Base K/Round 4 Strategy Modeling: Emissions

The purpose of this document is to summarize the emission estimates prepared for the latest 2002 base year (Base K) and 2008, 2009, 2012, and 2018 future year (Round 4) modeling. A list of the Round 4 modeling scenarios is provided in Table 1[1]. Sector-level emissions are presented in Figure 1 and Table 2. (For comparison, the sector-level emissions from Round 3 are presented in Figure 2.)

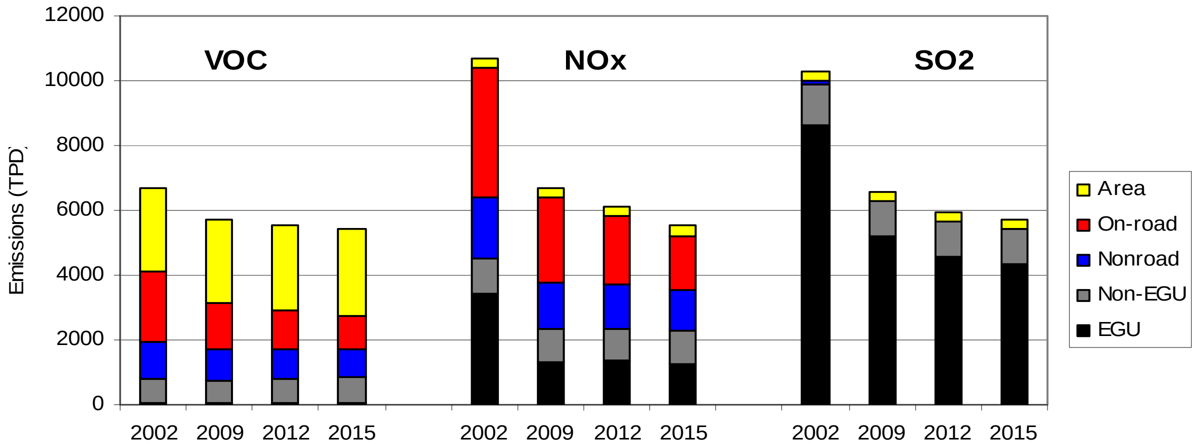


Figure 1. Round 4 Emissions Summary for 5-State LADCO Region (TPD, July weekday)

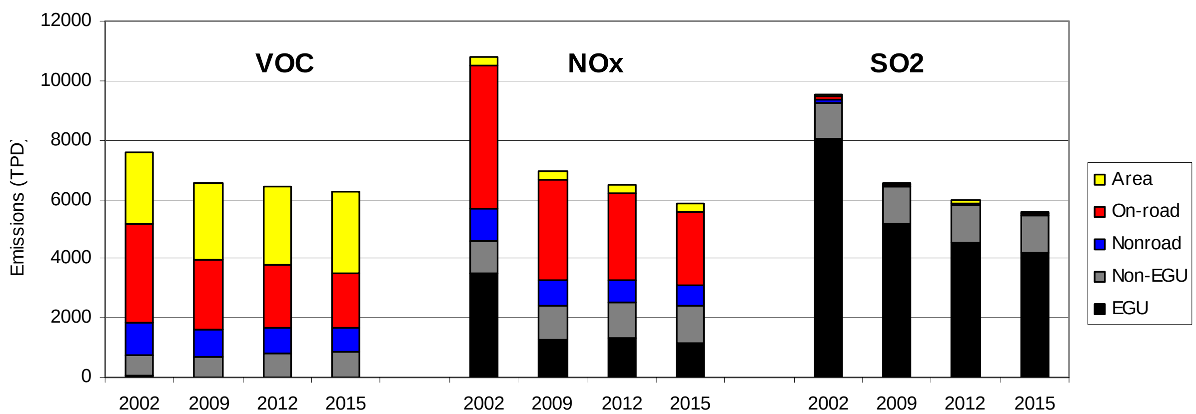


Figure 2. Round 3 Emissions Summary for 5-State LADCO Region (TPD, July weekday)

Base Year Emissions

Updates to the 2002 base year emissions compared to Base J include:

- Revised motor vehicle emissions: The new emission estimates are about 40% lower for VOC and 25% for NOx. This change is due to a correction in the calculation of motor vehicle emissions by EMS. (Previously, EMS was averaging the 25 different vehicle age emission rates in the database output, instead of doing a weighted-average based on mileage accumulation.) EMS was run to generate 36 days (weekday, Saturday, Sunday for each month) at 36 km, and 12 days (weekday, Saturday, Sunday for June – August) at 12 km.

1 Two additional scenarios were included late in the Round 4 modeling: Scenario 4-reflects control measures under discussion by the MW and NE State Commissioners, and Scenario 5-reflects a control option developed by LADCO Project Team.

- Revised ammonia temporal profile: New temporal profiles were derived by several test runs of the new process based ammonia model. The previous profile was based on Pinder's process based model for dairy farms. The new profile reflects hogs, beef, and dairy. (We used hog farms to define poultry because the process based model does not have a fully functional poultry housing model.) It is probably most critical to see what happens during the colder months, because those are the months where we are generally ammonia limited (see Figure 3). One other change to the ammonia inventory was to remove the point source ammonia emissions from other RPO's inventories, because confined animal operations were included in the point source inventory for some states, which led to double-counting of emissions.

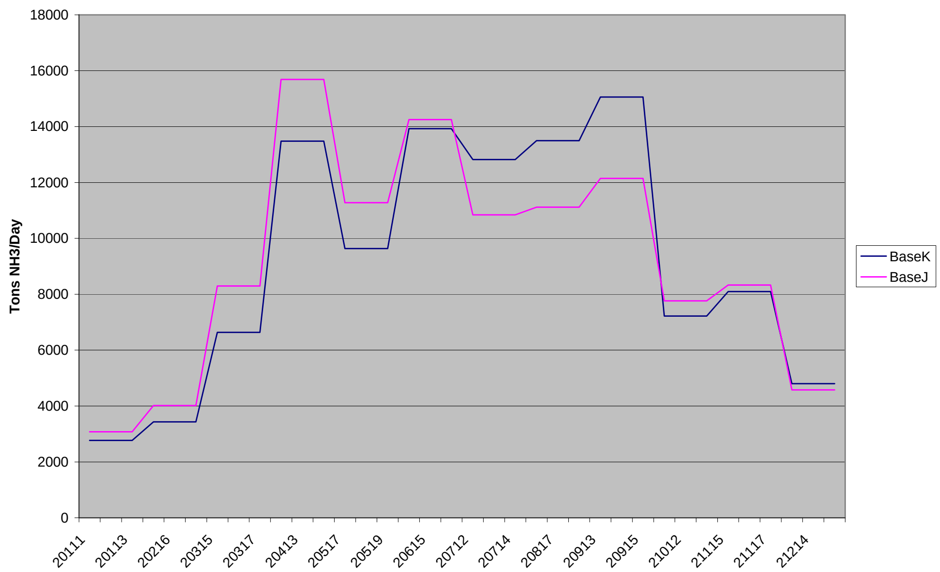


Figure 3. Base J v. Base K Regional Ammonia Emissions by Month

- Revised EGU temporal profile: Continuous emissions monitoring (CEM) data were processed to produce temporal profiles for EGUs which account for month of year, and day of week variations. Unit-specific profiles were developed. (Note, a contractor previously developed a limited number CEM-based temporal profiles, which were assigned to groups of EGUs, but these profiles became obsolete when the source ID numbers changed with the latest IPM modeling. For Base J, national default profiles were assumed.)

- New Canadian emissions: An updated inventory of Canadian stationary and mobile sources for 2000 was provided by Environment Canada. The new inventory reflects significantly lower emissions.

- Improved nonroad emissions: Two changes were made to the nonroad inventory: (1) commercial marine, airports, and railroads were included (note: these categories, which are not part of the NONROAD2004 model, were not included in Base J), and (2) NMIM (with NONROAD2004) was rerun with fuel parameter inputs consistent with the on-road emissions modeling (note – these emission estimates still do not include permeation effects).

- Point sources: All co-generation sources are now included in the EGU file. (Previously, some co-generation sources were in the EGU file and some in the non-EGU.) In addition, stack exit parameters were corrected for Ohio point sources.

Future Year Emissions

Four future year inventories were developed: 2008, 2009, 2012, and 2018. The emissions for 2009, 2012, and 2018 were derived by running the emissions model for each source sector for each year. For 2008, emissions were derived from interpolating between 2002 and 2009 for all sectors, except EGUs. For 2008 summer ozone modeling, the 2008 EGU emissions were processed based on the IPM modeling.

Scenario 1: This scenario represents the future year “base” inventory (i.e., growth to the future year of interest and application of existing [“on the books”] controls). The following controls were included in this scenario:

On-Highway Mobile Sources

- Tier II/Low sulfur fuel
- Inspection/Maintenance programs (nonattainment areas)
- Reformulated gasoline (nonattainment areas)

Off-Highway Mobile Sources

- Federal control programs incorporated into NONROAD model (e.g., nonroad diesel rule), plus the evaporative Large Spark Ignition and Recreational Vehicle standards
- Heavy-duty diesel (2007) engine standard/Low sulfur fuel
- Federal railroad/locomotive standards
- Federal commercial marine vessel engine standards

Power Plants

- Title IV (Phases I and II)
- NOx SIP Call
- Clean Air Interstate Rule
- Clean Air Mercury Rule

Other Point Sources

- VOC 2-, 4-, 7-, and 10-year MACT standards
- Combustion turbine MACT
- Industrial boiler/process heater/RICE MACT

Updates to the future year “base” emissions compared to Base J include:

- Updated growth factors for several area and point source categories (see “Development of Updated Growth and Control Factors for Lake Michigan Air Directors Consortium”, Draft Report, December 29, 2005, E.H. Pechan)

- Updated control factors for several area and point source categories (see “Development of Updated Growth and Control Factors for Lake Michigan Air Directors Consortium?, Draft Report, December 29, 2005, E.H. Pechan; and “Documentation for MACTEC NonEGU “On-the-Books” Control Factor File”, January 10, 2006, MACTEC). The changes include settlement agreement for petroleum refineries, and other non-EGU sources in the LADCO region.

- CAIR scenarios
  - 1a: "VISATASII_PC_1f" reflects the IPM scenario which assumed full trading and banking. The results of this IPM run were delivered in July 2005, and were used in Round 3.
  - 1b: "VISTASII_PC_3b" reflects the IPM scenario which assumed the CAIR state-specific emission budgets as an environmental constraint, but allowed banking. The results of this restricted trading IPM run were delivered in December 2005.
  - 1c: This scenario is the same as 1a, with the addition of BART reductions for non-EGU sources. The determination of sources subject to BART is based on the latest Midwest RPO analyses.
  - 1d: This scenario is based on 1a, but scales-back the emissions in each state to match the CAIR state-specific emission budgets (i.e., removes any excess introduced by banking).

- Inclusion of a pollution control retrofits at a few facilities (note: this information was not available at the time the IPM full trading was conducted in summer 2005)
  - MI – Monroe: SO2 emissions from Units 3-4 reduced by 97% (based on November 9 letter from Skiles Boyd, DTE-Energy)
  - MI – Campbell: NOx emissions from Units 2-3 reduced by 90% (based on information supplied by Louis Pocalujka, Consumers Energy)
  - IN – Gibson: SO2 emissions from Units 1-3 reduced by 95% (based on information supplied by Dan Weiss, Cinergy)
  - IN – Cayuga: SO2 emissions from Units 1-2 reduced by 95% (based on information supplied by Dan Weiss, Cinergy)

- Revised motor vehicle emissions: Unlike 2002, EMS was run for only a few days for 2009, 2012, and 2018. To provide emissions for all 36 days at 36 km, the 2002 emission files were scaled by the emission ratios for one day (i.e., September 13 for 2009, and August 16 for 2012). To provide emissions for all 12 days at 12 km, a similar approach was used, along with consideration of the spatially disaggregated 36 km derived emissions.

Scenario 2: This scenario reflects Scenario 1a plus the additional SO2 and NOx candidate control measures in the "Interim White Paper, Source Category: Electric Generating Units" (January 14, 2005):

2a reflects EGU2[2] for the top 30 EGUs in the 5-state region (based on Q/d)
2b reflects EGU2 for all EGUs within 100 km of a residual nonattainment area
2c reflects EGU2 throughout the 5-state LADCO region
2d reflects EGU2 throughout the 5-state LADCO region plus seven neighboring states: MN, IA, MO, KY, TN, WV, and PA
2e reflects EGU1 throughout the 5-state LADCO region
2f reflects EGU1 throughout the 5-state LADCO region based on recent IPM modeling
2g reflects EGU2 throughout the 5-state LADCO region based on recent IPM modeling

Further discussion of the modeling for these scenarios is provided in the Appendix.

---

2 EGU2 and EGU1 in Scenarios 2a – 2e were derived by applying control factors developed by MACTEC. The derivation of these control factors is explained in "Identification and Evaluation of Candidate Control Measures", prepared by MACTEC, Aprl 14, 2005.

Scenario 3: This scenario reflects Scenario 2 plus additional white paper controls for stationary and mobile sources

Scenario 3a reflects the minimum control level for the EGU, non-EGU point, and area source White Paper controls, plus chip reflashing for HDDVs and a "highly cost effective" voluntary/incentive control program for HDDVs and construction equipment (i.e., < $5,000/T)

EGU	EGU1 (Scenario 2e)
Non-EGU	ICI1 and GLASS1
Area	SOLV1A-7
On-Road	<u>Reflashing</u> – Base diesel NOx emissions derived by multiplying MOBILE6 emissions in 2002, 2009, 2012 by 1.04 to account for "true" compliance rates of chip reflashing (i.e., 10% in 2002, and 30% in 2009-2012 timeframe), based on MOBILE6 modeling by Chris Bovee, WDNR. (Note, MOBILE6 assumes a compliance rate of 90%.) Controlled diesel NOx emissions derived by multiplying MOBILE6 emissions by 1.01 in 2009 and 2012 to account for expected compliance rates of chip reflashing (i.e., 60-80%). <u>HDDV Voluntary Programs (Diesel Retrofits)</u> – Assume a reduction of 50 TPD (out of 850 TPD for Class 8 HDDV) – i.e., apply ratio of 0.94 to 2009 Class 8 HDDV inventory (or 0.95 to the entire on-road diesel inventory) <u>Low RVP Fuel</u> - Controlled emissions derived using adjustment factors developed by Environ (see Fuel Sensitivity Runs, March 7, 2005) for the following areas: Indianapolis: Boone, Hamilton, Hancock, Hendricks, Johnson, Madison, Marion, Morgan, and Shelby Detroit: Livingston, Macomb, Monroe, Oakland, St.Clair, Washtenaw, and Wayne Cleveland: Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit Cincinnati: Butler, Clermont, Hamilton, Warren, and Clinton Dayton: Clark, Greene, Miami, and Montgomery
Nonroad	<u>Construction Equipment Voluntary Programs (Diesel Retrofits)</u> – Assume a reduction of 45 TPD (out of 275 TPD) – i.e., apply ratio of 0.84 to diesel construction equipment

Scenario 3b reflects the maximum control level for the EGU, non-EGU point, and area source White Paper controls, plus chip reflashing for HDDVs and a "cost effective" voluntary/incentive control program for HDDVs, and construction and agricultural equipment (i.e., < $10,000/T)

EGU — EGU2 (Scenario 2c)

Non-EGU — ICI3, KILN1, GLASS2, and 25% NOx reduction for asphalt plants

Area — SOLV1B-4B 5A-7A

On-Road — Reflashing – Base diesel NOx emissions derived by multiplying MOBILE6 emissions in 2002, 2009, 2012 by 1.04 to account for "true" compliance rates of chip reflashing (i.e., 10% in 2002, and 30% in 2009-2012 timeframe), based on MOBILE6 modeling by Chris Bovee, WDNR. (Note, MOBILE6 assumes a compliance rate of 90%.)

Controlled diesel NOx emissions derived by multiplying MOBILE6 emissions by 1.01 in 2009 and 2012 to account for expected compliance rates of chip reflashing (i.e., 60-80%).

HDDV Voluntary Programs (Diesel Retrofits) – Assume a reduction of 100 TPD (out of 850 TPD for Class 8 HDDV) – i.e., apply ratio of 0.88 to 2009 Class 8 HDDV inventory (or 0.91 to the entire on-road diesel inventory)

Low RVP Fuel - Controlled emissions derived using adjustment factors developed by Environ (see Fuel Sensitivity Runs, March 7, 2005) for the following areas:

Indianapolis: Boone, Hamilton, Hancock, Hendricks, Johnson, Madison, Marion, Morgan, and Shelby
Detroit: Livingston, Macomb, Monroe, Oakland, St.Clair, Washtenaw, and Wayne
Cleveland: Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit
Cincinnati: Butler, Clermont, Hamilton, Warren, and Clinton
Dayton: Clark, Greene, Miami, and Montgomery

Nonroad — Construction Equipment Voluntary Programs (Diesel Retrofits) – Assume a reduction of 45 TPD (out of 275 TPD) – i.e., apply ratio of 0.84 to diesel construction equipment

Agricultural Equipment Voluntary Programs – Assume a reduction of 55 TPD (out of 255 TPD) – i.e., apply ratio of 0.78 to diesel agricultural equipment

Scenario 4: This scenario reflects Scenario 1a plus the additional control measures under discussion by the MW and NE State Commissioners:

Non-EGU	ICI1
Area	AIM, consumer products, and portable fuel containers
On-Road	Reflashing (see discussion under Scenario 3)

In addition, the Commissioners have discussed a voluntary retrofit program (although it is unclear whether the objective is to reduce NOx, VOC, and/or PM) and a regional gasoline. For the purposes of this model run, the Scenario 3a on-road and nonroad controls were assumed to reflect these possible other controls.

Scenario 5: This scenario reflects Scenario 1a plus the additional control measures identified by the LADCO Project Team as a possible control option:

EGU	EGU1 for SO2, EGU2 for NOx
Non-EGU	ICI1
Area	AIM, consumer products, and portable fuel containers
On-Road	Reflashing (see discussion under Scenario 3) HDDV voluntary programs (diesel retrofits) Low RVP fuel
Nonroad	Construction equipment voluntary programs (diesel retrofits)

In addition, the Project Team identified organic carbon control measures, case-by-case point source controls, and state programs (e.g., RACT rules). For the purposes of this model run, no emission reductions were assumed for these other controls due to the lack of specific control information.

May 16, 2006

Table 1. Round 4 Modeling Runs

Run		Description		2002	2008	2009	2012	2018
Base K		2002 baseyear emissions inventory		*36,12*				
Scenario 1		Existing (OTB) controls, plus CAIR						
		a. CAIR w/ full trading			*12*	*36,12*	*36,12*	*36*
		b. CAIR w/ restricted trading					*36,12*	
		c. CAIR w/ full trading and BART for non-EGUs						*36*
		d. EGU0 - CAIR w/ full trading scaled-back to state budgets				*36,12*	*36,12*	
Scenario 2		Scenario 1a plus EGU controls:						
		a. EGU2 for top 30 EGUs in 5-state region (based on Q/d)					*36,12*	
		b. EGU2 in 100 km radius of each residual NA area					*36,12*	
		c. EGU2 in 5-state region				*36,12*	*36,12*	*36*
		d. EGU2 in 12-state Midwest region					*36,12*	*36*
		e. EGU1 in 5-state region				*36,12*	*36,12*	
		f. EGU1-IPM in 5-state region						
		g. EGU2-IPM in 5-state region						
Scenario 3		a. Scenario 2 e plus "low" control level for non-EGU point, area, and mobile sources throughout 5-state region				*36,12*	*36,12*	
		Non-EGU Point Sources						
		* ICI Boilers - 40% SO2, 60% NOx reduction (ICI1)						
		* Glass manufacturing - 30% NOx reduction (GLASS1)						
		Area Sources						
		* Consumer products - OTC model rule (SOLV2A)						
		* AIM coatings - OTC model rule (SOLV1A)						
		* Portable fuel containers - OTC model rule (SOLV3A)						
		* Auto refinishing - extend IL.IN,WI RACT rules (SOLV4A)						
		* Ind. surface coating - more stringent RACT (SOLV5A)						
		* Degreasing – more stringent RACT (SOLV6A)						
		* Gas. Dispensing - enhanced vapor recovery (SOLV7A)						
		Mobile Sources						
		* HDDV – reflashing and voluntary measures <$5,000/T						
		* Construction Equipment - voluntary measures < $5,000/T						
		* Low RVP fuel (IN, MI, OH counties)						
		b. Scenario 2 c plus "high" control level for non-EGU point, area, and mobile sources throughout 5-state region				*36,12*	*36,12*	
		Non-EGU Point Sources						
		* ICI Boilers - 90% SO2, 80% NOx reduction (ICI3)						
		* Cement kilns – 90% SO2, 50% NOx reduction (KILN1)						
		* Asphalt plants – 25% NOx reduction						
		* Glass manufacturing - 75% NOx reduction (GLASS2)						
		Area Sources						
		* Consumer products - SCAQMD rule (SOLV2B)						
		* AIM coatings - CARB 2003 rule (SOLV1BA)						

		* Portable fuel cont, - Accelerated phase in (SOLV3B)						
		* Auto refinishing - SCAQMD rule (SOLV4B)						
		* Ind. surface coating - more stringent RACT (SOLV5A)						
		* Degreasing - more stringent RACT (SOLV6A)						
		* Gas. dispensing - enhanced vapor recovery (SOLV7A)						
		* Asphalt paving applications - low VOC formulations						
		Mobile Sources						
		* HDDV - reflashing and voluntary measures <$10,000/T						
		* Const. Equipment - voluntary measures < $10,000/T						
		* Agricultural Equipment - voluntary measures < $10,000/T						
		* Low RVP fuel (IN, MI, OH counties)						

Note: 12 = 12 km summer run, 36 = 36 km annual run

APPENDIX
Scenario 2 EGU Strategies

The Round 4 control strategy modeling includes five scenarios reflecting the EGU1 and EGU2 controls in the White Paper ("Interim White Paper – Midwest RPO Candidate Control Measures, Electric Generating Units", January 14, 2005). A summary of the scenarios is provided below.

<u>Overview of EGU1, EGU2</u>

EGU1 and EGU2 represent regional emission caps (tons per year for SO2 and NOx, and tons per season for NOx) based on the following emission limits:

SO2 (lb/MMBTU):	EGU1 0.36 (2009), 0.15 (2012)
	EGU2 0.24 (2009), 0.10 (2012)
NOx (lb/MMBTU):	EGU1 0.15 (2009), 0.10 (2012)
	EGU2 0.12 (2009), 0.07 (2012)

For this round of modeling, the compliance date is assumed to be 2012, not 2013 as identified in the original White Paper. EGU1 and EGU2 are defined based on the 2012 regional emissions cap. The 2009 " interim limits" represent where we expect to be on the path to meeting the 2012 emissions cap. The proposed emission cap applies to the entire region (and not individual states) and incorporates demand growth (calculated by IPM) for the target year.

MACTEC derived unit-specific control factors for EGU1 and EGU2 in the following manner:

- For each control measure and year, calculate the 5-state region annual SO2 emission caps and winter/summer NOx emission caps based on the IPM-projected heat inputs (mmBtu) and the average emission rate (lbs/mmBtu) for the control measure/year;
- Identify all units with emission rates below the average emission rate for the control measure/year; set the future year percent control efficiency to 0 for these units since they are already below the average emission rate on which the caps are based;
- Subtract the emissions from units with emission rates below the average emission rate and calculate an "adjusted" emission rate (lbs/mmBtu) that units above the average emission rate must meet;
- Calculate the control factor (for units above the "adjusted" emission rate) as one minus the ratio of the "adjusted" average emission rate to the actual emission rate for that unit.

<u>Description of Scenarios</u>

a. *EGU2 for top 30 EGUs in 5-state region (based on Q/d)*

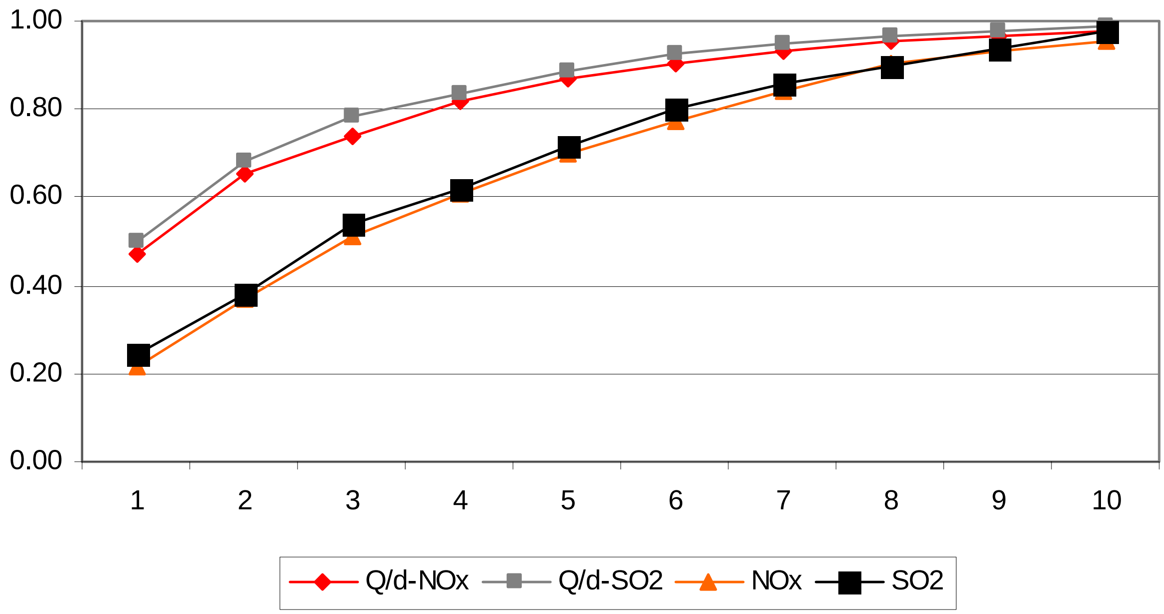
EGUs in the 5-state region were ranked based on their Q/d value. These values were calculated using:

- 2012 SO2 and NOx emission estimates; and
- distances to residual nonattainment monitors (based on Round 3 modeling – i.e., ozone: Chicago, Milwaukee, and Cleveland; PM2.5: Chicago, St.Louis/Granite City, Detroit, Cleveland, and Cincinnati) and nearby Class I areas.

The table below shows the Q/d values, emissions, and rankings for the top 40 facilities. The list is sorted based on the combined rankings of Q/d-NOx and Q/d-SO2.

Obs	cntryid	stid	stname	cyid	cyname	fcid	name	gridx	gridy	mindist	minmon	qdnox	nox	qdso2	so2	no	nq	so	sq	ord
1	US	26	Mich	163	Wayne	B2810	DETROIT EDISON RIV	1134.99	338.815	6	26163	3.39044	19.5	10.2767	59.2	108	1	92	1	1
2	US	39	Ohio	25	Clermont	1413100008	CINERGY CG&E WC BE	1089.89	-35.356	29	39061	1.30407	37.2	4.9612	141.6	44	3	19	2	2
3	US	39	Ohio	85	Lake	0243160009	CLEVELAND ELECTRIC	1279.13	291.746	23	39055	1.36151	30.8	3.3584	75.9	59	2	60	8	3
4	US	55	Wisc	117	Sheboygan	460033090	WP & L Alliant Ene	726.01	448.454	18	55117	1.07065	19.5	3.6255	66.0	109	4	80	6	4
5	US	26	Mich	163	Wayne	B2811	DETROIT EDISON TRE	1131.97	321.469	20	26163	0.74758	15.1	3.9601	80.1	149	7	52	4	5
6	US	26	Mich	147	St_Clair	B2796	ST. CLAIR / BELLE	1175.59	406.808	80	26163	0.73779	58.7	3.0537	243.1	18	8	2	9	6
7	US	18	Indi	29	Dearborn	00002	AMERICAN ELECTRIC	1040.07	-31.946	34	39061	0.71100	24.1	1.7065	57.8	81	9	97	16	7
8	US	26	Mich	115	Monroe	B2816	DETROIT EDISON/MON	1122.40	293.916	48	26163	0.43704	21.1	3.8031	183.6	99	22	7	5	8
9	US	39	Ohio	113	Montgomery	0857780013	DP&L, O.H. HUTCHIN	1080.83	32.197	49	39061	0.53632	26.2	1.9923	97.3	76	14	35	13	9
10	US	17	Illi	197	Will	197809AAO	MIDWEST GENERATION	754.82	201.224	55	17031	0.51395	28.3	2.0365	112.2	66	16	25	12	10
11	US	17	Illi	197	Will	197810AAK	MIDWEST GENERATION	739.33	216.943	44	17031	0.76842	34.0	1.5210	67.4	54	6	77	22	11
12	US	39	Ohio	61	Hamilton	1431350093	CINERGY CORP MIAMI	1044.54	-28.042	28	39061	0.57482	16.1	1.6199	45.5	130	11	136	19	12
13	US	17	Illi	31	Cook	031600AIN	MIDWEST GENERATION	740.23	258.241	20	17031	0.50121	10.1	1.9447	39.0	225	19	164	14	13
14	US	18	Indi	147	Spencer	00020	INDIANA MICHIGAN P	868.79	-182.363	116	MACA1	0.50965	59.1	1.6709	193.9	16	17	6	17	14
15	US	17	Illi	119	Madison	119020AAE	DYNEGY MIDWEST GEN	591.69	-103.839	17	17119	0.50712	8.7	1.5276	26.1	247	18	223	21	15
16	US	39	Ohio	35	Cuyahoga	1318000245	CLEVELAND ELECTRIC	1251.32	271.203	13	39035	0.37684	4.8	1.2550	16.1	352	24	290	26	16
17	US	17	Illi	31	Cook	031600AMI	MIDWEST GENERATION	770.73	243.506	16	17031	0.36113	5.9	1.1973	19.6	317	26	262	27	17
18	US	18	Indi	73	Jasper	00008	NIPSCO - R.M. SCHA	829.67	180.703	103	17031	0.39803	40.8	0.9307	95.4	37	23	38	32	18
19	US	18	Indi	89	Lake	00117	NIPSCO - DEAN H. M	792.89	223.831	46	17031	0.30339	13.9	1.1665	53.6	161	30	106	28	19
20	US	17	Illi	97	Lake	097190AAC	MIDWEST GENERATION	737.64	294.196	44	17031	0.24810	11.0	1.0000	44.3	205	34	141	29	20
21	US	39	Ohio	85	Lake	0243110008	PAINESVILLE MUNICI	1291.00	293.274	15	39055	0.14955	2.2	1.6578	24.8	474	53	228	18	21
22	US	26	Mich	115	Monroe	B2846	J.R. WHITING CO	1115.57	281.924	61	26163	0.18892	11.6	0.6854	42.1	196	41	148	39	22
23	US	39	Ohio	81	Jefferson	0641160017	W. H. SAMMIS PLANT	1370.12	182.626	121	39055	0.20359	24.7	0.5863	71.0	80	38	70	46	23
24	US	39	Ohio	1	Adams	0701000007	DP&L, J.M. STUART	1146.62	-66.909	93	39061	0.17124	15.9	0.6739	62.5	138	48	89	41	24
25	US	39	Ohio	93	Lorain	0247030013	AVON LAKE POWER PL	1233.49	243.827	40	39035	0.16397	6.6	0.6830	27.6	303	50	212	40	25
26	US	18	Indi	77	Jefferson	00001	IKEC - CLIFTY CREE	996.96	-75.840	95	39061	0.12745	12.0	1.4725	139.2	185	68	20	23	26
27	US	39	Ohio	95	Lucas	0448020006	TOLEDO EDISON CO.,	1113.16	257.144	86	26163	0.19430	16.7	0.5539	47.7	127	39	127	52	27
28	US	18	Indi	125	Pike	00002	IPL PETERSBURG GEN	842.68	-117.982	181	MACA1	0.31925	57.8	0.3770	68.3	20	28	73	71	28
29	US	18	Indi	43	Floyd	00004	PSI ENERGY - GALLA	968.21	-132.214	129	MACA1	0.17509	22.5	0.5434	69.9	91	47	71	53	29
30	US	55	Wisc	79	Milwaukee	241007800	WIS ELECTRIC POWER	735.39	372.568	72	55117	0.16369	11.8	0.5543	39.9	190	51	158	51	30
31	US	18	Indi	97	Marion	00033	IPL HARDING STREET	918.09	22.833	156	39061	0.14779	23.1	0.4341	67.8	88	56	75	62	31
32	US	55	Wisc	21	Columbia	111003090	Alliant Energy-Col	604.68	417.449	141	55117	0.11278	16.0	0.6267	88.7	137	77	45	43	32
33	US	39	Ohio	25	Clermont	1413090154	CINCINNATI GAS & E	1097.26	-48.043	43	39061	0.19308	8.3	0.3218	13.8	260	40	312	81	33
34	US	17	Illi	137	Morgan	137805AAA	AMEREN ENERGY GENE	573.75	-11.925	110	17119	0.13136	14.5	0.4641	51.2	156	67	113	58	34
35	US	26	Mich	139	Ottawa	B2835	J. H. CAMPBELL PLA	875.41	374.703	149	55117	0.09172	13.7	0.9888	147.2	165	95	18	31	35
36	US	26	Mich	163	Wayne	B2132	WYANDOTTE DEPT MUN	1133.22	331.351	11	26163	0.14801	1.6	0.3474	3.7	528	55	442	75	36
37	US	39	Ohio	7	Ashtabula	0204010000	CLEVELAND ELECTRIC	1339.05	329.017	63	39055	0.14809	9.4	0.3396	21.5	233	54	248	78	37
38	US	39	Ohio	31	Coshocton	0616000000	CONESVILLE POWER P	1273.11	126.550	144	39035	0.10727	15.4	0.5565	80.1	144	83	53	50	38
39	US	17	Illi	127	Massac	127855AAC	ELECTRIC ENERGY IN	730.42	-276.692	130	MING1	0.11597	15.1	0.4524	58.7	151	76	93	59	39
40	US	26	Mich	103	Marquette	B4261	WISCONSIN ELECTRIC	736.05	769.936	113	ISLE1	0.14091	16.0	0.3417	38.8	136	60	165	76	40

The figure below shows the fraction of the total regional Q/d value for each group of 10 facilities (i.e., the top 10 facilities are represented by the first set of symbols, which are designated by the number "1"). This shows that the top 30 facilities represent 75-80% of the regional Q/d value and about 50% of the regional NOx and SO2 emissions. To model this scenario, the MACTEC EGU2 control factors for only these top 30 facilities will be applied.



b. EGU2 in 100 km radius of each residual ozone and PM2.5 nonattainment area

There are 162 EGUs within 105 km of at least one of the residual nonattainment monitors/areas noted above. (Note: 105 km was used to flag facilities instead of 100 km because there were five large facilities slightly beyond 100 km.) These 162 EGUs represent 80% of the regional Q/d value and about 47% of the regional NOx and SO2 emissions. To model this scenario, the MACTEC EGU2 control factors for only these 162 facilities will be applied.

c. EGU2 in 5-state region

To model this scenario, the MACTEC EGU2 control factors for all 392 EGUs in the 5-state region will be applied.

d. EGU2 in 12-state region (5-state region plus MN, IA, MO, KY, TN, WV, PA)

To model this scenario, the MACTEC EGU2 control factors for all EGUs in the 5-state region plus EGUs in several neighboring factors (MN, IA, MO, KY, TN, WV, and PA)[3] will be applied.

e. EGU1 in 5-state region

To model this scenario, the MACTEC EGU1 control factors for all EGUs in the 5-state region will be applied.

[3] The control factors for these other states were derived by MACTEC following the same procedures as those outlined above for the five LADCO states.

f. EGU1 in 5-state region based on IPM modeling

IPM modeling for EGU1 was conducted by ICF to provide the modeling emissions inventory.

g. EGU2 in 5-state region based on IPM modeling

IPM modeling for EGU2 was also conducted by ICF to provide the modeling emissions inventory.

Two assumptions in the IPM modeling should be noted:

- ICF assumed banking and withdrawal of allowances, which results in higher SO2 and NOx emissions in later years, such as 2012, compared to the EGU1 and EGU2 emission caps. If desired, then ICF can disable banking so that the emissions in the LADCO states are at the level of the SO2 and NOx caps.

- ICF assumed EGU1 and EGU2 policies independent of the CAIR policies. If one wants to see a net reduction in both the LADCO and the CAIR regions, then it is necessary to retire the Title IV SO2 and the CAIR NOx allowance budgets to the extent that the EGU1 and EGU2 caps are lower than the CAIR state level budgets. This, too, can be implemented in IPM.

To undo these assumptions (i.e., disable banking and force the EGU1/EGU2 emission caps) will require another IPM run. (No decision has been made whether to pursue further IPM modeling.)