



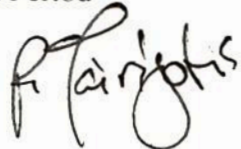
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

August 20, 2019

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

**MEMORANDUM**

**SUBJECT:** Guidance on Regional Haze State Implementation Plans for the Second Implementation Period

**FROM:** Peter Tsirigotis   
Director

**TO:** Regional Air Division Directors, Regions 1 – 10

The purpose of this memorandum is to distribute a guidance document titled, "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period." The U.S. Environmental Protection Agency (EPA) prepared this non-binding guidance document to assist states with the preparation of regional haze state implementation plans (SIPs) that are due to EPA by July 31, 2021. The document fulfills EPA's commitment in the agency's September 11, 2018, Regional Haze Reform Roadmap to issue regional haze SIP development guidance and replaces the 2016 draft regional haze guidance document.

The guidance document is posted on EPA's visibility website at:  
<https://www.epa.gov/visibility/visibility-guidance-documents>.

Please share this memorandum with your staff, as well as colleagues at state, local, and tribal air agencies. If you have questions concerning this document, please contact Liz Etchells at (919) 541-0253 or [etchells.elizabeth@epa.gov](mailto:etchells.elizabeth@epa.gov) for further information.

Attachment



# Guidance on Regional Haze State Implementation Plans for the Second Implementation Period



EPA-457/B-19-003  
August 2019

Guidance on Regional Haze State Implementation Plans for the Second Implementation Period

U.S. Environmental Protection Agency  
Office of Air Quality Planning and Standards  
Air Quality Policy Division  
Research Triangle Park, North Carolina



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APPENDIX A	Clean Air Act Provisions, EPA Rulemakings, and EPA Guidance Documents Related to SIPs Addressing Visibility Protection
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## I. Introduction

### A. Purpose of this guidance

The purpose of this guidance document is to help states<sup>1</sup> develop approvable regional haze state implementation plans (SIPs) to protect visibility in mandatory Class I Federal areas.<sup>2</sup> This guidance document in particular applies to the SIPs that are due to be submitted to the Environmental Protection Agency (EPA) by July 31, 2021, for the second implementation period ending in 2028.<sup>3</sup> The required content of these SIPs is specified in 40 CFR 51.308(f), which was revised in 2017.<sup>4</sup> This document supports key principles of program implementation, including supporting states in developing SIPs for complying with the Clean Air Act's (CAA) visibility requirements; reducing state planning burdens; and leveraging emission reductions achieved through CAA and other programs that further improve visibility in protected areas. EPA released a draft guidance for public comment in 2016; this 2019 final guidance document replaces the 2016 draft document.

The key principles referenced above, which were highlighted in the September 11, 2018 Regional Haze Reform Roadmap Memorandum,<sup>5</sup> articulate EPA's policy foundation for this document and the implementation of the regional haze program. Importantly, this guidance is intended to provide information about EPA's understanding of the discretion and flexibilities states have within the statutory and regulatory requirements to develop regional haze SIPs, even where states' approaches differ from those provided in this document. States retain the discretion to develop regional haze SIP revisions that differ from the recommendations in this guidance; however, states must ensure the regional haze SIPs are consistent with applicable requirements of the CAA and EPA regulations, and are the product of reasoned decision-making.

This document provides recommendations for use by states in developing SIP submissions, and for EPA Regional offices in acting on them. This document does not substitute for provisions or requirements of the CAA, nor is it a rule itself. As a legal matter, this document does not impose binding, enforceable requirements on any party. Therefore, this guidance is not judicially reviewable. Non-mandatory language such as "guidance," "recommend," and "may" in this document is intended to describe EPA's non-binding recommendations, while mandatory terminology such as "must," "required," and "may not" is intended to describe legal requirements under the CAA or EPA regulations.

Reasoned decision-making is a core component of the regional haze program, and thus of states' regional haze SIP submissions. EPA will evaluate a state's SIP revision to determine whether the

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<sup>1</sup> This guidance applies to plans to protect visibility in mandatory Class I Federal areas, none of which are located on tribal land. However, under the CAA and EPA regulations, a tribe may, but is not required to, apply for "treatment in the same manner as a state" for purposes of developing a tribal implementation plan (TIP), including a regional haze TIP. Many provisions of the Regional Haze Rule would apply to a regional haze TIP in the same way they apply to a SIP from a state without a mandatory Class I Federal area.

<sup>2</sup> For brevity, mandatory Class I Federal areas will be referred to as "Class I areas" in the remainder of this document.

<sup>3</sup> This guidance document does not address any SIP revisions that may be submitted to or reviewed by EPA during the second implementation period that concern only the requirements of the first implementation period. Such SIP revisions are subject to either 40 CFR 51.308(d) and (e) or 51.309, which are outside the scope of this guidance.

<sup>4</sup> Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017.

<sup>5</sup> Available at <https://www.epa.gov/visibility/epa-releases-regional-haze-reform-roadmap>.



state has reasonably conducted the required analyses and engaged with the requisite considerations in a manner that is consistent with the statutory visibility goal.<sup>6</sup> To this end, this guidance uses “should” where EPA recommends an approach because it is consistent with the overarching principle that states must engage in reasoned decision-making.

EPA encourages states to discuss SIP development approaches with their EPA Regional office early in their process so that EPA can support states in the development of approvable SIPs. For background purposes, a brief overview of the regional haze program and recent revisions to the Regional Haze Rule are provided below.

## **B. Brief overview of the regional haze program**

A detailed history and explanation of the regional haze program is provided in the preamble to the 2017 rule revisions, found at 82 FR 3078 (January 10, 2017). A brief overview is included here to provide context to the second implementation period SIP development information contained in this document. Appendix A contains descriptions of CAA provisions, EPA rulemakings, and EPA guidance documents related to visibility protection, and may also be informative.

“Regional haze” is defined at 40 CFR 51.301 as “visibility impairment that is caused by the emission of air pollutants from numerous anthropogenic 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.” This visibility impairment is a result of anthropogenic emissions of particles and gases in the atmosphere that scatter and absorb (i.e., extinguish) light, thus acting to reduce overall visibility. The primary cause of regional haze is light extinction by particulate matter (PM).<sup>7</sup> Section 51.308 of the Regional Haze Rule requires states to submit a series of SIPs to protect visibility in Class I areas.

In January 2017, EPA issued a final rule updating the regional haze program, including revising portions of the visibility protection rule promulgated in 1980 and the Regional Haze Rule promulgated in 1999.<sup>8</sup> The revised rule governs states’ obligations and EPA’s review of periodic SIPs developed for the second and subsequent implementation periods, among other requirements. As noted in the Regional Haze Reform Roadmap Memorandum, in January 2018 the EPA Administrator announced in a letter to several petitioners that EPA intends to

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<sup>6</sup> See, e.g., *North Dakota v. EPA*, 730 F.3d 750, 761 (8th Cir. 2013) (citing *Alaska Department of Environmental Conservation v. EPA*, 540 U.S. 461 (2004) (rejecting argument that EPA is required to approve determination under Clean Air Act § 169A that is “based upon an analysis that is neither reasoned nor moored to CAA’s provisions”); *Arizona ex. rel. Darwin v. EPA*, 815 F.3d 519, 531 (9th Cir. 2016) (“EPA has substantive authority to assure that a state’s proposals comply with the Act, not simply the ministerial authority to assure that the state has made *some* determination”).

<sup>7</sup> For purposes of the Regional Haze Rule, light extinction is estimated from measurements of PM and its chemical components (sulfate, nitrate, organic mass by carbon (OMC), light absorbing carbon, fine soil, sea salt, and coarse material), assumptions about relative humidity at the monitoring site, and the use of a commonly accepted algorithm. These estimates of light extinction are logarithmically transformed to deciviews. The PM measurements used in the regional haze program are collected by the IMPROVE (Interagency Monitoring for PROtected Visual Environments) monitoring network.

<sup>8</sup> Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017; Final Rulemaking: Visibility Protection for Federal Class I Areas, 45 FR 80084 (December 2, 1980); Final Rule: Regional Haze Regulations, 64 FR 35714 (July 1, 1999).

commence a notice-and-comment rulemaking to revisit certain aspects of the January 2017 Regional Haze Rule. The Regional Haze Reform Roadmap Memorandum indicated that such a rulemaking would impact future regional haze implementation periods.

Importantly, when EPA refers to the requirements for the second and subsequent implementation period SIPs, the Agency is referring to the requirements of 40 CFR 51.308(f). A summary of key changes to the Rule in 2017, including changes to 40 CFR section 51.308(f), is provided below.

- *Extension of the 2018 due date for SIPs.* EPA extended the due date for the second implementation period regional haze SIPs, from July 31, 2018, to July 31, 2021. The second implementation period still ends in 2028.
- *Relationship between the long-term strategy (LTS) and the reasonable progress goals (RPGs).* EPA clarified (1) the relationship between the LTS and RPGs in state plans<sup>9</sup> and (2) the LTS obligation of all states.<sup>10</sup>
- *Progress tracking.* EPA revised the way in which some days during each year are to be selected as the 20 percent most impaired days and then used for purposes of tracking progress towards natural visibility conditions. This change focuses attention on days when anthropogenic emissions impair visibility instead of days when wildfires and natural dust storms are the greatest contributors to reduced visibility.
- *Possible adjustment of the uniform rate of progress (URP) for the impacts of anthropogenic sources outside the U.S. (i.e., international sources) and certain types of wildland prescribed fire.* EPA added a provision that allows EPA to approve adjustments to the URP to reflect the impacts of these causes of visibility impairment if an adjustment has been developed through scientifically valid data and methods. These adjustments would be developed and applied separately, although they would both be accomplished by adding an estimate of the impact of the relevant source type or types to the value of the natural visibility condition for the 20 percent most anthropogenically impaired days, for the purposes of calculating the URP. The wildland prescribed fires that are eligible under the Regional Haze Rule to be included in this adjustment are those conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied.<sup>11</sup>
- *Progress reports.* EPA revised the due dates for progress reports and removed the requirement for progress reports to be submitted in the form of SIP revisions for the second and subsequent implementation periods.

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<sup>9</sup> This clarification of the existing requirements was accomplished primarily by a reordering of the subsections of 40 CFR 51.308(f) compared to the ordering of similar topics in the subsections of 40 CFR 51.308(d), and by a discussion in the preamble to final rule. *See* 82 FR 3090.

<sup>10</sup> In particular, EPA clarified that all states, including states with no Class I areas, are required to develop an LTS based on analysis of emission control measures and may be required to provide a robust demonstration that there are no additional emission control measures that are necessary for reasonable progress. *See* 40 CFR 51.308(f)(3) and 82 FR 3099.

<sup>11</sup> 40 CFR 51.308(f)(1)(vi)(B).

- *Reasonably attributable visibility impairment (RAVI)*. EPA updated, simplified, and extended to all states the provisions for RAVI. At the same time, EPA revoked many of the existing FIPs implementing the 1980 RAVI requirements.<sup>12</sup>
- *Federal land manager (FLM) consultation*. EPA made changes to FLM consultation requirements.
- *Monitoring strategy*. EPA removed the requirement for progress reports submitted for the second and later implementation periods to re-address the monitoring strategy for regional haze. The requirement for periodic SIP revisions to re-address the monitoring strategy was retained.

For convenient reference, Appendix B of this guidance document includes the sections of the Regional Haze Rule that are relevant to the preparation of the SIPs due by July 31, 2021.

## II. Regional haze SIP development steps

### A. Overview and framework for regional haze SIP development

The CAA and the Regional Haze Rule provide a process for states to follow to determine what is necessary to make reasonable progress in Class I areas. As a general matter, this process involves a state evaluating what emission control measures for its own sources, groups of sources, and/or source sectors<sup>13</sup> are necessary in light of the four statutory factors, five additional considerations specified in the Regional Haze Rule,<sup>14</sup> and possibly other considerations (e.g., visibility benefits of potential control measures, etc.). States have discretion to balance these factors and considerations in determining what control measures are necessary to make reasonable progress. The preamble to the 1999 Regional Haze Rule stated: “The flexibility for State discretion is, of course, exactly what the regional haze rule provides.” 64 FR 35760. This guidance is intended to help states exercise their discretion in SIP development for the second implementation period. Importantly, there is no specified outcome or amount of emission reduction or visibility improvement that is directed as the reasonable amount of progress for any Class I area.

Table 1 lists the key process steps that EPA anticipates that states will typically follow when developing a regional haze SIP for the second implementation period. The applicable sections of the Regional Haze Rule are also listed for reference. Table 1 also provides an outline for the remainder of this document which is organized by steps in the SIP development process.

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<sup>12</sup> On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address portions of the Regional Haze Rule as revised in 2017, including but not limited to the RAVI provisions and provisions related to Federal Land Manager consultation. *See <https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions>*. This letter also announced plans to develop regional haze SIP development guidance.

<sup>13</sup> Hereinafter, “sources, groups of sources, and/or source sectors” is referred to as “source(s).”

<sup>14</sup> 40 CFR 51.308(f)(2)(iv)(A)-(E).

**Table 1. Key steps in developing a regional haze SIP for the second implementation period**

<p>Step 1 Applies only to a state with a Class I area.</p>	<p><i>Ambient data analysis</i> Identify the 20 percent most anthropogenically impaired days and the 20 percent clearest days and determine baseline, current, and natural visibility conditions for each Class I area within the state. 40 CFR 51.308(f)(1)</p> <p>The separate 2018 EPA guidance document addresses this step.<sup>15</sup></p>
<p>Step 2 Applies to all states.</p>	<p><i>Determination of Affected Class I Areas in Other States</i> Determine which Class I area(s) in other states may be affected by the state's own emissions. <i>See</i> 40 CFR 51.308(f)(2)</p> <p>Section II.B.2 of this document addresses this step.</p>
<p>Step 3 Applies to all states.</p>	<p><i>Selection of sources for analysis</i> Select the emission sources for which an analysis of emission control measures will be completed in the second implementation period and explain the bases for these selections. For the purpose of this source selection step, a state may consider estimated visibility impacts (or surrogate metrics for visibility impacts), the four statutory factors, the five required factors listed in section 51.308(f)(2)(iv), and other factors that are reasonable to consider. <i>See</i> 40 CFR 51.308(f)(2)</p> <p>Section II.B.3 of this guidance document addresses this step.</p>
<p>Step 4 Applies to all states.</p>	<p><i>Characterization of factors for emission control measures</i> Identify potential emission control measures for the selected sources, develop data on the four statutory factors and on visibility benefits if they will be considered. <i>See</i> 40 CFR 51.308(f)(2)</p> <p>Section II.B.4 of this guidance document addresses this step.</p>
<p>Step 5 Applies to all states.</p>	<p><i>Decisions on what control measures are necessary to make reasonable progress</i> Consider the four statutory factors, the five required factors listed in section 51.308(f)(2)(iv) (if not already considered when selecting sources), and, optionally, visibility benefits, and decide on emission controls for incorporation into the LTS. Consider measures adopted by other contributing states, including all measures that have been agreed upon through interstate consultation. 40 CFR 51.308(f)(2)</p> <p>Section II.B.5 of this guidance document addresses this step.</p>
<p>Step 6</p>	<p><i>Regional scale modeling of the LTS to set the RPGs for 2028</i></p>

<sup>15</sup> Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018.  
[https://www.epa.gov/sites/production/files/2018-12/documents/technical\\_guidance\\_tracking\\_visibility\\_progress.pdf](https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf)

<p>Applies only to a state with a Class I area.</p>	<p>Determine the visibility conditions in 2028 that will result from implementation of the LTS and other enforceable measures to set the RPGs for 2028. Typically, a state will do this through regional scale modeling, although the Regional Haze Rule does not explicitly require regional scale modeling. 40 CFR 51.308(f)(3)</p> <p>Section II.B.6 of this guidance document addresses this step.</p>
<p><b>Step 7A</b></p> <p>Applies only to a state with a Class I area.</p>	<p><i>Progress, degradation, and URP glidepath checks</i></p> <ul style="list-style-type: none"> <li>● Demonstrate that there will be an improvement on the 20 percent most anthropogenically impaired days in 2028 at the in-state Class I area, compared to 2000-2004 conditions. 40 CFR 51.308(f)(3).</li> <li>● Demonstrate that there will be no degradation on the 20 percent clearest days in 2028 at the in-state Class I area, compared to 2000-2004 conditions. 40 CFR 51.308(f)(3).</li> <li>● Determine the URP that would achieve natural conditions at the in-state Class I area in 2064. The URP may be adjusted for international anthropogenic impacts and certain wildland prescribed fires subject to EPA approval as part of EPA’s action on the SIP submission. 40 CFR 51.308(f)(1).</li> <li>● Compare the 2028 RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath for the in-state Class I area. If the RPG is above the URP glidepath, demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS. If the RPG is above the URP glidepath, also provide the number of years needed to reach natural conditions. 40 CFR 51.308(f)(3)(ii)(A).</li> </ul> <p>Section II.B.7 of this guidance document addresses this step.</p>
<p><b>Step 7B</b></p> <p>Applies to a state only with respect to an out-of-state Class I area to which sources in the state may reasonably be anticipated to contribute to visibility impairment.</p>	<p><i>URP glidepath check</i></p> <p>If the RPG for the 20 percent most anthropogenically impaired days for the affected Class I area in another state is above the URP glidepath, the state preparing the SIP must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state whose emissions may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS. 40 CFR 51.308(f)(3)(ii)(B)</p> <p>Section II.B.7 of this guidance document addresses this step.</p>
<p><b>Step 8</b></p> <p>Applies to all states.</p>	<p><i>Additional requirements for SIPs</i></p> <p>Provide additional information necessary to ensure that other requirements of the Regional Haze Rule are met. 40 CFR 51.308(f)(4), (5), and (6)</p> <p>Section II.B.8 of this guidance document addresses this step.</p>

## B. Guidance on each SIP development step

### 1. Step 1: Ambient data analysis

This SIP development step is addressed in a detailed, separate 2018 guidance document that provides recommendations for selecting the 20 percent most anthropogenically impaired days and the 20 percent clearest days at Class I areas.<sup>16</sup> Section 51.308(f)(1) of the Regional Haze Rule requires each state with a Class I area to calculate the baseline, current, and natural visibility conditions as well as to determine the visibility progress to date and the uniform rate of progress (URP). Below is a short summary of EPA's recommendations for using the IMPROVE network ambient data to identify the 20 percent most anthropogenically impaired days and the 20 percent clearest days.

The 20 percent most anthropogenically impaired days are those days with the highest anthropogenic visibility impairment, in deciviews (dv), defined as:

$$\Delta dv_{\text{anthropogenic visibility impairment}} = dv_{\text{total}} - dv_{\text{natural}}$$

where  $dv_{\text{total}}$  is the overall deciview value for a day and  $dv_{\text{natural}}$  is the natural portion of the deciview value for a day. There are several steps required to calculate the  $dv_{\text{natural}}$  value, including the assignment of the daily extinction values into three categories: 1) episodic natural, 2) routine natural, and 3) anthropogenic. The episodic natural extinction is typically associated with extreme episodic events like wildfire smoke and dust storms that are identified by a site-specific threshold of carbon (organic carbon + elemental carbon) and dust (fine soil + coarse matter) based on observed IMPROVE 95<sup>th</sup> percentile values from 2000-2014. The non-episodic extinction values for each day are then allocated to the routine natural and anthropogenic categories based on the ratio of the NC-II estimates<sup>17</sup> and non-episodic annual average for each chemical species. Any remaining extinction after determining the episodic and routine natural extinction is assigned to the anthropogenic category. Days selected as the 20 percent most anthropogenically impaired have the highest anthropogenic extinction relative to the natural extinction. The natural visibility conditions are calculated by the average of the 2000-2014 annual averages of  $dv_{\text{natural}}$  from the 20 percent most anthropogenically impaired days.

The uniform rate of progress is calculated according to the following equation:

$$\text{URP} = [(2000-2004 \text{ visibility})_{20\% \text{ most impaired}} - (\text{natural visibility})_{20\% \text{ most impaired}}]/60$$

2000-2004 represents the baseline period of the URP and 2064 represents the endpoint where the deciview value of the URP is assumed for the purpose of analysis to reach natural visibility conditions.

The procedure for identifying the 20 percent clearest days is unchanged from the first implementation period meaning the 20 percent clearest days continue to be those days with the

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<sup>16</sup> Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018.

[https://www.epa.gov/sites/production/files/2018-12/documents/technical\\_guidance\\_tracking\\_visibility\\_progress.pdf](https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf).

<sup>17</sup> Copeland, S., Pitchford, M. & Ames, R., 2008. Regional Haze Rule Natural Level Estimates Using the Revised IMPROVE Aerosol Reconstructed Light Extinction Algorithm, s.l.:

[http://vista.cira.colostate.edu/improve/Publications/GrayLit/032\\_NaturalCondIpaper/Copeland\\_etal\\_NaturalConditionsII\\_Description.pdf](http://vista.cira.colostate.edu/improve/Publications/GrayLit/032_NaturalCondIpaper/Copeland_etal_NaturalConditionsII_Description.pdf).

lowest daily extinction and  $dv_{\text{total}}$  values, not the days with the lowest anthropogenic impairment. Therefore, it is unnecessary to assign extinction on the clearest days to anthropogenic and natural fractions.

## **2. Step 2: Determination of affected Class I areas in other states**

Section 51.308(f)(2) of the Regional Haze Rule requires each state to develop an LTS that includes the control measures necessary to make reasonable progress at each Class I area outside the state “that may be affected by emissions from the state.”<sup>18</sup> This section addresses how a state determines which Class I areas in other states may be affected by its own emissions, so it knows which out-of-state Class I areas need to be considered in the development of its LTS. This linkage to specific Class I areas affects LTS development because baseline visibility impacts from individual sources and visibility benefits from possible emission control measures are specific to a Class I area. Also, section 51.308(f)(3) of the Regional Haze Rule provides that if a state contains sources whose emissions are reasonably anticipated to contribute to visibility impairment in a Class I area in another state for which the RPG is above the URP glidepath, the state must provide a “robust demonstration” that there are no additional emission reduction measures that would be reasonable to include in its own LTS.<sup>19</sup>

As an initial matter, a state has the flexibility to use any reasonable method for quantifying the impacts of its own emissions on out-of-state Class I areas, and it may use any reasonable assessment for this determination. Additionally, since determinations of affected Class I areas were previously made for the first regional haze implementation period, states may consider retaining the same linkages and assumptions from those SIPs, but if states do so then they should consider whether the assumptions about source-receptor relationships have changed since those assessments.

States that are reassessing their linkages for the second implementation period may make this determination based on the state’s recent emissions or anticipated emissions in 2028, which is the end of the second implementation period. Because visibility impairment is defined such that only anthropogenic emissions are considered to contribute to visibility impairment, all types of anthropogenic sources are to be included in this determination. States may also make this determination based on total statewide emissions.

A variety of technical, quantitative approaches exist to assess which out-of-state Class I areas may be affected by aggregate emissions from a given state. The most common approach in the first implementation period was to use a photochemical transport model to track the contribution due to emissions from whole states to specific Class I areas. This approach may also be used in the second implementation period, or a state may use another reasonable approach (e.g., back trajectory-based approaches).

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<sup>18</sup> Section 51.308(f)(2) of the Regional Haze Rule also requires each state to develop an LTS that includes the control measures necessary to make reasonable progress at each of its own Class I areas. The qualification regarding “may be affected” applies only to out-of-state Class I areas; the state preparing a SIP revision must develop an LTS that includes measures necessary to make reasonable progress at each of its own Class I areas regardless of the impact from its own sources’ emissions on those areas.

<sup>19</sup> See Section II.B.7.c of this document for additional information regarding the requirement for a robust demonstration.

A state with a Class I area may advise another state that it considers its Class I area to be affected by emissions from the other state. However, each state is responsible for its determination of what Class I areas may be affected by its emissions, regardless of impacts that a neighboring state might or might not have identified.<sup>20</sup> This is also a suitable subject for interstate consultation. The Regional Haze Rule requires that states describe actions taken to resolve any disagreements and document interstate consultations.<sup>21</sup>

### **3. Step 3: Selection of sources for analysis**

This section addresses how a state selects emission sources for analysis of emission control measures.<sup>22</sup> In the subsequent analysis of control measures, the state will determine what emission control measures are necessary to make reasonable progress at the state's own Class I areas and Class I areas in other states. The selection of a source for analysis at this step does not necessarily mean that an additional emission control measure will ultimately be required for that source.<sup>23</sup>

A key flexibility of the regional haze program is that a state is not required to evaluate all sources of emissions in each implementation period. Instead, a state may reasonably select a set of sources for an analysis of control measures. The guidance that an analysis of control measures is not required for every source in each implementation period is based on CAA section 169A(b)(2), which requires each SIP to contain emission limits, schedules of compliance, and other measures as may be necessary to make reasonable progress, but (in marked contrast to the statutory provision for BART<sup>24</sup>) does not provide direction regarding the particular sources or source categories to which such emission limits, etc., must apply. Selecting a set of sources for analysis of control measures in each implementation period is also consistent with the Regional Haze Rule, which sets up an iterative planning process and anticipates that a state may not need to analyze control measures for all its sources in a given SIP revision. Specifically, section 51.308(f)(2)(i) of the Regional Haze Rule requires a SIP to include a description of the criteria the state has used to determine the sources or groups of sources it evaluated for potential controls. Accordingly, it is reasonable and permissible for a state to distribute its own analytical work, and the compliance expenditures of source owners, over time by addressing some sources in the second implementation period and other sources in later periods. For the sources that are not selected for an analysis of control measures for purposes of the second implementation

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<sup>20</sup> If the state preparing a SIP revision has no Class I areas of its own and it has demonstrated that there are no out-of-state Class I areas that may be affected by its sources' emissions, we encourage the state to discuss this conclusion with their EPA Regional office.

<sup>21</sup> 40 CFR 51.308(f)(2)(ii)(C).

<sup>22</sup> In this document, the term "analysis of control measures" refers to an analysis of what emission control measures for a particular source are necessary in order to make reasonable progress. The analysis of control measures must include consideration of the four statutory factors. It must also include consideration of the five additional factors listed in 40 CFR 51.308(f)(2)(iv) unless these five factors have already been considered in the selection of the sources for which the state will complete an analysis of control measures. It may include the consideration of visibility benefits.

<sup>23</sup> Section II.B.5 of this document addresses the determination of what measures are necessary for reasonable progress.

<sup>24</sup> CAA section 169A(b)(2)(A).



period, it may be appropriate for a state to consider whether measures for such sources are necessary to make reasonable progress in later implementation periods.

The Regional Haze Rule does not explicitly list factors that a state must or may not consider when selecting the sources for which it will determine what control measures are necessary to make reasonable progress. A state opting to select a set of its sources to analyze must reasonably choose factors and apply them in a reasonable way given the statutory requirement to make reasonable progress towards natural visibility. Factors could include but are not limited to baseline source emissions, baseline source visibility impacts (or a surrogate metric for the impacts<sup>25</sup>), the in-place emission control measures and by implication the emission reductions that are possible to achieve at the source through additional measures, the four statutory factors (to the extent they have been characterized at this point in SIP development), potential visibility benefits (also to the extent they have been characterized at this point in SIP development), and the five additional required factors listed in 40 CFR 51.308(f)(2)(iv).

A state that brings no sources forward for analysis of control measures must explain how doing so is consistent with the CAA's requirements that SIPs make reasonable progress towards the national goal of preventing future and remedying existing anthropogenic visibility impairment, and that reasonable progress must be determined by considering the four statutory factors. For example, such an explanation could include a discussion of the types and origins of visibility impairing pollutants impacting the state's Class I areas and/or out-of-state Class I areas to which the state is linked, an assessment of anthropogenic emissions of visibility impairing pollutants in the state broken down by source type and location, and a reasoned assessment based in empirical data and analysis of why further reductions of visibility impairing pollutants are not reasonable (*see* Sections II.B.3.d and II.B.3.f of this document for further detail).

An initial assessment of projected visibility impairment in 2028, considering growth and on-the-books controls, can be a useful piece of information for states to consider as they decide how to select sources for control measure evaluation. Such modeling is optional, but EPA understands that many RPOs and/or states plan to do such modeling to help states understand visibility impairment at Class I areas. Both the emissions inputs and modeling results can provide states with an understanding of the major contributors to visibility impairment.<sup>26</sup>

Overall, this section provides guidance on the types of information that may be useful for selecting a set of sources and the flexibilities a state has when considering this information. This section begins in Section II.B.3.a of this document with a discussion of how a state determines which pollutants (i.e., which forms of particulate matter and its precursors) it will consider in selecting sources for analysis of control measures. Section II.B.3.b of this document then addresses the technical question of how a state can estimate visibility impacts from individual

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<sup>25</sup> Instead of quantifying and considering visibility impacts for the purpose of selecting sources to analyze, a state may also develop and consider a reasonable surrogate metric for such impacts (e.g., the emissions/distance relationship, etc.). Surrogate metric here refers to a quantitative metric that is correlated to some degree with visibility impacts as they would be estimated via air quality modeling. For example, a simple surrogate metric is emissions in tons/year divided by distance to an affected Class I area in kilometers, also known as Q/d. A more complicated surrogate metric could also, for example, incorporate information from wind trajectories and daily light extinction budgets. *See* Section II.B.3.b of this document.

<sup>26</sup> Such modeling can also provide states with an early indication of whether their SIP might need to include a robust demonstration that no further additional emission reduction measures are reasonable to include in its LTS. *See* Section II.B.7.c of this document.

sources or source sectors. Section II.B.3.c of this document contains guidance on how a state can use estimates of visibility impacts to select sources that will be evaluated to determine emission control measures necessary to make reasonable progress at the Class I areas affected by the state. Visibility impacts are not the only factor that can be considered in selecting sources for evaluation; Sections II.B.3.d through II.B.3.f of this document discuss other factors a state may wish to consider. Section II.B.3.g addresses some considerations that apply only to wildland fire. Section II.B.3.h of this document summarizes the Rule's requirements to document the basis of the source selection step.

#### **a) Determining which pollutants to consider**

The direct and precursor pollutants that can impair visibility include sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), fine and coarse particulate matter (PM), volatile organic compounds (VOC), and ammonia. When selecting sources for analysis of control measures, a state may focus on the PM species that dominate visibility impairment at the Class I areas affected by emissions from the state and then select only sources with emissions of those dominant pollutants and their precursors. Also, it may be reasonable for a state to not consider measures for control of the remaining pollutants from sources that have been selected on the basis of their emissions of the dominant pollutants.

IMPROVE data and a 2018 EPA technical guidance document on tracking visibility progress<sup>27</sup> can be used directly to develop light extinction budgets (i.e., pie charts showing the light extinction contribution from each ambient PM species) for single days and average budgets for the 20 percent most anthropogenically impaired days. These budgets reveal the relative importance of each PM species to total light extinction. As such, they may be used by a state to focus its SIP development work on the pollutants that matter most.

However, we recommend that the fact that a PM species accounts for only a small percentage of *total* light extinction not be used, by itself, to eliminate the species from subsequent analysis, because a large portion of the total light extinction may be due to natural source impacts, even on the 20 percent most anthropogenically impaired days. In that scenario, the percentage contribution to total light extinction by an individual PM species may give a false sense of the role of that PM species relative to anthropogenic light extinction. For example, organic mass by carbon (OMC) light extinction might be dominant in the IMPROVE data for a western Class I area on the average of the 20 percent most anthropogenically impaired days, even though days heavily affected by fires will tend not to be included in the 20 percent most anthropogenically impaired days. This may cause sulfate to account for only a small percentage of total light extinction. However, it could be clear that most of the OMC is natural and that sulfate dominates *anthropogenic* light extinction. In this situation, we recommend that a state consider SO<sub>2</sub> sources and SO<sub>2</sub> control measures.

To systematically address situations such as this, it is possible to use the recommended data analysis approach in the 2018 technical guidance document on tracking visibility progress cited above to develop an extinction budget specifically for anthropogenic impairment at a Class I area for each day, and to then calculate an average anthropogenic extinction budget for the 20 percent most anthropogenically impaired days. Source attribution modeling using a photochemical grid

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<sup>27</sup> Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program, U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018.

model with good performance for all PM species may also be used to develop extinction budgets for anthropogenic light extinction. Using photochemical models and emissions projections, it may be possible to construct light extinction budgets that have a 2028 perspective, and then use those prospective budgets to determine the most important contributors to anthropogenic light extinction. Typically, the state with a Class I area takes the lead on developing the total and/or anthropogenic versions of the light extinction budgets for the Class I area (if a multistate organization or a federal agency has not already provided this information), but the implications of the light extinction budgets apply to all states with sources that contribute to impairment at the area.

In the first implementation period, many states eliminated VOC and ammonia emissions from consideration based on the expectation that anthropogenic VOC emissions make only a small contribution to visibility impairment and that formation of nitrate and sulfate PM is most effectively reduced by reducing emissions of NO<sub>x</sub> and SO<sub>2</sub> rather than by anthropogenic emissions of ammonia. EPA believes that, in general, this would also be a reasonable approach for the second implementation period. EPA recommends that states that eliminated NO<sub>x</sub>, SO<sub>2</sub>, or PM emissions from full consideration in the first implementation period consider this determination again in the second implementation period.

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

#### **b) Estimating baseline visibility impacts for source selection**

This section offers recommendations on developing and applying air quality model-based visibility impact estimates. Section II.B.3.c of this document offers recommendations on applying these visibility impact estimates in the source-selection step. Modeling guidance for setting RPGs is available in other EPA guidance documents,<sup>28</sup> as well as in Section II.B.6. of this document. The recommendations in this section are primarily directed at estimating source impacts on visibility using an air quality model. They focus mainly on analysis, modeling, and identification of sources for subsequent evaluation of potential control measures.

##### *Modeling-based estimates of visibility impacts versus surrogates for visibility impacts*

While most of the discussion in this section presumes the use of an air quality model to obtain estimates of source or source category visibility impacts, the Regional Haze Rule does not require states to develop estimates of individual source or source category visibility impacts, or to use an air quality model to do so. Reasonable surrogate metrics of visibility impact may be used instead. Many, but not all, of the concepts and recommendations here and in Section II.B.3.c of this document can also be applied when selecting sources based on surrogate metrics.

States may find some or all of the following techniques useful for examining source impacts for the second implementation period.

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<sup>28</sup> Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, July 2017 (<https://www.epa.gov/air-emissions-inventories/air-emissions-inventory-guidance-implementation-ozone-and-particulate>); Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM<sub>2.5</sub>, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 ([https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling\\_Guidance-2018.pdf](https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf)).

- 1) Emissions divided by distance (Q/d)
- 2) Trajectory analyses
- 3) Residence time analyses
- 4) Photochemical modeling (zero-out and/or source apportionment)

The above techniques are listed in order from the least complicated (Q/d) to the most complicated and resource intensive (photochemical modeling). Each technique has advantages and disadvantages. In general, the simple techniques are easy to implement, but do not provide detailed information. The more sophisticated techniques provide detailed information on PM and PM species impacts, but they are more resource intensive. States may use other reasonable techniques.

**Emissions divided by distance (Q/d).** A state may use a source's annual emissions in tons divided by distance in kilometers between the source and the nearest Class I area (often referred to as Q/d) as a surrogate for source visibility impacts, along with a reasonably selected threshold for this metric. This metric is a less reliable indicator of actual visibility impact because it does not consider transport direction/pathway, dispersion and photochemical processes, or the particular days that have the most anthropogenic impairment due to all sources. Therefore, it is recommended that use of this technique be limited to source selection for the purpose of developing a list of sources for which a state may conduct a four-factor analysis.

In the most simple implementation of Q/d, metrics and thresholds<sup>29</sup> can be defined on the basis of the sum of emissions of all visibility-impairing pollutants. However, since primary PM and PM precursors may have very different visibility impacts per ton of emissions, it may be best to evaluate Q/d metrics on an individual pollutant basis. Additionally, since the magnitude of Q/d may vary considerably when total emissions are considered versus emissions of individual primary PM and precursor pollutants, appropriate pollutant-specific Q/d thresholds for primary PM and each precursor may need to be considered as part of the analysis. Metrics may also be defined based on only the pollutants that have not been previously eliminated as insignificant contributors.

Section II.B.3.h of this document discusses how a state should document the technical basis of its source selection approach including the basis for any visibility impact thresholds used.

**Trajectory analyses.** Additional information can be provided through trajectory analyses which examine the wind direction on individual days. Directionality of upwind sources and source categories can be established by examining sources that tend to emit pollutants upwind of Class I areas on individual days. Back trajectories start at the Class I area and go backwards in time to examine the path that emissions took to get to the Class I areas. Back trajectory analyses are typically run for 72 hours or more, using multiple starting heights and multiple start times throughout the day of interest.

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<sup>29</sup> The magnitude of previously used Q/d thresholds were closely tied to the specific modeling tools and metrics used in the first implementation period. Therefore, states' previously selected Q/d thresholds may or may not be appropriate to use when selecting sources for analysis of reasonable progress measures in the second implementation period. Thresholds should be evaluated and justified based on the facts and circumstances of the available technical information for the second implementation period.

**Residence time analyses.** A more sophisticated trajectory-based analysis technique combines emissions, ambient PM data, and trajectory information. This approach selects sources for analysis using an approach that gives each point source a score that takes into account the source's emissions, the daily values of light extinction at a Class I area, the distance between the source and a Class I area, and the relative frequency with which wind trajectories indicate that each source is upwind of the IMPROVE monitoring site.<sup>30</sup> Large sources of pollutants contributing more to light extinction that are near the Class I area and frequently upwind of the Class I area will get higher scores. This type of approach does not quantify daily visibility impacts, but a state can focus on certain days, for example the 20 percent most anthropogenically impaired days, by generating trajectories only for those days. The score will not be in units of light extinction or deciviews. States using this approach would select the sources that are above a chosen score threshold. If the details of this approach are reasonably chosen, a state may use this type of approach for selecting sources in the second implementation period.

**Photochemical modeling.** In addition to these non-modeling techniques, states can also use a photochemical model to quantify source or source sector visibility impacts. In 2017, EPA finalized revisions to 40 CFR Part 51 Appendix W, Guideline on Air Quality Models.<sup>31</sup> As part of that action, EPA stated that photochemical grid models should be the generally preferred approach for estimating source impacts on secondary PM concentrations. The existing SIP Modeling Guidance<sup>32</sup> provides recommendations on model setup, including selecting air quality models, meteorological modeling, episode selection, the size of the modeling domain, the grid size and number of vertical layers, and evaluating model performance. EPA Regional offices are available to provide an informal review of a modeling protocol before a state or multijurisdictional organization begins the modeling.

The SIP Modeling Guidance focuses on the process for calculating RPGs using a photochemical grid model. The SIP Modeling Guidance does not specifically discuss using photochemical modeling outputs for estimating daily light extinction impacts for a single source or source sector. However, the approach on which the SIP Modeling Guidance is based can also be applied to a specific source or set of sources. The first step in doing this is to estimate the impact of the source or set of sources on daily concentrations of PM species.

The simplest approach to quantifying daily PM species impacts with a photochemical grid model is to perform brute force “zero-out” model runs, which involves at least two model runs: one “baseline” run with all emissions and one run with emissions of the source(s) of interest removed

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<sup>30</sup> See section 5.6 of *Final Report - Technical Support Document for VISTAS Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans*, Environ International Corp., March 11, 2009. VISTAS narrowed its focus to sulfate impacts prior to this step of its analysis, and consequently considered only the sulfate contribution to light extinction along with SO<sub>2</sub> emissions.

<sup>31</sup> Final Rule: Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter, 82 FR 5182, January 17, 2017.

<sup>32</sup> Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM<sub>2.5</sub>, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 ([https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling\\_Guidance-2018.pdf](https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf)).

from the baseline simulation.<sup>33</sup> The difference between these simulations provides an estimate of the PM species impact of the emissions from the source(s).

An alternative approach to quantifying daily PM species impacts is photochemical source apportionment. Some photochemical models have been developed with a photochemical source apportionment capability, which tracks emissions from specific sources or groups of sources and/or source regions through chemical transformation, transport, and deposition processes to estimate the apportionment of predicted PM<sub>2.5</sub> species concentrations.<sup>34</sup> Source apportionment can “tag” and track emissions sources by any combination of region and sector, or by individual source. For example, PM species impacts can be tracked from any particular source category in the U.S., or from individual states or counties. Individual point sources can also be tracked.

#### *Selection of days to consider*

Some possible methods of selecting sources to analyze for control measures are based on information about daily visibility impacts which can vary from day to day. For example, this is the case if wind trajectories or photochemical modeling is used. Because the impact of emissions from a source can vary daily, the determination of whether a source will be selected for analysis of emission control measures may involve a decision about which day or days’ impacts to use in making the determination.

The Regional Haze Rule requires that the 20 percent most anthropogenically impaired days be used for purposes of setting reasonable progress goals. The 20 percent most anthropogenically impaired days are also used for tracking progress (along with the 20 percent clearest days). Considering source sector impacts averaged across the 20 percent most anthropogenically impaired days when selecting sources will focus attention on the sectors that have the greatest consistent impacts on visibility on days that now have the most impairment.<sup>35</sup>

If a state selects sources for analysis of control measures using annual emissions or annual emissions divided by the distance to a Class I area (i.e., Q/d), it is not necessary for the state to select a particular set of days to focus on at this step in SIP development.

Alternative metrics may be more appropriate when examining visibility impacts from individual sources. Depending on wind direction and other meteorological factors, emissions from a single source may not always or frequently impact a particular Class I area. But there may be individual day visibility impacts that may be important to consider. This is particularly important for modeled demonstrations that provide a single year of meteorological regimes at a given Class I area which may not capture days over the broader multi-year period where a source may be

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<sup>33</sup> Cohan, D. S., Hakami, A., Hu, Y. T., and Russell, A. G., (2005), Nonlinear response of ozone to emissions: Source apportionment and sensitivity analysis, *Environ. Sci. Technol.*, 39, 6739–6748.

<sup>34</sup> Kwok, R. H. F., Napelenok, S. L., & Baker, K. R., (2013), Implementation and evaluation of PM<sub>2.5</sub> source contribution analysis in a photochemical model. *Atmospheric Environment*, 80, 398-407. Kwok, R., K. Baker, S. Napelenok, and G. Tonnesen. Photochemical grid model implementation and application of VOC, NO<sub>x</sub>, and O<sub>3</sub> source apportionment. Geoscientific Model Development. Copernicus Publications, Katlenburg-Lindau, Germany, 8:99-114, (2015); User's Guide Comprehensive Air Quality Model with Extensions Version 6.50, [www.camx.com](http://www.camx.com). Ramboll Environment and Health, Novato CA, 2018.

<sup>35</sup> If these emissions from these sources are reduced as a result of measures in the LTS for the second implementation period, other types of days may become the 20 percent most anthropogenically impaired, which may lead to the selection of other sources in later implementation periods.

contributing to visibility impairment. Therefore, for individual sources, the maximum daily visibility impact on all days may be a more meaningful metric. However, a state may also consider the values of visibility impacts on other days. Sections II.B.3.c and II.B.3.d of this document further discuss how a visibility impact metric can be developed based on the days selected by the state.

#### *Delta deciviews versus light extinction in inverse megameters*

The Regional Haze Rule requires that baseline period visibility conditions, current visibility conditions, natural conditions, and the URP be expressed in deciviews, calculated based on total light extinction. Deciview units were also typically used in BART and reasonable progress analyses in the first implementation period. For the purposes of selecting sources for analysis of control measures in the second implementation period, a state has the flexibility to express visibility impacts in units of light extinction (inverse megameters,  $Mm^{-1}$ ) or in deciviews. The two approaches will rank sources by visibility impact in the same order, but the deciview approach involves additional computational complexities that can make public understanding more difficult. Therefore, EPA recommends that states use light extinction units, rather than deciviews, for quantifying baseline visibility impacts.

States that decide to use a deciview approach to quantifying source-specific visibility impacts may want to consider the following and are encouraged to discuss an appropriate approach with their EPA Regional office. Quantifying baseline source impacts in units of deciviews involves the “delta deciview” approach.<sup>36</sup> A state should not evaluate the visibility impact of a source by only using a delta deciview value for which the current visibility condition, or the projected 2028 condition, is the “background” in the delta deciview calculation. The “background” value should be the light extinction due to natural sources only. EPA recommends the use of the natural conditions values included in the December 2018 Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program as the background value.<sup>37</sup> The values provided in the December 2018 guidance document are for the 20 percent most impaired days and are in deciview units but can be converted to light extinction units. Additionally, the logic of expressing delta deciview impacts relative to natural visibility conditions was articulated in the preamble to the final rule that established the BART Guidelines.<sup>38</sup>

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<sup>36</sup> Under the delta deciview approach, the daily visibility impact of a source should be the difference between the daily visibility that would exist if the source were the only anthropogenic source, added to the natural background, and the daily visibility that would exist due to the natural background alone.

<sup>37</sup> EPA spoke to using natural visibility as background values during the first implementation period, and the Eighth Circuit upheld this approach in *North Dakota v. EPA*, 730 F.3d 750, 764-766 (8th Cir. 2013).

<sup>38</sup> The preamble stated, “Using existing conditions as the baseline for single source visibility impact determinations would create the following paradox: the dirtier the existing air, the less likely it would be that any control is required. This is true because of the nonlinear nature of visibility impairment. In other words, as a Class I area becomes more polluted, any individual source’s contribution to changes in impairment becomes geometrically less. Therefore, the more polluted the Class I area would become, the less control would seem to be needed from an individual source. We agree that this kind of calculation would essentially raise the ‘cause or contribute’ applicability threshold to a level that would never allow enough emission control to significantly improve visibility. Such a reading would render the visibility provisions meaningless, as EPA and the States would be prevented from assuring ‘reasonable progress’ and fulfilling the statutorily-defined goals of the visibility program. Conversely, measuring improvement against clean conditions would ensure reasonable progress toward those clean conditions.” 70 FR 39124, July 6, 2005.

### *Selection of emissions information when estimating visibility impacts (or surrogates) for source selection purposes*

All of the techniques described above require estimates of source emissions. Generally, we recommend that states use estimates of 2028 emissions (resolved by day and hour, as appropriate) to estimate visibility impacts (or related surrogates) when selecting sources, rather than values of recent year emissions. By doing so, sources that are projected on a reasonable basis to cease or greatly reduce their operations or to install much more effective emissions controls by 2028 may be removed from further consideration early in the SIP development process, which can reduce analytical costs. Generally, the estimate of a source's 2028 emissions is based at least in part on information on the source's operation and emissions in a representative historical period. However, there may be circumstances under which it is reasonable to project that 2028 operations will differ significantly from historical emissions. Enforceable requirements are one reasonable basis for projecting a change in operating parameters and thus emissions; energy efficiency, renewable energy, or other such programs where there is a documented commitment to participate and a verifiable basis for quantifying any change in future emissions due to operational changes may be another. A state considering using assumptions about future operating parameters that are significantly different than historical operating parameters should consult with its EPA Regional office.

If a state uses a value for emissions in an earlier year, we recommend the state consider whether emissions have appreciably changed (or will change) between the earlier year, the current period, and the projected future year (2028). It is especially important to consider whether source emissions have increased or are likely to increase in the future compared to earlier emissions values.

### *Use of actual emissions versus allowable emissions*

Generally, we recommend that a reasonably projected actual level of source operation in 2028 be used to estimate 2028 actual emissions for purposes of selecting sources for control measure analysis. Source operation during a historical period can inform this projection, but temporary factors that suppressed or bolstered the level of operation in the historical period should be considered, along with factors that indicate a likely increase or decrease in operation. *See* the SIP Emissions Inventory Guidance for more details.<sup>39</sup> Questions about projecting 2028 emissions may be directed to EPA Regional offices.

### *Choice of emission inventory year for source selection purposes*

Whether a state is selecting sources based on forecasts of 2028 actual emissions or on actual source emissions in a historical period, the state should be aware of the relevant requirement of section 51.308(f)(2)(iii) of the Regional Haze Rule.

Section 51.308(f)(2)(iii) of the Regional Haze Rule requires a state to document, among other things, the emissions information on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress, and requires that this

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<sup>39</sup> Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. May 2017. Available at: [https://www.epa.gov/sites/production/files/2017-07/documents/ei\\_guidance\\_may\\_2017\\_final\\_rev.pdf](https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf)



emissions information must include, but need not be limited to, information on emissions in a year at least as recent as the most recent year for which the state has submitted emission inventory information to EPA as part of the triennial National Emissions Inventory process (referred to here as the “most recent NEI submission year”).<sup>40</sup> The requirements of section 51.308(f)(2)(iii) of the Regional Haze Rule can be met if a state uses information from the most recent NEI submission year from the start of its SIP development if its SIP development schedule allows. The state would not be required to use the same information as it has submitted to the NEI, and instead may use more recently updated or corrected emissions information for that year or a more recent year. However, in some cases, a state may have begun its modeling and source selection using emissions information for an earlier year.

While it may not be reasonable for a state to revise its work to entirely rely on emissions information from the most recent NEI submission year at the source selection step, the state should consider updating its source selection work in whole or in part to incorporate this more recent information if it is reasonable to do so.

Another reasonable option for a state to satisfy the requirement in section 51.308(f)(2)(iii) of the Regional Haze Rule, when it is not possible to fully incorporate the more recent information in all the source selection analysis steps, may be to verify in a reasonable manner, for some or all of the state’s sources, that there are no important differences between the older and new emissions information that can be expected to affect the selection of sources. In most cases, the state should focus on source sectors that may have experienced increased emissions in the most recent NEI or new sources that did not exist in the previous inventory.

For example, if a state has used 2014 information to select sources (directly, or as the starting point for a 2028 projection) and if for that state the most recent NEI submission year is 2017, the state could compare the 2014 and 2017 emissions for some sources. If 2017 emissions from a source the state has not selected are lower than its 2014 emissions, the state could reasonably conclude that using the 2017 information would not have resulted in the source being selected if the analysis had been based only on 2017 emissions information. If 2017 emissions are higher than 2014 emissions, further consideration of that source may be appropriate.

In addition, another way the state could use information from the most recent NEI submission year is to use such information in the subsequent analysis of control options, to the extent it is reasonable to do so. *See* section II.B.4 of this document.

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<sup>40</sup> However, if a state has made a submission for a new inventory year in the period 12 months prior to submission of the SIP, the State may use the inventory year of its prior submission. This 12-month period serves as a grace period, so that a state does not have to incorporate the newest emissions information into its SIP revision late in the process of its adoption at the state level. As explained in Section II.B.6 of this document, there is no Regional Haze Rule requirement as what emission inventory year is used as the starting point to project the 2028 RPGs. Also, in preliminary modeling to project 2028 visibility levels with already adopted emission controls or to attribute current or 2028 visibility impairment to sources or groups of sources for purposes of general understanding of the regional haze situation, neither of which is a requirement of the rule, a state may use any inventory year as the starting point. Note that, as discussed in Section II.B.6 of this document, there is no Regional Haze Rule requirement for which year emissions inventory is used as the starting point for modeling to project 2028 visibility levels, to attribute current or 2028 visibility impairment to sources, or to project the 2028 RPGs.

### c) Using estimates of visibility impacts to select sources

A state choosing to consider visibility impacts may consider any of a number of possible visibility impact metrics. A state may define a reasonable value of its chosen metric to serve as a threshold, such that only sources with impacts above this threshold are selected for analysis of control measures. As already stated, EPA recommends that visibility metrics and thresholds be put in terms of inverse megameters of light extinction.

#### *Selecting a threshold level for visibility impacts for selecting sources*

The appropriate threshold for selecting sources may reasonably differ across states and Class I areas due to varying circumstances. In setting a threshold, a state may consider the number of emissions sources affecting the Class I areas at issue, the magnitude of the individual sources' impacts, and the amount of anthropogenic visibility impairment at the Class I area.<sup>41</sup> Various visibility metrics may be appropriate to use, but metric thresholds should be developed in consideration of the magnitude of an individual metric at an individual Class I area. For example, if modeling a full year, the maximum modeled day visibility impact may be several orders of magnitude larger than the impact averaged across the 20 percent most impaired days. There may be other approaches and factors that would be appropriate for states to use when setting and explaining such a threshold. If quantifiable, the amount of anthropogenic visibility impairment from a source can be compared to the total anthropogenic impairment at a Class I area. For example, a threshold of "X"  $\text{Mm}^{-1}$  may be reasonable if current visibility impairment is mostly due to relatively few sources with impacts above "X"  $\text{Mm}^{-1}$ , but may not be reasonable if current visibility impairment is due to a large number of sources each with impacts below "X"  $\text{Mm}^{-1}$ . A similar concept applies if source-specific visibility impacts are expressed as percentages of total light extinction.

Whatever threshold is used, the state must justify why the use of that threshold is a reasonable approach, *i.e.*, why it captures a reasonable set of sources of emissions to assess for determining what measures are necessary to make reasonable progress.<sup>42</sup> For example, it may be difficult to show reasonableness of a threshold set so high that an uncontrolled or lightly controlled source that is one of the largest contributors to anthropogenic light extinction at a Class I area is excluded.

#### *Visibility impacts at multiple affected Class I areas*

EPA recommends that a state preparing a SIP submission repeat the source selection step from the perspective of each Class I area in the state and each Class I area in another state that may be affected by emissions from the state. For example, for the first Class I area to be considered, we recommend that the impacts from sources in the state preparing a SIP submission be compared to the threshold to select the sources that will be subject to analysis of control measures. This

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<sup>41</sup> The BART Guidelines recommended that states choose a deciview value of up to 0.5 for visibility impacts as the threshold for subject-to-BART determinations, and provide justification for the choice of threshold. Most states used 0.5 dv. However, the magnitude of the previously recommended subject-to-BART threshold was closely tied to the specific modeling tools and metrics recommended in the BART Guidelines, as well as to the purpose and structure of the BART provisions. Therefore, states' previously selected subject-to-BART thresholds are not necessarily appropriate thresholds to use when selecting sources for analysis of reasonable progress measures in the second implementation period.

<sup>42</sup> Section 51.308(f)(2)(i) of the Regional Haze Rule.

process would then be repeated for other Class I areas. In this analysis, it does not matter in which state a Class I area is located. A source within the state preparing the SIP submission that is identified for analysis of control measures because of its potential visibility impacts on any one of the Class I areas, whether in that state or another state, would then be brought forward for analysis of control measures. If impacts at different areas are estimated using different approaches or if different thresholds are used for different Class I areas, this must be explained in the presentation of the results, including the state's rationale for using different approaches or thresholds.

#### **d) Option to consider the four statutory factors when selecting sources**

EPA expects that, typically, states are more likely to select sources based on visibility impacts and not consider the four reasonable progress factors (i.e., cost of compliance, remaining useful life, time necessary for compliance, and energy and non-air quality environmental impacts) until after a source is selected. However, in some cases, a state may already have information on one or more of the four reasonable progress factors at the time of source selection. If so, the state may consider that information at the source-selection stage. In particular circumstances, that information may indicate that it is reasonable to exclude the source for evaluation of emission control measures because it is clear at this step that no additional control measures would be adopted for the source. The source-selection step is intended to add flexibility and discretion to the state planning process – ultimately, the state decides which sources to consider for reasonable progress.

EPA anticipates the two most common factors that states may decide to use at the source-selection step are remaining useful life and cost of compliance. The following paragraphs provide specific guidance about how a state could consider already-available information on these two reasonable progress factors at the source selection step if a state so chooses. Should a state be interested in using information on the remaining factors, EPA recommends the state discuss with their EPA Regional office. A state opting to not bring a source or sources forward for further analysis based on preliminary information regarding the statutory factors should explain its basis for concluding that no additional control measures would be reasonable to require.

*Remaining useful life* – If a source is expected to close by December 31, 2028, under an enforceable requirement, a state may consider that to be sufficient reason to not select the source at the source selection step. Given the combination of the time required for EPA to review and act on the SIP<sup>43</sup> and the reasonable time required for the source to come into compliance once EPA has approved the emission limit, the remaining time period in which additional controls, if required, could provide a visibility benefit prior to shutdown of the source would be very limited. The year 2028 is not a bright line for these considerations, so a state may be able to justify not selecting a source for analysis of control measures because there is an enforceable requirement for the source to cease operation by a date after 2028. The remaining useful life factor is closely related to the cost of compliance factor, with the calculated cost of compliance generally increasing with a shorter remaining useful life based on the decreasing amortization period. Therefore, it may be more challenging for a state to reasonably use a shorter remaining useful

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<sup>43</sup> As explained in Section II.B.5.e of this document, it is acceptable for a state to conceptually “start the clock” on the reasonable time for compliance with a new measure included in a SIP at the date of EPA approval of the SIP emission limit anticipated under the statutory deadlines.

life as the basis for not selecting sources the further away the enforceable shutdown date gets from 2028.

*Cost of compliance* – States choosing to consider the cost of compliance at the source selection step should do so on the basis of complete cost data; that is, estimated values of capital costs, annual operating and maintenance costs, annualized costs, and cost per ton of emission reductions that have been prepared according to EPA’s Control Cost Manual. Such cost estimates could be either generic or source-specific; if generic estimates are used, EPA recommends that states use EPA’s Control Cost Manual generic cost estimates. Generally, we expect that states will not have complete cost data for the full range of potentially applicable control measures at the source-selection step; that is, that states will not yet have fully developed the information outlined above. If complete cost data is available, states should consult with their EPA Regional office regarding its consideration at the source-selection step.

#### **e) Option to consider the five additional factors when selecting sources**

Section 51.308(f)(2)(iv) of the Regional Haze Rule requires that when developing its LTS, a state must consider five additional factors. However, the rule does not specify that these factors be considered at any particular step of developing the LTS. As part of meeting the requirement to consider these five additional factors, a state may take one or more of them into consideration when it selects sources. If a state decides not to consider these factors during source selection, the subsequent analysis of control options will provide another opportunity for states to meet the rule requirement to consider the five factors. These five factors are described in more detail below.

##### *Section 51.308(f)(2)(iv)(A) of the Regional Haze Rule -Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment*

This factor is inherently considered in the process of source selection if visibility impacts are used to select sources, since those visibility impacts depend on emission reductions from ongoing air pollution control programs. This factor is also considered if a state does not select certain sources based on those sources already having effective emissions controls in place. *See*, also, the discussion of the fifth of these factors, below.

##### *Section 51.308(f)(2)(iv)(B) of the Regional Haze Rule -Measures to mitigate the impacts of construction activities*

If the state has selected construction activities as a source category for an analysis of control measures, it will consider this factor in that analysis. That analysis and the decision about what measures are necessary for reasonable progress are the subjects of Sections II.B.4 and II.B.5 of this document.

If the state does not select construction activities as a source category for an analysis of control measures, the SIP must nevertheless indicate how the state has considered measures to mitigate the impacts of construction activities. For example, if the IMPROVE-based light extinction budget or the modeling-based extinction budget indicates a small impact for all coarse PM, or if modeling indicates a small impact from construction dust, the state can show it has considered this factor by explicitly concluding that measures to mitigate dust due to construction activities would have only small visibility benefits. If a state has existing measures in place to mitigate the

impacts of construction activities, a state could present that information in the SIP to address this requirement.

*Section 51.308(f)(2)(iv)(C) of the Regional Haze Rule -Source retirement and replacement schedules*

This factor can be considered in selecting sources for control measure analysis, for example by not selecting sources that have an enforceable commitment to be retired or replaced by 2028.

*Section 51.308(f)(2)(iv)(D) of the Regional Haze Rule -Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs*

The fire-related recommendations in Section II.B.3.g of this document explain ways in which a state can consider this factor.

*Section 51.308(f)(2)(iv)(E) of the Regional Haze Rule -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*

A projection of the anticipated net effect on visibility progress that will occur during the second implementation period due to projected changes in emissions from sources within the state can be a useful consideration in determining which in-state sources to select. That is, the amount of net visibility progress during the second period that will result from in-state emission reductions due to ongoing air pollution control programs, including source measures the state has adopted to meet CAA requirements other than for visibility protection, and any measures that the state has already adopted or will adopt into its LTS for the second implementation period, can be a consideration when determining which sources to include in the analysis of controls measures in the second implementation period. As an early, optional step in developing its SIP, a state may project 2028 visibility conditions assuming only already adopted controls. National-scale modeling runs conducted by EPA may be useful in this process.

The fact that visibility conditions in 2028 will be on or below the URP glidepath is not a sufficient basis by itself for a state to select no sources for analysis of control measures; however, the state may consider this information when selecting sources. *See* the final rule preamble discussion of this subject at 82 FR 3078 at 3093 and 3099-3100, January 10, 2017. Rather, that fact would serve to demonstrate that, after a state has gone through its source selection and control measure analysis, it has no “robust demonstration” obligation per 40 CFR 51.308(f)(3)(ii)(A) and/or (B).

**f) Sources that already have effective emission control technology in place**

It may be reasonable for a state not to select an effectively controlled source. A source may already have effective controls in place as a result of a previous regional haze SIP or to meet another CAA requirement. In general, if post-combustion controls were selected and installed fairly recently (*see* illustrative examples below) to meet a CAA requirement, there will be only a low likelihood of a significant technological advancement that could provide further reasonable emission reductions having been made in the intervening period. If a source owner has recently made a significant expenditure that has resulted in significant reductions of visibility impairing pollutants at an emissions unit, it may be reasonable for the state to assume that additional

controls for that unit are unlikely to be reasonable for the upcoming implementation period. A state that does not select a source or sources for the following or any similar reasons should explain why the decision is consistent with the requirement to make reasonable progress, i.e., why it is reasonable to assume for the purposes of efficiency and prioritization that a full four-factor analysis would likely result in the conclusion that no further controls are necessary. This consideration forms the basis of the following examples, which are intended to illustrate (in a non-exhaustive fashion) scenarios in which EPA believes it may be reasonable for a state not to select a particular source for further analysis:

- New, reconstructed, or modified emission units subject to and complying with New Source Performance Standards (NSPS) that were promulgated or reviewed since July 31, 2013,<sup>44</sup> and that regulate emissions of visibility-impairing pollutants, on a pollutant-specific basis.<sup>45</sup> The statutory considerations for setting NSPS are similar to the four statutory factors for reasonable progress, and it is unlikely that new control measures will be available, or that previously known control measures can be made significantly more effective, beyond those relied on in up-to-date NSPS.
- New, reconstructed, or modified emission units that went through Best Available Control Technology (BACT) review under the Prevention of Significant Deterioration (PSD) program or Lowest Achievable Emission Rate (LAER) review under the nonattainment new source review program for major sources and received a construction permit on or after July 31, 2013,<sup>46</sup> on a pollutant-specific basis. The statutory considerations for selection of BACT and LAER are also similar to, if not more stringent than, the four statutory factors for reasonable progress.
- For the purpose of SO<sub>2</sub> control measures, an EGU that has add-on flue gas desulfurization (FGD) and that meets the applicable alternative SO<sub>2</sub> emission limit of the 2012 Mercury Air Toxics Standards (MATS) rule<sup>47</sup> for power plants. The two limits in the rule (0.2 lb/MMBtu for coal-fired EGUs or 0.3 lb/MMBtu for EGUs fired with oil-derived solid fuel) are low enough that it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these limits would conclude that even more stringent control of SO<sub>2</sub> is necessary to make reasonable progress.<sup>48</sup>

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<sup>44</sup> The CAA requires EPA to review, and if necessary, revise NSPS every 8 years. Therefore, NSPS promulgated or reviewed since July 31, 2013, will be up-to-date as of the due date for the second implementation period regional haze SIPs.

<sup>45</sup> Unless otherwise indicated, “on a pollutant-specific basis” here and elsewhere in this section means that the consideration is relevant only for the pollutant that was the target of the control installed on or after the indicated date. If the source emits other pollutants that impair visibility, the source would still be brought forward for analysis of control measures for those other pollutants. For example, an EGU may participate in a trading program for SO<sub>2</sub> and NO<sub>x</sub>, while being subject to a requirement to install new controls for PM emissions under an up-to-date NSPS. It may be reasonable to not select that source for analysis of additional control measures for PM, but to select it for analysis of additional SO<sub>2</sub> and NO<sub>x</sub> controls.

<sup>46</sup> BACT and LAER determinations are informed by, among other things, applicable NSPS, which the CAA requires to be reviewed on 8-year cycles. Therefore, a BACT or LAER determination within 8 years of SIP submission for the second implementation period should be consistent with up-to-date, effective, and reasonable control measures.

<sup>47</sup> 77 FR 9309, February 16, 2012. The MATS rule has been revised since 2012, but those revisions have not affected the alternative SO<sub>2</sub> emissions limits.

<sup>48</sup> EGUs without FGD are not included in this category because an analysis of control measures for an EGU that has elected to meet the standard of 0.2 or 0.3 lb/MMBtu through use of a particular type of coal rather than a scrubber

- For the purpose of PM control measures, a unit that is subject to and complying with<sup>49</sup> any CAA section 112 National Emission Standard for Hazardous Air Pollutants (NESHAP) or CAA section 129 solid waste combustion rule, promulgated or reviewed since July 31, 2013, that uses total or filterable PM as a surrogate for metals or has specific emission limits for metals. The NESHAPs are reviewed every 8 years and their emission limits for PM and metals reflects at least the maximum achievable control technology for major sources and the generally available control technology for area sources. It is unlikely that an analysis of control measures for a source meeting one of these NESHAPs would conclude that even more stringent control of PM is necessary to make reasonable progress.
- For the purpose of SO<sub>2</sub> and PM control measures, fuel combustion units<sup>50</sup> that combust only pipeline natural gas per enforceable requirements.<sup>51</sup> Add-on SO<sub>2</sub> controls or more stringent limits on the sulfur content of the natural gas would very likely not be determined to be necessary to make reasonable progress.
- For the purposes of SO<sub>2</sub> and PM control measures, fuel combustion units that are restricted to using only distillate fuel with a sulfur content of no more than 0.0015 percent, per enforceable requirements. This is the sulfur limit for ultra-low sulfur diesel fuel for mobile sources and is also the lowest limit adopted or advocated by any state for stationary sources using distillate fuel.
- For the purposes of SO<sub>2</sub> and NO<sub>x</sub> control measures, a combustion source (e.g., an EGU or industrial boiler or process heater) that, during the first implementation period,<sup>52</sup> installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), on a pollutant-specific basis.<sup>53</sup>

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could result in a determination that a scrubber is necessary to make reasonable progress. The alternative MATS SO<sub>2</sub> limit is not available to EGUs without FGD.

<sup>49</sup> States should consult with their EPA Regional offices to address situations in which a NESHAP has been promulgated at the time of SIP development and has a compliance date for existing sources at some point during the second implementation period.

<sup>50</sup> Stationary fuel combustion units are units that combust solid, liquid, or gaseous fuel, generally for the purposes of producing electricity, generating steam, or providing useful heat or energy for industrial, commercial, or institutional use, or reducing the volume of waste by removing combustible matter. Stationary fuel combustion sources include, but are not limited to, boilers, simple and combined-cycle combustion turbines, engines, incinerators, and process heaters.

<sup>51</sup> This does not include units that physically can and are permitted to also use liquid fuel, for example for startup or during a gas supply interruption. However, such a source can be excluded if it is required to use only liquid fuels that meet the sulfur limits in the next two category descriptions.

<sup>52</sup> For purposes of this consideration, the first regional haze implementation period started when SIPs were due on December 17, 2007.

<sup>53</sup> While a 90 percent control effectiveness is used in this example, we expect that any FGD system installed to meet CAA requirements since 2007 would have an effectiveness of 95 percent or higher. This does not apply to a source that has recently achieved a higher level of control efficiency without the installation of a control system, for example if it has merely increased the flow rate of a reagent. In such a situation, the four factors should be fully considered. The outcome may still be that the current level of control is the measure that is necessary to make reasonable progress.

- BART-eligible units that installed and began operating controls to meet BART emission limits for the first implementation period, on a pollutant-specific basis.<sup>54</sup> Although the Regional Haze Rule anticipates the re-assessment of BART-eligible sources under the reasonable progress Rule provisions,<sup>55</sup> if a source installed and is currently operating controls to meet BART emission limits, it may be unlikely that there will be further available reasonable controls for such sources. However, states may not categorically exclude all BART-eligible sources, or all sources that installed BART controls, as candidates for selection for analysis of control measures.

#### **g) Special considerations for wildland fires**

Consistent with the regional haze program’s focus on reducing anthropogenic impacts, the rule provides for considerations for wildland fires and wildland prescribed fires as part of the SIP planning process.

##### *Wildland wildfires*

The Regional Haze Rule defines wildland wildfires to be natural events.<sup>56</sup> Accordingly, emissions from wildland wildfires are considered to be natural emissions that contribute to natural reductions in visibility, but these emissions do not contribute to “visibility impairment.” Thus, the Regional Haze Rule does not obligate states to select, or even to consider selecting, wildland wildfires for analysis of control measures.

##### *Wildland prescribed fire*

Consistent with the December 2018 Executive Order on Promoting Active Management of America’s Forests, Rangelands, and other Federal Lands to Improve Conditions and Reduce Wildfire Risk, EPA supports the promotion of healthy and resilient forests, rangelands, and other Federal lands by actively managing them through partnerships with states, tribes, communities, non-profit organizations, and the private sector. This active forest management includes the use of prescribed fires. For the purpose of the regional haze program, EPA considers prescribed fires to be anthropogenic sources of visibility-impairing pollutants.<sup>57</sup> Section 51.308(f)(2)(iv)(D) of the Regional Haze Rule requires that as they develop their LTSs, all states must consider basic smoke management practices<sup>58</sup> for prescribed fire used for agricultural and wildland vegetation

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<sup>54</sup> This consideration may be relevant for sources that installed and began operating controls that satisfied the BART requirement on or after December 17, 2007, but is not applicable to BART-eligible units that were determined to be not subject to BART, BART-subject units for which the BART requirement was met in whole or in part by emission reductions at other units as part of a better-than-BART alternative or trading program, units that were not subject to BART that contributed emission reductions for a better-than-BART alternative or trading program, and sources for which existing controls were determined to be BART. A state might, however, have a different, reasonable basis for not selecting such sources for control measure analysis.

<sup>55</sup> 40 CFR 51.308(e)(5) states that “After a State has met the requirements for BART or implemented an emissions trading program or other alternative measure that achieves more reasonable progress than ... BART, BART-eligible sources will be subject to the requirements of paragraphs (d) and (f) of this section.”

<sup>56</sup> 40 CFR 51.301.

<sup>57</sup> See 40 CFR 51.301; 82 FR at 3105-09.

<sup>58</sup> Basic smoke management practices are types of actions that the manager of a prescribed fire can take to reduce the amount of smoke generated by a prescribed fire and/or to reduce public exposure to the smoke that is generated. These practices are described in more detail in a publication issued by federal agencies that use prescribed fire as part of their land management programs. See USDA Forest Service and Natural Resources Conservation Service,



management purposes and smoke management programs.<sup>59</sup> However, EPA notes there are many ways to consider such practices and programs and the rule does not require states to incorporate them into their regional haze SIPs (82 FR 3108).

There are many ways that a state can give consideration to basic smoke management practices and smoke management programs. In particular, a state does not need to shoehorn prescribed fire, basic smoke management practices, and smoke management programs into a formal source selection analysis or a formal analysis of control measures. Relatedly, the 2017 Regional Haze Rule revisions allow states to propose an adjustment to the endpoint of the URP glidepath to account for wildland prescribed fire impacts (Section 51.308(f)(1)(vi) of the Regional Haze Rule). States with substantial wildland prescribed fire may consider the option to propose adjusting the endpoint of the URP glidepath to account for prescribed fire impacts. Consistent with section 51.308(f)(1)(vi) of the Regional Haze Rule, the URP adjustment may be an important tool used to accommodate use of wildland prescribed fire when such fires are conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species, and during which appropriate basic smoke management practices are applied.

The following are possible paths that a state can take. EPA is not offering a recommended path, as the situations among the states and Class I areas are too varied for a general recommendation. A state may consult with the EPA Regional office about its particular situation. As states consider whether to adopt new measures that might affect the ability of land managers to use prescribed fire, they may consider both the effectiveness of their smoke management programs in protecting visibility and the benefits of wildland prescribed fire for ecosystem health and public safety. Consultation with the FLMs and state forestry agencies may be useful during this consideration.

*A path that may be appropriate when there is no contribution, or only little contribution, from prescribed fires.* If in-state prescribed fires do not contribute significantly to visibility impairment on the 20 percent most anthropogenically impaired days at any of the Class I areas to which the state's sources contribute, the state may meet the fire-relevant requirements of the Regional Haze Rule simply by stating and supporting this conclusion. This can be done, for example, by observing that there is very little in-state prescribed fire activity and/or observing that light extinction at the Class I area(s) in question due to elemental and organic carbon has been at levels that are not consistent with a significant impact from biomass burning generally or from prescribed fire specifically. Emission inventory values for prescribed fire emissions may also be cited and compared to other sources in the state and/or neighboring states. In this situation, the state will have implicitly considered basic smoke management practices and smoke management programs even though it has not selected prescribed fire for analysis of control measures.

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Basic Smoke Management Practices Tech Note, October 2011.  
[http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1046311.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046311.pdf).

<sup>59</sup> The term "smoke management program" is used within the fire management community to refer to a multi-participant program that seeks to influence or regulate both whether and when prescribed fires are conducted and, typically, the smoke management practices employed during a prescribed fire.

*Paths that may be appropriate when there is significant contribution from prescribed fire.* If in-state prescribed fires contribute significantly to visibility impairment<sup>60</sup> at one or more Class I areas, the state may show it has considered basic smoke management practices and smoke management programs in any reasonable way, which might or might not involve an analysis of control measures. The state can show that it has reasonably considered basic smoke management practices by explaining that basic smoke management practices are required by state law or are promoted as voluntary measures, or by showing that the large majority of prescribed fire managers already employ these practices. Section 51.308(f)(2)(iv)(D) of the Regional Haze Rule does not require or recommend a state incorporate its existing requirements into the SIP as enforceable measures.

To show reasonable consideration of smoke management programs, a state that has an existing smoke management program (or that is adopting a smoke management program) can describe the program and note that it has benefits for visibility, while considering how the use of prescribed fire on wildland can benefit ecosystem health and public health from the air quality impacts of wildfires. A state that does not have an existing smoke management program (and that chooses not to adopt one) can show that it has reasonably considered smoke management programs by explaining why it is not adopting a smoke management program. EPA recommends that states consult with the FLMs, state forestry agencies, and other wildland managers/owners when considering smoke management programs.

#### **h) Documentation of the source selection process and result**

Consistent with section 51.308(f)(2)(iii) of the Regional Haze Rule, which requires a state to document the technical basis, including modeling, monitoring, cost, engineering, and emissions information, on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress in each Class I area it affects, a state must document the basis of its source selection step. Additionally, section 51.308(f)(2)(i) of the Regional Haze Rule requires a SIP to include a description of the criteria the state has used to determine the sources or groups of sources it evaluated for potential controls. EPA recommends that this documentation and description provide both a summary of the state's source selection approach and a detailed description of how the state used technical information to select a reasonable set of sources for an analysis of control measures for the second implementation period. The state could include qualitative and quantitative information such as: the basis for the visibility impact thresholds the state used (if applicable), additional factors the state considered during its selection process, and any other relevant information. While there is no requirement for states to select a certain number of sources or percentage of visibility impairing pollutants emitted for four-factor analysis in any given implementation period. It may be helpful, however, for states to

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<sup>60</sup> Source apportionment or sensitivity modeling may be a useful way to determine whether prescribed fire is a significant contributor to visibility impairment. The EPA's Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program (EPA-454/R-18-010, December 2018) describes EPA's recommended methods on two technical aspects of regional haze SIP development: 1) the visibility tracking metrics and 2) estimating international anthropogenic impacts and optional adjustment to the URP glidepath. The method to adjust the URP glidepath for international anthropogenic impacts can also be used to propose adjustments to the glidepath for prescribed fire impacts. EPA will provide modeling results that may be useful to states interested in making such URP glidepath endpoint adjustments. Additionally, to the extent that credible projections of international anthropogenic emissions and/or prescribed fire burning activity are available, whether increases or decreases, it may be appropriate to calculate glidepath adjustments based on future year emissions estimates. States are encouraged to consult with their EPA Regional Office during the development of any proposed approach.

provide an assessment of the portion of sources and/or emissions selected in order to demonstrate that the source selection process employed has achieved a reasonable result.

The above section provided information regarding the source selection step, a step typically undertaken by states during regional haze SIP development. Some of the above concepts will also be discussed as part of the control analysis step (step 4), which is discussed in the next section.

#### **4. Step 4: Characterization of factors for emission control measures**

The characterization of relevant factors for emission control measures for a source or group of sources is a necessary step before those factors can be taken into consideration when determining what measures are necessary to make reasonable progress. States will typically characterize most of the relevant factors only after selecting sources for further analysis, because one function of the source selection step is to reduce the number of sources for which the full set of relevant factors will be characterized. This section will discuss the four statutory factors and other considerations relevant to this part of the analysis.

Section 169A(g)(1) of the CAA lists four factors that must be taken into consideration in determining reasonable progress and states are required to consider those four factors (i.e., cost of compliance, time necessary for compliance, energy and non-air environmental impacts, and remaining useful life of the source) in the control analysis step. The visibility benefit of an emission reduction measure is not listed as a required factor, but neither the CAA nor the Regional Haze Rule prohibits a state from considering visibility benefits when it determines what emission control measures are required for a source to make reasonable progress at a Class I area. Therefore, a state may consider the visibility benefits of potential control measures when determining what is necessary to make reasonable progress.<sup>61</sup> A state may also consider one or more of the five additional factors listed in section 51.308(f)(2)(iv) of the Regional Haze Rule. All these factors are addressed in this section.

The Regional Haze Rule has very few specific requirements for how factors are to be characterized. States have flexibility to decide how to characterize the factors, but a state's approaches must be reasonable. Additionally, Section 51.308(f)(2)(iii) of the Regional Haze Rule requires that the SIP must document how the state has done its analysis. Technically sound facts regarding costs, visibility benefits, and other factors will help states make well-reasoned decisions in step 5 that are also technically sound. Before it can characterize the relevant factors for potential emission control measures for the selected sources, a state must determine which emission controls measures it will consider. Accordingly, that is the first topic addressed in this section.

##### **a) Determining which emission control measures to consider**

The first step in characterizing control measures for a source is the identification of technically feasible control measures for those pollutants that contribute to visibility impairment.

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<sup>61</sup> The introduction to Section II.B.4.g of this document provides more discussion on the consideration of the visibility benefits of emission control measures in the determination of what measures are necessary to make reasonable progress.

Identification of these measures does not create a presumption that one of them will be determined to be necessary to make reasonable progress.

A state must reasonably pick and justify the measures that it will consider, recognizing that there is no statutory or regulatory requirement to consider all technically feasible measures or any particular measures. A range of technically feasible measures available to reduce emissions would be one way to justify a reasonable set.

Once a set of potential control measures have been identified for a selected source, the state must characterize (i.e., collect data on and apply) the four statutory factors that will be considered in selecting the measure(s) for that source that are necessary to make reasonable progress. A state planning to consider visibility benefits will also need to characterize those benefits.

#### *Control measures versus emissions limitations*

The analysis of control measures focuses on possible physical or operational changes at the source that may reduce emissions of visibility impairing pollutants. Once such a change or set of such changes has been determined to be necessary to make reasonable progress based on the four statutory factors and other factors, the state will need to address what emission limitation or limitations are appropriate to ensure that the physical or operational change or changes are implemented by the source. That topic is addressed in Section II.B.5.e of this document.

#### *Baseline control scenario for the analysis*

Typically, a state will not consider the total air pollution control costs being incurred by a source or the overall visibility conditions that would result after applying a control measure to a source but would rather consider the incremental cost and the change in visibility associated with the measure relative to a baseline control scenario. The projected 2028 (or the current) scenario can be a reasonable and convenient choice for use as the baseline control scenario for measuring the incremental effects of potential reasonable progress control measures on emissions, costs, visibility, and other factors. A state may choose a different emission control scenario as the analytical baseline scenario. Generally, the estimate of a source's 2028 emissions is based at least in part on information on the source's operation and emissions during a representative historical period. However, there may be circumstances under which it is reasonable to project that 2028 operations will differ significantly from historical emissions. Enforceable requirements are one reasonable basis for projecting a change in operating parameters and thus emissions; energy efficiency, renewable energy, or other such programs where there is a documented commitment to participate and a verifiable basis for quantifying any change in future emissions due to operational changes may be another. A state considering using assumptions about future operating parameters that are significantly different than historical operating parameters should consult with its EPA Regional office.

#### *Examples of types of emission control measures states may consider*

States have the flexibility to reasonably determine which control measures to evaluate, and the following is a list of example types of control measures that states may consider:

- Emission reductions through improved work practices.
- Retrofits for sources with no existing controls.
- Upgrades or replacements for existing, less effective controls.

- Year-round operation of existing controls.
- Fuel mix with inherently lower SO<sub>2</sub>, NO<sub>x</sub>, and/or PM emissions. States may also determine that it is unreasonable to consider some fuel-use changes because they would be too fundamental to the operation and design of a source.
- Operating restrictions on hours, fuel input, or product output to reduce emissions.
- Energy efficiency and renewable energy measures that could be applied elsewhere in a state to reduce emissions from EGUs.<sup>62</sup>
- Basic smoke management practices and smoke management programs for agricultural or wildland prescribed fires.

*The state must consider the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress in the Class I area*

This requirement of section 51.308(f)(2)(ii)(B) of the Regional Haze Rule applies to all states affecting a given Class I area. To give adequate consideration to this factor, a state must (1) consult with other contributing states to learn what measures they have identified as being necessary to make reasonable progress and then (2) consider those measures for any similar in-state sources that it has already selected for analysis of control measures. This provision of the rule does not require the state to select additional sources for analysis of control measures if its source selection process is otherwise reasonable; however, a state should explain why its source selection process arrived at a different result.

A state that has determined that certain measures for its sources are or are not necessary to make reasonable progress will have developed technical analyses on costs and other factors that may be informative to other states. Such analyses could be shared and discussed during interstate consultation.

#### **b) Selection of emissions information for characterizing emissions-related factors**

After a state has identified potential control measures for further evaluation, the state will generally need to use emissions information to estimate the emission reductions from the potential control measures. This information on emission reductions feeds into the estimation of visibility benefits and into calculations of cost effectiveness. EPA's recommendations in this area are similar to the recommendations in Section II.B.3.b of this document regarding how emissions information is selected and used as part of using baseline visibility impacts in the process of selecting sources. As described in Section II.B.3.b of this document, a state should be sure to address in its analysis of control measures the relevant requirement of section 51.308(f)(2)(iii) of the Regional Haze Rule at either the source-selection step or the analysis of control measures step.

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<sup>62</sup> EPA understands that some states may be interested in exploring such measures for their second implementation period SIPs, which is generally appropriate. We suggest such states discuss the measures and programs and their incorporation into the SIP with their EPA Regional office. Additionally, the following resources may be helpful: Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans - [https://www.epa.gov/sites/production/files/2016-05/documents/eeremanual\\_0.pdf](https://www.epa.gov/sites/production/files/2016-05/documents/eeremanual_0.pdf); EPA's website with energy efficiency and renewable energy resources - <https://www.epa.gov/energy-efficiency-and-renewable-energy-sips-and-tips>; AVOIDED Emissions and geneRATION Tool (AVERT) - <https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert>.

### **c) Characterizing the cost of compliance (statutory factor 1)**

After a state has identified the potential control measures for evaluation and the emissions information to be used in that evaluation, a state begins collecting information to characterize the statutory factors. This subsection covers the first statutory factor – the cost of compliance – and provides EPA’s recommendations for determining the costs of the identified control measures.

For purposes of the second implementation period, EPA recommends that states follow the source type-relevant recommendations in the EPA Air Pollution Control Cost Manual<sup>63</sup> that are stated in the manual as applying to cost estimates in a permitting context.<sup>64</sup> Cost calculation spreadsheets consistent with the Control Cost Manual recommendations are available for several types of emission control systems. Also, the final revised chapter 2 of section 1 of the Control Cost Manual provides useful conceptual background and recommendations for the analytical approach to cost estimation, including the use of the “overnight method” for accounting for capital investments.

EPA recommends that states follow the recommendations in the Control Cost Manual to facilitate apples-to-apples comparisons of different controls options for the same source, and comparisons across different sources. This type of consistency is helpful to support informed public comment and reasoned decision-making. Also, state-level review of source-prepared cost estimates and EPA review of SIPs will be more efficient if sources and states follow the recommendations in the Control Cost Manual. A state that is following the recommendations in the Control Cost Manual can rely on a simple reference to the manual as documentation of approach and its rationale for that approach. We recommend that a state that deviates from these principles and factors explain how its alternative approach is appropriate.

In some instances, the installation of a new control may involve the removal or discontinuation of existing emission controls. Such situations present special issues and states should consult with their Regional offices. For example, it may be appropriate to account for the salvage value of dismantled equipment. We recommend against including sunk capital costs the cost of compliance for any scenario.

EPA recommends that a state express the costs of compliance in terms of a cost/ton of emissions reduction metric, and that the emission reduction used as the denominator for the cost/ton metric be the annual tons of reduction from implementation of the additional measure. The state must document the cost analyses within the SIP. States with questions on cost analysis may want to consult with their EPA Regional offices.

#### *Use of generic cost estimates for particular types of control equipment*

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<sup>63</sup> EPA is engaged in a long-term process to update portions of the Control Cost Manual. A project plan describing the scope and schedule for this update effort is available at [https://www3.epa.gov/ttn/ecas/docs/cost\\_manual\\_timeline\\_2016-08-04.pdf](https://www3.epa.gov/ttn/ecas/docs/cost_manual_timeline_2016-08-04.pdf). As draft or final updated chapters are available, we recommend that states follow the recommendations in those future updates rather than in the 6<sup>th</sup> Edition. Final revised chapters and cost calculation spreadsheets are posted at <https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution>. Draft revised chapters are announced in the *Federal Register* when available for public comment and can be obtained from EPA Docket No. EPA-HQ-OAR-2015-0341 at <https://www.regulations.gov>.

<sup>64</sup> Recommendations presented in the Control Cost Manual as applying to EPA rulemakings and other national analyses are not relevant to SIP development.

For a streamlined approach or when site-specific cost estimates are not available, states may quantify control costs for particular types of control equipment by using generic cost estimates or estimation algorithms. The Control Cost Manual is EPA's recommended source of generic cost estimates and algorithms.

The Control Strategy Tool, or CoST, is a software tool that states can use as a source of cost estimates primarily for non-EGUs. CoST replaces AirControlNet, which EPA previously used to estimate the costs of some national rules affecting non-EGUs. CoST is best applied for estimates of average or typical control costs rather than costs for a particular source. Even so, the cost estimates for individual control measures, which are found in the control measure documentation for CoST, may be useful to identify relevant ranges or generate preliminary estimates. The cost equations and control measure database documentation reports for CoST at <https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-analysis-modelstools-air-pollution#control-strategy-tool> are useful references.

#### *Use of source-specific cost estimates*

We recommend that states exercise caution before accepting or rejecting controls based on generic cost estimates if adequately documented source-specific estimates are available or can be prepared. When considering source-specific estimates, states may place greater weight on vendor quotes that represent an offer to enter a contract at that price than on estimates without an offer to enter a contract. When using source-specific cost estimates, such estimates should provide sufficient detail to allow for a complete review of the estimate. We recommend that a state that intends to be following the Control Cost Manual recommendations assess whether the vendor or expert's treatment of costs is consistent with the principles in the Control Cost Manual (e.g., contingency adjustments, cost escalation, etc.). Adjustments or exclusions may achieve this consistency if it is not already present. If a cost quote or opinion prepared for one source is adopted or adapted to another source, EPA recommends the state explain in its SIP submittal how the source for which the original cost estimate was made is relevant to estimating the cost of compliance for the source in question.

As part of meeting the requirement of the Regional Haze Rule for the state to document the cost and engineering information on which the State is relying to determine the emission reduction measures that are necessary to make reasonable progress (40 CFR 51.308(f)(2)(iii)), every source-specific cost estimate used to support an analysis of control measures must be documented in the SIP. If information about a source has been asserted to be confidential, we recommend the state consult with its EPA Regional office regarding whether such confidentiality is appropriate and allowed under the CAA and if so how it can be reconciled with the need for adequate documentation of the basis for the SIP.

#### **d) Characterizing the time necessary for compliance (statutory factor 2)**

Characterizing the second statutory factor – the time necessary for compliance – involves estimating the time needed for a source to comply with a potential control measure. Prior experiences with the planning and installation of new emission controls of the same or similar type at similar sources may be helpful when estimating how much time a particular source will reasonably need for compliance. However, we recommend that states consider source-specific factors, if available and appropriate. Section II.B.5.e of this document discusses setting compliance deadlines, once the time needed for compliance is determined.

A state should justify the time needed to install a control measure as being reasonable. Unlike for BART, there is no requirement in the Regional Haze Rule that emission control measures that have been determined to be necessary to make reasonable progress must be installed as expeditiously as practicable or within 5 years of EPA's approval of the SIP revision.

#### **e) Characterizing energy and non-air environmental impacts (statutory factor 3)**

Characterizing information about the third statutory factor – the energy and non-air environmental impacts – generally involves assessing the impacts of a control measure on the energy consumed by a source. Non-air environmental impacts can include the generation of wastes for disposal and impacts on other environmental media, such as nearby water bodies.

##### *Energy impacts*

The Control Cost Manual provides advice on estimating energy requirements or savings for some situations. States may consider energy impacts in terms of kilowatt-hours or mass of fuels used. We recommend that states focus their analysis on direct energy consumption at the source rather than indirect energy inputs needed to produce raw materials for the construction of control equipment. Prior experience with energy impacts of the same or similar emission control measure at similar sources can also be informative.

##### *Non-air environmental impacts*

When there are significant potential non-air environmental impacts, characterizing those impacts will usually be very source- and place-specific. Other EPA guidance intended for use in environmental impact assessments under the National Environmental Policy Act may be informative, but not obligatory to follow, in this task.<sup>65</sup>

#### **f) Characterizing remaining useful life of the source (statutory factor 4)**

Characterizing the final statutory factor – remaining useful life of the source – involves collecting information on how long the source will remain in operation and the lifetime of potential control measures. Depending on the type of source, there may be different considerations, as discussed in the following subsection.

##### *Remaining useful life for stationary sources*

Generally, states can consider this factor by considering the useful life of the control system rather than the source. Typically, the remaining useful life of the source itself will be longer than the useful life of the emission control system under consideration unless there is an enforceable requirement for the source to cease operation sooner. The presumption is that after the end of the useful life of the emission control system, it will be replaced by a like system. Thus, annualized compliance costs are typically based on the useful life of the control equipment rather than the life of the source, unless the source is under an enforceable requirement to cease operation.

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<sup>65</sup> A collection of EPA policies and guidance related to the National Environmental Policy Act is available at <https://www.epa.gov/nepa/national-environmental-policy-act-policies-and-guidance>. See, for example, Considering Ecological Processes in Environmental Impact Assessments, July 1999.



If a control measure involves only operational changes, there typically will be only small capital costs, if any, and the useful life of the source or control equipment will not materially affect the annualized cost of the measure.

In the situation of an enforceable requirement for the source to cease operation before the end of the useful life of the controls under consideration, a state may use the enforceable shutdown date as the end of the remaining useful life. To the extent such a requirement is being relied upon for a reasonable progress determination, the measure would need to be included in the SIP and/or be federally enforceable. See 40 CFR 51.308(f)(2). The length of the useful life is the number of years prior to the shutdown date during which the new emission control would be operating, taking into account the date that a possible new emission limit under consideration for the LTS would become enforceable if it were adopted into the SIP and the time normally needed for EPA to review and approve such emission limit. In the situation where an enforceable shutdown date does not exist, the remaining useful life of a control under consideration should be full period of useful life of that control as recommended by EPA's Control Cost Manual. *See* Section II.B.5.e of this document.

The Control Cost Manual provides guidance on typical values for the useful life of various emission control systems used at stationary sources. EPA recommends that states use these values.

#### *Remaining useful life for reciprocating internal combustion engines*

Some mobile and stationary reciprocating internal combustion engines are retired and replaced, or substantially rebuilt, on fairly short intervals in the normal course of business (or personal) use. For engines, states may rely on a reasonable estimate of when the engine will be replaced or rebuilt even if there is no enforceable requirement to replace or rebuild the engine (or to cease operation).

When considering whether new or enhanced add-on emission controls for a particular engine or a category of engines are necessary for reasonable progress, the state may take into account how the anticipated replacement or rebuild schedule will affect how long the add-on controls would reduce emissions from the engine(s). The add-on emission control equipment might be reusable on the new or rebuilt engine. However, an anticipated engine replacement or rebuild might instead preclude continued use of the new add-on emission control system, for example if the new engine would be purchased with comparable or superior emission controls already in place.

#### **g) Characterizing visibility benefits**

A state choosing to consider visibility benefits along with the four statutory factors will need to estimate the visibility benefits of possible control measures for sources that are selected for analysis of control measures. Like visibility impacts, visibility benefits will vary from day to day due to variations in emissions and meteorology. This section discusses how a state can quantify daily visibility benefits and form a single-valued metric to summarize those daily benefits.

While visibility impacts and/or potential benefits may be considered in the source selection step in order to prioritize the examination of certain sources for further analysis of emission control measures, visibility benefits may again be considered in that control analysis to inform the determination of whether it is reasonable to require a certain measure. While the recommendations in Section II.B.3.b of this document are primarily directed at estimating daily

baseline impacts on visibility and summary metrics for those impacts for the purpose of source selection, those recommendations are also relevant to the estimation of daily visibility benefits from emission control measures and metrics for those benefits.

EPA recommends that visibility benefits of a control measure be expressed in units of light extinction (inverse megameters,  $Mm^{-1}$ ), for the reasons explained in Section II.B.3.b of this document. EPA also recommends that, if a state is going to consider a metric defined as the cost per unit of visibility benefit, it use light extinction units in the denominator for quantifying visibility benefits. When visibility benefits are expressed in units of light extinction, the visibility benefit can be calculated from modeling results in multiple ways.

The modeled visibility benefit can be calculated by making two air quality modeling runs, with and without the measure assumed to be in place. However, if a source's impacts on ambient PM species under a particular emissions scenario have been determined through source apportionment/attribution, it will generally be appropriate to estimate the reductions in ambient PM species due to pollutant-specific emission reductions from the source by assuming a proportionality between source emissions of the relevant species precursor and the ambient PM species concentration. The PM species concentrations with and without the measure can then be used to estimate the light extinction benefit of the measure.

A large set of values for daily visibility benefits can be summarized by one or more metrics. A state may use the average of the daily visibility benefits on the 20 percent most anthropogenically impaired days as its visibility benefit metric. However, as noted in Section II.B.3.b of this document, alternative metrics may be more appropriate when examining visibility impacts from individual sources. Modeled demonstrations that provide a single year of meteorological regimes at a given Class I area may not capture days over the broader multi-year period where a source may be contributing to visibility impairment. Therefore, for individual sources, the maximum daily visibility impact on all days may be a more meaningful metric. A state may instead, or also, consider the maximum daily visibility benefit within the most impaired days or the values of visibility benefits on other days.

The discussion in Section II.B.3.b of this document regarding the use of a natural background light extinction value when expressing baseline source impacts in delta deciview units applies as well when expressing visibility benefits in delta deciview units. In particular, a state should not use the difference in projected 2028 visibility with and without the control measure (e.g., the effect on the 2028 RPG) as its only characterization of the visibility benefit of the measure.<sup>66</sup>

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<sup>66</sup> In the first implementation period and in comments submitted in the rulemaking for the 2017 revisions to the Regional Haze Rule, some stakeholders stated that, when considering visibility benefits as one of the five statutory factors for BART or when considering visibility along with the four statutory factors for reasonable progress, it is appropriate to consider only the amount by which a potential measure or combination of measures would change the projected overall ambient deciview index value as of the end of the implementation period, i.e., the incremental effect on the RPGs. The Rule requires RPGs to represent the expected actual overall visibility conditions at the end of the implementation period. The RPGs are values that will be compared in a progress report to actual visibility conditions. In contrast, estimates of the visibility benefits of emission control measures have a different purpose, which is to help guide decisions on the control of individual sources. In this context, relying solely on a quantification of visibility benefits relative to "dirty background" (i.e., conditions with greater impairment than natural background visibility conditions) obscures the full potential benefits of control measures and makes it less likely that a measure would appear reasonable from a visibility benefit perspective. EPA has used a natural

In some instances, the installation of a new control may involve the removal or discontinuation of existing emission controls. Such situations present special issues about how to quantify emission reductions and visibility benefits. We recommend that states consult with their EPA Regional offices for advice on such special situations.

#### **h) Reliance on previous analysis and previously approved approaches**

To satisfy the requirement for documentation in section 51.308(f)(2)(iii) of the Regional Haze Rule, a state that is referencing and relying on a previous analysis could explain why it concludes that the previous analysis does not require an update. It may be appropriate for a state to rely on a previous BART analysis or reasonable progress analysis for the characterization of a factor, for example information developed in the first implementation period on the availability, cost, and effectiveness of controls for a particular source, if the previous analysis was sound and no significant new information is available. Nonetheless, a state must reasonably consider all new public comments about the previous factual information that are substantive and relevant.

#### **5. Step 5: Decisions on what control measures are necessary to make reasonable progress**

This section addresses how, once it has characterized relevant factors, a state makes decisions on what emission control measures for a source or group of sources are necessary to make reasonable progress for the second implementation period. As noted earlier, the regional haze program is an iterative program that provides states with flexibility to develop a cohesive strategy that demonstrates reasonable progress over time. This section makes recommendations consistent with this overarching principle. In rare instances, a state may be able to demonstrate, based on careful consideration of the relevant factors for its selected sources, that no additional measures are necessary to make reasonable progress in the second implementation period.

Importantly, this section assumes that the state will consider visibility benefits as part of the analysis. Section 51.308(f)(2)(i) of the Regional Haze Rule requires consideration of the four factors listed in CAA section 169A(g)(1) and does not mention visibility benefits.<sup>67</sup> However, neither the CAA nor the Rule suggest that only the listed factors may be considered. Because the

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background light extinction value when expressing baseline source impacts in delta deciview units in the North Dakota (77 FR 20894, April 6, 2012), Montana (77 FR 57864, September 18, 2012), Arizona (79 FR 52420, September 3, 2014), and Texas (81 FR 296, January 5, 2016) FIPs and partial disapprovals of North Dakota (77 FR 20894, April 6, 2012) and Texas (81 FR 296, January 5, 2016) SIPs that relied on modeling employing high-deciview ambient background conditions. This approach has been upheld by the Eighth Circuit. *North Dakota v. EPA*. 730 F.3d 750, 764-766 (8th Cir. 2013) (“Although the State was free to employ its own visibility model and to consider visibility improvement in its reasonable progress determinations, it was not free to do so in a manner that was inconsistent with the CAA. Because the goal of § 169A is to attain natural visibility conditions in mandatory Class I Federal areas, see 42 U.S.C. § 7491(a)(1), and EPA has demonstrated that the visibility model used by the State would serve instead to maintain current degraded conditions, we cannot say that EPA acted in a manner that was arbitrary, capricious, or an abuse of discretion by disapproving the State’s reasonable progress determination based upon its cumulative source visibility modeling.”)

<sup>67</sup> Section 51.308(f)(2)(iv) of the Regional Haze Rule also requires consideration of five listed additional factors in developing the LTS. While the fifth of these additional factors is the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the LTS, this is not the same as considering the visibility improvements that would result from implementation of a specific, additional measure under consideration in the context of the control analysis.

goal of the regional haze program is to improve visibility, it is reasonable for a state to consider whether and by how much an emission control measure would help achieve that goal. Likewise, it is reasonable that such information on visibility benefits be considered in light of other factors that may weigh for or against the control at issue. Such a balancing of outcomes is consistent with CAA section 169A(b)(2), which states that SIPs must contain elements as may be necessary to make reasonable progress towards meeting the national visibility goal. Thus, EPA interprets the CAA and the Regional Haze Rule to allow a state reasonable discretion to consider the anticipated visibility benefits of an emission control measure along with the other factors when determining whether a measure is necessary to make reasonable progress.

A state that chooses not to consider visibility benefits would decide on the basis of the four statutory factors whether it considers a particular measure to be necessary for reasonable progress. The state would not use the magnitude of the visibility benefit to justify rejecting the measure.<sup>68</sup>

Section II.B.5. of this document discusses the factors that EPA expects typically may influence the determination of whether an emission control measure is necessary to make reasonable progress (i.e., the cost of compliance and the visibility benefits). Sections II.B.5.b-d of this document discuss the remaining three statutory factors. Section II.B.5.e of this document discusses how a state establishes emission limits that correspond to the measures that have been determined to be necessary to make reasonable progress.

#### **a) Considering the cost of compliance and visibility benefits**

We anticipate that the outcome of the decision-making process by a state regarding a control measure may most often depend on how the state assesses the balance between the cost of compliance and the visibility benefits, with the other three statutory factors either being subsumed into the cost of compliance or not being major considerations.<sup>69</sup> Because we anticipate that the balance between the cost of compliance and the visibility benefits will be an important consideration in a state's decisions, the discussion in this section focuses on providing guidance on weighing the costs of compliance and visibility benefits. The other three statutory factors are discussed in Sections II.B.5.b (time necessary for compliance), Section II.B.5.c (energy and non-air quality environmental impacts), and Section II.B.5.d (remaining useful life) of this document.

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<sup>68</sup> It is not inconsistent for a state choosing this approach to have considered baseline visibility impacts when selecting sources for analysis of control measures, even though it has decided to not consider visibility benefits along with the four factors in determining what controls are necessary to make reasonable progress. Section II.B.3 of this document, which addresses the step in which the state would select the sources for which it will determine what measures are necessary to make reasonable progress, is applicable to all states.

<sup>69</sup> States will typically consider the remaining useful life of a source by annualizing the costs of compliance. States will typically consider the time necessary for compliance by setting a compliance deadline that provides a reasonable amount of time for the source to implement the measure. We anticipate that only in unusual situations will energy or non-air environmental impacts that cannot be incorporated into the costs of compliance be such significant considerations that they strongly influence the decision about the control measure under consideration. We emphasize that this is not a recommendation that a state give particular or extra weight to the cost factor and visibility benefits, but rather a prediction on our part of how states will view the factors. For a state that is not considering visibility benefits, we similarly anticipate that the outcome of the state's decision-making process will most often depend on the costs of compliance, with the other three statutory factors either being subsumed into the cost of compliance or not being major considerations.

A state should generally make control decisions that are reasonably consistent among and across sources within the state. Absent a thorough explanation, inconsistent control determinations are “the hallmark of arbitrary action.” *NPCA v. EPA*, 788 F.3d 1134, 1145 (9th Cir. 2015). When two sources are of a similar type and size and a certain common new emission control measure would have similar costs and visibility benefits when applied to each, consistency may be achieved by applying the measure to both if it is applied to either. Consistency is also an issue if two sources have the prospect of similar costs and visibility benefits for dissimilar measures that could be applied to each. Even if the costs and visibility benefits are different, consistency is an issue if the ratio of the two is similar for two sources.

#### *Metrics for compliance costs and visibility benefits*

The technical analyses described in Section II.B.4 of this document will typically produce estimated values of capital costs, annual operating and maintenance costs, annualized costs, and cost per ton of emission reductions, as well as multiple values for daily visibility benefits. As discussed in that section, a state may simplify this information by using summary metrics for the cost and visibility benefit factors. The summary metrics for cost and visibility benefits can be combined in a ratio to form a metric for cost per unit of visibility benefit.

If multiple Class I areas would experience visibility benefits from a control measure, we recommend that the state consider all of those benefits. Consideration of a supplemental metric equal to the sum of the selected visibility metric across the affected Class I areas (in addition to a metric expressing visibility benefits at individual Class I areas) is one possible approach.

#### *Use of decision thresholds*

A state may find it useful to develop thresholds for single metrics to organize and guide its decision-making. As the Ninth Circuit explained in *NPCA v. EPA*, 788 F.3d at 1142, the Regional Haze Rule does not prevent states from implementing “bright line” rules, such as thresholds, when considering costs and visibility benefits. However, the state must explain the basis for any thresholds or other rules (*see* 40 CFR 51.308(f)(2)). If a state applies a threshold for any particular metric to remove control measures from further consideration before all other relevant factors are considered, it should explain why its selected threshold is appropriate for that purpose, i.e., why its application is consistent with the requirement to make reasonable progress.

*Visibility benefits* – If a state uses a visibility benefit threshold to evaluate control measures, it must explain how its approach is consistent with the requirement to consider the statutory factors in making reasonable progress determinations. Additionally, EPA has previously explained that, because regional haze results from a multitude of sources over a broad geographic area, a measure may be necessary for reasonable progress even if that measure in isolation does not result in perceptible visibility improvement.<sup>70</sup>

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<sup>70</sup> *See* Response to Comment Document, Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017 at 268-69 (explaining that a measure may be necessary for reasonable progress even if it does not result in a perceptible visibility improvement because progress will require addressing many relatively small contributions to impairment); *see, also*, 77 FR 57864, 57883 (September 18, 2012) (citing 70 FR 39104, 39129 (July 6, 2005)) (perceptibility of visibility impairment is not dispositive in BART context “because regional haze is produced by a multitude of sources and activities which are located across a broad geographic area”).

*Cost/ton* – If a state applies a threshold for cost/ton to evaluate control measures, we recommend that the SIP explain why the selected threshold is appropriate for that purpose and consistent with the requirement to make reasonable progress. As explained below, a cost/ton metric and comparisons to the cost/ton values for measures that have been previously implemented may or may not be useful in determining the reasonableness of compliance costs.

EPA does not believe it is reasonable to solely use a threshold for the capital cost or annualized cost to determine that a measure is not necessary to make reasonable progress. Large capital costs considered in isolation may not provide complete information about the potential reasonableness of a measure; additionally, decisions to exclude control measures from consideration should also take into account relevant information for other factors.

*Cost/inverse megameter* – If a state uses a cost per unit of visibility benefit metric to evaluate control measures, EPA recommends the use of a cost/inverse megameter metric rather than a cost/deciview metric because the application of the deciview scale on a source- or measure-specific basis is complicated by the logarithmic nature of the deciview scale. When only one Class I area is affected by a measure under consideration, a state may calculate and consider the cost/inverse megameter metric for that one area. If multiple Class I areas would experience visibility benefits from a measure, a state may calculate and consider a metric defined as the annualized compliance cost divided by the sum of the light extinction benefit across these Class I areas. A state may use reasonable thresholds for these metrics as a way of considering the balance between compliance costs and visibility benefits.

#### *Consideration of past decisions regarding reasonable progress and other CAA requirements*

A state may consider in its analysis of control measures how it, other states, and EPA made reasonable progress decisions during the first implementation period and may consider final decisions already made in the second implementation period, if any. Consultation among states during the development of their SIPs will give states an early understanding of how other states are contemplating making their own decisions.

Past reasonable progress determinations may or may not have involved the balancing of compliance costs and visibility benefits as many states relied on BART decisions to also satisfy reasonable progress. As the program transitions away from the first implementation period, under which states had both BART and reasonable progress obligations, and proceeds into the second implementation period, under which states only have reasonable progress obligations, SIPs need to include a reasonable progress analysis that meets the requirements of the CAA and the implementing regulations. If a state is considering visibility benefits and is comparing its decisions with those of other states, comparisons between similar analysis approaches are likely to be the most helpful (i.e., comparisons amongst states that also considered visibility).

When comparing past decisions and current situations needing a decision, states may want to consider how both context and the use of different analytical methods and/or metrics may have influenced the quantification of factors on which past decisions were based. In addition, the cost impact and visibility benefits for a measure reported and considered by another state may have been relative to a particular analytical baseline scenario, and that this may affect the comparison between the cases. For example, a cost/ton value for SCR presented in a document prepared by one state may have been relative to uncontrolled NO<sub>x</sub> emissions, while a source in another state may already have some NO<sub>x</sub> controls in place.

When the cost/ton of a possible measure is within the range of the cost/ton values that have been incurred multiple times by sources of similar type to meet regional haze requirements or any other CAA requirement, this weighs in favor of concluding that the cost of compliance is not an obstacle to the measure being considered necessary to make reasonable progress. The state would then proceed to weigh the cost of compliance and the visibility benefits.<sup>71</sup> Where the cost/ton of a possible measure exceeds the historical range of cost/ton values, we recommend that the state not automatically conclude that the cost of compliance by itself makes the measure not necessary to make reasonable progress. Rather, the state may need to conduct further source-specific investigation before a conclusion can be reached. In comparing a cost/ton value associated with a past regulatory action and a cost/ton value developed more recently, we recommend a state consider whether the past value reflects the principles in the Control Cost Manual, and how the comparison is affected by changes in equipment and construction prices and operation and maintenance prices in the period between the dates on which the two values were developed.

#### *Separate consideration of sources in a group of sources*

It can be efficient for a state to consider a group of similar sources when determining what measures are necessary to make reasonable progress. However, if it is feasible to establish and enforce different requirements for specific sources or subgroups of sources, and if relevant factors can be quantified for specific sources or subgroups of sources, making a separate decision for each source or subgroup will help states make well-reasoned decisions. For source sectors in which sources are smaller and more numerous or for which specific information to characterize the relevant factors for each source is not available, it may not be possible to give separate consideration to the specifics of each source. The only practical choice may be to subject all the sources to a common requirement or to exclude them as a group. In such situations, we recommend that states conduct an aggregate assessment.

At a single source, we recommend that states separately assess units that can be controlled with separate equipment.

#### *Multiple control alternatives*

States may consider the incremental differences in cost and visibility benefits between the alternative control measures for a single source and may use an incremental version of the cost/ton and cost/inverse megameters metrics when doing so.

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<sup>71</sup> As already stated, we anticipate that the outcome of the decision-making process by a state regarding a control measure may most often depend on how the state assesses the balance between the cost of compliance and the visibility benefits, with the other three statutory factors either being subsumed into the cost of compliance or not being major considerations. A state that is not considering visibility benefits would not weigh visibility benefits and the cost of compliance. If the measure is not rejected as unreasonable based on the cost of compliance alone, it would be determined to be necessary for reasonable progress unless one or more of the other three factors makes it unreasonable.

## *Visitation*

We do not recommend the use of weighting of visitation, high or low, in protecting visibility in Class I areas. In addition, we believe that a state should not give less weight to protecting visibility in a given Class I area during times of the year with lower visitation.<sup>72</sup>

### **b) Time necessary for compliance**

While the CAA and the Regional Haze Rule require states to consider the time necessary for compliance when selecting emission control measures that are necessary to make reasonable progress, the time necessary for compliance factor enters the decision-making process in a different way than the other three statutory factors. While high compliance costs, adverse energy or non-air quality impacts, or a short remaining useful life may weigh in the direction of not including a particular control measure in the LTS, the time necessary for compliance does not present the same type of barrier. This is because the time perspective of the regional haze program is long and extends well beyond the time required to install and “shake down” any emission control system. It would be inconsistent with the regulation for a state to have selected a source for reasonable progress analysis and found that a control is reasonable from a cost, energy and non-air quality environmental impacts, remaining useful life, and visibility benefit perspective, but not require that control simply because the time frame for implementing it falls outside the regulatorily established implementation period. In considering the time necessary for compliance, if the State concludes that a control measure cannot reasonably be installed and become operational until after the end of the implementation period, the State must not consider this fact in determining whether the measure is necessary to make reasonable progress (40 CFR 51.308(f)(2)(i)).<sup>73</sup>

We recommend that states consider the time necessary for compliance as part of their determination of what compliance deadlines for selected control measures are reasonable, rather than as part of their determination whether to adopt the control measures in the first instance. In other words, the other three factors determine *how much* progress is reasonable, while the time necessary for compliance factor determines *when* that progress can be reasonably achieved. See Section II.B.5.e of this document for further discussion of setting compliance deadlines.

### **c) Energy impacts and non-air quality environmental impacts**

EPA recommends that states consider energy impacts by accounting for any increase or decrease in energy use at the source as part of the costs of compliance. Upstream energy impacts, like the energy used to produce construction materials, are already reflected in the price of those materials.

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<sup>72</sup> The 2005 BART rule preamble includes statements regarding visitation that do not apply to the reasonable progress analysis. Specifically, the 2005 BART rule preamble stated, “Other ways that visibility improvement may be assessed to inform the control decisions would be to examine distributions of the daily impacts, determine if the time of year is important (e.g. high impacts are occurring during tourist season), consideration of the cost-effectiveness of visibility improvements (i.e. the cost per change in deciview), using the measures of deciview improvement identified by the State, or simply compare the worst case days for the pre- and post-control runs.” This statement no longer represents EPA’s position on the subject of visitation.

<sup>73</sup> We anticipate this situation to arise only when a SIP is not submitted on time, or when a SIP is disapproved and a new plan is developed by the state or EPA closer to the end of the implementation period.



We expect that in most cases it will not be appropriate for states to take into account energy purchases by EGUs during outages for installation of pollution controls. EGUs typically can plan for pollution control installation during scheduled unit outages, when the unit would have been down anyway for other maintenance. Compliance deadlines can be set with consideration of such planned outages.

EPA recommends that states consider relevant non-air quality environmental impacts, such as water usage or waste disposal of spent catalyst or reagent, by accounting for them as part of the costs of compliance. The fact that a control measure would create liquid and solid waste that must be disposed of does not necessarily argue against that measure being determined to be necessary to make reasonable progress, particularly if the control measure has been applied to similar facilities elsewhere and the solid or liquid waste that will be generated is similar in character and quantity to that generated at those other facilities. On the other hand, in location-specific cases, the installation of a control measure may lead to adverse non-air quality environmental impacts. In these cases, states may consider such impacts separately from the costs of compliance when determining whether the measure is necessary to make reasonable progress.

States may also consider any beneficial non-air quality environmental impacts.

The CAA does not require states to consider air deposition impacts, including effects on water, soils, and vegetation, when determining reasonable progress.

#### **d) Remaining useful life**

Section II.B.4.f of this document discusses how a state determines the remaining useful life of a source and the useful life of new emission control systems. In most cases, EPA recommends that states consider remaining useful life by using it to calculate emission reductions, annualized compliance costs, and cost/ton values.<sup>74</sup>

We recommend that states interested in using the remaining useful life factor in another way contact the EPA Regional office.

#### **e) Establishing emission limitations, compliance schedules, and other measures necessary to make reasonable progress**

Section 51.308(f)(2) of the Regional Haze Rule requires SIPs to include the “enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress as determined pursuant to [51.308](f)(2)(i) through (iv).”<sup>75</sup> This provision requires SIPs to include enforceable emission limitations and/or other measures to address regional haze, deadlines for their implementation, and provisions to make the measures practicably enforceable including averaging times, monitoring requirements, and record keeping

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<sup>74</sup> Note, as stated in Section II.B.3.d of this document, if a source is certain to close by December 31, 2028 (or soon thereafter), under an enforceable requirement, a state can reasonably consider that to be sufficient reason to remove the source from further analysis and reasonable progress consideration.

<sup>75</sup> If a source is not selected for analysis of control measures, the LTS is not required to include emission limits for the source. In this situation, the state is not determining that any particular controls on the source are necessary or not necessary for reasonable progress. Rather, it is deferring a determination on that source until a later implementation period.

and reporting requirements. There is a considerable body of applicable EPA rules, EPA guidance, and EPA-approved state practices on the topic of practicably enforceable emission limits.<sup>76</sup> The regional haze program is implemented through SIPs, and the second implementation period SIPs must include the emission limits and other measures necessary to assure reasonable progress in order to comply with the applicable statutory and regulatory requirements.<sup>77</sup>

If a state determines that an in-place emission control at a source is a measure that is necessary to make reasonable progress and there is not already an enforceable emission limit corresponding to that control in the SIP, the state is required to adopt emission limits based on those controls as part of its LTS in the SIP via the regional haze second implementation period plan submission. The LTS can be said to include those controls only if the SIP includes emission limits or other measures (with associated averaging periods and other compliance program elements) that effectively require the use of the controls. If the current SIP includes emission limits and other measures that would not ensure the continued use of that technology with good operating practices, then the limits and compliance program elements in the LTS must be revised via the regional haze second implementation period plan submission. Inclusion in the SIP makes the emission limits permanent (meaning they cannot be subsequently revised without an EPA-approved SIP revision) and federally enforceable.

A source that has been selected for analysis of emission control measures may have recent actual emissions below its permitted levels, for example due to the voluntary use of a cleaner fuel with a favorable current price, and the state may have reasonably projected that this situation will continue through 2028 based on the best available information. Depending on the facts of the particular case, a state might reasonably conclude based on appropriate considerations that requiring the source to continue using the cleaner fuel (or indirectly requiring this via an emission limit that would be impractical to attain when using the prior higher emission fuel) is not a measure that is necessary to make reasonable progress. Such a conclusion could be based on the likelihood that the future cost of the cleaner fuel may become unreasonably expensive, and support for this conclusion should be appropriately documented. However, in this situation, the state should consider: determining whether there is any additional measure when operating on the cleaner fuel that is necessary to make reasonable progress; conducting a control measure analysis for the higher-emitting fuel; and adopting an emission limit applicable when the higher-emitting fuel is used, if the existing emission limit when using that fuel is not as stringent as would be necessary to make reasonable progress. Alternatively, the state could require the use of the cleaner fuel (or adopt an emission limit that reflects the use of the cleaner fuel) and plan to submit a SIP revision to change this requirement if market conditions change such that a sufficiently higher price for the cleaner fuel is expected to prevail for an extended period.

It is also possible that a source may be operating an emission control device but could remain in compliance with applicable emission limits if it stopped operation of the device. The state may reasonably consider based on appropriate factors whether continued operation of that device is necessary to make reasonable progress, such that the regional haze SIP submission for the

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<sup>76</sup> See 57 FR 13497, 13567 (April 16, 1992) (explaining principles, including enforceability and accountability, to which SIPs and implementing instruments must adhere to help assure that planned emission reductions will be achieved); and 77 FR 74355, 74365 (December 14, 2012) (State's SIP must contain monitoring, recordkeeping, and reporting components necessary to make regional haze-related emission limitations enforceable).

<sup>77</sup> See CAA section 169A(b)(2) and 40 CFR § 51.308(f)(2).

second implementation period must make such operation of the device (or attainment of an equivalent level of emission control) enforceable. EPA recommends that the state consult with its EPA Regional office in such a situation.

#### *Regulatory mechanisms to incorporate emission limits within a SIP*

A state may adopt a numerical emission limit or other measure via a state regulatory requirement (e.g., a general rule or a source-specific rule) and then incorporate that regulatory document (including the relevant emission limits and associated monitoring, recordkeeping, and reporting provisions) into the SIP. Similarly, if a permit issued under a SIP-approved minor or major source PSD or nonattainment NSR program, or a federally enforceable state operating permit program includes a relevant requirement that the state is relying upon for regional haze purposes, the state may want to consult with the EPA Regional office to ensure that limit is appropriately included into the SIP. This can often be accomplished by what is commonly referred to as a source-specific SIP revision. Another avenue may be that a limit is included in an enforcement order, and that key aspects of the limit (and associated monitoring, recordkeeping, and reporting provisions) are then included into the SIP for regional haze purposes. Due to the fact-specific circumstances typically surrounding these activities, states are encouraged to collaborate with their EPA Regional offices on these matters. As states consider limits, the rule also requires that additional consideration be given to ensuring that not only the limit, but also the appropriate monitoring, recordkeeping, and reporting provisions needed to make those limits practicably enforceable are included. The limit itself may take different forms, and some information about that is provided below.

#### *Averaging period and units*

We recommend that the averaging period for an emission limit be short enough to make enforcement practicable, i.e., so that special compliance stack testing if needed can be reasonably short in duration and thus also be conducted at a reasonable cost, and so that an ongoing upset causing abnormally high emissions will constitute an actionable violation within a reasonably short period. Additionally, we recommend that the averaging period be long enough for natural variations in source emissions to average out without causing a noncompliance situation when the source and the emission controls are properly maintained and operated. For sources equipped with a continuous emissions monitoring system or that will be so equipped, 30 days is a common averaging period.

Generally, we recommend that a state that has determined that a technology-based measure is necessary for reasonable progress initially consider emissions limits expressed in terms of pounds per throughput (i.e., input or output) based on the capability of that measure. EPA recommends that such a throughput-based emission limit apply to the ratio of the sum of the emissions and the sum of the throughput during the operating days in the averaging period, rather applying to the average of shorter-period ratios. Such a ratio-based approach excludes days with no operation from the averaging period.

The Regional Haze Rule also allows SIPs to contain limits on mass emissions during a particular time period (e.g., a cap on 30-operating day mass emissions). A mass-based emission limit could allow a source that sufficiently reduces its operating level to cease operating the emission controls equipment that the state had determined to be reasonable (or to cease combustion of a cleaner fuel that the state had determined to be reasonable) and still be in compliance. If the state

has determined, independent of the forecasted operating level, that operation of the emission control equipment (or use of the cleaner fuel) is necessary to make reasonable progress, a mass-based emission limit may not be appropriate. For example, if the annualized cost of the measure is dominated by costs that are incurred only during operating hours (such as for fuel or reagent), the state's determination may be independent of the operating level scenario, in which case a mass-based emission limit may not be appropriate. On the other hand, if the annualized cost for a measure is dominated by fixed capital costs, the state may have determined that the measure is necessary to make reasonable progress if the operating level is high (making cost/ton and cost/Mm<sup>-1</sup> relatively low) but not if the operating level is low (making cost/ton and cost/Mm<sup>-1</sup> relatively high). In this case, a mass-based emission limit may be reasonable because it could relieve the source of the requirement to install the control if it manages its operating level strategically.

Section II.B.4.a of this document indicated that in addition to considering technology-based emission control measures, a state may consider restrictions on hours of operation, fuel input, or product output. Such restrictions could be implemented directly or by a time-based limit on mass emissions.

We note that under other requirements flowing from other CAA provisions and EPA rules, sources may be subject to other emission limits that have averaging periods as short as 1 hour. The need for such short averaging periods generally does not apply in the context of regional haze.

#### *Establishing compliance deadlines*

The state may establish a compliance deadline that provides reasonable time for an affected source to come into compliance in an efficient manner, without unusual amounts of overtime, above-market wages and prices, or premium charges for expedited delivery of control equipment. In addition, compliance deadlines should be specific and objectively determined, considering available historical data regarding time necessary for the installation of similar control measures.

A state may reasonably tie the compliance deadline for a new requirement to EPA approval of the specific SIP provision containing that new requirement. The time necessary for compliance generally is considered to be a source-by-source question, with each source required to comply by a date that is reasonable for that source. In setting a reasonable compliance date, a state may coordinate the compliance deadline with an already planned source outage, so that installation of needed equipment does not require an additional outage that would increase costs. A state may set a staggered compliance schedule that appropriately takes into account the risks of taking multiple electrical generating units serving the same market off line at the same time if these risks have been well researched and documented.<sup>78</sup>

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<sup>78</sup> In the first implementation period, EPA considered and invited public comment on the question in Wyoming of whether requiring multiple EGUs to install SCR units (as BART) close in time would be overly risky to power system reliability, or would cause unreasonable additional cost to purchase replacement power, given that each unit would have to be taken off line during construction.

## 6. Step 6: Regional scale modeling of the LTS to set the RPGs for 2028

### a) Overview

The relationship between the LTS and the RPGs for the clearest and most impaired days is a key concept in the regional haze program, as the two RPGs provide a way for the states to check the projected outcome of the LTS against the goals for visibility improvement. After a state with a Class I area has determined the emissions controls necessary to make reasonable progress based on consideration of the four factors and visibility benefits of specific measures applied to selected sources (Sections II.B.5.a-d of this document) and incorporated those measures into its LTS (Section II.B.5.e of this document), the state must project the average of the daily visibility conditions on the 20 percent most anthropogenically impaired and on the 20 percent clearest days at each Class I area within the state as of the end of the implementation period.<sup>79</sup> (States with no Class I areas do not set RPGs.) The state typically does this via photochemical air quality modeling. The modeling run uses emissions that reflect the measures in its own LTS, the measures that other contributing states have determined to be necessary to make reasonable progress (whether or not they have already been adopted in enforceable form or submitted as a SIP revision),<sup>80</sup> and measures that have been adopted by the states or EPA to meet other requirements of the CAA. These projections of the visibility outcomes at the end of the implementation period (in deciviews) are the RPGs.<sup>81</sup>

Thus, the content of the LTS determines the RPGs. The two RPGs are a projected outcome, rather than visibility conditions established directly, and meeting the RPGs is not an enforceable requirement of the Regional Haze Rule.<sup>82</sup> Once adopted, the RPGs are not themselves

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<sup>79</sup> 40 CFR 51.308(f)(3)(i).

<sup>80</sup> 40 CFR 51.308(f)(3)(i) provides that the RPGs are to be based, in part, on the enforceable emissions limitations and compliance schedules in a state's own LTS and "other measures required under paragraph (f)(2) of this section" that can be fully implemented by the end of the applicable implementation period. EPA interprets "other measures required under paragraph (f)(2) of this section" to include all measures that other contributing states have determined are necessary to make reasonable progress, because a state only makes such determinations in order to meet the requirements of paragraph (f)(2). If another contributing state has submitted its SIP for the second implementation period, that SIP will make it clear what measures that state has determined to be necessary to make reasonable progress because those will be the measures in its LTS. However, even if the SIP revision for another state has not been fully developed and submitted to EPA, it may still be that the state has already officially made some such determinations and is in the process of completing its SIP development and submission work. If so, the state projecting the RPGs should account for those determinations. If another contributing state has not yet even determined the measures that are necessary to make reasonable progress at the jointly affected Class I area, then the state with the Class I area must set the RPGs based on whatever measures that the contributing state has actually adopted to meet the requirements for the first implementation period and other CAA requirements. The state with the Class I area may not base its RPGs on speculation about what another state will do. We encourage regional cooperation between states in conducting this modeling, especially with respect to establishing a common understanding on emissions inventory assumptions and inputs.

<sup>81</sup> 40 CFR 51.308(f)(3). EPA recognizes that for practical reasons involving schedules and resources, it may not be possible for the state setting the RPG to include in its final air quality model run all of the control measures that 40 CFR 51.308(f)(3) and this guidance indicate should be included. If this is the case, the Regional Haze Rule does not preclude later adjustments to the modeling outputs to account for the excluded measures. *See* Section II.B.6.b. of this document.

<sup>82</sup> Given the regulatory structure, it would not be consistent with the Regional Haze Rule as well as the accepted practice during the first implementation period, to establish RPGs first, as some stakeholder comments have suggested, and then work backwards to develop an LTS that supports such RPGs. *See* 40 CFR 51.308(f)(3)(i).

enforceable but they enable states to project the visibility impact of the LTS and to compare ambient visibility levels during later portions of the implementation period to those goals. So, in summary, although RPGs are not enforceable, they provide a useful metric for evaluating progress.

There are no requirements in the Regional Haze Rule regarding the method and tools used to project the RPGs, e.g., the details of the air quality modeling platform including the base period of air quality data and the year of the base modeling inventory. However, many of the details associated with the EPA-recommended modeling process for projecting RPGs are explained in EPA's SIP Modeling Guidance,<sup>83</sup> section 5 of which directs states through the recommended steps to apply base period and future year air quality model simulation results to ambient data, resulting in future year visibility projections.

The RPGs for the second implementation period are to be based only on the combined effect of the LTS measures with compliance dates on or before December 31, 2028. Given the July 31, 2021, SIP revision submission deadline, the CAA deadline for EPA action on a SIP (12 months from the completeness determination), and the time needed to implement even the most complicated controls, we expect that all measures included in a timely SIP for the second implementation period to be implementable and implemented by December 31, 2028. Thus, the RPGs generally will reflect all measures in the LTS.

Readily available air quality modeling platforms may not encompass Alaska, Hawaii, or the Virgin Islands. The SIPs for these jurisdictions may use any reasonable method to set the RPGs provided the method adheres to the above-stated principle about reflecting a certain set of emission control measures. EPA recommends that these jurisdictions consult with the appropriate EPA Regional office regarding appropriate methods.

#### **b) Adjustment of RPGs using a post-modeling approach<sup>84</sup>**

At the time a state (or an RPO on behalf of a state) is prepared to model the impacts of states' LTSs, the outcome of some final state decisions on emission control measures may not be known. That modeling will, therefore, be based on known decisions and possibly also on anticipated decisions. Because the air quality modeling to calculate RPGs is resource intensive and time consuming, EPA does not always expect the modeling to be repeated after a subsequent change in the content of a state's own LTS, after a new determination by another state that an emission control measure is necessary to make reasonable progress, or after another state decides contrary to expectations that a measure is not necessary to make reasonable progress. However, the comparison of the RPG for the 20 percent most anthropogenically impaired days to the URP

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(RPGs "reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period *as a result* of those enforceable emissions limitations, compliance schedules, and other measures required under paragraph (f)(2) of this section" (emphasis added). *See*, also, 82 FR at 3091–92 (explaining that EPA's regulations require states to establish RPGs that reflect, among other things, the measures in their LTS as determined by applying the four factors to sources).

<sup>83</sup> Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM<sub>2.5</sub>, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 ([https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling\\_Guidance-2018.pdf](https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf)).

<sup>84</sup> EPA considers a post-modeling approach to be an approach that adjusts existing modeling results without conducting additional air quality modeling.

glidepath must be done with an RPG value that reflects only measures that have been adopted or that have at least already been determined to be necessary to make reasonable progress (and, hence, will be adopted before submission of the relevant SIP).<sup>85</sup> Therefore, if the modeling run did not include all such measures or included any other measures, a state may need to adjust its RPGs to reconcile the scenarios before the SIP revision with the RPGs is submitted.

We recommend that any state using a post-modeling approach to adjust an RPG consult with EPA about an appropriate method for doing so, which may depend on the specifics of the case and the information that is available. If overall baseline impacts on PM species have been determined for a specific source, it may be appropriate to make these adjustments by assuming a proportionality between source emissions of the relevant species precursor and the PM species concentration. Any adjustment must be clearly documented in the SIP submission.

### **7. Step 7: Progress, degradation, and URP glidepath checks**

After a state containing a Class I area projects the visibility conditions for the end of the implementation period (step 6, Section II.B.6 of this document), the Regional Haze Rule requires a comparison of these RPGs to the baseline period visibility conditions and to the URP glidepath (possibly including certain adjustments to the glidepath).

#### **a) Checking for improvement in visibility on the 20 percent most impaired days**

The 2028 RPG for the 20 percent most anthropogenically impaired days is to be compared to the 2000-2004 baseline period visibility condition for the same set of days and must provide for visibility improvement since the baseline period. *See* 40 CFR 51.308(f)(3)(i). This set of most anthropogenically impaired days is determined from IMPROVE data, and EPA's recommended approaches are explained in a separate 2018 guidance document<sup>86</sup> for separating natural light extinction from anthropogenic light extinction for each day or another method justified by the state as reasonable. Once the most anthropogenically impaired days are determined, the IMPROVE estimates of overall light extinction for those days are converted to deciview values and the deciview values are averaged.

#### **b) Checking for no visibility degradation on the 20 percent clearest days**

The 2028 RPG for the 20 percent clearest days is to be compared to the 2000-2004 baseline period visibility condition for the 20 percent clearest days and must ensure that no visibility degradation from the baseline period is projected. *See* 40 CFR 51.308(f)(3)(i). This set of clearest days is directly determined from IMPROVE estimates of overall light extinction. Once the clearest days are determined, the IMPROVE estimates of overall light extinction for those days are converted to deciview values and the deciview values are averaged.

A state may face a special issue in making the check for no visibility degradation on the 20 percent clearest days, stemming from the comparison of light extinction values influenced by possibly inconsistent meteorology patterns. Typically, the RPG for the 20 percent clearest days will be predicted by air quality modeling that is based on meteorology from a year in the range of

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<sup>85</sup> A state may not affect this comparison by assuming that its neighboring states will adopt additional controls that are still only under consideration or that have been rejected by the other states.

<sup>86</sup> Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM<sub>2.5</sub>, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 ([https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling\\_Guidance-2018.pdf](https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf)).

2011 to 2017, depending on the SIP submittal date, the timing of SIP development, and the state’s determination of what year of meteorology is most reasonable to use. There will always be differences between the meteorology in the 2000-2004 period that influenced the “baseline visibility condition” and the meteorology used in the air quality modeling. These differences could introduce some artifacts into the comparison between the 2000-2004 clearest days and the 2028 clearest days that are large enough to affect the no degradation check. The clearest days are susceptible to such artifacts because reductions in anthropogenic emissions between the two periods may not have had a strong effect on the clearest days. If this situation occurs, we recommend that a state consult with its EPA Regional office on this point.<sup>87</sup>

Also, EPA has observed a few cases in which the sea salt component of PM during the 20 percent clearest days has increased when comparing recent IMPROVE data to data from the 2000-2004 period, in particular at some Class I areas near an ocean. The projection of the 2028 sea salt concentration typically would reflect the sea salt concentration in the recent period of IMPROVE data used for the photochemical modeling process. This use of sea salt concentrations from two widely separated periods of IMPROVE data might then be a factor in the check for degradation on the 20 percent clearest days. States with Class I areas near an ocean may wish to be alert to this type of situation and consult with their EPA Regional office if a projected increase in sea salt concentrations in 2028 appears to be the reason for an inability to show no degradation in overall visibility compared to 2000-2004 for the 20 percent clearest days.<sup>88</sup>

### **c) URP glidepath check**

Under 40 CFR 51.308(f)(3)(ii)(A) and (B), a state with a Class I area, or with sources that contribute to visibility impairment in a Class I area in another state, must compare the RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath. Prior to making the comparison described here, a state may adjust the URP glidepath for impacts from international anthropogenic sources and certain prescribed fires on wildland, subject to the Administrator’s approval. Section 3 of a separate 2018 guidance document provides information on making these adjustments.<sup>89</sup>

It should be noted that the Regional Haze Rule neither establishes the URP glidepath as the amount of visibility improvement that constitutes “reasonable progress,” nor requires that a state

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<sup>87</sup> Inconsistent meteorology can also create artifacts in the comparisons for the 20 percent most impaired days. However, because of the amount of progress in reducing light extinction on the 20 percent most anthropogenically impaired days stemming from emission reductions between these two periods, we do not believe an inconsistency in meteorology could affect the outcome of the check that there has been visibility improvement on the 20 percent most impaired days.

<sup>88</sup> This use of sea salt concentrations from two widely separated periods of IMPROVE data can also create artifacts in the progress check for the 20 percent most impaired days. However, because of the amount of progress in reducing light extinction due to other PM components on the 20 percent most anthropogenically impaired days stemming from emission reductions between these two periods, we do not believe an inconsistency in meteorology could affect the outcome of the progress check for the 20 percent most impaired days. Similarly, we believe it is unlikely that this sea salt issue could affect the outcome of the URP glidepath check because it is also based on the 20 percent most impaired days.

<sup>89</sup> Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program, U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018. In addition, EPA will provide modeling results that may be useful to states interested in proposing URP glidepath endpoint adjustments from international anthropogenic sources and prescribed fire impacts.



achieve the URP glidepath if measures that are reasonably determined to be needed to make reasonable progress pursuant to 40 CFR 51.308(f)(2) do not accomplish that result.<sup>90</sup>

If the 2028 RPG for the 20 percent most impaired days is below the URP glidepath, that does not exempt states from any of the requirements of the CAA or the Regional Haze Rule, in particular the requirement to include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress as determined by taking into consideration the four statutory factors.<sup>91</sup> Rather, these analyses must be included with the SIP submittal, along with any measures, explaining how the state complied with the second implementation period requirements. If the 2028 RPG for the 20 percent most impaired days for a Class I area is above the URP glidepath, the rule requires the state with the Class I area and any other state with sources affecting that area to make a “robust demonstration” that there are no additional emission reduction measures for sources that may reasonably be anticipated to contribute to visibility impairment that would be reasonable to include in the LTS. The robust demonstration requires an analysis to ensure there are no additional emission reduction measures that would be reasonable to include in the LTS. This section discusses considerations for making this demonstration.

EPA does not interpret 40 CFR 51.308(f)(3)(ii) as requiring a state in this position to perform an additional analysis of control measures for every source in the state. Also, EPA does not interpret this rule provision as meaning that a state with an RPG above the URP glidepath must weigh the factors differently than a state with an RPG below the URP glidepath. A state does not have to demonstrate that it would not be reasonable to adopt measures sufficient to be on the URP glidepath.<sup>92</sup>

To address this rule provision, a state could provide within its SIP submission a narrative explanation of how the state has already conducted the source selection and control measures analyses in such a manner that addresses the requirements of 51.308(f)(3)(ii). Such a narrative explanation would essentially describe how the initial analyses constitute the required robust demonstration. Other possible approaches to satisfying this rule requirement focus on demonstrating whether it would be reasonable for a state to expand the set of sources selected for control analysis; examples of such approaches are listed below. There may be other approaches to this demonstration that would also be approvable, such as:

- If the state has eliminated a PM species from consideration, it may reconsider this decision.
- If the state has removed low emitting sources prior to its visibility impact-based source selection analysis, it may reconsider its emissions threshold.
- The state may compare the visibility impact (e.g., light extinction) threshold it has used to select sources to the thresholds used by other states that contribute to visibility impairment at the same Class I area. If the state’s threshold is significantly higher than

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<sup>90</sup> 40 CFR 51.308(d)(1)(ii) which applied to the first implementation period contains a requirement for a state that is not achieving the URP to demonstrate that the URP is not reasonable, but this section does not apply in the second and subsequent implementation periods.

<sup>91</sup> See the discussion of this subject in the preamble to the 2017 final rule, at 82 FR 3078 at 3093 and 3099-3100, January 10, 2017.

<sup>92</sup> A provision of 40 CFR 51.308(d)(1)(ii) to this effect, applicable only to the first implementation period, has no counterpart in 51.308(f).

used by other states, the state may consider repeating the source selection with a lower threshold than it used initially. If another state has used a different approach to source selection, for example a different surrogate for visibility impact, the state may consider whether the other approach would bring more of its own sources forward for analysis of control measures.

- The state may reconsider any cost/ton, cost/light extinction, and/or light extinction thresholds it used in its initial analysis of control measures.
- If the state has used recent emissions in the source selection process and/or to estimate visibility benefits in its analyses of control measures, the state may reconsider its source selection step and analyses of control measures using projected 2028 emissions. For a sector that is growing, this may lead to a conclusion to bring additional sources forward for analysis of control measures and a conclusion that additional controls are necessary to make reasonable progress.
- If a technically feasible control was rejected for a source because the cost/ton for the measure was higher than for prior regulatory requirements at similar sources, the state may consider whether there are distinguishing features that would make the cost of compliance with the measure reasonable for that source.
- The state may revisit how it has considered the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress. For example, the state may not have already considered those measures for all its own sources of the same types and may revisit its reasoning for that choice. (See Section II.B.4.a. of this document)
- The state may revisit its responses to other states' requests for analysis of control measures of particular sources or better emissions control at particular sources.

#### **d) Calculation of the number of years it would take to attain natural visibility conditions**

Section 51.308(f)(3)(ii) of the Regional Haze Rule requires that if a state adopts an RPG for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress, i.e., if the RPG is above the URP glidepath, it must include within its SIP submission an assessment of the number of years it would take to attain natural visibility conditions if visibility improvement were to continue at the rate of progress selected by the state as reasonable for the implementation period.

The number of years (N) beyond 2004 it would take to attain natural visibility conditions can be calculated as follows.<sup>93</sup>

$$N = \frac{(\text{Baseline visibility conditions} - \text{Natural visibility conditions})}{[(\text{Baseline visibility conditions} - \text{RPG}_{2028})/24]}$$

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<sup>93</sup> This equation calculates the number of years needed to reach natural visibility conditions based on the rate of progress that will be achieved between the baseline period of 2000-2004 and 2028. An alternative approach is to make this calculation by starting with visibility conditions in a period closer to SIP submission. This alternative approach is also allowed by the Regional Haze Rule.

## **8. Step 8: Additional requirements for regional haze SIPs**

### **a) Consultation and discussions with other parties**

#### *Consultation with other states*

The Regional Haze Rule requires states to consult with those other states that have emissions that are reasonably anticipated to contribute to visibility impairment in the same Class I area or areas, in order to develop coordinated emission management strategies for making reasonable progress. 40 CFR 51.308(f)(2)(ii). The rule does not provide a definition of coordinated emission management strategies. EPA believes that this requirement is procedural in nature and is meant to ensure that states share and consider each other's technical information, and does not mean that states' strategies must be developed with the same thresholds and other decision approaches or that states must apply the same measures to similar sources.

Three more specifically stated requirements are described in subparagraphs A, B, and C of 40 CFR 51.308(f)(2)(ii), which are addressed below. These requirements apply regardless of when a state plans to submit its SIP revision, but the nature of the consultation that is possible and reasonable may be affected by the stage of SIP development that the other contributing states have reached by the time any one state submits its SIP revision. Regardless of individual SIP development timeframes, states must demonstrate that they have reasonably consulted with each of the states having emissions that are reasonably anticipated to contribute to visibility impairment in the affected Class I area. EPA understands that states are proceeding with SIP development on different timelines, and we do not expect these different timelines to impact our evaluations of SIPs vis-à-vis the regulatory requirements. States may initiate their own consultation process whenever it makes sense and should engage with other states in a timely manner.

A downwind state with a Class I area may request that an upwind state adopt specific measures that the downwind state believes are reasonable. Similarly, an upwind contributing state may request actions by the downwind state with respect to the downwind state's own sources. Such requests do not by themselves obligate the other state to take the requested action in order for its second implementation period SIP submission to be approvable. We recommend that a state respond in writing to any request by explaining its view of the facts regarding the sources and measures at issue. The state can confirm its intention to require the identified measures, explain why it chooses not to require the requested controls based on consideration of the relevant factors, or explain that it has not reached the point in its analysis and decision process to be able to provide its intentions regarding the identified measures. We expect that the analysis each state will be preparing to support its own SIP will be informative to use in such a response.

In the interest of efficient use of resources, states may wish to consult early on a plan for the development of factual information, for example information on sources' contributions to the visibility impairment in Class I areas. Generally, the state with the source will be in the best position to obtain and share information on the source's physical configuration, recent emissions, already planned modifications or shut down, and existing and potential additional emission controls.

40 CFR 51.308(f)(2)(ii)(A) requires a state to demonstrate that it has included in its implementation plan all measures agreed to during state-to-state consultations or a regional

planning process, or measures that will provide equivalent visibility improvement. If the consultations between states have not otherwise resulted in an official commitment on the part of one or both participating states to adopt specific measures, this provision does not require the states to arrive at a set of agreed upon measures. In particular, the fact that a state's modeling has assumed certain controls at a particular source in another state when forecasting future visibility does not constitute an agreement among the participating states, even if there has been no objection to such an assumption by the participating state where the source is located. If there is an official agreement, then the individual SIP submissions must include the agreed measures, or measures that will provide equivalent visibility improvement. EPA recommends that a state wishing to take the path of providing equivalent visibility improvement consult with its EPA Regional office regarding the base case scenario that it intends to use to demonstrate equivalency, as there may be complex issues of potential double counting.

40 CFR 51.308(f)(ii)(B) requires a state to consider the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress in the Class I area, and this rule requirement is addressed in Section II.B.4.a of this document.

40 CFR 51.308(f)(ii)(C) requires that in any situation in which a state cannot agree with another state on the emission reduction measures necessary to make reasonable progress in a Class I area, the state must include in its implementation plan a description of the actions taken to resolve the disagreement. Consultation may include efforts to reach agreement on the measures that each state will apply to its sources, or agreement on decision thresholds and other decision approaches, but it does not require such effort by any state and does not require that agreements be reached. If neither consulting state has sought an agreement about measures to be included in their SIP revisions, neither state is required to include in its implementation plan the description mentioned in this requirement. However, if one state has formally asked another state to adopt a particular measure for a particular source, and the second state has not adopted that measure and also has not adopted an equivalent measure(s) as described in 40 CFR 51.308(f)(2)(ii)(A), then both states are subject to this requirement to describe the actions taken to resolve the disagreement.<sup>94</sup> This provision does not specify that any particular actions towards resolution be taken. If the two states submit SIP revisions that disagree on the controls in each state that are needed for reasonable progress, the Regional Haze Rule provides for EPA to consider the technical information and explanations presented by both states when considering whether to approve each state's SIP.

#### *Consultation, notification, and information sharing between a state and FLMs*

*In-person consultation on Regional Haze SIPs* - Section 51.308(i)(2) of the Regional Haze Rule requires the state to offer an in-person consultation meeting with FLMs early enough to allow consideration of FLM input by the state before important decisions are made by state decision makers as to what *proposed* LTS will be presented for public comment. *See* section 51.308(i)(2) of the Regional Haze Rule.<sup>95</sup> The Regional Haze Rule requires that this consultation meeting be

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<sup>94</sup> If a state has made a request of another state and as of the time that state is making its SIP submission the other state has not responded or has indicated that it is not yet able to respond to the request, we recommend that this be treated as an inability to agree.

<sup>95</sup> On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address the FLM consultation provisions of the

offered no less than 60 days before the start of a public comment period or public hearing on the planned SIP submittal. The rule also provides that the in-person consultation meeting will be considered to meet the requirement that it be “early enough” if it takes place at least 120 days before the start of a public comment period or public hearing on the draft SIP submission for the LTS.

The rule requires that the state offer FLMs an in-person meeting, but FLMs may agree to a conference call instead or to having an opportunity to comment on the SIP materials that are about to be made available for public comment.

Section 51.308(i)(3) of the Regional Haze Rule requires that when a state submits a SIP revision to EPA, the state must include a description of how it addressed any comments provided by FLMs.

*Continuing consultation on Regional Haze SIPs* – Section 51.308(i)(4) of the Regional Haze Rule requires each SIP to provide procedures for continuing consultation between a state and FLMs on the implementation of the visibility protection program required by the rule, including development and review of implementation plan revisions and progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in Class I areas. Topics that may be discussed during this consultation include discussions about the approach a state anticipates taking in its SIP development, the state’s planned technical work, and the decisions about the sources and source categories to be subject to analysis of control measures. “Procedures for continuing consultation” encompasses plans for when and how consultation will be initiated, in addition to the identification of participants and topics. Engagements with FLMs as part of multistate meetings and conference calls can be an element of the procedures.

#### *Discussions with EPA*

Discussions with the EPA Regional office about the state’s plans and progress in developing its regional haze SIP are likewise encouraged to begin early and continue throughout the SIP development process. In these discussions, EPA can provide feedback to the state on how the provisions of the Regional Haze Rule and the recommendations in this guidance document can be applied in the context of the state’s SIP. EPA encourages collaboration between Regional offices and multi-state organizations. EPA will share EPA technical products, as appropriate and relevant.

#### *Discussions with tribes*

Because the content of SIPs may affect air quality in and around tribal land, EPA recognizes the value in EPA, states, and multi-state organizations maintaining a dialogue with tribes through all stages of developing regional haze SIPs.

It may be that the tribe or EPA that has responsibility for regulating a source on tribal land for purposes of regional haze, depending on the status of the tribe for purposes of implementing CAA programs. If a state believes that control of a source on tribal land is appropriate, the state

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Regional Haze Rule. See <https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions>.

may contact the EPA Regional office to discuss the issue further. EPA will consult with tribes under its tribal consultation policy as appropriate.

#### **b) Progress report elements**

Section 51.308(f)(5) of the Regional Haze Rule requires a state to address in the plan revision the requirements of paragraphs 51.308 (g)(1) through (5), so that the plan revision due in 2021 will serve also as a progress report addressing the period since submission of the progress report for the first implementation period.<sup>96</sup> The progress report for the first implementation period was only able to report on visibility levels, emissions, and implementation status up to a date sometime before it was submitted. To fully inform the public and EPA about past implementation activities, we recommend that the 2021 SIP cover a period approximately from the first full year that was not actually incorporated in the previous progress report through a year that is as close as possible to the submission date of the 2021 SIP.

#### **c) Monitoring strategy and other elements**

There are six parts to section 51.308(f)(6) of the Regional Haze Rule. With respect to sections 51.308(f)(6)(i) through (iv) regarding monitoring of ambient visibility conditions, we recommend that all states with Class I areas confirm in their SIPs that they participate in the IMPROVE monitoring program through the representation of their interests by a state air agency representative on the IMPROVE Steering Committee and through the allocation of CAA air management grant funding to the IMPROVE program. The SIP could also describe any other, more direct participation in the IMPROVE program, for example any state assistance in quality assurance checks at IMPROVE monitoring sites. The IMPROVE program's practice of providing data directly to EPA satisfies the requirements in sections 51.308(f)(6)(iv) and (vi) of the Regional Haze Rule for the regional haze SIP to provide for reporting of visibility monitoring data to the Administrator at least annually.

Regarding section 51.308(f)(6)(v) of the Regional Haze Rule on emission inventories, we first note that the requirement in the rule is to provide for the preparation of emission inventories. The emission inventories themselves are not required SIP elements and so are not required to be submitted according the procedures for SIP revisions. The emission inventories themselves are not subject to EPA review. We also note that the 2017 revisions to the Regional Haze Rule clarified that SIPs for the second and later implementation period do not need to provide for a statewide inventory for a baseline year, because SIPs for the first implementation period provided for that one-time inventory. A state may note in its regional haze SIP that its compliance with the Air Emissions Reporting Requirements in 40 CFR Part 51 Subpart A satisfies the requirement to provide for an emissions inventory for the most recent year for which data are available. To satisfy the requirement to provide estimates of future projected emissions, a state may explain in its SIP how projected emissions are developed for use in establishing RPGs for its own and nearby Class I areas. Typically, these projections are developed through a regional planning process, in some cases using projections provided by EPA as a starting point or

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<sup>96</sup> The 2017 revisions to the Regional Haze rule eliminated the requirement for any other progress report that would otherwise have been due before the 2021 SIPs are due.

point of comparison. States will also find relevant explanations and advice in a separate EPA guidance document on the preparation of SIP emission inventories.<sup>97</sup>

### **III. Conclusion**

This non-binding guidance document is intended to help states prepare regional haze SIPs for the second implementation period ending in 2028 (SIPs due by July 31, 2021). We encourage states to discuss any SIP preparation questions and/or plans with their EPA Regional offices.

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<sup>97</sup> Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, July 2017, available at [https://www.epa.gov/sites/production/files/2017-07/documents/ei\\_guidance\\_may\\_2017\\_final\\_rev.pdf](https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf).

## APPENDIX A

### **Clean Air Act Provisions, and EPA Rulemakings, and EPA Guidance Documents Related to SIPs Addressing Visibility Protection**

#### *Clean Air Act (CAA) Provisions*

In section 169A of the 1977 Amendments to the CAA, Congress established a program for protecting and restoring visibility in certain national parks, wilderness areas, and other Class I areas due to their “great scenic importance.”<sup>1</sup> This section of the CAA establishes as a national goal the “prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.” This section also requires EPA to issue regulations requiring states to adopt SIPs containing emission limits as may be necessary to make reasonable progress towards meeting this goal, including Best Available Retrofit Technology (BART) limits for particular types of large industrial sources. Section 169A of the CAA specifies the five statutory factors for determining BART. This section also provides that in determining reasonable progress there must be taken into consideration four factors (often referred to as the “four statutory factors”): 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 existing source subject to such requirements.

In 1990, Congress added section 169B to the CAA. Among other things, this section includes provisions for EPA to conduct visibility research with the National Park Service and other federal agencies, and to provide periodic reports to Congress on visibility improvements due to implementation of other air pollution protection programs. CAA section 169B also allows the Administrator to establish visibility transport commissions and specifically required the Administrator to establish a commission for the Grand Canyon area. It also created a mandatory duty for the Administrator to carry out the regulatory responsibilities in CAA section 169A within 18 months of receiving the report from a visibility transport commission, including establishing criteria for measuring reasonable progress toward the national goal.

#### *1980 Reasonably Attributable Visibility Impairment (RAVI) Rule*

In 1980, EPA promulgated regulations to address visibility impairment in Class I areas, including but not limited to impairment that is “reasonably attributable” to a single source or small number of sources, i.e., “reasonably attributable visibility impairment” or “RAVI.” 45 FR 80084 (December 2, 1980). These regulations, codified at 40 CFR 51.300 through 51.307, represented the first phase in addressing visibility impairment from existing sources. The regulations on RAVI originally promulgated in 1980 were revised in 2017.

#### *1999 Regional Haze Rule*

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

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<sup>1</sup> H.R. Rep. No. 294, 95th Cong. 1st Sess. at 205 (1977).



amended some parts of 51.300-307. Some key features of the 1999 Rule are the following (with mention of the subsequent revisions of January 2017 as needed to avoid confusion).

*Applicability.* All 50 states, the District of Columbia, and the Virgin Islands (“states”) became subject to the requirements of the Regional Haze Rule and were required to submit regional haze SIPs.

*Schedule for SIPs.* States were required to submit the first implementation plans (SIPs) addressing regional haze visibility impairment no later than December 17, 2007. 70 FR 39104. (This December 17, 2007, SIP due date is a Congressionally mandated revision to the due date initially set in the 1999 Rule.) Further, under 40 CFR 51.308(f) as promulgated in 1999, states were required to submit periodic comprehensive revisions no later than July 31, 2018, and every 10 years thereafter. (The July 31, 2018, SIP due date was revised in 2017 to July 31, 2021.)

*Content of periodic SIPs.* The periodic SIP revisions were required to address a number of elements, including quantification of baseline, current, and natural visibility conditions, actual progress made toward natural conditions during the previous implementation period, a long-term strategy (LTS), and reasonable progress goals (RPGs).

*RPGs.* States were required to set RPGs, calculated in deciviews, in every implementation period for each Class I area within the state that provide for reasonable progress towards achieving natural visibility conditions. For each Class I area, states were required to set two RPGs, one for the 20 percent most anthropogenically impaired days and one for the 20 percent least impaired days. The goal for the most impaired days must provide for an improvement in visibility over the period of the SIP, and the goal for the least impaired days must ensure no degradation of visibility over the period of the SIP. In addition, the 1999 Rule required a state to consider the four statutory factors when establishing its reasonable progress goals.<sup>2</sup>

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

*Progress reports.* 40 CFR 51.308(g) as promulgated in 1999 required each state to submit progress reports, in the form of SIP revisions, every 5 years following the submission of the initial SIP due on December 17, 2007. These progress reports must evaluate the progress made towards the RPGs for Class I areas located within the state as well as those Class I areas located outside the state that may be affected by emissions from within the state. (The schedule and the form for progress reports were revised in 2017.)

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

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<sup>2</sup> In the 2017 revisions, the requirement for a state to consider the four statutory factors is associated with the development of the LTS, rather than the setting of the RPGs. The 2017 revisions also affect how the most impaired days are to be selected.

planning obligations with their planning obligations under the 1980 RAVI rule, so that one SIP revision would address both aspects.

*Uniform rate of Progress (URP) framework.*<sup>3</sup> States were required to analyze and determine the consistent rate of progress over time, starting at the baseline period of 2000-2004, that would be needed to attain the natural visibility condition on the 20 percent most anthropogenically impaired days by the year 2064.<sup>4</sup> This hypothetical straight-line path is referred to in this document as the URP glidepath. The URP is the slope of this line. In establishing their RPGs for the first SIPs, states were required to consider the URP and the emission reduction measures needed to achieve this level of improvement in visibility for the time period covered by the SIP. When the progress anticipated in the SIP for the implementation period is less than the URP, a state was required to project when (after 2064) the natural visibility condition for the 20 percent worst days would be reached if the SIP's rate of progress were to continue beyond the end of the implementation period. Attaining natural visibility conditions by the end of 2064 is not an enforceable requirement of the regional haze program.<sup>5</sup>

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

### *2003 Guidance Documents on Tracking Progress and Estimating Natural Visibility Conditions*

In 2003, EPA published two guidance documents:

- Guidance for Tracking Progress Under the Regional Haze Rule.
- Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule.

Tracking progress and estimating natural visibility conditions have been more recently addressed in the 2018 EPA technical guidance document on progress tracking cited at the end of this appendix.

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<sup>3</sup> The term URP framework refers to the interrelated Regional Haze Rule requirements regarding the quantification of historical and projected visibility conditions using specific metrics, the quantification of natural conditions, the quantification of the uniform progress that would achieve natural visibility conditions for the 20 percent most anthropogenically impaired days in 2064, the determination of the URP glidepath, the setting of RPGs for the end of the implementation period, and the comparison of the RPG for the 20 percent most anthropogenically impaired days to the URP glidepath.

<sup>4</sup> The reason the specific year of 2064 plays a role in determining the URP is explained in the preamble to the 1999 Regional Haze Rule. 64 FR 35731; July 1, 1999.

<sup>5</sup> The 2017 revisions established a separate section (40 CFR 51.308(f)) applicable to the second and subsequent implementation period, with somewhat different requirements for what the state must consider as part of the URP framework.

### *2005 BART Guidelines*

In 2005, EPA published the Guidelines for BART Determinations Under the Regional Haze Rule at Appendix Y to 40 CFR Part 51 (BART Guidelines) to assist states in determining which of their sources are subject to the BART requirements and in setting appropriate emission limits for each applicable source. 70 FR 39104 (July 6, 2005). In this rulemaking, EPA also established that the Clean Air Interstate Rule (CAIR) would result in greater reasonable progress than source-specific BART, and adopted regulations allowing states to rely on participation in CAIR to meet the BART requirements with respect to SO<sub>2</sub> and NO<sub>x</sub> emissions from electric generating units subject to CAIR.

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

The BART Guidelines are not requirements that states must meet when addressing reasonable progress.

### *2006 Guidance Memorandum on BART*

In 2006, the EPA Office of Air Quality Planning and Standards widely distributed a memorandum addressing the issue of pollutant-specific modeling of BART-eligible sources to determine if they are subject to BART for PM when SO<sub>2</sub> and NO<sub>x</sub> BART requirements are addressed through participation in a trading program, and the issue of the acceptable averaging period for natural visibility conditions used in a subject-to-BART determination. Although this memorandum has little relevance to SIPs for the second implementation period, it is included here for completeness.<sup>6</sup>

### *2006 Questions and Answers from EPA*

In 2006, EPA informally distributed to the states a document titled “Additional Regional Haze Questions, September 27, 2006 Revision.” Most of these questions and answers related to the BART requirements.

### *2007 EPA Guidance on Reasonable Progress*

In 2007, EPA issued a guidance document titled, “Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program,” June 1, 2007, revised.

### *2012 CSAPR Better-than-BART rule*

As mentioned above, EPA’s regulations allowed states to rely on participation in CAIR to meet the BART requirements with respect to SO<sub>2</sub> and NO<sub>x</sub> emissions from BART-eligible EGUs. Subsequent to EPA’s 2005 rule allowing for this, CAIR was remanded by the United States

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<sup>6</sup> Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determination, memorandum from Joe W. Paisie to Kay Prince, EPA Region 4, July 19, 2006, [https://www.epa.gov/sites/production/files/2016-02/documents/memo\\_2006\\_07\\_19.pdf](https://www.epa.gov/sites/production/files/2016-02/documents/memo_2006_07_19.pdf).

Court of Appeals for the District of Columbia Circuit, and EPA promulgated the Cross-State Air Pollution Rule (CSAPR) to replace CAIR. In 2012, EPA finalized a rule that allowed participation in the CSAPR trading programs to serve as an alternative to BART with respect to SO<sub>2</sub> and NO<sub>x</sub> emissions from EGUs subject to CSAPR. In the 2012 rulemaking, EPA also finalized limited disapprovals of certain states' regional haze SIPs that previously relied on CAIR to improve visibility and substituted federal implementation plans (FIPs) that rely on CSAPR for some but not all of the states affected by these disapprovals. 77 FR 33642.

#### *2016 and 2017 Revisions to CSAPR and Affirmation that CSAPR as Updated is Better-than-BART*

EPA revised the CSAPR ozone season NO<sub>x</sub> trading program in a rulemaking completed in September 2016. 81 FR 74504. The revisions changed the states subject to the trading program and the state level allowances. In October 2017, EPA removed Texas from the annual SO<sub>2</sub> and NO<sub>x</sub> trading programs. 81 FR 74504. In the same action, EPA re-affirmed that CSAPR as updated remained a better-than-BART alternative for states participating in the CSAPR trading programs, on a pollutant-specific basis.

#### *2017 Revisions to the Visibility Protection Program for Class I Areas*

In 2017, EPA issued a final rule revising portions of the visibility protection rule promulgated in 1980 and the Regional Haze Rule promulgated in 1999.<sup>7</sup> The revised rule governs EPA review of periodic SIPs developed for the second and subsequent implementation periods and EPA review of progress reports submitted subsequent to those plans. A summary of key changes to the rule in 2017, including changes to 40 CFR 51.308(f), is provided below.

- *Extension of the 2018 due date for SIPs.* EPA extended the due date for the second implementation period regional haze SIPs, from July 31, 2018, to July 31, 2021. The second implementation period still ends in 2028.
- *Relationship between the long-term strategy (LTS) and the reasonable progress goals (RPGs).* EPA clarified (1) the relationship between LTS and RPGs in state plans<sup>8</sup> and (2) the LTS obligation of all states.<sup>9</sup>
- *Progress tracking.* EPA revised the way in which some days during each year are to be selected as the 20 percent most impaired days and then used for purposes of tracking progress towards natural visibility conditions. This will focus attention on days when anthropogenic emissions impair visibility and away from days when wildfires and natural dust storms are the greatest contributors to reduced visibility.
- *Possible adjustment of the uniform rate of progress (URP) for the impacts of anthropogenic sources outside the U.S. (i.e., international sources) and certain types of wildland prescribed fire.* EPA added a provision that allows EPA to approve adjustments to the URP to reflect the impacts of these causes of visibility impairment, if an

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<sup>7</sup> Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017.

<sup>8</sup> This clarification of the existing requirements was accomplished primarily by a reordering of the subsections of 40 CFR 51.308(f) compared to the ordering of similar-topic subsections of 40 CFR 51.308(d), and by a discussion in the preamble to final rule. See 82 FR 3090.

<sup>9</sup> In particular, EPA clarified that all states, even states with no Class I area, are required to develop an LTS based on analysis of emission control measures and may be required to provide a robust demonstration that there are no additional emission control measures that are necessary for reasonable progress. See 40 CFR 51.308(f)(3) and 82 FR 3099.

adjustment has been developed through scientifically valid data and methods. These adjustments would be developed and applied separately, although they would both be accomplished by adding an estimate of the impact of the relevant source type or types to the value of the natural visibility condition for the 20 percent most anthropogenically impaired days, for the purposes of calculating the URP. The wildland prescribed fires that are eligible under the Regional Haze Rule to be included in this adjustment are those conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied.<sup>10</sup>

- *Progress reports.* EPA revised the due dates for progress reports and removed the requirement for progress reports to be SIP revisions for the second and subsequent implementation periods.
- *Reasonably attributable visibility impairment (RAVI).* EPA updated, simplified, and extended to all states the provisions for RAVI. At the same time, EPA revoked existing FIPs implementing the 1980 RAVI requirements.<sup>11</sup>
- *Federal land manager (FLM) consultation.* EPA made changes to FLM consultation requirements.<sup>12</sup>
- *Monitoring strategy.* EPA removed the requirement for progress reports submitted for the second and later implementation periods to re-address the monitoring strategy for regional haze. The requirement for periodic SIP revisions to re-address the monitoring strategy was retained.

### *2018 Regional Haze Reform Roadmap*

In 2018, EPA issued the Regional Haze Reform Roadmap<sup>13</sup> which outlined the implementation tools and guidance documents that EPA will release over the next year to help focus states' efforts and reduce and streamline the time and resources needed to meet the statutory and regulatory requirements under the regional haze program. This information will support states in their SIP development processes and provide key improvements for the upcoming second implementation period.

### *2018 Technical Guidance on Tracking Visibility Progress*

In 2018, EPA issued a technical guidance document focused on the data analysis tasks specified in 40 CFR 51.308(f)(1). This guidance document includes EPA's final recommendations on (1) methods for selecting the 20 percent most impaired days to track visibility and determining natural visibility conditions; and (2) methods for accounting for anthropogenic international

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<sup>10</sup> 40 CFR 51.308(f)(1)(vi)(B).

<sup>11</sup> On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address the RAVI provisions of the Regional Haze Rule. See <https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions>.

<sup>12</sup> On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address the FLM consultation provisions of the Regional Haze Rule. See <https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions>.

<sup>13</sup> <https://www.epa.gov/visibility/epa-releases-regional-haze-reform-roadmap>

impacts to adjust the uniform rate of progress (i.e., the URP glidepath) for the second implementation period.<sup>14</sup>

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<sup>14</sup> Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program, U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018.

## APPENDIX B

### Relevant Provisions of the Regional Haze Rule (40 CFR Part 51) as Revised in 2017

#### 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.* The provisions of this subpart 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.

#### 51.301 Definitions.

For purposes of this subpart:

*Adverse impact on visibility* means, for purposes of section 307, visibility impairment which interferes with the management, protection, preservation, or enjoyment of the visitor's visual experience of the Federal Class I area. This determination must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments, and how these factors correlate with (1) times of visitor use of the Federal Class I area, and (2) the frequency and timing of natural conditions that reduce visibility. This term does not include effects on integral vistas.

\* \* \*

*Baseline visibility condition* means the average of the five annual averages of the individual values of daily visibility for the period 2000–2004 unique to each Class I area for either the most impaired days or the clearest days.<sup>1</sup>

\* \* \*

*Building, structure, or facility* means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities must be considered as part of the same industrial grouping if they belong to the same Major Group (i.e., which have the same two-digit code) as described in the Standard Industrial Classification Manual, 1972 as amended by the 1977 Supplement (U.S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0 respectively).

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

*Current visibility condition* means the average of the five annual averages of individual values of daily visibility for the most recent period for which data are available unique to each Class I area for either the most impaired days or the clearest days.

*Deciview* is the unit of measurement on the deciview index scale for quantifying in a standard manner human perceptions of visibility.

*Deciview index* means a value for a day that is derived from calculated or measured light extinction, such that uniform increments of the index correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to very obscured. The deciview index is calculated based on the following equation (for the

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<sup>1</sup> In this guidance document, the term “baseline period visibility condition” is used instead of “baseline visibility condition.”

purposes of calculating deciview using IMPROVE data, the atmospheric light extinction coefficient must be calculated from aerosol measurements and an estimate of Rayleigh scattering):

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

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

*End of the applicable implementation period* means December 31 of the year in which the next periodic comprehensive implementation plan revision is due under §51.308(f).

\* \* \*

*Federal Class I area* or *Class I Federal area* means any Federal land that is classified or reclassified Class I.

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

*Federally enforceable* means all limitations and conditions which are enforceable by the Administrator under the Clean Air Act including those requirements developed pursuant to parts 60 and 61 of this title, requirements within any applicable State Implementation Plan, and any permit requirements established pursuant to §52.21 of this chapter or under regulations approved pursuant to part 51, 52, or 60 of this title.

*Fixed capital cost* means the capital needed to provide all of the depreciable components.

\* \* \*

*Implementation plan* means, for the purposes of this part, any State Implementation Plan, Federal Implementation Plan, or Tribal Implementation Plan.

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

\* \* \*

*Installation* means an identifiable piece of process equipment.

\* \* \*

*Least impaired days* means the twenty percent of monitored days in a calendar year with the lowest amounts of visibility impairment.

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

*Mandatory Class I Federal Area* or *Mandatory Federal Class I Area* means any area identified in part 81, subpart D of this title.

*Most impaired days* means the twenty percent of monitored days in a calendar year with the highest amounts of anthropogenic visibility impairment.

*Natural conditions* reflect naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast, or coloration, and may refer to the conditions on a single day or a set of days. These phenomena include, but are not limited to, humidity, fire events, dust storms, volcanic activity, and biogenic emissions from soils and trees. These phenomena may be near or far from a Class I area and may be outside the United States.

*Natural visibility* means visibility (contrast, coloration, and texture) on a day or days that would have existed under natural conditions. Natural visibility varies with time and location, is estimated or inferred rather than directly measured, and may have long-term trends due to long-term trends in natural conditions.

*Natural visibility condition* means the average of individual values of daily natural visibility unique to each Class I area for either the most impaired days or the clearest days.

\* \* \*

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



*Reasonably attributable* means attributable by visual observation or any other appropriate technique.

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

\* \* \*

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

*Secondary emissions* means emissions which occur as a result of the construction or operation of an existing stationary facility but do not come from the existing stationary facility. Secondary emissions may include, but are not limited to, emissions from ships or trains coming to or from the existing stationary facility.

\* \* \*

*State* means “State” as defined in section 302(d) of the CAA.

*Stationary Source* means any building, structure, facility, or installation which emits or may emit any air pollutant.

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

*Visibility impairment* or *anthropogenic visibility impairment* means any humanly perceptible difference due to air pollution from anthropogenic sources between actual visibility and natural visibility on one or more days. Because natural visibility can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured.

*Wildfire* means any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.

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

\* \* \*

### **51.308 Regional haze program requirements**

(a) *What is the purpose of this section?* This section establishes requirements for implementation plans, plan revisions, and periodic progress reviews to address regional haze.

(b) *When are the first implementation plans due under the regional haze program?* Except as provided in §51.309(c), each State identified in §51.300(b) must submit, for the entire State, an implementation plan for regional haze meeting the requirements of paragraphs (d) and (e) of this section no later than December 17, 2007.

(c) [Reserved]

\* \* \*

(f) *Requirements for periodic comprehensive revisions of implementation plans for regional haze.* Each State identified in §51.300(b) must revise and submit its regional haze implementation plan revision to EPA by July 31, 2021, July 31, 2028, and every 10 years thereafter. The plan revision due on or before July 31, 2021, must include a commitment by the State to meet the requirements of paragraph (g). In each plan revision, the State must address regional haze in each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State that may be affected by emissions from within the State. To meet the core requirements for regional haze for these areas, the State must submit an implementation plan containing the following plan elements and supporting documentation for all required analyses:

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

(i) *Baseline visibility conditions for the most impaired and clearest days.* The period for establishing baseline visibility conditions is 2000 to 2004. The State must calculate the baseline visibility conditions for the most

impaired days and the clearest days using available monitoring data. To determine the baseline visibility condition, the State must calculate the average of the annual deciview index values for the most impaired days and for the clearest days for the calendar years from 2000 to 2004. The baseline visibility condition for the most impaired days or the clearest days is the average of the respective annual values. For purposes of calculating the uniform rate of progress, the baseline visibility condition for the most impaired days must be associated with the last day of 2004. For mandatory Class I Federal areas without onsite monitoring data for 2000-2004, the State must establish baseline values using the most representative available monitoring data for 2000-2004, in consultation with the Administrator or his or her designee. For mandatory Class I Federal areas with incomplete monitoring data for 2000-2004, the State must establish baseline values using the 5 complete years of monitoring data closest in time to 2000-2004.

(ii) *Natural visibility conditions for the most impaired and clearest days.* The State must calculate natural visibility condition by estimating the average deciview index existing under natural conditions for the most impaired days and the clearest days based on available monitoring information and appropriate data analysis techniques; and

(iii) *Current visibility conditions for the most impaired and clearest days.* The period for calculating current visibility conditions is the most recent 5-year period for which data are available. The State must calculate the current visibility conditions for the most impaired days and the clearest days using available monitoring data. To determine the current visibility condition, the State must calculate the average of the annual deciview index values for the most impaired days and the clearest days for each year in the 5-year period. The current visibility condition for the most impaired or the clearest days is the average of the respective annual values.

(iv) *Progress to date for the most impaired and clearest days.* The State must calculate the actual progress made towards the natural visibility condition since the baseline period, and actual progress made during the previous implementation period up to and including the period for calculating current visibility conditions, for the most impaired days and for the clearest days.

(v) *Differences between current visibility condition and natural visibility condition.* The number of deciviews by which the current visibility condition exceeds the natural visibility condition, for the most impaired and for the clearest days.

(vi) *Uniform rate of progress.* (A) The uniform rate of progress for each mandatory Class I Federal area in the State. To calculate the uniform rate of progress, the State must compare the baseline visibility condition for the most impaired days to the natural visibility condition for the most impaired days in the mandatory Class I Federal area and determine the uniform rate of visibility improvement (measured in deciviews of improvement per year) that would need to be maintained during each implementation period in order to attain natural visibility conditions by the end of 2064.

(B) As part of its implementation plan submission, the State may propose (1) an adjustment to the uniform rate of progress for a mandatory Class I Federal area to account for impacts from anthropogenic sources outside the United States and/or (2) an adjustment to the uniform rate of progress for the mandatory Class I Federal area to account for impacts from wildland prescribed fires that were conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied. To calculate the proposed adjustment(s), the State must add the estimated impact(s) to the natural visibility condition and compare the baseline visibility condition for the most impaired days to the resulting sum. If the Administrator determines that the State has estimated the impact(s) from anthropogenic sources outside the United States and/or wildland prescribed fires using scientifically valid data and methods, the Administrator may approve the proposed adjustment(s) to the uniform rate of progress.

(2) *Long-term strategy for regional haze.* Each State 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 that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress, as determined pursuant to (f)(2)(i) through (iv). In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) The State must evaluate and determine the emission reduction measures that are necessary to make reasonable progress by considering 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 anthropogenic source of visibility impairment. The State should consider evaluating major and minor stationary sources or groups of

sources, mobile sources, and area sources. The State must include in its implementation plan a description of the criteria it used to determine the sources or groups of sources it evaluated and how the four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy. In considering the time necessary for compliance, if the State concludes that a control measure cannot reasonably be installed and become operational until after the end of the implementation period, the State may not consider this fact in determining whether the measure is necessary to make reasonable progress.

(ii) The State must consult with those States that have emissions that are reasonably anticipated to contribute to visibility impairment in the mandatory Class I Federal area to develop coordinated emission management strategies containing the emission reductions necessary to make reasonable progress.

(A) The State must demonstrate that it has included in its implementation plan all measures agreed to during state-to-state consultations or a regional planning process, or measures that will provide equivalent visibility improvement.

(B) The State must consider the emission reduction measures identified by other States for their sources as being necessary to make reasonable progress in the mandatory Class I Federal area.

(C) In any situation in which a State cannot agree with another State on the emission reduction measures necessary to make reasonable progress in a mandatory Class I Federal area, the State must include in its implementation plan a description of the actions taken to resolve the disagreement. In reviewing the State's implementation plan, the Administrator will take this information into account in determining whether the plan provides for reasonable progress at each mandatory Class I Federal area that is located in the State or that may be affected by emissions from the State. All substantive interstate consultations must be documented.

(iii) The State must document the technical basis, including modeling, monitoring, cost, engineering, and emissions information, on which the State is relying to determine the emission reduction measures that are necessary to make reasonable progress in each mandatory Class I Federal area it affects. The State may meet this requirement by relying on technical analyses developed by a regional planning process and approved by all State participants. The emissions information must include, but need not be limited to, information on emissions in a year at least as recent as the most recent year for which the State has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of subpart A of this part. However, if a State has made a submission for a new inventory year to meet the requirements of subpart A in the period 12 months prior to submission of the SIP, the State may use the inventory year of its prior submission.

(iv) The State must consider the following additional 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) Source retirement and replacement schedules;

(D) Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs; and

(E) The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy.

(3) *Reasonable progress goals.* (i) A State in which a mandatory Class I Federal area is located must establish reasonable progress goals (expressed in deciviews) that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of those enforceable emissions limitations, compliance schedules, and other measures required under paragraph (f)(2) that can be fully implemented by the end of the applicable implementation period, as well as the implementation of other requirements of the CAA. The long-term strategy and the reasonable progress goals must provide for an improvement in visibility for the most impaired days as compared to the baseline visibility condition and ensure no degradation in visibility for the clearest days as compared to the baseline visibility condition.

(ii)(A) If a State in which a mandatory Class I Federal area is located establishes a reasonable progress goal for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress calculated under paragraph (f)(1)(vi) of this section, the State must demonstrate, based on the analysis required by paragraph (f)(2)(i) of this section, that there are no additional emission reduction measures for anthropogenic

sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the long-term strategy. The State must provide a robust demonstration that includes a description of the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy. The State must provide to the public for review as part of its implementation plan an assessment of the number of years it would take to attain natural visibility conditions if visibility improvement were to continue at the rate of progress selected by the State as reasonable for the implementation period.

(B) If a State contains sources which are reasonably anticipated to contribute to visibility impairment in a mandatory Class I Federal area in another State for which a demonstration by the other State is required under (f)(3)(ii)(A), the State must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in its own long-term strategy. The State must provide a robust demonstration that includes a description of the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy.

(iii) The reasonable progress goals established by the State are not directly enforceable but will be considered by the Administrator in evaluating the adequacy of the measures in the implementation plan in providing for reasonable progress towards achieving natural visibility conditions at that area.

(iv) In determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions, the Administrator will also evaluate the demonstrations developed by the State pursuant to paragraphs (f)(2) and (f)(3)(ii)(A) of this section and the demonstrations provided by other States pursuant to paragraphs (f)(2) and (f)(3)(ii)(B) of this section.

(4) If the Administrator, Regional Administrator, or the affected Federal Land Manager has advised a State of a need for additional monitoring to assess reasonably attributable visibility impairment at the mandatory Class I Federal area in addition to the monitoring currently being conducted, the State must include in the plan revision an appropriate strategy for evaluating reasonably attributable visibility impairment in the mandatory Class I Federal area by visual observation or other appropriate monitoring techniques.

(5) A comprehensive periodic plan revision must also meet the requirements of paragraphs (g)(1), (g)(2), (g)(4), and (g)(5) of this section for the period of time since the most recent progress report.

(6) *Monitoring strategy and other implementation plan requirements.* The State must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State. Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network. The implementation plan must also provide for the following:

(i) The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.

(ii) Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas both within and outside the State.

(iii) For a State with no mandatory Class I Federal areas, procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.

(iv) The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.

(v) A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

\* \* \*

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

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

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

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

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

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

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

(4) The plan (or plan revision) must provide procedures for continuing consultation between the State and Federal Land Manager on the implementation of the visibility protection program required by this subpart, including development and review of implementation plan revisions and progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in mandatory Class I Federal areas.

## APPENDIX C

### Explanation of Certain Terms Used in This Guidance

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

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

*Analysis of control measures* – The analysis of what emission control measures are necessary for a particular source in order to make reasonable progress. The analysis of controls measures must include consideration of the four statutory factors for reasonable progress. It must include consideration of the five additional factors listed in 40 CFR 51.308(f)(2)(iv) unless these five factors have already been considered in the selection of the sources for which the state will complete an analysis of control measures. It may include the consideration of visibility benefits.

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

*Baseline visibility condition* or *baseline period visibility condition* – The average of the five annual averages of the individual values of daily visibility for the baseline period of 2000-2004, unique to each Class I area, for either the most impaired days or the clearest days. The Regional Haze Rule uses the term *baseline visibility condition*. This document uses the term *baseline period visibility condition* for greater clarity.

*Baseline visibility impact or impacts of a source* – Baseline visibility impacts of a source are estimates of a source's impacts on visibility at a Class I area in the absence of additional reasonable progress measures for the second implementation period. Estimates of baseline visibility impacts may be represented by either a source's current visibility impacts or impacts it will have on a future date, e.g., 2028, under existing regulatory requirements. Baseline visibility impact can be expressed in delta deciview units or inverse megameters of light extinction. Baseline visibility impacts can be used to select sources for analysis of emission control options and as the baseline for quantifying visibility benefits of additional emission control measures.

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

*b<sub>ext</sub>* – Light extinction coefficient, expressed in inverse megameters (Mm<sup>-1</sup>).

*CALPUFF* – A particular Lagrangian puff air quality modeling system. See <https://www.epa.gov/scram/air-quality-dispersion-modeling-alternative-models#calpuff>.

*Characterize* or *characterization* – To quantify or qualitatively describe the facts about a source or about an emission control measure that are relevant to selecting the source for analysis of control measures and/or to determining what emission control measures are necessary to make reasonable progress.

*Class I area* – A mandatory Class I Federal area (also referred to as a “mandatory Federal Class I area” in some sections of EPA’s visibility protection rules) where visibility is an important value, as identified in 40 CFR part 81 subpart D.

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

*CoST* – Control Strategy Tool, part of EPA’s emissions modeling framework.

*Current visibility condition* – The average of the five annual averages of individual values of daily visibility for the most recent period for which data are available unique to each Class I area, for either the most impaired days or the clearest days.

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

*Deciview index* – A value for a day that is derived from calculated or measured light extinction, such that uniform increments of the index correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to very obscured. The deciview index is calculated based on the following equation (for the purposes of calculating deciview using IMPROVE data, the atmospheric light extinction coefficient must be calculated from aerosol measurements and an estimate of Rayleigh scattering):

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

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

*Delta deciview* – The difference in the deciview index for two different ambient conditions. This difference can express the visibility impact of a source or the visibility benefit of an emission control measure. For example, the daily visibility impact of a source in delta deciview units is the difference between the deciview index value that would exist if the source were the only anthropogenic source, added to the natural background, and the daily visibility that would exist due to the natural background alone. Because of the logarithmic nature of the deciview scale, the delta deciview value between two ambient conditions with a certain difference in light extinction values depends on the value of the overall light extinction of the less polluted condition and not only on the difference in light extinction. This guidance recommends the use of light extinction units to express visibility impacts and visibility benefits instead of the use of delta deciviews.

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

*Federal Land Manager* – The Secretary of the department with authority over the 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.

*Fine soil* – The portion, species, or component of  $\text{PM}_{2.5}$  attributable to crustal material, as estimated based on the quantity of certain chemical elements in a sample of  $\text{PM}_{2.5}$ .

*Four statutory factors for reasonable progress* or *four factors* – 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 existing source subject to such requirements.

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

*Light extinction budget* – An apportionment of light extinction to the chemical components of the PM aerosol and the Rayleigh scattering effect causing the light extinction.

*Long-term strategy* or *LTS* – The compilation of enforceable emissions limitations, compliance schedules, and other measures in a periodic regional haze SIP submission that a state has determined are necessary to make reasonable progress for Class I areas within the state and affected by the state. The LTS also includes measures that a state had adopted pursuant to an agreement reached during interstate consultation, as required by 40 CFR 51.308(f)(2)(ii)(A). The LTS was first established in the implementation plan for the first implementation period. Subsequent SIP submissions add to the LTS.

*Mm* – Millions of meters or megameters.

*Mm<sup>-1</sup>* – Inverse megameters (used to indicate division by the number of megameters). This unit is used to quantify light extinction.

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

*Natural conditions* – Naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast, or coloration, and may refer to the conditions on a single day or a set of days. These phenomena include, but are not limited to, humidity, fire events, dust storms, volcanic activity, and biogenic emissions from soils and trees. These phenomena may be near or far from a Class I area and may be outside the U.S.

*Natural visibility* – The visibility (contrast, coloration, and texture) on a day or days that would have existed under natural conditions. Natural visibility varies with time and location, is estimated or inferred rather than directly measured, and may have long-term trends due to long-term trends in natural conditions.

*Natural visibility condition* – The average of individual values of daily natural visibility unique to each Class I area for either the most impaired days or the clearest days.

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

*Rayleigh scattering* – The scattering of sunlight off the gas molecules of the atmosphere.

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

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

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



*Regional haze* – Visibility impairment that is caused by the emission of air pollutants from numerous anthropogenic 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.

*Smoke management program* – A framework to minimize the impact of smoke from prescribed agricultural and/or wildland management burning operations that includes enforceable restrictions on prescribed fire.

*Stationary source, source, group of sources, or source category* – The Regional Haze Rule defines a stationary source as “any building, structure, facility or installation which emits or may emit any air pollutant.” In this document, the terms *stationary source* and *source*, depending on context, may also refer to a single emission release point, process, or unit at a building, structure, facility, or installation. *Group of sources* and *source category* are used interchangeably in this guidance document. In addition, the use of *source* in a statement does not necessarily exclude the application of a concept or step to a group of sources or source category, nor exclude the application of a concept or step to only one unit or emissions process at a source. Statements in this document that include the word “source” are not meant to interpret any provisions of the Regional Haze Rule that use that term.

*URP framework* – The interrelated Regional Haze Rule requirements regarding the quantification of historical and projected visibility conditions using specific metrics, the quantification of natural conditions, the quantification of the uniform rate of progress that would achieve natural visibility conditions for the 20 percent most anthropogenically impaired days in 2064, the URP glidepath, the setting of RPGs for the end of the implementation period, and the comparison of the RPG for the 20 percent most anthropogenically impaired days to the URP glidepath.

*URP glidepath* – The hypothetical straight-line path on the deciview scale between the baseline period visibility condition in 2000-2004 (associated with December 31, 2004) and the sum of the natural visibility condition and optional adjustments for international anthropogenic impacts and impacts from certain wildland prescribed fires (associated with December 31, 2064), for the 20 percent most anthropogenically impaired days for a particular Class I area.

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

*Visibility impairment or anthropogenic visibility impairment* – The Regional Haze Rule defines these terms as “any humanly perceptible difference due to air pollution from anthropogenic sources between actual visibility and natural visibility on one or more days. Because natural visibility can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured.” This document uses these two terms interchangeably.

*Wildfire* – Any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.

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

## APPENDIX D

### More Detail on Steps in Developing a Regional Haze SIP

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
1 All states.	Take inventory of information resources available for SIP development.	Not explicitly addressed.
2 All states.	Determine Class I areas in other states that may be affected by emission sources in the state.	40 CFR 51.308(f)(2)
3 All states.	Determine which other states have sources that may be reasonably anticipated to affect in-state Class I areas.	40 CFR 51.308(f)(2)(ii)
4 All states.	Consult with these states, through multi-state organizations and directly.	40 CFR 51.308(f)(2)(ii)
5 All states.	Consult with FLMs for all in-state Class I areas and affected out-of-state Class I areas on an ongoing basis.	40 CFR 51.308(i)(4)
6 States with Class I areas.	<p>Analysis of visibility monitoring data</p> <p>Determine the baseline (2000-2004) visibility condition and the current visibility condition (as defined in section 51.301) for the 20 percent most anthropogenically impaired days and for the 20 percent clearest days, for each in-state Class I area. This must be done based on using available monitoring data.</p> <p>Determine the natural visibility condition (as defined in section 51.301) for the 20 percent most anthropogenically impaired days and for the 20 percent clearest days, for each in-state Class I area. This must be done based on using available monitoring data and appropriate data analysis techniques.</p> <p>Determine the difference between the baseline period visibility condition and the current visibility condition, for both sets of days. This is the “actual progress made towards the natural visibility condition since the baseline period.”</p> <p>Determine the difference between the average visibility condition in the period of 2003-2007 and the average visibility condition for each subsequent 5-year period, up to and including the 5-year period that determines current visibility conditions, for both sets of days. This is the “actual progress made during the previous implementation period up to and including the period for calculating current visibility conditions.”</p>	40 CFR 51.308(f)(1)
6 States with Class I areas.	Determine the difference between the current visibility conditions and natural visibility conditions, for both sets of days.	

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
7 States with Class I areas.	(Optional) Develop current extinction budgets for each Class I area.	Not explicitly addressed.
8 All states.	Identify significant future trends in emissions.	40 CFR 51.308(f)(2)(iv)(A)
9 All states.	(Optional) Conduct source apportionment modeling and/or review available results from such modeling by other parties.	Not explicitly addressed.
10 All states.	(Optional) Conduct modeling to predict visibility levels for the 20 percent most impaired and 20 percent clearest days as of the end of the implementation period assuming already adopted emissions controls and/or review available results from such modeling by other parties. A comparison of these projected levels to current visibility conditions is a factor that may be considered in the source selection step (step 12 on this list).	Not explicitly addressed
11 All states.	(Optional) Estimate baseline visibility impacts for source selection purposes.	Not explicitly addressed.
12 All states.	Select sources for analysis of control measures.	40 CFR 51.308(f)(2)(i)
13 All states.	Identify emission control measures to be considered for these sources.	40 CFR 51.308(f)(2)(i)
14 All states.	Characterize the four factors for these sources and measures.	40 CFR 51.308(f)(2)(i)
15 All states.	(Optional) Quantify visibility benefits for these sources and measures.	Not explicitly addressed.
16 All states.	Consider evaluating major and minor stationary sources or groups of sources, mobile sources, and area sources.	40 CFR 51.308(f)(2)(i)
17 All states.	Document the criteria used to determine the sources or groups of sources that have been evaluated and how the four factors were taken into consideration in selecting the measures for inclusion in the long-term strategy (LTS).	40 CFR 51.308(f)(2)(i)
18 All states.	Document the technical basis, including information on the four factors and modeling, monitoring, and emissions information on which the state is relying to determine the emission reductions from anthropogenic sources in the state that are necessary for achieving reasonable progress towards natural visibility conditions in each Class I area it affects.	40 CFR 51.308(f)(2)(iii)
19 All states.	Identify the emissions information on which the state's strategies are based and explain how this information meets the Regional Haze Rule's requirements regarding the year(s) represented in the information, i.e., the tie to the submission of information to the NEI.	40 CFR 51.308(f)(2)(iii)

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
20 All states.	Consult with those states that have emissions that are reasonably anticipated to contribute to visibility impairment in the in-state Class I areas to develop coordinated emission management strategies containing the emission reductions necessary to make reasonable progress. This consultation could include the exchange of relevant portions of analyses of control measures and associated technical information.	40 CFR 51.308(f)(2)(ii)
21 All states.	Include in the SIP all measures agreed to during state-to-state consultations or a regional planning process, or measures that will provide equivalent visibility improvement.	40 CFR 51.308(f)(2)(ii)(A)
22 All states.	Consider the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress in the Class I area.	40 CFR 51.308(f)(2)(ii)(B)
23 All states.	Include in the SIP a description of the actions taken to resolve any disagreements with other states regarding measures that are necessary to make reasonable progress at jointly affected Class I areas.	40 CFR 51.308(f)(2)(ii)(C)
24 All states.	Consider emission reductions due to ongoing air pollution control programs, including measures to address RAVI.	40 CFR 51.308(f)(2)(iv)(A)
25 All states.	Consider measures to mitigate the impacts of construction activities.	40 CFR 51.308(f)(2)(iv)(B)
26 All states.	Consider source retirement and replacement schedules.	40 CFR 51.308(f)(2)(iv)(C)
27 All states.	Consider basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs. After consideration of basic smoke management practices, states have the option to include the practices into their SIP submittal, but it is not required.	40 CFR 51.308(f)(2)(iv)(D)
28 All states.	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.	40 CFR 51.308(f)(2)(iv)(E)
29 All states.	Select measures for inclusion in the LTS.	40 CFR 51.308(f)(2)
30 All states.	Set emission limits, averaging periods and monitoring and record keeping requirements.,	40 CFR 51.308(f)(2) – opening text
31 All states.	Set compliance deadlines.	40 CFR 51.308(f)(2) – opening text
32 States with Class I areas.	Project the 2028 RPGs for the 20 percent most anthropogenically impaired and 20 percent clearest days.	40 CFR 51.308(f)(3)
33 All states.	<i>URP Glidepath Check</i>	

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
33A States with Class I areas.	Determine the URP using the baseline period visibility condition value and the natural visibility conditions value for the 20 percent most anthropogenically impaired days. The URP may be adjusted for impacts from anthropogenic sources outside the U.S. and from certain types of prescribed fires, subject to EPA approval as part of EPA's action on the SIP submission.	40 CFR 51.308(f)(1)(vi)
33B All states.	Compare 2028 RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath. If the 2028 point is above the glidepath demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS.	40 CFR 51.308(f)(3)(ii)
33C All states.	If the 2028 RPG for the 20 percent most anthropogenically impaired days is above the 2028 point on the URP glidepath, Calculate the number of years it would take to reach natural conditions at the rate of progress provided by the SIP for the implementation period.	40 CFR 51.308(f)(3)(ii)(A)
34 States with Class I areas.	Compare the 2028 RPG for the 20 percent clearest days to the 2000-2004 conditions for the same days, and strengthen the LTS if there is degradation. Also, compare the 2028 RPG for the 20 percent most anthropogenically impaired days to the 2000-2004 conditions for the same days, and strengthen the LTS if the RPG does not show an improvement.	40 CFR 51.308(f)(3)(i)
35 States with Class I areas.	Submit a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all Class I areas within the state.	40 CFR 51.308(f)(6)
36 States with Class I areas.	Provide for the establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all Class I areas within the state are being achieved.	40 CFR 51.308(f)(6)(i)
37 States with Class I areas.	Provide for procedures by which monitoring data and other information are used in determining the contribution of emissions from within the state to regional haze visibility impairment at Class I areas both within and outside the state.	40 CFR 51.308(f)(6)(ii)
38 States without a Class I area.	For a state with no Class I areas, provide for procedures by which monitoring data and other information are used in determining the contribution of emissions from within the state to regional haze visibility impairment at Class I areas in other states.	40 CFR 51.308(f)(6)(iii)
39 States with Class I areas.	Provide for reporting of all visibility monitoring data to the Administrator at least annually for each Class I area in the state. To the extent possible, the state should report visibility monitoring data electronically.	40 CFR 51.308(f)(6)(iv)

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
40 All states.	Provide for a statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any Class I area. The inventory must include 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.	40 CFR 51.308(f)(6)(v)
41 States with Class I areas.	Provide other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.	40 CFR 51.308(f)(6)(vi)
42 All states.	Commit to submit the January 31, 2025, progress report.	40 CFR 51.308(f) opening text
43 All states.	Offer an in-person consultation meeting with responsible FLMs at a point early enough in the state's policy analyses of its LTS emission reduction obligation so that information and recommendations provided by the Federal Land Manager can meaningfully inform the state's decisions on the LTS.	40 CFR 51.308(i)(2).
44 All states.	Include in the SIP submission a description of how the state addressed any comments provided by the FLMs.	40 CFR 51.308(i)(3)

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United States  
Environmental Protection  
Agency

Office of Air Quality Planning and Standards  
Air Quality Policy Division  
Research Triangle Park, NC

Publication No. EPA-457/B-19-003  
August 2019

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