LOUISIANA DEPARTMENT OF
ENVIRONMENTAL QUALITY

Regional Haze State Implementation Plan

EGU BART Analysis

Submitted to: EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas TX 75202-2733

FINAL October 2017

JOHN BEL EDWARDS
GOVERNOR

CHUCK CARR BROWN, PH.D.
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF THE SECRETARY

October 26, 2017

Mr. Sam Coleman, Acting Administrator
US EPA Region 6 (6-RA)
1445 Ross Avenue, Suite 1200
Dallas Texas 75202-2733

RE: Regional Haze State Implementation Plan
EGU BART Analysis (R. S. Nelson)

Dear Mr. Coleman:

The State of Louisiana has approved and is submitting the State Implementation Plan revision for the Regional Haze Rule as required by the Clean Air Act Amendments of 1990 and 40 CFR 51, Appendix Y.

Please contact the Office of Environmental Services through Vivian H. Aucoin at (225) 219-3482 if you have any questions.

Best wishes and warm personal regards.

Sincerely,

Chuck Carr Brown, Ph.D.
Secretary

Enclosures

c: Wren Stenger, EPA Region 6
Guy Donaldson, EPA Region 6

Post Office Box 4301 • Baton Rouge, Louisiana 70821-4301 • Phone 225-219-3953 • Fax 225-219-3971
www.deq.louisiana.gov

I. Background on the Regional Haze Rule

A. Plan Submission

[No Change]

B. Legal Authority

[No Change]

C. Public Notice

In accordance with La. R.S. 49:950, et seq., and to comply with 40 CFR§51.285 Public Notification, the LDEQ published a notice seeking comment on the then proposed SIP revision on June 20, 2017 in the *Louisiana Register*. The public comment period closed on July 26, 2017. No hearing was requested; as such a public hearing was not held. Copies of the potpourri notice as well as comments are included in Appendix A

D. Commitment to Plan Revision

[No Change]

E. History of Regional Haze

[No Change]

F. Breton National Wilderness Area (Class I)

[No Change]

G. Louisiana's Visibility History

[No Change]]

H. Class I Areas outside the State Boundaries

[No Change]

II. BART Analysis

[No Change]

A. CLECO

[No Change]

B. Louisiana Generating, LLC, a subsidiary of NRG

[No Change]

C. Entergy Louisiana LLC

Entergy submitted to LDEQ CALPUFF modeling for SO_2 and PM for the various units that were found to be BART-eligible; all reports are included in Appendix D. In the course of this exercise, Entergy has submitted not only CALPUFF modeling and a five-factor analysis to satisfy the RH and BART requirements, but has also submitted CAMx modeling to support their findings. While LDEQ has not used the CAMx modeling to ascertain that the units have satisfied the BART requirements, the model results have been included for consideration. Following Louisiana's final revision submittal, a discussion between EPA, LDEQ and Entergy took place and based upon the results of that discussion, EPA provided additional information on Entergy's proposed BART five-factor analysis and EPA's draft analyses for LDEQ's review. Therefore this SIP was revised to include the EPA information. The additional information submitted by EPA was included in Appendix F.

- **Entergy Ninemile Point Units:**

[No Change]

- **Entergy Little Gypsy Units:**

[No Change]

- **Entergy Willow Glen Units:**

[No Change]

- **Entergy Sterlington Units:**

[No Change]

- **Entergy Michoud Units:**

[No Change]

- **Roy S. Nelson Generating Plant (Nelson):** The facility is located in Westlake, Calcasieu Parish, Louisiana and is located 264 miles due west of the Breton National Wilderness Area and 286 miles due south of the Caney Creek Wilderness Area in Arkansas. The facility is a fossil-fuel steam electric power generating facility and operates three BART-eligible steam generating units: Unit 4, Unit 4 Auxiliary Boiler and Unit 6.

The Unit 4 Boiler is permitted to combust natural gas, No. 2, No. 4 and No. 6 fuel oils and refinery fuel gas. Unit 4 has a maximum heat rated capacity of 5400 MMBtu/hour and exhausts out of one stack. It has flue gas recirculation equipment installed for control of NOx emissions. The Auxiliary Boiler for Unit 4 is permitted to burn natural gas and fuel oil.

The Unit 6 Boiler is permitted to burn coal as its primary fuel, with No. 2 and No. 4 fuel oils as its secondary fuels which are mainly used for start-up. Unit 6 has maximum heat rated capacity of 6216 MMBtu/hour and exhausts out of one stack. It has an electrostatic precipitator (ESP) with flue gas condition for control of particulate matter (PM) emissions. Unit 6 has installed Separated Overfire Air Technology (SOFA) and a Low NOx Concentric Firing System (LNCFS) for NOx control. Steam from these boilers is used to drive steam turbines which in turn generate rotary motion that is used to drive electric generators. The electric generators then produce electricity.

Unit 4 and the auxiliary boiler are permitted to burn fuel oil. However, fuel oil has not been burned at either unit in several years and there are no current operational plans to burn fuel oil. Entergy and LDEQ have executed an Administrative Order on Consent (AOC) that states before fuel oil firing is allowed to take place at Unit 4 and/or the auxiliary boiler, a revised BART determination must be promulgated for SO_2 and PM for the fuel oil firing scenario through a SIP revision, which will then have to be approved by EPA and such action will become federally enforceable.

Entergy performed the traditional CALPUFF analysis as well as CAMx modeling based upon EPA modeling guidance. The guidance, Appendix Y of the BART rule (July 6, 2005), states that CALPUFF shall be used for single-source modeling where the distance between the BART source and the Class I area is less than 300 kilometers (km). Since CALPUFF may significantly over predict impacts at greater distances, CAMx is approved for situations where the distance is greater than 300km. The facility is 425 km from Breton and 460km from Caney Creek.

In the Entergy BART five-factor SO_2 analysis for the Unit 6 Boiler, a number of emission reduction controls were reviewed. The reviewed controls included the use of a lower sulfur coal, DSI, enhanced DSI, dry flue-gas desulfurization (FGD) and wet FGD. LDEQ has reviewed and weighed the five factors carefully; after a review of the information that Entergy and EPA provided, LDEQ has concluded that the appropriate BART for this facility is to establish an emission limit of 0.6 lbs/MMBtu based on a 30 day rolling average as defined in the AOC (see Appendix D). While additional visibility benefits may be available through the use of FGD, the lower sulfur coal option results in visibility benefits at a lower annual cost. Along with the extra cost, FGD use results in additional waste due to spent reagent and has some power demands to run the equipment. LDEQ believes, at present, that the use of lower sulfur coal presents the appropriate SO_2 control based on consideration of economics, energy impacts, non-air quality environmental impacts, and impacts to visibility.

Regarding PM, Unit 6 is currently equipped with an ESP to control PM emissions.

Impacts from PM emissions are small and any additional controls beyond the ESP would have minimal visibility benefits and would not be cost–effective. Therefore, the existing controls are sufficient to meet BART for PM.

Based upon this decision and the inclusion of the emission limits in the AOC, LDEQ has determined that the conditions are sufficient to meet BART. As the energy industry evolves, LDEQ continues to work with EGUs throughout Louisiana to evaluate the operation of utilities. As such, LDEQ will engage in discussions with Entergy about any potential changes in usage or emission rates at the Nelson facility. Any such changes will be considered for reasonable progress for future planning periods as appropriate.

- **Waterford 1 & 2 Electric Generating Plant (Waterford):**

[No Change]

D. Municipal Facility Units

[No Change]

Appendix A

Public Notice and Participation

Potpourri

POTPOURRI

Department of Environmental Quality
Office of the Secretary
Legal Division

State Implementation Plan for Regional Haze Program
Electrical Generating Units BART

Under the authority of the Louisiana Environmental Quality Act, R. S. 30:2001 et seq., the secretary gives notice that the Office of Environmental Services, Air Permits Division, will submit a proposed revision to the state implementation plan (SIP) for the Regional Haze Program as required under the Clean Air Act, part C, section 169, and 40 CFR part 51.308. *Regional haze* is defined as visibility impairment caused by the cumulative air pollutant emissions from numerous sources over a wide geographic area. (1706Pot1)

On July 3, 2012, the Environmental Protection Agency (EPA) made final a partial limited approval and partial disapproval of the original SIP submitted on June 13, 2008. This revision answers the requirements for the electrical generating unit (EGU) at the Entergy Gulf States Louisiana, Roy S. Nelson facility, located in Westlake, Calcasieu Parish, Louisiana, which was addressed under the best available retrofit technology (BART) section and that is subject to the EPA partial disapproval.

All interested persons are invited to submit written comments concerning the SIP revision no later than 4:30 p.m., Wednesday, July 26, 2017, to Vivian H. Aucoin, Office of Environmental Services, P.O. Box 4313, Baton Rouge, LA 70821-4314, fax (225) 219-3482, or e-mail at vivian.aucoin@la.gov. A public hearing will be held upon request. The deadline for requesting a public hearing is Friday, July 7, 2017.

A copy of the proposal may be viewed on the Louisiana Department of Environmental Quality website, or at LDEQ headquarters at 602 North Fifth Street, Baton Rouge, LA 70802.

Herman Robinson
General Counsel

1706#020

POTPOURRI

Department of Health
Bureau of Health Services Financing

2018 First Quarter Hospital Stabilization Assessment

In compliance with the House Concurrent Resolution (HCR) 51 of the 2016 Regular Session, the Department of Health, Bureau of Health Services Financing amended the provisions governing provider fees to establish hospital assessment fees and related matters (*Louisiana Register*, Volume 42, Number 11).

House Concurrent Resolution 8 of the 2017 Regular Session of the Louisiana Legislature enacted an annual hospital stabilization formula and directed the Department of Health to calculate, levy and collect an assessment for each assessed hospital.

The Department of Health shall calculate, levy and collect a hospital stabilization assessment in accordance with HCR 8. For the quarter beginning July 1, 2017 through September 30, 2017, the quarterly assessment amount to all hospitals will be $12,453,469. This amounts to 0.109555 percent of total inpatient and outpatient hospital net patient revenue of the assessed hospitals.

Rebekah E. Gee MD, MPH
Secretary

1706#045

POTPOURRI

Department of Health
Bureau of Health Services Financing

Public Hearing—Substantive Changes to Proposed Rule
Ambulatory Surgical Centers—Licensing Standards
(LAC 48:I.4503, 4567, 4569 and 4573)

In accordance with the provisions of the Administrative Procedures Act, R.S. 49:950 et seq., the Department of Health, Bureau of Health Services Financing published a Notice of Intent in the February 20, 2017 edition of the *Louisiana Register* (LR 43:429-455) to repeal and replace LAC 48:I.Chapter 45 in the Medical Assistance Program as authorized by R.S. 36:254 and R.S. 40:2131-2141. This Notice of Intent proposed to repeal and replace the licensing standards governing ambulatory surgical centers in order to: 1) clarify the existing provisions; 2) provide for inactivation of the provider license in the event of specific qualifying events or circumstances; 3) establish provisions which allow ambulatory surgical centers to enter into use agreements; and 4) ensure consistency with other licensing rules, regulations and processes.

The department conducted a public hearing on this Notice of Intent on March 30, 2017 to solicit comments and testimony on the proposed Rule. As a result of the comments received, the department now proposes to amend the provisions in §4503 and §§4567, 4569 and 4573 of the proposed Rule to further clarify these provisions.

Taken together, all of these revisions will closely align the proposed Rule with the department's original intent and the concerns brought forth during the comment period for the Notice of Intent as originally published. No fiscal or economic impact will result from the amendments proposed in this notice.

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Vivian Aucoin

From: Vivian Aucoin
Sent: Wednesday, July 12, 2017 10:53 AM
To: 'Allen, Tim'
Subject: RE: Regional Haze SIPs for Louisiana

http://deq.louisiana.gov/

If you click on our new website, scroll to the bottom of the page you will see that there is an icon to the far right that says EDMS. It is a big blue square. Click on it!

They just "reinvented" our website, so let me know if you have any issues.

Thanks!

From: Allen, Tim [mailto:tim_allen@fws.gov]
Sent: Wednesday, July 12, 2017 10:37 AM
To: Vivian Aucoin
Subject: Re: Regional Haze SIPs for Louisiana

can you tell me how to get to EDMS?

On Wed, Jul 12, 2017 at 9:07 AM, Vivian Aucoin <Vivian.Aucoin@la.gov> wrote:

Dear Tim,

I was remiss in sending the Regional Haze SIP revisions for RS Nelson. It is in EDMS, Doc ID No. 10650796. The document is a revision to the information that was previously sent to EPA on February 10, 2017. That document can be found in EDMS as well, Doc. ID No. 10496542.

Please let me know if you have an questions.

Vivian H. Aucoin

Environmental Scientist Manager

Office of Environmental Assessment, Air Planning Division

225-219-3482

vivian.aucoin@la.gov

--

Tim Allen
U.S. Fish & Wildlife Service
(303) 914-3802

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Appendix B

CLECO

BART Determination and Evaluation

[No Change]

Appendix C

NRG
BART Determination and Evaluation

[No Change]

Appendix D

Entergy Louisiana LLC
BART Determination and Evaluation

[AOC for R. S. Nelson Facility add; otherwise no change]

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

OFFICE OF ENVIRONMENTAL ASSESSMENT

IN THE MATTER OF	*	
	*	
ENTERGY LOUISIANA, LLC	*	**REGIONAL HAZE**
R.S. NELSON GENERATING PLANT	*	**STATE IMPLEMENTATION PLAN**
CALCASIEU PARISH, LOUISIANA	*	**EGU BART ANALYSIS**
	*	
	*	**AGENCY INTEREST NO. 19588**
	*	
PROCEEDINGS UNDER THE LOUISIANA	*	
ENVIRONMENTAL QUALITY ACT,	*	
La. R.S. 30:2001, ET SEQ.	*	

ADMINISTRATIVE ORDER ON CONSENT

The following **ADMINISTRATIVE ORDER ON CONSENT** is issued this day to **ENTERGY LOUISIANA, LLC (RESPONDENT)** by the Louisiana Department of Environmental Quality (the Department), under the authority granted by the Louisiana Environmental Quality Act (the Act), La. R.S. 30:2001, *et seq.*, and particularly by La. R.S. 30:2011(D)(6) and (D)(14). The Respondent consents to the requirements set forth below.

FINDINGS OF FACT

I.

The Respondent owns and/or operates the R. S. Nelson Generating Plant located at 3500 Houston River Road, Westlake, Calcasieu Parish, Louisiana (the Facility). The Facility currently operates pursuant to Title V and PAL Permit Number 6250-00014-V4 issued on April 11, 2017.

II.

Under Clean Air Act (CAA) section 110, each state must prepare and submit for the EPA approval, a SIP that provides for the implementation, maintenance and enforcement of the National Ambient Air Quality Standards (NAAQS) in each air quality control region within the state.

III.

In addition to the general SIP requirements, in CAA section 169A, 42 U.S.C. §7491, Congress created a program for protecting visibility in the nation's national parks and wilderness areas. This section establishes as a national goal the "prevention of any future, and the remedying of any existing, impairment of visibility" in those national parks and wilderness areas identified as "Class I" areas under CAA section 161, 42 U.S.C. §7472(a), 42 U.S.C. §7491.

IV.

Under CAA section 169A and its associated implementing regulations, states must assure the reasonable progress toward the goal of achieving natural visibility conditions in Class I areas by preparing, and submitting for EPA approval, a Regional Haze SIP. *See generally,* 42 U.S.C. §7491; 40 C.F.R. § 51.308.

V.

To comply with the requirements set forth in CAA section 169A and the implementing regulations, the Department is concurrently submitting a proposed SIP on behalf of the State of Louisiana to EPA Region VI that addresses Best Available Retrofit Technology (BART) for the Facility. The BART analysis is based, in part, on submittals made by Respondent to the Department including, but not limited to, Respondent's submittal on May 12, 2015.

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VI.

Notwithstanding the terms and conditions in this **ADMINISTRATIVE ORDER ON CONSENT**, including the above Findings of Fact, Respondent reserves its right to assert all defenses and other legal arguments during any subsequent legal challenge of the Regional Haze SIP for Louisiana.

ADMINISTRATIVE ORDER

Based on the foregoing, the Department **hereby orders**, and the Respondent hereby **agrees** that:

I.

The Respondent shall comply with the following condition:

> If the Respondent intends to operate Unit 4 (EQT 0013) or the Unit 4 Auxiliary Boiler (EQT 0011) by combusting fuel oil, the Respondent shall conduct a BART analysis for this EGU based on this fuel type. The Respondent further agrees not to combust fuel oil until the BART analysis is approved by the LDEQ and EPA.

II.

The Respondent shall submit annual reports to the Department advising of any and all compliance measures taken to alleviate those pollutants that are associated with the causation of regional haze until Unit 6 is able to continuously meet a SO_2 emissions limit of 0.6 lbs/MMBtu. These reports shall be submitted to the Office of Environmental Assessment, Air Planning Division and are due by March 31 for the prior calendar year.

III.

The Respondent shall comply with the sulfur dioxide (SO_2) emission limitations set forth below as expeditiously as practicable, but no later than three years of the effective date of a final SIP pursuant to 40 CFR PART 51, Appendix Y:

Unit	**Pollutant**	**Emission Limit lbs/ MMBtu (30-day rolling average)**
6	**SO_2**	**$\leq$ 0.6***

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* The SO_2 emissions limit for Unit 6 shall be based on use of significant figures and standard rounding conventions. Thus, the Respondent shall round emissions data to the tenths place to assess compliance with the 30-day rolling average limit.

IV.

The Respondent shall comply with the particulate matter less than 10 microns (PM_{10}) emissions limit set forth below no later than the effective date of a final SIP pursuant to 40 CFR PART 51, Appendix Y:

Unit 6

Unit	Pollutant	Emission Limit lb/hr (30-day rolling average)
6	PM_{10}	$\leq$ 317.61

V.

The Respondent shall continue to comply with all reporting and record keeping requirements contained within all applicable permits.

VI.

To the extent required by law, further proceedings relating to this **ADMINSTRATIVE ORDER** will be governed by the Administrative Procedure Act, La. R.S. 49.950, *et seq*.

VII.

This **ADMINISTRATIVE ORDER ON CONSENT** may be executed in counterparts, each of which may be executed by one (1) or more of the signatory parties hereto. Signature pages may be detached from the counterparts and attached to one or more copies of this Agreement to form multiple legally effective documents. Facsimile signatures shall be sufficient in lieu of original signatures.

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VIII.

For each action or event described herein, the Department reserves the right to seek compliance with its rules and regulations in any manner allowed by law, and nothing herein shall be construed to preclude the right to seek such compliance.

IX.

This **ADMINISTRATIVE ORDER ON CONSENT** may be amended by mutual consent of the Department and Respondent. Such amendments shall be in writing, shall follow proper SIP procedures and be submitted to EPA as a SIP revision, and shall be final and effective upon signature by an authorized representative of the Department and signature by the authorized representative of the Respondent.

X.

The following paragraph addresses transfers of the obligations of this **ADMINISTRATIVE ORDER ON CONSENT** and the Facility:

A) The obligations of this **ADMINISTRATIVE ORDER ON CONSENT** apply to and are binding upon the State and upon the Respondent and its officers, employees, agents, subsidiaries, successors, assigns, or other entities or persons otherwise bound by law.

B) Prior to the execution of any agreement for the transfer of ownership or operation of the Facility, the Respondent shall provide notice of and a copy of this **ADMINISTRATIVE ORDER ON CONSENT** to the proposed transferee. No transfer of ownership or operation of any portion of the Facility shall relieve the Respondent of its obligation to ensure that the terms of this **ADMINISTRATIVE ORDER ON CONSENT** is implemented unless at least 30 days prior to such

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transfer, the Respondent provides written notice of the prospective transfer to the EPA Region 6 and the Department and the prospective transferee executes an **ADMINISTRATIVE ORDER ON CONSENT** with the Department prior to the effective date of the transfer providing for continued compliance with these standards. The Notice of Transfer shall clearly identify the parties responsible for any existing violations of this **ADMINISTRATIVE ORDER ON CONSENT** and otherwise comply with LAC 33:I.1907. Any attempt to transfer ownership or operation of the Facility without complying with this Paragraph constitutes a violation of this **ADMINISTRATIVE ORDER ON CONSENT**.

XI.

This **ADMINISTRATIVE ORDER ON CONSENT** shall be final and effective upon signature by an authorized representative of the Department and signature by the authorized representative of the Respondent.

Baton Rouge, Louisiana, this 26th day of October 2017.

Chuck Carr Brown, Ph.D.
Secretary

Entergy Louisiana LLC

By: _____ Date: 10/20/17

Name: Philip R. May

Title: President and CEO – Entergy Louisiana

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CAMx Modeling Report

Prepared For:

Entergy Services

Prepared By:

Trinity Consultants, Inc.
5801 E. 41st St.
Suite 450
Tulsa, OK 74135
(918) 622-7111

ALL4 Inc.
12946 Dairy Ashford Rd.
Suite 375
Sugar Land, TX 77478
(281) 937-7553

October 14, 2016

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Figure 6-1. Maximum Contribution by Plant to Deciview Haze Index at Breton Wilderness Area for All Days based on Natural Visibility Background Approach 6-3

Figure 6-2. Maximum Contribution by Plant to Deciview Haze Index at Caney Creek Wilderness Area for All Days based on Natural Visibility Background Approach 6-4

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1. EXECUTIVE SUMMARY

On November 9, 2015, Entergy submitted an initial CAMx analysis which demonstrated minimal modeled impacts from Entergy's BART-eligible sources in Louisiana and concluded that none of the Entergy BART-eligible sources are subject-to-BART. In response, on March 16, 2016, the EPA provided comments that called for revisions to the CAMx modeling analysis. Entergy disagreed with these requests, as detailed later in this report, but nevertheless submitted revised modeling results on June 30, 2016. EPA subsequently requested additional revisions to the CAMx modeling methodology that appear to be technically unsound and will render the CAMx results less accurate. Entergy holds that the November 2015, CAMx modeling already submitted to the EPA utilizes the most technically defensible methodology. This report reiterates the value of using CAMx instead of the CALPUFF modeling system, briefly describes Entergy's previously submitted modeling, and explains why EPA's requested changes to the CAMx modeling methodology are technically unsound.

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2. SUPERIORITY OF CAMx OVER CALPUFF

In April 2003, EPA revised Appendix W, *Guideline on Air Quality Models (Guideline)*, making CALPUFF the recommended model for long-range transport (distances > 50 km).[1] Per the *Guideline*, CALPUFF is intended for use on scales from tens of meters from a source to hundreds of kilometers. On July 29, 2015, EPA published proposed revisions to the *Guideline* in the Federal Register that would remove CALPUFF as the recommended model for long-range transport.[2] In the proposed rule, EPA states that, although the proposed changes to the *Guideline* do not affect their recommendation in the 2005 BART Guidelines to use CALPUFF in the BART determination process, consistent with the BART guidelines, the state may accept an alternate modeling protocol at its discretion.[3]

As discussed in our Updated BART Applicability Screening Analysis report submitted to the EPA on November 9, 2015, the CALPUFF model and Central Regional Air Planning Association (CENRAP) BART protocol defaults have a number of specific limitations, including but not limited to the well-documented distance limitations and over-prediction of nitrates. These limitations, which are discussed in greater detail below, support the use of CAMx as a superior alternative for assessing visibility impacts.

DISTANCE LIMITATION

In 1998, the Interagency Workgroup on Air Quality Modeling (IWAQM) conducted a study using tracers to test the ability of CALPUFF to match measured concentrations.[4] The study specifically involved non-reacting tracers and focused on the model's ability to predict plume location and concentration rather than accuracy of the model chemistry. Table 2-1 below summarizes the results of the IWAQM study.

Table 2-1. Summary of the IWAQM CALPUFF Study

Experiment	Distance (km)	Error in Model Results	
		Angle of Error (degrees)	Concentration Error
Savannah River	~100	25	140%
Idaho Falls	48	40	200%
	90	40	200%
Great Plains	100	5-20	250%
	600	25	-300%

Based on the results shown above, IWAQM concluded that CALPUFF could be used to predict concentrations at distances of "200 kilometers or less" from the source and that "transport beyond 200 to 300 km should be done cautiously with an awareness of the likely problems involved."[5] Despite this, EPA's BART guidelines fail to address the uncertainties in model predictions at distances greater than 200 km and often require sources to

[1] U.S. EPA's *Guideline on Air Quality Models* 40 CFR Part 51, Appendix W (Revised, November 9, 2005) (*Guideline*).

[2] 80 Federal Register 45340 (July 29, 2015).

[3] Ibid.

[4] EPA-454/R-98-019, December 1998.

[5] Ibid.

install expensive controls based on small impacts predicted by CALPUFF at distances in excess of 200 km. Table 2-2 below shows the approximate distance from six (6) Entergy electric generating stations to Breton and Caney Creek. The six (6) Entergy plants are located at distances between 100 and 427 km from Breton and between 460 and 620 km from Caney Creek. Distance from the source should be taken into consideration when reviewing the visibility impacts at Caney Creek and Breton predicted by the BART screening analyses, given there is significant uncertainty in the model predictions with increasing distance from the source. Based on these distances, use of the CALPUFF modeling system to predict impacts at Caney Creek for these sources and at Breton from Nelson should be evaluated further for potential problems.

Table 2-2. Approximate Distances from Class I Areas

Entergy Plant	Distance to Breton (km)	Distance to Caney Creek (km)
Little Gypsy	150	592
Nelson	427	460
Willow Glen	217	530
Waterford	150	592
Ninemile	117	615
Michoud	100	620

OVER-PREDICTION OF NITRATES

NO_X and SO_2 in the atmosphere react with ammonia to form ammonium nitrates and ammonium sulfates, which are two of the primary particulates that cause light extinction. It has been well documented that the CALPUFF modeling system over-predicts nitrate contributions by a significant margin when compared to measured contributions.[6] The EPA BART modeling protocol assumes a single constant background ammonia value of 3 ppb that does not vary spatially or temporally, when in reality background ammonia concentrations are typically lower in winter months. The primary source of ammonia in the atmosphere is biodegradation of vegetation, which occurs at a much lower rate during winter months. As such, background ammonia concentrations are highly variable on a seasonal basis. CALPUFF continuously predicts formation of nitrates even when there would be insufficient ammonia available for the chemical reaction to occur. Additionally, nitrate formation is temperature dependent. Nitrates do not form in high temperatures so, during the summer when ammonia is more readily available to react with NO_X, the temperature becomes a limiting factor. The version of the CALPUFF model used in the screening analyses does not consider this.

To further explore this issue, Trinity evaluated the respective contributions from nitrates and sulfates to total extinction using actual IMPROVE observations, CALPUFF predicted values, and data from the CENRAP Particulate Source Apportionment Technology (PSAT) tool for Breton, displayed in Figure 2-1 through Figure 2-3, respectively. The CENRAP PSAT tool data are based on the CAMx modeling predictions from CENRAP's CAMx modeling analysis. Based on an analysis of IMPROVE data, sulfate is the primary contributor to total extinction at Breton, with an average of 70.74% contribution on the worst 20% days. Nitrates contribute on average only 9.28% to the total extinction on the worst 20% days. The CALPUFF predictions, however, indicate that nitrate is the highest contributor with 55.32% while the predicted sulfate contribution is only 43.85%. In comparison, the CAMx-based CENRAP PSAT tool predicted speciated contributions agree very closely with the observed IMPROVE data.

[6] Gale F. Hoffnagle, Accuracy of Visibility Protocol Modeling in BART Evaluations, TRC Environmental Corporation, June 15, 2012.

Figure 2-1. Observed (IMPROVE) Percent of Total Extinction by Species for 20% Worst Days at Breton Wilderness Area

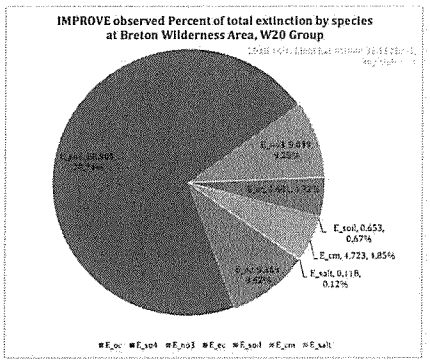


Figure 2-2. CALPUFF Predicted Percent of Total Extinction by Species for 20% Worst Days at Breton Wilderness Area

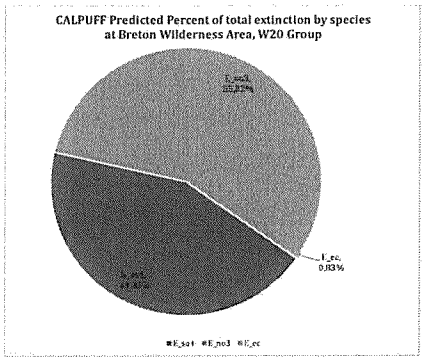
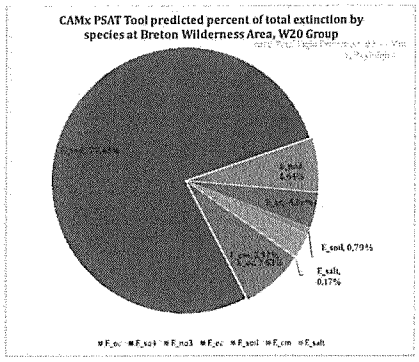


Figure 2-3. CENRAP CAMx PSAT Tool Predicted Percent of Total Extinction by Species for 20% Worst Days at Breton Wilderness Area



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3. CAMx MODELING FOR VISIBILITY

The CAMx modeling system is significantly more robust than the CALPUFF modeling system and alleviates many of the concerns about CALPUFF's accuracy. Therefore, Entergy opted to utilize CAMx modeling as part of its BART screening analysis, the results of which were first submitted in the November 9, 2015 BART Applicability Screening Analysis report.

As discussed in this first CAMx report, the CAMx modeling system is a publicly available computer modeling system for the integrated assessment of photochemical and particulate air pollution. The modeling system is composed of a gridded photochemical model, meteorological model, and an emissions model. The PSAT probing tool allows for the determination of individual source contribution within a run. CAMx includes full chemistry, which allows for more accurate characterization of reactions taking place in the atmosphere. The use of nested grids, PSAT, and full chemistry Plume-in-Grid (PIG) allows for finer resolution and better characterization of plume transport, dispersion, and chemistry for individual point sources. Photochemical models, such as CAMx, may be used for BART modeling to overcome known limitations in the CALPUFF modeling system.[7]

The draft EPA *Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze,* released in December 2014 (herein referred to as the Draft Guidance), discusses the use of photochemical grid models, noting that the Community Multi-scale Air Quality (CMAQ) modeling system and CAMx are the most commonly used models for attainment demonstrations. The Draft Guidance specifically notes that "a modeling based demonstration of the impacts of an emissions control scenario...as part of a regional haze assessment usually necessitates the application of a chemical transport grid model." The discussion throughout the Draft Guidance focuses on items specific to photochemical grid models such as CAMx, including emissions inventories, supporting models, pre-processors, and applying a model to attainment and changes in visibility. Additionally, the CENRAP BART Modeling Guidelines acknowledge that CALPUFF substantially over-predicts concentrations at large distances from the source.[8] Per the CENRAP BART Modeling Guidelines, "the application of comprehensive, full-science regional visibility assessment tools will yield more realistic BART control requirements than those generated by a puff model." [9] The use of CMAQ or CAMx is not only deemed acceptable by CENRAP but is recommended for refined visibility modeling of BART-eligible sources.

The Draft Guidance states that "the emission sources included in the analysis must be comprehensive, including emissions from all source categories" (i.e., point sources, non-point stationary sources, on-road and non-road mobile sources, fires, and biogenic sources) and "all sources of emissions." A CAMx modeling analysis includes a comprehensive inventory, capturing each of these source categories, which are then available to react with available precursors. CALPUFF analyses conducted in support of BART do not consider the full inventory of sources and, thus, do not account for other pollutants challenging and consuming precursor emissions. As such, ammonia and other precursor pollutants are more fully available to react with a facility's emissions and generate haze in a modeled simulation using CALPUFF. Therefore, the use of CALPUFF does not accurately reflect the interaction of pollutants in the atmosphere.

Distance should be one of the main factors in deciding which model is most appropriate. Based on the IWAQM study, as discussed above, CALPUFF is recommended for use within 200 km or less. As shown in Table 2-2, the six (6) Entergy electric generating stations are located between 100 and 427 km from Breton and between 460 and 620 km from Caney Creek. In its Reasonable Progress (RP) analysis conducted in support of the Oklahoma and Texas Regional Haze FIP, EPA relied on CAMx rather than CALPUFF. In the Technical Support Document

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[7] Alpine Geophysics CENRAP BART Modeling Guidelines, Chapter 1, Section 1.3.1 *Three BART Modeling Approaches, Source-Specific Modeling*, December 15, 2005.

[8] Alpine Geophysics CENRAP BART Modeling Guidelines, Chapter 8 *Alternative Model Applications*, December 15, 2005.

[9] Ibid.

(TSD) for the Oklahoma and Texas Regional Haze FIP, EPA expressed its concern with using CALPUFF at greater distances due to over-prediction and decreased accuracy. Given the significant distances between all six plants and Caney Creek and the significant distances between Breton and the Nelson and Willow Glen Plants, CALPUFF is not the appropriate model to use for assessing visibility impacts from these sources.

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4. ENTERGY'S ORIGINAL CAMx MODELING

Entergy's modeling contractor Trinity Consultants (Trinity) performed an initial CAMx modeling analysis based on EPA's Texas RP CAMx modeling. Trinity utilized nearly the same emissions inventories and model options selected for the Texas RP modeling, with the only differences being those related to Entergy's BART-eligible sources and the PSAT options.

Specific updates to Entergy's BART-eligible units' stack parameters include revisions to the stack height, stack diameter, and exit temperature of several units in order to more accurately represent the sources. Many of the exit velocities given in the EPA's unaltered RP modeling inventory were inaccurately represented as being one-tenth as high as they should be. As a result, the exit velocities of all selected sources were updated. Additionally, each stack location was updated to reflect the stack's actual location, as opposed to using the general facility latitude and longitude used in the RP modeling. Two auxiliary boilers at the Nelson and Willow Glen facilities not included in the RP modeling were also incorporated into the inventory. For convenience, the stack IDs of most sources were also updated to better reflect the stack identification used at each facility. The modeled NO_X, SO_2, and PM_{10} emission rates utilized for Entergy's sources were the maximum actual annual emissions from the baseline period, 2000-2004. $PM_{2.5}$ emissions were either calculated as a ratio of the PM_{10} emissions or were conservatively set equal to the PM_{10} emission rates, and VOC and CO emissions were left unchanged from the values utilized in the RP modeling. Similar updates were made to several Cleco Corporation (Cleco) BART-eligible sources. All other RP modeling inventory sources were left unchanged.

Following the post-processing methodology for CAMx visibility assessments utilized in the Texas RP modeling and described in the EPA's Draft Guidance document, Trinity determined the predicted future visibility impacts from Entergy's sources during the 20% worst visibility days. Table 4-1 presents the maximum source contribution from individual units to the Breton Class I area while Figure 4-1 presents the maximum source contribution by each plant at Breton. Table 4-2 and Figure 4-2 present the maximum impairment from individual Nelson Plant units as well as the overall Nelson impacts at Caney Creek, respectively. The results presented below may differ slightly from those presented in the Trinity's November BART screening report. A revised CAMx modeling analysis was performed incorporating updated PM emission rates for Entergy's BART-eligible sources.[10] Due to anticipated comments on CAMx modeling from the EPA (see Section 5), these revised modeling results were not submitted.

As presented in the figures below, at Breton, the maximum individual unit contribution is 0.019 dv by Michoud Unit 3 and the maximum facility contribution is 0.025 dv from the Waterford Plant. At Caney Creek, the maximum individual unit contribution is only 0.019 dv from Nelson Plant Unit 6 and the maximum facility contribution is only 0.019 dv from the Nelson facility. Therefore, the post-processing methodology utilized by the EPA for its RP modeling results in impacts that are insignificant in comparison to the 0.5 dv BART screening threshold.

[10] Condensable PM emissions were incorporated into the modeled CAMx emission rates for units at the Waterford, Little Gypsy, Ninemile, and Nelson facilities.

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Table 4-1. Maximum Contribution by Individual Unit to Deciview Haze Index at Breton Wilderness Area During 20% Worst Days

Entergy Unit	Maximum Contribution (dv)
Little Gypsy 2 (C2)	0.002
Little Gypsy 3 (C3)	0.001
Little Gypsy 4 (C4)	0.000
Michoud 2 (C2)	0.003
Michoud 3 (C3)	0.019
Nelson 4 (C4)	0.001
Nelson 6 (C6)	0.012
Nelson Aux. (C7)	0.001
Ninemile 4 (C4)	0.003
Ninemile 5 (C5)	0.003
Waterford 1 (C1)	0.012
Waterford 2 (C2)	0.014
Waterford 3 (C3)	0.000
Willow Glen 2 (C2)	0.002
Willow Glen 3 (C3)	0.001
Willow Glen 4 (C4)	0.001
Willow Glen 5 (C5)	0.004
Willow Glen 6 (C6)	0.001

Table 4-2. Maximum Contribution by Individual Unit to Deciview Haze Index at Caney Creek Wilderness Area During 20% Worst Days

Entergy Unit	Maximum Contribution (dv)
Nelson 4 (C4)	0.000
Nelson 6 (C6)	0.019
Nelson Aux. (C7)	0.000

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Figure 4-1. Maximum Contribution by Plant to Deciview Haze Index at Breton Wilderness Area During 20% Worst Days

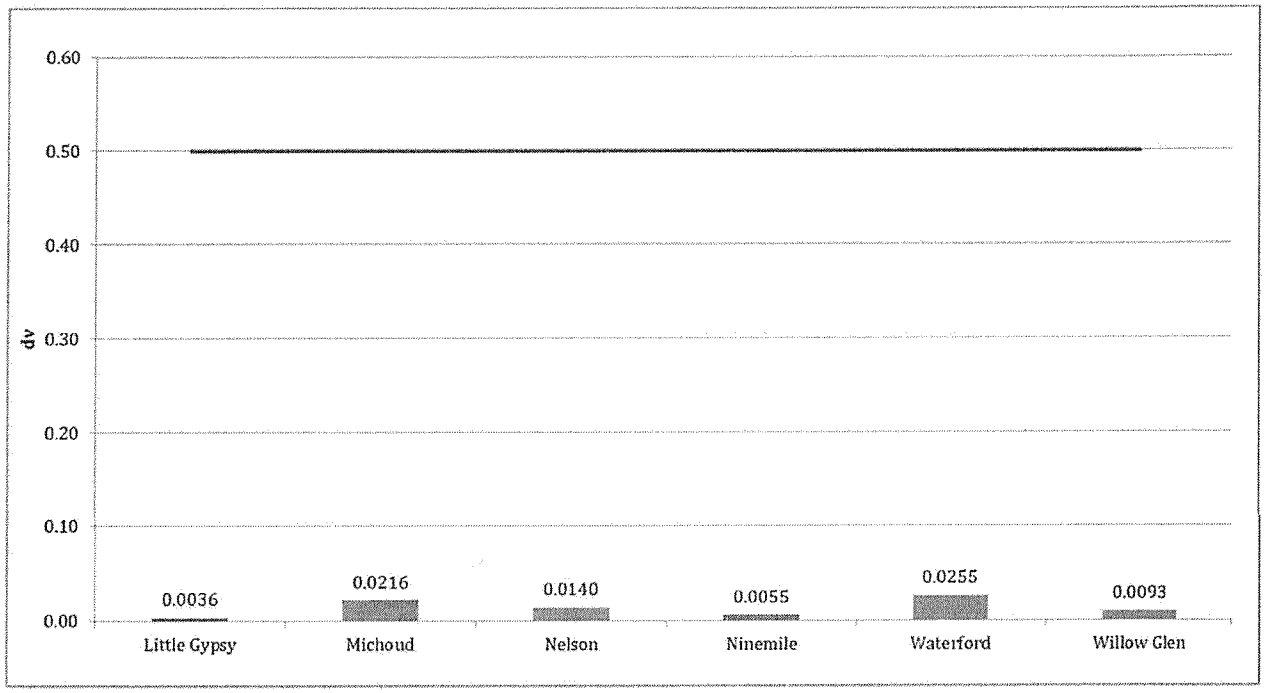

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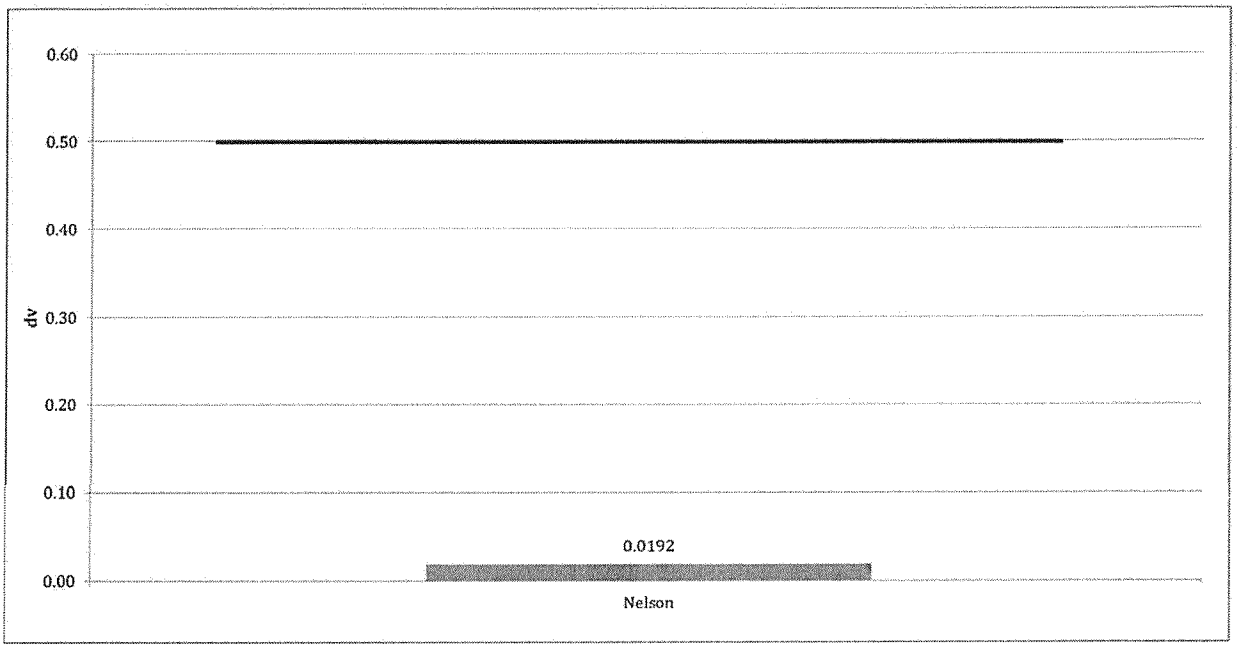
Figure 4-2. Maximum Contribution by Plant to Deciview Haze Index at Caney Creek Wilderness Area During 20% Worst Days



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5. EPA'S REQUESTED UPDATES TO BART ANALYSIS CAMx MODELING METHOD

The EPA provided an initial response to Entergy's CAMx modeling as part of a March 16, 2016 *Preliminary Review Response* letter. Referencing a previously approved BART screening CAMx modeling protocol for potential BART-eligible sources in Texas developed by Ramboll-Environ (Environ) for the Texas Commission on Environmental Quality (TCEQ), the EPA made the following requests:

1. Use of emissions representative of maximum 24-hr actual emissions from the baseline period
2. Evaluation of the maximum modeled impact for all days, not just the subset of 20% Worst days
3. Calculation of the deciview visibility impact based on a natural visibility background approach using the annual average natural background conditions for each Class I area.

Recent conversations between Entergy and the EPA regarding the use of CAMx for the purposes of Louisiana BART analyses have reinforced the EPA's insistence on these three requests in addition to the requirement to directly evaluate the CAMx modeled concentrations without tethering the model data to monitor data. Entergy holds that these requests are based on a technically unsound application of CALPUFF modeling principles to CAMx processing and should not apply to CAMx modeling analyses.

MAXIMUM 24-HOUR EMISSIONS

The request from EPA to utilize the maximum 24-hour emissions instead of the actual annual emission rates for the BART-eligible sources stems from the BART guidelines which merely "recommend" the use of maximum 24-hour emissions and do not specifically state that they are required. In addition, it is worth noting that the recommendations made in the BART guidelines were developed based on use of the CALPUFF modeling system to determine contributions to visibility impairment from individual sources. As described above, CALPUFF and CAMx are fundamentally different modeling systems. EPA accepts that the CAMx modeling system is more suited for evaluating the average visibility impairment due to individual sources during the 20% worst days as part of reasonable progress analyses. Furthermore, EPA accepts that *"photochemical models, like the CAMx model, provide a complete representation of emissions, chemistry, transport, and deposition, while CALPUFF treats a single source with simplified chemistry and parameterized physical processes."*[11]

Although the EPA insists that the CALPUFF protocols are still appropriate for BART assessments based purely on the fact that a "majority of BART determinations have been made using CALPUFF," the EPA has already proposed "to remove the CALPUFF modeling system as an EPA-preferred model for long-range transport" from the *Guideline on Air Quality Models*.[12] Despite this recommendation, the EPA still expects Entergy to apply the guidelines designed for a single-source, simplified-chemistry model—including the recommendation to use maximum 24-hour emissions—to a multi-source, advanced-chemistry photochemical model with the ability to better characterize visibility. The CAMx model's capability to provide complete representation of emissions, chemistry, transport, and deposition will be skewed if the emissions from a select few sources are inflated. The use of maximum 24-hour emissions will create an implicit bias against the BART sources and the CAMx predictions will not be a realistic representation of the impact or contribution from those sources.

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[11] 81 Federal Register 66393 (September 27, 2016).

[12] 80 Federal Register 45349-45350 (July 29, 2015).

CAMx POST-PROCESSING

Although CAMx is a more robust modeling system than CALPUFF, CAMx is still subject to concerns about potential model performance issues. In its Response to Comments regarding the Texas and Oklahoma FIP for Regional Haze, the EPA itself admits that "any bias issues in CAMx are ameliorated by tethering the model to real monitoring data, through the use of relative response factors generated by modeling of base and future cases to predict future monitored values."[13] This use of relative response factors (RRFs) combined with actual monitor data gathered by the Interagency Monitoring of Protected Visual Environments (IMPROVE) program is the methodology utilized in RP modeling analyses and was the basis for Entergy's original CAMx modeling. Entergy holds that this post-processing methodology (RRFs combined with IMPROVE monitor data) represents the most appropriate – and only technically defensible – evaluation of CAMx modeling outputs for visibility purposes.

If Entergy were to hypothetically concede that the CAMx model output can be evaluated directly without the use of RRFs, Entergy holds that doing so would only be appropriate if the 98th percentile impacts were to be the metric compared with the visibility threshold. In the final BART guidelines, the EPA states that the use of the 98th percentile is to effectively minimize "the likelihood that the highest modeled visibility impacts might be caused by unusual meteorology or conservative assumptions in the model."[14] In the same document, the EPA also indicates that "although CALPUFF is the best currently available tool for analyzing the visibility effects of individual sources, it is a model that includes certain assumptions and uncertainties." Thus, "a State should not necessarily rely on the maximum modeled impact in determining whether a source may reasonably be anticipated to contribute to visibility impairment in a Class I area."[15]

Despite the fact that CAMx is a far more robust model than CALPUFF, CAMx modeling is still subject to assumptions and uncertainties which require consideration of outliers caused by unusual meteorology. The EPA has stated in its RP modeling Response to Comments that "the use of RRFs...removes much of the concerns about potential model performance issues," which indicates that the EPA recognizes the necessity of accounting for outliers when using CAMx output.[16] Therefore, if the EPA does not allow RRFs to be used for BART-related CAMx modeling analyses, the EPA should be consistent and allow the use of the 98th percentile metric to account for outliers.

The EPA has referenced the previously approved TCEQ BART screening CAMx modeling as the basis for why the maximum impacts should be compared with the threshold as opposed to the 98th percentile. Specifically, it appears that the decision to use the maximum impacts was the result of an informal agreement between the TCEQ and the EPA, documented in an email sent by Kathy Pendleton of the TCEQ on February 16, 2007, which was not made publicly available or incorporated into the approved final BART screening protocol. This agreement should not be considered to have established a precedent in Texas that should automatically apply to Louisiana without complete consideration of all circumstances.

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[13] "Response to Comments for the Federal Register Notice for the Texas and Oklahoma Regional Haze State Implementation Plans; Interstate Visibility Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze; and Federal Implementation Plan for Regional Haze." December 9, 2015.

[14] 70 Federal Register 39121 (July 6, 2005).

[15] Ibid.

[16] "Response to Comments for the Federal Register Notice for the Texas and Oklahoma Regional Haze State Implementation Plans; Interstate Visibility Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze; and Federal Implementation Plan for Regional Haze." December 9, 2015.

6. ENTERGY'S REVISED CAMx MODELING

Although Entergy disagrees with the EPA's requested updates, an attempt was made to comply with the EPA's requests and Entergy submitted revised results to EPA on June 30, 2016. In accordance with the previously approved TCEQ BART screening CAMx modeling protocol, Trinity modeled doubled 2002 actual annual emission rates as representative estimates of the maximum 24-hour emissions for Entergy's BART-eligible sources.[17] In an attempt to process all modeled days as requested while still utilizing the more appropriate RRF-based methodology, Trinity processed outputs with the EPA's Modeled Attainment Test Software (MATS) to obtain 20% best and 20% worst RRFs. These RRFs were averaged and applied to all available monitored data in order to calculate individual visibility impacts from each of Entergy's BART-eligible sources based on a natural visibility background approach.

Table 6-1 and Table 6-2 present the maximum contributions from individual units for all days based on the natural visibility background approach for Breton and Caney Creek, respectively. Figure 6-1 and Figure 6-2 display the maximum contributions from each facility for all days using the natural visibility background approach for Breton and Caney Creek, respectively.

At Breton, the maximum individual unit contribution from all days with a natural background is 0.1343 dv from Nelson Unit 6 while the maximum facility contribution is 0.1710 dv from the Ninemile facility. The maximum individual unit contribution from all days with a natural background at Caney Creek is 0.3261 dv from Nelson Unit 6 while the maximum facility contribution is 0.3363 dv from the Nelson Plant. As such, even using a modified version of EPA's overly conservative and technically unsound post-processing methodology, Entergy's BART-eligible sources are still not reasonably anticipated to "cause" or "contribute" to visibility impairment at any Class I area and should therefore not be subject to BART.

[17] Revised Draft Final Modeling Protocol: Screening Analysis of Potentially BART-Eligible Sources in Texas. Prepared for the TCEQ by ENVIRON International Corporation. September 27, 2006.

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Table 6-1. Maximum Contribution by Individual Unit to Deciview Haze Index at Breton Wilderness Area for All Days based on Natural Visibility Background Approach

Entergy Unit	Maximum Contribution (dv)
Little Gypsy 2 (C2)	0.0071
Little Gypsy 3 (C3)	0.0165
Little Gypsy 4 (C4)	0.0000
Michoud 2 (C2)	0.0146
Michoud 3 (C3)	0.0849
Nelson 4 (C4)	0.0007
Nelson 6 (C6)	0.1343
Nelson Aux. (C7)	0.0000
Ninemile 4 (C4)	0.0714
Ninemile 5 (C5)	0.1003
Waterford 1 (C1)	0.0119
Waterford 2 (C2)	0.0106
Waterford 3 (C3)	0.0000
Willow Glen 2 (C2)	0.0002
Willow Glen 3 (C3)	0.0037
Willow Glen 4 (C4)	0.0034
Willow Glen 5 (C5)	0.0098
Willow Glen 6 (C6)	0.0055

Table 6-2. Maximum Contribution by Individual Unit to Deciview Haze Index at Caney Creek Wilderness Area for All Days based on Natural Visibility Background Approach

Entergy Unit	Maximum Contribution (dv)
Nelson 4 (C4)	0.0018
Nelson 6 (C6)	0.3261
Nelson Aux. (C7)	0.0087

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Figure 6-1. Maximum Contribution by Plant to Deciview Haze Index at Breton Wilderness Area for All Days based on Natural Visibility Background Approach

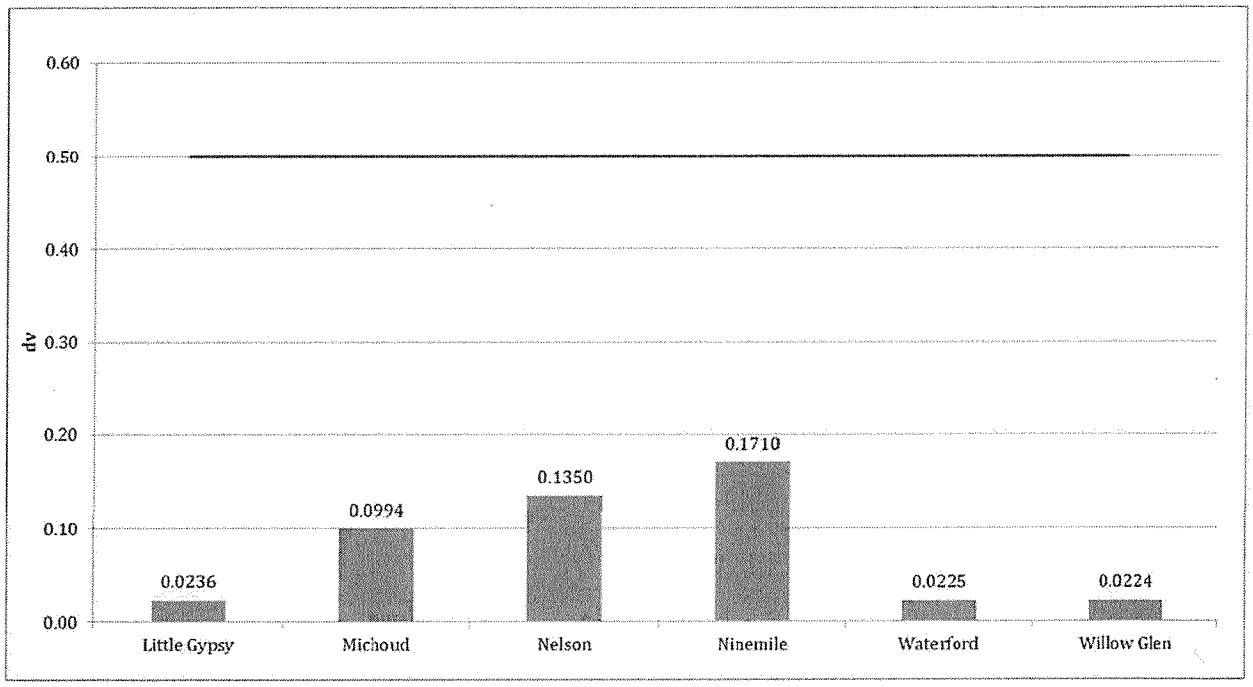

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Figure 6-1. Maximum Contribution by Plant to Deciview Haze Index at Breton Wilderness Area for All Days based on Natural Visibility Background Approach

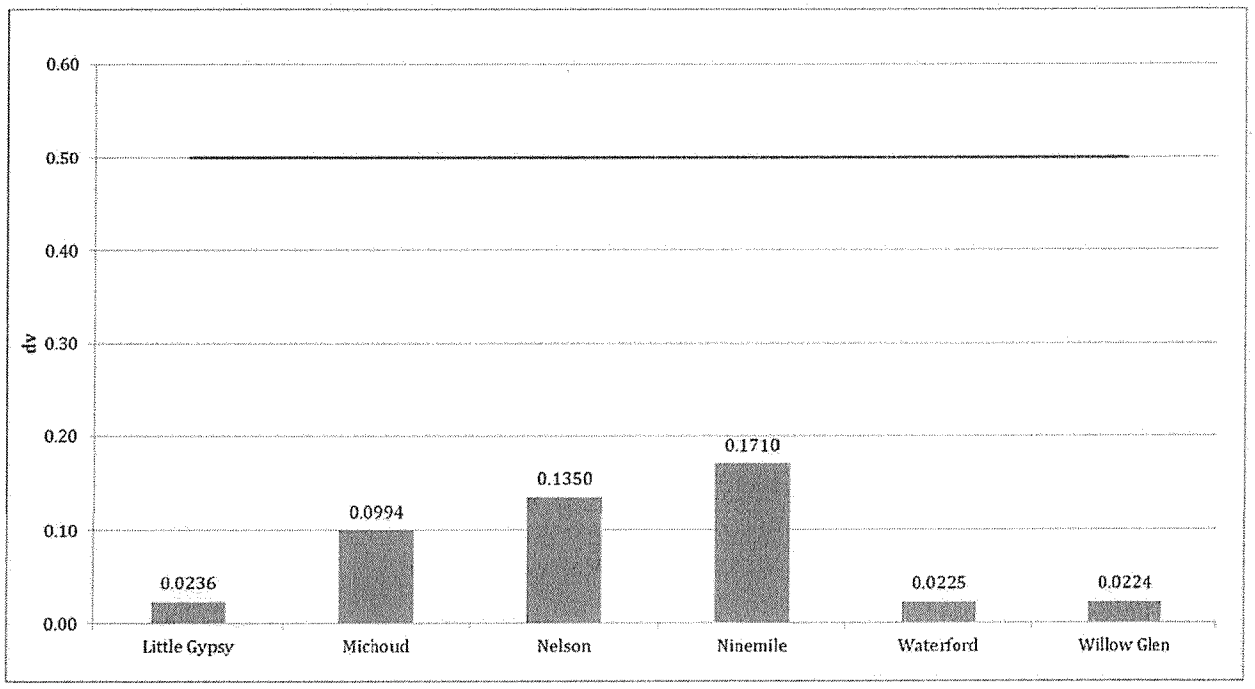

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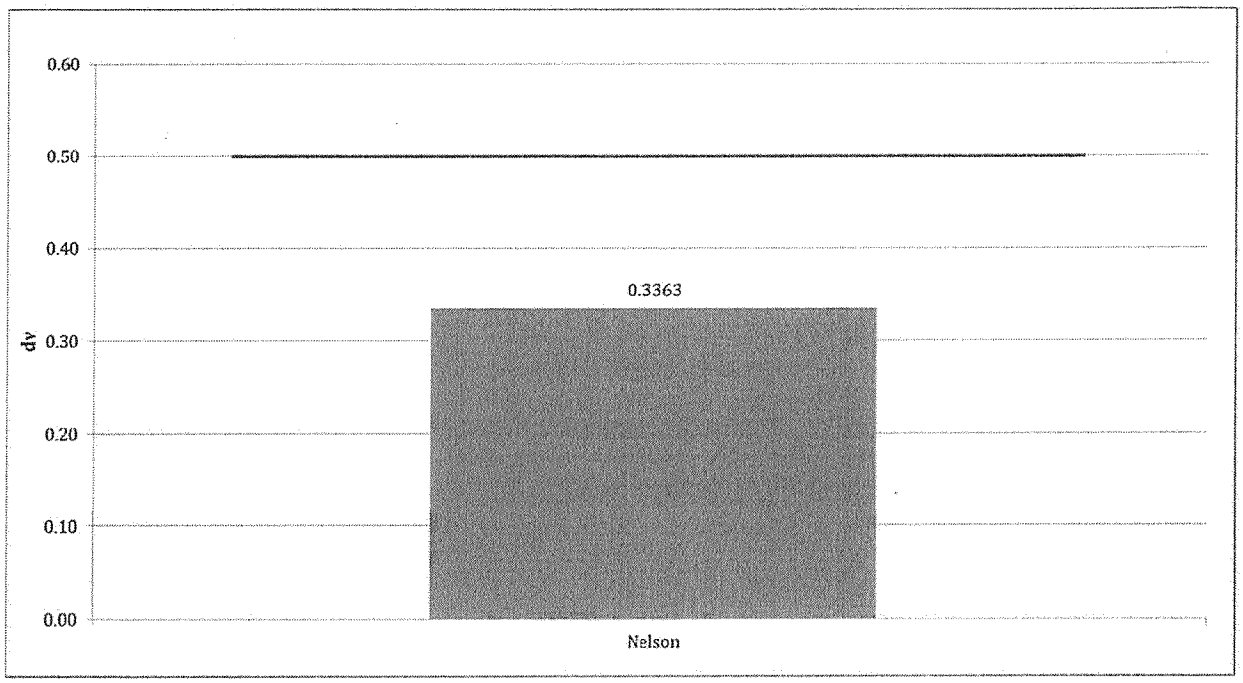
Figure 6-2. Maximum Contribution by Plant to Deciview Haze Index at Caney Creek Wilderness Area for All Days based on Natural Visibility Background Approach



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Appendix E

Municipal Facilities

[No Change]

Appendix F

EPA DRAFT BART Modeling and Costs Information

[No Change]