time as Arkansas's Regional Haze SIP is approved, the Visibility Protection SIP will continue to serve as the mechanism for compliance with the requirements of §51.308(d)(3)(v)(A). In accordance with its current Visibility Protection SIP, ADEQ will continue to comply with the requirements of §51.308(d)(3)(v)(A) by starting the three-year visibility review in February 2009 if its Regional Haze SIP is not approved prior to January 2009.

Response to Region 6 Review of ADEQ's Responses to BART Engineering Analyses Comments Emailed on 5/1/07

Comments 1 – 9 ADEQ has not officially approved the subject-to-BART sources' engineering analyses. These analyses will be reviewed and approved or rejected during the permit process.

Region 6 Review of ADEQ's Responses to BART Engineering Analyses Comments Emailed on 5/1/07

Note: The following are extracted from ADEQ's response to comments Region 6 emailed on 5/1/07 concerning the BART engineering analysis that was reviewed prior to the draft SIP. Region 6 focuses herein on major points that it feels remain to be resolved, although it reserves the right to offer further comments during the final review of the SIP.

1. Arkansas Electric Cooperative's (AEC) SO2 analysis for the Bailey and McClellan units considered two options - wet scrubbers and switching to low sulfur fuel. The wet scrubbers would have cost $2,108.25/ton for the Bailey unit and $1,658.32/ton for the McClellan unit. Switching to 1% sulfur fuel would have resulted in a cost to the units of $54.90/ton and $158.60/ton, respectively. However, the scrubbers would have removed 95% of the SO2 in comparison to the fuel switch removing only 55% of the SO2 at the Bailey unit, and only 65% at the McClellan unit. How was it determined that the $2100/ton and $1600/ton controls, which would have removed another 40% were not cost effective? Why did ADEQ not require both scrubbers and low sulfur fuel, since the latter's cost is relatively minor?

ADEQ Response: The five-factor analysis considers more than economic feasibility. ADEQ ruled out SO2 scrubbers based on the energy impacts and non-air quality environmental impacts as well as the significant increase in costs.

Region 6 Response: Tables 9.4b and 9.4c,on page 50, indicate that even after switching to 1% sulfur fuel, these facilities are still projected to have very significant impacts on both the Caney Creek and the Upper Buffalo Class I areas. ADEQ states in its response: "The five-factor analysis considers more than economic feasibility. ADEQ ruled out SO2 scrubbers based on the energy impacts and non-air quality environmental impacts as well as the significant increase in costs." It does not appear that ADEQ included its five factor analysis for these facilities, so Region 6 cannot evaluate the energy impacts and non-air quality environmental impacts. However, it does appear the costs are reasonable. Region 6 notes that since ADEQ states in Appendix 9.1 the primary fuel for these boilers is natural gas, a permit revision restricting the fuel to natural gas is also an option.

2. AEC proposes a switch to 1 % sulfur fuel oil. On page 39171 of the July 5, 2005 BART rule (70 FR 39171), EPA states, "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." Region 6 notes that similar facilities across the U.S. use fuel oil with a sulfur content as

low as 0.05%. What criteria did ADEQ use to make a determination that a lower sulfur content was not cost effective?

ADEQ Response: 0.05% fuel oil is significantly more expensive. For example, the cost could be 16 times greater than the cost of 1% sulfur content fuel oil.

Region 6 Response: Concerning BART limits for SO2 from oil-fired units, EPA notes in 70 FR 39134 (published July 6, 2005): "States should accordingly evaluate a one percent sulfur content limitation as a starting point of their BART determination for oil-fired EGUs subject to BART." Accordingly, ADEQ should supply the documentation for the cost for lower sulfur content fuel oils, and by application of the five factors reassess whether a lower sulfur fuel oils should be required.

3. The Domtar Ashdown Mills BART analysis states on page 4-3 that even 100% SO2 control on Boiler 1 would not significantly affect visibility at any Class I area, because that boiler burns predominantly wood products. However, R6 notes that boiler (p. 2-1) is actually permitted to burn up to 2,700,000 gallons per year of fuel oil, and the sulfur content of the fuel used is limited to 3.0 percent by weight. ADEQ should explain how the addition of fuel oil to the fuel mix was considered in the BART analysis, and why a restriction on burning low sulfur fuel (see above comment on sulfur content) should not be viewed as BART.

ADEQ Response: At the Department's request, Domtar revised the SO2 limits for Boiler 1. Domtar will be restricted to an SO2 limit of 1.12 lb/MMBtu at this source. This is consistent with the BART limits imposed on the other sources in the state.

Region 6 Response: What is the percentage of sulfur in this fuel oil?

R6 also notes both Boilers 1 and 2 are permitted to burn tire-derived fuel (TDF). The Domtar Ashdown Mills BART analysis states on page 4-3, TDF usage (total for No. 1, No. 2, and No. 3 Power Boilers) is limited to 220 tons per day. Although TDF can contain a lower sulfur content than some coals, it has been estimated to contain between 0.86 - 2.8%[17], which is potentially significant, considering the visibility impact the Domtar facility has on the visibility of the Caney Creek Class I area. Therefore, ADEQ should explain how the addition of TDF to the fuel mix was considered in the BART analysis, and why conventional sulfur control should not be considered in the BART analysis.

Domtar Response: The addition of TDF to the fuel mix was part of the composite fuel mix utilized in the BART analysis. No. 2 Power Boiler has an existing wet scrubber for SO2 and particulate control. Since wet scrubbing is the most effective method of controlling SO2 emissions, no additional analysis was needed for SO2 emissions from No. 2 Power Boiler. On No. 1 Power Boiler, the addition of caustic to the Wet Electrostatic Precipitator was evaluated through modeling at a 90% SO2 reduction level.

[17] U.S. EPA, Control of Mercury Emissions from Coal-Fired Electric Utility Boilers, April 2002, EPA-600/R-01-109, Table A-11 at:http://www.epa.gov/appcdwww/aptb/EPA-600- R-01-109 A.pdf

The results of the modeling showed no additional improvement at Caney Creek with this amount of SO2 control on No. 1 Power Boiler, and therefore add-on controls were not considered further.

Region 6 Response: Regarding the No. 1 boiler, Domtar states that the addition of caustic to the wet precipitator was evaluated but did not show any improvements in visibility at Caney Creek. The evaluation does not appear to be included in the SIP.

4. The Domtar Ashdown Mills BART analysis states on page 4-3 that no further BART analysis is merited for Boiler 2, since it employs a wet scrubber with a 90% control efficiency. R6 notes the presumptive limit for SO2 control for EGUs at power plants with a total generating capacity in excess of 750 MW is 95% control or 0.15 lbs/mmBtu. This indicates EPA believes this level of control can typically be met through the use of wet scrubbers at coal fired boilers. Regarding this, ADEQ should address how pollution prevention techniques, improvements to existing controls, and combinations of inherently lower-emitting processes (70 FR 39164) were considered.

Domtar Response: The No. 2 Power Boiler is a swing boiler in a pulp and paper facility. It is not a base-loaded boiler at an EGU. As stated on page 4-3 of our BART analysis, the 90% control efficiency is the BART-based control efficiency presumed by the Central Regional Air Planning Association (CENRAP) and the Midwest Regional Planning Organization (MRPO) for pulp and paper industry power boilers.

Region 6 does not believe ADEQ has provided the kind of documentation necessary to demonstrate that it has considered, "[The 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."[18]

5. Domtar eliminates the use of SNCR on the No. 1 and 2 power boilers due to technical infeasibility. The No. 1 boiler is primarily wood-fired and the No. 2 boiler is primarily coal-fired. A review of the RACT/BACT/LAER Clearinghouse (Process types 11.120 and 11.190) indicates there are several wood-fired utility boilers that employ SNCR. In particular, a very similar source, the bark boiler at the Temple Inland Kraft Linerboard Mill in Orange, TX employs SNCR, Low Excess Air (LEA), and low NOx gas burners. In addition, the Weyerhaeuser Red River Mill in Campti, Louisiana is planning on installing SNCR on its 940 MMBtu/hr hogged fuel boiler. Both of these boilers exhibit some load swing. The RACT/BACT/LAER Clearinghouse also lists numerous examples of SNCR being used on coal-fired utility boilers. As a consequence, ADEQ should ensure that Domtar revises its BART analysis to consider the use of SNCR for both boilers.

6. In its letter to the ADEQ, dated March 1,2007, Entergy addresses an ADEQ inquiry concerning why it feels the Lake Catherine Unit 4 boiler should be exempt from installing post combustion NOx controls. In its response, Entergy references the BART Guidelines

[18] 70 FR 39164

(70 FR 39172):

> "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."

The context of the above reference is with regard to whether EPA felt a presumptive emissions limit was appropriate for gas-fired EGUs. It was not intended to limit the consideration for BART of possible choices of cost effective post combustion controls for these sources. As a consequence, Region 6 does not believe Entergy adequately followed the BART guidelines, since it has not completed STEP 1-Identify All Available Retrofit Control Technologies, as outlined in 70 FR 39164, July 6, 2005. Region 6 requests that ADEQ direct Entergy to re-assess its BART analysis for the Lake Catherine Plant to properly assess all control options, including post combustion controls, as outlined in the BART Guidelines. This should be done for both gas and oil firing and should include documented and detailed cost estimates for all control options that are technically feasible.

Entergy should provide documentation for the efficiencies of the control equipment evaluated within its BART analysis for the Lake Catherine Plant.

ADEQ Response: ADEQ copied a response from Entergy. Summarized herein, this response stated that Entergy had run a computer program that evaluated electrical generating unit performance and the capital and O&M cost associated with each identified control technology in a stepwise fashion and stopped the analyses when it felt that a cost threshold ceiling had been met. Entergy then supplied additional information that partially evaluated some additional control options that were not evaluated in its initial analyses, such as SNCR and SCR.

Region 6 Response: ADEQ should ensure that the initial BART analysis for the Entergy the Lake Catherine Unit 4 boiler is revised to include this and the additional information that Entergy provide in response to the remaining Region 6 comments on its BART analysis. ADEQ should ensure this BART analysis specifically addresses all the steps outlined in the BART Guidelines (70 FR 39 164, July 6, 2005). Region 6 emphasizes EGUs are required to follow the BART Guidelines in preparing their BART analyses.

Although Region 6 is not concerned the analyses be performed in a specific order, all the steps outlined in the BART Guidance must be specifically addressed.

7. Entergy has conducted its BART analysis for the Lake Catherine Plant assuming the use of (1) 1% sulfur fuel when the Unit 4 boiler is oil fired, and (2) a 10% future capacity factor. To R6's knowledge, these limitations of Entergy's operations are not housed within its Title V permit. ADEQ should therefore include a commitment in its SIP to modify Entergy's Title V permit in time to ensure these limitations, should they be deemed BART, are operational no later than 5 years after SIP approval.

ADEQ Response: As stated in a previous response, ADEQ has provided provisions in

Reg 19 for all subject-to-BART sources to re-open their Title V permits.

Region 6 Response: This response does not address the specific questions as to whether (1) 1% sulfer fuel limit will be imposed when the Unit 4 boiler is oil fired, and (2) a 10% future capacity factor will be imposed. Neither of these limitations is discussed in Reg 19 (although there is a 0.562lb/MMBtu SO2 limit). ADEQ should include a commitment in its SIP to modify Entergy's Title V permit in time to ensure these limitations, *should they be deemed BART,* are operational no later than *5* years after SIP approval. Region 6 has some remaining reservations regarding the level of NOx control Entergy has proposed for BART that may be submitted during the final review that could be attenuated depending on the outcome of this issue.

8. The Entergy Lake Catherine BART analysis is limited to the analysis of the effects of the NOx emissions for Unit 4. However, the Title V permit for the Lake Catherine Facility indicates the permitted PM and SO2 emissions are above the de minimis limits of 40 tpy for SO2 and 15 tpy for PM10. Therefore, Entergy should either take a permit limit of these levels or lower, or Entergy should expand its BART analysis to include PM and S02.

Response: The Entergy Lake Catherine BART analysis included PM and SO2 for oil firing. Species specific screening modeling conducted by ADEQ determined that PM and SO2 emissions when combusting gas did not contribute to visibility degradation in any Class I area. Additionally,

Region 6 Response: It does not appear ADEQ finished the response to this comment.

9. The Entergy Lake Catherine and White Bluff BART analyses apparently assumes the auxiliary boiler, SN-05 is not subject to BART. Through correspondence with ADEQ, Region 6 understands Entergy's reasoning for this is the answer to No. BART 19 of the document, "Additional Regional Haze Questions," dated 8/24/07:

"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."

However, SN-05 is permitted for 8760 hrs/yr of operation. Although Entergy has historically employed this unit far less than that, the potential for greater use exits due to the permit limit. Therefore, Entergy should either include SN-05 in the BART analysis assuming 8760 hrs/yr of operation, or revise its permit to reflect this unit's historical function.

Response: At the Department's request, Entergy - White Bluff accepted an operation limit of 4360 hours annually. Please refer to Regulation 19.1505 (L).

Region 6 Response: Since Entergy feels it must retain this level of operational flexibility for SN-05, then it should perform its BART analysis on this basis.

EPA submitted several comments specific to engineering analyses that were submitted by BART-eligible facilities, the control scenarios that were proposed and the resulting

ADEQ determination of appropriate BART emission limits. ADEQ reviewed the information provided by these facilities to establish BART emission limits. These limits were modeled for each source in order to establish that the reductions achieved would mitigate impacts on affected Class I areas. The resulting emission limits were incorporated in the Arkansas Pollution Control and Ecology Regulation Number 19, Regulations of the Arkansas Plan of Implementation for Air Pollution Control. Regulation 19 does not specify the control technologies that each BART source will eventually install. At such time as a facility is required to install BART controls, it will be required to submit a Title 5 Permit application that specifies controls that result in emission reductions that are equivalent to, or greater than, those specified in the SIP. EPA will have an opportunity to review these permit applications at such time.

Comments Received From Entergy and AEP

Note: The only timely public comments that were submitted were from two electric utilities that would be directly impacted by the BART provisions in the SIP. The following addresses these comments collectively. The public comments submitted by these companies are included below, followed by ADEQ's response.

Arkansas Environmental Support
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Mark C. Bowles, Manager
Arkansas Environmental
Support

AR-08-048

July 21, 2008

Doug Szenher
Arkansas Department of Environmental Quality
Public Outreach and Assistance Division
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

Subject: **Comments on Arkansas Regional Haze Rule State Implementation Plan (SIP)**

Dear Mr. Szenher,

Entergy commends the Arkansas Department of Environmental Quality (ADEQ) for the steps taken to implement the requirements of the Regional Haze Rule (RHR), 40 CFR 51.308. Entergy is pleased to have the opportunity to submit the following comments on the draft Arkansas Regional Haze SIP.

1. Regulatory Certainty: As stated in prior comments to the Agency dated July 10, 2007, Entergy requests that ADEQ modify the required compliance schedule in the Arkansas SIP and in Reg. 19 1504(B) to match guidance issued by EPA in the Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations. Current language in the SIP requiring implementation no later than 6 years after the effective date of Reg. 19 (incorporation of BART SIP) should be stricken since that date is likely to be in advance of the deadline established by the EPA. EPA's Final Rule (70 Fed. Reg. 39158 (July 6, 2005)) requires that States must ensure compliance with BART requirements no later than 5 years after EPA approves the SIP. Entergy requests that the Arkansas SIP and Reg. 19 be modified to require compliance in the same fashion – five years from EPA approval of the SIP – in order to avoid this potential timing problem.

Additionally, some of the controls required to comply with BART represent a major undertaking, requiring significant funding, long-term planning and engineering, and decision-making and financial commitments well in advance of implementation. Entergy is concerned that the current language requiring implementation no later than six years after the effective date of Regulation 19 will drive companies to make critical decisions and commitments prior to EPA's approval of the SIP. The current schedule suggested by the SIP unnecessarily creates significant risk and financial exposure for both companies and rate-payers in the event the SIP is modified by EPA. ADEQ should consider changing the language in 11.4.1.2 to require that BART controls be in place no later than five years after the EPA approves the Arkansas Regional Haze SIP.

2. Clean Air Interstate Rule (CAIR): On July 11, 2008 the United States Court of Appeal for the D.C. Circuit vacated CAIR. Numerous states surrounding Arkansas based their BART compliance strategy on the premise that CAIR was "better than" BART. Many if not all of these states have not conducted BART assessments for NOx and SO2 for their BART sources, since they were relying on CAIR to satisfy BART. Additionally, all states conducted BART modeling assuming emission reductions from CAIR. These assumptions are no longer correct, implying that all states may need to halt BART implementation and re-evaluate their BART strategy. If Arkansas continues the implementation of BART no later than 6 years after the effective date of Reg. 19, Arkansas facilities will be required to expend billions of dollars while other states conduct BART assessments that may impact EPA's review of state SIPs. This multiplies the regulatory uncertainty detailed above in comment Number 1. In light of the vacatur of CAIR, it is not prudent to require Arkansas sources to proceed with BART implementation in a timeline driven *by Arkansas' own adoption of its SIP or Reg. 19*, because the uncertainty created by the vacatur (and the expected requirement that other states perform new BART assessments) adds significant uncertainly to the expected timing of EPA's approval of the various state SIPs, including Arkansas'. Instead, the implementation of BART in Arkansas should be timed *from EPA's approval of the SIP*.

Entergy Arkansas, Inc. is concerned that EPA may choose to reject the AR SIP because it relies in part on CAIR, which the D.C. Circuit previously vacated. For this reason, we again request that Arkansas revise Regulation 19 and any associated SIP language so that compliance dates are tied to the approval of this SIP by EPA. The Arkansas SIP directly references CAIR in at least two important places. The first reference is in "Section 7.2: Overview of the 2018 Emission Inventory," which describes that the 2018 Emission Inventory used for modeling was developed using the IPM model that included CAIR emission reductions. Entergy Arkansas, Inc. is unsure how EPA will view the 2018 Emission Inventory since the CAIR vacatur and questions whether EPA will approve the Inventory as currently developed. The second direct reference of the Clean Air Interstate Rule is in "Section 11.4.1.1: Clean Air Interstate Rule (CAIR)" - This section directly refers to assumed NOx reductions in Arkansas based on the 2015 CAIR seasonal cap. This statement is no longer valid with the D.C. Circuit decision to vacate CAIR, and Entergy Arkansas, Inc. is concerned that EPA may not find the SIP valid. ADEQ should consider striking "Section 11.4.1.1: Clean Air Interstate Rule" from the state SIP given that CAIR has been vacated by the D.C. Circuit.

3. International Transport: The preamble to the RHR states that the Environmental Protection Agency (EPA) will work with the governments of Canada and Mexico to seek cooperative

solutions on trans-boundary pollution problems. We are concerned that EPA may not take action to address these transport issues in a timely fashion to help meet the natural visibility goal in 2064. These transboundary problems should be resolved by EPA prior to seeking additional emission reductions from sources located in Arkansas to meet the reasonable progress goals. A similar approach should be employed for Class 1 areas outside of Arkansas where modeling indicates an impact from Arkansas sources, prior to pursuing additional in-state reductions.

4. Class 1 Area Monitoring: It is essential that Class 1 area monitoring be implemented in Arkansas. The SIP indicates that the availability of monitors necessary to assess compliance with the reasonable progress goals at Class I areas will be contingent upon availability of funds to the custodians of these Class 1 areas. Industry in Arkansas will be expending billions of dollars to address visibility issues; therefore, monitoring must be employed to document the benefits of these expenditures. The Arkansas Regional Haze SIP should include a firm commitment that monitoring equipment will be installed and reliably maintained to gauge visibility improvements. Since visibility goals are Class 1 area-specific, it is not reasonable to use data from other Class 1 areas or from EPA network monitors to verify progress goals in an individual Class 1 area or for requiring additional emission reductions to meet future progress goals.

5. Smoke Management Plan: FLM prescribed burning can result in visibility-impairing, health-effecting, NAAQS-violating emissions. The Arkansas Regional Haze SIP should contain enforceable conditions to mitigate these activities. The smoke management plan included in the SIP is a good qualitative document but should be supplemented with appropriate enforceable standards.

6. Typographical Corrections and Suggestions: Please see below for corrections and suggestions for Tables 9.3a and 9.3b of Chapter 9 denoted in red text.

Table 9.3a BART-Level Emissions Reductions from the 2002 Baseline, Sulfur Dioxide (SO_2)

Source and Unit	Maximum 24-Hour Actual Emissions (lb/day) [2]	Baseline Peak 24-hour Emissions (lb/hr) [2]	BART Level of Control % Removal [1] [2]	Future Peak 24-hour Emission Rate (lb/hr) [2]	Emission Limit [3]
04-00107 276-AOP-R1 American Electric Power SN-01	113483.81	4728.49	78.3%	1026.08	0.15 lb/MMBtu
74-00024 154-AOP-R0 AR Electric Coop Bailey Plant SN-01	57018.10	2375.75	55%	1069.09	1034.17 lb/hr (1% S fuel oil)
52-00055 181-AOP-R1 AR Electric Coop McClellan Plant SN-01	65942.06	2747.59	65%	961.66	982.47 lb/hr (1% S fuel oil)
41-00002 287-AOP-R2 Domtar SN-03	10620	442.5	0%	442.5	1.12 lb/MMBtu
41-00002 287-AOP-R2 Domtar SN-05	18916.8	788.2	0% (using existing scrubber)	788.2	1.20 lb/MMBtu
30-00011 1717-AOP-R1 Entergy Lake Catherine Plant SN-03 *oil*	126647.84	5276.99	46%	2860.4	0.562 lb/MMBtu (0.5% S fuel oil)
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-01	186319.32	7763.3	82%	1400.8	0.15 lb/MMBtu (Bituminous & sub-bituminous coal)

Source and Unit	Maximum 24-Hour Actual Emissions (lb/day) [2]	Baseline Peak 24-hour Emissions (lb/hr) [2]	BART Level of Control % Removal [1] [2]	Future Peak 24-hour Emission Rate (lb/hr) [2]	Emission Limit [3]
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-02	187799.35	7825.0	80%	1533.2	0.15 lb/MMBtu (Bituminous & sub-bituminous coal)
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-05	No emission standards have been established for this source. Rather the state has established work practice standards for this source pursuant to 40 CFR 51.308(e)(1)(iii).				

1. Only listed if facility is adding controls or taking limits that will reduce emission per BART requirements. Facilities which are not adding controls or using controls which are already installed have a 0% BART control efficiency.
2. Modeled
3. 30-day rolling average

Table 9.3b BART-Level Emissions Reductions from the 2002 Baseline, Oxides of Nitrogen (NO_x)

Source and Unit	Maximum 24-Hour Actual Emissions (lb/day) [1]	Baseline Peak 24-hour Emissions (lb/hr) [1]	BART Level of Control % [1]	Future Peak 24-hour Emission Rate (lb/hr) [1]	Emission Limit [2]
04-00107 276-AOP-R1 American Electric Power SN-01	46680.0	1945	16.8%	1618.24	0.23 lb/MMBtu
41-00002 287-AOP-R2 Domtar SN-03	4309.0	179.54	0%	179.54	0.46 lb/MMBtu
41-00002 287-AOP-R2 Domtar SN-05	12643.2	526.8	30%	368.76	0.450 lb/MMBtu

Source and Unit	Maximum 24-Hour Actual Emissions (lb/day) [1]	Baseline Peak 24-hour Emissions (lb/hr) [1]	BART Level of Control % [1]	Future Peak 24-hour Emission Rate (lb/hr) [1]	Emission Limit [2]
30-00011 1717-AOP-R1 Entergy Lake Catherine Plant SN-03 *gas*	58960.0	2456.67	69.6%	746.82	0.15 lb/MMBtu
30-00011 1717-AOP-R1 Entergy Lake Catherine Plant SN-03 *oil*	60273.0	2511.38	47.6%	1315.96	0.25 lb/MMBtu
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-01	104920.0	4371.7	69%	1355.23	0.28 lb/MMBtu (bituminous coal)
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-01	104920.0	4371.7	69%	1355.22	0.15 lb/MMBtu (sub-bituminous coal)
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-02	113540.0	4730.8	69%	1466.56	0.28 lb/MMBtu (bituminous coal)
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-02	113540.0	4730.8	69%	1466.56	0.15 lb/MMBtu (sub-bituminous coal)
35-00110 263-AOP-R1 Entergy White Bluff Plant SN-05	No emission standards have been established for this source. Rather the state has established work practice standards for this source pursuant to 40 CFR 51.308(e)(1)(iii).				

1. Modeled
2. 30-day rolling average

Table 9.3c BART-Level Emissions Reductions from the 2002 Baseline, Particulate Matter 10 micrometers (PM_{10})

Source and Unit	Maximum 24-Hour Actual Emissions (lb/day) [1]	Baseline Peak 24-hour Emissions (lb/hr) [1]	BART Level of Control % [1]	Future Peak 24-hour Emission Rate (lb/hr) [1]	Emission Limit [2]
41-00002 287-AOP-R2 Domtar SN-03	4068.0	169.5 (filterable)	76%	40.6	0.07 lb/MMBtu
41-00002 287-AOP-R2 Domtar SN-05	1958.4	81.6 (filterable)	29.7% (using existing scrubber)	57.4	0.10 lb/MMBtu

1. Modeled
2. 30-day rolling average

Table 9.3d BART-Level Emissions Reductions from the 2002 Baseline, Particulate Matter 2.5 micrometers ($PM_{2.5}$)

Source and Unit	Maximum 24-Hour Actual Emissions (lb/day) [1]	Baseline Peak 24-hour Emissions (lb/hr) [1]	BART Level of Control % [1]	Future Peak 24-hour Emission Rate (lb/hr) [1]	Emission Limit [2]
30-00011 1717-AOP-R1 Entergy Lake Catherine Plant SN-03 *oil*	6810.0	283.75	69.4%	86.83	0.037lb/MMBtu (filterable & condensable) 0.5% S fuel oil

1. Modeled
2. 30-day rolling average

Should you have any questions or need additional information, please call Tracy Johnson or me at 501-377-4033 or 501-377-3958, respectively.

Sincerely,

Mark C. Bowles, Manager
Arkansas Environmental Support

Bcc: Myra Glover
Jim Schott
Joe Hantz
Renee Keys
Tracy Johnson
Chuck Barlow

Files –8111.30

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AR-08-048 Sent Electronically (with Hard Copy to follow by Mail)

July 21, 2008

Doug Szenher
Arkansas Department of Environmental Quality
Public Outreach and Assistance Division
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

Subject: American Electric Power(AEP)/Southwestern Electric Power Company (SWEPCO) Comments to the draft Arkansas Regional Haze Rule State Implementation Plan (SIP) to implement requirements of the federal Regional Haze Rules (RHR), 40 CFR 51.308

Dear Mr. Szenher,

I am pleased to offer these comments to the draft Arkansas Regional Haze SIP, dated June 7, 2008 on behalf of SWEPCO, an operating subsidiary of AEP. SWEPCO operates and co-owns the coal-fired Flint Creek Power Station in Gentry Arkansas, with Arkansas Electric Cooperative Corporation.

At the very outset, we applaud the ADEQ for the comprehensive and the logical layout of the contents of the draft SIP document. Our review process was greatly enhanced by ADEQ's relegation of the detailed analysis to the Appendices and summarization of only the pertinent and needed information in the main chapters of the text. We offer below some general and specific comments for your consideration.

- The DC Court vacated the Clean Air Interstate Rule (CAIR), July 11, 2008. Considering the close alignment of the Best Available Retrofit Technology (BART) and Reasonable Progress Goals (RPG) obligations of CAIR states (that took shelter under the provision that CAIR=EGU BART for NOx and SO2, and thus performed no BART analysis), the EPA will call for reexamination of the basis for RHR SIPs and possibly require restructuring of individual state SIPs. Thus, ADEQ's commitments in this draft RHR SIP for AR sources in terms of control obligations and commitments dates could be compromised by the final outcome of the CAIR vacatur. We would thus recommend that the ADEQ consider pulling back the SIP submittal in its present form until EPA can provide better guidance. In any event, the provisions in

the draft SIP which commits to deadlines in Regulation 19 (that is included by reference) for BART to be in place 6 years from Regulation 19 signature or within 5-years of the EPA approval of the AR RHR SIP would seem to be inappropriate at this juncture.

- Table 5.2 of Chapter 5 speaks to the Visibility metrics including the natural background conditions, used in establishing the Uniform Rate of Progress glide path. We believe that the natural background numbers stated should adequately address trans-boundary pollution influences and be appropriately taken into consideration to reflect the true obligations in the Uniform Rate of progress determinations

- Tables 9.3a and 9.3b in Chapter 9 present emissions levels and emission rates for Sulfur Dioxide and Oxides of Nitrogen. The titles for columns 2 through 5 in these Tables should be modified to include the word "Modeled" to distinguish those from the last column which is a listing of the "applicable compliance emission limits" (reckoned on a "30-day rolling average per the RHR) for the listed units

- Table 10.2 and Figures 10.2 and 10.4 in Chapter 10 provide Uniform Rate of Progress goal information for the 20% best days for Caney Creek and Upper Buffalo Class 1 areas in Arkansas. The glide path information is only required for the 20% worst days per the RHR. The only requirement in the rules with respect to the 20% best days is to avoid degradation. To avoid confusion, it is suggested that such information as depicted in Table 10.2 and Figures 10.2 and 10.4 be deleted from Chapter 10

- It is our belief that the information in Table 10.1 and the glide paths shown in Figures 10.1 and 10.3 for the Class 1 areas for the worst 20% days may not be reflective of the true progress needed because of the lack of proper accounting of trans-boundary influences on the natural conditions

- Appendix 11.1 to Chapter 11 dealing with Long Term Strategies contains a basic Smoke Management Program with mere stipulation for voluntary notification to the state of fire plans for Agricultural and Forestry Smoke management. There are no enforceable limitations on such area sources. As the state recognizes, the emissions from prescribed burning which includes the activities of the FLMs, if left unchecked will have visibility, health and NAAQS related consequences in Class 1 areas and beyond and the state should consider imposing quantitative limitations on emissions from such operations

- The draft SIP indicates that availability of monitors to assess compliance with the reasonable progress goal targets at Class 1 areas will be contingent upon availability of funds to the custodians of these Class 1 areas, i.e. the FLM. While point sources will be expending millions of dollars to address an aesthetic related visibility issue at these Class 1 areas, it is a sad commentary that there is no sure way to discern the benefits of such massive expenditures. We would suggest that the SIP reflect a firm commitment from the FLM to take the responsibility to secure funds to have monitoring equipment installed and reliably maintained to gauge visibility improvements. It is our belief that a sound justification would be required if additional emissions reductions are called for from in-state sources in the future.

Should you need additional information, please call N. N. Dharmarajan at 214-777-1373.

Sincerely,

Bruce W. Moore

Bruce W. Moore

Manager Air Quality Services – West

CC: T. B. Bond
N. N. Dharmarajan
D. Lee – FLC
S. Cain - AECC

ADEQ's Response to Comments Received From Entergy and AEP

Due to the DC Circuit Court's recent *vacatur* of the federal Clean Air Interstate Rule (CAIR), one commenter requested that ADEQ consider putting off submittal of its Regional Haze SIP and wait for additional guidance from EPA. Two comments recommended removing language that potentially requires implementation of BART prior to final EPA approval of the SIP. In the following discussion, it should be noted that the Regional Haze Rule, including the BART provisions, and the CAIR Rule are two distinct rules. The Regional Haze Rule pre-dates the Clean Air Interstate Rule and States are obligated to implement its requirements regardless of the status of the CAIR Rule.

The federal court's *vacatur* of the CAIR Rule has no effect on implementation of the BART Rule for Arkansas sources. While it is true that Arkansas's reasonable progress goals were partially based on reductions associated with the implementation of the CAIR rule for out-of-state sources, CAIR was not used for the purpose of determining BART for facilities in Arkansas. All States were required to conduct BART-eligibility determinations for facilities (or develop similar emission reduction strategies) before making BART determinations. It appears that, in the absence of CAIR, many States will have to initiate BART determinations for those "BART-eligible" sources that elected to use CAIR reductions in lieu of BART determinations. While there is considerable uncertainty regarding the emission reductions associated with these new analyses, it is likely that the reductions achieved through the application of BART to these facilities will be similar to those using the now outdated assumption that CAIR reductions constitute BART. As an alternative, there are several efforts underway that would provide short-term "fixes" as a means of achieving the reductions that were expected from implementation of the CAIR Rule requirements.

ADEQ is obligated to submitting a Regional Haze SIP. The Regional Haze Rule requires implementation of BART controls "*as expeditiously as practicable* (emphasis added), but in no event later than five years after approval of the implementation plan revision." When establishing its BART deadline, ADEQ intended to reduce the uncertainty associated with EPA review and approval of its SIP while at the same time assuring that BART implementation would not be unduly delayed. The CAIR Rule *vacatur* does not affect this intent.

The Regional Haze Rule gives States the discretion to establish what constitutes BART. ADEQ contacted each of its BART-eligible sources and collaboratively established the level of control that would constitute BART for each affected facility. The potential emission reductions associated with the CAIR Rule were not relevant to these determinations thus, its *vacatur* has no effect on them.

Comments included concerns regarding the contribution of international emission sources and how these were treated in the determination of natural background conditions and the development of the SIP. EPA's guidance on determining natural

background does not currently include a procedure for determining trans-boundary contributions. While international emissions do contribute to regional haze and natural background conditions, they had no influence on the BART determinations that ADEQ conducted. The determination of the extent of international contributions is an on-going effort. As the understanding of trans-boundary influences grows, ADEQ will take this into consideration.

The Regional Haze Rule does not require States to mitigate impacts associated with international emissions. Trans-boundary influences are poorly understood and difficult to determine without significant additional information regarding the source and intensity of international emissions and the meteorological conditions associated with their influence. These factors are beyond the scope of the analyses that have been conducted by Regional Planning Organizations in their attempts to address the requirements of the Regional Haze Rule. ADEQ has established reasonable progress goals that can be met without having to consider trans-boundary contributions. As a better understanding of the nature of trans-boundary contributions is developed, ADEQ will re-evaluate their impacts on the ability to achieve reasonable progress.

Comments were received regarding the expression of emission rates in Tables 9.3a - 9.3d. A commenter suggested the footnote “modeled” be added to columns 2 – 4 of Tables 9.3a – 9.3d. The commenter also suggested ADEQ add footnote “30-day rolling average” to column 6 of the afore-mentioned tables. ADEQ used the numbers in columns 2, 3, and 5 of Tables 9.3a – 9.3d for BART determination modeling and subject-to-BART post-control modeling. The emission rates are actual emissions which were provided to ADEQ by the facilities shown in these tables. Column 4 is the percent of removal due to the BART level of controls and represents the reduction of pollutant emissions after BART controls are installed. Therefore, ADEQ is of the opinion it is not necessary to add the footnote “modeled” to the suggested columns in Tables 9.3a – 9.3d. As for the request to add the footnote “30-day rolling average” to column 6 of Tables 9.3a – 9.3d, ADEQ agrees with the commenter and has added the requested footnote to the afore-mentioned column and tables.

ADEQ agrees that the goal for the 20% best days is “no degradation” and has revised tables that appeared to establish specific goals other than “no degradation”.

Comments were received regarding the contribution of prescribed burning to regional haze and the advisability of establishing quantitative emission limits for prescribed burning operations. Arkansas’s Smoke Management Plan, while voluntary, is adhered to by federal land managers and other major entities that conduct prescribed burns. It effectively limits emissions in an air-shed to a level that minimizes the potential for smoke-related impacts. ADEQ does not have the regulatory authority to specifically regulate emissions from prescribed burning.

Comments were received regarding the need to continue monitoring regional haze in Class I areas. ADEQ cannot require FLMs to fund on-going monitoring effort

funding in a State rule. In the absence of continued funding, ADEQ intends to continue operation of its existing monitoring network with State funds.

Appendix 5.1

Revised Algorithm for Estimating Light Extinction from IMPROVE Particle Speciation Data

TECHNICAL PAPER

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Revised Algorithm for Estimating Light Extinction from IMPROVE Particle Speciation Data

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ABSTRACT

The Interagency Monitoring of Protected Visual Environments (IMPROVE) particle monitoring network consists of approximately 160 sites at which fine particulate matter ($PM_{2.5}$) mass and major species concentrations and course particulate matter (PM_{10}) mass concentrations are determined by analysis of 24-hr duration sampling conducted on a 1-day-in-3 schedule. A simple algorithm to estimate light extinction from the measured species concentrations was incorporated in the 1999 Regional Haze Rule as the basis for the haze metric used to track haze trends. A revised algorithm was developed that is more consistent with the recent atmospheric aerosol literature and reduces bias for high and low light extinction extremes. The revised algorithm differs from the original algorithm in having a term for estimating sea salt light scattering from Cl^- ion data, using 1.8 instead of 1.4 for the mean ratio of organic mass to measured organic carbon, using site-specific Rayleigh scattering based on site elevation and mean temperature, employing a split component extinction efficiency associated with large and small size mode sulfate, nitrate and organic mass species, and adding a term for nitrogen dioxide (NO_2) absorption for sites with NO_2 concentration information. Light scattering estimates using the original and the revised algorithms are compared with nephelometer measurements at 21 IMPROVE monitoring sites. The revised algorithm reduces the underprediction of high haze periods and the overprediction of low haze periods compared with the performance of the original algorithm. This is most apparent at the hazier monitoring sites in the eastern United States. For each site, the PM_{10} composition for days selected as the best 20% and the worst 20% haze condition days are nearly identical regardless of whether the basis of selection was light scattering from the original or revised algorithms, or from nephelometer-measured light scattering.

IMPLICATIONS

Concerns raised about the use of the original IMPROVE algorithm for estimating light extinction from particle composition data for calculating the metric for tracking trends for the Regional Haze Rule (RHR) have been addressed in the formulation of a revised algorithm. The new algorithm reduces biases at the upper and lower extremes, which are of particular concern with regards to the RHR, which mandates reducing the impacts of manmade emissions on the 20% worst haze days while avoiding degradation of the 20% best haze conditions. The revised algorithm is likely to be adopted by most states for the technical assessments and modeling supporting their RHR state implementation plans.

INTRODUCTION

Atmospheric light extinction is a fundamental metric used to characterize air pollution impacts on visibility. It is the fractional loss of intensity in a light beam per unit distance due to scattering and absorption by the gases and particles in the air. Light extinction (b_{ext}) can be expressed as the sum of light scattering by particles ($b_{s,P}$), scattering by gases ($b_{s,g}$), absorption by particles ($b_{a,P}$) and absorption by gases ($b_{a,g}$). Traditionally, for visibility-protection applications, the most sensitive portion of the spectrum for human vision (550 nm) has been used to characterize light extinction and its components.

Light extinction due to the gaseous components of the atmosphere are relatively well understood and well estimated for any atmospheric conditions. Absorption of visible light by gases in the atmosphere is primarily by nitrogen dioxide (NO_2) and can be directly and accurately estimated from NO_2 concentrations by multiplying by the absorption efficiency. Scattering by gases is described

by the Rayleigh scattering theory. Rayleigh scattering depends on the density of the atmosphere, with the highest values at sea level (about 12 Mm^{-1}) and diminishing with elevation (8 Mm^{-1} at about 4 km), and varies somewhat at any elevation because of atmospheric temperature and pressure variations. Rayleigh scattering can be accurately determined for any elevation and meteorological conditions.

Particle light extinction is more complex than that caused by gaseous components. Light-absorbing carbon (e.g., diesel exhaust, soot, and smoke) and some crustal minerals are the only commonly occurring airborne particle components that absorb light. All particles scatter light, and generally particle light scattering is the largest of the four light extinction components. The amount of light scattered by an ensemble of particles can be quite accurately estimated using Mie theory when its size distribution and index of refraction are known.[1] Mie theory describes how electromagnetic energy (light as a function of wavelength) interacts with a particle as it passes through and around the particle. The scattering and absorption of the ensemble of particles is then calculated by summing over all particles with their various known optical and physical properties.[2] However, it is rare that the intrinsic optical and physical properties of each particle are known, so simplified calculation schemes are typically used to make extinction estimates.

The *I*nteragency *M*onitoring of *Pro*tected *V*isual *E*nvironments (IMPROVE) particle monitoring provides 24-hr duration mass concentrations for coarse (PM_{10}) and fine ($PM_{2.5}$) particulate matter (PM), as well as most of the $PM_{2.5}$ component concentrations on a 1-day-in-3 schedule. These data are routinely available at each of the approximately 160 IMPROVE monitoring sites for use in estimating light extinction. At 21 IMPROVE monitoring sites (Table 1), hourly averaged nephelometer and relative humidity (RH) data are also routinely available. Data from these sites have been key to evaluating the performance of the original IMPROVE algorithm, as well as for development and performance evaluation of various alternative revised algorithms.

Table 1. IMPROVE monitoring sites with nephelometers used to evaluate algorithm performance.

Abbreviation	Name	State	Region
ACAD	Acadia National Park	Maine	East
BIBE	Big Bend National Park	Texas	West
BOWA	Boundary Waters Canoe Area	Minnesota	East
CORI	Columbia River Gorge	Washington	West
DOSO	Dolly Sods/Otter Creek Wilderness	West Virginia	East
GICI	Gila Wilderness	New Mexico	West
GRCA	Grand Canyon National Park	Arizona	West
GRGU	Great Gulf Wilderness	New Hampshire	East
GRSM	Great Smoky Mountains	Tennessee	East
JARB	Jarbidge Wilderness	Nevada	West
LOPE	Lone Peak Wilderness	Utah	West
LYBR	Lye Brook Wilderness	Vermont	East
MACA	Mammoth Cave National Park	Kentucky	East
MORA	Mount Rainier National Park	Washington	West
MOZI	Mount Zirkel Wilderness	Colorado	West
OKEF	Okefenokee National Wildlife Refuge	Georgia	East
SHEN	Shenandoah National Park	Virginia	East
SHRO	Shining Rock Wilderness	North Carolina	East
SNAP	Snoqualamie Pass Wilderness	Washington	West
THIS	Three Sisters Wilderness	Oregon	West
UPBU	Upper Buffalo Wilderness	Arkansas	East

The IMPROVE algorithm for estimating light extinction was adopted by the U.S. Environmental Protection Agency (EPA) as the basis for the regional haze metric used to track progress in reducing haze levels for visibility-protected areas under the 1999 Regional Haze Rule (RHR).[3] As a result, the IMPROVE algorithm has been carefully scrutinized to assess deficiencies that could bias the implementation of the RHR.

The RHR uses the IMPROVE algorithm to estimate light extinction, which is then converted to the deciview haze index (i.e., a logarithmic transformation of b_{ext}). The RHR then calls for the determination of the mean of the annual 20% best and 20% worst haze days for each of the IMPROVE monitoring sites that represent the visibility-protected areas. States are asked to manage emissions so that over a 60-yr period the worst haze days will improve to natural conditions without degrading visibility conditions for the best haze days. For consistency, the same approach (i.e., IMPROVE algorithm and conversion to the deciview haze index) is also used to estimate natural haze levels for each representative monitoring site using estimates of the natural concentration levels for the major particle components. For each location, the linear rate of reduction of the deciview values for the worst haze days during the baseline period (2000–2004) that is needed to reach the estimated worst haze days under natural conditions by 2064 must be determined. This linear rate is used as a guide to pace the desired rate of haze reduction and to determine interim visibility goals that are compared to the monitoring data trends of the best and worst haze days.

The RHR emphasizes the extremes of light extinction through its requirement to estimate best and worst haze days for the baseline period and for estimates of natural worst haze conditions. Also, the use of the deciview index means that additive biases in the light extinction estimates (e.g., the use of a standard Rayleigh scattering term for all sites regardless of elevation) will affect the calculation of a linear glide slope, which is a guide used to set the pace of emission reductions. Use of the IMPROVE algorithm for the RHR elicited concerns about possible biases in the apportionment among the various major particle components. Such issues have been the subject of a number of critical reviews of the use of the IMPROVE algorithm in the RHR.[4,5]

In light of the concerns raised by its use in the RHR, the IMPROVE Steering Committee initiated an internal review, including recommendations for revisions of the IMPROVE algorithm for estimating light extinction. The full report of this review is available elsewhere.[6] Subsequently, the IMPROVE Steering Committee established a subcommittee to develop a revised algorithm that reduces biases in light extinction estimates and is as consistent as possible with the current scientific literature, while constrained by the need to use only those data that are routinely available from the IMPROVE particle monitoring network. The resulting algorithm was accepted for use by the IMPROVE Steering Committee and is being used by

most states in their implementation of the RHR. The primary purpose of this paper is to describe the revised algorithm, summarize the rationale for each of the changes from the original algorithm, and characterize the performance of the original and revised algorithms.

Original IMPROVE Algorithm

The original IMPROVE algorithm for estimating light extinction from IMPROVE particle monitoring data assumes that absorption by gases ($b_{a,g}$) is zero, that Rayleigh scattering ($b_{s,g}$) is 10 Mm^{-1} for each monitoring site regardless of site elevation and meteorological condition, and that particle scattering and absorption ($b_{s,P}$ and $b_{a,P}$) can be estimated by multiplying the concentrations of each of six major components by typical component-specific mass extinction efficiencies. The six major components are sulfate (assumed to be ammonium sulfate), nitrate (assumed to be ammonium nitrate), organic compounds (based on measured organic carbon [OC] mass), elemental or black carbon (directly measured), fine soil (crustal elements plus oxides) and coarse mass (the difference between PM_{10} and $PM_{2.5}$ mass concentrations). The component dry mass extinction efficiency values are expressed as single significant digit constants, reflecting the level of uncertainty of these values. The sulfate and nitrate mass extinction efficiency terms include a water growth factor that is a function of RH (displayed as *f(RH)*) multiplied by a constant dry extinction efficiency. Monthly averaged water growth terms for each site were developed because most monitoring sites do not include on-site RH monitoring. Expressed as an equation, the original algorithm for estimating light extinction from IMPROVE data takes the following form where the particle component concentrations are indicated in the brackets. The formulas for the composite components are available elsewhere.[7]

$$\begin{aligned} b_{ext} \approx\ & 3 \times f(RH) \times [Sulfate] + 3 \times f(RH) \times [Nitrate] \\ & + 4 \times [Organic\ Mass] \\ & + 10 \times [Elemental\ Carbon] \\ & + 1 \times [Fine\ Soil] + 0.6 \times [Coarse\ Mass] \\ & + 10 \end{aligned} \quad (1)$$

The units for light extinction and Rayleigh scattering are inverse megameters ($1/10^6$ m usually written Mm^{-1}); component concentrations shown in brackets are in microgram per meter cubed ($\mu g/m^3$); dry mass extinction efficiency terms are in units of meters squared per gram (m^2/g); and the water growth terms, *f(RH)*, are unitless.

Among the implicit assumptions for this formulation of the algorithm are that

- Six particle component terms plus a constant Rayleigh scattering term are sufficient for a good estimate of light extinction;
- Constant dry mass extinction efficiency terms rounded to one significant digit for each of the six particle components (e.g., for both sulfate and nitrate the value is 3) works adequately for all locations and times; and
- Light extinction contributed by the individual particle components can be adequately estimated as separate terms as they would if they were in completely separate particles (externally mixed), though they often are known to be internally mixed in particles.

A relatively simple algorithm for estimating light extinction using only the available monitoring data requires assumptions such as these.

Estimates of particle scattering by this algorithm (i.e. excluding the light absorbing carbon and Rayleigh terms) have been compared with directly measured particle scattering data at the 21 monitoring sites that have hourly averaged nephelometer and RH data. As shown in Figure 1, the algorithm performs reasonably well over a broad range of particle light scattering values and monitoring locations. The algorithm tends to underestimate the highest extinction values and to overestimate the lowest extinction values. Since its first use,[7] the original algorithm has been a useful tool that significantly contributed to a better understanding of haze levels and the relative magnitude of haze contribution by the various particle components.

Revised IMPROVE Algorithm

A revised algorithm was developed to address issues raised concerning the original algorithm. The revised algorithm meets many of the overall design criteria of the original,

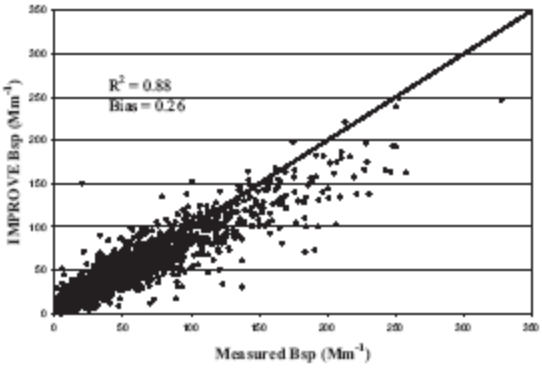

Figure 1. A scatter plot of the original IMPROVE algorithm estimated particle light scattering vs. measured particle light scattering.

including that it is a relatively simple algorithm that produces consistent estimates of light extinction for all remote-area IMPROVE aerosol monitoring sites and permits the individual particle component contributions to light extinction to be separately estimated. Five major revisions were made to the original IMPROVE algorithm for estimating light extinction from IMPROVE particle speciation data. They include

- Addition of a sea salt term, which is a particular concern for coastal monitoring locations in which the sum of the major components of light extinction and mass has been deficient;
- Change of the assumed organic compound mass to OC mass ratio from 1.4 to 1.8 to reflect more recent peer-reviewed literature on the subject;
- Use of site-specific Rayleigh scattering based on the elevation and annual average temperature of the monitoring sites;
- Development and use of a split component extinction efficiency model for sulfate, nitrate, and OC components, including new water growth terms for sulfate and nitrate to better estimate light extinction at the high and low extremes of the range; and
- Addition of a NO_2 light absorption term that would only be used at sites with available NO_2 concentration data.

The technical rationale for making each of these changes is described in separate sections below.

Sea Salt

The original IMPROVE protocol for estimating light extinction does not include light scattering (b_{sp}) by sea salt aerosols. Lowenthal and Kumar[4] demonstrated that inclusion of elements from sea salt (e.g., sodium [Na], chlorine [Cl]) increased the accuracy of mass reconstruction at coastal IMPROVE sites. Contributions of sea salt particles to light extinction at some coastal IMPROVE sites may be significant, especially because b_{sp} by sea salt particles should be significantly enhanced by hygroscopic growth in humid environments. Lowenthal and Kumar[8] found that fine sea salt aerosols accounted for 43% of estimated b_{sp} at the U.S. Virgin Islands IMPROVE site. Coastal area sea salt is a natural source of haze that will increase in relative importance as anthropogenic contributions are reduced.

To include sea salt in the IMPROVE light extinction equation, it is necessary to: (1) estimate the sea salt mass concentration; (2) specify a dry sea salt mass scattering efficiency; and (3) specify an *f(RH)* curve for sea salt representing the enhancement of sea salt scattering by hygroscopic growth as a function of RH.

Sea Salt Mass Concentration. Estimating sea salt mass requires a sea salt marker species measured in IMPROVE aerosol samples. The most obvious markers are Na and Cl, because NaCl is the main component in seawater and sea salt. Based on the composition of sea water, pure sea salt mass is Na multiplied by 3.1 or Cl multiplied by 1.8.[9] However, Na is poorly quantified by the X-ray fluorescence (XRF) used by IMPROVE and Cl can be depleted in ambient aerosol samples by acid-base reactions between sea salt particles and sulfuric and nitric acids.[10] Without accurate measurement of both Na (or other conservative tracers) and Cl, it is not possible to estimate how much Cl has been replaced by nitrate and/or sulfate in ambient samples. Further, without chemical speciation of the PM_{10} sample (Module D of the IMPROVE sampler), it is not possible to estimate coarse sea salt scattering.

Given these limitations, the revised algorithm estimates the $PM_{2.5}$ sea salt concentration as the concentration of chloride ion (Cl^-) measured by ion chromatography multiplied by 1.8. If the chloride measurement is below the detection limit, missing, or invalid, then the $PM_{2.5}$ sea salt concentration should be estimated as the concentration of Cl measured by XRF multiplied by 1.8.

Although the XRF measurement can detect Cl at lower concentrations, the A-module sample for XRF is more exposed to reactive losses because acidic gases are not removed from the airstream and any HCl they release from the sample is not retained by the Teflon filter. Unless speciated data become available for PM_{10}, coarse sea salt mass and light scattering will not be considered. To the degree that Cl^- has been replaced by sulfate or nitrate in ambient particles, this approach will underestimate the mass and scattering contributed by the substituted sea salt that results (e.g. $NaNO_3$, $NaHSO_4$, or Na_2SO_4). This mass is partially accounted for by ammonium sulfate and ammonium nitrate in the IMPROVE equation. However, the substituted Na salt mass is underestimated because ammonium is lighter than sodium. The scattering is also underestimated because the sodium salts absorb more water than does ammonium sulfate above 60% RH. On the other hand, the 1.8 factor accounts for sea salt constituents such as calcium (Ca) and magnesium (Mg), which are included in the fine soil aerosol composite component, resulting in a small double counting of mass. Given the limitations of the available data, 1.8 times Cl^- provides a reasonable and likely lower-limit to the fine sea salt mass.

Sea Salt Dry Mass Scattering Efficiency. To estimate the dry mass scattering efficiency and *f(RH)* for sea salt aerosols, their dry mass size distribution must be known. Although this has not been measured at most IMPROVE sites, extensive sea salt size distribution measurements have been made in the remote marine environment during cruise-based experiments.[11–13] On the basis of these studies, a dry log-normal mass size distribution with a geometric mean diameter (D_g) of 2.5 μm and geometric standard deviation (σ_g) of 2 is recommended. A dry scattering efficiency for $PM_{2.5}$ sea salt of 1.7 m^2/g was calculated using the Mie theory on the basis of this size distribution assuming a sea salt refractive index of [1.55+ i0] and a density of 1.9 $g \cdot cm^{-3}$ recommended by Quinn et al.[11]

Sea Salt f(RH). Tang et al.[14] determined hygroscopic growth curves for aerosols generated from Long Island, NY, and Atlantic Ocean seawater. The water absorption curves for sea salt were nearly identical to that of NaCl. The NaCl growth factors derived from the AIM3 thermodynamic equilibrium model[15] are shown in Table 2 as a function of RH. Below the crystallization point (RH = 47%), the growth factor is set to 1. Values are presented to

Table 2. Sea salt particle diameter growth and water growth function.

RH (%)	Growth Factor[a]	f(RH)	RH (%)	Growth Factor	f(RH)
1–46	1.0000	1.0000	71	1.8434	3.1269
47	1.5922	2.3584	72	1.8589	3.1729
48	1.6001	2.3799	73	1.8751	3.2055
49	1.6081	2.4204	74	1.8921	3.2459
50	1.6162	2.4488	75	1.9100	3.2673
51	1.6245	2.4848	76	1.9288	3.3478
52	1.6329	2.5006	77	1.9488	3.4174
53	1.6415	2.5052	78	1.9700	3.5202
54	1.6503	2.5279	79	1.9925	3.5744
55	1.6593	2.5614	80	2.0166	3.6329
56	1.6685	2.5848	81	2.0423	3.6905
57	1.6779	2.5888	82	2.0701	3.8080
58	1.6875	2.6160	83	2.1001	3.9505
59	1.6974	2.6581	84	2.1328	4.0398
60	1.7075	2.6866	85	2.1684	4.1127
61	1.7179	2.7341	86	2.2077	4.2824
62	1.7286	2.7834	87	2.2512	4.4940
63	1.7397	2.8272	88	2.2999	4.6078
64	1.7511	2.8287	89	2.3548	4.8573
65	1.7629	2.8594	90	2.4174	5.1165
66	1.7751	2.8943	91	2.4898	5.3844
67	1.7877	2.9105	92	2.5749	5.7457
68	1.8008	2.9451	93	2.6769	6.1704
69	1.8145	3.0105	94	2.8021	6.7178
70	1.8286	3.0485	95	2.9610	7.3492

Notes: [a]Diameter at RH/dry diameter.

RH = 95%, to which higher RH are "rolled back" under the RHR protocol[3] to mitigate the potentially large errors associated with RH measurement uncertainty for near saturation conditions. Dry (RH = 0%) light scattering ($b_{sp(Dry)}$) was calculated using Mie theory for sea salt at unit $PM_{2.5}$ mass concentration with the dry mass size distribution, refractive index, and density described above. Light scattering at RH = 46–95% at unit RH intervals ($b_{sp(RH)}$) was calculated by applying the NaCl growth curve (Table 2) to the dry mass size distribution using Mie theory, accounting for the change in particle volume and refractive index from the addition of water. The *f(RH)* values, defined as $b_{sp(RH)}/b_{sp(Dry)}$, are listed in Table 2. The *f(RH)* values in Table 2 were used to generate monthly, site-specific "climatological" values using long-term hourly RH data representative of each of the IMPROVE monitoring sites, as was done in the original algorithm for ammonium sulfate/ammonium nitrate. Light scattering by sea salt (SS) aerosols is estimated as indicated in eq 2.

$$b_{sp(SS)} = 1.7 f_{52}(RH)[1.8 * Cl^-] \quad (2)$$

Organic Mass to Organic Carbon Ratio

For the original IMPROVE algorithm, a factor of 1.4 was used to convert OC to organic mass (OM) to account for unmeasured elements (e.g. O, H, N) in OM. The value of 1.4 was based on an experiment conducted by Grosjean and Friedlander[16] in urban Pasadena, CA, in 1973. They found that the carbon content of these samples averaged 73%. White and Roberts[17] suggested an OC to OM conversion factor (OM/OC) of 1.4, the reciprocal of 0.73. Andrews et al.[18] attempted to explain the reconstructed mass deficit during SEAVS (Southeastern Aerosol and Visibility Study) at the Great Smoky Mountains National Park in terms of underestimation of OM.

Turpin and Lim[19] recommended the use of OM/OC factors of 1.6 ± 0.2 and 2.1 ± 0.2 for urban and nonurban aerosol, respectively, based on the chemical structure of organic compounds found in such environments. This is consistent with an expectation that the OM/OC ratio should increase as aerosols age during transport and photochemical reactions produce secondary organic compounds that are more oxygenated than their primary precursors. Krivácsy et al.[20] isolated the polar, water-soluble OC fraction of aerosols from the Jungfraujoch, Switzerland using solid phase extraction. An OM/OC ratio of 1.91 was inferred from elemental composition (C, N, H, and S). Poirot and Husar[21] found that agreement between reconstructed and measured $PM_{2.5}$ was closer with an OM/OC ratio of 1.8 than with the factor of 1.4 for samples from the IMPROVE and STN networks in the northeastern United States during summer 2002, when large impacts from forest fires in Quebec were observed. Malm et al.[22] found that $PM_{2.5}$ mass and light scattering closure was achieved assuming an OM/OC ratio of 1.8 during a two-month study at Yosemite National Park in summer 2002. El-Zanan et al.[23] derived OM/OC ratios of 1.92 ± 0.40 from solvent extracts of archived filter samples from five IMPROVE sites and 2.07 ± 0.32 from chemical mass balance in 40,532 daily IMPROVE samples at 50 sites from 1988–2003. Malm and Hand[24] estimated OM/OC ratios at 160 IMPROVE monitoring sites using regression analysis and found an average across all sites of 1.7 ± 2.4, with the highest values (>1.9) generally for sites in the west and that are often influenced by biogenic smoke and the lowest values (~1.4) for sites in the central and northeastern United States and in urban areas.

Although additional experimental work is needed to further explore this issue, it is clear that an OC conversion factor of 1.4 is not generally applicable for remote areas of the United States. On the basis of the recent research, a value of 1.8 was selected for use in the revised algorithm as more applicable for remote area datasets.

Split Component Mass Extinction Efficiency Model

Concentration-Varying Dry Mass Scattering Efficiencies. The original IMPROVE algorithm employs dry mass scattering efficiencies of 3 m^2/g for ammonium sulfate and ammonium nitrate and 4 m^2/g for OM. Data from IMPROVE special studies suggest that dry mass extinction efficiencies are variable. Lowenthal and Kumar[25] found that $PM_{2.5}$ mass scattering efficiencies increased with increasing levels of particle light scattering and mass concentration. This was attributed to growth of the dry particle size distribution into size ranges with higher scattering efficiencies under more-polluted conditions, which are related to a higher degree of cloud processing during transport. Malm et al.[26] estimated dry ammoniated sulfate mass scattering efficiencies ranging from 2.4–4.1 m^2/g during the Big Bend Aerosol and Visibility Observational Study (BRAVO). A weak relationship between efficiency

and ammoniated sulfate mass concentration was reported. Malm and Hand[24] using regression analysis found that organic and inorganic fine mass dry mass scattering efficiencies have a functional dependence on mass concentration at most of the 21 sites with collocated IMPROVE aerosol and nephelometer measurements.

The revised IMPROVE algorithm accounts for the increase of ammonium sulfate/ammonium nitrate and OM efficiencies with concentration using a simple mixing model in which the concentrations of ammonium sulfate, ammonium nitrate, and OM are each comprised of external mixtures of mass in small and large particle size modes. The large mode represents aged and/or cloud processed particles, whereas the small mode represents freshly formed particles. These size modes are described by log-normal mass size distributions with D_g and geometric standard deviations (σ_g) of 0.2 μm and 2.2 for small mode and 0.5 μm and 1.5 for the large mode, respectively. The dry mass $PM_{2.5}$ scattering efficiencies for small- and large-mode ammonium sulfate (2.2 and 4.8 m^2/g), ammonium nitrate (2.4 and 5.1 m^2/g), and OM (2.8 and 6.1 m^2/g) were calculated using the Mie theory at a wavelength of 550 nm based on the log-normal mass size distribution parameters described above. The ammonium sulfate, ammonium nitrate, and OM densities and refractive indexes used in this calculation are 1.77, 1.73, and 1.4 g/cm^3, respectively, and 1.53 + i0, 1.55 + i0, and 1.55 + i0, respectively. No attempt was made to account for possible difference in composition between the two size modes of these particles.

Use of the split component approach requires a method to estimate the apportionment of the total fine particle concentration of each of the three measured species into the concentrations of the small and large size fractions. The selected method was empirically developed and evaluated using the light scattering and composition data for the 21 monitoring sites with nephelometer data (Table 1). The fraction of the fine particle component (sulfate, nitrate, or organic mass) that is in the large mode is estimated by dividing the total concentration of the component by 20 $\mu g/m^3$ (e.g., if the total fine particulate OC concentration is 4 $\mu g/m^3$, the large mode concentration is calculated to be one-fifth of 4 $\mu g/m^3$ or 0.8 $\mu g/m^3$, leaving 3.2 $\mu g/m^3$ in the small mode). If the total concentration of a component exceeds 20 $\mu g/m^3$, all of it is assumed to be in the large mode. Alternate values were tested for the 20-$\mu g/m^3$ value used in this empirical approach, including use of species-specific values designed to improve the performance in estimating light scattering. The modest performance improvements associated with the best of these alternate values was not considered sufficient justification for trying to further tune these values to fit the available light scattering dataset.

f(RH). The original IMPROVE algorithm applies a single *f(RH)* curve to ammonium sulfate and ammonium nitrate scattering, which is based on a hygroscopic growth curve [$D_{(RH)}/D_{(Dry)}$, the particle diameter at ambient RH divided by the dry particle diameter] for pure ammonium sulfate that was smoothed between the deliquescence and efflorescence branches.[5] The revised IMPROVE algorithm contains *f(RH)* curves for small- and large-mode ammonium sulfate that are also applied to small and large mode ammonium nitrate. The *f(RH)* for OM is assumed to be 1 at all RH for small and large OM modes. This assumption is based principally on a lack of evidence for water growth by ambient particulate OM. Additional experimental work is needed to further explore this issue. The *f(RH)* for ammonium sulfate and ammonium nitrate are based on the hygroscopic growth curve for pure ammonium sulfate derived from the AIM thermodynamic equilibrium model.[15] This growth curve represents the upper branch, also referred to as the efflorescence or hysteresis branch, of the ammonium sulfate growth curve. The upper branch is

Table 3. Water growth for the small and large sized distribution sulfate and nitrate components.

RH (%)	$f_S(RH)$	$f_L(RH)$	RH (%)	$f_S(RH)$	$f_L(RH)$	RH (%)	$f_S(RH)$	$f_L(RH)$
0–36	1.00	1.00	56	1.78	1.61	76	2.60	2.18
37	1.38	1.31	57	1.81	1.63	77	2.67	2.22
38	1.40	1.32	58	1.83	1.65	78	2.75	2.27
39	1.42	1.34	59	1.86	1.67	79	2.84	2.33
40	1.44	1.35	60	1.89	1.69	80	2.93	2.39
41	1.46	1.36	61	1.92	1.71	81	3.03	2.45
42	1.48	1.38	62	1.95	1.73	82	3.15	2.52
43	1.49	1.39	63	1.99	1.75	83	3.27	2.60
44	1.51	1.41	64	2.02	1.78	84	3.42	2.69
45	1.53	1.42	65	2.06	1.80	85	3.58	2.79
46	1.55	1.44	66	2.09	1.83	86	3.76	2.90
47	1.57	1.45	67	2.13	1.86	87	3.98	3.02
48	1.59	1.47	68	2.17	1.89	88	4.23	3.16
49	1.62	1.49	69	2.22	1.92	89	4.53	3.33
50	1.64	1.50	70	2.26	1.95	90	4.90	3.53
51	1.66	1.52	71	2.31	1.98	91	5.35	3.77
52	1.68	1.54	72	2.36	2.01	92	5.93	4.06
53	1.71	1.55	73	2.41	2.05	93	6.71	4.43
54	1.73	1.57	74	2.47	2.09	94	7.78	4.92
55	1.76	1.59	75	2.54	2.13	95	9.34	5.57

used because deliquescence is rarely observed in the environment. Because pure ammonium sulfate crystallizes at 37% RH, it is assumed that there is no hygroscopic growth and that the $f(RH)$ is one below this RH.

Dry (RH = 0%) light scattering ($b_{sp(Dry)}$) was calculated using Mie theory for small- and large-mode ammonium sulfate. Light scattering at RH = 37–95% at unit RH intervals ($b_{sp(RH)}$) was calculated by applying the AIM ammonium sulfate growth curve to the small and large dry mode size distributions using Mie theory, accounting for the change in particle volume and refractive index from the addition of water. The $f(RH)$, defined as $b_{sp(RH)}/b_{sp(Dry)}$, are listed in Table 3 for the small ($f_{(S)}RH$) and large ($f_{(L)}RH$) modes. Values are presented to RH = 95%, to which higher RH are "rolled back" under the RHR protocol.[3] The same $f(RH)$ are applied to small- and large-mode ammonium sulfate and ammonium nitrate.

Site-Specific Rayleigh Scattering

Rayleigh scattering refers to the scattering of light from the molecules of the air, and a constant value of 10 Mm^{-1} is used in the original IMPROVE algorithm. However, Rayleigh scattering depends on the density of the air and thus varies with temperature and pressure. Site-specific Rayleigh scattering was estimated using a Rayleigh Scattering Calculator developed by Air Resource Specialists, Inc. that calculates Rayleigh scattering as a function of temperature and pressure. For each IMPROVE site, we used the standard U.S. atmospheric pressure corresponding to the monitoring site elevation, and an estimated annual mean temperature. The temperature data were obtained from the nearest weather stations for time periods encompassing 10–30 yr and were interpolated to the monitoring site location. Site-specific Rayleigh scattering calculated using this procedure is available for each IMPROVE monitoring site on the IMPROVE and VIEWS Web sites.[27] These are integer-rounded, site-specific values that range from 8 Mm^{-1} for sites at about 4 km elevation to 12 Mm^{-1} for sites near sea level.

NO_2 Absorption

An NO_2 absorption efficiency term (PAE_{NO2}) was calculated by dividing the sum of the products of the relative observer photopic response values, PR(λ), for viewing an image of 2° angular size and the spectral NO_2 absorption efficiency values, AE(λ), by the sum of the photopic response values over the wavelength range of 350–755 nm, as shown in eq 3.

$$PAE_{NO_2} = \frac{\sum_{350}^{750} PR(\lambda) \times AE(\lambda)}{\sum_{350}^{750} PR(\lambda)} \quad (3)$$

The spectral NO_2 absorption efficiency values are from Dixon[28] and available in the PLUVUE Users Manual,[29] where they were given in 10-ηm increments that were interpolated to generate 1-ηm values. The PR values are from the CIE Ybar function downloaded directly from the CVRL Color and Vision database.[30] Both curves are shown in Figure 2. The resulting photopic-weighted absorption efficiency value (PAE_{NO2}) equals 0.33 Mm^{-1}/ppb.

A lack of NO_2 monitoring data at IMPROVE sites limits the utility of the NO_2 light absorption term in the revised algorithm. It was included for completeness should any of the sites initiate such monitoring, and to allow model-estimated NO_2 concentrations to be, incorporated into an estimated light extinction calculation. For

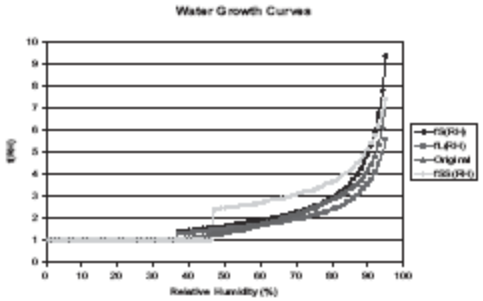

Figure 3. Water growth curves for small and large size distribution sulfate and nitrate, sea salt, and the original IMPROVE algorithm sulfate and nitrate.

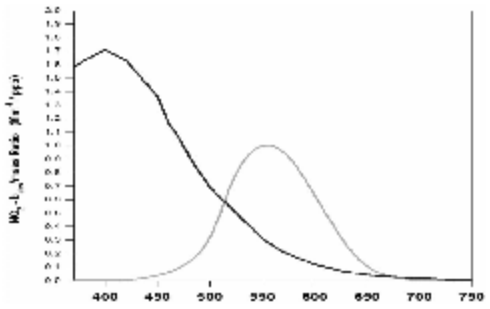

Figure 2. NO_2 absorption coefficient and 2° observer PR curves as a function of wavelength (ηm).

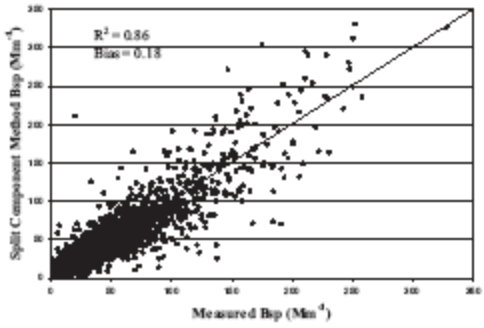

Figure 4. Scatter plot of the revised algorithm estimates of light scattering vs. measured light scattering.

Table 4. Average fractional bias by quintiles for the original and revised algorithms for sites east and west of the 100th meridian.

	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Region	Original	Revised	Original	Revised	Original	Revised	Original	Revised	Original	Revised
East	0.63	0.47	0.24	0.14	0.15	0.09	0.06	0.06	−0.11	−0.01
West	1.04	0.81	0.35	0.23	0.17	0.07	0.07	0.01	−0.08	−0.10

remote areas, the relative NO_2 contributions to light extinction are generally considered too small to justify their assessment. However, the NO_2 concentrations in plumes and layers near sources with good particle emission controls could make significant contributions to the total light extinction and produce a noticeable brown appearance to the plume or layer.

Revised Algorithm

The revised algorithm is shown in eq 4, with the new and changed terms printed in boldface to emphasize the difference from the original IMPROVE algorithm.

$$\begin{aligned} b_{ext} \approx\ & \mathbf{2.2} \times f_S(RH) \times [\textit{Small Sulfate}] \\ & + \mathbf{4.8} \times f_L(RH) \times [\textit{Large Sulfate}] \\ & + \mathbf{2.4} \times f_S(RH) \times [\textit{Small Nitrate}] \\ & + \mathbf{5.1} \times f_L(RH) \times [\textit{Large Nitrate}] \\ & + \mathbf{2.8} \times [\textit{Small Organic Mass}] \\ & + \mathbf{6.1} \times [\textit{Large Organic Mass}] \\ & + 10 \times [\textit{Elemental Carbon}] + 1 \times [\textit{Fine Soil}] \\ & + \mathbf{1.7} \times f_{SS}(RH) \times [\textit{Sea Salt}] \\ & + 0.6 \times [\textit{Coarse Mass}] \\ & + \textit{Rayleigh Scattering (Site Specific)} \\ & + \mathbf{0.33} \times [\mathbf{NO_2\ (ppb)}] \end{aligned} \quad (4)$$

Comparing this to the original algorithm (eq 1), notice that the three split components (i.e. sulfate, nitrate, and organic mass) have dry mass extinction efficiencies that are smaller than the original dry mass extinction efficiency values for the small particle size modes and larger than the original values for the large particle size modes. This permits the new algorithm to perform better than the original algorithm with its single dry mass extinction efficiency at the concentration extremes where either the small or large particle size modes will dominate, resulting in less or more efficient particle light scattering.

The water growth curves for the large and small particle size modes for sulfate and nitrate, and for sea salt are shown in Figure 3 along with the water growth curve used in the original algorithm for sulfate and nitrate. The large and small particle size mode growth curves exceed the original algorithm growth curve for RH less than approximately 60% because the original growth curve was estimated to be an average of the upper and lower hysteresis branches of the ammonium sulfate curve, whereas the curves used for the revised algorithm are solely the upper branch of the ammonium sulfate curve. At higher RH, the large particle size mode *f(RH)* is below the original curve, whereas the small particle size mode *f(RH)* is above the original curve.

Algorithm Performance Evaluation

Performance of the original and revised algorithm for estimating extinction can be assessed in a number of ways each of which serves to answer different questions. Reduction of the biases in light scattering estimates at the extremes (i.e. underestimation of the high values and overestimation of the low values) when compared with nephelometer measurements was one of the most compelling reasons for development of a new algorithm, so comparisons of bias for the original and revised algorithm are one way to evaluate performance.

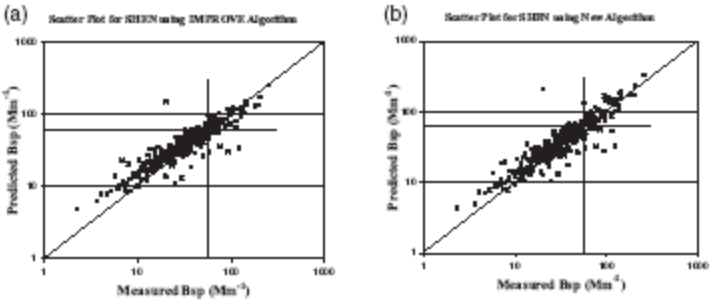

Figure 5. Scatter plots of the (a) original IMPROVE and (b) revised algorithm estimates of light scattering vs. measured light scattering for Shenandoah National Park. Horizontal and vertical lines are at the 80th percentile for estimated and measured light scattering.

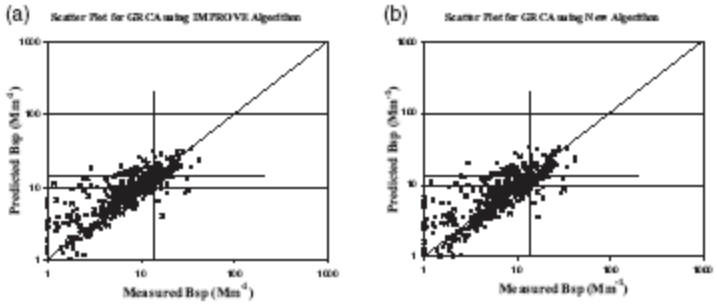

Figure 6. Scatter plots of the (a) original IMPROVE and (b) revised algorithm estimates of light scattering vs. measured light scattering for Grand Canyon National Park. Horizontal and vertical lines are at the 80th percentile for estimated and measured light scattering.

Scatter plots of light scattering estimates from the original and new proposed algorithms versus nephelometer data (Figures 1 and 4, respectively) for all available data at 21 monitoring sites are one way to view the overall performance differences between the two algorithms. These figures show that the bias at the extremes is reduced using the new algorithm (bias = 0.18) compared with the original IMPROVE algorithm (bias = 0.26) (i.e., the points tend to be better centered on the one-to-one line). They also show that the new algorithm has marginally greater uncertainty (r^2 = 0.86) compared with the original algorithm (r^2 = 0.88). Although these plots are weighted toward sites with longer sample histories, it is also the case that the average fractional bias is lower at 19 of the 21 sites. The averages of the site-averaged fractional biases are 0.25 and 0.17 for the original and revised algorithms, respectively. Table 4 shows the averaged fractional bias in quintiles of measured particle light scattering by region of the country in which the 21 monitoring sites are located (as shown in Table 1, East includes the 11 sites east of the one-hundredth meridian and West includes the 10 remaining sites). The bias values for the original algorithm are reduced for the revised algorithm for most of the quintiles in both East and West regions.

Figures 5 and 6 are scatter plots for two individual sites, Shenandoah and Grand Canyon National Parks. The logarithmic scales on these plots exaggerate the scatter for low values compared with high values. The individual-site scatter plots have the 80th percentile values indicated on the graphs for the predicted and measured values by horizontal and vertical lines respectively. Points that are to the right of the vertical line have nephelometer values that are among the 20% worst light scattering for that monitoring site. Points that are above the horizontal line have algorithm-determined values that are among the 20% worst estimated light scattering for that monitoring site.

The revised algorithm performs better with respect to having data points more centered on the one-to-one line at the high and low haze level extremes (bias = 0.04 and 0.40, respectively) than the original IMPROVE algorithm (bias = −0.04 and 0.55, respectively) for Shenandoah National Park, which is typical for the high haze level locations in the southeast United States A large number of the measured worst haze sample periods are correctly identified by the original (81%) and revised (76%) algorithms (these are the points above and to the right of the two 80th percentile lines). The differences between the two algorithms for Grand Canyon National Park and most of the other much less hazy locations are not as apparent in these scatter plots.

Table 5 shows the performance of the original and revised algorithms in correctly classifying sample periods into the 20% best and the 20% worst visibility days on the basis of nephelometer measurements for the East and West regions. Although the results are similar between the two algorithms, the modestly greater extinction estimation uncertainty for the revised algorithm results in its misclassification of 1–3% more sample periods than the original algorithm. To evaluate the significance of the misclassification by either algorithm, the average composition of the best haze days and the worst haze days as selected using each algorithm and using the measured light scattering were examined. Table 6 contains the average composition by region of the country for days selected as best and worst by these three methods. The contributions to light extinction by the various components were not explicitly calculated, but are inherently somewhat different because of the explicit differences in the two algorithms. This table demonstrates that the new algorithm selects days with mean light scattering values that are somewhat closer to the mean values of measurement-selected best and worst days compared with the values using the original algorithm. It also indicates that the average composition associated with the best and worst haze days are not very sensitive to the method of identifying the sample periods for the best and worst categories.

Table 5. Percentage of days correctly classified by the original and revised algorithms as 20% best and 20% worst visibility days for sites east and west of the 100th meridian.

	20% Best Days (%)		20% Worst Days (%)	
Region	Original	Revised	Original	Revised
East	78	77	83	80
West	75	74	80	79

Table 6. Mean light scattering and percent PM_{10} composition for the major components on the 20% best and 20% worst haze days as selected by nephelometer measurements, the original algorithm, and the revised algorithm for sites east and west of the 100th meridian.

Region/ Extreme	Basis of Selection	Light Scattering (Mm^{-1})	Ammonium Sulfate (%)	Ammonium Nitrate (%)	Organic Mass (%)	Elemental Carbon (%)	Fine Soil (%)	Coarse Mass (%)
East/Best	Measured	10.7	22.9	4.7	20.7	2.8	4.1	44.6
	Original	14.0	22.4	5.0	21.3	3.0	4.0	44.2
	Revised	12.8	23.1	5.3	20.8	3.0	3.9	44.1
East/Worst	Measured	91.1	39.0	5.4	21.4	2.5	3.9	27.9
	Original	81.9	39.5	5.1	20.9	2.5	4.1	28.4
	Revised	90.8	39.5	4.4	21.6	2.5	3.8	28.7
West/Best	Measured	4.5	13.0	3.1	19.6	2.9	7.0	54.2
	Original	6.6	13.8	3.7	19.9	3.1	7.1	52.3
	Revised	5.9	14.1	4.0	19.6	3.3	6.9	52.0
West/Worst	Measured	36.0	16.6	5.2	26.5	2.8	7.5	41.3
	Original	32.2	16.2	5.2	25.1	2.6	7.6	43.5
	Revised	32.3	15.2	4.6	26.1	2.6	7.8	44.0

Similar results for each of the 21 nephelometer monitoring locations are available elsewhere.[31] Among the 21 sites, only Grand Canyon had any substantial variations in the composition between measurement-selected days compared with algorithm-selected days, both only involving nitrates and coarse mass. Grand Canyon nitrates and coarse mass contributed mean values of 16% and 50%, respectively, on the measurement-selected worst days, and 11% and 57%, respectively, for both algorithms selection of worst days, and measurement-selected best days for nitrate and coarse mass contributed mean values of 14% and 55%, respectively, compared with 18% and 48% for both algorithms-selected best days.

SUMMARY AND DISCUSSION

An algorithm to estimate light extinction at rural sites from IMPROVE network aerosol speciation data has been revised to reduce bias at the extremes and to incorporate more recent literature. The revised algorithm significantly reduces the biases compared with measurements at the high and low extremes. This is most apparent for sites in the hazier eastern United States. Compared with the original, the revised algorithm has marginally reduced precision (i.e., points on a scatter plot of estimated versus measured are further from the one-to-one line), with the result that there are somewhat (1–3%) more misclassified worst 20% haze days using the revised algorithm. However, the composition of days selected as best and worst by the original and the new algorithms are very similar, and similar to days selected by measurements.

Most of the reduction of bias associated with the new algorithm is attributed to the use of the split-component mass extinction efficiency method for sulfate, nitrate, and OC components that permitted variable mass extinction efficiency depending on the component mass concentration. Although not subject to explicit performance testing, the revised algorithm also contains specific changes from the original algorithm that reflect more recent scientific literature (e.g., change to 1.8 from 1.4 for OC mass to carbon mass ratio), a more complete accounting for contributors to haze (e.g. sea salt and NO_2 terms), and use of site-specific Rayleigh scattering to reduce elevation-related bias.

Both the original and revised algorithms were developed to enable consistent estimates of light extinction from IMPROVE aerosol data at remote area monitoring sites nationwide under the current range of aerosol conditions. These algorithms may not be appropriate for urban areas or for other substantially changed conditions. Regionally optimized and urban algorithms can be developed to better estimate light extinction (e.g., urban ratios of organic compound mass to carbon mass is lower than in remote areas). Most of the remote area monitoring sites do not have collocated RH or nephelometer data, so the algorithms are typically used with long-term monthly averaged water growth terms. For sites with collocated coincident RH, better light extinction estimates can be determined by using the day-specific RH data in the algorithm to account for particle water growth. Sites with collocated coincident nephelometer data can have site-optimized algorithms developed that would provide better estimates of light extinction than either the original or revised IMPROVE algorithms.

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Appendix 5.2
Determination of Baseline Visibility Conditions

Baseline conditions for the 20% worst and 20% best days for Caney Creek Wilderness Area and Upper Buffalo Wilderness Area were determined from data collected at the IMPROVE monitoring site located on Eagle Mountain, Polk County, Arkansas and the IMPROVE monitoring site located in Deer, Newton County, Arkansas respectively. The aforementioned data is housed at the Visibility Information Exchange Web System (VIEWS) web site (http://vista.cira.colostate.edu/views/). The IMPROVE calculated variables and Regional Haze data derived from the New IMPROVE Algorithm (IRHR2) was downloaded from the VIEWS website. It was from this dataset ADEQ calculated baseline conditions for the two Class I areas located in Arkansas (Tables 5.2A and 5.2B).

Table 5.2A Summary data for Caney Creek's baseline conditions

Parameter	Baseline 20% Worst Days	Baseline 20% Best Days	Units	sRay*
Aerosol B_{ext}	134.1	20.61	Mm^{-1}	11
B_{ext} Coarse Mass	3.73	1.82	Mm^{-1}	11
B_{ext} Elemental Carbon	4.8	1.5	Mm^{-1}	11
B_{ext} Nitrate	13.76	4.04	Mm^{-1}	11
B_{ext} Organic Mass	23.44	4.33	Mm^{-1}	11
B_{ext} Sulfate	87.05	8.53	Mm^{-1}	11
B_{ext} Soil	1.12	0.25	Mm^{-1}	11
B_{ext} Ss	0.18	0.16	Mm^{-1}	11
Coarse Mass	6.21	3.03	$\mu g/m^3$	11
Deciview	23.36	11.24		11

*sRay is the abbreviation for site specific Rayleigh extinction

Table 5.2B Summary data for Upper Buffalo's baseline conditions

Parameter	Baseline 20% Worst Days	Baseline 20% Best Days	Units	sRay*
Aerosol B_{ext}	131.95	22.19	Mm^{-1}	11
B_{ext} Coarse Mass	6.85	2.81	Mm^{-1}	11
B_{ext} Elemental Carbon	4.72	1.51	Mm^{-1}	11
B_{ext} Nitrate	13.3	4.55	Mm^{-1}	11
B_{ext} Organic Mass	22.54	4.24	Mm^{-1}	11
B_{ext} Sulfate	83.18	8.68	Mm^{-1}	11
B_{ext} Soil	1.21	0.34	Mm^{-1}	11
B_{ext} Ss	0.16	0.06	Mm^{-1}	11
Coarse Mass	11.41	4.69	$\mu g/m^3$	11
Deciview	26.27	11.71		11

*sRay is the abbreviation for site specific Rayleigh extinction

Appendix 5.3
Estimate of Natural Visibility Conditions

Natural conditions for Caney Creek Wilderness Area and Upper Buffalo Wilderness Area both located in Arkansas was developed by the IMPROVE Steering committee using the "refined" algorithm (Equation 1) and Trijonis' eastern values for natural background concentrations for ammonium sulfate (sulfate), ammonium nitrate (nitrate), organic carbon mass, elemental carbon, soil, and coarse mass (Table 5.2).

Equation 1

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

Table 5.3 Average natural levels of aerosol components for the eastern half the United States of America (Trijonis, J.C., NAPAP State of the Science & Technology, Vol. III, 1990)

Average Natural Concentrations (microgram per cubic meter, $\mu g/m^3$)	
Aerosol Component	Eastern Concentrations
Ammonium sulfate	0.23
Ammonium nitrate	0.10
Organic carbon mass	1.40
Elemental carbon	0.02
Soil	0.50
Coarse mass	3.0

Additionally, the following equations were used to determine the natural concentrations (NC) for large and small sulfate fractions.

Equation 2

$$[\text{Large Sulfate}] = \frac{[\text{Total Sulfate}]}{20\ \mu g/m^3} \times [\text{Total Sulfate}], \text{ for } [\text{Total Sulfate}] < 20\ \mu g/m^3$$

Equation 3

$$[\text{Large Sulfate}] = [\text{Total Sulfate}] \text{ for } [\text{Total Sulfate}] \geq 20\ \mu g/m^3$$

Equation 4

$$[\text{Small Sulfate}] = [\text{Total Sulfate}] - [\text{Large Sulfate}]$$

Equations 2 – 4 were also used to apportion the natural concentrations of nitrate and organic mass concentrations into the small and large size fractions. Please refer to the Revised Algorithm for Estimating Light Extinction from IMPROVE Particle Speciation Data (Pitchford, et al, AWMA 57:1326-1336, 2007) located in Appendix 5.1 for further discussion on the development of Equations 2 – 4.

As per Marc Pitchford (personal comm. 2007), the following methodology was used to determine the natural conditions:

1. Average the current yearly concentrations for the individual aerosol components
2. Perform the following calculations using the values in Table 5.3:
    a. 0.23/Average Current [Sulfate]
    b. 0.1/Average Current [Nitrate]
    c. 1.4/Average Current [Organic Mass]
    d. 0.02/Average Current [Elemental Carbon]
    e. 0.50/Average Current [Soil]
    f. 3.0/Average Current [Coarse Mass]
3. Determine the daily natural concentrations for the individual aerosol components by multiplying the daily current concentrations by the results in step 2. For example, Day 1 Current [Sulfate] x(0.23/Average Current [Sulfate]) = Day 1 Natural [Sulfate]
4. Equations 2 – 4 were used to apportion the daily natural [Large Sulfate], [Small Sulfate], [Large Nitrate], [Small Nitrate], [Large Organic Mass], and [Small Organic Mass]

5. The daily light extinction (β_{ext}) for the individual aerosol components was calculated.
    a. Sulfate β_{ext} = 2.2 x f_S(RH) x Natural [Small Sulfate] + 4.8 x f_L(RH) x Natural [Large Sulfate]
    b. Nitrate β_{ext} = 2.4 x f_S(RH) x Natural [Small Nitrate] + 5.1 x f_L(RH) x Natural [Large Nitrate]
    c. Organic Mass β_{ext} = 2.8 x Natural [Small Organic Mass] + 6.1 x Natural [Large Organic Mass]
    d. Elemental Carbon β_{ext} = 10 x Natural [Elemental Carbon]
    e. Fine Soil β_{ext} = 1 x Natural [Fine Soil]
    f. Sea Salt β_{ext} = 1.7 x f_{ss}(RH) x Natural [Sea Salt]
    g. Coarse Mass β_{ext} = 0.6 x Natural [Coarse Mass]
6. Total daily β_{ext} was determined using Equation 1
7. The daily deciview (dv) value was calculated using the following equation: dv = 10 x ln(Total β_{ext} /10)
8. The 20% best and 20% worst days were determined for each year by sorting the dv values from lowest to highest. The top 20% was used for the 20% best and the lowest 20% were used for the 20% worst.

Regional Haze Rule Natural Level Estimates Using the Revised IMPROVE Aerosol Reconstructed Light Extinction Algorithm

Final Paper # 48

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INTRODUCTION

In 1999 the Environmental Protection Agency (EPA) promulgated the Region Haze Rule (RHR)[1] that established a program to mitigate existing visibility impairment in 156 visibility-protected federal class I areas (i.e. certain large national parks and wilderness areas as specified by the Clean Air Act). RHR implementation guidance requires states to determine the uniform rate of haze reduction that would result in reaching natural haze level from current conditions for the five-year mean of the annual 20% most impaired visibility condition for each protected area.[2] They must also show that the five-year mean of the annual 20% least impaired visibility conditions at each protected area do not degrade. For the RHR, haze levels are expressed using units of deciview, which is a log-transformation of light extinction that results in a more perceptually uniform metric of haze than either light extinction or visual range.[3] Light extinction is estimated from particle speciation data generated by the Interagency Monitoring of Protected Visual Environments (IMPROVE)[4] monitoring network that samples on a one day in three schedule at 110 monitoring sites representative of the class I protected areas. Though states may ultimately justify adoption of an alternative rate of progress in their RHR implementation plans, they must first determine the uniform rate of progress for their state's class I areas.

Haze levels for the 20% worst natural haze conditions need to be estimated in order to determine the 60-year uniform rate of progress for each protected area. EPA provided a default approach[5] for estimating worst natural haze levels that involves a three step process. First the mean natural haze levels are estimated using the original IMPROVE

algorithm[6] for estimating light extinction from PM speciation data applied to estimates of natural PM species concentrations developed by John Trijonis[7] and a spatially-interpolated 10-year measured relative humidity data set that provides distinct values for each visibility protected area. The second step is to convert the mean natural light extinction levels for each protected area to deciview values using the simple log-transformation that defines the deciview scale.[3] The final step is to add 1.28 times the assumed standard deviation of the natural haze distribution in deciview units to the mean value from the second step to get an estimate of the 90th percentile that was thought to be a reasonable approximation of the mean of the 20% highest haze levels. Estimates of the 20% least impaired natural conditions were made in a similar way by subtracting 1.28 times the assumed standard deviation of the natural haze distribution in deciview units. The assumed standard deviation of 3dv for eastern class I areas and 2dv for western class I areas was based on the distribution of data at the most pristine locations in the east and west.[8] Following this procedure, EPA provided estimated default mean, worst and best natural haze levels for all of the protected areas as part of their guidance which states could use unless they chose to refine the approach.

The default approach for estimating natural conditions was the subject of technical reviews as a result of its role in determining the uniform rate of progress for the RHR.[9, 10, 11] The Trijonis estimates of typical natural species concentrations which provided one set of values for the eastern U.S. and another set for the western U.S. were based on the limited available PM composition monitoring data in the late 1980s, so were seen as not likely to be representative of all of the visibility protected areas. The statistical approach that calculated the 90th and 10th percentile natural levels for use as estimates of the mean of the 20% best and 20% worst haze levels was shown to be flawed in a number of ways. The IMPROVE algorithm was shown to overestimate light extinction at low levels and to underestimate it at high levels. It also didn't work well for data from coastal monitoring sites because it didn't account for light scattering by sea salt.

The IMPROVE algorithm was revised in 2005 to reduce biases at the high and low light extinction extremes, to incorporate more recent information from the literature, to include extinction from sea salt (an important component at some coastal sites), and to include elevation-specific estimates of Rayleigh light scattering.[12] Many states indicated their intent to adopt the new algorithm for RHR assessment and planning purposes. For consistency in the determination of a uniform rate of progress, the use of the revised algorithm for estimating current haze levels implies the need to use it to estimate natural conditions.

In 2006 the Regional Planning Organizations (i.e. five regional organizations of state, tribal, federal and stakeholder organizations established to promote regionally consistent RHR implementation) established an ad hock committee to establish a uniform approach for the application of the revised IMPROVE algorithm to estimate natural levels and to remedy other flaws in the default methodology where possible. A presentation of the results of their work is available on the IMPROVE web site.[13] In the sections that follow is a description of the revised natural haze estimation methodology, the results of its application, and a discussion of the differences between the default and revised natural haze estimates and uniform rate of progress results.

METHODOLOGY

There are two fundamental differences between the default and the revised approach for estimating the 20% highest and 20% lowest natural haze levels for each of the visibility protected areas. The first difference involves the use of the revised IMPROVE algorithm for estimating light extinction from PM speciation data in place of the original IMPROVE algorithm. The second difference addresses the flaw in the default approach's use of a statistical method to estimate the highest and lowest natural haze levels. The revised approach adjusts each sample period's species concentration to generate a simulated natural haze distribution with the annual mean for each species being equivalent to the Trijonis estimated natural concentration for that species. The step by step details of this approach are described below.

1. Start with the "Daily Values Including Patched Values" data set from the on the Visibility Information Exchange Web Sites (VIEWS) data summary website[14].
2. For sites with fewer than three valid sample years from the 2000-2004 baseline period, use the substituted data[15] set in place of the standard VIEWS data from step 1.
3. Select records with sample dates from 2000-2004 for each site of interest.
4. Retain only records from "valid" years based on EPA RHR guidance[2].
5. Retain only records that have "valid" sample codes for each of the seven aerosol species (i.e. sulfate, nitrate, organic carbon, elemental carbon, fine soil, coarse mass, and sea salt) needed to reconstruct aerosol extinction using the revised IMPROVE algorithm[12].
6. Discard records which have any patched values from the EPA RHR patching technique[2].
7. Calculate arithmetic means for each of the seven species for each site and each calendar year.
8. Divide the resultant means by the Trijonis-based EPA default natural conditions estimates[5] for the six species (i.e., all except sea salt, which is included in the revised

IMPROVE algorithm but not included in the default estimates). "East" and "West" are defined as east or west of the 98th meridian respectively for purposes of determining which default natural conditions to use. The ratio of baseline annual mean to default natural annual mean becomes the scaling factor for each of the species.

9. In cases where the baseline annual mean concentration of a species is less than the EPA default estimated concentration, the baseline values are retained (i.e. the scaling factor is 1). Similarly, sea salt concentrations have a scaling factor of 1, which defines the baseline condition as the natural condition.

10. Every observation is divided by the appropriate species specific scaling factor, creating a new distribution for each species which has the same annual mean as the EPA default natural annual mean (or the baseline value when a scaling factor of 1 is used) while retaining the shape of the baseline distribution. Figure 1 illustrates the adjustment of species concentration for one site-year.

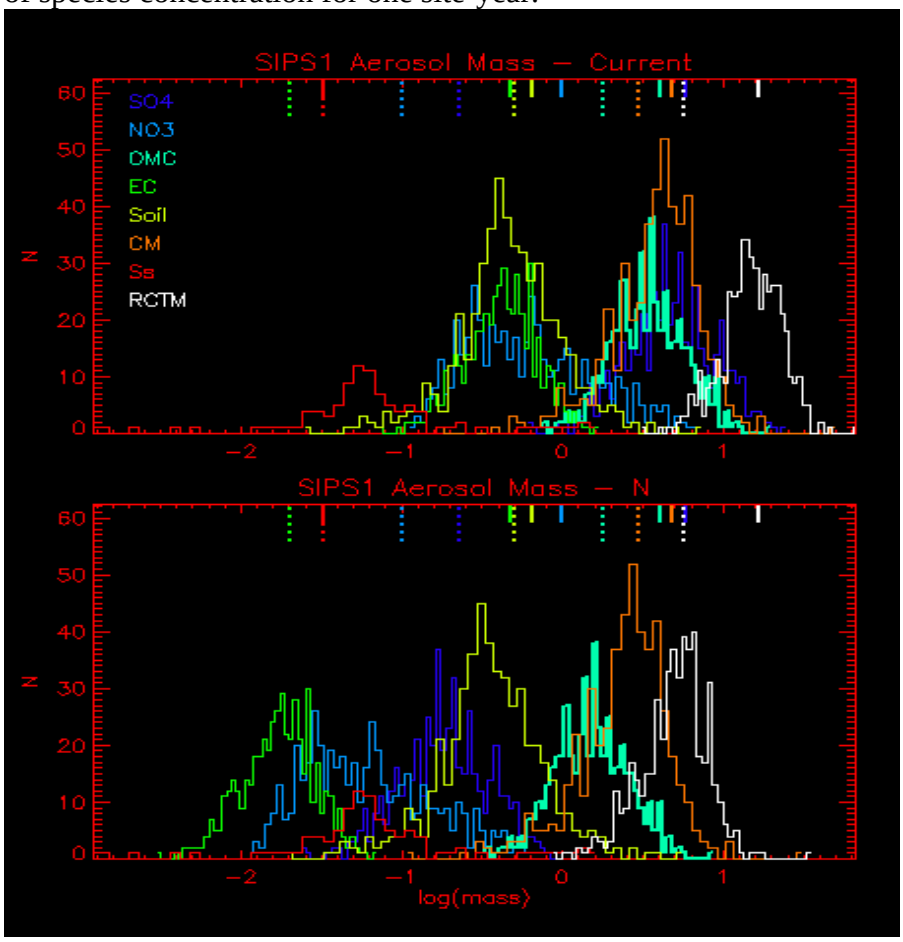

Figure 1. Frequency distribution of the current (i.e. measured) species concentration for Sipsey Alabama (top) and the species concentrations adjusted to Trijonis-based natural levels (bottom). The use of a logarithmic concentration scale means that the distributions are the same shape for each current and natural species, though translated horizontally. No log transformation is performed in the approach however. The hanging bars at the top of each plot show the mean for each species (see color key) with short solid lines being current and longer dotted lines being adjusted means.

11. Keeping the observations grouped by the sample date, convert the scaled masses of each species to extinction values using the revised IMPROVE algorithm.
12. Sum the resultant species specific extinctions for each sample date, and add the site specific Rayleigh scattering value.
13. Convert this daily extinction value to a deciview value. For pristine conditions at high elevation sites (i.e. >2200m) these deciview values are sometimes negative. While counterintuitive, this is mathematically appropriate and negative or zero values are retained. The result is up to five years worth of daily deciview values adjusted to be simulated natural haze levels at each IMPROVE site. Figure 2 illustrates the current and natural haze distributions that result from this process.

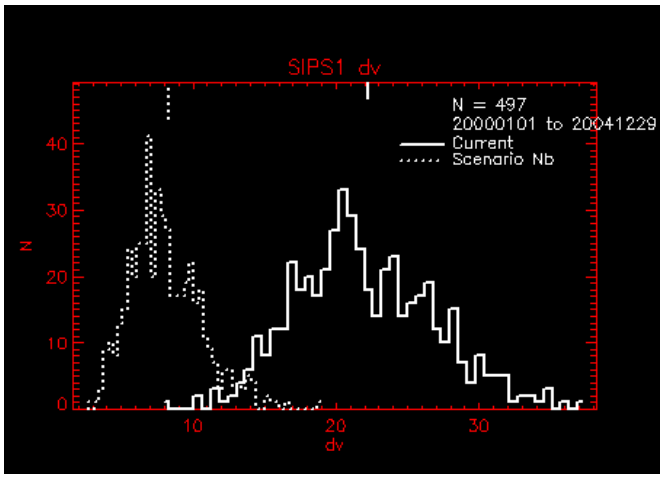

Figure 2. Frequency distribution of current and adjusted natural haze levels in deciview units for Sipsey Alabama. Notice that the distribution shape is not the same.

14. Determine the highest and lowest 20% simulated natural deciview days for each year and site in the same way that the highest and lowest 20% deciview days are determined for baseline haze levels. Note that these sample dates will probably not be the same sample dates that were the highest and lowest 20% dates for the baseline calculations.
15. Calculate the arithmetic mean for each year and each species for sample dates which comprise the lowest 20% and highest 20% haze days.
16. Calculate the arithmetic mean across the five annual means for each species including deciview.

The results of these steps are lowest 20% and highest 20% natural conditions estimates for each site with species compositions, and the natural deciview values needed for glide slope calculation. Note that since the deciview transformation is non-linear, the mean deciview value will not equal the deciview value calculated from the sum of the mean aerosol extinction values plus Rayleigh.

RESULTS

Estimates of the mean, highest 20% and lowest 20% haze levels for each of the IMPROVE monitoring sites representing visibility protected areas is available as the Natural Haze Levels II (version 2) spreadsheet on the VIEWS website[16]. Figure 3 contains contour maps that show the spatial distribution of the EPA default and revised approach estimates for the highest 20% values. Both have the same striking east – west gradient that results directly from the different Trijonis estimates of natural species concentrations for the eastern and western states. The greatest difference between the patterns on the two maps is along the California coast where sea salt contributes significantly to the $PM_{2.5}$ concentration and hence to the haze at coastal monitoring sites. The default approach doesn't account for sea salt while the revised approach explicitly includes it. The natural haze levels from the revised approach at some high elevation sites are lower due to the use of a lower, elevation-dependent Rayleigh light extinction value compared to the default approach. However many other high elevation sites have higher natural haze level estimates using the revised approach (principally those in the Pacific Northwest), probably due to the broader distribution of current and thus simulated natural haze levels associated with a higher incidence of wildfire influence.

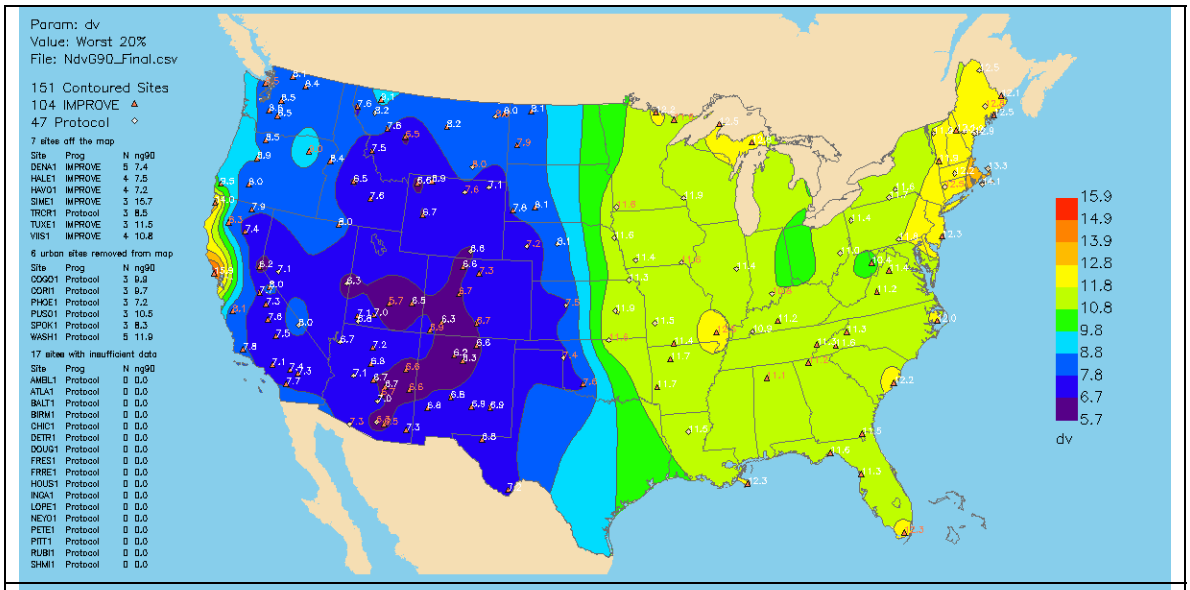

Figure 3. Contour maps of the revised (top) and default (bottom) natural haze level estimate.

Perhaps of greater interest is a comparison of the uniform rate of progress values for the revised approach compared to the default approach. Figure 4 shows contour maps of the uniform rate of progress in units of deciview per decade. As with the natural haze level contour maps, the two algorithms yield similar looking spatial patterns, with the greatest

rates centered on the Ohio River basin in the East and Southern California in the West. Notice that the revised approach uniform rate of progress values for California coastal sites are not obviously affected by sea salt since its contribution to haze is counted in both the natural and baseline condition estimates.

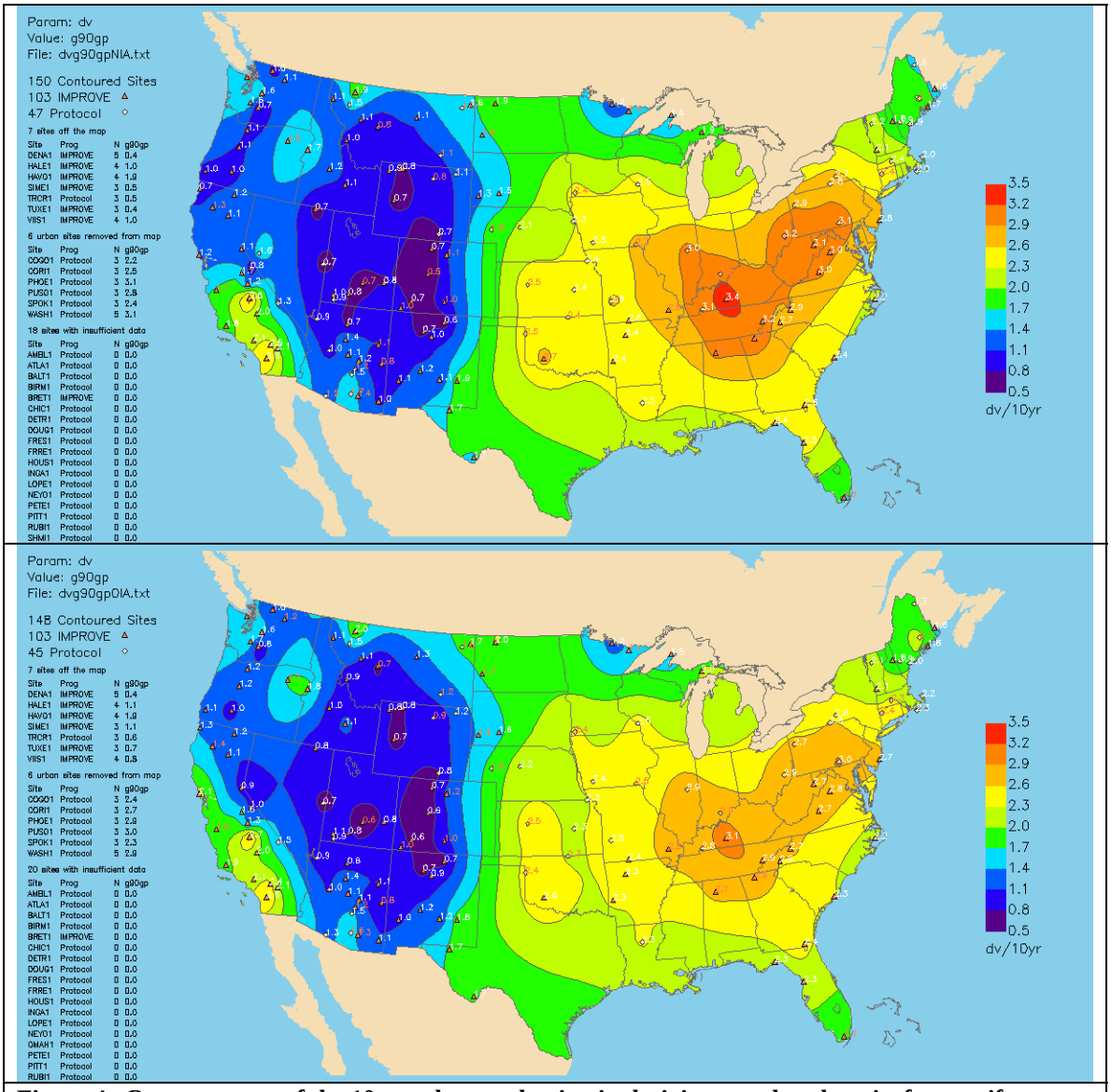

Figure 4. Contour maps of the 10 year haze reduction in deciview per decade units for a uniform rate of progress for the revised (top) and default (bottom) approaches of estimating natural levels and current conditions.

DISCUSSION & CONCLUSIONS

The decision by a number of states to adopt the revised IMPROVE algorithm to estimate haze levels from IMPROVE speciation data resulted in the need for a consistent approach for estimating natural haze levels. In addition to using the new IMPROVE algorithm, the methodology for estimating revised natural haze levels changed the method of estimating the 20% haziest and 20% clearest conditions to avoid the flawed statistical approach that was used to generate the default natural haze levels.

Both the default and revised approaches for estimating natural haze levels rely extensively on the Trijonis East and West estimates of natural species concentration levels, which is undoubtedly why the spatial distributions in Figure 3 show the similar strong gradients along the arbitrarily selected demarcation line between east and west. The only justification for using only two geographically distinct sets of natural PM speciation concentration estimates for all of the visibility protected areas is the lack of estimates for other smaller regions. Tombach[9] shows that up to 15 geographically distinct regions are justified based on similar characteristic of current PM species concentrations, but his work doesn't offer estimates of natural levels for these regions. Global scale modeling may ultimately provide better estimates of natural haze levels on a more spatially and temporally resolved basis, as well as address the related issue of estimating haze from non-U.S. man-made emissions for each visibility protected area.[15]

The inclusion in the revised approach of sea salt with the assumption that all sea salt is from natural sources demonstrates how sample-period-specific monitoring data can be used to refine the estimate of natural levels. However, most PM species are from a combination of natural and man-made sources so some type of attribution analysis would be needed to apportion how much of each species is from either source category on a sample-specific basis. It's unclear whether application of either receptor or air quality simulation modeling would sufficiently improve the accuracy of natural level concentrations over those provided by Trijonis or similar estimates that could be developed for a greater number of regions.

The 60-year schedule of the RHR with its periodic planning and technical review provides the time needed to further expand our knowledge and technology to improve our estimates of natural levels. Ultimately as man-made emissions that contribute to haze in visibility protected areas are reduced, current conditions will more closely match natural haze levels, perhaps making the task of specifying them somewhat easier.

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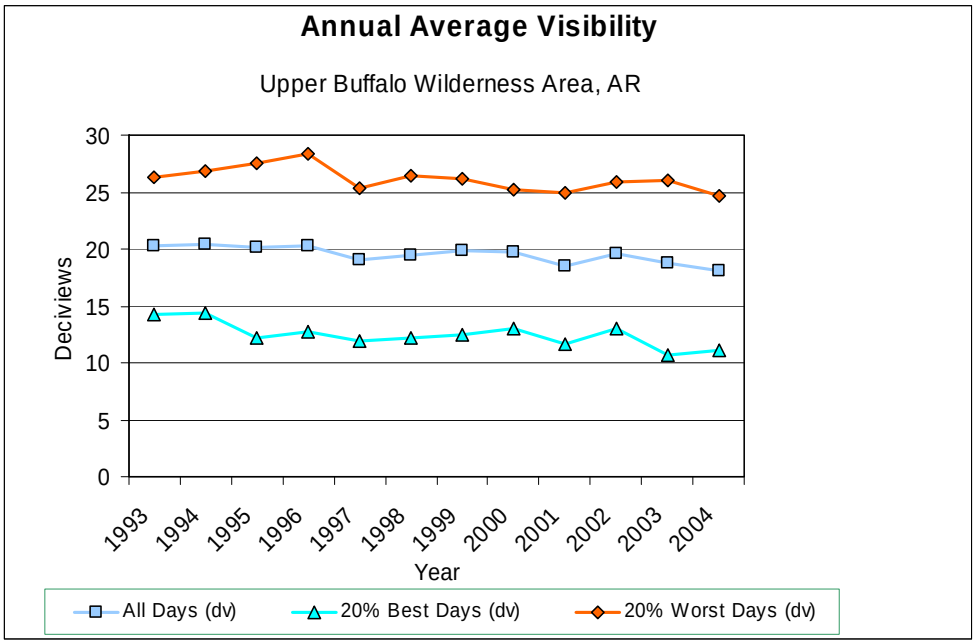
Appendix 6.1

Monitoring and Data Analysis to Support the Regional Haze Rule

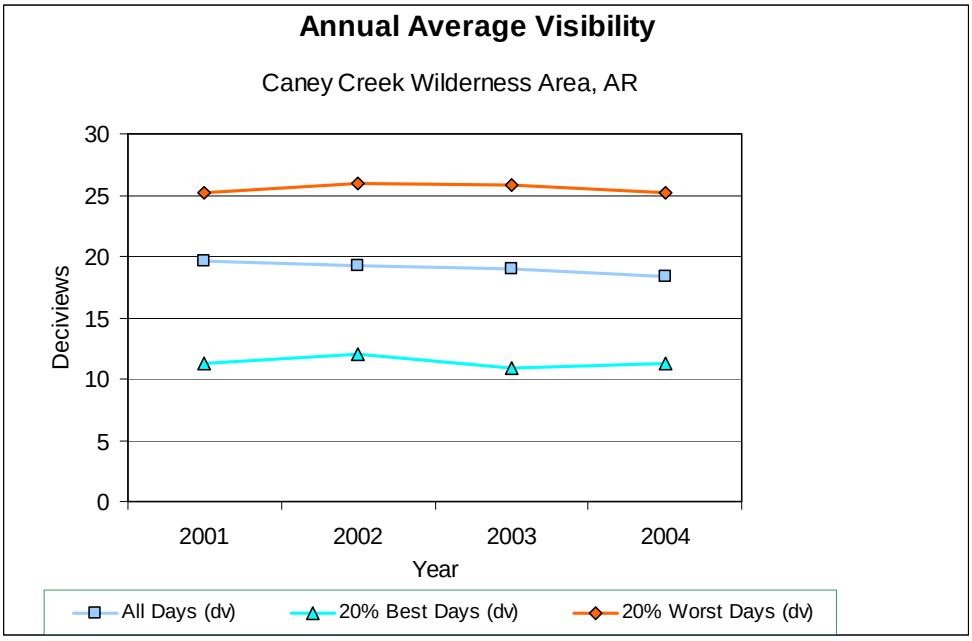
In 1991 the Upper Buffalo Wilderness area was selected as a site for an Interagency Monitoring of Protected Visual Environments (IMPROVE) system, and the IMPROVE monitor was installed on 12/18/1991. IMPROVE monitors the ambient atmosphere for visibility impairment from fine aerosols such as sulfates, nitrates, organic and elemental carbon, and crustal material. The Upper Buffalo Wilderness area site is located near Deer, Arkansas, at the 11,801 acre Upper Buffalo Wilderness in the Ozark National Forest in Newton County. The Upper Buffalo Class I area includes the original wilderness area and the additions to it, but it does not include the Buffalo National River. The figure below shows the Upper Buffalo Wilderness area site.

Trend analysis at the Upper Buffalo Wilderness area site shows a slight two to three deciview visibility improvement. The figure below shows an improvement of the 20 percent worst visibility days, and a prevention of degradation of the 20 percent best visibility days at the Upper Buffalo Wilderness area IMPROVE site using the original IMPROVE algorithm.



The Caney Creek Wilderness area IMPROVE monitor was added on 6/22/2001. The Caney Creek Wilderness area site is located at the 14,460 acre Caney Creek Wilderness area near Mena, Arkansas, in the Ouachita National Forest in Polk County. The figure below shows the Caney Creek Wilderness area site.

In 2007 trend analysis at Caney Creek Wilderness area site was limited to four years of data. The data indicates the average visibility for all days has slightly improved since 2001. The figure below shows visibility data at the Caney Creek Wilderness area IMPROVE site using the original IMPROVE algorithm.



Appendix 6.2
CENRAP Regional Haze Monitoring Strategy

CENRAP MANE-VU Midwest RPO VISTAS

November 29, 2005 Final Draft

Monitoring & Data Analysis to Support the Regional Haze Rule – A Strategic Plan

I. Objectives of this RHR Monitoring Strategy

The purpose of this document is to identify the ambient haze related monitoring and data analysis activities that are required over the next 10 years of the regional haze implementation plans (i.e., over the first planning period of 2008 to 2018) to successfully implement the RHR. It provides a framework for the integration of the core national IMPROVE monitoring program and the monitoring and analysis activities that are needed to support continued improvement in the monitoring methods and understanding of the contributors to visibility impairment. This document was prepared by representatives of the five regional planning organizations (RPOs) to describe the monitoring activity needed and desired to support the collection of haze-related data of sufficient quality, representativeness, and quantity to support both the national visibility goal and the efforts of states, tribes, and RPOs in the initial regional haze SIPs and TIPs.

The document provides a list and description the RPOs need to provide the federal, state, tribal, and non-governmental organizations that sponsor or conduct air quality/haze monitoring programs for information to support their planning needs. The framework can also help illuminate potential for collaboration, efficiencies and opportunities associated with future work. This document may also be included or referenced in regional haze SIPs and TIPs to provide a description of the national monitoring activity needed to support their programs and context for the additional monitoring and analysis States and Tribes believe are necessary to support their implementation plans.

The description of the monitoring activities that are required for progress tracking and the activities the RPOs see as important for the initial, and future plans to be based on the most current science, is included to support considerations by EPA and the federal land management agencies in their fiscal planning. This document is limited to national and regional monitoring needs, so it does not attempt to include any of the site-specific or local issues that individual SIPs and TIPs may address. Table 1 following identifies the existing and future needs for regional haze monitoring and data analysis programs. The balance of the document is organized into sections that describe the objectives of ambient monitoring and data assessment, the relevance and relationship of

haze monitoring to other national air monitoring programs, and a priority rating of various monitoring and assessment activities based on their support of the RHR. Two appendices are included as well.

Table 1: Priority and ranking of activities for the RHR and other air quality issues.

Activity	Scope		Issues & Requirements	Resources		Rating & (Rank TBD)[1]	
	Geographic	Temporal		Funds	Sponsors	RHR	Non-RHR
IMPROVE 110-site aerosol speciation monitoring	National	Long-term trends network	Trends tracking for each of the visibility protected class I areas;	$3.85M/yr[2] $0.55M/yr	EPA FLM	Required	Important
VIEWS data archive & analysis tools	National	Long-term	Integrated data access & analyses tools to promote consistency & efficiency in assessments among RPOs, states, tribes, etc.	$120k/year	RPOs (EPA)	Essential	Helpful
5-year technical assessment	National	Periodic	Progress assessment in 2013 will require 2 to 3 years of effort	$100k/year/RPO	RPOs (EPA)	Required	Helpful
10-year technical assessment for SIP revisions	National	Periodic	Technical assessment to support RHR SIP revisions in 2018 will require 2 to 3 years of effort	$100k/year/RPO	RPOs (EPA)	Required	Important
Ammonia/ Ammonium monitoring	CenRAP, MWRPO & VISTAS	Special studies for X years (or trends)	Ammonia emissions inventory assessment & the role of ammonia in nitrate formation	$200K/year	RPO (EPA)	Important	Important
RAIN program oversight & data analysis	MANE-VU	Long Term	Detailed aerosol & precursor gases at 3 regional scale sites	$100k/year	MANE-VU (EPA)	Important	Important
FASTNET	National	Long-term	Real-time PM event tracking component of datafed.net (Husar)	$50k/year	RPOs (EPA)	Helpful	Helpful
IMPROVE remote-area protocol sites	Regional	Long-term	Track trends for those representative of class I areas; fill spatial gaps for regions without class I areas	$35k/site/yr	State, RPO, or tribe	Site-dependent	Helpful

[1] The rating scale for the RHR includes RHR-Required, Essential for efficient RHR implementation, Important for effective RHR-SIP development and Helpful for better understanding of the causes of haze. Ratings are also suggested for other-than-RHR utility of the monitoring and data analysis activities with a different scale: Important, Helpful, Limited or Unknown utility

[2] Totals are assuming $35k/site/year for EPA for laboratory/data/QA support, and $5k/site/year for FLM operator support.

Activity	Scope		Issues & Requirements	Resources		Rating & (Rank TBD)[1]	
	Geographic	Temporal		Funds	Sponsors	RHR	Non-RHR
Carbonaceous aerosol speciation	Regional	Special studies	Source attribution for carbonaceous aerosol	$200K/yr	RPOs	Important	
Additional ambient characterization of the sources of ammonia emissions, their flux in the atmosphere, and the associated visibility and air quality impacts	National	Special studies for X years to support 5- and 10-year SIP assessments	Studies' scope to be defined in regional haze plans submitted in 2007, to include emissions inventories, additional monitoring, and modeling analyses	$500k/year	EPA (RPOs)	Required	Important
Additional ambient characterization of the sources and chemical constituents of dust and fire emissions, their flux in the atmosphere, and the associated visibility and air quality impacts	West of the 100th meridian	Special studies for X years to support 5- and 10-year SIP assessments	Studies' scope to be defined in regional haze plans submitted in 2007, to include emissions inventories, additional monitoring, and modeling analyses	$1,000k/year	EPA (RPOs)	Required	Important
IMPROVE optical monitoring	National	Long-term	Refine aerosol extinction algorithms used in the RHR		FLM, RPOs, EPA	Important	Helpful
Haze cams	National & Regional Programs	Long-term	Document actual scene and visual range in near-real time for outreach/education and research use	$6k/site/yr	RPOs, FLMs	Helpful	Helpful
Optical method development	National	Long-term	Development and deployment of routine continuous direct measurement of visibility or highly correlated indicators		EPA, RPOs	Helpful	Helpful

II. Introduction

Regional Haze Rule monitoring requirements

The goals of monitoring and data analysis activities supporting the Regional Haze Rule (RHR) are to provide the data necessary to track the expected visibility improvements resulting from emissions reductions obligations identified in regional haze plans and provide the interpretation of the available data to identify areas where progress is being made and improvements are possible. Through routine regular sampling, the RHR monitoring program must provide comprehensive, consistent and ongoing standardized tracking of species (and by analysis, the source types) causing contributing to visibility impairment. Beyond the application to calculation of the visibility metric, analysis of the variation in haze species, including contributors, source types, temporal and spatial variations and the distribution of visibility-impairing species, will provide the basic information needed to make sound decisions to support continued progress. Specific requirements of the RHR involving assessment of monitoring data are shown in Table 2.

The history of Class I area visibility and regional haze regulatory monitoring since the 1977 CAAA shows that EPA's policy choices leading to the adoption of a consistent federally-specified, operated, and funded system in their rulemakings[3] was a good approach. The process that has allowed the Interagency Monitoring of Protected Visual Environments (IMPROVE) Steering Committee to build and evolve a robust monitoring network and the sample collection and analysis systems is providing a rich accessible national dataset for analysts. Given the historical success of the IMPROVE network (discussed in more detail later), future regional haze monitoring strategies must be based on, or directly comparable to IMPROVE.

The primary monitoring network for regional haze is IMPROVE. The program currently consists of 110 aerosol visibility monitoring sites and additional instrumentation that operates according to IMPROVE protocols. The 110 IMPROVE network monitoring sites were selected to provide regionally representative coverage and data applicable to all 156 Class I federally protected areas. The additional IMPROVE protocol sites include 65 aerosol samplers, plus transmissometers, nephelometers, and cameras that fill identified data needs and enhance and fill spatial gaps in the core IMPROVE network. The first sites began collecting data in 1988, and along with the IMPROVE network expansion in 2000-01; provide the only long-term record available for tracking visibility improvement and degradation.

In recent years, additional haze related measurements have been made by a number of organizations (principally the RPOs) to supplement IMPROVE and answer fundamental questions about particle formation, speciation, transport, and precursors. All of these studies are tied through collocation, correlation, or method to the foundation provided by IMPROVE. These measurements are typically more specialized, regionally focused, and generally have a 1-3 year lifetime. Establishing a longer-term or

[3] Mid-1980s Attributable Haze Monitoring requirements resulting from the Environmental Defense lawsuit settlement (date & citation) and 1999 Regional Haze (64 FR 35764, July 1, 1999) rulemakings.

permanent monitoring network is difficult for RPOs or States because a stable funding mechanism is not available and the available funding varies from year to year. The data collected is used in multiple ways, but the overarching goal of most monitoring programs is to provide information that can be used to develop more technically sound State and Tribal Implementation Plans (SIPs and TIPs). For example, data collected from the Midwest RPO urban organic speciation study is being used as part of a comprehensive source apportionment analysis, which includes comparison with previous source apportionment studies based on less detailed data. The study data will also be used in photochemical model evaluation, emission inventory evaluation, and model development, as well as contributing to the general characterization of organic carbon in urban environments (sources, concentrations, seasonality) and continued growth of the regional conceptual model for $PM_{2.5}$ and haze. All of these analyses are part of a weight-of-evidence approach to determining the contribution of emissions from states to downwind Class I areas, as required by 40CFR 51.308. Table 3 summarizes recent monitoring studies and programs sponsored by RPOs and stakeholders that have been implemented to investigate various aspects of regional haze.

Continuing the IMPROVE network approach provides the stable foundation for long-term tracking and trend analysis. The centralized funding used for IMPROVE supports the stability needed, but leaves individual states or Regional Planning Organizations little capability to augment or enhance IMPROVE regional haze monitoring for specific regional or subregional monitoring needs. The work done in RPO-sponsored studies shown in Table 3 in preparation for the initial SIP and TIP development has addressed regional questions, raised others and helped advance understanding, capability and capacity to address both the requirements and needs of visibility improvement. The capability to build on a stable base of IMPROVE network data will be a valuable component of improving our understanding of the processes and effects, and the efficiency, representativeness, and quality of the ambient data collection. Options for funding needed for special monitoring studies and data analyses in support of RHR implementation will need to be identified, while maintaining the resources necessary to support IMPROVE program and the essential state and RPO activities. Additional or ongoing special monitoring studies, and/or a better and more complete regional haze monitoring network will likely be needed address data gaps and questions identified as a result of the intensive study and evaluation of the analytical results and their inherent uncertainties driven by the development of the regional haze plans due at the end of 2007.

This document references the RHR requirements associated with monitoring and data analysis activities in 40CFR Part 50 Subpart P. (Reproduced in Appendix I of this document).

Table 2. Regional Haze Rule requirements needing monitoring data collection and data analysis support

	Due Date (period)	Supporting Activities	Responsibility	
Regional Haze Rule Requirements				
Reasonable Progress Goals		IMPROVE	States, Tribes	308(d)(1)
Calculation of Baseline Conditions	2005	IMPROVE	States, Tribes	308(d)(2)
Monitoring Strategy		IMPROVE	States, Tribes	308(d)(4)
Reporting of visibility monitoring data	Annually	IMPROVE	States, Tribes	308(d)(4)(iv)
Assessment of Default Rate of Progress	(5 year)		States, Tribes	308(g)(4)
Technical Progress Review	(5 year)		States, Tribes	
Comprehensive SIP /TIP Revisions	2018 (10 year)		States, Tribes	308(f)
Additional Activities				
Additional ambient characterization of the sources of dust, fire, and ammonia emissions, their flux in the atmosphere, and the associated visibility and air quality impacts	As needed, result of regional haze plans, especially west of the 100th meridian for dust and fire	IMPROVE	EPA, RPOs	308
Natural Background Level Refinement				
Model Evaluation			EPA, RPOs	

Table 3: Existing/completed RHR-related monitoring and data analysis studies

Project	Sponsor	Target Areas	Parameters	Goal	Reference/Issues
Focus Sites	VISTAS	Class 1 and Urban Areas	Mass, NO_3, SO_4, EC/OC, LAC, NO_y, CO, SO_2, O_3	Collocated with IMPROVE or STN protocol, collect continuous speciated particulate, precursor gasses and met for model performance and method evaluation	http://www.vistas-sesarm.org/documents/RPOTech0605.ppt Temporal variability in source and receptor areas Model evaluation Method comparison
RAIN	MANE-VU	Rural	Mass, SO_2, O_3, SO_4, EC/OC, b_{scat}	Characterization of transported aerosol in the NE	http://bronze.nescaum.org/committees/haze/Allen-awma_haze-rain-paper-Oct%202004_proceedings.pdf
SEARCH	EPRI	Urban and Rural pairs	Mass, SO_4, NO_3, NH_4, NO_y, O_3, NH_3 CO, SO_2, EC/OC, crustal, b_{scat}, b_{abs}	Collect data for model evaluation, characterization of PM constituents and precursors, differences between urban/rural and coastal/inland aerosols, method investigation and development.	http://www.atmospheric-research.com/studies/SEARCH/
Ammonia and HNO_3	MRPO CENRAP	9 Rural (IMPROVE), 1 Urban site	NH_3, HNO_3, SO_2, SO_4, NH_4, NO_3, Mass	Determine $PM_{2.5}$ limiting N species, characterize precursor gases, validate models and refine methods.	http://64.27.125.175/reports/rpo/MWRPOprojects/Monitoring/YearOneReport(Final).pdf
Rural and Urban OC Speciation	MRPO	2 rural sites (1 Class 1), 5 urban sites	Speciated OC	Collection and analysis of organic compounds for use in CMB and PMF source attribution analysis, determination of primary/secondary source contributions.	http://64.27.125.175/reports/rpo/MWRPOprojects/Monitoring/SENEY%20FINAL%20REPORT%20-%20UW%20MADISON1.pdf, http://64.27.125.175/reports/rpo/MWRPOprojects/Monitoring/Interim_Report.pdf
Sources of Carbon	VISTAS	Southeast Class 1 areas	SVOCs, C^{14}	Collection and analysis of organic compounds for use in CMB source attribution analysis.	http://www.vistas-sesarm.org/documents/RPOTech0605.ppt
BRAVO Study	EPA, NPS, Texas, EPRI	Big Bend National Park, ~40 remote locations in Texas	Mass, elements, ions, optical, artificial tracer, & meteorology	Assess the causes of haze at Big Bend National Park.	http://vista.cira.colostate.edu/improve/Studies/BRAVO/Studybravo.htm#FinalReport Impacts from sources in Mexico. Improved understanding of aerosol optical relationships. Improving regional met and air quality models.

III. Overall objectives of gathering and interpreting monitoring data for implementation of the regional haze rule through state and tribal plans

A continuing program of haze-related measurements and data assessment generate information required to meet five broad objectives that support regional haze rule implementation:

- Documentation of haze trends for the protected areas;
- Improved understanding of the haze-important atmospheric properties;
- Identification of particulate species and emission sources responsible for haze;
- Evaluation of regional atmospheric simulation models; and
- Utilization, integration, and communication of monitoring data and derived policy-relevant information (e.g. regional haze conceptual models).

Each of these is discussed in the sections that follow.

A. Track long-term trends as called for by the RHR

The RHR calls for tracking of haze trends for all of the mandatory federal class I areas with visibility protection as a means to assess the effectiveness of SIP and TIP mandated emission control programs designed to reduce haze levels. There are 156 such areas in 32 states. The 110-site Interagency Monitoring of Protected Visual Environment (IMPROVE) Network collects and analyzes every third day 24-hour duration particle samples at sites chosen to represent 155 of the federal class I areas[4]. Specifically, aerosol speciation data collected and processed in the manner of the IMPROVE Network from monitoring sites that are representative of the visibility protected federal class I areas are required to establish the five-year averaged baseline and subsequent five-year averages of haze levels for the haziest (worst) and clearest (best) 20% of days for as long as the regional haze rule is in effect (currently envisioned as a 60-year process).

The IMPROVE Network has been generally viewed as an efficient, uniform, and cost-effective means to generate the required class I area representative data needed for regional haze trends tracking. While long-term consistency is the hallmark of a successful trends monitoring program, a number of issues should be explored that may result in changes to monitoring for trends tracking over the next 10 years. These include: the degree to which the current monitoring sites represent the visibility-protected Class I areas, and the advisability of continued use of filter-based sampling with the current suite of analyses.

[4] Bering Sea Wilderness, on an uninhabited island in the Bering Sea about 200 miles off the Alaska Coast, was deemed impractical for routine monitoring

The ultimate question for the issue of representativeness is whether the current network sites adequately represent all of the class I areas without redundancy. Some of the class I areas are large and situated in complex terrains, so that even if a monitoring site represents some portion of the class I area, it may not represent conditions in other parts of the same area. This type of concern motivated Arizona to apply a share of its state and federal air quality monitoring resources to expand the IMPROVE monitoring for their Class I areas[5]. On the other hand, the levels and temporal variations of some of the measured species (e.g. sulfates, nitrate, and organic carbon) are similar at multiple IMPROVE monitoring sites within a region, which raises the question of redundancy. However, simple comparisons of data from neighboring sites could be misleading since sites that currently measure similar concentrations may not do so under future emissions configurations. IMPROVE is planning to conduct a network assessment that should be complete early in 2006 to explore these concerns.

Possible changes to the IMPROVE sampling and analysis protocols need to be carefully tested and considered prior to implementation because of the possibility of introducing artifacts that would detrimentally impact trends assessments. However it is likely that some changes will be made over the next ten years. These may result from monitoring technology advancements (e.g. high-time resolution speciation instrumentation for long-term monitoring application), or changes in our understanding of atmosphere processes that identify other critical components that should be monitored (e.g. inclusion of ammonium ion monitoring), or identification of problems with the current monitoring approach that need to be rectified in order to generate data of adequate quality. In addition to understanding their impacts on the data trends, any potential change in the funding and practical consequences of potential changes need to be factored into all protocol change decisions. The IMPROVE program continually assesses and adjusts protocol for issues related to data quality, as well as considering the possible application of innovated technology or changes to characterize additional atmospheric parameters.

In summary the regional haze rule clearly calls for tracking haze trends via monitoring of aerosol species at sites representative of the class I areas over the anticipated 60-year period of haze reductions as a means to assess the effectiveness of SIP-mandated emissions changes. The 110-site IMPROVE network supplemented by some IMPROVE Protocol sites selected to represent some of the larger class I areas currently fills this need. Over the next 10 years this trends monitoring approach may evolve somewhat (i.e. minor changes in the number of sites and/or monitoring protocols), but remains necessary for implementation of the regional haze rule.

[5] Aerosol monitoring funded by individual state, federal or tribal agencies at sites beyond the 110-site IMPROVE Network but using identical procedures is referred to as IMPROVE Protocol. There are about 60 IMPROVE Protocol sites that serve a number of objectives with respect to the regional haze rule and other air quality programs. Only about 8 of those sites are representative of some of the larger class I areas, so are appropriate for use in regional haze trends tracking.

B. Support a better understanding of the atmospheric processes of importance for haze formation, movement and dissipation

The IMPROVE network provides the foundation for determination of long-term trends, detailed seasonal and spatial patterns, and ultimately compliance with the haze rule's "glide path" requirements. To go beyond that and obtain data that can be used to better understand the underlying processes of the formation, transport, and fate (removal or dissipation) of haze relevant aerosols in the boundary layer in sufficient detail to determine appropriate control strategies, we need more temporally detailed measurements than those provided by the 3rd-day integrated data provided by programs like IMPROVE, STN, or CASTNET.

RPO programs such as the VISTAS "Focus" sites or the MANE-VU "RAIN" sites provide highly time-resolved (one to 3 hours) hourly aerosol mass and composition data and related precursor gases (such as SO_2, O_3, and NO_y) that allow enhanced insight into source characterization, aerosol formation processes (SO_2 to SO_4 conversion rates, secondary organic aerosol formation, etc.), factors that drive short-term visibility, the role of meteorology in transport, and aerosol model performance and evaluation. The latter is perhaps ultimately the most important use of these enhanced sites, since it is the modeling process that is used in generation of SIPs and TIPs. Many aspects of modeling need to take into account non-linear chemical processes, meteorology, and deposition factors that are highly variable on a sub-daily time scale; 24-hour integrated samples do not allow evaluation of how well models handle these factors.

Deposition, both of haze-related aerosols and key gas-phase precursors, is another area where detailed monitoring can provide valuable insight. Wet deposition of aerosols can be through "in-cloud" processes or via a "wash-out" process (less likely). SO_2 measurements can help quantify the dry deposition of this critically important haze-aerosol precursor. With a network that has sufficient spatial scale, better understanding of the dispersion and fate of haze-related aerosols can be obtained. When coupled with actual visual range measurements ("wet" nephelometry), these data can also be used to validate and possibly improve some of the underlying assumptions used in the IMPROVE reconstructed extinction equation.

What is most notably missing in our current ability to routinely measure important haze-relevant pollutants with high time resolution is the nitrogen species -- nitrate, ammonia, nitric acid, nitrous acid, et cetera. Real-time methods exist for these parameters, but are not yet sufficiently robust for routine deployment, or do not provide sufficient data quality to justify the resources for deployment. Progress is being made in this area however, and over the next few years we expect to be able to add these parameters to these enhanced monitoring sites.

C. Identify chemical species and make connections to man-made and natural emissions sources that contribute to existing haze levels

The IMPROVE program is the primary source of data on PM composition in Class 1 areas. Its national scope and consistent protocols allow us to make valid comparisons of data from one part of the country to another and to characterize the major components of haze. Its suite of measurements is also the basis for source apportionment analyses that indicate the relative importance of various sources (e.g., power plants, wildfires, cars and trucks) to visibility impairment. These analyses are critical to the development of defensible control programs. In addition, source apportionment analyses based on ambient measurements serve as the only independent verification of modeled estimates of source contributions, as well as the emission inventories that are input to the models. Thus they provide an invaluable real-world check on these vital components of regional haze implementation plans. Source apportionment analyses also provide key information for tracking progress, since trends in source contributions must be tracked over time as controls are implemented. Without a long term consistent dataset like IMPROVE these analyses are severely hampered.

Given these required applications of IMPROVE data, it is important to note that the IMPROVE data have some weaknesses that limit our ability to discriminate among important sources. The chemical similarity of many organic carbon sources (mobile sources, industrial combustion, vegetative burning) makes them difficult to separate on the basis of the carbon components provided by IMPROVE. Because organic carbon makes up a large percentage of $PM_{2.5}$ mass, and because some emissions are from natural biogenic sources and some from anthropogenic sources, better understanding of these particular source contributions is necessary to establish realistic targets for potential reductions. More specialized monitoring, carbon analyses, and apportionment studies are required to truly discern and quantify source contributions, to separate natural from anthropogenic influences, and to adequately distinguish impacts from local sources. These issues are critical elements to be addressed to support ongoing implementation of the RHR.

The identity of the sources of dust and soil components monitored by IMPROVE is also limited by many of the same factors as organic carbon, i.e., many similar chemical sources, composition is assumed for the coarse ($PM_{2.5}$ to PM_{10}) fraction, some emissions are natural and some anthropogenic in origin, while dust and soil are at the same time, noticeable contributors to visibility impairment west of the 100^{th} meridian of longitude. Again, specialized monitoring and apportionment studies to identify sources are needed.

While the IMPROVE program, and to a lesser extent the EPA speciation network, can provide data suitable for continued tracking of trends for haze and some of its major components (sulfate and nitrate), it has more limited utility for determining sources of OC, dust, and soil components. Consequently it will be more difficult to track the effects of PM and haze controls on OC sources using this data. Differences among regions, and even among individual Class 1 areas, demand more specialized monitoring to truly discern and quantify source contributions, to separate natural from anthropogenic influences, and to

adequately distinguish impacts from local sources. Resources to address these issues through ongoing apportionment studies are needed critical elements to support implementation of the RHR.

D. Evaluate regional meteorological and air quality models that are used for regional haze rule implementation

The outputs of atmospheric models are a critical component in the development of emission reduction strategies and demonstration of reasonable progress toward the goals of the Regional Haze Rule. Proposed strategies will be tested by application of the models and the most promising options will be incorporated into the $PM_{2.5}$ and regional haze State and Tribal Implementation Plans. Measurements gathered through the fine particulate monitoring networks are the reference for the critical first step in the demonstration of atmospheric model performance and the credibility of the modeling results. The quality, consistency and availability of the monitoring data affect the ability of organizations to evaluate model performance and refine the models as the understanding of the processes involved, and our ability to account for them, improves.

Implementation plans require a demonstration that the performance of the atmospheric model meets established performance goals. Model performance is constrained by measurement uncertainty, including that associated with fine particulate matter, precursor gases, and meteorological parameters, as well as the uncertainties in emissions inventories and the representation of chemical and transport processes in the model. Monitoring data sufficient to represent the spatial variability across the domain for speciated aerosol data and optical measurements and gaseous parameter measurements are needed to test the model outputs. Sulfate measurements are comparable across the fine particulate monitoring networks but differences in existing network measurement methods contribute to measurement uncertainty for other components, especially for organic carbon mass. These differences, and others, need to be considered when evaluating model performance using data from different networks.

Proper evaluation of the models demands not only adequate spatial distribution to capture variability, but also the temporal resolution sufficient to capture the short-term variability in the contributors and the results of particle production. Most ambient monitoring has been designed around the need to demonstrate compliance with the NAAQS and track long-term trends in visibility. The species monitored that are most closely related to regional haze are primarily sampled and reported as 24-hour average data. Related gaseous data, while available as hourly concentrations, are typically not collocated with the particulate samplers. The atmospheric models generate hourly predictions and a comprehensive suite of collocated, hourly ambient data is needed to ensure adequate characterization of the diurnal profiles of the various species. The availability and comprehensiveness of the hourly gaseous, fine mass, speciated aerosol and optical data is critical to model performance evaluation.

The availability of vertical profiles of atmospheric conditions, whether gained through periodic soundings or continuously collected with the various profiler systems; provide the raw inputs to the met fields prepared for the models. On the local scale, detailed understanding of the lower atmosphere is needed to understand the causes and contributors to short term variability.

Profile data collection tends to be associated with population centers and is spatially removed from the typically more remote Class 1 areas. In many cases, topography and local meteorology in the areas of interest is markedly different from the profiler locations. Collocation of profilers with fine particulate or haze related monitoring or at locations more representative of the areas of interest would provide the inputs needed to improve the met fields, investigate local influences and better evaluate latest model performance.

Remote sensing is becoming a powerful tool for the tracking of particulate and visibility related events on the scale of the regional, national and global models. The ground truth provided by meteorological, particulate, gaseous and optical measurements contribute to our ability to improve the quality of the analysis and improve the confidence in the interpretation of remote sensing data at locations between the monitor locations. The availability of the large view provided by the sensors now available, and those planned, provide another tool, that when validated against the available monitoring data, can allow a large scale check of model performance.

As the understanding of the atmosphere and the processes effecting visibility impairment improve and the representation of those processes are captured in the models, there will likely be a need for improvement in the current measurement systems and enhanced measurement of additional species. Ammonia is recognized as a significant contributor, but ambient concentrations are not widely and consistently measured. The importance of speciated organic carbon, now only available for limited areas and time periods, will likely grow as sulfate concentrations decrease. The measurement of the impact of sea salt has not been a priority, but is being recognized as significant at coastal sites. As visibility goals are approached, the contribution of ambient gasses may become significant enough to make collocated measurements valuable.

Changes in the relative importance of contributors to visibility impairment, improvement in the understanding or the processes and their incorporation into more refined models will require that monitoring anticipate and collect the data needed to evaluate the next revisions of the models.

E. Utilization, Integration and Communication of the Monitoring Data

For each individual Class I federal area, the characterization of current baseline visibility conditions and future trends in the haziest and clearest days (Section IIIA) can be considered a critical but minimal requirement of a visibility-monitoring plan. To provide useful support for achieving the national visibility goal encoded in the 1999 Regional Haze Rule, these “minimal” monitoring data need to be efficiently stored, distributed, analyzed, integrated with other measurement or model data and utilized to support many additional objectives. These include: developing a clear understanding of the atmospheric processes, aerosol species and emissions sources which cause or contribute to regional haze (sections II B and C), developing and evaluating efficient regulatory strategies to reduce those contributions which are controllable (section IIC), providing continuing and timely feedback on the effects of emissions control programs and new source influences, adding technical support for possible future

refinements to the regional haze regulatory metrics, and efficiently communicating all of the above to policy decision makers and to the public.

Efficiently integrating the monitoring data with various other sources of information provides a "weight of evidence" approach for distilling the complex technical details of the regional haze phenomenon into a "conceptual model", in which our continually evolving scientific knowledge is summarized, updated and communicated in terms that clearly define and link the goals of the regional haze rule, regional strategies to attain those goals, and short and long-term measures of performance. For example, in most eastern US Class I areas, the monitoring data indicate that reconstructed extinction on the haziest 20% of the days tends to be predominantly due to hygroscopic aerosol sulfur compounds. The EPA Clean Air Interstate Rule (CAIR) calls for SO_2 emissions reductions by 2015 of up to 70% in 28 eastern states. Have past eastern SO_2 emission reductions, such as those required by the 1990 Clean Air Act Amendments, resulted in measurable improvements in reconstructed extinction in eastern Class I areas? Can these past changes in measured extinction be reproduced by currently available emissions-based models? Are the aerosol measurements and emission-based model results consistent with results from mathematical and trajectory-based receptor models? Are future CAIR reductions in eastern SO_2 emissions expected to result in "linear" reductions in extinction, or will reductions in sulfate be partially offset by increases in aerosol nitrate at some locations? Will these improvements be sufficient to meet the 2018 reasonable progress requirements of the Regional Haze Rule in all eastern Class I areas, and will CAIR SO_2 emissions reductions have any benefits in the central or western Class I areas? What kinds of additional control strategies have been effective or will be needed to assure progress in central and western class I areas where current baseline visibility is clearer, and where extinction is proportionately less dominated by sulfates and more influenced by a more diverse mixture of aerosol species and emission sources? What additional data and analyses are needed for areas not dominated by sulfate, such as most of the western Class I areas? How will 5- and 10-year SIP assessments and updates be accomplished, i.e., what technical data, analyses, and studies need to be completed in advance of those SIP/TIP assessment milestone dates?

Developing and clearly illustrating answers to these kinds of questions with ambient measurement data is dependent, in part, on data and metadata which are of uniformly high quality relative to data quality objectives, have clearly documented uncertainties, and are consistently collected and archived for multiple monitoring sites over long periods of time. The ability to acquire these data and associated data quality information, the potential to analyze and illustrate their spatial, temporal and compositional patterns, and the ability to merge and integrate these data with other forms of haze-related data and information are all key elements of a comprehensive visibility monitoring strategy. These critical data usage, integration and communication functions require efficient data storage/retrieval and analysis systems, such as the VIEWS (http://vista.cira.colostate.edu/views/), CATT and FASTNET (http://datafed.net) tools developed by the RPOs. These analysis tools take on added value over time, as basic IMPROVE data accumulate, and are enhanced by new IMPROVE protocol sites adding more detail for especially large or topographically complex Class I areas, or filling regional holes between Class I areas to provide better regional characterization of spatial, temporal and compositional trends. These data and analysis products are further enhanced with measurements from and

access to data from various IMPROVE special studies, the regional SEARCH, FOCUS and RAIN networks, methods inter-comparisons with the EPA STN and Canadian Speciation Networks, other national or international fine and coarse particle monitoring programs, various NOAA and NASA satellite data and results from regional, national or global aerosol modeling efforts.

IV. Haze Monitoring as a Component of National (& Regional) Ambient Air Monitoring Strategy (NAAMS)

Section III summarized monitoring needs to meet the specific objectives required under the Regional Haze Rule. As measurements have been and continue to be conducted for these Class I area/visibility-centric objectives, the resultant data can and should also be viewed in the larger context of a comprehensive National Ambient Air Monitoring Strategy (NAAMS see: http://www.epa.gov/ttn/amtic/monitor.html). Through this dynamic NAAMS process, all EPA supported ambient monitoring activities are being reviewed, and in many cases revised, to provide more efficient, timely information on criteria pollutants of greatest concern from a human health perspective – ozone and $PM_{2.5}$ – and more comprehensive information on pollutant precursors and interactions.

IMPROVE data from Class I areas are the key component of the regional haze monitoring strategy, but because these Class I areas are nationally distributed, and since there is also a relatively widespread incidence of urban areas (and some regions) which fail to meet the primary health standard for $PM_{2.5}$ (15 ug/m3 annual average), IMPROVE data have taken on an important added objective of defining both the fine mass and chemical composition of "regional background" $PM_{2.5}$. The value of these data for illuminating PM attainment issues may take on added future importance as EPA is currently considering revisions to standards which include: a large reduction in the 24-hour primary $PM_{2.5}$, a new secondary sub-daily $PM_{2.5}$ standard (for protecting visibility outside of Class I areas) and new primary and secondary $PM_{10-2.5}$ standards (see for example: http://www.epa.gov/ttn/naaqs/standards/pm/data/pmstaffpaper_20050630.pdf).

A large new $PM_{2.5}$ Speciation Trends Network (STN) was established in 1999, using methods adapted from (but not identical to) IMPROVE. STN sites are primarily urban but there are also a number of new rural speciation sites, many of which employ IMPROVE methods. These include the former CASTNet "Visibility" sites, a number of State operated "SIP" sites, and several rural and urban methods comparison sites where IMPROVE and STN sampling is conducted concurrently. The new rural IMPROVE protocol sites help fill in the national map, enhancing regional coverage in areas where Class 1 areas are sparse, and this expanded IMPROVE coverage, in turn, defines regional-scale $PM_{2.5}$ concentration and composition, enhancing the value of the urban STN data, by allowing distinction between regional and local species composition and source contributions. The urban STN data may in turn help identify the nature and location(s) of urban or industrial sources that contribute to haze in downwind class I areas, and can also help quantify the spatial and temporal scales of large regional events (forest fires, dust storms, sulfate or

nitrate episodes) that affect urban and rural sites alike. Haze-inspired data tools like VIEWS, CATT and FASTNET have also been modified to accommodate analyses of STN and other haze-related PM data from other networks.

This added new usage and expanded spatial coverage of data originally collected exclusively for regional haze purposes also may impose constraints, as it becomes increasingly important to employ consistent methods (for carbon for example) at our rural and urban monitoring sites, and to maintain this consistency in the future. Conversely, the current NAAMS calls for a substantial reduction in the number of $PM_{2.5}$ speciation sites, and this may jeopardize continued operation of new rural and urban IMPROVE protocol sites which are not in Class I areas. Maintaining rural and urban IMPROVE and STN protocol sites should be given a high priority, since they already employ "consistent methods", include both fine and coarse mass, and so contribute most effectively to both regional haze and PM monitoring objectives.

While the NAAMS calls for a general reduction of filter-based speciation sites, it also emphasizes an increased number of sites (about 500) using continuous methods for ozone and $PM_{2.5}$, and a smaller number (about 75) of more comprehensive National Core monitoring (NCore Level 2) sites with continuous methods for $PM_{2.5}$ (and likely soon for $PM_{10\text{-}2.5}$) mass, species (SO_4, EC, OC, etc.) and precursor gases or tracers (low level SO_2, CO, NOy, NH_3, O_3). The NAAMS also advocates a few (3 to 10) intensive (NCore Level 1) methods evaluation and technology transfer sites. While most NCore Level 1 and Level 2 sites would be urban, some will be intentionally located in rural locations. This kind of multi species, highly time-resolved information would provide a valuable complement to existing routine regional haze monitoring programs (see section IIIB), and every effort should be made to assure that rural NCore sites are collocated with IMPROVE sites in Class I areas.

The CASTNET (Clean Air Status and Trends Network) includes "visibility sites" which have already been folded into the IMPROVE program, and also includes "dry deposition" sites which, like IMPROVE, are rural, regionally representative and intended to evaluate long-term trends, which include some haze-relevant aerosol species (sulfate, nitrate and ammonium) and precursors (SO_2, HNO3, NH3), and which have been useful in combination with IMPROVE for evaluating spatial and temporal trends. Under NCore, a subset of the CASTNET sites will deploy and evaluate sophisticated experimental continuous methods for multiple ionic aerosol species and gaseous precursors. For purposes of assessing both regional haze and deposition and trends in acidifying compounds, every effort should be made to coordinate, and if possible collocate IMPROVE and CASTNET sites, especially if new CASTNET continuous methods prove to be effective. In a similar way, NADP wet deposition chemistry measurements (some of which are already collocated at IMPROVE sites and which have otherwise good long-term national spatial coverage) are not conducted with an objective of adding information on regional haze, but unavoidably provide useful indirect information by quantifying the removal of sulfate, nitrate, ammonium, sodium chloride and soil-related cations from the atmosphere. The combination of data from routine IMPROVE, IMPROVE special studies, STN, CASTNET, NADP, continuous PM and gaseous precursor monitoring programs, and intensive NCore Level I and II, and regional continuous monitoring projects

(i.e., VISTAS Focus and MANE-VU RAIN sites) provides a much more comprehensive view of atmospheric concentrations, compositions, sources, sinks and trends than is possible from any single monitoring network.

Other valuable aerosol and haze-relevant information is provided by other national or international monitoring programs, such as airport (ASOS) visibility observations, various real-time fire monitoring and forecast systems, solar radiation networks (AERONET, USDA UVB), lidar networks, a growing number of NOAA and NASA satellite sensors and data products, and aerosol forecast models like NAAPS and WRF – none of which have implementation of regional haze regulations as an objective, but all of which provide haze-relevant information, and can add dimensions to our understanding that can't be provided by any one monitoring approach alone. Regional haze monitoring can be substantially enhanced if the resulting data can be merged and integrated with these other information sources, in the same way that haze monitoring data can provide invaluable "ground truth" to enhance the value of these other measurement programs.

Appendix I

[45 FR 80089, Dec. 2, 1980, as amended at 64 FR 35764, July 1, 1999]
[Revised as of July 1, 2004]
[CITE: 40CFR51.308]
[Page 259-267]
(**selected parts related to Visibility Monitoring**)

TITLE 40--PROTECTION OF ENVIRONMENT

CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY (CONTINUED)

PART 51_REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS

Subpart P - Protection of Visibility

Section 51.305 - Monitoring for reasonably attributable visibility impairment.

(a) For the purposes of addressing reasonably attributable visibility impairment, each State containing a mandatory Class I Federal area must include in the plan a strategy for evaluating reasonably attributable visibility impairment in any mandatory Class I Federal area by visual observation or other appropriate monitoring techniques. Such strategy must take into account current and anticipated visibility monitoring research, the availability of appropriate monitoring techniques, and such guidance as is provided by the Agency.

(b) The plan must provide for the consideration of available visibility data and must provide a mechanism for its use in decisions required by this subpart.

(4) 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. This monitoring strategy must be coordinated with the monitoring strategy required in Sec. 51.305 for reasonably attributable visibility impairment. 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.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

(g) Requirements for periodic reports describing progress towards the reasonable progress goals. Each State identified in Sec. 51.300(b)(3) must submit a report to the Administrator every 5 years evaluating progress towards the reasonable progress goal for each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State which may be affected by emissions from within the State. The first progress report is due 5 years from submittal of the initial implementation plan addressing paragraphs (d) and (e) of this section. The progress reports must be in the form of implementation plan revisions that comply with the procedural requirements of Sec. 51.102 and Sec. 51.103. 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.

(3) For each mandatory Class I Federal area within the State, the State must assess the following visibility conditions and changes, with values for most impaired and least impaired days expressed in terms of 5-year averages of these annual values.

(i) The current visibility conditions for the most impaired and least impaired days;

(7) A review of the State's visibility monitoring strategy and any modifications to the strategy as necessary.

(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 Sec. 51.305 and this section.

(2) The State must provide the Federal Land Manager with an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on an implementation plan (or plan revision) for regional haze required by this subpart. This consultation must include the opportunity for the affected Federal Land Managers to discuss their assessment of impairment of visibility in any mandatory Class I Federal area; and …

Appendix II - Example Regional Haze Implementation Plan Chapter Application of Regional Haze Monitoring Strategy (from CENRAP SIP Template)

Chapter 6.0 Monitoring Strategy	6.0 A States/Tribes with Class I Areas 6.0 B. States/Tribes without Class I areas	CONTENT 6.0A. Reference to monitoring strategy in appendix and commitment to maintain and evaluate monitoring network and commitment to reporting of results at least annually to EPA. 6.0B. Statement of commitment to work with CENRAP to assess progress of visibility impairment in Class I areas from sources within the state. Map of CENRAP states and border state monitor locations and Class I areas State-specific map of class 1 areas and monitors (if applicable). *Ensure that text addresses possibility in future of technology changes/ need for new monitors and that 308(d)(4) subsections (i), (ii), (iii), (iv) and (vi) requirements are specifically mentioned.*	DESCRIPTION OF APPENDIX MATERIAL 1. Demonstration that Data From Monitors Outside (but near) Class I Area Adequately Represents Air Quality in that Class I Area (if applicable) moved from Ch. 5.0 2. Monitoring Strategy for Each Class I Area in the State 3. Procedures for Use of Monitoring Data and Other Information in Determining the Contribution of Emissions From Within a State on Class I Areas inside and Outside of a State. 4. Procedures to Address Elements Necessary to Assess and Report on Visibility (reporting, record keeping, etc.) *Do we want to get letters of commitment from the Forest Service/Park Service?*	Write Ch. 6 template language CENRAP will do "skeletal appendices. CENRAP is working with Inter-RPO data analysis group to develop a monitoring plan that will form the basis for these appendices. Group could ID need for additional appendices AS is working with FLMs on plan to coordinate FLM review and need for "letters of commitment"	States with Class I add more specific info to appendices as needed.