

8-Hour Ozone

Modeling Analyses Summary

for Southern Indiana/Louisville Kentucky

Introduction

Various modeling has been conducted to determine the impacts from federal emission control measures in the Eastern and Central United States. Included in this modeling is the US EPA's "Technical Support Document for Heavy Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements: Air Quality Modeling Analyses", EPA-420-R-00-028, December 2000, and the LADCO White Paper, Attainment of the 8-Hour Ozone Standard in the Lake Michigan Area", May 2, 2001. Results from these modeling analyses demonstrate that the Southern Indiana/Louisville, KY area will attain the National Ambient Air Quality Standard (NAAQS) for 8-hour ozone with modeled concentrations below 85 parts per billion (ppb).

One method to determine the impact of emission control measures is to model a basecase year with emissions based on emission statements and other real-world information, then model a future year with projected emission growth and taking federal emission control measures into account. Relative reduction factors (RRF) are used to determine future year design values for each monitor. This approach is consistent with U.S. EPA's draft guidance for attainment demonstrations for National Ambient Air Quality Standards (NAAQS) for 8-hour ozone where RRFs or ratios of maximum predicted concentrations for future year emissions to the maximum predicted concentrations for current year can be used to determine the future year design values.

US EPA Heavy Duty Engines and Fuel Standards, 2000 (EPA420-R-00-028)

This document described the procedures and results of the air quality modeling analyses used to support the Heavy Duty Engine and Vehicle Standards and Highway Diesel Fuel (HDE) final rulemaking. The air quality modeling was conducted to support several components of the rulemaking. Included in this document were assessments of the impact of the new standards on existing monitoring locations in the eastern United States. Among these were seven monitors located in Southern Indiana/Louisville area. Table 1 shows a spreadsheet of relative reduction factors for the seven monitoring sites. The column of interest is the "RRF 2007 Base." The 2007 Base scenario contains controls "on the books" for that year, such as the NOx SIP Call, and calculates the RRF from implementation of these programs.

Table 1
8-Hour Relative Reduction Factors

Site Id.	State	County	Area name	RRF 2007 Base	RRF 2020 Base	RRF 2020 Control	RRF 2030 Base	RRF 2030 Control
180190005	IN	CLARK CO	NEW ALBANY, IN	0.8857	0.8729	0.8538	0.8892	0.8638
180431004	IN	JEFFERSON CO	CHARLESTOWN, IN	0.8914	0.8859	0.8731	0.9022	0.8858
210290006	KY	BULLITT CO	LOUISVILLE, KY	0.8603	0.8479	0.8287	0.8632	0.8365
211110027	KY	JEFFERSON CO	LOUISVILLE, KY	0.8918	0.8929	0.8832	0.9105	0.8979
211110051	KY	JEFFERSON CO	LOUISVILLE, KY	0.8929	0.8866	0.8713	0.9024	0.8812
211111021	KY	JEFFERSON CO	LOUISVILLE, KY	0.8946	0.8846	0.8703	0.9019	0.8833
211850004	KY	OLDHAM CO	LOUISVILLE, KY	0.8678	0.8494	0.8296	0.8658	0.8384

Design values for each monitor for the 3-year period of 2001 through 2003 are listed below with the respective relative reduction factor (RRF) from each modeling scenario applied.

**Table 2
Future Design Values**

Site Id.	State	County	2001-2003 Design Value	RRF 2007 Base	RRF 2020 Base	RRF 2020 Control	RRF 2030 Base	RRF 2030 Control
180190005	IN	CLARK CO	92	82	80	79	82	80
180431004	IN	JEFFERSON CO	86	77	76	75	78	76
210290006	KY	BULLITT CO	82	71	70	68	71	69
211110027	KY	JEFFERSON CO	79	71	71	70	72	71
211110051	KY	JEFFERSON CO	84	75	75	73	76	74
211111021	KY	JEFFERSON CO	79	71	70	69	71	70
211850004	KY	OLDHAM CO	86	75	73	71	75	72

LADCO White Paper on Attainment of the 8-Hour Ozone Standard for Lake Michigan Area, 2002

The purpose of this report was to begin to assess what it will take to attain the new 8-hour standard in the Lake Michigan area. It took modeling which was performed to support the 1-hour attainment demonstration for the Lake Michigan area, and applied 8-hour metrics. This modeling was conducted for the future year of 2007, the attainment year for the Chicago-Gary-Milwaukee non-attainment area. It included a total of four episodes, two of which were also used by US EPA in their HDE modeling. The control scenario used for the Lake Michigan Air Directors Consortium (LADCO) modeling also included all known controls to be effective in 2007. Since this modeling was performed before the Heavy Duty Engine rule was proposed, it is similar to the HDE 2007 Base run. The modeling results, performed to conform to US EPA's "Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS", May 1999, modeled a base design value for the Southern Indiana/Louisville area between 86 and 93 ppb. From those base design values, the future design values for each monitor under federally mandated emission control scenarios are determined.

The different federally mandated emission control scenarios include NO_x and VOC controls associated with Clean Air Act amendments, Tier II/Low Sulfur Rule and Nitrogen Oxide State Implementation Plan (SIP) Call. These emission control rules focus on projected emission reductions at companies, mobile sources and utilities. In addition, projected emission growth of mobile and industrial sources in the future year are estimated and modeled.

Table 3 shows the future design values for each monitor as a result of modeling each phase of federal emission reductions. As can be seen, all monitors will have modeled future design values below the standard by implementing the Clean Air Act controls, Tier II/Low Sulfur Rules and Nitrogen Oxides SIP Call.

**Table 3
Future Year Design Values**

Site Id.	State	County	Area name	Base	Clean Air Act (CAA) Controls	CAA and Tier II	CAA/ Tier II/ NOX SIP	CAA/ Tier II/ NOX SIP/ States
180190005	IN	CLARK CO	NEW ALBANY, IN	93	89	87	84	79
180431004	IN	JEFFERSON CO	CHARLESTOWN, IN	91	89	87	84	78
210290006	KY	BULLITT CO	LOUISVILLE, KY	86	80	78	75	71
211110027	KY	JEFFERSON CO	LOUISVILLE, KY	91	87	86	84	78
211110051	KY	JEFFERSON CO	LOUISVILLE, KY	88	87	84	82	76
211111021	KY	JEFFERSON CO	LOUISVILLE, KY	90	86	84	82	76
211850004	KY	OLDHAM CO	LOUISVILLE, KY	89	85	81	79	75

Clean Air Rules of 2004 (Interstate Air Quality Rule)

U.S. EPA has proposed significant NOx and SO2 emission reductions for power plants that will help reduce ozone and fine particles by the year 2015. Modeling was done to demonstrate what impact the proposed emission reductions would have on 29 states in the eastern United States and the District of Columbia. While final modeling has not been conducted, preliminary results show that impacts in the Southern Indiana/Louisville area from this rule will be 1 to 2 ppb. For more information concerning the Clean Air Rules of 2004, please refer to U.S. EPA's website at <http://www.epa.gov/cleanair2004/>

Summary

Various modeling analyses have been conducted by U.S. EPA as well as regional planning organizations (RPOs) throughout the United States, including LADCO that attempt to determine the impact of national emission control measures on ozone concentrations throughout the country. The results of the modeling analyses show that ozone concentrations decrease in the Southern Indiana/Louisville area to attainment status or 8-hour ozone concentrations below 85 parts per billion. While the results should not discourage areas from looking for ways to reduce pollution locally, federal measures currently implemented or are scheduled to be implemented in the next 5 to 6 years will greatly benefit air quality throughout the eastern United States, including the Southern Indiana/Louisville area.