TECHNICAL SUPPORT DOCUMENT
FOR
BEST AVAILABLE RETROFIT TECHNOLOGY
UNDER THE REGIONAL HAZE RULE

AQPSTR 09-06

July 31, 2009

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List of Acronyms

BART	Best Available Retrofit Technology
CAA	Clean Air Act
CD	Consent Decree
CO	Carbon Monoxide
CPS	Combined Pollutant Standards
EGAS	Economic Growth Analysis System
EGU	Electrical Generating Unit
FGD	Flue Gas Desulfurization
IPM	Integrated Planning Model
LADCO	Lake Michigan Air Directors Consortium
LNB	Low NO_x Burner
MPS	Multi-Pollutant Standards
MRPO	Midwest Regional Planning Organization
NH_3	Ammonia
NO_x	Oxides of Nitrogen
OFA	Over-fire Air
PAMS	Photochemical Assessment Monitoring Sites
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter 2.5 microns in diameter
PM_{10}	Particulate Matter 10 microns in diameter
SCR	Selective Catalytic Reduction
SDA	Spray Dryer Absorbers
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Sites
SNCR	Selective Non-catalytic Reduction
SO_2	Sulfur Dioxide
SPM	Special Purpose Monitors
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
VOM	Volatile Organic Material

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Executive Summary

In an effort to restore visibility in national parks and wilderness areas in the United States to pristine conditions, the United States Congress amended the Clean Air Act ("CAA") to remedy any existing visibility impairment, and to prevent any future impairment. The federal Regional Haze Rule, finalized by the United States Environmental Protection Agency ("USEPA") in 1999[1], is aimed at achieving pristine visibility conditions in the subject areas by 2064. This goal is to be achieved by addressing the combined effects of several pollutants from a number of sources over a wide geographic area that have been found to negatively impact visibility in the affected areas. USEPA has determined that as part of a strategy to reduce pollutants such as oxides of nitrogen ("NO_x"), sulfur dioxide ("SO_2"), and particulate matter ("PM") that certain stationary emission sources should be subject to a Best Available Retrofit Technology ("BART") standard. The sources subject to a BART standard, according to "Guidelines for BART Determinations under the Regional Haze Rule" ("BART Guidelines")[2] published by USEPA in July of 2005, must be one of 26 specified source categories; were in existence in August 1977; began operating after August 1962; and have the potential to emit 250 tons per year or more of any air pollutant.

The federal Regional Haze Rule requires consultation between the states, tribes, and Federal Land Managers ("FLMs") responsible for managing Class I areas. This multi-state and multi-agency consultation process has been facilitated by Regional Planning Organizations ("RPOs") established specifically for this purpose. Illinois fully participated in the planning and technical development efforts of the Midwest Regional Planning Organization ("MRPO"), which also includes the States of Indiana, Michigan, Ohio, and Wisconsin. States in other parts of the country participated in similar RPOs. Illinois has also participated in consultations with other RPO's and states that have requested Illinois' participation in their planning process.

The Illinois EPA, in conjunction with the MRPO, has made adequate plans to meet the requirements of the Regional Haze Rule by performing the necessary modeling to determine its impact on visibility in Class I areas. The modeling approach used by the Illinois EPA to address BART was developed in consultation with the MRPO, the other participating MRPO states, the USEPA, and participating FLMs.

The purpose of this document is to describe Illinois' approach for meeting the BART requirements for emission sources in Illinois that have been shown to be BART-eligible. Technical analyses conducted by the Illinois EPA have shown that certain BART-eligible sources in Illinois are causing or contributing to visibility impairment in several Class I areas in the eastern United States, including Mammoth Cave National Park in Kentucky, the Mingo Wilderness Area in Missouri, and Isle Royale National Park in Michigan. Illinois is therefore required to submit revisions to its State Implementation Plan ("SIP") to require that subject emission sources install cost effective retrofit control technologies, or provide equivalent emission reductions.

Illinois has promulgated emission control requirements for most of the emission units in Illinois that are subject to BART that provide greater emission reductions, and greater environmental benefits, than would be provided by implementation of BART. Other emission units are subject to provisions contained in federally enforceable consent decrees that provide greater emission reductions than would be achieved by BART. The remaining emission units in Illinois that are subject to BART have committed to meet the BART requirements, as formalized in Memoranda of Understanding between the affected sources and the Illinois EPA. All of these provisions and agreements require significant emission reductions that the Illinois EPA considers to be better than the BART requirements contained in the Regional Haze Rule, and all requirements will be contained in federally enforceable permits.

1.0 Introduction

In an effort to restore national parks and wilderness areas in the United States to pristine conditions with regard to man-made visibility impairment, the United States Congress amended the Clean Air Act ("CAA") in 1977 to remedy any existing visibility impairment, and to prevent any future impairment. These amendments led to measures specifically addressing plume blight caused by visible plumes from nearby emission sources, but did little to reduce regional haze in the United States. When Congress again amended the CAA in 1990, it directed further research into regional haze, and mandated periodic assessments of progress toward regional haze goals. The resulting research and mandates led to the adoption on July 1, 1999 of USEPA's Final Regional Haze Rule. The Regional Haze Rule set the goal of achieving pristine visibility conditions at federal Class I areas by 2064. The Rule also addressed the visibility effects of pollution sources over a wide geographic range, and included sources from states without any Class I areas located within them.

USEPA has determined that as part of its strategy to reduce visibility impairing air pollutants, such as oxides of nitrogen ("NO_x"), sulfur dioxide ("SO_2"), and particulate matter ("PM"), that certain stationary emission sources should be subject to a Best Available Retrofit Technology ("BART") standard. BART is defined as an "emission limitation based on the degree of reduction available through the application of the best system of continuous emission reduction for each pollutant which is emitted by an existing stationary facility" (40 CFR 51.301). The sources subject to a BART standard, according to "Guidelines for BART Determinations under the Regional Haze Rule" ("BART Guidelines")[2] published by USEPA in July of 2005, must be one of 26 specified source categories; were in existence in August 1977; began operating after August 1962; and have the potential to emit 250 tons per year or more of any air pollutant.

In 2002, the Regional Haze Rule was challenged by the American Corn Growers Association in the United States Court of Appeals for the District of Columbia Circuit. *American Corn Growers Ass'n v. EPA,* 291 F.3d 1 (D.C. Cir. 2002). The court issued a ruling vacating the rule in part and sustaining it in part. The ruling denied the challenge to the Regional Haze Rule mandating goals of zero visibility impairment and no degradation in Class I areas, but remanded the Best Available Retrofit Technology ("BART") requirements to the USEPA for revision. In

response to the court's ruling, USEPA promulgated final amendments to its Regional Haze Rule that specifically apply to the BART provisions of the rule. 70 Fed. Reg. 39104 (July 6, 2005).

As stated in the final BART Guidelines, "The process of establishing BART emission limitations can be logically broken down into three steps:

(1) States identify those sources which meet the definition of "BART-eligible source" set forth in 40 CFR 51.031. These sources are any which: (1) have the potential to emit 250 tons per year ("TPY") or more of a visibility impairing air pollutant; (2) were put in place between August 7, 1962 and August 7, 1977; and (3) whose operations fall within one or more of 26 specifically listed source categories.

(2) States determine whether such sources "emit [] any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility [in a Class I area.]. A source which fits this description is "subject to BART."

(3) For each source subject to BART, states then identify the appropriate type and the level of control for reducing emissions.

The final BART Guidelines discuss how to determine whether a source "emits any pollutants which may reasonably be anticipated to cause or contribute to any visibility impairment." For the purpose of this analysis, the Illinois EPA used CALPUFF for modeling visibility impacts, as recommended by USEPA.[2]

The BART Guidelines identify the following visibility-impairing pollutants: SO_2, NOx, and PM. In addition, USEPA recommends exercising judgment in deciding whether VOC and ammonia and ammonia compounds should be considered as visibility-impairing pollutants. The guidelines also allow states to exclude visibility-impairing pollutants from consideration if they are below de minimis levels (i.e., 40 TPY for SO_2 and NOx, and 15 TPY for PM on a source-wide basis).

The federal Regional Haze Rule requires consultation between the states, tribes, and Federal Land Managers ("FLMs") responsible for managing Class I areas. This multi-state and multi-agency consultation process has been facilitated by Regional Planning Organizations ("RPOs") established specifically for this purpose. Illinois fully participated in the planning and technical development efforts of the Midwest Regional Planning Organization ("MRPO"), which also includes the States of Indiana, Michigan, Ohio, and Wisconsin. States in other parts of the country participated in similar RPOs. The modeling approach used by the Illinois EPA to address BART was developed in consultation with the MRPO, the other participating MRPO states, the USEPA, and participating FLMs.

The purpose of this document is to summarize the analyses that were conducted to determine which BART-eligible stationary sources in Illinois are subject to the BART standards pursuant to the Regional Haze Rule. In addition, this document details how these sources will comply with the rule, whether by meeting a BART standard or by an alternative strategy.

2.0 BART-Eligible Sources in Illinois

According to USEPA's BART Guidelines, a source is BART-eligible if it: (1) falls into one of 26 specified source categories, (2) was "in existence" on August 8, 1977, and "in operation" on or after August 8, 1962, and (3) has potential emissions of 250 TPY or more of any visibility-impairing pollutant (i.e., SO_2, NO_x, or PM).

The Illinois EPA identified potentially eligible BART sources using a multi-step process. First, Illinois EPA identified potential BART-eligible sources based upon data available from Title V operating permits, including information on dates of operation and maximum actual emissions from a source (with a threshold of 100 TPY). Second, the Illinois EPA requested the dates of construction and potential to emit ("PTE") for individual units from all Title V sources in Illinois that fell into one of the 26 specified source categories. Table 2.1 provides the initial list of sources that operate one or more potential BART-eligible emission units. Finally, those sources found to be potentially BART-eligible were modeled using CALPUFF to determine whether the source contributes to visibility impairment. The modeling methodology, developed in cooperation with the MRPO, is detailed in Section 3 of this document.

As summarized in Table 2.1, the Illinois EPA determined that there are 26 sources in Illinois that operate emission units that are BART-eligible. Eleven of those sources are coal-fired electric generating units ("EGUs"). Of the non-EGUs, there are four petroleum refineries, three chemical process plants, two Portland cement plants, two glass fiber processing plants, one lime plant and one iron and steel plant.

Table 2.1 Initial List of BART-Eligible Sources

SOURCE_NAME	County	SOURCE ID
Big River Zinc Corp	St. Clair	163121AAK
Carmeuse Lime Inc	Cook	031600ADY
Chicago Carbon Co	Will	197803AAK
CITGO Petroleum Corp	Will	197090AAI
ConocoPhillips Co Wood River Refinery	Madison	119090AAA
Equistar Chemicals LP	Grundy	063800AAC
ExxonMobil Oil Corp	Will	197800AAA
Illinois Cement Co	La Salle	099030AAZ
Lone Star Industries Inc	La Salle	099816AAF
Marathon Petroleum Co LLC	Crawford	033808AAB
US Steel Granite City	Madison	119813AAI
Owens-Brockway Glass Container Inc	La Salle	099490AAD
Pilkington North America Inc	La Salle	099825AAG
Aventine Renewable Energy Inc	Tazewell	179060ACR
Koppers Inc	Cook	031300AAJ
Dynegy Midwest Generation Inc - Baldwin	Randolph	157851AAA
Ameren Energy Generating Inc - Coffeen	Montgomery	135803AAA
City Water Light and Power (CWLP)	Sangamon	167120AAO
Ameren Energy Resources Generating Co -	Fulton	057801AAA
Ameren Energy Resources Generating Co –	Peoria	143805AAG
Midwest Generation LLC - Joliet	Will	197809AAO
Dominion Kincaid Generation, LLC	Christian	021814AAB
Midwest Generation LLC - Powerton	Tazewell	179801AAA
Soyland Power Coop	Pike	149817AAB
Midwest Generation LLC - Will County	Will	197810AAK
Dynegy Midwest Generation Inc - Wood River	Madison	119020AAE

3.0 Modeling Approach

The Illinois EPA used modeling to support its decision on which BART–eligible sources cause or contribute to visibility impairment and are therefore subject to BART. The modeling approach used by the Illinois EPA to address BART was developed in consultation with the MRPO, the other participating MRPO states, the USEPA, and participating FLMs. The approach is described in detail in the document: "Single Source Modeling to Support Regional Haze BART – Modeling Protocol", prepared by the Lake Michigan Air Directors Consortium ("LADCO") (March 21, 2006). This document is included as Appendix A.

3.1 Available Modeling Methodologies for the Regional Haze Rule

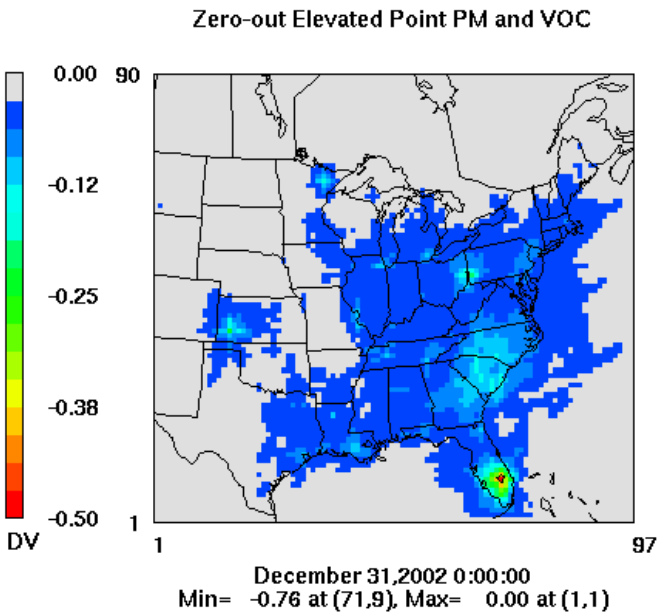
To determine whether a source causes or contributes to visibility impairment, USEPA identified three modeling approaches in the BART Guidelines. These were the individual source attribution approach, the use of model plants, and the cumulative modeling approach.

Under the "individual source attribution" approach, CALPUFF (or other appropriate models) could be used to show that SO_2, NO_x, and direct PM emissions from an individual source do not cause or contribute to visibility impairment in a Class I area. The first step in this approach is to prepare a modeling protocol. Following release of the final BART Guidelines, the MRPO, in conjunction with Illinois and the other MRPO states, developed a CALPUFF modeling protocol, "Single Source Modeling to Support Regional Haze BART," March 21, 2006. See, Appendix A, attached. The Illinois EPA used the modeling methodologies described in this document to determine if BART-eligible sources cause or contribute to visibility impairment.

Under the "model plants" option, analyses of model plants can be used to exempt sources that share specific characteristics. USEPA used this approach, with representative plume characteristics, to assess the visibility impact from emission sources of different sizes and distances from two hypothetical Class I areas (one in the East and one in the West). Based on these analyses, USEPA concluded that if a State establishes 0.5 deciviews as a contribution threshold, then the State could exempt sources with combined SO_2 and NO_x emissions of less than 500 TPY located more than 50 kilometers ("km") from a Class I area, or less than 1,000 TPY located more than 100 km from a Class I area. However, Illinois EPA believes that

applying this threshold methodology as a bright-line test may lead to questions about sources that fall just beneath the threshold. Illinois EPA therefore elected to use the "individual source attribution" approach to model all BART-eligible sources individually, regardless of emissions or distance from the nearest federal Class I area.

Figure 3.1



Modeling of total visibility impacts from all BART-eligible sources in a given state, the "cumulative modeling" option allowed by the BART guidelines, can be used to show that the sources collectively do not cause or contribute to visibility impairment in a Class I area. The MRPO used this approach to assess the likelihood that PM emissions in the MRPO states will cause or contribute to visibility impairment. Specifically, the MRPO used the Comprehensive Air Quality Model With Extensions ("CAMx"), with all point source PM emissions set to zero domain-wide, to assess the contribution of PM emissions to visibility impairment in the Eastern United States. The model results, which are presented in Figure 3.1, show that these emissions do not contribute to visibility impairment (impact greater than 0.5 deciviews) in the Eastern United States. Since the PM emissions from just the BART-eligible sources represent a small fraction of the total PM emissions from all point sources, the MRPO determined that the visibility impact of PM emissions from just the BART-eligible sources in the MRPO states will be much less than 0.5 deciviews in any Class I area. Illinois EPA has therefore excluded emissions of PM from the BART review process in Illinois.

3.2 Modeling Methodology

The Illinois EPA used the "individual source attribution" approach as described in the previous section. The Illinois EPA modeled each BART-eligible source using the CALPUFF model on an individual unit basis. CALPUFF is a non-steady-state puff dispersion model that simulates the effects of time and space-varying meteorological conditions on pollution transport, transformation, and removal. CALPUFF consists of the plume transport model (CALPUFF), two meteorological data pre-processors (CALMM5, CALMET), an inorganic chemistry parameterization module (POSTUTIL), and the post-processor (CALPOST).[7,8] The specific versions of the CALPUFF modeling system used for this analysis are listed in Table 3.1.

Table 3.1 CALPUFF Modeling System Versions

	Level	Version
CALPUFF	5.771a	040716
CALPOST	5.51	030709
CALMET	5.53a	040716
CALMM5	2.0	021111
POSTUTIL	1.4	040818

Except where noted below, the modeling system was applied in a manner consistent with the MRPO modeling protocol (Appendix A) and USEPA guidance recommendations set forth in the Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts compiled by the Interagency Workgroup on Air Quality Modeling ("IWAQM"). [3]

Since all of the BART-eligible sources in Illinois are more than 50 kilometers from any Federal Class I area, Gaussian modeling is not required. The IWAQM guidance states that less than 5 years of meteorological data may be used if a meteorological model using four-dimensional data assimilation ("FDDA") is used to supply data. The Illinois EPA used three years of meteorological data developed by the MRPO using FDDA. The Illinois EPA applied CALPUFF for NOx and SO_2 emissions from all BART units at each BART-eligible source for calendar years 2002, 2003, and 2004.

The CALPUFF/CALMET modeling domain used in this analysis was a Lambert conformal grid projection centered at (97 W, 40 N) with true latitudes at 33 N and 45 N and origin at (-900 km, -1620 km). The horizontal domain consists of 97 cells of 36-km in the east-west direction and 90 cells of 36 km in the north-south direction (see Figure 3.1). The basis for meteorological files that were processed through CALMET consisted of three years of 36-km grid Fifth-Generation Mesoscale Model ("MM5") simulations (2002-2004). The MM5 data were processed using FDDA, which incorporates surface and upper air observational data.

CALPUFF was applied using discrete receptor points in each Class I area with an approximate receptor resolution of one kilometer. POSTUTIL is used to repartition nitrate into the gas or particulate phase depending on the estimated ammonia availability. This option has been shown to improve model performance. [7,8] CALPOST was then applied to the POSTUTIL output for each group of Class I area receptors (shown in Figure 3.2 and in Table 3.3). CALPUFF, POSUTIL, and CALPOST were also run for three consecutive years for each source during the first round of modeling for gridded receptors that match the CALMET/CALPUFF domain shown in Figure 3.1. These runs allow for quality assurance and quality control by plotting the results geographically. The results are checked for the reasonableness of the stack location, stack parameters, and emission rates.

3.3 Alternate Modeling Parameters

Modeling parameters were generally set in a fashion consistent with the IWAQM guidance; however, the Illinois EPA modified a few of the suggested parameter settings. For CALMET, several options were selected to use the MM5 output as input to CALMET rather than observation data. For CALPUFF, certain variables were modified affecting dry and wet deposition flux, which are not considered to be applicable for this analysis. Other variables affecting output species concentrations were set to be consistent with measured regional concentrations.

CALPUFF requires the input of monthly background ozone (O_3) and ammonia (NH_3) concentrations representative of the entire modeling domain. Seasonal domain averaged

concentrations of these parameters were obtained from an annual 2002 CAMx4 simulation. These values are shown in Table 3.2.

Figure 3.2 Model Domain with Class I Areas

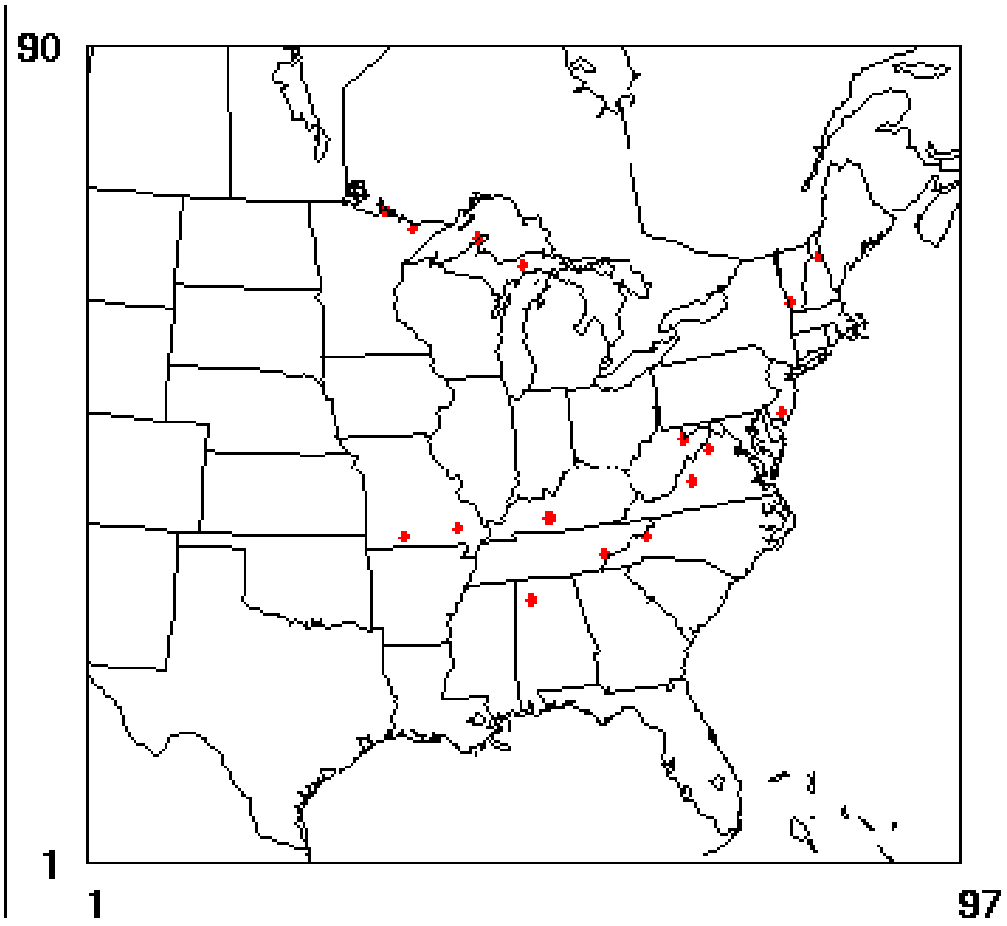


Table 3.2 Domain Seasonal Average Concentrations (ppb)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O_3 (ppb)	31	31	31	37	37	37	33	33	33	27	27	27
NH_3 (ppb)	.3	.3	.3	.5	.5	.5	.5	.5	.5	.5	.5	.5

3.4 Class I Area Receptors

The receptor data used to determine visibility impacts were taken from the National Park Service's ("NPS") Class I Area Receptor Index.[4] According to the BART modeling guidance, receptors "…should be located in the nearest Class I area with sufficient density to identify likely visibility effects." [2] Table 3.3 shows the list of Class I areas and the total number of discrete receptors covering each Class I area used as the receptor field in CALPUFF.

Table 3.3 Class I Receptor Areas and Total Discrete Receptors

Class I Area	Table 3.5 Abbreviation	State	Discrete Receptors
Boundary Waters Canoe area	BOWA	MN	856
Brigantine National Wildlife Refuge		NJ	16
Dolly Sods/Otter Creek Wilderness		WV	187
Great Gulf Wilderness		NH	38
Great Smoky Mountains National Park		TN	736
Hercules-Glades	HEGL	MO	80
Isle Royale National Park	ISLE	MI	966
James River Face		VA	52
Linville Gorge		NC	66
Lye Brook Wilderness		VT	103
Mammoth Cave National Park	MACA	KY	302
Mingo	MING	MO	47
Seney	SENE	MI	173
Shenandoah National Park		VA	298
Sipsy Wilderness		AL	148
Voyageurs National Park		MN	366

Illinois EPA used either maximum daily or maximum hourly emission rates for SO_2 and NO_x, and specific stack parameters for each unit identified as BART-eligible, based on data supplied by affected sources.

3.5 CALPUFF Output: Post Processing and Interpretation

The Illinois EPA relied upon USEPA's "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Program"[5] for the methodologies described in the remainder of this section. The light extinction equation in CALPUFF uses the monthly average relative humidity ("RH"), rather than the daily average humidity as detailed in the BART modeling guidance.[3,6] This necessitates using the CALPOST background light extinction option 6, which computes light extinction from speciated PM measurements with a monthly RH adjustment factor. The Class I area centroid specific monthly RH adjustment factors are taken from Table A-3 of the USEPA's visibility guidance document.[5]

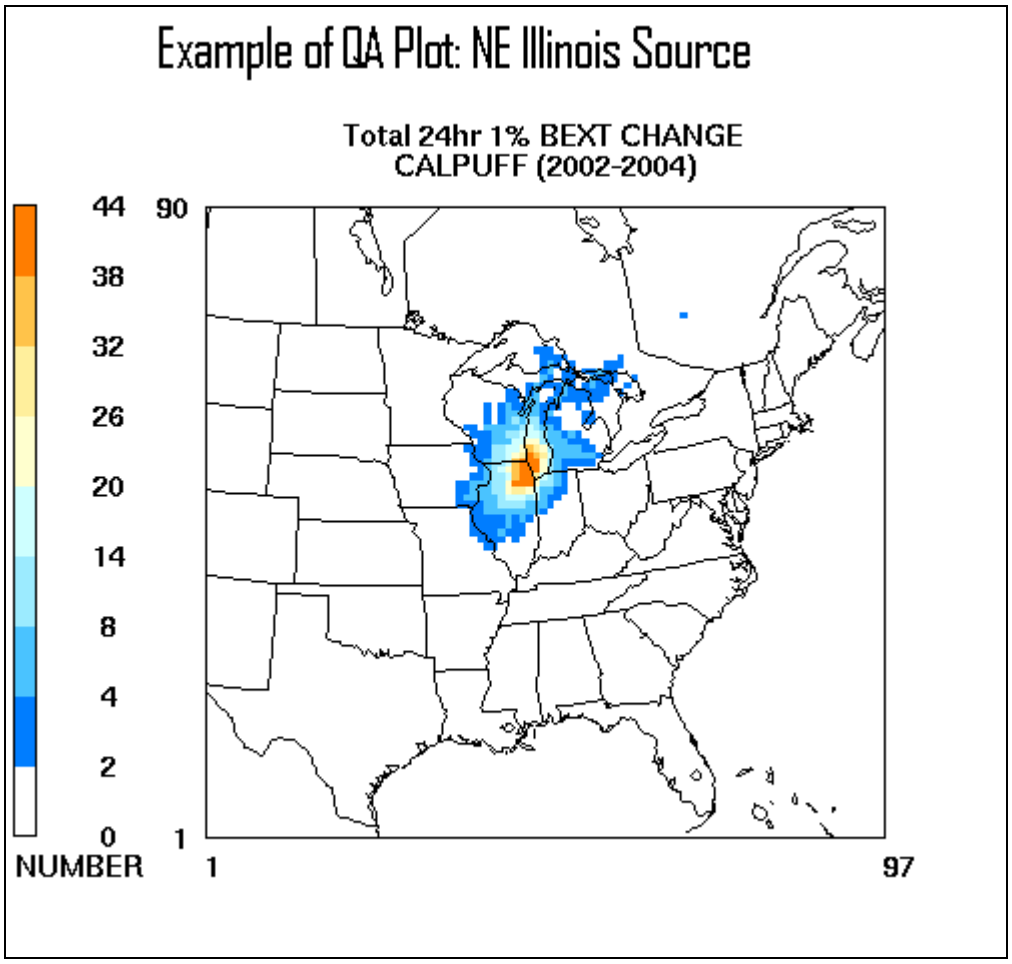
The daily visibility metric for each receptor is expressed as the change in deciviews compared to natural visibility conditions as outlined in the IWAQM guidance.[3] Natural visibility conditions, the 20% best days, for Class I areas used in this analysis are found in Appendix B of USEPA's visibility guidance document.[5] Annual background concentrations for the Eastern United States are also given in USEPA's visibility guidance document in Table 2-1.[5]

3.6 Data Interpretation

Having determined the natural background conditions for each Class I area, modeling was conducted to determine visibility degradation beyond natural conditions due to specific sources. The difference in visibility degradation due to a source compared with natural conditions, expressed in deciviews, is calculated for each Class I area and ranked over the length of the modeling simulation.

The CALPOST post-processing software was used to depict the output from the CALPUFF model. These plots provided initial qualitative spatial information on visual impacts from each BART-eligible source. An example of plot from CALPOST model data is given in Figure 3.3. CALPOST was used to determine the number of days at each receptor that have at least a 1% degradation in light extinction (1/Mm) over background conditions, which is equivalent to 0.5 deciviews degradation.

Figure 3.3 Sample CALPOST Plot



3.7 Modeling Results

The CALPUFF modeling results are summarized in Table 3.5. According to the BART Guidelines, a source ”causes” visibility impairment if it imparts a change of visibility of at least 1.0 deciview at any Class I area, while a source ”contributes” to visibility impairment if it causes a change to visibility impairment of at least 0.5 deciviews. States are given the opportunity to enact more stringent de minimis thresholds if they choose. Illinois EPA believes that these thresholds are adequate and does not propose an alternative level. According to the BART Guidelines, the 98th percentile value should be compared to the contribution threshold to determine whether a BART-eligible source is subject to BART. If it is determined that for a given source there are more than 21 days in three years (the 98th percentile based on modeling

Table 3.4 CALPUFF Modeling Results - Number of Days with Impacts Greater than 0.5 deciviews at Nearby Class I Areas

Source	MAX 3 YR	MAX 1 YR	BOWA	HEGL	ISLE	MACA	MING	SENE
EGUs								
Baldwin	151	57	19	67	18	104	151	43
Kincaid	118	50	26	48	30	118	109	59
Coffeen	175	68	33	95	50	166	175	75
Edwards	136	53	61	76	69	115	127	136
Powerton	93	37	43	46	43	76	72	93
Joliet	103	40	27	22	36	42	51	103
CWLP	103	44	33	45	35	87	103	68
Duck Creek	39	17	17	16	17	31	28	39
Will County	32	16	5	2	10	6	5	32
Wood River	16	6	1	4	2	7	16	4
Non-EGUs								
ExxonMobil	81	34	18	12	27	28	27	81
CITGO	52	22	8	4	14	10	14	52
Conoco	0	0	0	0	0	0	0	0
Aventine	0	0	0	0	0	0	0	0
US Steel	1	1	0	1	0	0	0	0
Marathon	0	0	0	0	0	0	0	0
Lone Star	3	2	1	0	2	0	0	3
Chicago carbon	2	1	0	0	0	0	0	2
Pilkington	0	0	0	0	0	0	0	0
Big River	0	0	0	0	0	0	0	0
IL Cement	0	0	0	0	0	0	0	0
Owens Brockway	0	0	0	0	0	0	0	0
Koppers	0	0	0	0	0	0	0	0
Carmeuse Lime	0	0	0	0	0	0	0	0
Equistar	0	0	0	0	0	0	0	0

three years) on which the source causes a 0.5 deciviews impact, or if there are more than 7 days in a single year (the 98th percentile based on modeling one year) with a 0.5 deciviews impact,

then the source is subject to BART. Table 3.5 contains the maximum number of exceedances attributed to each source for the highest year at any of the Class I areas modeled, the maximum number of exceedances over the three-year period at any Class I area modeled, and the three year exceedance total for the six nearest federal Class I areas. The six Class I areas listed in Table 3.5 are the areas most frequently impacted by sources in Illinois. To preserve clarity in the tabular results, only these six Class I areas are listed. All of the Class I areas listed previously in Table 3.3 were included in the modeling, however.

Table 3.5 List of Sources Subject to BART

SOURCE_NAME	County	SOURCE ID	Category
CITGO Petroleum Corp	Will	197090AAI	11
ExxonMobil Oil Corp	Will	197800AAA	11
Dynegy Baldwin	Randolph	157851AAA	1
Dominion Kincaid	Christian	021814AAB	1
Ameren Coffeen	Montgomery	135803AAA	1
Ameren Edwards	Peoria	143805AAG	1
Ameren Duck Creek	Fulton	057801AAA	1
Midwest Generation Powerton	Tazewell	179801AAA	1
Midwest Generation Joliet	Will	197809AAO	1
Midwest Generation Will County	Will	197810AAK	1
Springfield CWL&P	Sangamon	167120AAO	1

Based on the results of the modeling, eleven sources in Illinois exceed the 0.5 deciview visibility impact threshold on at least 22 days over the three-year modeling timeframe, or on at least 8 days in any one of the three modeled years. These sources are listed in Table 3.6. Of the 11 sources, nine are electric generating unit ("EGU") sources and two are non-EGU sources. The two non-EGUs are petroleum refineries located near Chicago (CITGO and ExxonMobil), and the nine power generation sources are spread geographically across Illinois. The specific emission units at the sources are listed in Table 3.7. The Illinois EPA concludes that these sources are subject to BART.

Table 3.6 List of Units Subject to BART

SOURCE_NAME	Unit ID	SOURCE_NAME	Unit ID
Dynegy Baldwin	Boiler #1	**CITGO**	Heater 115 B-2
Dynegy Baldwin	Boiler #2	**CITGO**	Heater 116 B-1
Dynegy Baldwin	Boiler #3	**CITGO**	Heater 116 B-2
Dominion Kincaid	Boiler #1	**CITGO**	Heater 116 B-3
Dominion Kincaid	Boiler #2	**CITGO**	Heater 116 B-4
Ameren Coffeen	Boiler CB-1	**CITGO**	Heater 118 B-1
Ameren Coffeen	Boiler CB-2	**CITGO**	Heater 118 B-51
Ameren Edwards	Boiler #2	**CITGO**	Heater 122 B-2
Ameren Edwards	Boiler #3	**CITGO**	Heater 123 B-5
Ameren Duck Creek	Boiler #1	**CITGO**	Heater 125 B-1
Midwest Gen. Powerton	Boiler #51	**CITGO**	Reboiler 125 B-2
Midwest Gen. Powerton	Boiler #52	**CITGO**	SRU 119 A train
Midwest Gen. Powerton	Boiler #61	**CITGO**	SRU 119 B train
Midwest Gen. Powerton	Boiler #62	**CITGO**	SRU 121 C train
Midwest Gen. Joliet	Boiler #71	**CITGO**	SRU 121 D train
Midwest Gen. Joliet	Boiler #72	**ExxonMobil**	South sulfur trains
Midwest Gen. Joliet	Boiler #81	**ExxonMobil**	FCCU
Midwest Gen. Joliet	Boiler #82	**ExxonMobil**	Heaters 1B1A & 1B1B
Midwest Gen. Will County	Boiler #4	**ExxonMobil**	Vacuum heater
Springfield CWL&P	Boiler Dallman 1	**ExxonMobil**	Coker chg heaters (E & W)
Springfield CWL&P	Boiler Dallman 2	**ExxonMobil**	Heater 7B1
Springfield CWL&P	Boiler Lakeside 8	**ExxonMobil**	Aux boiler
CITGO	Heater 111B-1A	**ExxonMobil**	Sat gas lean oil reboiler
CITGO	Heater 111B-1B	**ExxonMobil**	Heater 2B3
CITGO	Heater 111B-2	**ExxonMobil**	Heater 2B5
CITGO	FCCU	**ExxonMobil**	Heater 2B4
CITGO	Heater 113 B-1	**ExxonMobil**	Heater 2B6
CITGO	Aux Boiler 430 B-1	**ExxonMobil**	Heater 2B7
CITGO	Heater 113 B-2	**ExxonMobil**	Reboiler 17-B-2
CITGO	Heater 114 B-1	**ExxonMobil**	Heater 3B1
CITGO	Heater 114 B-2	**ExxonMobil**	Heater 3B2
CITGO	Heater 114 B-3	**ExxonMobil**	Blow down East flare
CITGO	Heater 115 B-1	**ExxonMobil**	Blow down South flare

4.0 BART Controls in Illinois

Illinois EPA has evaluated the emission units at each subject-to-BART source, or the fleet of sources held by specific companies in the case of EGUs, to determine the level of control necessary for those units and sources to meet BART. The Illinois EPA will include appropriate emission limits in federally enforceable permits for each source, so it is not anticipated that state rulemaking will be necessary to implement BART for the subject units. A more detailed discussion of these evaluations follows in the subsequent subsections of this Section.

4.1 BART Controls for Illinois EGUs

For coal-fired EGUs, the BART Guidelines provide presumptive emission limits or control levels for various boiler types and coal types. The presumptive emission limits for coal-fired EGUs are shown in Table 4.1. The Illinois EPA has compared these presumptive BART emission levels to existing emission reduction requirements and commitments for the subject-to-BART EGUs in Illinois. The existing emission reduction requirements and commitments for coal-fired EGUs in Illinois that are subject-to-BART include:

- the Multi-Pollutant Standard ("MPS") and Combined Pollutant Standards ("CPS") codified in the Illinois Mercury Rule, 35 Ill. Adm. Code Part 225, that apply to Ameren, Dynegy, and Midwest Generation;
- a multi-pollutant agreement via a Memorandum of Understanding ("MOU") between the Illinois EPA and Dominion Energy Services, as operator, and Kincaid Generation, LLC, as owner, of the Kincaid Generating Station (collectively "Dominion Kincaid"), to achieve BART-control levels; and
- a similar MOU between the Illinois EPA and City Water, Light & Power ("CWLP"), Springfield, Illinois, to achieve BART-control levels and to shut down one of its existing subject-to-BART units.

4.1.1 EGUs Under the MPS and CPS

Three electric utilities operating in Illinois, Ameren, Dynegy, and Midwest Generation have committed to comply with the MPS and CPS under the Illinois Mercury Rule, requiring the installation of state-of-the-art pollution controls on many of their electric generating units in

Table 4.1 Presumptive BART Emission Limits for Coal-Fired EGUs

Pollutant	Boiler Type	Coal Type	Presumptive Limit (lbs/mmBTU)
SO_2	All units	All coal types	0.15 (or 95% control)
NOx	Dry-bottom wall-fired	Bituminous	0.39
		Sub-bituminous	0.23
		Lignite	0.29
	Tangential-fired	Bituminous	0.28
		Sub-bituminous	0.15
		Lignite	0.17
	Cell burners	Bituminous	0.40
		Sub-bituminous	0.45
	Dry-turbo-fired	Bituminous	0.32
		Sub-bituminous	0.23
	Wet-bottom tangential-fired	All	0.62
	Cyclone	All	(SCR operated annually)

Illinois. These regulations were promulgated to allow coal-fired electric utilities more flexibility in meeting the Illinois Mercury Rule in exchange for significant NO_x and SO_2 reductions. While the MPS and CPS include "system-wide" limits on NO_x and SO_2, they also contain specific commitments for controls that apply to individual units. These unit-specific requirements will be contained in federally enforceable permits.

The following Subsections describe the controls that will be installed at the subject-to-BART sources as a result of the MPS and CPS.

4.1.1.1 Dynegy

Dynegy operates several electric generating stations in Illinois, all of which are affected by the requirements of the MPS. Only the three coal-fired boilers at Baldwin are subject to BART, however. Units 1 and 2 are cyclone boilers firing sub-bituminous coal, while Unit 3 is a tangentially fired unit burning sub-bituminous coal. Currently, Units 1 and 2 are controlled by selective catalytic reductions ("SCRs") for NO_x, while Unit 3 is controlled by low-NO_x burners and over-fire air. All three units are also limited by a federal consent decree which requires that NOx emissions cannot exceed 0.10 pounds per million British thermal units ("lb/mmBTU") of NO_x. USEPA has not established a presumptive BART emission limit for NOx for cyclone boilers. Rather, USEPA requires installation and year-round operation of SCRs on cyclone EGU boilers. For purposes of calculating emission reductions from BART, the Illinois EPA has assumed that the presumptive BART NOx control requirement equates to an effective emission limit of 0.125 lb/mmBTU for cyclone boilers. For tangentially-fired EGU boilers burning sub-bituminous coal, the presumptive BART emission limit is 0.15 lb/mmBTU. Since all three units at Baldwin are required to meet 0.10 lb/mmBTU, the presumptive BART limits for NO_x are being met for all units.

All three units at Baldwin currently use low-sulfur coal to reduce SO_2 emissions. However, Dynegy has committed to installing scrubbers on all three units at Baldwin by 2012, which will allow these units to achieve SO_2 emissions levels well below the presumptive BART limit of 0.15 lb/mmBTU. Dynegy has also committed to installing baghouses on all units for particulate control by 2012.

Table 4.2 and 4.3 compare the emission reductions expected from Dynegy system wide from compliance with the MPS and the expected emission reductions from compliance with BART for NOx and SO_2, respectively. The Illinois EPA has estimated that compliance with the MPS will reduce NO_x emissions from Dynegy system wide by 23, 867 TPY compared to 2002 emissions levels, and SO_2 system wide will be reduced by 47,378 TPY compared to 2002 emissions levels. Applying presumptive BART controls to just the units at Baldwin that are subject to BART will yield NOx reductions of 14,843 TPY, and SO_2 reductions of 16,711 TPY. Compliance with the

MPS on a system wide basis will therefore yield much larger reductions of NO_x and SO_2 than will BART.

Table 4.2 NO_x Reductions from Dynegy - BART vs. MPS

		Base Year 2002			Presumptive BART			MPS		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Baldwin	1	43,884	0.55	12,119	0.1	2,194	9,925	0.1	2,194	9,925
Baldwin	2	37,135	0.4	7,405	0.1	1,857	5,549	0.1	1,857	5,549
Baldwin	3	46,403	0.12	2,850	0.15	3,480	-630	0.1	2,320	530
Havana	9	28,514	0.27	3,901	NA	NA	NA	0.1	1,426	2,475
Hennepin	1	4,684	0.32	760	NA	NA	NA	0.1	234	525
Hennepin	2	17,575	0.33	2,862	NA	NA	NA	0.1	879	1,983
Vermilion	1	5,311	0.37	986	NA	NA	NA	0.1	266	720
Vermilion	2	6,741	0.37	1,231	NA	NA	NA	0.1	337	894
Wood River	4	5,561	0.19	521	NA	NA	NA	0.1	278	243
Wood River	5	17,611	0.22	1,903	NA	NA	NA	0.1	881	1,023
							14,843			**23,867**

Table 4.3 SO_2 Reductions from Dynegy - BART vs. MPS

		Base Year 2002			Presumptive BART			MPS		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Baldwin	1	43,884	0.41	9,053	0.15	3,291	5,762	0.19	4,169	4,884
Baldwin	2	37,135	0.39	7,283	0.15	2,785	4,498	0.19	3,528	3,755
Baldwin	3	46,403	0.43	9,931	0.15	3,480	6,451	0.19	4,408	5,523
Havana	9	28,514	0.9	12,815	NA	NA	NA	0.19	2,709	10,106
Hennepin	1	4,684	0.43	1,000	NA	NA	NA	0.19	445	555
Hennepin	2	17,575	0.43	3,792	NA	NA	NA	0.19	1,670	2,122
Vermilion	1	5,311	2.75	7,293	NA	NA	NA	0.19	505	6,788
Vermilion	2	6,741	2.74	9,224	NA	NA	NA	0.19	640	8,584
Wood River	4	5,561	0.55	1,536	NA	NA	NA	0.19	528	1,008
Wood River	5	17,611	0.65	5,726	NA	NA	NA	0.19	1,673	4,053
							16,711			**47,378**

4.1.1.2 Ameren

Ameren operates EGUs at six locations in Illinois: Hutsonville, Newton, Coffeen, Meredosia, Duck Creek, and Edwards. Three of these, Coffeen, Duck Creek, and Edwards have at least some BART-eligible units.

Coffeen

There are two units at Coffeen, both of which are subject to BART. They are both cyclone-type units firing a blend of bituminous and sub-bituminous coals. NOx emissions from both units are already controlled using SCRs, which, when operated annually, meets the presumptive BART control requirement. There are currently no controls for SO_2, but Ameren has committed to install wet scrubbers on both units by the end of 2009, which will allow both units to meet presumptive BART for SO_2.

Duck Creek

The single unit at Duck Creek is subject to BART. It is a dry-bottom wall-fired unit burning bituminous coal. The unit is controlled by an SCR in addition to low NO_x burners for NO_x control. The presumptive BART limit for NO_x at this unit is 0.39 lb/mmBTU, which is easily met with SCR technology. There is currently no control for SO_2, but Ameren is scheduled to install a wet scrubber in 2009, which will allow the unit to meet presumptive BART for SO_2.

Edwards

Ameren operates three units at the Edwards facility, two of which (Units 2 and 3) are subject to BART. Both units are dry-bottom wall-fired units which burn sub-bituminous coal. Unit 2 has low NO_x burners, which Ameren plans to upgrade with a new low NO_x burner/over-fire air system. NO_x is currently being controlled at Unit 3 with an SCR and low NO_x burners, which is sufficient to meet presumptive BART. Ameren will install a new scrubber, along with a baghouse for particulate control, on Unit 3 by January 2014. This will allow Unit 3 to meet presumptive BART for SO_2. Boiler 2 will likely not meet presumptive BART for either SO_2 or NO_x. Ameren is relying on system wide reductions required by the MPS to meet BART at Edwards.

For Ameren system wide, the MPS provides substantially greater source-wide reductions of NO_x and SO_2 than would be achieved by just requiring subject-to-BART units to meet the presumptive BART emission limits. As shown in Tables 4.4 and 4.5, the MPS will lead to a fleet-wide reduction of about 8,000 TPY of NO_x, and more than 42,000 TPY of SO_2 beyond presumptive BART emission levels.

Table 4.4 NO_x Reductions from Ameren - BART vs. MPS

		Base Year 2002			Presumptive BART			MPS		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Coffeen	1	18,570	0.53	4,918	0.1	928	3,989	0.11	1,021	3,896
Coffeen	2	37,545	0.5	9,422	0.1	1,877	7,544	0.11	2,065	7,357
Duck Creek	1	22,635	0.47	5,328	0.39	4,414	914	0.11	1,245	4,083
E D Edwards	1	6,417	0.41	1,306	NA	NA	NA	0.11	353	953
E D Edwards	2	17,222	0.45	3,901	0.23	1,981	1,920	0.11	947	2,954
E D Edwards	3	15,972	0.46	3,639	0.23	1,837	1,802	0.11	878	2,760
Grand Tower	7	0	0	0	NA	NA	NA	0.11	0	0
Grand Tower	8	0	0	0	NA	NA	NA	0.11	0	0
Grand Tower	9	0	0	0	NA	NA	NA	0.11	0	0
Hutsonville	5	3,161	0.57	897	NA	NA	NA	0.11	174	723
Hutsonville	6	3,443	0.52	902	NA	NA	NA	0.11	189	712
Joppa	1	13,548	0.13	876	NA	NA	NA	0.11	745	131
Joppa	2	16,258	0.13	1,048	NA	NA	NA	0.11	894	153
Joppa	3	15,396	0.13	1,030	NA	NA	NA	0.11	847	183
Joppa	4	13,402	0.13	904	NA	NA	NA	0.11	737	167
Joppa	5	15,094	0.12	939	NA	NA	NA	0.12	939	0
Joppa	6	16,063	0.12	999	NA	NA	NA	0.12	999	0
Meredosia	1	1,134	0.51	292	NA	NA	NA	0.51	292	0
Meredosia	2	1,337	0.5	336	NA	NA	NA	0.5	336	0
Meredosia	3	1,069	0.51	271	NA	NA	NA	0.51	271	0
Meredosia	4	1,406	0.51	357	NA	NA	NA	0.51	357	0
Meredosia	5	10,810	0.47	2,524	NA	NA	NA	0.47	2,524	0
Newton	1	40,631	0.15	3,037	NA	NA	NA	0.15	3,037	0
Newton	2	38,533	0.11	2,215	NA	NA	NA	0.11	2,215	0
							16,170			**24,074**

Table 4.5 SO_2 Reductions from Ameren - BART vs. MPS

		Base Year 2002			Presumptive BART			MPS		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Coffeen	1	18,570	1.54	14,332	0.15	1,393	12,939	0.25	2,321	12,011
Coffeen	2	37,545	1.49	27,999	0.15	2,816	25,183	0.25	4,693	23,306
Duck Creek	1	22,635	0.97	11,026	0.15	1,698	9,328	0.25	2,829	8,197
E D Edwards	1	6,417	3.55	11,399	NA	NA	NA	0.25	802	10,597
E D Edwards	2	17,222	1.7	14,666	0.15	1,292	13,375	0.25	2,153	12,513
E D Edwards	3	15,972	1.21	9,683	0.15	1,198	8,485	0.25	1,997	7,687
Grand Tower	7	0	0	0	NA	NA	NA	0.25	0	0
Grand Tower	8	0	0	0	NA	NA	NA	0.25	0	0
Grand Tower	9	0	0	0	NA	NA	NA	0.25	0	0
Hutsonville	5	3,161	4.53	7,163	NA	NA	NA	0.25	395	6,768
Hutsonville	6	3,443	4.53	7,791	NA	NA	NA	0.25	430	7,361
Joppa	1	13,548	0.51	3,441	NA	NA	NA	0.25	1,694	1,748
Joppa	2	16,258	0.51	4,139	NA	NA	NA	0.25	2,032	2,107
Joppa	3	15,396	0.51	3,947	NA	NA	NA	0.25	1,925	2,023
Joppa	4	13,402	0.52	3,488	NA	NA	NA	0.25	1,675	1,813
Joppa	5	15,094	0.52	3,932	NA	NA	NA	0.25	1,887	2,045
Joppa	6	16,063	0.52	4,182	NA	NA	NA	0.25	2,008	2,174
Meredosia	1	1,134	5.02	2,844	NA	NA	NA	0.25	142	2,702
Meredosia	2	1,337	5.02	3,356	NA	NA	NA	0.25	167	3,189
Meredosia	3	1,069	5.04	2,694	NA	NA	NA	0.25	134	2,560
Meredosia	4	1,406	5	3,518	NA	NA	NA	0.25	176	3,342
Meredosia	5	10,810	2.34	12,639	NA	NA	NA	2.34	12,648	-9
Newton	1	40,631	0.45	9,046	NA	NA	NA	0.45	9,142	-96
Newton	2	38,533	0.46	8,823	NA	NA	NA	0.46	8,863	-40
							69,310			**111,997**

4.1.1.3 Midwest Generation

Midwest Generation operates 19 coal-fired EGUs at six separate locations in Illinois. Nine of these units, located at the Powerton, Joliet, and Will County, are subject to BART.

Powerton

All four units at the Powerton station are subject to BART. All four units are cyclone type boilers firing sub-bituminous coal, and vent to a common stack. Current NO_x control for all units consists of low NO_x burners and over-fire air. SCR control will be in place for all units in 2011. The operation of SCRs at Powerton will allow these units to meet presumptive BART of 0.10 lb/mmBTU for NO_x. Control for SO_2 currently consists of only the use of low sulfur coal. However, scrubber control is scheduled to be in place in 2012 for all four units, which will allow the units to meet presumptive BART for SO_2.

Joliet

Four of the five units (Units 71, 72, 81, and 82) at the Joliet facility are subject to BART. The four units of interest are all tangentially fired boilers burning sub-bituminous coal. Current NO_x controls for Boilers 71, 72, and 81 consist of low NO_x burners and over-fire air. NO_x control on Boiler 82 is over-fire air and gas reburn. No additional NO_x controls are planned at Joliet. Although it is unlikely that the four BART units at Joliet will meet the presumptive BART NOx emission limit of 0.15 lb/mmBTU, Midwest Generation will achieve greater NOx emission reductions system wide through implementation of the CPS than would be achieved under BART (see Table 4.6). For SO_2, Midwest Generation has committed to install scrubbers on all four BART units at Joliet by 2015, which will allow these units to meet the presumptive BART emission limits.

Will County

Of the four units at the Will County plant, only Unit 4 is subject to BART. Unit 4 is tangentially fired and burns sub-bituminous coal. NO_x emissions from Unit 4 are currently controlled by low NO_x burners and over-fire air. Midwest Generation will be installing an SNCR by 2011, which will meet the presumptive BART limit for NOx of 0.15 lb/mmBTU for this unit. For SO_2, Midwest Generation will be installing a scrubber by 2016, which will meet the presumptive BART emission limit for SO_2. Midwest Generation will also be replacing the existing electrostatic precipitator on Unit 4 with a fabric filter, which will reduce particulate emissions.

Under the CPS, Midwest Generation has committed to achieve NO_x and SO_2 emission rates of 0.11 lb/mmBTU, for both pollutants, on a system-wide basis. Tables 4.6 and 4.7 show that the CPS will lead to system wide reductions of more than 15,000 TPY of NO_x and more than 29,000 TPY of SO_2 beyond the reductions that would be achieved by meeting the presumptive BART emission levels at just the subject-to-BART units.

Table 4.6 NO_x Reductions from Midwest Generation - BART vs. CPS

		Base Year 2002			Presumptive BART			CPS		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Crawford	7	11,627	0.2	1,187	NA	NA	NA	0.11	639	547
Crawford	8	17,348	0.19	1,663	NA	NA	NA	0.11	954	709
Fisk	19	14,650	0.34	2,463	NA	NA	NA	0.11	806	1,657
Joliet 29	71	15,034	0.12	871	0.15	1,128	-256	0.11	827	44
Joliet 29	72	13,824	0.12	816	0.15	1,037	-220	0.11	760	56
Joliet 29	81	15,585	0.13	1,049	0.15	1,169	-120	0.11	857	192
Joliet 29	82	15,403	0.14	1,073	0.15	1,155	-82	0.11	847	226
Joliet 9	5	14,369	0.36	2,562	NA	NA	NA	0.11	790	1,772
Powerton	51	20,936	0.73	7,594	0.1	1,047	6,547	0.11	1,151	6,442
Powerton	52	21,137	0.73	7,695	0.1	1,057	6,638	0.11	1,163	6,532
Powerton	61	18,293	0.66	5,995	0.1	915	5,080	0.11	1,006	4,989
Powerton	62	18,088	0.66	5,936	0.1	904	5,032	0.11	995	4,941
Waukegan	17	7,502	0.63	2,365	NA	NA	NA	0.11	413	1,953
Waukegan	7	16,117	0.14	1,092	NA	NA	NA	0.11	886	206
Waukegan	8	21,950	0.14	1,488	NA	NA	NA	0.11	1,207	280
Will County	1	9,398	0.85	4,000	NA	NA	NA	0.11	517	3,483
Will County	2	8,293	0.8	3,310	NA	NA	NA	0.11	456	2,854
Will County	3	15,559	0.17	1,300	NA	NA	NA	0.11	856	444
Will County	4	27,585	0.15	2,009	0.15	2,069	-60	0.11	1,517	491
							22,558			**37,819**

Table 4.7 SO_2 Reductions from Midwest Generation - BART vs. CPS

		Base Year 2002			Presumptive BART			CPS		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Crawford	7	11,627	0.54	3,142	NA	NA	NA	0.11	639	2,503
Crawford	8	17,348	0.51	4,453	NA	NA	NA	0.11	954	3,499
Fisk	19	14,650	0.52	3,843	NA	NA	NA	0.11	806	3,037
Joliet 29	71	15,034	0.7	5,276	0.15	1,128	4,148	0.11	827	4,449
Joliet 29	72	13,824	0.7	4,828	0.15	1,037	3,791	0.11	760	4,068
Joliet 29	81	15,585	0.68	5,300	0.15	1,169	4,131	0.11	857	4,443
Joliet 29	82	15,403	0.68	5,260	0.15	1,155	4,105	0.11	847	4,413
Joliet 9	5	14,369	0.63	4,559	0.15	1,078	3,482	0.11	790	3,769
Powerton	51	20,936	0.42	4,444	NA	NA	NA	0.11	1,151	3,293
Powerton	52	21,137	0.43	4,497	0.15	1,585	2,912	0.11	1,163	3,334
Powerton	61	18,293	0.43	3,964	0.15	1,372	2,592	0.11	1,006	2,958
Powerton	62	18,088	0.43	3,909	0.15	1,357	2,552	0.11	995	2,914
Waukegan	17	7,502	0.44	1,642	NA	NA	NA	0.11	413	1,229
Waukegan	7	16,117	0.47	3,754	NA	NA	NA	0.11	886	2,868
Waukegan	8	21,950	0.49	5,385	NA	NA	NA	0.11	1,207	4,178
Will County	1	9,398	0.42	1,969	NA	NA	NA	0.11	517	1,452
Will County	2	8,293	0.39	1,617	NA	NA	NA	0.11	456	1,161
Will County	3	15,559	0.47	3,636	NA	NA	NA	0.11	856	2,780
Will County	4	27,585	0.47	6,462	0.15	2,069	4,393	0.11	1,517	4,945
							32,107			**61,292**

4.1.2 Other Illinois EGUs

The MPS and CPS requirements do not apply to Dominion Kincaid or to CWLP. The Illinois EPA has negotiated separate MOUs with these companies to address the BART requirements. The MOUs with Dominion Kincaid and CWLP are included in this document as Appendices D and E, respectively. Both plants have either installed controls or plan to install controls that will meet or exceed the presumptive BART limits. Unit specific requirements for these sources will be contained in federally enforceable permits. The individual BART-eligible units at each source are detailed below.

4.1.2.1 CWLP

The subject-to-BART units at CWLP are Dallman 31, Dallman 32, and Lakeside 8. CWLP has committed to shut down the Lakeside unit in 2009. The Dallman 31 and 32 units are cyclone boilers and burn bituminous coal. CWLP currently operates SCRs and scrubbers on both Dallman units. For NOx, the SCRs, when operated on an annual basis, will meet the presumptive BART control requirement for cyclone boilers. For SO_2, the scrubbers on the Dallman units will achieve greater than 95% emissions reductions, which will meet the presumptive BART requirement for boilers burning bituminous coal. Tables 4.8 and 4.9 demonstrate that CWLP will achieve emission reductions for NOx and SO_2, respectively, which meet or exceed the presumptive BART emission limits.

Table 4.8 NO_x Reductions from CWLP - BART vs. MOU

		Base Year 2002			Presumptive BART			MOU		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Dallman	31	4,528	1.1	2,484	0.125	283	2,201	0.11	249	2,235
Dallman	32	4,787	1.11	2,654	0.125	299	2,355	0.11	263	2,391
Lakeside	8	1,593	0.94	749	0.125	100	649	0	0	749
							5,205			**5,375**

Table 4.9 SO_2 Reductions from CWLP - BART vs. MOU

		Base Year 2002			Presumptive BART			MOU		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Dallman	31	4,528	0.33	753	0.29	657	96	0.23	521	232
Dallman	32	4,787	0.35	835	0.29	694	141	0.23	551	284
Lakeside	8	1,593	5.47	4,358	0.29	231	4,127	0	0	4,358
							4,364			**4,875**

4.1.2.2 Dominion - Kincaid

Both boilers at Dominion Kincaid are subject to BART. The two boilers are cyclones and both burn sub-bituminous coal. Dominion Kincaid currently operates SCRs on both units to control NOx emissions, which, when operated on an annual basis, will meet the presumptive BART control requirement for cyclone boilers. There are currently no controls in place to reduce emissions of SO_2. The MOU between Dominion Kincaid and the Illinois EPA requires that SO_2 emissions be reduced from the current rate of 0.46 lbs/mmBTU to a rate of 0.20 lbs/mmBTU by January 1, 2014, and to 0.18 lbs/mmBTU by January 1, 2017. This emission rate will not meet the presumptive BART emission limit of 0.15 lb/mmBTU. To address this, Dominion conducted a site-specific BART analysis for the Kincaid plant, which includes a control technology review and CALPUFF modeling to assess the visibility impacts of several control alternatives. Dominion's site specific analysis for the Kincaid plant is included as Appendix F. Based on this analysis, Dominion proposed alternative control levels for NOx and SO_2, consistent with USEPA's BART Guidelines. Dominion's alternative control plan, which is incorporated in the MOU between Dominion and the Illinois EPA, will require the two subject-to-BART units at Kincaid to meet a NOx emission rate of 0.07 lbs/mmBTU on a year-round basis beginning March 1, 2013. This emission limit will significantly reduce NOx emissions below the level that would be achieved from just meeting the presumptive BART control requirement. Dominion analysis demonstrates that the proposed alternative control plan will result in the same or greater visibility improvements than would be expected from implementation of controls that just met the presumptive BART emission limits, at a much lower cost to the company.

Table 4.10 and 4.11 compare the emission reductions expected from Dominion Kincaid's alternate control plan and the emission reductions that would occur from compliance with the presumptive BART emission limits for NOx and SO_2, respectively. As shown in the tables, expected NOx emission reductions from Dominion Kincaid's alternate control plan exceed the reductions that would occur from implementation of BART by about 1,700 TPY. Meeting the presumptive BART SO_2 emission limits at Kincaid would achieve about 1,000 TPY greater SO2 emission reductions relative to the alternative control plan. Since Dominion has adequately demonstrated that the proposed alternative control plan will result in the same or greater

visibility improvement, at much lower costs, the Illinois EPA has agreed that the alternative control plan proposed by Dominion meets the BART requirement for the Kincaid facility.

Table 4.10 NO_x Reductions from Dominion - BART vs. MOU

		Base Year 2002			Presumptive BART			MOU		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Kincaid	1	32,265	0.64	10,300	0.125	2,016	8,284	0.07	1,129	9,171
Kincaid	2	32,238	0.66	10,605	0.125	2,015	8,590	0.07	1,128	9,476
							16,874			**18,648**

Table 4.11 SO_2 Reductions from Dominion - BART vs. MOU

		Base Year 2002			Presumptive BART			MOU		
Plant	Unit	1000 mmBTU	Lbs/ mmBTU	Tons	Lbs/mmBTU	Tons	Tons/Year Reduction	Lbs/mmBTU	Tons	Tons/Year Reduction
Kincaid	1	32,265	0.55	8,891	0.15	2,420	6,471	0.18	2,904	5,987
Kincaid	2	32,238	0.54	8,774	0.15	2,418	6,356	0.18	2,901	5,873
							12,827			**11,860**

4.2 BART Controls for Non-EGUs

The two non-utility sources that have emission units that are subject to BART are both petroleum refineries located in the Chicago area. These sources are the CITGO refinery at Lemont and the ExxonMobil refinery at Joliet. Both refineries have been the subject of litigation by USEPA that has resulted in legal settlements as set forth in consent decrees. The consent decrees establish federally enforceable emission limits for these sources that have resulted, or will result, in significant reductions in SO_2 and NO_x emissions. The Illinois EPA considers the requirements of these consent decrees to be sufficient to meet the requirements for BART. The consent decrees for ExxonMobil and CITGO are included in this document as Appendices G and H, respectively. The following subsections describe the requirements established by the consent decrees for these sources.

4.2.1 CITGO

The burners and heaters that are subject to BART are required by the consent decree to burn fuel gas having no more than 0.1 grams per dry standard cubic foot of hydrogen sulfide, consistent with NSPS Subpart J limits. (40 CFR 60.100) The FCCU has an SCR/wet gas scrubber system that began operation early in 2008. The FCCU controls will reduce SO_2 by more than 85% and NO_x by more than 95%. In 2008, a tail gas recovery unit was installed to control SO_2 emissions from the 119A and 119B sulfur trains. Units 119C and 119D had previously been controlled. These controls have reduced SO_2 from each train by about 98%, reducing the emissions to below the NSPS Subpart J limit of 250 parts per million of volume ("ppmv") of SO_2. Tables 4.12 and 4.13 compare expected emissions for NOx and SO2, respectively, from the application of controls on units that are subject-to-BART, and on units affected by the consent decree. On a source-wide basis, the consent decree will decrease NO_x emissions by about 120 TPY more compared to the reductions achievable with BART. The SO_2 reductions via the consent decree will be almost 400 TPY more than would be achievable with the application of BART controls. Although BART-level controls are not required on all emission units subject to BART, the source will achieve greater emissions reductions through compliance with the consent decree than would be achieved if controls were applied to just the units subject to BART.

4.2.2 ExxonMobil

As with CITGO, the combustion units at ExxonMobil are required to fire fuel gas that complies with NSPS Subpart J. The FCCU and the south sulfur recovery unit are the largest remaining emission units that are subject to BART. The FCCU is controlled by a wet gas scrubber installed in 2008. ExxonMobil is required under the consent decree to install and operate an SCR to control NO_x emissions from the FCCU by 2012. The south sulfur recovery unit now operates with a tail gas recovery unit installed in 2008, which reduces emissions of SO_2 to below the NSPS Subpart J limit of 250 ppmv of SO_2. This unit is not significant for NOx. The consent decree will ensure that the subject-to-BART sources will meet BART for both NO_x and SO_2. In addition, these controls will remove nearly 60 additional TPY of NO_x and 400 TPY of SO_2 from the source. A detailed listing of subject-to-BART units at ExxonMobil and their emissions under the consent decree and BART emission levels is shown in Tables 4.14 and 4.15.

Table 4.12 NO_x Reductions from CITGO - BART vs. Consent Decree

		2002 Base	Presumptive BART		Consent Decree 2013	
Point	Unit #	Tons	Tons	Tons/Year Reduction	Tons	Tons/Year Reduction
3	ATMOSPHERIC HEATER 111B-1A	92.84	92.84	0	92.84	0
4	ATMOSPHERIC HEATER 111B-1B	122.98	122.98	0	56.16	66.82
5	CRUDE VACUUM HEATER 111B-2	9.36	9.36	0	9.36	0
7	FCCU CATALYST REGENERATION 112D-1	1007.61	98.83	908.78	98.83	908.78
11	COKER CHARGE HEATER 113B-1	12.74	12.74	0	12.74	0
12	113B-3: Coker 1 charge heater	6.14	NA	NA	2.46	3.69
19	CHARGE HEATER & STABILIZER REBOILER 116B-1	107.67	107.67	0	107.67	0
21	HOT OIL HEATER 118B-1	10.36	10.36	0	10.36	0
27	123B-1: Feed preheater	3.27	NA	NA	1.31	1.96
31	FEED HEATER 125B-1	6.45	6.45	0	6.45	0
37	AUXILIARY BOILER 430B-1	167.11	10.03	157.08	10.03	157.08
38	BOILER #19	44.57	NA	NA	17.83	26.74
50	109B-62: Steam HC reformer heater	12.44	NA	NA	4.98	7.47
64	COKER CHARGE HEATER 113B-2	12.44	12.79	-0.35	12.44	0
66	INTERHEATER & NAPTHA STRIPPER REBOILER 116B-2	58.75	58.75	0	58.75	0
70	123B-2: Feed preheater	3.96	NA	NA	1.58	2.38
71	123B-3: Reheat furnace	7.2	NA	NA	2.88	4.32
73	123B-5: Reheat furnace	18.21	NA	NA	7.28	10.93
74	STRIPPER REBOILER 125B-2	18.21	5.45	12.76	18.21	0
194	112B-1: FCC air heater	6.2	NA	NA	2.48	3.72
215	CLAUS SULFUR RECOVERY UNITS 119A & B	5.45	6.4	-0.95	5.45	0
216	CLAUS SULFUR RECOVERY UNITS 121C & D	6.2	6.2	0	6.2	0
				1077.32		1193.89

Table 4.13 SO_2 Reductions from CITGO - BART vs. Consent Decree

		2002 Base	Presumptive BART		Consent Decree 2013	
Point	Unit #	Tons	Tons	Tons/Year Reduction	Tons	Tons/Year Reduction
3	ATMOSPHERIC HEATER 111B-1A	2.44	2.44	0	2.44	0
4	ATMOSPHERIC HEATER 111B-1B	0.27	0.265	0	0.27	0
5	CRUDE VACUUM HEATER 111B-2	1.63	1.63	0	1.63	0
7	FCCU CATALYST REGENERATION 112D-1	10384.10	519.21	9864.9	207.68	10176.42
11	COKER CHARGE HEATER 113B-1	2.10	2.1	0	2.1	0
12	113B-3: Coker 1 charge heater	2.77	NA	NA	1.11	1.66
19	CHARGE HEATER & STABILIZER REBOILER 116B-1	1.14	1.14	0	1.14	0
21	HOT OIL HEATER 118B-1	0.27	0.27	0	0.27	0
27	123B-1: Feed preheater	0.62	NA	NA	0.25	0.37
31	FEED HEATER 125B-1	1.14	1.14	0	1.14	0
37	AUXILIARY BOILER 430B-1	1.47	1.47	0	1.47	0
38	BOILER #19	1.93	NA	NA	0	1.93
50	109B-62: Steam HC reformer heater	0.62	NA	NA	0.25	0.37
64	COKER CHARGE HEATER 113B-2	0.56	0.56	0	0.56	0
66	INTERHEATER & NAPTHA STRIPPER REBOILER 116B-2	0.63	0.63	0	0.63	0
70	123B-2: Feed preheater	3.71	NA	NA	1.48	2.22
71	123B-3: Reheat furnace	0.95	NA	NA	0.38	0.57
73	123B-5: Reheat furnace	0.86	NA	NA	0.34	0.52
74	STRIPPER REBOILER 125B-2	1.05	1.05	0	1.05	0
194	112B-1: FCC air heater	0.00	NA	NA	0	0
215	CLAUS SULFUR RECOVERY UNITS 119A & B	2475.21	123.76	2351.45	49.5	2425.71
216	CLAUS SULFUR RECOVERY UNITS 121C & D	0.45	0.02	0.43	0.45	0
				12216.78		12609.77

Table 4.14 NO_X Reductions from ExxonMobil - BART vs. Consent Decree

		2002 Base	Presumptive BART		Consent Decree 2013	
Point	Unit #	Tons	Tons	Tons/Year Reduction	Tons	Tons/Year Reduction
2	AUX BOILER	19.61	19.61	0	19.61	0
4	REFINERY WASTE GAS BLOWDOWN SYSTEM AND 2 FLARES	810.3	810.3	0	810.3	0
12	SAT GAS LEAN OIL REBOILER	24.4	24.4	0	24.4	0
13	SULFUR TRAINS INCLUDING SULFUR PIT AND LOADING RACK	12.49	12.49	0	12.49	0
15	FLUID CATALYTIC CRACKING UNIT	1818.02	334.33	1483.69	334.33	1483.69
18	CRUDE UNIT HEATERS (#1B1A AND #1B1B)	288.72	288.72	0	288.72	0
19	CRUDE UNIT VACUUM HEATER	114.61	114.61	0	114.61	0
21	COKER CHARGE HEATERS (EAST AND WEST)	133.78	133.78	0	133.78	0
25	REFORMER CHARGE HEATERS (2B3, 2B4, 2B5, AND 2B6)	124.62	124.62	0	124.62	0
26	PT REFORMATE DEBUT REBOILER 2B7	23.07	23.07	0	23.07	0
27	PRETREAT REACTOR CHARGE HEATER 17-B-1	23.07	23.07	0	23.07	0
28	PRETREAT DEBUT REBOIL 17-B-2	32.91	32.91	0	32.91	0
33	CHD REACT CHARGE HEATER 3B1	35.87	35.87	0	35.87	0
34	CHD STRIP REBOILER 3B2	41.72	41.72	0	41.72	0
37	CHD REACTOR REGENERATION, 40 HR TWICE/YR M AND B	36.63	36.63	0	14.65	21.98
38	ALKY ISOSTRIP REBOILER HEATER 7B1	36.63	36.63	0	14.65	21.98
38	ALKY ISOSTRIP REBOILER HEATER 7B1	23.94	23.94	0	9.58	14.36
90	CCR REGENERATOR	0.41	0.5	-0.09	0.41	0
113	CRUDE UNIT FEED PREHEATER 1-B3/13-B-4	31.27	31.27	0	31.27	0
				1483.6		1542.01

Table 4.15 SO_2 Reductions from ExxonMobil - BART vs. Consent Decree

		2002 Base	Presumptive BART		Consent Decree 2013	
Point	Unit #	Tons	Tons	Tons/Year Reduction	Tons	Tons/Year Reduction
2	AUX BOILER	0.89	0.89	0	0.89	0
4	REFINERY WASTE GAS BLOWDOWN SYSTEM AND 2 FLARES	1156.32	1156.32	0	1156.32	0
12	SAT GAS LEAN OIL REBOILER	1.42	1.42	0	1.42	0
13	SULFUR TRAINS INCLUDING SULFUR PIT AND LOADING RACK	9340.6	467	8873.6	186.81	9153.79
15	FLUID CATALYTIC CRACKING UNIT	9865	493	9372	197.3	9667.7
18	CRUDE UNIT HEATERS (#1B1A AND #1B1B)	14.84	14.84	0	14.84	0
19	CRUDE UNIT VACUUM HEATER	4.36	4.36	0	4.36	0
21	COKER CHARGE HEATERS (EAST AND WEST)	8.9	8.9	0	8.9	0
25	REFORMER CHARGE HEATERS (2B3, 2B4, 2B5, AND 2B6)	10.8	10.8	0	10.8	0
26	PT REFORMATE DEBUT REBOILER 2B7	1.16	1.16	0	1.16	0
27	PRETREAT REACTOR CHARGE HEATER 17-B-1	0.089	0.089	0	0.09	0
28	PRETREAT DEBUT REBOIL 17-B-2	1.67	1.67	0	1.67	0
33	CHD REACT CHARGE HEATER 3B1	1.36	1.36	0	1.36	0
34	CHD STRIP REBOILER 3B2	2.14	2.14	0	2.14	0
37	CHD REACTOR REGENERATION, 40 HR TWICE/YR M AND B	0	0	0	0	0
38	ALKY ISOSTRIP REBOILER HEATER 7B1	1.89	1.89	0	1.89	0
38	ALKY ISOSTRIP REBOILER HEATER 7B1	0	0	0	0	0
90	CCR REGENERATOR	4.92	4.92	0	4.92	0
113	CRUDE UNIT FEED PREHEATER 1-B3/13-B-4	1.84	1.84	0	1.84	0
				18245.6		18821.49

5.0 Summary

USEPA has determined that, as part of a strategy to reduce pollutants found to negatively impact visibility in national parks and wilderness areas in the United States, certain stationary emission sources should be subject to a Best Available Retrofit Technology ("BART") standard. The sources subject to a BART standard, according to "Guidelines for BART Determinations under the Regional Haze Rule" published by USEPA in July of 2005, must be one of 26 specified source categories; were in existence in August 1977; began operating after August 1962; and have the potential to emit 250 tons per year or more of any air pollutant.

USEPA's Regional Haze Rule requires consultation between the states, tribes, and Federal Land Managers ("FLMs") responsible for managing Class I areas. This multi-state and multi-agency consultation process has been facilitated by Regional Planning Organizations ("RPOs") established specifically for this purpose. Illinois fully participated in the planning and technical development efforts of the Midwest Regional Planning Organization ("MRPO"), which also includes the States of Indiana, Michigan, Ohio, and Wisconsin. States in other parts of the country participated in similar RPOs. Illinois has also participated in consultations with other RPO's and states that have requested Illinois' participation in their planning process.

The Illinois EPA, in conjunction with the MRPO, has made adequate plans to meet the requirements of the Regional Haze Rule by performing the necessary modeling to determine its impact on visibility in Class I areas. The modeling approach used by the Illinois EPA to address BART was developed in consultation with the MRPO, the other participating MRPO states, the USEPA, and participating FLMs.

The purpose of this document is to describe Illinois' approach for meeting the BART requirements for emission sources in Illinois that have been shown to be BART-eligible. Technical analyses conducted by the Illinois EPA have shown that certain BART-eligible sources in Illinois are causing or contributing to visibility impairment in several Class I areas in the eastern United States, including Mammoth Cave National Park in Kentucky, the Mingo Wilderness Area in Missouri, and Isle Royale National Park in Michigan. Illinois is therefore

required to submit revisions to its SIP to require that subject emission sources install cost effective retrofit control technologies, or provide equivalent emission reductions.

Illinois has promulgated emission control requirements for most of the emission units in Illinois that are subject to BART that provide greater emission reductions, and greater environmental benefits, than would be provided by implementation of BART. Other emission units are subject to provisions contained in federally enforceable consent decrees which again provide greater emission reductions than would be achieved by BART. The remaining emission units in Illinois that are subject to BART have committed to meet the BART requirements, as formalized in Memoranda of Understanding between the affected sources and the Illinois EPA. All of these provisions and agreements require significant emission reductions that the Illinois EPA considers to be better than the BART requirements contained in the Regional Haze Rule, and all requirements will be contained in federally enforceable permits.

Illinois EPA has attempted in this document and its appendices to provide a complete record of the efforts made by it and by other entities on its behalf in order to: determine the Illinois sources that are subject to the BART requirements; detail the current emission controls and planned controls for those sources; and compare the current and planned controls and emission rates at affected sources to those required by the BART Guidelines.

References

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2. **Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations; Final Rule, 70 Fed. Reg. 39104-39172, (July 6, 2005).**

3. **Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts, USEPA, EPA-454/R-98-019, December 1998.**

4. **National Park Service Class I Area Receptor Index is a database that can be accessed online at: http://www.nature.nps.gov/air/Maps/Receptors/index.cfm**

5. **Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Program, USEPA, EPA-404/B-03-005, September 2003.**

6. **Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase I Report, U.S. Forest Service -- Air Quality Program, National Park Service -- Air Resources Division, U.S. Fish and Wildlife Service – Air Quality Branch, December 2000.**

7. **Scire, J.S., D.G. Strimaitis, R.J. Yamartino, 2000a. A User's Guide for the CALPUFF Dispersion Model (Version 5). Earth Tech, Inc., Concord, MA http://src.com/calpuff/calpuff1.htm**

8. **Scire, J.S., F.R. Robe, M.E. Fernau, and R.J. Yamartino, 2000b: A User's Guide for the CALMET Meteorological Model (Version 5). Earth Tech, Inc., Concord, MA**