SUMMARY OF FLM COMMENTS AND STAFF RESPONSES FOR PROPOSED REVISION TO THE OKLAHOMA REGIONAL HAZE STATE IMPLEMENTATION PLAN

COMMENTS RECEIVED PRIOR TO THE DECEMBER 16, 2009 PUBLIC HEARING

Written Comments

US Forest Service – Letter dated December 4 2009, received by DEQ December 10, 2009, signed by Norman L. Wagoner, Forest Supervisor of the Ouachita National Forest, and Judith L. Henry, Forest Supervisor of the Ozark St. Francis National Forest.

1. **COMMENT:** We believe Caney Creek and Upper Buffalo Wilderness should have been included at the same level of analysis as Wichita Mountains Wilderness (WIMO) as they are impacted by emissions from Oklahoma. The modeled impacts from Best Available Retrofit Technology (BART) sources in Oklahoma (tables VI-10 & VI-11) clearly demonstrate some of Oklahoma's impacts. Caney Creek is less than 17 miles or 27 km from the Oklahoma border. While Upper Buffalo is further away (94 km), it is still being impacted from Oklahoma's emissions and needs to be analyzed in more detail.

   RESPONSE: Emissions from Oklahoma occasionally can reach Caney Creek and Upper Buffalo in Arkansas; however, this implementation plan revision does not discuss these Class I areas at length. The regional haze regulation does not oblige DEQ to consider Class I areas outside Oklahoma at the same level of analysis as the Wichita Mountains; rather, 40 CFR § 51.308(d)(1)(i), 40 CFR § 51.308(d)(2), and 40 CFR § 51.308(d)(4) explicitly apply only to Arkansas with respect to Caney Creek and Upper Buffalo. Other subsections of 40 CFR § 51.308(d)(1) mostly implicitly apply only to Arkansas. The regional haze regulation, however, may oblige other states to develop long-term strategies for the Class I areas in Arkansas pursuant to 40 CFR § 51.308(d)(3). This obligation applies only to some states, the emissions from which "may affect" the Class I areas outside their borders. Because of variability and nonlinearity in atmospheric dynamics, emissions from every state may reach every Class I area; however, in casting this regulation, Environmental Protection Agency did not require explicitly every state to evaluate every Class I area. DEQ considers the language of this regulation to exclude insignificantly small contributions of emissions from one state to visibility impairment at Class I areas in other states. Even if DEQ errs in this admittedly fortunate interpretation, this implementation plan revision still addresses all necessary and appropriate factors for approval. The long-term strategy in Chapter VII applies concerning Class I areas in other states, including Caney Creek and Upper Buffalo in Arkansas.

   The model outputs in Tables VI-10 and VI-11 estimate the anticipated improvement in visibility at the Wichita Mountains, Caney Creek, Upper Buffalo, and Hercules Glades from the installation and operation of BART at each facility listed. BART analysis for each facility concern only the 98th percentile of visibility impairment from that facility on each Class I area. These facilities shall install, operate, and maintain BART. The long-term strategy pursuant to 40 CFR § 51.308(d)(3), however, aims to achieve reasonable progress goals. Arkansas may also set reasonable progress goals for its Class I areas pursuant to 40 CFR § 51.308(d)(1), providing for improvement in visibility on the worst quintile of days and ensuring no degradation on the best quintile of days. The worst quintile of days need not include any of the 2 percent of days at or above the 98th percentile for the effect of any BART facility at a Class I area. Winds from the

sources in Oklahoma required to install BART usually do not reach either Class I area. The improvement shown in Tables VI-10 and VI-11 consequently will occur on relatively few days.

DEQ acknowledges the proximity of Caney Creek to the Oklahoma border; however, very few anthropogenic emissions sources exist in the very remote Ouachita Mountains of southeastern Oklahoma. Winds from large pollution sources in Oklahoma only rarely reach Caney Creek. Prevention of significant deterioration laws and regulations effectively will prevent the establishment of large point sources that impair visibility at Caney Creek in Arkansas. DEQ will continue to enforce these requirements. Caney Creek moreover may benefit somewhat from emissions reductions from BART-eligible sources, including lumber-industry sources in McCurtain County, Oklahoma. Despite the proximity of Caney Creek to the Oklahoma border, CENRAP modeling suggests that sources in eastern states, Texas, Arkansas, Indiana, Illinois, Tennessee, Kentucky, Missouri, Minnesota, Ohio, Canada, Alabama, and Louisiana each contributed more to regional haze at Caney Creek than all sources in Oklahoma did on the worst quintile days in 2002.

The prevailing wind pattern in Oklahoma and the orientation of topography in the Ozark Mountains of western Arkansas and eastern Oklahoma ordinarily prevent pollution from sources in Oklahoma from reaching Upper Buffalo. Modeling discussed in this implementation plan revision quantifies the contribution from all sources in Oklahoma to visibility impairment at Upper Buffalo at 2.43 Mm^{-1} on the worst quintile days in 2002 or 1.70% of total visibility impairment. This impairment corresponds to an imperceptibly slight 0.17 deciview, defined pursuant to 40 CFR § 51.301. If Forest Service possesses different information that implicates Oklahoma sources more significantly, then Forest Service may share that information with DEQ. Forest Service thus far has not done so; therefore, DEQ continues to rely on this model output from CENRAP in developing this implementation plan revision. This model output suggests that sources in eastern states, Indiana, Illinois, Arkansas, Missouri, Kentucky, Ohio, Tennessee, Texas, Canada, Minnesota, Alabama, Iowa, Wisconsin, and Louisiana each contributed more to regional haze at Upper Buffalo than all sources in Oklahoma did on the worst quintile days in 2002.

2. **COMMENT:** We acknowledge that Wichita Mountains is the easternmost Interagency Monitoring of Protected Visibility Environments (IMPROVE) site to be assigned in the "Western US" natural conditions estimates. As such, using natural conditions that lie between the revised eastern and western values is probably appropriate. It appears that Uniform Rate of Progress (URP) values are appropriately calculated using the regional haze rule specified values and that the natural conditions estimates do not appear to materially affect control strategies in this SIP. Refining natural conditions estimates in a later SIP revision seems appropriate if new information warrants this.

   RESPONSE: DEQ likely will revisit the setting of natural conditions in a future implementation plan revision.

3. **COMMENT:** We do not consider Oklahoma impacts at other Class I areas to be "insignificant." It appears to us in reviewing Table VI-2, that non-BART subject sources by themselves maybe having a significant impact.

   RESPONSE: DEQ considers this comment from Forest Service curious, especially because Fish and Wildlife Service commented, "combined emissions from Oklahoma indicate an insignificant

contribution to Class I areas outside the State." DEQ did not arrive at this determination lightly; however, at every Class I area except the Wichita Mountains, sources in each of several other states contribute more to visibility impairment than sources in Oklahoma do. At the Wichita Mountains, sources in Texas contribute more to visibility impairment than all sources in Oklahoma do. Sources in Oklahoma contribute little to visibility impairment at Class I areas other than the Wichita Mountains. At Hercules-Glades in Missouri, the Class I area whereat emissions from Oklahoma contribute most to visibility degradation, model output indicated that all Oklahoma sources contributed only 4.84 Mm^{-1} or 3.20% of visibility impairment on the worst quintile days in 2002; this extinction corresponded to an imperceptible 0.33 deciview, defined pursuant to 40 CFR § 51.301.

The table displays the maximum (or 98th percentile) modeled effect of each facility individually on visibility impairment at any Class I area on any day; a different day applies to each facility in the table. The table does not identify the Class I area where each facility most impairs visibility on that basis. These sources contribute far less to visibility impairment on the overwhelming majority of days than a different interpretation of Table VI-2 might suggest.

4. **COMMENT:** We believe that Table VIII-10 demonstrates that Oklahoma is doing its share to reduce impacts at WIMO. We believe ODEQ needs to demonstrate that it is doing its share to reduce impacts at Caney Creek and Upper Buffalo Wilderness as well.

   RESPONSE: This comment is addressed in responses to comments #1 and 3.

5. **COMMENT:** Reasonable progress and Best Available Retrofit Technology (BART) evaluations were not adequate. Protocols for BART and voluntary control limits were not well summarized in the main document. Likewise, we believe too little information was presented as to how the four factors (or five for BART) were considered in making control decisions. Additional summary of ODEQ's BART analysis process is needed for us to assess the SIP.

   RESPONSE: DEQ used the five factor-BART analysis process as the basis for making control decisions as required to establish BART. DEQ details its evaluation of these factors in the BART Chapter (Chapter VI). In response to comments, additional information on the BART/BART waiver protocol and analysis process has been added to the BART Chapter. Also, the CENRAP BART Modeling Guidelines (CALPUFF Modeling Protocol) are now included in Appendix 6-2. However, DEQ believes that each of the BART Determinations in Appendix 6-4 adequately expresses DEQ's five factor-BART analysis process.

   DEQ considered the four factors for making control decisions as required to establish the reasonable progress goals. DEQ details its evaluation of these factors in Chapter IX, but the cost of compliance generally overrode the other factors. In 42 USC § 7470(3), Congress listed economic growth among the purposes of the prevention of significant deterioration part of the Clean Air Act, which part includes the visibility subpart (42 USC §§ 7491 & 7492). DEQ ultimately concluded that it would not impose additional controls beyond BART.

   DEQ feels that no additional information needed to be added to the Reasonable Progress Goal chapter (Chapter IX) at this time. DEQ will continue to consult with Forest Service and federal

land managers on the implementation of BART, including any quinquennial progress reports under 40 CFR § 51.308(g).

6. **COMMENT:** All Class I areas within 300 km should be used in the cost analysis to determine the cost per deciview of visibility improvement. Oklahoma Gas & Electric did not consider all four Class I areas where the Muskogee and Sooner Generating Stations are causing or contributing to visibility impairment.

   RESPONSE: Tables VI-10 and VI-11 of the Draft SIP (Table VI-13 in the SIP submittal) lay out projected visibility improvement with BART controls for all four Class I areas. In addition, Table VI-14, SO_2 source control cost effectiveness (in dollars per deciview), has been added. See also response to Comment 28.

7. **COMMENT:** All Class I areas should be considered as smoke sensitive sites in Oklahoma's Smoke Management Program.

   RESPONSE: This recommendation will be taken into consideration in the development of Oklahoma's Smoke Management Plan.

Department of Interior, US Fish and Wildlife Service, and National Park Service - Letter dated December 4, 2009, received by FAX on December 4, 2009, signed by Sandra V. Silva, Chief, Branch of Air Quality, US Fish and Wildlife Service, and John B……. on behalf of Christine L. Shaver, Chief, Air Resources Division, National Park Service

8. **COMMENT:** In Section II.D, the State indicates that it might consider hourly influences of moisture on visibility impacts in future revisions of the SIP. Monthly factors were recommended for SIP analysis to minimize short-term moisture events. Because the SIP deals with 5-year average baseline and future projects, short-term impacts due to moisture would not be overly beneficial.

   RESPONSE: Short-term moisture events indeed modulate visibility naturally. Congress in 42 USC § 7491 refers repeatedly to "visibility" without such qualifications. Although haze does not impair visibility noticeably on most naturally foggy days, moisture makes hygroscopic components of regional haze more noticeable, especially when low clouds and fog do not accompany humidity. This implementation plan revision did not employ hourly relative humidity observations in part because of a lack of a defensible method of dealing with consequent complications. EPA initially contracted the calculation of relative humidity factors to Science Applications International Corporation in 2001. This contractor noted (p. 1 2) developed relative humidity estimates for the various Class I areas, noting that relative humidity measurement existed at only one-quarter of the Class I areas. The contractor interpolated data from 375 weather stations across the country to derive these estimates. Interpolation generates considerable error, especially on short time scales like hours or days, introduces considerable error. At the Wichita Mountains, however, two weather stations provide relative humidity observations in close proximity to IMPROVE sampler. Inter-annual variation in relative humidity also complicates the establishment and evaluation of reasonable progress goals.

J. L. Hand and W. C. Malm (in "Review of the IMPROVE equation for Estimating Ambient Light Extinction Coefficients") use hourly calculation of relative humidity functions. Consideration of actual relative humidity enables calculation of actual visibility. Relative humidity may exhibit considerable inter-annual variation, but this variation generally reflects inter-annual variability in other meteorological parameters, including soil moisture, mixing depths, and the origins of upwind air masses. Winds that transport pollution to the Wichita Mountains (or to other Class I areas) also transport moisture; inter-annual changes and trends in relative humidity consequently reflect changes in source of air masses at the Wichita Mountains, introducing changes and trends into IMPROVE observations unrelated to pollution control.

9. **COMMENT:** In Section III, the State discusses the variables that affect the natural conditions estimates for the Wichita Mountains Wilderness Area. We acknowledge that Wichita Mountains is the easternmost IMPROVE site to be assigned the "western US" natural conditions estimates. As such, using natural conditions that lie between the revised eastern and western values is probably appropriate. It appears that uniform rate of progress values are appropriately calculated using the Regional Haze Rules specified values, and that the natural conditions estimates do not appear to materially affect control strategies in the SIP, so consideration of refining natural conditions estimates at a later date may be appropriate.

   RESPONSE: DEQ thanks Fish and Wildlife Service for input and appreciates their concurrence regarding the estimate of natural conditions at Wichita Mountains.

   We believe DEQ fulfilled its obligations under 40 CFR § 51.308(d)(1)(i)(B) when calculating a uniform rate of progress at the Wichita Mountains. DEQ thanks Fish and Wildlife Service for their efforts at checking for mathematical errors in this implementation plan revision. Fish and Wildlife Service correctly assumes that natural conditions estimates do not affect materially the control strategies in this implementation plan; DEQ recognizes that the uniform rate of progress likely sets an unrealistic ultimate target.

10. **COMMENT:** Table IV-2 summarizes area sources emissions inventory data by subcategory and pollutant species. The bottom row of the table, labeled "Total area sources" should contain the sum of the five subcategory emissions for each pollutant. However, the data entered in this row do not reflect such sum. We expect the entries are in error, and ask ODEQ to verify the figures presented in this table.

    RESPONSE: DEQ corrected this table.

11. **COMMENT:** Sections VI.A through VI.C discuss the BART screening determination, and voluntary permit limit processes and results. Little to no information is provided to summarize protocols (screening or refined) that become the basis for the results. Although we understand that BART details are provided in an appendix, summarizing processes is valuable and consistent with other sections of the SIP.

    RESPONSE: Additional information was added to Sections VI.A through VI.C to address this comment.

12. **COMMENT:** The timing of BART controls must occur within five years from EPA approval of the Oklahoma Regional Haze SIP, rather than seven years after submission of the SIP to EPA. Section VI. C of the draft SIP incorrectly states that BART controls must occur by the later of five years from EPA approval of the SIP or seven years from the date of submittal of the SIP to EPA. This is contrary to Oklahoma's own regulation, 252:100-8-75(e): "The owner or operator of each BART-eligible source subject to BART shall install and operate BART no later than five years after EPA approves the Oklahoma Regional Haze SIP." The SIP wording should be changed accordingly.

    RESPONSE: The wording in Section VI. C has been revised to remove the phrase "or seven years from the date of submittal of the SIP to EPA."

13. **COMMENT:** The discussion of Tables VI-10 and VI-11 in Section VI.C of the draft SIP states that modeling for existing electrostatic precipitators and proposed fabric filter controls shows visibility impairment well below 0.5 deciviews at all Class I areas. This is an incorrect interpretation of the use of 0.5 deciview. The 0.5 deciview threshold is used in determining whether a BART-eligible facility is to be considered subject-to-BART, but not whether a given pollutant has been controlled adequately. This is determined by the 5-factor BART process.

    RESPONSE: Consideration of PM emissions was included in the BART Determinations. The use of 0.5 deciviews in the cited discussion was intended as a relative reference and not a regulatory threshold or absolute comparison. However, the reference to 0.5 deciview in the last paragraph of Section VI.C has been deleted.

14. **COMMENT:** In Section VI.D of the Oklahoma draft SIP, ODEQ allows itself time after the SIP submittal to make a final BART determination for SO_2 control of the OG&E facilities based on revised cost effectiveness calculations and the appeal by OG&E. ODEQ should make all BART determination in the SIP before the public comment period and submittal to EPA.

    RESPONSE: Final BART determinations were made after consideration of public comments received and in compliance with all applicable Federal requirements.

15. **COMMENT:** Please assure that all emission controls and emission limits proposed as part of the Oklahoma Regional Haze SIP are documented as being federally enforceable and are located in appendices or other referenced State documents. Specifically, the ODEQ BART determinations outlined in the SIP should reference the ODEQ Application Analysis for each facility that developed those determinations. It is not currently clear that this step has been taken.

    RESPONSE: The BART Determinations (DEQ Application Analyses) in Appendix 6-4 document emission controls and limits for the BART-Subject facilities. Chapter VI has been revised to provide additional information on the resulting federally enforceable requirements. The DEQ will follow all consultation and public participation procedures normal included in the permitting process when incorporating requirements into permits for BART-Subject facilities and facilities that obtained a waiver from BART based on facility/permit changes. See also response to Comment 10 (a) (EPA).

16. **COMMENT:** Section I of the draft SIP includes identification of Class I areas that are possibly affected by Oklahoma sources' emissions. This section omits the Forest Service managed wilderness areas of Upper Buffalo and Caney Creek, both in Arkansas. However, the modeled

impacts from several of Oklahoma's BART sources demonstrate impact at these Class I areas. These two Class I areas should be specifically included in the SIP.

RESPONSE: Current PSD regulations require an evaluation of all Class I areas within 300 km of any pollution source in Oklahoma subject to prevention of significant deterioration rules or regulations. These regulations, rules, and practices effectively prevent significant deterioration to visibility at Class I areas in Arkansas. Prevailing winds do not blow from urban, industrialized, or other areas of Oklahoma with considerable sources of anthropogenic air pollution. Air currents from Oklahoma sources usually do not reach these Class I areas in Arkansas on days among the worst quintile; therefore, the effect of Oklahoma sources on these Class I areas is very slight despite their proximity to the Oklahoma border. Nevertheless, because of the prevention of significant deterioration evaluations for these Class I areas, the discourse and tables in Section I was revised to include them and better integrate best available retrofit technology and other prevention of significant deterioration language.

17. **COMMENT:** Section V.G – Although combined emissions from Oklahoma indicate an insignificant contribution to Class I areas outside the State, specific BART analysis shows individual impacts as being highest at Class I areas other than Wichita Mountains. Reasonable Progress control evaluations are not limited to whole-State strategies, rather must be considered on the individual (or smaller group) basis when warranted.

    RESPONSE: Section V.G assesses the average contribution to visibility impairment on the worst quintile days according to photochemical modeling. The BART analyses, however, assess the contribution to visibility impairment from one source on a 98th percentile basis for that source alone. If wind patterns bring non-trivial quantities of visibility-impairing pollution from an individual BART-eligible source to a particular Class I area only on days not among the worst quintile for visibility impairment from all sources at that Class I area, then that BART-eligible source impairs visibility only trivially on the average worst quintile day. Prevailing winds do not carry pollution from BART-eligible sources in Oklahoma toward the Class I areas in Arkansas. Westerly winds from significant pollution sources in Oklahoma to the Class I areas in Arkansas occur infrequently, and notwithstanding the pollution from any Oklahoma sources, the days on which such winds blow may not rank regularly among the worst quintile days at those Class I areas. The reasonable progress goals established subject to 40 CFR § 51.308(d)(1) and the definitions in 40 CFR § 51.301 only must provide for an improvement in visibility on the worst quintile days and ensure no degradation on the best quintile days. Although BART analyses may cover those days, the regional haze regulation does not require any reduction in visibility on days not among the worst quintile. The regulation presumably hopes that reductions in emissions that impair visibility on the worst quintile days will lead to improvements on other days too. Moreover, the regional haze regulation in 40 CFR § 51.308(f) requires decennial comprehensive periodic revisions to this implementation plan revision. Such decennial revisions may discuss more extensively efforts of DEQ to combat regional haze in Arkansas if conditions warrant such consideration.

    Although the law does not limit control evaluations to statewide strategies, DEQ did not identify any significant non-BART sources (other than Grand River Dam Authority) that may warrant consideration of other sources. Chapter IV inventories emissions from large point sources and significant groups of sources. Chapter IX establishes the reasonable progress goal and discusses several evaluations of various sources and classes of sources individually. DEQ ultimately

decided against imposing controls on non-BART sources for this implementation plan revision; however, several individual sources each shall install, operate, and maintain BART.

18. **COMMENT:** The long-term strategy presented in Section VII of the draft SIP does not address construction emission controls within Oklahoma. The Regional Haze Rule, at 40 CFR 51.308(d)(3)(v)(B), identifies "Measures to mitigate the impacts of construction activities" as one of the factors each State must consider, at a minimum, in developing its long-term strategy.

    RESPONSE: Fugitive dust from construction activities is addressed in Subsection VII-B-5 of the implementation plan revision. Moreover, DEQ already enforces the Clean Air Act provisions (and relevant regulations) that prevent significant deterioration in air quality, including visibility, from newly constructed and modified sources, as discussed in Section VII-A.

19. **COMMENT:** In Section III.A.3, a statement is made regarding the benefits of fire to Oklahoma's habitat. The statement: "Consideration of fires as natural phenomena necessarily entails acceptance of slight degraded visibility at the Wichita Mountains from organic elemental carbonaceous particulate," is short-sighted. Although it is later indicated in the SIP that Oklahoma is working on a voluntary compliance Smoke Management Plan, the State should discuss ways to minimize impacts from fire smoke at Class I areas in the same vigor as it does other sources.

    RESPONSE: Habitats at the Wichita Mountains and elsewhere in Oklahoma undoubtedly include fire, and several species depend on regular fires at and beyond the Wichita Mountains. Fish and Wildlife Service actually use prescribed burns at the Wichita Mountains, a property under their management, to benefit the habitat. DEQ recognizes that these benefits extend to land under private or other management too. However, DEQ is aware of the need to manage fire and plans to address this issue more fully in its Smoke Management Plan.

20. **COMMENT:** In Section III.A.4, the State claims that, due to the increased incidence of western fires in the United States, the Trijonis estimates of natural conditions are "far too low." Natural background estimates for use with the new IMPROVE equation, though uncertain, do include influence of natural occurring fire. It may be too harsh of a statement to imply that fire resulting from years of suppression warrants such a strong statement. The statement overly implies that all fire from farmland and pastureland is natural.

    RESPONSE: DEQ concurs with Fish and Wildlife Service. Natural background estimates include a severe amount of uncertainty. A change in land management practices regarding fires around a century ago resulted in a dramatic decrease in incidence of fires across much of the American West (including the Great Plains).

    DEQ has deleted the word "~~far~~" in the final sentence of Section III.A.4. From the final sentence of the final paragraph of Section III.A.4, strike the independent clause, "~~both as huge conflagrations in the American West and as a management tool on farmland and pastureland in the Great Plains,~~" including the commas both preceding and succeeding this clause.

21. **COMMENT:** Section IX.D.2 – We appreciate that the State is working on a Smoke Management Plan for Oklahoma. In addition to the conditions already presented, please consider defining

Class I areas as sensitive receptors which requires sources to consider ways to minimize smoke intrusions.

RESPONSE: ODEQ will take this comment into consideration as it works to finalize Oklahoma's Smoke Management Plan.

22. **COMMENT:** Section X.A identifies several States with which Oklahoma consulted during the development of its draft SIP. However, the discussion there does not mention any consultation with the State of Louisiana. Earlier in the document, Table VIII-3 indicates that Louisiana's contribution to light extinction at the Wichita Mountains Class I area is both significant and increasing between the 2002 and 2018 model projection. During our conference call on November 16, 2009, ODEQ staff indicated that they had discussed these findings and their implications with their Louisiana counterparts. It is important that the results of these discussions be explained in the Oklahoma SIP.

    RESPONSE: Section X.A has been revised to document Oklahoma's consultations with Louisiana. Louisiana did not submit written comments.

23. **COMMENT:** All costs presented by OG&E for SO_2 control were excessive. This was highlighted by ODEQ when it presented more reasonable cost estimates in the Muskogee and Sooner Application Analysis documents. Citing costs higher than those cited in the EPA BART Guidelines due to inflationary pressures does not remove these sources from being subject to EPA's established BART controls. To compare current OG&E cost estimates that have been inflated over several years to the EPA cost estimates in the EPA BART Guidelines and then declare excessive costs for the project is an erroneous comparison. To have a limit less stringent than EPA's established BART levels, the State would need to establish that the source would face exceptional costs, due to the source's configuration or other plant-specific features, compared to the costs of other sources subject to presumptive BART emissions limits. The current information that we have does not support this position.

    Construction costs in the 2012 period will likely be lower than the rapidly increasing costs in the 2007-2008 period. All of the reasons that caused Flue Gas Desulfurization (FGD) construction costs to dramatically escalate in the 2007-2008 period are abating. Costs in the 2011-2012 period when these dry FGD units will be constructed, will likely be significantly lower than currently proposed by OG&E. Some of the variables have been shown to be the price of oil, the price of materials, a declining dollar and demand from China for equipment vendors. This justifies use of the 2007 National Lime Association Report for developing a cost scenario presented below.

    Insufficient cost information was provided. OG&E should supply the vendor quotations and Sargent and Lundy internal cost data that was used to substantiate OG&E estimates. The information that was available provided a good summary on cost, but lacked detailed information supporting development of those costs. Regarding cost estimates, the EPA BART Guidelines state that, "The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual). In order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual, where possible."

In the comparison of wet FGD to dry FGD with Spray Dryer Absorption (dry FGD w/SDA) for SO_2 control, OG&E's contention is that wet FGD causes slower exit velocity, lower stack temperature and higher SO_4 emissions; thus, visibility impairment is higher for wet than dry FGD. If this contention is accepted as being true, since the bottom line of emission controls is visibility improvement in Class I areas, the dry FGD alternative is probably reasonable. However, more information should be supplied by OG&E regarding the excessive production of sulfuric acid mist with wet FGD causing visibility impairment greater than that produced by dry FGD w/SDA, because we question the validity of this contention. Pending more information on the wet FGD versus dry FGD w/SDA comparison, we will continue with the OG&E analysis pertaining to dry FGD w/SDA.

Since the Muskogee Generating Station Units #4 and #5 and the Sooner Generating Station Units #1 and #2 are very similar in their size and configuration, comments below apply to all of those units even though only Muskogee Unit #4 serves as the working example.

The revised, more reasonable cost estimates presented by ODEQ in the BART Application Analysis for both the Muskogee and Sooner Generating Stations provided an excellent analysis. The FWS would like to provide an alternative lower cost analysis taken from the 2007 Flue Gas Desulfurization Technology Evaluation, Dry Lime vs. Wet Limestone FGD, prepared for National Lime Association. This analysis provides a Total Capital Requirement of $136,500,000 for a 500 MW dry FGD w/SDA, compared to the $181,896,000 - $205,348,000 used by ODEQ. This results in a capital cost per kilowatt in the range of $273, rather than ODEQ's $318 - $359 estimate. Finally, the annual operation and maintenance costs per kilowatt were found to be $17.58, rather than the ODEQ range of $43 - $47. Using the values shown above as a realistic model for Muskogee Unit #4, the cost per ton of SO_2 is developed as follows:

Annual Emissions Baseline (TPY) (Max year for 2002-2008)	9775 TPY
Baseline lb/MMBtu	.507 lb/MMBtu
Emission Rate for Dry FGD w/SDA	.065 lb/MMBtu
(reference: Application of LS Power – High Plains Plant, CO)	
Dry FGD w/SDA Capital Cost	$156,200,000
(reference: Nat'l Lime 2007 w/PRB Coal; 500 MW = $136,500,000, scaled to 572 MW)	
Annualized Capital Costs using 25 yrs @ 7% (.0858)	$13,401,960
Annual O&M Costs per Nat'l Lime 2007	$10,055,760
($17.58/kw x 572,000 kw)	
Total Annual Cost	$23,457,720
Tons Reduced *((1-(.065/.507)) x 9,775)*	8,521
Cost per Ton of SO_2 reduced *($23,457,720/8,521 tons)*	$2,753

A cost per ton for SO_2 control of $2,753 is considered reasonable by the FWS, so dry FGD w/SDA is considered to be a cost-effective alternative under BART. Given the similarity of all four Muskogee and Sooner units, this conclusion should apply to all four units.

RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

24. **COMMENT:** ODEQ should have considered and discussed whether dry FGD w/SDA can be applied without replacing the existing ESP with a fabric filter. An ESP, rather than a fabric filter can be used for particulate removal from a dry FGD w/SDA if the ESP is designed to handle the increased particulate loading, though it is slightly inferior to the fabric filter in efficiency. There was no discussion whether the existing ESP units with some upgrades might be able to handle the particulate loading without adding $105 million in capital and associated costs for new fabric filters for each unit. Alternatively, it may be possible to install a small baghouse (at a lower cost) downstream of the existing ESP.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

25. **COMMENT:** In developing the fifth factor of BART analyses, the cost per deciview of improved visibility, the effect on multiple Class I areas should be taken into consideration. We continue to believe that it is appropriate to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected. It is not appropriate to use the same metric to evaluate the effects of reducing emissions from a BART source that impacts only one Class I area as for a BART source that impacts multiple Class I areas. And, it also is not appropriate to evaluate impacts at one Class I area, while ignoring others that are similarly significantly impaired. If emissions from the Muskogee and Sooner Generating Stations are reduced, the benefits will be spread well beyond only the most-impacted Class I areas (Caney Creek and Wichita Mountains, respectively). The State should consider all benefits when establishing BART limits. While OG&E presented data describing improvements to visibility at all four affected Class I areas (Caney Creek, Wichita Mountains, Upper Buffalo and Hercules Glades) that would result from the various control scenarios it investigated, OG&E did not explain how it incorporated this information on impacts upon all four Class I areas into its BART decision. For example, the Oregon Department of Environmental Quality (OR DEQ) has posted on its website a proposal to require under the BART program that the Boardman power plant install a dry scrubber and Selective Catalytic Reduction (SCR). As part of its BART determination, OR DEQ evaluated the benefits of various control strategies on all 14 of the Class I areas within 300 km of the plant. The following is an excerpt from comments the FLMs sent to OR DEQ:

    > *The BART Guidelines represent an attempt to create a workable approach to estimating visibility impairment. As such, they require several assumptions, simplifications, and shortcuts about when visibility is impaired in a Class I area, and how much impairment is occurring. The Guidelines do not attempt to address the geographic extent of the impairment, but assume that all Class I areas are created equal, and that there is no difference between widespread impacts in a Class I area and isolated impacts in a Class I area. To address the problem of geographic extent, we have been looking at the cumulative impacts of a source on all Class I areas affected, as well as the cumulative benefits from reducing emissions. While there are certainly more sophisticated approaches to this problem, we believe that this is the most practical, especially when considering the modeling techniques and information*

available. In this case, we applied this cumulative approach to the Boardman analysis and found that the cumulative impact from the baseline condition on visibility in the 14 Class I areas is 29.7 dv, with a total of 2,367 "days" of impaired visibility across the 14 Class I areas.

We understand that OR DEQ used a similar approach in its analyses. In addition, the Wyoming Department of Environmental Quality, as well as EPA Regions 8 and 9 support this concept. In its development of cost per deciview of visibility improvement, OG&E did not consider all four Class I areas where the Muskogee and Sooner Generating Stations are causing or contributing to visibility impairment. We would be pleased to work with ODEQ to further develop this approach.

Implementation of the above multiple Class I area visibility improvement discussion is provided by example as follows: Using the average annual cost of the ODEQ cost range from Table 9 in the Muskogee BART Application Analysis for dry FGD w/SDA ($42,358,700), divided by only the maximum-improvement at a Class I area (Wichita Mountains at 1.053 dv) the cost per deciview is $40.2 million. Deciview improvement for dry FGD w/SDA at each of the nearest Class I areas (2003) is as follows: Wichita Mountains - 1.053 dv; Caney Creek - 1.490 dv; Upper Buffalo - 1.119 dv; Hercules Glades - .0744 dv. If the annual cost is divided by the sum of the deciview improvements at all four Class I areas using the 2003 year (4.406 dv), the result is $9.6 million per deciview. This is well within what is considered reasonable under BART ($10 - $19 million/dv for SO_2 controls. It should be noted that using the FWS model developed above, where the annual cost was $23.5 million, the cost per deciview even at just Wichita Mountains is $22.3 million.

RESPONSE: DEQ agrees that the cost per deciview should be incorporated into the fifth factor of the BART analysis. The cost per deciview of improvement is one element of determining overall cost effectiveness. In ODEQ's view, there is no one metric or one threshold value that determines cost effectiveness; it is instead a combination of total cost, cost per ton removed and cost per deciview improvement. Federal Land Managers have provided guidance that costs less than $10,000,000/dv should be considered cost effective. Comments provided on the draft SIP indicate that the cost effectiveness threshold for SO_2 for the Federal Land Managers has since nearly doubled to $19,000,000/dv. DEQ has taken these thresholds under advisement; however, DEQ would disagree that this metric alone determines BART and would further question the rationale behind a $19,000,000/dv threshold and different thresholds for different pollutants. The BART chapter has been revised to include cost effectiveness determinations for each of the control technologies examined.

The following tables address $/dv for each BART evaluation across all impaired class I areas within 300km of the source. The listed dv improvements represent the average 98th percentile improvements across the modeled years (2001-2003). Average improvements were used with the understanding that some years would be more cost effective than others and the use of an average would be the most equitable way to determine the true cost of improvement.

SO_2 source control cost effectiveness (in dollars per deciview)

Source	Wichita Mountains Δ-dv	Caney Creek Δ-dv	Upper Buffalo Δ-dv	Hercules Glades Δ-dv	Total Δ-dv	Cost Effectiveness $/dv
OG&E Muskogee (DFGD/SDA)	1.182	0.849	1.053	0.979	4.063	$25,252,375
OG&E Sooner (DFGD/SDA)	0.531	0.303	0.394	1.19	2.418	$38,736,394
PSO Northeastern (DFGD/SDA)	1.052	0.837	0.842	1.068	3.799	$22,835,694

Wet scrubbers provided minimal improvement in visibility impairment and therefore did not offset the cost increase over the less costly dry scrubbers for OG&E Sooner and AEP-PSO Northeastern. Installation of the more costly wet scrubbers at the OG&E Muskogee facility was not found to decrease visibility impairment over the use of dry scrubbers.

NOX Source Control Cost Effectiveness- (Coal-Fired Units)

Source	Caney Creek	Hercules Glade	Upper Buffalo	Wichita Mts.	Total	Cost Effectiveness
	Δdv	Δdv	Δdv	Δdv	Δdv	$/dv
OG&E Sooner						
LNB/OFA	0.377	0.278	0.312	0.831	1.798	$2,317,241
LNB/OFA-SCR	0.442	0.323	0.364	0.973	2.101	$29,476,059
OG&E Muskogee						
LNB/OFA	0.771	0.334	0.553	0.438	2.096	$1,995,992
LNB/OFA-SCR	0.939	0.403	0.672	0.531	2.544	$24,210,377
AEP-PSO Northeastern						
LNB/OFA	0.643	0.302	0.411	0.390	1.746	$1,381,150
LNB/OFA-SCR	0.821	0.385	0.524	0.494	2.224	$21,486,421

26. **COMMENT:** Dry FGD w/SDA should be considered to attain 93% reduction efficiency, rather than the 87.5% & 88.2% assumed by OG&E for Muskogee Units #4 and #5, respectively. The following sources document at least 93% control efficiency for dry FGD w/SDA in a 500 MW unit using Powder River Basin Coal:
    - Dry Flue Gas Desulfurization Technology Evaluation, Project Number 11311-000, Prepared for National Lime Association, Sept. 2002
    - Economics of Lime and Limestone for Control of Sulfur Dioxide, William DePriest and Rajendra P. Gaikwad, Sargent and Lundy LLC
    - Don Shepherd of the National Park Service maintains a comprehensive listing of recent BACT determinations relating to SO_2 control. The range of conrol efficiency for dry FGD w/SDA is from 89.8% to 96.5%.

The OG&E assumption that an emission rate of 0.1 lb/MMBtu will be attained by dry FGD w/SDA is understated when considering 93% control effectiveness on a 0.507 lb/MMBtu baseline emission rate. Ninety three percent SO_2 reduction of a 0.507 lb/MMBtu input emission rate could *theoretically* result in a 0.036 lb/MMBtu emission rate. In practice NPS's compilation of recent BACT applications shows one plant (Sierra Pacific, Ely, NV) applying for an emission rate as low as 0.060 lb/MMBtu. An additional regulatory emission limit cushion might result in a permitted .065 lb/MMBtu emission rate.

The FWS agrees that something other than the maximum 24-hour emission rate over the baseline period (2002 – 2005) could be used as the baseline emission rate. However, rather than using the average annual emission rate over the 2004 – 2006 as proposed by OG&E (e.g., 9,113 tpy SO_2 for Muskogee #4), the maximum year within the baseline years (2002 – 2008) should be used (e.g., 9,775 tpy SO_2). The reason is that the post-BART emission rate included in the OG&E permits will be a 30-day emission rate derived from a *given* annual emission rate (not an average over multiple years), so the baseline emission rate that is used should be in commensurate terms. Also, if OG&E wants to use a 90% capacity factor to calculate the annual emissions, then permits issued which may allow a given annual emission should also reflect a maximum capacity of 90%.

RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

27. **COMMENT:** In Section VI.D of the Oklahoma draft SIP, ODEQ allows itself time after the SIP submittal to make a final BART determination for SO_2 control of the OG&E facilities based on revised cost effectiveness calculations and the appeal by OG&E. ODEQ should make all BART determination in the SIP before the public comment period and submittal to EPA.

    RESPONSE: See response to comment 14

28. **COMMENT:** Regarding NO_x controls using the alternative of Low NO_x Burners (LNB), Over-fire Air (OFA) and Selective Catalytic Reduction (SCR), we believe that OG&E has understated the ability of modern SCR systems to reduce NO_x emissions (0.07 lb/MMBtu for LNB/OFA/SCR) and has overestimated the costs ($30,795,600 annual cost per boiler). Our review of operating data suggests that a NO_x limit of 0.06 lb/MMBtu is appropriate for LNB/OFA/SCR for a 30-day rolling average, and 0.07 lb/MMBtu for a 24-hour limit and for modeling purposes, but a lower rate (e.g., 0.05 lb/MMBtu or lower) should be used for annual average and annual cost estimates. Multiple surveys published in recent years have documented cost per kilowatt (kW) in a general range between $83/kW - $300/kW, with the upper end of this range occurring for highly complex retrofits with severe space constraints. OG&E assumed a cost of $337.5/kW for the Muskogee units. Choosing a rate on the higher end of the range, but a more reasonable $250/kW, the resulting average annual cost might be closer to $26,500,000 rather than $30,795,600. Using the FWS estimates, the cost per ton of NO_x reduction is $2,759/ton for Unit #4 and $2,599/ton for Unit #5. These values should be considered as being reasonable for NO_x control. The cost of visibility improvement using this scenario at the four affected Class I areas results in $18.8 million per deciview.

RESPONSE: DEQ has evaluated the cost effectiveness of controls based both on direct costs per ton as well as incremental costs per ton. On an incremental basis, SCR controls were determined not to be cost effective. Further, the listed $18.8 million per deciview is well in excess of the less than $10 million per deciview cost generally considered to be cost effective both through discussions with the FLMs and DEQ's review of BART determinations made in other States.

Public Service Company of Oklahoma (PSO) Northeastern Power Station Units #3 and #4

29. **COMMENT:** Issues relating to the PSO Northeastern Power Station Units #3 (490 MW) and #4 (490 MW) low-sulfur coal-fired units are about the same as for the OG&E Muskogee and Sooner Plants discussed above. First, PSO's capital costs for dry FGD w/SDA were more realistically estimated by a cost range provided by ODEQ. This resulted in cost per ton of SO_2 estimates in the $2000 range, rather than the $3,266/ton presented by PSO. Even PSO's $3,266/ton estimate was deemed as being reasonable by ODEQ. Second, insufficient cost information was provided by PSO; the company should supply the vendor quotations and cost data that were used to substantiate its cost estimates. Actually, the FWS has not seen a PSO BART analysis for the Northeastern Power Station other than a letter from PSO to ODEQ committing to meet the presumptive emission limits. If it is available, the BART analyses for these units should be provided to the FWS for review. Third, more information should be supplied by PSO regarding the excessive production of sulfuric acid mist with wet FGD causing visibility impairment greater than that produced by dry FGD w/SDA. Fourth, PSO should have considered and discussed whether dry FGD w/SDA can be done without replacing the existing ESP with a fabric filter. Fifth, in developing the visibility improvement factor of BART analyses (i.e., the cost per deciview of improved visibility), the effect on multiple Class I areas should be taken into consideration. Sixth, dry FGD w/SDA should be considered to attain 93% reduction efficiency, rather than the 83% assumed by PSO. This factor has a significant effect on the cost per ton of SO_2 removed and it should be reflected by ODEQ in determining the permitted emission limits for the facility.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable. Regarding the request that the BART analyses for PSO Northeastern Units 3 and 4 be provided to the FWS for review, DEQ has included these in Appendix 6-4 of the SIP submittal.

30. **COMMENT:** The baseline emission rate (maximum 24-hour emission rate) used in ultimately developing cost per ton of SO_2 control was not subsequently challenged by PSO as it was by OG&E, presumably because PSO committed unconditionally to meet presumptive emission limits. As a result ODEQ has proposed dry FDG w/SDA as BART without qualifying that determination as it did with the Muskogee and Sooner Generating Stations. Should ODEQ qualify the current BART determination for Northeastern Power Station Units #3 and #4 as was done in the OG&E case, considerably more information must be supplied by PSO as discussed above and all parties must be provided the opportunity to scrutinize the new data before any determination is finalized in the Oklahoma Regional Haze SIP.

    RESPONSE: The portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed as the result of comments

received – including those from the federal land managers (FLMs). Federal regulations do not require DEQ to provide an additional review period, and given the time constraints for submitting this SIP revision to EPA, is unable to do so. In the future, the FLMs will have opportunities to comment when DEQ proposes permits that incorporate those determinations.

ODEQ BART Application Analysis Documents for Natural Gas-Fired EGUs:
Oklahoma Gas & Electric, Seminole Station Units 1, 2, and 3 (Seminole)
Public Service Company of Oklahoma (PSO), Northeastern Power Station Unit 2 (Northeastern)
American Electric Power Southwestern Power Station Unit 3 (Southwestern)
American Electric Power Comanche Power Station Units 1 & 2 (Comanche)

31. **COMMENT:** ODEQ generally determined the cost of some combination of NO_X combustion controls and the determined the incremental cost of adding SCR, concluding that the incremental cost was excessive. SCR is nearly always deployed with underlying combustion controls, so the cost of the LNB/OFA/SCR alternative should be the average cost of the entire 'package' of controls. The reasonableness of this overall average cost should then be judged.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

32. **COMMENT:** For Seminole, Unit 3, OG&E seemed to understate the efficiency of LNB/OFA/FGR/SCR as being 81.8%, whereas Units 1 and 2 were above 88%. There is a question as to why Unit 3 is somehow different from the other two units. Actually, this technology should be assumed to operate at 90% efficiency.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

33. **COMMENT:** Section C, "BART DETERMINATION" within the ODEQ BART Application Analysis for Seminole omitted "FGR" when stating that LNB with OFA (and FGR) is determined to be BART for NO_x control for Units 1-3.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

34. **COMMENT:** Table 8 of the Northeastern, Unit 2 document contains a subtraction error. The line, "Annual NO_x Reduction (TPY), in the column, "Option 3: LNB/OFA+SCR" should read 1,880 (2,099-219), rather than 1,027. This change would affect the average cost per ton of that alternative.

RESPONSE: DEQ concurs that there was a subtraction error in Table 8 of the PSO Northeastern, Unit 2 BART analysis. Please note that revised BART analysis values differ from those included in the draft RH SIP. The NO_X baseline annual emissions were increased as the result of comments received, and the Option 3 annual NO_X reduction was recalculated.

35. **COMMENT:** In the Comanche analysis for each of Units 1 and 2, Tables 4 and 6 seem to show two different values for the baseline NO_x emission rate (e.g., for Unit 1, Table 4 shows 0.696 lb/MMBtu and Table 6 shows 0.48 lb/MMBtu). It is not immediately clear as to why these values would differ. The same type of difference exists in the Northeastern Unit 2 analysis when comparing the baseline NO_x emission rate in Table 1 and Table 8.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

36. **COMMENT:** The fifth factor in a BART determination is calculation of the cost of visibility improvement for each BART alternative at each of the affected Class I areas. Deciview improvement data for the Combustion Controls/SCR alternative is provided in each of the analysis documents, but the final step of presenting the cost of visibility improvement has not been performed.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

37. **COMMENT:** The capital cost for SCR at Southwestern was reported to be $65,968,400, or $287/kW. This is at the high end of a range of SCR capital costs reported over five different studies (range $83/kW to $300/kW), where a reasonable average might be considered to be around $200/kW. The smaller size of this unit (332 MW) may account for costs tending upward, but costs in this range should only occur in the case of highly complex retrofits. No such justification was explained in the document. These costs should be reconsidered.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

38. **COMMENT:** Generally, insufficient cost information was provided, though the OG&E BART determination for Seminole provided more detailed cost information than the others. The information that was available provided a good summary on cost, but lacked detailed information supporting development of those costs. Regarding cost estimates, the EPA BART Guidelines state that, "The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor(i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual). In order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual, where possible.

RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.

39. **COMMENT:** The FWS asks that ODEQ consider the above general comments regarding the BART determinations for the natural gas-fired EGUs and rework the materials as necessary. The adjustments may or may not result in more reasonable costs and a selection of an SCR alternative as BART in one or more cases.

    RESPONSE: After considering the comments received, the portion of the Regional Haze SIP and/or attached BART determination(s) relevant to the above comment(s) has been modified or removed. Consequently, the above comment has been addressed and/or is no longer applicable.