APPENDICES for the Technical Support Document For the Proposed Toxics Rule
Emissions Inventories

APPENDIX A

Inventory Data Files Used for Each Proposed Toxics Rule Air Quality Modeling Cases - SMOKE Input Inventory Datasets

In any of the following dataset names where the placeholder <mon> has been provided, this is intended to mean 12 separate files with the <mon> placeholder replaced with either jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, or dec, each associated with a particular month of the year.

Several inventories are the same in the 2005 base case and all future year cases. These inventories are listed in the “All Cases” in Table A-1.

Table A-1. List of inventory data associated with TR modeling cases.

Case	**Sector**	**SMOKE Input Files**
All Cases	avefire	arinv_avefire_2002_hap_18nov2008_v0_orl.txt
		arinv_avefire_2002ce_21dec2007_v0_ida.txt
	other	arinv_canada_afdust_xportfrac_cap_2006_03feb2009_v0_orl.txt
		arinv_canada_ag_cap_2006_03feb2009_v0_orl.txt
		arinv_canada_aircraft_cap_2006_04feb2009_v0_orl.txt
		arinv_canada_marine_cap_2006_03feb2009_v0_orl.txt
		arinv_canada_oarea_cap_2006_02mar2009_v3_orl.txt
		arinv_canada_offroad_cap_2006_04feb2009_v0_orl.txt
		arinv_canada_rail_cap_2006_03feb2009_v0_orl.txt
		arinv_nonpt_mexico_border1999_21dec2006_v0_ida.txt
		arinv_nonpt_mexico_interior1999_21dec2006_v0_ida.txt
		arinv_nonroad_mexico_border1999_21dec2006_v0_ida.txt
		arinv_nonroad_mexico_interior1999_21dec2006_v0_ida.txt
	othon	mbinv_canada_onroad_cap_2006_04feb2009_v0_orl.txt
		mbinv_onroad_mexico_border1999_21dec2006_v0_ida.txt
		mbinv_onroad_mexico_interior1999_21dec2006_v0_ida.txt
	othpt	ptinv_canada_point_2006_orl_09mar2009_v2_orl.txt
		ptinv_canada_point_cb5_2006_orl_10mar2009_v0_orl.txt
		ptinv_canada_point_uog_2006_orl_02mar2009_v0_orl.txt
		ptinv_mexico_border99_03mar2008_v1_ida.txt
		ptinv_mexico_interior99_05feb2007_v0_ida.txt
		ptinv_ptnonipm_offshore_oil_cap2005v2_20nov2008_20nov2008_v0_orl.txt
2005 cases (2005cr_05b, 2005cr_hg_05b)	afdust	arinv_afdust_2002ad_xportfrac_26sep2007_v0_orl.txt
	ag	arinv_ag_cap2002nei_06nov2006_v0_orl.txt
	alm_no_c3	arinv_lm_no_c3_cap2002v3_20feb2009_v0_orl.txt
		arinv_lm_no_c3_hap2002v4_20feb2009_v0_orl.txt
	nonpt	arinv_nonpt_cap_2005_TCEQ_Oklahoma_OilGas_28may2010_v0_orl.txt
		arinv_nonpt_cap_2005_WRAP_OilGas_04feb2009_v0_orl.txt
		arinv_nonpt_pf4_cap_nopfc_28may2010_v3_orl.txt
		arinv_pfc_2002_caphap_27dec2007_v0_orl.txt
	nonroad	arinv_nonroad_calif_caphap_2005v2_<mon>_02apr2008_v0_orl.txt
		arinv_nonroad_caps_2005v2_<mon>_revised_08sep2008_v0_orl.txt
		arinv_nonroad_haps_2005v2_<mon>_revised_05sep2008_v0_orl.txt
	on_moves_runp m	mbinv_on_moves_runpm_2005cr_<mon>_06MAY2010_06may2010_v0_orl.txt
	on_moves_startp	mbinv_on_moves_startpm_2005cr_<mon>_06MAY2010_06may2010_v0_orl.txt

Case	Sector	SMOKE Input Files
	m	
2005 cases	on_noadj	mbinv_on_noadj_MOVES_2005cr_<mon>_06MAY2010_06may2010_v0_orl.txt
		mbinv_on_noadj_nmim_not2moves_2005cr_<mon>_04MAY2010_04may2010_v0_orl.txt
		mbinv_onroad_calif_caphap_2005v2_revised_<mon>_29jun2010_v0_orl.txt
	seca_c3	ptinv_eca_imo_FINAL_c3_baf_vochaps_2005_canada_24jun2010_28jun2010_v0_orl.txt
		ptinv_eca_imo_FINAL_c3_baf_vochaps_2005_us_24jun2010_24jun2010_v0_orl.txt
		ptinv_eca_imo_FINAL_c3_caps_2005_canada_24jun2010_28jun2010_v0_orl.txt
		ptinv_eca_imo_FINAL_c3_caps_2005_us_24jun2010_24jun2010_v0_orl.txt
2005cr_05b	ptipm	Annual: ptinv_ptipm_cap2005v2_revised12mar2009_15jul2010_v5_orl.txt
		Annual: ptinv_ptipm_hap2005v2_allHAPs_revised12mar2009_14jul2010_v1_orl.txt
		Daily: ptday_ptipm_caphap_cem_2005cr_05b_<mon>_ida.txt
		Daily: ptday_ptipm_caphap_noncem_2005cr_05b_<mon>_ida.txt
	ptnonipm	ptinv_ptnonipm_hap2005v2_revised_08jul2010_v2_orl.txt
		ptinv_ptnonipm_xportfrac_cap2005v2_20nov2008_revised_22jul2010_v5_orl.txt
		ptinv_ptnonipm_2005hap_v1_from_2005ai_ND_ADM_plant_30jun2010_v0_orl.txt
		ptinv_ptnonipm_caphap_ethanol_plant_additions_2005_30jun2010_v3_orl.txt
		ptinv_ptnonipm_xportfrac_2005cap_v1_from_2005ai_ND_ADM_plant_30jun2010_v0_orl.txt
2005cr_hg_05b	nonpt	arinv_nonpt_2005pf4_hap_nopfc_nobafmpesticidesplus_noboilermacthg_23aug2010_v0_orl.txt
	other_hg	arinv_area_canada_hg_2000_noduplicates_23jul2008_v0_ida.txt
	othpt_hg	ptinv_point_canada_hg_2000_08sep2008_v1_ida.txt
	ptipm	Annual: ptinv_2005_ptipm_natahg_minus_boilermacticr_17aug2010_v0_orl.txt
		Daily: ptday_ptipm_hg_cem_2005cr_hg_05b_<mon>_ida.txt
		Daily: ptday_ptipm_hg_noncem_2005cr_hg_05b_<mon>_ida.txt
	ptnonipm	ptinv_2005_ICR_BoilerMACT_Hg_ptnonipm_20aug2010_v0_orl.txt
		ptinv_2005_ptnonipm_natahg_minus_boilermacticr_17aug2010_v0_orl.txt
2016 cases (2016cr_05b, 2016cr2_hg_05b, 2016cr2_hg_control1_05b)	afdust	arinv_afdust_2016cr_24aug2010_v0_orl.tx
	ag	arinv_ag_2016cr_24aug2010_v0_orl.txt
	alm_no_c3	arinv_lm_no_c3_cap2016cr_24aug2010_v0_orl.txt
		arinv_lm_no_c3_hap2016cr_24aug2010_v0_orl.txt
	nonpt	arinv_nonpt_2016cr_cap_2008_TCEQ_Oklahoma_OilGas_23sep2010_v0_orl.txt
		arinv_nonpt_2016cr_cap_2018PhaseII_WRAP_OilGas_23sep2010_v0_orl.txt
		arinv_nonpt_2016cr_hap_nopfc_nobafmpesticidesplus_noboilermacthg_23sep2010_v0_orl.txt
		arinv_nonpt_2016cr_pf4_cap_nopfc_23sep2010_v0_orl.txt
		arinv_pfc_caphap2016_13jul2010_v0_orl.txt
	nonroad	arinv_nonroad_calif_caphap_2016_revised_<mon>_24jun2010_v0_orl.txt
		arinv_nonroad_caphap_2016_<mon>_07jun2010_v0_orl.txt

Case	Sector	SMOKE Input Files
	on_moves_runpm	mbinv_on_moves_runpm_2016cr_<mon>_10JUN2010_10jun2010_v0_orl.txt
2016 cases	on_moves_startpm	mbinv_on_moves_startpm_2016cr_<mon>_10JUN2010_10jun2010_v0_orl.txt
	on_noadj	mbinv_on_noadj_MOVES_2016cr_<mon>_10JUN2010_10jun2010_v0_orl.txt
		mbinv_onroad_calif_caphap_2016_<mon>_09jun2010_v0_orl.txt
	ptnonipm	ptinv_ptnonipm_2016cr_hap2005v2_revised_06oct2010_v0_orl.txt
		ptinv_ptnonipm_2016cr_xportfrac_cap2005v2_20nov2008_revised_06oct2010_v0_orl.txt
		ptinv_ptnonipm_capHG_cementISIS_2016cr_16AUG2010_16aug2010_v0_orl.txt
		ptinv_ptnonipm_cornproducts17031_hap_cap_2008t_27aug2010_v0_orl.txt
		ptinv_ptnonipm_2005hap_v1_from_2005ai_ND_ADM_plant_30jun2010_v0_orl.txt
		ptinv_ptnonipm_caphap_ethanol_plant_additions_2005_30jun2010_v3_orl.txt
		ptinv_ptnonipm_xportfrac_2005cap_v1_from_2005ai_ND_ADM_plant_30jun2010_v0_orl.txt
	seca_c3	ptinv_eca_imo_FINAL_c3_baf_vochaps_2016_canada_24jun2010_24jun2010_v0_orl.txt
		ptinv_eca_imo_FINAL_c3_baf_vochaps_2016_us_24jun2010_24jun2010_v0_orl.txt
		ptinv_eca_imo_FINAL_c3_caps_2016_canada_24jun2010_24jun2010_v0_orl.txt
		ptinv_eca_imo_FINAL_c3_caps_2016_us_24jun2010_24jun2010_v0_orl.txt
2016cr_05b	ptipm	Annual: ptinv_PTINV_EPA410_BC_15b_summer_2015_w_MH_SCC_edits_emis_reds_22SEP2010_08oct2010_nf_v1_orl.txt
		Daily: ptday_ptipm_caphap_cem_2016cr_05b_<mon>_ida.txt
		Daily: ptday_ptipm_caphap_noncem_2016cr_05b_<mon>_ida.txt
2016cr2_hg_05b	ptipm	Annual: ptinv_PTINV_EPA410MACTAQ_BC_2b_summer_2015_w_MH_SCC_edits_emis_reds_minus_boilermacthg_20oct2010_v0_orl.txt
		Daily: ptday_ptipm_caphap_cem_2016cr2_hg_<mon>_ida.txt
		Daily: ptday_ptipm_caphap_noncem_2016cr2_hg_<mon>_ida.txt
	ptnonipm_hg	ptinv_2016cr2_ICR_BoilerMACT_Hg_ptnonipm_06oct2010_v0_orl.txt
		ptinv_ptnonipm_2016cr2_natahg_minus_boilermacticr_15oct2010_v0_orl.txt
		ptinv_ptnonipm_capHG_cementISIS_2016cr_16AUG2010_16aug2010_v0_orl.txt
2016cr2_hg_control1_05b	ptipm	Annual: ptinv_PTINV_EPA410MACTAQ_BC_5d_summer_2015_w_MH_SCC_edits_emis_reds_minus_boilermacthg_09nov2010_v0_orl.txt
		Daily: ptday_ptipm_caphap_cem_2016cr2_hg_control1_<mon>_ida.txt
		Daily: ptday_ptipm_caphap_noncem_2016cr2_hg_control1_<mon>_ida.txt
	ptnonipm_hg	ptinv_2016cr2_ICR_BoilerMACT_Hg_ptnonipm_06oct2010_v0_orl.txt
		ptinv_ptnonipm_2016cr2_natahg_minus_boilermacticr_15oct2010_v0_orl.txt
		ptinv_ptnonipm_capHG_cementISIS_2016cr_16AUG2010_16aug2010_v0_orl.txt

APPENDIX B – List of OECA Consent Decrees- Whereby Reductions Were Apportioned to Facilities in a Particular Corporation

Table B-1. Description of application of OECA Consent Decrees for future-year projections

Corporation	Pollutant	Compliance Date	Description of reductions	2005 Emissions (tons/year)
Bunge	NO_X	31DEC2005	Combined NO_X emissions reduced by 278 tons per year. Combined is over select Bunge facilities.	942
	PM	31DEC2005	Combined PM emissions reduced by 258 tons per year. Combined is over select Bunge facilities.	1,266
	SO_2	31DEC2005	Combined SO_2 emissions reduced by 574 tons per year. Combined is over select Bunge facilities.	2,926
	VOC	31DEC2005	Combined VOC emissions reduced by 1,122 tons per year. Combined is over select Bunge facilities.	2,761
Cargill	CO	01SEP2010	Combined CO emissions reduced by 10,900 tons per year. Combined over select Cargill facilities.	11,167
	NO_X	01SEP2007	Combined NO_X emissions reduced by 1,350 tons per year. Combined over select Cargill facilities.	4,451
	SO_2	01SEP2008	Combined SO_2 emission reduced by 2,250 tons per year. Combined over select Cargill facilities.	10,527
	VOC	01SEP2008	Combined VOC emissions reduced by 98% or 10,450 tons per year. Combined over select Cargill facilities.	6,617
Conoco Phillips	NO_X	31DEC2008	Combined NO_X emissions reduced by 10,000 tons per year. Combined over select Conoco Phillips facilities.	17,409
	SO_2	31DEC2008	Combined SO_2 emissions reduced by 37,100 tons per year. Combined over select Conoco Phillips facilities	31,003
Dupont	SO_2	01MAR2010	Annual SO_2 emissions cap at 123 tons per year at James River	0
		01MAR2012	Annual SO_2 emissions cap at 248 tons per year at Wurtland	2,268
			Annual SO_2 emissions cap at 281 tons per year at Fort Hill	2,228
		01SEP2009	Annual SO_2 emissions cap at 1,007 tons per year at Burnside.	9,517
Hunt	NO_X	31DEC2010	Must meet heat input capacity of 150 mmBTU/hr or greater such that weighted average is no greater than 0.044 lbs/mmBTU, applied at Lumberton, Sandersville, and Tuscaloosa.	350
	SO_2	31DEC2007	No burning of fuel greater than 5 wt% sulfur. SO_2 emissions will not exceed 20ppm or that weighted average H_2S concentrations will not exceed 162 ppm H_2S, applied at Lumberton, Sandersville, and Tuscaloosa.	939
MGP Ingredients	CO	2009	CO reductions by 90%	31

Corporation	Pollutant	Compliance Date	Description of reductions	2005 Emissions (tons/year)
	VOC	2009	VOC reductions by 95%	112
Rhodia Inc	SO_2	01JUL2007	Annual emission limit of 2.2 lbs/ton.	240
			Annual emission limit of 2.5 lbs/ton	396
			Must meet SCAQMDR limit (1.7lbs/ton or less)	392
		01JUL2009	Annual emission limit of 2.2 lbs/ton.	282
		01MAY2012	Baton Rouge #1 -> limit of 1.9 lbs/ton. Baton Rouge #2 -> limit of 2.2 lbs/ton	7,920
		2008	Houston #8 -> limit of 2.5 lbs/ton within 1 year of Date of Entry. Houston #2 -> limit of 1.8 /lbs/ton within 1 year of Date of Entry	9,686
St. Mary's Cement	NO_X	30APR2009	Reduce combined NO_X emissions by 2,700 tons per year.	1,700
Sunoco	NO_X	2006 (Marcus Hook, PA)	Combined NO_X emissions reduced by 4,500 tons per year. Combined over select Sunoco facilities.	746
		31DEC2009 (Toledo, OH)	Combined NO_X emissions reduced by 4,500 tons per year. Combined over select Sunoco facilities.	2,339
		31DEC2010 (Philadelphia, PA)	Combined NO_X emissions reduced by 4,500 tons per year. Combined over select Sunoco facilities.	3,390
	PM	2006 (Marcus Hook, PA)	Combined PM emissions reduced by 300 tons per year. Combined over select Sunoco facilities.	34
		31DEC2009 (Toledo, OH)	Combined PM emissions reduced by 300 tons per year. Combined over select Sunoco facilities.	391
		31DEC2010 (Philadelphia, PA)	Combined PM emissions reduced by 300 tons per year. Combined over select Sunoco facilities.	591
	SO_2	2006 (Marcus Hook, PA)	Combined SO_2 emissions reduced by 19,500 tons per year. Combined over select Sunoco facilities.	3,536
		31DEC2009 (Toledo, OH)	Combined SO_2 emissions reduced by 19,500 tons per year. Combined over select Sunoco facilities.	9,072
		31DEC2010 (Philadelphia, PA)	Combined SO_2 emissions reduced by 19,500 tons per year. Combined over select Sunoco facilities.	3,353
Total Petrochemicals USA	CO	2007	Annual CO emissions cap at 120 tons per year.	386
	NO_X	31DEC2009	Annual NO_X emissions cap at 180 tons per year.	798
	SO_2	2010	Annual SO_2 emissions cap at 800 tons per year.	146

Corporation	Pollutant	Compliance Date	Description of reductions	2005 Emissions (tons/year)
Valero	NO_X	2011	Combined NO_X emissions reduced by 1870 tons per year. Combined is over facilities: Lima, Memphis, and Port Arthur.	4,165
		31DEC2011	Combined NO_X emissions reduced by 4,000 tons per year. Combined over Valero facilities in Ardmore OK, Benicia CA, Martinez CA, Wilmington CA, Denver CO, St. Charles LA, Krotz Spring LA, Paulsboro NJ, Corpus Christi TX (east and west), Houston TX, Sunray TX, Texas City TX, and Three Rivers TX.	13,742
	PM	31DEC2011	Combined PM emissions reduced by 526 tons per year. Combined over Valero facilities listed in other two lists for NOx and SO2.	3,027
	SO_2	2011	Combined SO_2 emissions reduced by 1,810 tons per year. Combined is over facilities: Lima, Memphis, and Port Arthur.	4,105
		31DEC2011	Combined SO_2 emissions reduced by 16,000 tons per year. Combined over Valero facilities in Ardmore OK, Benicia CA, Martinez CA, Wilmington CA, Denver CO, St. Charles LA, Krotz Spring LA, Paulsboro NJ, Corpus Christi TX (east and west), Houston TX, Sunray TX, Texas City TX, and Three Rivers TX.	19,618

Appendix C

Gold Mine Mercy Reductions Due to NESHAP:

DATE FOR PROJECTION FACTOR Assume 2014 (rule done end of 2010 and 3 years compliance)

NEI_SITE_ID	FIPS	pollcode	STATE_FACILITY_ ID	Facility Name	FACILITY WIDE mercury emissions (in tons per year)*	**FACILITY WIDE PROJECTION FACTOR computed from the 2016 emissions. (base year x Projection Factor = Future Year)**	2016 emissions (in tons per year) **	
NEI1827	08119	199	80860CRPPL2755S	CRIPPLE CREEK & VICTOR GOLD MINING CO	0.01715	1	0.01715	
NEI2NV41116	32021	199	89406KNNCT55MIL	KENNECOTT RAWHIDE MINING CO	0.02	0.215	0.0043	Facility wide emissions estimate is based on 2007 emissions test data
NEI2NV444.01	32023	199	89045SMKYV1SMOK	SMOKY VALLEY COMMON OPERATION	0.03	0.388333333	0.01165	Facility wide emissions estimate is based on 2007 emissions test data
NEI2NVT18242	32011	199	T$18242	RUBY HILL MINE	0.018	0.166666667	0.003	Facility wide emissions estimate is based on 2007 emissions test data
NEIAK09099737PGMNX38	02240	7439976	99737PGMNX38MIL	POGO MINE	0.0005	1	0.0005	
NEIAKT$13660	02090	199	99707FRTKN1FORA	FORT KNOX MINE	0.000065	1	0.000065	
NEIAKT$13665	02110	199	99801KNNCT13401	KENNECOTT GREENS CREEK MINING COMPANY	0.002715	1	0.002715	
NEIMT15320	30043	199	59759GLDNS453MO	GOLDEN SUNLIGHT MINES INC.	0.00085	1	0.00085	

NEINV3201589821CRTZG	32015	199	89821CRTZGSTARA	CORTEZ GOLD MINES	0.42575	0.234879624	0.1
NEINVT$1249 8	32013	199	89414NWMNT35MIL	NEWMONT MINING CORP TWIN CREEKS MINE	0.296	0.506756757	0.15

Appendix C

Gold Mine Mercy Reductions Due to NESHAP:

DATE FOR PROJECTION FACTOR Assume 2014 (rule done end of 2010 and 3 years compliance)

NEI_SITE_ID	FIPS	pollcode	STATE_FACILITY_ ID	Facility Name	FACILITY WIDE mercury emissions (in tons per year)*	**FACILITY WIDE PROJECTION FACTOR computed from the 2016 emissions. (base year x Projection Factor = Future Year)**	2016 emissions (in tons per year) **	
NEINVT$12499	32027	199	89418FLRDCEXIT 1	STANDARD MINING INC	0.08	0.4	0.032	Facility wide emissions estimate is based on 2008 emissions test data
NEINVT$12500	32027	199	89419CRRCH180EX	COEUR ROCHESTER INC	0.069	1	0.069	Facility wide emissions estimate is based on 2007 emissions test data
NEINVT$12506	32013	199	89438GLMSM3MILE	GLAMIS MARIGOLD MINE	0.1638	0.018315018	0.003	
NEINVT$12510	32013	199	89438NWMNTST ONE	NEWMONT MINING CORP LONE TREE MINE	0.311	0.225080386	0.07	Facility wide emissions estimate is based on 2006 emissions test data
NEINVT$12523	32007	199	89801JRRTT50MI L	JERRITT CANYON MINE	0.23	0.217391304	0.05	Facility wide emissions estimate is for the 2004-05 timeframe and is based on the estimate submitted to Nevada DEP in response to ICR survey sent to the company.
NEINVT$12524	32033	199	89803BLDMN70MIL	BALD MOUNTAIN MINE	0.14	0.214285714	0.03	Facility wide emissions estimate is based on 2008 emissions test data
NEINVT$12525	32007	199	89803BRRCK27MIL	BARRICK GOLDSTRIKE MINES INC	0.35	0.085714286	0.03	Facility wide emissions estimate is based on 2007 emissions test data
NEINVT$12529	32007	199	T$12529	NEWMONT MINING CORP RAIN AREA	0.0001	1	0.0001	

				MINE			
NEINVT$125 3 1	3201 1	199	89822NWMNT6 MAIL	NEWMONT MINING CORP CARLIN SOUTH AREA	0.345	0.405797101	0.14

* except for Pogo Mines, the pollutant code used is 199. For Pogo Mines it is 7439976.
** These are projected emissions estimates post-MACT based on analyses of expected reductions done for the 2010 Proposed MACT rule.

Appendix D

Mercury Emission Reductions, 2005-2016 for Particular NonEGU Categories based on data/approaches developed by SPPD[1]

ELECTRIC ARC FURNACES (EAFs): Reduction to an emission level of 5 tpy (a 2.3 tpy Hg reduction) by 2016 is estimated based on the 2007 MACT rule)(72 FR 74108). The NATA inventory for 2005 shows 7.3 tpy Hg emissions. For the rule, EPA estimated 5 tpy reductions (from 10 tpy). This is considered a conservative assumption at this time; Hg emissions could go to 0 tpy, if mercury switches are removed from the process, or Hg emissions could move toward 0 tpy based on vehicle fleet turnover and the increasing use of mercury-free switches. Because the source of mercury for EAFs is scrap metal containing mercury switches from an aging vehicle fleet that has been replaced with mercury-free technology, there is the potential that there will be very low levels of mercury by 2016, via mandatory controls and continuous monitoring as a result of the new MACT rule (an upcoming area source rule that is in the planning stage), and through vehicle fleet turnover.

We determined a 35.1% reduction was needed from a starting point of 7.3 tons to get to 5 tons.
However, our starting point inventory was actually lower than the NATA value of 5 tons because the following sources were not in the starting modeling inventory or had different emissions than the 2005 NATA due to other controls applied that would have contributed to getting to 5 tons in the future

nata_plant	scc	nata_emis	Starting Emissions in projection
Northwestern Steel & Wire Co (shut down prior to 2005)	30300908	0.337223	0
Gerdau Ameristeel US Inc. Charlotte Stee	30400701	0.0144	Same, but other controls reduce this source
Gerdau Ameristeel US Inc. Charlotte Stee	30400799	0.0005	Same, but other controls reduce this source
Texas Industries Inc.	30300908	0.325819	0.059951 (other controls applied)

Because our pre-MACT emissions were 6.6 tons, to get to a projected value of 5 tons, the percent reduction is 24.4% instead of 35.1%,. Therefore our projection resulted in a 2016 value of 4.53 tons instead of 5 tons for this sector.
However, because the actual emissions for this sector could move towards 0 in the future so the error is much smaller than the undcertainty. Note that the reductions for this sector were 2.12 tons.

HAZARDOUS WASTE COMBUSTORS (HWCs): A 0.2 tpy reduction of Hg by 2016 is estimated from the 2005 MACT rule. The 2005 standards are in effect and all HWCs are required to be in compliance with them. The Hg reductions achieved by the 2005 standards were estimated to be 0.2 tpy. This was due in part to "interim standards" that were put in place in 2002, which reduced Hg emissions by 12.9 tpy.

.Note that identifying which HWCs have reductions may not be possible.
We determine that a *6.25% reduction would be needed to achieve a 0.2 ton reduction based on a 2005 category-wide sum of 2.3 tons. However, we inadvertently applied a 31.5% reduction and therefore reduced emissions by 0.94 tons instead of 0.2 tons. Since the 0.74 extra ton reductions are spread across more than 250 counties, this is not expected to impact any one area of the country significantly.*

[1] **transmitted by Amy Vasu of SPPD on Sept 7 and Sept 8, 2010 (email to Madeleine Strum)**

One other issue is that it appeared that some HWCs are part of the ISIS model and that they should not be addressed both by the ISIS projection and the across-th-board HWC reduction.

Upcoming revised rule. Work to revise the rule (to replace the Hg standards, due to the remand) is at the pre-proposal stage, and there is not an estimate of reductions that those future standards may achieve. It is not known if the compliance date would be prior to 2016 for the revised rule.

MERCURY CHLORALKALI PLANTS: Estimated emissions for 2009 are 0.3 tpy; this is a 0.8 T/yr reduction from 2005 levels. Mercury emissions could remain at 0.3 tpy or go to 0 tpy by 2013-2016 due to facility closure or conversion, but is highly uncertain at this time.

2003 MACT rule. NATA inventory for 2005 shows 1.1 tpy Hg emissions, however, this is inconsistent with the 2005 NATA version we used because which sums to 3.1 tons. Estimates of mercury emissions under this rule are 0.3 tpy in 2009 through 2012. Four facilities remain in operation (Augusta, GA; Charleston, TN; New Martinsville, WV; and, Ashtabula, OH). It is estimated that emissions could go to 0 tpy as early as 2013

ASHTA (Ashtabula, OH facility; Ashtabula County) OLIN -

GA (Augusta, GA facility; Richmond County) OLIN - TN

(Charleston, TN facility; Bradley County) PPG (New

Martinsville, WV facility; Wetzel County)

In order to generate a Mercury Chloralkali estimate consistent with the above, we had to remove Hg from the sources identified as Mercury chloralkali plants based on their MACT code of 1403. These are shown below; and the sum is 1.4 tons.

In addition, we applied facility specific reductions to the following 4 facilities ASHTA (Ashtabula, OH facility; Ashtabula County)

OLIN - GA (Augusta, GA facility; Richmond County)

OLIN - TN (Charleston, TN facility; Bradley County)

PPG (New Martinsville, WV facility; Wetzel County)

Such that the resultant emissions would match data provided by rule developers.
Specifically:

NEIOHT$5933 is for ASHTA (Ashtabula, OH facility; Ashtabula County) 2005 Hg is 0.4065 tons (813 lbs) FIPS=39007, PLANTID= 44004LCPCH3509M, POLL = 7439976 (2 records for this facility)

Final emissions in Amy's table (2008) is **62** pounds. Therefore, percent reduction is **92.4% Actual final emissions from projection is 61.788 for ashta**

NEIGAT$3892 is for OLIN - GA (Augusta, GA facility; Richmond County) 2005 Hg is 0.412 tons (824 lbs) FIPS= 13245 PLANTID= 30913LNGST2402L, POLL = 7439976 (2 records for this facility)

Final emissions in Amy's table **(2008) is 95 pounds** Therefore, percent reduction is **88.5% Actual final emissions from projection is 94.76 pounds**

NEI10894 is for OLIN - TN (Charleston, TN facility; Bradley County) 2005 Hg is 0.7675 tons (1535 lbs)
FIPS = 47011 PLANTID = ???? check leading zeroes 14??? POLL = 7439976 (2 records for this facility) Final emissions in Amy's table (**2008) is 327** pounds. Therefore % reduction is 78.7%
Actual final emissions from projection is 326.955 pounds

NEI42444 PPG (New Martinsville, WV facility; ~~Wetzel County~~ this is in Marshall county not Wetzel county Boiler MACT database also has it as Marshall county) 2005 Hg is 0.127 tons (254 lbs)

FIPS = 54051 PLANTID = 5405100002 check leading zeroes POLL = 199 (2 records for this facility)
Final emissions in Amy's table is **150** pounds per the settlement Decree Amy indicated that limits their emissions to that level. Therefore % reduction is **40.9%**

Actual final emissions from projection is 150 pounds

Overall reduction for the above plants is 1.396249 tons in addition, 1.4 tons were zeroed out so the total reduction is 2.8 tons.

Plants to shut down

nata_uniq	fips	plantid	scc	poll	nata_emis Hg (tons)	nei_emis Hg (tons)	emis_diff	nata_plant	nata_mact code
NEIAL0330002	1033	2	30100802	199	0.27	0.27	0	Occidental Chemical Corporation	1403
NEI26211	10003	1000300030	30100899	7439976	0.002387	0.002387	0	OCCIDENTAL CHEMICAL CORPORATION	1403
NEI26211	10003	1000300030	30100899	7439976	5.40E-05	5.40E-05	0	OCCIDENTAL CHEMICAL CORPORATION	1403
NEI26211	10003	1000300030	30100802	7439976	0.1263	0.1263	0	OCCIDENTAL CHEMICAL CORPORATION	1403
NEI26211	10003	1000300030	30100899	7439976	0.000254	0.000254	0	OCCIDENTAL CHEMICAL CORPORATION	1403
NEI6076	22019	5200004	30100802	7439976	0.0795	0.0795	0	PPG INDUSTRIES INC/LA KE CHARLE S COMPL EX	1403
NEI6076	22019	5200004	30100802	7439976	0.0005	0.0005	0	, five	1403
NEI6076	22019	5200004	30100802	7439976	0.5225	0.5225	0	PPG INDUSTRIES INC/LA KE CHARL ES COMPLEX	1403
NEI6076	22019	5200004	30100802	7439976	0.0005	0.0005	0	PPG INDUSTRIES INC/LA KE CHARL ES COMPLEX	1403
NEI6076	22019	5200004	30100802	7439976	0.0005	0.0005	0	PPG INDUSTRIES INC/LA KE CHARL ES COMPLEX	1403
NEILAT$10650	22047	70776STFFRRIVE R	39999999	7439976	0.36525	0.36525	0	PIONEER AMERICAS LLC/CHLOR-ALKALI PLANT	1403
NEILAT$10650	22047	70776STFFRRIVE R	39999999	7439976	0.024	0.024	0	PIONEER AMERICAS LLC/CHLOR-ALKALI PLANT	1403
NEI42973	55141	772010470	30100802	7439976	0.00465	0.00465	0	ERCO WORLDWIDE (USA)	1403

NEI42973	55141	772010470	30100802	7439976	0.003	0.003	0	ERCO WORLDWIDE (USA)	1403

Pulp and Paper: A Hg emission reduction of 0.7 tpy is estimated as a result of replacement of a smelter at G-P Big Island (Beford County, VA) with a recovery furnace. This results in 0.4 tpy Hg emissions for Pulp and Paper.
REDUCTION = 0.728172

Implementation: Zero out Hg emissions from the following unit

nata_uniq	fips	plantid	pointid	stackid	segment	scc	poll	nata_emis	nata_plant	nata_mact
NEI42211	51019	00003	10	10	3	30700399	199	0.728172	GP Big Island LLC	1626-2

Upcoming rules not yet proposed. Possible future Hg controls (should EPA regulations dictate Hg controls - which remains to be seen) are activated carbon injection or more likely a wet scrubber applied to recovery furnaces. If we assume a 99% Hg reduction associated with these controls, then the recovery furnace Hg emissions from the NEI (totaling 0.177 tpy for DCE + NDCE) would be reduced by 0.175 tpy.

Thus, the best-case Hg reduction estimated for the P&P industry is rounded to 0.18 tpy based on current NEI data (corrected for a shut-down smelter) and a 99% reduction of Hg emissions from recovery furnaces. These possible future Hg controls are not currently accounted for in the projections done for nonEGU.

Appendix E

Ptnonipm (Non EGU) Plant Closures Included in the 2016 Base Case and the Resulting Emissions Changes Due to the Closures (impacts on emissions from these closures are provided in the main document).

fips	plantid	pointid	stackid	segment	plant	effective_date
1073	10730360				U.S. Pipe N. Birmingham , Walter Coke, I	7/31/2010
1073	35207NTDST30003				U. S. PIPE & FOUNDRY COMPANY LLC.(NO. B'	12/11/2009
1073	10730350				SLOSSINDUSTRIESCORPORATION-MINERALW	12/11/2009
1073	35207SLSSN35003				SLOSSINDUSTRIESCORPORATION-MINERALW	12/11/2009
1073	10730068				W.J. Bullock	10/31/2009
1073	35224WJBLL1501E				W.J. Bullock	10/31/2009
12105	1050059				MOSAICFERTILIZERLLCNEWWALESPLANT	12/31/2008
12105	33860MCFRTHIGHW				MOSAICFERTILIZERLLCNEWWALESPLANT	12/31/2008
12105	T$15385				MOSAICFERTILIZERLLCNEWWALESPLANT	12/31/2008
13051	5100008				TronoxPigments(Savannah)Inc	12/31/2006
13051	31404KMRWCEASTP				TronoxPigments(Savannah)Inc	12/31/2006
17031	031012ABI				CornProductsInternationalInc	6/30/2010
18167	22				INTERNATIONALPAPERCO.	12/31/2007
19111	56-02-004				INTERNATIONALPAPERCORP-FORTMADISON	8/31/2005
19111	52632THHBNONPR	2			ROQUETTEAMERICA,INC	3/1/2008
19111	56-01-009	242710			ROQUETTEAMERICA,INC	3/1/2008
19111	56-01-009	242802			ROQUETTEAMERICA,INC	3/1/2008
19111	56-01-009	242828			ROQUETTEAMERICA,INC	3/1/2008
22067	1				INTERNATIONALPAPERCO/LOUISIANAMILL	11/30/2008
22067	19200001				INTERNATIONALPAPERCO/LOUISIANAMILL	11/30/2008
22067	7122ONTRNT705CO				INTERNATIONALPAPERCO/LOUISIANAMILL	11/30/2008
22079	1				INTERNATIONALPAPERCO/PINEVILLEMILL	5/30/2010
22079	23600001				INTERNATIONALPAPERCO/PINEVILLEMILL	5/30/2010
22079	T$10715				INTERNATIONALPAPERCO/PINEVILLEMILL	5/30/2010
23007	2300700007				WAUSAUPAPEROTISMILL	5/31/2009
23019	1900056				KATAHDINPAPERCO-WESTMILL	8/31/2008
23019	2301900056				KATAHDINPAPERCO-WESTMILL	8/31/2008
25003	01238KMBRLGREYL				SCHWEITZERMAUDUITINTERNATIONALINC.	5/31/2008
25003	1170016				SCHWEITZERMAUDUITINTERNATIONALINC.	5/31/2008
25003	1170014				MWCUSTOMPAPERS,LLC-LAURELMILL	7/31/2007
25003	T$14390				MWCUSTOMPAPERS,LLC-LAURELMILL	7/31/2007
25017	01760NTCKP90NMA				NATICKPAPERBOARD	11/30/2005
25017	1190241				NATICKPAPERBOARD	11/30/2005
26121	A4203				SDWARRENMUSKEGONMIOPERATIONS	8/31/2009

fips	plantid	pointid	stackid	segment	plant	effective_date
26121	T$7810				SDWARRENMUSKEGONMIOPERATIONS	8/31/2009
33007	03570JMSRV650MA				FRASERNHLLC	4/30/2008
33007	3300700001				FRASERNHLLC	4/30/2008
36083	4382800006				BENNINGTONPAPERBOARDCO	4/30/2009
37119	583				CaraustarMillGroup,Inc.	3/31/2009
39153	1677010193	B101			GOODYEARTIRE&RUBBERCO.	12/31/2007
39153	1677010193	B102			GOODYEARTIRE&RUBBERCO.	12/31/2007
39153	1677010193	B103			GOODYEARTIRE&RUBBERCO.	12/31/2007
39153	T$6196	1			GOODYEARTIRE&RUBBERCO.	12/31/2007
47063	197				LIBERTYFIBERSCORPORATION	7/31/2010
47063	37778LNZNGTENNE				LIBERTYFIBERSCORPORATION	7/31/2010
47063	T$4972				LIBERTYFIBERSCORPORATION	7/31/2010
48141	5				ELPASOPLANT	6/1/2010
48141	1				ELPASOPLANT	6/1/2010
55075	438039360				STORAENSONORTHAMERICANIAGARAMILL	12/31/2008
55075	54151NGRFW1101M				STORAENSONORTHAMERICANIAGARAMILL	12/31/2008
55075	T$8508				STORAENSONORTHAMERICANIAGARAMILL	12/31/2008
55141	772010580				DOMTARA.W.CORP.-PORTEDWARDS	6/30/2008
55141	772010580				DOMTARA.W.CORP.-PORTEDWARDS	6/30/2008
55141	T$8586				DOMTARA.W.CORP.-PORTEDWARDS	6/30/2008

APPENDIX F

Approach to Apply RICE reductions to project 2005 Emissions in the 2005v4.1 modeling Platform: 2004 and 2010 rules

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1 Introduction

There are three rulemakings for National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines. These rules reduce hazardous air pollutant (HAPs) from existing and new stationary reciprocating internal combustion engines (RICE). In order to meet the standards, existing sources with certain types of engines will need to install controls. In addition to reducing HAPs, these controls also reduce criteria air pollutants (CAPs).

This document presents a methodology for incorporating the CAP reductions from the three RICE NESHAP in the future year projection of the 2005 v4.1 modeling platform. The methodology addresses the following future years: 2012, and 2014 and beyond. In 2014 and beyond, all 3 rules' compliance dates have passed; thus all 3 rules are included in the emissions projection. In 2012 only the earliest rule's compliance date has passed so only one rule is included.

The rules are listed below:

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (69 FR 33473) published 06/15/04

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (FR 9648) published 03/03/10

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (75 FR 51570) published 08/20/2010

The difference among these three rules is that they focus on different types of engines, different facility types (major for HAPs, versus area for HAPs) and different engine sizes based on horsepower (HP). In addition, the they have different compliance dates. We project CAPs from the 2005 NEI RICE sources, based on the requirements of the rule for **existing sources**,. We consider only existing sources, since the inventory includes only existing sources and the current projection approach does not estimate emissions from new sources. As indicated earlier, for the 2012 projections, only the requirements associated with the June 15, 2007 compliance date are incorporated. All of the **Error! Not a valid bookmark self-reference.** requirements are incorporated in projections for 2014 and beyond.

Table 1-1summarizes the rule information that was used for the emissions projection. As indicated earlier, for the 2012 projections, only the requirements associated with the June 15, 2007 compliance date are incorporated. All of the **Error! Not a valid bookmark self-reference.** requirements are incorporated in projections for 2014 and beyond.
Table 1-1. Summary of Existing Source RICE Reductions Reflected in the Projection Methodology

Engine Type	Control and Pollutant Reductions	Horse Power Range Affected (Existing Sources Only)	Publication Date of the RICE NESHAP	Compliance Date	Reductions for Existing Sources, Rule Documentation (tons)**
Spark Ignition: Four stroke rich burn (SI: 4SRB)	Non-selective catalytic reduction 97% NOX, 49% CO * 76% VOC	Non-emergency, Major, HP > 500	06/15/04	June 15, 2007	CO: 98,040 NOX: 69,862 VOC:1461***
SI: 4SRB	Same as above	Non-emergency, Area, HP >500	08/20/10	October 19, 2013	NOX: 96,479 CO: 109,321 VOC: 30,907
SI: Four stroke lean burn (4SLB)	Oxidation Catalyst 94% CO, 71% VOC	Non-emergency Major, 100-500 HP, Area > 500 HP	08/20/10	October 19, 2013	
Compression Ignition (CI)	Oxidation Catalyst 70% CO and VOC 30% PM2.5	Non-emergency Major and Area, HP >300	03/03/10	May 3, 2013	CO: 14,342 VOC: 27,395 PM: 2,844

*% CO used in 6/2004 rule was 90%
**Total Reductions across these rules: NOX (tons)= 166,379; CO (tons) = 221,703; VOC (tons) = 58,402; and PM (tons) = 2,844.
*** VOC reductions weren't estimated for the 2004 rule. Used 2010 approach: estimated the VOC emissions as a function of the HAP emissions by dividing HAP by 0.1944 to get the VOC emissions.

Based on analyses done in support of the rules, the RICE NESHAP published 06/15/04 estimated 69,862 tons of NOX would be reduced, and the RICE NESHAP published 08/20/10 estimates 96,479 tons NOX to be reduced. Total NOX to be reduced from existing sources for the two rules is therefore 166,379 tons. The sum of reductions for all rules for CO is 221,703; for VOC is 58,402 and for PM is 2,844.

Our projection approaches generally try to maintain the percent reductions for a category rather than match the absolute mass of the reductions. This is because the inventories used to estimate reductions from the rules are often inconsistent with the inventories that we use for modeling.

The rule-specific inventories generally come from industry survey data, and the NEI comes from state-reported data. So, rather than attempting to remove the tonnages listed in above, we used a percent reduction approach.

The percent reduction approach is to determine and apply the appropriate percent reductions to RICE sources in the modeling platform. RICE emissions are identified based on the source classification codes (SCCs) in the modeling inventory. As explained earlier, because the modeling inventory was not used as the basis for determining the air impacts of the rule, the tonnage reductions achieved by applying percent reductions associated with the RICE requirements to the platform are not expected to provide exactly the values cited above.

The percentage reduction to be applied is determined as a function of the efficiency of the control device, and the fraction of emissions in the SCC estimated to be impacted by the rule requirements. The remainder of this document presents the data and equations used to estimate the overall percent reductions to apply to each SCC. Section 2 discusses the source coverage as a function of the inventory SCCs. Sections 3 and 4 present the data used to determine the percentage of emissions from these SCCs to apply the control device efficiencies. Section 5 discusses the approach for addressing the already controlled engines, and Section 6 provides the equations for percent reduction, and summarizes the values of the parameters used to compute the percent reduction by pollutant and by engine type for years past 2014; Section 7 provides this information for the 2012 projection year which includes reductions only from the rule published in 2004. Section 8 provides a summary of the results.

2 Source Coverage

The engine types affected by the NESHAP are Spark Ignition (SI) and Compression Ignition (CI). Spark Ignition engines can be classified as Four Stroke Rich Burn Engines (4SRB), Two Stroke Lean Burn Engines (2SLB) and Four Stroke Lean Burn Engines (4SLB). Because the requirements of the rules differ between SI engine types, we must be able to distinguish among these types in the inventory.

The inventory source classification codes (SCCs) that represent SI and CI engines in the NEI are shown in Table 2-1, along with emissions (50-state sums) from the 2005 modeling platform (case=2005cr). The SI SCCS are assigned to one of five “reduction” categories depending upon the specificity of the type of SIC engine. These are: 4SRB, 4SLB, 2SLB and “SI, generic”, “boiler + engine” and “RICE + turbine.” Note that all of the gasoline engines are considered to be 100% 4SRB. A method and data to apportion the fraction of emissions from the non-specific engine type categories of “SI, generic”, “boiler+engine” and “RICE+turbine” to 4SRB and 4SLB engine types is presented in the next section. The CI SCCs only need to be apportioned to non-emergency engines, and not by any specific CI engine type, therefore the “Category for Application of Reduction” is CI.

There are also SCCs in the inventory for oil and gas operations that include emissions from the use of RICE. We denote these as “oil&gas” in Table 2-1. We do not have any data to apportion the amount of emissions from SI nor CI RICE from these SCCs. Focusing on NOX reductions, we can determine the amount of NOX reductions needed from the oil&gas SCCs in order to bring the total NOX to equal the estimates provided in the rule. The total NOX reductions from the non oil&gas SCCs sum to 80,597 tons and the total NOX reductions estimated by the two rules is 166,379 tons. If the remaining NOX from oil&gas SCCs were to make up this difference, 26% of the total oil&gas NOX would need to be reduced. Since this fraction turns out higher than the fraction of reduction to be applied to "SI, generic" SCCs, and it is expected that oil&gas SCCs would have more NOX emitting operations than the "SI,generic" SCCs, we have chosen to apply the "SI, generic" SCC fraction to the oil&gas SCCS. Because it is likely that the vast majority of oil&gas VOC is from operations other than RICE, we will not compute any VOC reduction from oil&gas SCCs. We will use the same fraction as "SI,generic" for CO.

Table 2-1. SCCs representing the point source and non-point source universe of RICE

SCC	Description	Engine Type	Category for Application of Reduction	NOX 2005 (tons)	CO 2005 (tons)	VOC 2005 (tons)	PM2.5 2005 (tons)
20100102	Internal Combustion Engines;Electric Generation;Distillate Oil (Diesel);Reciprocating	CI	CI	17,662	3,792	1,294	645
20100105	Internal Combustion Engines;Electric Generation;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby	CI	CI	87	22	10	9
20100107	Internal Combustion Engines;Electric Generation;Distillate Oil (Diesel);Reciprocating: Exhaust	CI	CI	221	79	9	10
20100202	Internal Combustion Engines;Electric Generation;Natural Gas;Reciprocating	SI	SI, generic	7,490	3,675	909	115
20100207	Internal Combustion Engines;Electric Generation;Natural Gas;Reciprocating: Exhaust	SI	SI, generic	1	0	0	0
20200102	Internal Combustion Engines;Industrial;Distillate Oil (Diesel);Reciprocating	CI	CI	11,785	3,323	908	772
20200104	Internal Combustion Engines;Industrial;Distillate Oil (Diesel);Reciprocating: Cogeneration	CI	CI	494	128	18	31
20200107	Internal Combustion Engines;Industrial;Distillate Oil (Diesel);Reciprocating: Exhaust	CI	CI	254	74	15	7
20200202	Internal Combustion Engines;Industrial;Natural Gas;Reciprocating	SI	SI, generic	215,888	74,610	16,560	2,339
20200204	Internal Combustion Engines;Industrial;Natural Gas;Reciprocating: Cogeneration	SI	SI, generic	704	413	110	14
20200207	Internal Combustion Engines;Industrial;Natural Gas;Reciprocating: Exhaust	SI	SI, generic	15	50	1	0
20200252	Internal Combustion Engines;Industrial;Natural Gas;2-cycle Lean Burn	SI	2SLB	153,857	27,103	9,089	2,216
20200253	Internal Combustion Engines;Industrial;Natural Gas;4-cycle Rich Burn	SI	4SRB	66,871	53,724	5,337	512
20200254	Internal Combustion Engines;Industrial;Natural Gas;4-cycle Lean Burn	SI	4SLB	47,932	20,287	5,333	385
20200255	Internal Combustion Engines;Industrial;Natural Gas;2-cycle Clean Burn	SI	2SLB	591	288	70	22
20200256	Internal Combustion Engines;Industrial;Natural Gas;4-cycle Clean Burn	SI	4SLB	1,719	1,924	365	29
20200301	Internal Combustion Engines;Industrial;Gasoline;Reciprocating	SI	4SRB	660	1,966	110	26
20200307	Internal Combustion Engines;Industrial;Gasoline;Reciprocating: Exhaust	SI	4SRB	56	54	9	3
20201001	Internal Combustion Engines;Industrial;Liquified Petroleum Gas (LPG);Propane: Reciprocating	SI	SI, generic	101	130	52	9
20201002	Internal Combustion Engines;Industrial;Liquified Petroleum Gas (LPG);Butane: Reciprocating	SI	SI, generic	13	22	0	0
20201702	Internal Combustion Engines;Industrial;Gasoline;Reciprocating Engine	SI	4SRB	3	31	9	0
20201707	Internal Combustion Engines;Industrial;Gasoline;Reciprocating: Exhaust	SI	4SRB	0	4	0	0
20300101	Internal Combustion Engines;Commercial/Institutional;Distillate Oil (Diesel);Reciprocating	CI	CI	4,476	1,512	455	330
20300105	Internal Combustion Engines;Commercial/Institutional;Distillate Oil	CI	CI	0	0	0	0

SCC	Description	Engine Type	Category for Application of Reduction	NOX 2005 (tons)	CO 2005 (tons)	VOC 2005 (tons)	PM2.5 2005 (tons)
	(Diesel);Reciprocating: Crankcase Blowby						
20300107	Internal Combustion Engines;Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Exhaust	CI	CI	9	1	0	6
20300201	Internal Combustion Engines;Commercial/Institutional;Natural Gas;Reciprocating	SI	SI, generic	17,532	6,165	1,883	113
20300204	Internal Combustion Engines;Commercial/Institutional;Natural Gas;Cogeneration	SI	generic	170	200	22	4
20300207	Internal Combustion Engines;Commercial/Institutional;Natural Gas;Reciprocating: Exhaust	SI	SI, generic	17	2	1	0
20300301	Internal Combustion Engines;Commercial/Institutional;Gasoline;Reciprocating	SI	4SRB	348	4,250	245	80
20300307	Internal Combustion Engines;Commercial/Institutional;Gasoline;Reciprocating: Exhaust	SI	4SRB	4	21	3	-
20301001	Internal Combustion Engines;Commercial/Institutional;Liquified Petroleum Gas (LPG);Propane: Reciprocating	SI	SI, generic	61	28	12	2
20301002	Internal Combustion Engines;Commercial/Institutional;Liquified Petroleum Gas (LPG);Butane: Reciprocating	SI	SI, generic	0	0	0	-
20400401	Internal Combustion Engines;Engine Testing;Reciprocating Engine;Gasoline	SI	4SRB	647	11,538	738	44
20400402	Internal Combustion Engines;Engine Testing;Reciprocating Engine;Diesel/Kerosene	CI	CI	3,935	968	235	163
20400403	Internal Combustion Engines;Engine Testing;Reciprocating Engine;Distillate Oil	CI	CI	2	1	0	0
31000203	Industrial Processes;Oil and Gas Production;Natural Gas Production;Compressors	SI	SI, generic	29,605	10,849	2,333	272
50100421	Waste Disposal;Solid Waste Disposal - Government;Landfill Dump;Waste Gas Recovery: Internal Combustion Device	SI	SI, generic	914	1,220	103	53
2101004000	Stationary Source Fuel Combustion;Electric Utility;Distillate Oil;Total: Boilers and IC Engines	CI	Boiler+engine	258	60	4	1
2101004002	Stationary Source Fuel Combustion;Electric Utility;Distillate Oil;All IC Engine Types	CI	CI	2,218	462	112	9
2101006000	Stationary Source Fuel Combustion;Electric Utility;Natural Gas;Total: Boilers and IC Engines	SI	Boiler+engine	2,413	4,500	1,294	8
2101006002	Stationary Source Fuel Combustion;Electric Utility;Natural Gas;All IC Engine Types	SI	RICE+turbine	6,089	1,347	52	148
2102004000	Stationary Source Fuel Combustion;Industrial;Distillate Oil;Total: Boilers and IC Engines	CI	Boiler+engine	89,906	20,956	3,223	6,494
2102006000	Stationary Source Fuel Combustion;Industrial;Natural Gas;Total: Boilers and IC Engines	SI	Boiler+engine	150,642	99,171	6,733	775
2102006002	Stationary Source Fuel Combustion;Industrial;Natural Gas;All IC Engine Types	SI	RICE+turbine	14,845	5,791	1,543	9
2103004000	Stationary Source Fuel Combustion;Commercial/Institutional;Distillate Oil;Total: Boilers and IC Engines	CI	Boiler+engine	43,266	10,520	1,340	6,461
2103006000	Stationary Source Fuel Combustion;Commercial/Institutional;Natural Gas;Total: Boilers and IC Engines	SI	Boiler+engine	138,027	95,914	8,684	933
2199004000	Stationary Source Fuel Combustion;Total Area Source Fuel Combustion;Distillate Oil;Total: Boilers and IC Engines	CI	Boiler+engine	199	210	12	15
2199004002	Stationary Source Fuel Combustion;Total Area Source Fuel Combustion;Distillate Oil;All IC Engine Types	CI	RICE+turbine	11,327	5,227	1,158	797
2199006000	Stationary Source Fuel Combustion;Total Area Source Fuel Combustion;Natural Gas;Total: Boilers and IC Engines	SI	Boiler+engine	2,592	600	124	166
2310020600	Industrial Processes;Oil and Gas Exploration and Production;Natural Gas;Compressor Engines	SI	SI, generic	48,393	29,980	5,300	-
2310000000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes;Total: All Processes	oil&gas		14,456	2,654	26,308	-
2310000220	Industrial Processes;Oil and Gas Exploration and	oil&gas		85,302	26,575	5,579	2,945

SCC	Description	Engine Type	Category for Application of Reduction	NOX 2005 (tons)	CO 2005 (tons)	VOC 2005 (tons)	PM2.5 2005 (tons)
	Production;All Processes;Drill Rigs						
2310000440	Industrial Processes;Oil and Gas Exploration and Production;All Processes;Saltwater Disposal Engines	oil&gas		121	17	7	-
2310001000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes : On-shore;Total: All Processes	oil&gas		193,183	226,478	286,654	-
2310002000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes : Off-shore;Total: All Processes	oil&gas		1,859	-	310	-
2310020000	Industrial Processes;Oil and Gas Production: SIC 13;Natural Gas;Total: All Processes	oil&gas		7,253	3,114	17,584	101
2310023000	Industrial Processes;Oil and Gas Exploration and Production;Natural Gas;Cbm Gas Well - Dewatering Pump Engines	oil&gas		4,104	-	-	-

3 Spark Ignition (SI) Engines

Table 3-1, Table 3-2, and Table 3-3 provides the distribution of emissions by source type (major versus area), engine type and HP range for NOX, CO and VOC, respectively. The data are from the rule analyses and were provided by Melanie King, EPA, Sector Policies and Programs Division. These tables provide the information needed to apportion the emissions from generic reciprocating engine SI SCCs in Table 2-1 to the particular engine type requiring controls. For example, the proportion of NOX emissions from major 4SRB Non-emergency engines from all major reciprocating engines is 91,657/278,460 = 33%. The emissions in these tables are also broken out by HP; thus they also provide the data needed to apportion the emissions to the HP range requiring the controls. Furthermore, we have used them to create a ratio of major to area emissions for SI engines. We had previously used the NEI's SRCTYPE data field which indicates the facility's status- major vs area- with respect to HAPs (based on the major/area definitions in Section 112 of the Clean Air Act). This approach, which used for the 2016cr1_hg_05 case and related source apportionment case (both of these were used for the Boiler MACT Regulatory Impact Assessment, and no other modeling) resulted in major/area splits heavily weighted to major sources: 77%/23%, 81%/19% and 75%/25% for 4SRB for NOX, CO and VOC, respectively and 91%/9% for both CO and VOC for 4 SLB. However, we have chosen to update this as we have more confidence in the major/area breakout done for the rule analysis than the value reported in the inventory for which we have discovered errors in the SCRTYPE value or found it missing. Using the data Table 3-1, Table 3-2, and Table 3-3, we determine that 27% of the emissions are from major sources and 73% are from area sources. This is approximately the same for all pollutants, and we also use it for all SI engine types.

The below subjections provide the apportionment factors for both engine type and HP ranges for the SI engines.

Table 3-1. Distribution of NOX by engine and HP type for major and area sources

Baseline NOX emissions from major and area sources (with 20% 4SRB have NSCR), SI engines

HP Range	Total NOx Emissions-**major sources**	2SLB Non-emergency-**major sources**	4SLB Non-emergency-**major sources**	4SRB Non-emergency-**major sources**	Emergency-**major sources**	Landfill/ Digester Gas Non-emergency-**major sources**	Total NOx Emissions-**area sources**	2SLB-**area sources**	4SLB-**area sources**	4SRB-**area sources**	Emergency-**area sources**	Landfill/ Digester Gas-**area sources**
25-50	41,751	12,806	15,054	13,853	38	0	68,566	21,031	24,722	22,750	63	0
50-100	22,363	6,859	8,063	7,420	21	0	58,985	18,092	21,268	19,571	54	0
100-175	64,914	19,911	23,405	21,538	60	0	133,065	40,815	47,978	44,150	123	0
175-300	24,168	7,413	8,714	8,019	22	0	82,359	25,261	29,695	27,326	76	0
300-500	25,106	7,700	9,052	8,330	23	0	99,679	30,574	35,940	33,073	92	0
500-600	19,426	5,825	6,847	6,301	18	436	69,094	19,760	23,228	21,375	59	4,671
600-750	4,097	1,228	1,444	1,329	4	92	14,438	4,328	5,087	4,682	13	327
>750	76,635	22,971	27,002	24,848	71	1744	227,890	68,313	80,303	73,896	210	5,169
Total	**278,460**	**84,713**	**99,581**	**91,637**	**256**	**2,272**	**754,077**	**228,175**	**268,222**	**246,822**	**690**	**10,167**

Table 3-2. Distribution of CO by engine and HP type for major and area sources

Baseline CO emissions from major and area sources (with 20% 4SRB have NSCR), SI engines

HP Range	Total CO Emissions-**major sources**	2SLB Non-emergency-**major sources**	4SLB Non-emergency-**major sources**	4SRB Non-emergency-**major sources**	Emergency-**major sources**	Landfill/ Digester Gas Non-emergency-**major sources**	Total CO Emissions-**area sources**	2SLB-**area sources**	4SLB-**area sources**	4SRB-**area sources**	Emergency-**area sources**	Landfill/ Digester Gas-**area sources**
25-50	28,798	3,247	5,131	20,368	51		46,898	5,333	8,031	33,450	83	
50-100	15,425	1,739	2,748	10,910	27		40,344	4,588	6,909	28,776	71	
100-175	44,774	5,049	7,978	31,668	79		91,013	10,350	15,586	64,917	161	
175-300	16,670	1,880	2,970	11,791	29		56,331	6,406	9,646	40,179	100	
300-500	17,316	1,953	3,086	12,248	30		68,178	7,753	11,675	48,629	121	
500-600	13,402	1,477	2,334	9,264	23	303	47,273	5,011	7,546	31,429	78	3,209
600-750	2,826	312	492	1,954	5	64	9,876	1,097	1,653	6,884	17	225
>750	52,851	5,825	9,204	36,535	93	1,194	155,890	17,323	26,086	108,654	275	3,551
Total	**192,062**	**21,482**	**33,944**	**134,738**	**337**	**1,561**	**515,803**	**57,862**	**87,132**	**362,918**	**906**	**6,985**

Table 3-3. Distribution of VOC by engine and HP type for major and area sources

Baseline VOC emissions from major and area sources (with 20% 4SRB have NSCR), SI engines

HP Range	Total VOC Emissions - major sources	2SLB Non-emergency - major sources	4SLB Non-emergency -major sources	4SRB Non-emergency - major sources	Emergency - major sources	Landfill/ Digester Gas Non-emergency - major sources	Total VOC Emissions - area sources	2SLB Non-emergency- area sources	4SLB Non-emergency - area sources	4SRB Non-emergency - area sources	Emergency - area sources	Landfill/ Digester Gas Non-emergency - area sources
25-50	5,696	939	3,513	1,240	3.3		9,354	1,543	5,770	2,036	5.4	
50-100	3,051	503	1,882	664	1.8		8,047	1,327	4,964	1,751	4.6	
100-175	8,855	1,460	5,463	1,927	5.1		18,153	2,994	11,198	3,951	10.4	
175-300	3,297	544	2,034	718	1.9		11,235	1,853	6,931	2,445	6.5	
300-500	3,425	565	2,113	745	2.0		13,598	2,242	8,388	2,960	7.8	
500-600	2,650	427	1,598	564	1.5	59	9,415	1,449	5,421	1,913	5.0	627
600-750	559	90	337	119	0.3	12	1,969	317	1,187	419	1.1	44
>750	10,450	1,685	6,302	2,224	6.0	233	31,076	5,010	18,742	6,613	17.8	693
Total	**37,982**	**6,213**	**23,241**	**8,200**	**22**	**305**	**102,846**	**16,736**	**62,600**	**22,088**	**58.7**	**1,364**
Note that this table accounts for changes to VOC baseline values made on August 16, 2010												

3.1 *Four Stroke Rich Burn Engines (4SRB)*

For 4SRB, non-selective catalytic reduction (NSCR) is expected to be required to meet the formaldehyde limit. In addition to reducing NOX, NSCR reduces CO and VOC. The control device efficiency for NOX, CO and VOC, denoted $\mathbf{R_{poll}}$ is based on the average value in Table 4 of the memo "CO Removal Efficiency as a Surrogate for HAP Removal Efficiency". For 4SRB, $\mathbf{R_{NOX}}$ **=** 97%, $\mathbf{R_{CO}}$ **=** 49%; and $\mathbf{R_{VOC}}$ = 76%

As discussed earlier, the point source inventory source classification codes (SCCs) that represent or could include these engines in the NEI are shown in Table 2-1. To determine the fraction of 4SRB in the "SI, generic" SCCs, we compute the percent of NOX, CO and VOC emissions from rich burn engines from "baseline estimates" (considering existing controls --- 20% 4SRB have NSCR) of NOX, CO and VOC from 4SRB. We denote this fraction as $\mathbf{F_{4SRB,\ poll}}$. Using the total NOX emissions from all SI RICE and 4SRB in Table 3-1, the proportion of NOX from 4SRB from major source SI engines is computed as 91,637/278,460 = 33% and the proportion of NOX from 4SRB from area source SI engines is computed as 246,822/754,077 = 33%. Thus, $\mathbf{F_{4SRB,\ NOX}}$ = 0.33. Using Table 3-2, $\mathbf{F_{4SRB,\ CO}}$ = 0.7 (same for both major and area sources) and using Table 3-3**,** $\mathbf{F_{4SRB,\ VOC}}$ = 0.216 (same for both major and area sources). As discussed previously, we use the same $\mathbf{F_{4SRB}}$ for oil&gas SCCs other than for VOC, for which we use $\mathbf{F_{4SRB,\ VOC}}$ = 0

To apportion the "engine+boiler" SCCs to 4SRB, we use the inventory estimates of boiler and engine emissions stationary RICE, to apportion to "SI, generic" and then use the factors discussed above to apportion to 4SRB. Using the 2005 emission estimates for SCCs associated with natural gas boilers, natural gas RICE and turbine RICE, we compute that 63% of the NOX are from natural gas RICE, 54% of the CO are from natural gas RICE and 70% of the VOC are from natural gas RICE. Therefore, for engine and boiler SCCs: $\mathbf{F_{4SRB,\ NOX}}$ = 0.63x0.33 = 0.21, $\mathbf{F_{4SRB,\ CO}}$ = 0.54x0.7 = 0.38 and $\mathbf{F_{4SRB,\ VOC}}$ = 0.70x0.216= 0.15.

We apportion "RICE+turbine" SCCs using 2005 Platform emissions as well. In this case, $\mathbf{F_{4SRB,\,NOX}}$ = 0.78x0.33 = 0.26, $\mathbf{F_{4SRB,\,CO}}$ = 0.79x0.7= 0.55 and $\mathbf{F_{4SRB,\,VOC}}$ = 0.89x0.216 = 0.19

The August 2010 regulation requires engines at area sources greater than 500 HP to have NSCR. Major sources that are of that size are subject to limits that require NSCR from the 2004 rule. To determine the fraction of 4SRB emissions that are greater than 500 HP, we use the data in Table 3-1, Table 3-2, and Table 3-3. Since the size cutoffs and emissions distributions are different for major and area sources, we denote the fraction as $\mathbf{F_{sizecut,major,poll}}$ and $\mathbf{F_{sizecut,area,poll}}$ for major and area sources, respectively. The values from the tables are as follows,
$\mathbf{F_{sizecut,major,NOX}} = \mathbf{F_{sizecut,major,CO}} = \mathbf{F_{sizecut,major,VOC}} = 0.354$ and
$\mathbf{F_{sizecut,area,NOX}} = \mathbf{F_{sizecut,area,CO}} = \mathbf{F_{sizecut,area,VOC}} = 0.405$

3.2 Two Stroke Lean Burn Engines (2SLB)

For 2SLB, the only engines that would be required to meet limits based on catalysts would be new (meaning constructed 2003 and later) non-emergency >500 HP at major sources. As a result, we will not apply any reductions to 2SLB in the 2005 NEI.

3.3 Four Stroke Lean Burn Engines (4SLB)

These engines will require an oxidation catalyst, which in addition to reducing HAP, reduces CO and VOC. Per information emailed by Melanie King (7/7/2010): For 4SLB, $\mathbf{R_{CO}}$ = 94%; and $\mathbf{R_{VOC}}$ = 71%

To apportion emissions of "SI,generic" SCCs to 4SLB , we use the total CO emissions from all SI RICE and 4SLB in Table 3-1. The proportion of CO from 4SLB from major source SI engines is computed as 33,944 / 192,062 = 18% and the proportion of CO from 4SLB from area source SI engines is computed as 87,132/515,803 = 17%. Since these values are close, we chose 17%. ($\mathbf{F_{4SLB,\,CO}}$ = 0.17.) Using Table 3-2, $\mathbf{F_{4SLB,\,VOC}}$ = 0.61 (roughly the same fraction for both major and area sources). The $\mathbf{F_{4SLB,\,CO}}$ value also applies to oil&gas SCCs. $\mathbf{F_{4SLB,\,VOC}}$ from oil&gas SCCs =0.

We also need to determine $\mathbf{F_{4SLB,\,CO}}$ and $\mathbf{F_{4SLB,\,VOC}}$ for SCCs with categories of "Boiler+engine" and "RICE+turbine". We can use the same approach as for 4SRB. In this case, for "Boiler+engine" SCCs, $\mathbf{F_{4SLB,\,CO}}$ = 0.54x 0.17 = 0.10 and $\mathbf{F_{4SLB,\,VOC}}$ = 0.70 x 0.61 = 0.43. For "RICE+turbine" SCCs: $\mathbf{F_{4SLB,\,CO}}$ = 0.79 x.0.17 = 0.13 and $\mathbf{F_{4SLB,\,VOC}}$ = 0.89 x0.61 = 0.54.

The August 20, 2010 rule requires existing non-emergency engines 100-500 HP at major sources and existing non-emergency engines >500 HP at area sources to meet limits based on oxidation catalyst. Engines greater than 500 HP at major sources were regulated under the 2004 rule and we didn't put any emission limits on them, and therefore would not need an oxidation catalyst.

To determine the fraction of 4SLB emissions that in those HP ranges, we use the data in Table 3-1, Table 3-2, and Table 3-3. Since these fractions are different for major and area sources, we denote the fraction as $\mathbf{F}_{\mathbf{sizecut,major,poll}}$ and $\mathbf{F}_{\mathbf{sizecut,area,poll}}$ for major and area sources, respectively. The values from the tables are as follows,

$\mathbf{F}_{\mathbf{sizecut,major\ ,CO}} = \mathbf{F}_{\mathbf{sizecut,\ major,VOC}} = 0.41$ and $\mathbf{F}_{\mathbf{sizecut,area,CO}} = \mathbf{F}_{\mathbf{sizecut,area,VOC}} = 0.40$

4 Compression Ignition (CI) Engines

Compression ignition engines are not distinguished further (by burn type) as are Spark Ignition. However, the amount of emissions from emergency engines, for which existing engines would not be required to apply oxidation catalyst, is significant relative to non-emergency engines. Therefore the fraction of emissions from non-emergency engines will be applied to all SCCs identified as CI in Table 2-1 in addition to the fraction that will be subject to oxidation catalyst based on the size. Since the regulation that promulgated in March would require non-emergency existing CI engines >300 HP that are located at both major and area sources of HAP to install oxidation catalyst. Since major and area sources have the same requirements, we can use data on the proportion of emissions of the total CI population, presented in Table 4-1. The data are from the rule analyses and were provided by Melanie King, EPA, Sector Policies and Programs Division.

Table 4-1. Distribution of CO, PM and VOC emissions from Compression Ignition Engines by Engine and HP type for major and area sources

Summary of Major Source and Area Source Baseline Emissions for the RICENESHAP								
		Baseline Emissions (tpy)				**Baseline Emissions (tpy)**		
Size Range (HP)	***Number of Engines - nonemergency***	***CO - nonemergency***	***PM - nonemergency***	***VOC - nonemergency***	***Number of Emergency Engines***	***CO emergency***	***PM emergency***	***VOC emergency***
Major Sources								
50-100	18,547	6,454	487	2,010	74,187	1,291	97	402
100-175	24,301	8,457	1,170	4,828	97,206	1,691	234	966
175-300	18,429	6,413	1,532	6,324	73,715	1,283	306	1,265
300-500	9,696	3,374	1,357	5,604	38,785	675	271	1,121
500-600	860	299	165	683	3,438	60	33	137
600-750	440	153	104	429	1,760	31	21	86
>750	971	338	340	1,402	3,882	68	68	280
Total	73,243	25,489	5,155	21,281	292,974	5,098	1,031	4,256
Area Sources								
50-100	27,820	9,681	730	3,015	111,281	1,936	146	603
100-175	36,452	12,685	1,754	7,242	145,808	2,537	351	1,448
175-300	27,643	9,620	2,298	9,486	110,573	1,924	460	1,897
300-600	21,816	7,592	3,436	14,186	87,266	1,518	687	2,837
600-750	3,657	1,273	864	3,567	14,628	255	173	713
>750	6,479	2,255	2,268	9,361	25,914	451	454	1,872
Total	123,867	43,106	11,350	46,857	495,470	8,621	2,270	9,371

Per the rule, there would be 70% reduction of HAP, CO, and VOC and 30% reduction of PM from the catalyst. We also assume that the control achieves the same reduction from PM2.5 as PM. There are no NOX reductions. Therefore, For CI, $\mathbf{R}_{\mathbf{CO}} = 70\%$; $\mathbf{R}_{\mathbf{VOC}} = 70\%$ and $\mathbf{R}_{\mathbf{PM2.5}} = 30\%$.

The fraction of emissions for CO and VOC that are both non-emergency and greater than 300HP are computed from the above Table 4-1
$\mathbf{F}_{nonE,sizecut,major,CO}$ = 0.14. $\mathbf{F}_{nonE,sizecut,major,VOC}$ = $\mathbf{F}_{nonE,sizecut,major,PM2.5}$ =0.32
$\mathbf{F}_{nonE,sizecut,area,CO}$ = 0.40 $\mathbf{F}_{nonE,sizecut,area,VOC}$ = $\mathbf{F}_{nonE,sizecut,area,PM2.5}$ = 0.65

We also need to apportion the fraction of emissions from SCCs with categories of "Boiler+engine" and "RICE+turbine" that are attributed to CI engines. We can use a similar approach as for 4SRB and 4SLB. In this case, we only need to break out CI RICE (and not a type of CI) so we only need the fraction of "Boiler+engine" emissions that are CI RICE. Using 2005 Platform emissions from diesel SCCs for boilers, RICE and turbine engines, we compute the following fractions to apportion "Boiler+engine" SCCs to CI RICE:, $\mathbf{F}_{CI,\ CO}$ = 0.61 and $\mathbf{F}_{CI,\ VOC}$ = 0.84 and $\mathbf{F}_{CI,\ PM2.5}$ = 0.50

For "RICE+turbine" SCCs: $\mathbf{F}_{CI,\ CO}$ = 0.83 and $\mathbf{F}_{CI,\ VOC}$ = 0.92 and $\mathbf{F}_{CI,\ PM2.5}$ = 0.78

5 Approach For Addressing Already-Controlled Sources

Although we know that a certain percentage of engines are already controlled (they set the basis of the MACT floor), we will use the existing control information in the inventory (and the capability for the software applying the controls to not apply additional controls to already-controlled sources) rather than account for already-controlled sources by pro-rating the percent reduction we apply to all sources. While this approach will overestimate reductions for already-controlled sources that are missing the control information in the inventory, it will be less of an impact than the pro-rating approach which would underestimate the reductions for the uncontrolled sources.

6 Percent Reduction Calculations to be applied to NEI That Account for all Three RICE rules

The next sections provide the calculations and data to determine the percent reductions to apply to the 2005 v4.1 modeling platform for projecting these emissions to2014 and beyond. By 2014 all three of the RICE rules' compliance dates have passed

6.1 SI Engines

Table 6-1shows the reduction to be applied to the SI engine SCCs identified in Table 2-1 based on the parameters computed from the baseline emissions in Table 3-1, Table 3-2 and Table 3-3 and discussed in Section 3. The formula for the percent reduction is provided in the first row:

Table 6-1. Formula for determining the percent reduction to apply to SI SCCs for Projection Years of 2014 and Beyond

PERCENT REDUCTION$_{SI,poll}$ **= PERCENT REDUCTION**$_{4SRB,poll}$ + **PERCENT REDUCTION**$_{4SLB,poll}$

Where:

PERCENT REDUCTION$_{4SRB,poll}$ **=** $R_{poll} \times F_{4SRB} \times F_{sizecut,major,poll} \times F_{major,poll} + R_{poll} \times F_{4SRB} \times F_{sizecut,area,poll} \times F_{area,poll}$

PERCENT REDUCTION$_{4SLB,poll}$ **=** $R_{poll} \times F_{4SLB} \times F_{sizecut,major,poll} \times F_{major,poll} + R_{poll} \times F_{4SLB} \times F_{sizecut,area,poll} \times F_{area,poll}$

Note that R_{poll} F_{major} F_{area} $F_{sizecut,major,poll}$ $F_{sizecut,area,poll}$ are all dependent upon the engine (4SRB versus 4SLB) . Values for these and the other parameters are provided below.

Parameter	Description	Value and How Determined, 4SRB	Value and How Determined, 4SLB
R_{poll}	The estimated reduction of pollutant "poll" (e.g., NOX, VOC, CO) resulting from application of the control device needed to meet the standard	NSCR: Use same values used in rule. NOX reduction, R_{NOX} is 97% CO reduction, R_{CO} is 49% VOC reduction, R_{VOC} is 76%	Oxidation Catalyst: Use same reductions values used in rule. CO reduction, R_{CO} is 94% VOC reduction, R_{VOC} is 71%
$F_{major,poll}$	the fraction of emissions from SI engines that attributable to major sources	As discussed in Section 3, we used Tables 3-1 to 3-3 to compute the fraction and used the same for all pollutants and all SI engine types $F_{major,NOX}$ =, $F_{major,CO}$ =, $F_{major,VOC}$= 0.27	As discussed in Section 3, we used Tables 3-1 to 3-3 to compute the fraction and used the same for all pollutants and all SI engine types $F_{major,CO}$ =,$F_{major,VOC}$= 0.27
$F_{area,poll}$	the fraction of emissions from rich burn engines attributable to area sources	1 - F_{major}	1 - F_{major}
$F_{sizecut,major,poll}$	the fraction of emissions equal or above the size cutoff for which the control device will be required for major sources	Table 3-1, Table 3-2, and Table 3-3. Cutoff is 500 HP Compute fraction of emissions for 4SRB engines at 500 and above HP to total 4SRB; major sources. $F_{sizecut,major,NOX}$ = $F_{sizecut,major,CO}$ = $F_{sizecut,major,VOC}$ =0.354	Table 3-1, Table 3-2, and Table 3-3. Assume 100-500 HP. Compute fraction of emissions for 4SLB engines between 100 and 500HP to total 4SLB; major sources. $F_{sizecut,major,CO}$ = $F_{sizecut,major VOC}$ = 0.41
$F_{sizecut,area,poll}$	the fraction of emissions equal or above the size cutoff for which SNCR will be required for area sources	Table 3-1, Table 3-2, and Table 3-3. Assume 300 HP (final rule Aug 2010). Compute fraction of emissions for 4SRB engines at 300 and above HP to total 4SRB; area sources. $F_{sizecut,area,NOX}$ = $F_{sizecut,area,CO}$ = $F_{sizecut,area,VOC}$ =0.405	Table 3-1, Table 3-2, and Table 3-3.. Assume 500 HP. Compute fraction of emissions for 4SLB engines at 500 and above HP to total 4SLB; area sources. $F_{sizecut,area,CO}$ = $F_{sizecut,area,VOC}$ = 0.40
$F_{4SRB, poll}$ $F_{4SLB, poll}$	Fraction of emissions within the SCC that are rich burn and 4 stroke lean burn, respectively	Use 100% for 4SRB SCCs. For "SI, generic" SCCs, use Table 3-1, Table 3-2, and Table 3-3. Percent of emissions of 4SRB out of all SI. $F_{4SRB, NOX}$ = .33, $F_{4SRB, CO}$ = .70 $F_{4SRB, VOC}$= .216 Note that same values apply to "oil&gas" SCCs except $F_{4SRB, VOC}$= 0 For "Boiler+engine" SCCs" : $F_{4SRB, NOX}$ = .21, $F_{4SRB, CO}$ = .38 $F_{4SRB, VOC}$= .151 For ""RICE+turbine" SCCs: $F_{4SRB, NOX}$ = .26, $F_{4SRB, CO}$ = .55 $F_{4SRB, VOC}$= .192	Use 100% for 4SLB SCCs . For "SI, generic" SCCs, use Table 3-1, Table 3-2, and Table 3-3. Percent of emissions of 4SLB out of all SI. $F_{4SLB, CO}$ = .17, $F_{4SLB, VOC}$= .59 Note that same values apply to "oil&gas" SCCs except for VOC. For "Boiler+engine" SCCs" : $F_{4SLB, CO}$ = .10, $F_{4SLB, VOC}$= .41 For ""RICE+turbine" SCCs: $F_{4SLB, CO}$ = .13, $F_{4SLB, VOC}$= .52

6.2 CI Engines

Table 6-1 shows the reduction to be applied to the CI engine SCCs identified in **Error! Reference source not found.** based on the parameters computed from the baseline emissions in Table 4-1.

Table 6-2. Formula for determining the percent reduction to apply to Compression Ignition (CI) SCCs for Projection Years of 2014 and later

$$\text{PERCENT REDUCTION}_{CI,poll} = R_{poll} \times F_{CI,\,POLL} \times F_{nonE,sizecut,major} \times F_{major} + R_{poll} \times F_{CI,\,POLL} \times F_{nonE,sizecut,area} \times F_{area}$$

Parameter	Description	Value and How Determined, CI
R_{poll}	the estimated reduction of pollutant "poll" (e.g., NOX, VOC, CO) resulting from application of the control device needed to meet the standard	Oxidation Catalyst: Use same values used in rule. (specific to CI) CO reduction, R_{CO} is 70% VOC reduction, R_{VOC} is 70% PM2.5 reduction, $R_{PM2.5}$ is 30%
$F_{CI,\,POLL}$	The fraction of emissions that are CI RICE. This value is 1 except for CI engines that are in "Boiler+Engine" or "turbine+RICE" Use 2005 Platform emissions of RICE, non-RICE engines and boilers to compute fractions	**Value is 1 except for** CI engines that are characterized in "Boiler+Engine" or "turbine+RICE" **For** "Boiler+Engine" SCCs, $F_{CI,\,CO} = 0.61$ and $F_{CI,\,VOC} = 0.84$ and $F_{CI,\,PM2.5} = 0.50$ For "RICE+turbine" SCCs: $F_{CI,\,CO} = 0.83$ and $F_{CI,\,VOC} = 0.92$ and $F_{CI,\,PM2.5} = 0.78$
F_{major}	the fraction of emissions from CI engines attributable to major sources	Based on an analysis of the 2005 NEI using the "SRCTYPE" field (01 are the major, 02 are area). Since so much unknown, renormalize $F_{major,CO} = 0.42$, $F_{major,VOC} = 0.38$, $F_{major,PM2.5} = 0.44$ That fraction will be used for all pollutants.
F_{area}	the fraction of emissions from CI engines attributable to area sources	$1 - F_{major}$
$F_{nonE,sizecut,major,poll}$	The fraction of emissions from major sources from the CI SCCs that will require oxidation catalyst to meet the standard because they are non-Emergency and meet the size cutoff.	Table 4-1. The fraction of emissions of non-emergency engines from major sources equal or above 300 HP $F_{nonE,sizecut,major,CO} = 0.14$. $F_{nonE,sizecut,major,VOC} = F_{nonE,sizecut,major,PM2.5} = 0.32$
$F_{nonE,sizecut,area,poll}$	The fraction of emissions from area sources from the CI SCCs that will require oxidation catalyst to meet the standard because they are non-Emergency and meet the size cutoff.	Table 4-1. The fraction of emissions of non-emergency engines from major sources equal or above 300 HP $F_{nonE,sizecut,area,CO} = 0.40$. $F_{nonE,sizecut,area,VOC} = F_{nonE,sizecut,area,PM2.5} = 0.65$

7 Percent Reduction Calculations to be applied to NEI accounting for only the 2004 RICE rule

This section presents the formula and values to use when projecting emissions to 2012; in this situation, only the SI 4SRB engines greater than 500 HP at major sources are reduced because the compliance date for the rule that affects these engines in June 2007 which is prior to 2012. The other engines' reductions are not anticipated until the compliance dates (2013) of the most recent rules. Because these dates are after 2012, they are not incorporated into the emission projection for 2012.

7.1 SI Engines

Table 7-1 shows the reduction to be applied to the SI engine SCCs identified in Table 2-1 based on the parameters computed from the baseline emissions in Table 3-1, Table 3-2 and Table 3-3 and discussed in Section 3. The formula for the percent reduction is provided in the first row:

Table 7-1. Formula for determining the percent reduction to apply to SI SCCs for the 2012 projection

$\textbf{PERCENT REDUCTION}_{SI,poll} = \textbf{PERCENT REDUCTION}_{4SRB,poll}$ $\textbf{PERCENT REDUCTION}_{4SRB,poll} = R_{poll} \times F_{4SRB} \times F_{sizecut,major,poll} \times F_{major,poll}$

Parameter	Description	Value and How Determined, 4SRB
R_{poll}	The estimated reduction of pollutant "poll" (e.g., NOX, VOC, CO) resulting from application of the control device needed to meet the standard	NSCR: Use same values used in rule. NOX reduction, R_{NOX} is 97% CO reduction, R_{CO} is 49% VOC reduction, R_{VOC} is 76%
$F_{major,poll}$	the fraction of emissions from SI engines that attributable to major sources	Based on an analysis of the 2005 NEI using the "SRCTYPE" field (01 are the major, 02 are area) $F_{major,NOX}$ = 0.77, $F_{major,CO}$ =0.81, $F_{major,VOC}$= 0.75
$F_{sizecut,major,poll}$	the fraction of emissions equal or above the size cutoff for which the control device will be required for major sources	Table 3-1, Table 3-2, and Table 3-3. Assume 300 HP (final rule Aug 2010). Compute fraction of emissions for 4SRB engines at 300 and above HP to total 4SRB; major sources. $F_{sizecut,major,NOX}$ = $F_{sizecut,major,CO}$ = $F_{sizecut,major,VOC}$ =0.445
$F_{sizecut,area,poll}$	the fraction of emissions equal or above the size cutoff for which SNCR will be required for area sources	Table 3-1, Table 3-2, and Table 3-3. Assume 300 HP (final rule Aug 2010). Compute fraction of emissions for 4SRB engines at 300 and above HP to total 4SRB; area sources. $F_{sizecut,area,NOX}$ = $F_{sizecut,area,CO}$ = $F_{sizecut,area,VOC}$ =**0.405**\
$F_{4SRB, poll}$ $F_{4SLB, poll}$	Fraction of emissions within the SCC that are rich burn and 4 stroke lean burn, respectively	Use 100% for 4SRB SCCs. For "SI, generic" SCCs, use Table 3-1, Table 3-2, and Table 3-3. Percent of emissions of 4SRB out of all SI. $F_{4SRB, NOX}$ = .33, $F_{4SRB, CO}$ = .7 $F_{4SRB, VOC}$= .37 Note that same values apply to "oil&gas" SCCs except $F_{4SRB, VOC}$= 0 For "Boiler+engine" SCCs" :

		$\mathbf{F_{4SRB, NOX}}$ = .21, $\mathbf{F_{4SRB, CO}}$ = .38 $\mathbf{F_{4SRB, VOC}}$= .26 For ““RICE+turbine” SCCs: $\mathbf{F_{4SRB, NOX}}$ = .26, $\mathbf{F_{4SRB, CO}}$ = .55 $\mathbf{F_{4SRB, VOC}}$= .34

7.2 CI Engines

For a 2012 projection there are no reductions to apply to existing CI engines since they are impacted only by the 2010 NESHAP.

8 Results

A summary of the percent reductions by Engine Type and Reduction Category for the SCCs shown in Table 2-1 resulting from the implementation of the RICE rule as amended in August 2010 is presented in Table 8-1. A summary associated with just the 2004 RICE rule (which is applicable to a 2012 projection) is shown in Table 8-2.

Table 8-1. Summary of Percent Reductions and Emissions reduced from the 2005 Platform resulting from all 3 RICE rules (Future years 2014 and later)

engine type	reduction category	NOX reduction	CO reduction	VOC reduction	PM2.5 Reduction	NOX 2005cr emis (tons)	NOX_reductions (tons)	CO 2005cr emis (tons)	CO_reductions (tons)	VOC 2005cr emis (tons)	VOC_reductions (tons)	PM2.5 2005cr emis (tons)	PM25_reductions (tons)
CI	Boiler+engine	0.0%	12.4%	30.8%	7.6%	133,629	-	31,746	3,942	4,579	1,412	12,971	982
	CI	0.0%	20.4%	36.7%	15.1%	38,941	-	9,903	2,016	2,945	1,081	1,974	299
	RICE+turbine	0.0%	16.9%	33.8%	11.8%	13,545	-	5,689	961	1,270	429	806	95
oil&gas		12.5%	19.9%	0.0%	0.0%	306,278	38,367	258,838	51,400	336,442	-	3,046	0
SI	2SLB	0.0%	0.0%	0.0%	0.0%	154,448	-	27,391	-	9,159	-	2,238	0
	4SLB	0.0%	37.9%	28.6%	0.0%	49,651	-	22,211	8,408	5,698	1,629	414	0
	4SRB	38.0%	19.2%	29.7%	0.0%	68,589	26,036	71,588	13,727	6,451	1,919	665	0
	Boiler+engine	8.0%	11.1%	16.7%	0.0%	293,674	23,410	200,185	22,165	16,835	2,812	1,882	0
	RICE+turbine	9.9%	15.5%	21.2%	0.0%	20,934	2,066	7,138	1,104	1,595	339	157	0
	SI, generic	12.5%	19.9%	23.9%	0.0%	320,904	40,199	127,344	25,288	27,286	6,512	2,921	0
Grand Total						1,400,593	**130,078**	762,033	**129,011**	412,260	**16,134**	27,074	**1,376**

Table 8-2. Summary of Percent Reductions and Emissions reduced from the 2005 Platform resulting from the 2004 RICE NESHAP

engine type	reduction category	NOX reduction	CO reduction	VOC reduction	NOX 2005cr emis (tons)	NOX_ reductions (tons)	CO 2005cr emis (tons)	CO_reductions (tons)	VOC 2005cr emis (tons)	VOC_ reductions (tons)
CI	Boiler+engine	0.0%	0.0%	0.0%	133,629	0	31,746	0	4,579	0
	CI	0.0%	0.0%	0.0%	38,941	0	9,903	0	2,945	0
	RICE+turbine	0.0%	0.0%	0.0%	13,545	0	5,689	0	1,270	0
oil&gas		3.1%	3.3%	0.0%	306,278	9,381	258,838	8,495	336,442	0
SI	2SLB	0.0%	0.0%	0.0%	154,448	0	27,391	0	9,159	0
	4SLB	0.0%	0.0%	0.0%	49,651	0	22,211	0	5,698	0
	4SRB	9.3%	4.7%	7.3%	68,589	6,366	71,588	3,357	6,451	469
	Boiler+engine	1.9%	1.8%	1.1%	293,674	5,724	200,185	3,567	16,835	185
	RICE+turbine	2.4%	2.6%	1.4%	20,934	505	7,138	184	1,595	22
	SI, generic	3.1%	3.3%	1.6%	320,904	9,829	127,344	4,180	27,286	429
Grand Total					1,400,593	**31,806**	762,033	**19,782**	412,260	**1,105**

9 SO2 reductions resulting from the Ultra-low Sulfur Diesel Requirement for CI engines

This section discusses an approach to project the impact of the Ultra-low Sulfur diesel requirement for CI engines greater than 300 HP that was part of the requirements published 3/30/2010. These reductions were not accounted for in the rule due to the expectation that engine owners/operators would make the switch anyway because ULSD is what would primarily be available. On page 9669 of **Federal Register** / Vol. 75, No. 4:

We have not quantified the SOX reductions that would occur as a result of engines switching to ULSD because we are unable to estimate the number of engines that already use ULSD and therefore we are unable to estimate the percentage of engines that may switch to ULSD due to this rule. If none of the affected engines would use ULSD without this rule, then we estimate the SOX reductions are 31,000 tpy in the year 2013. If all of the affected engine would use ULSD regardless of the rule then the additional SOX reduction would be zero.

We are aware[2] of several state rules on the books or in the proposal stage that will limit the sulfur content of home heating oil. However, some do not go into effect until after the RICE ULSD limits. Because of this timing and because we have received comments on the need to account for SO2 reductions resulting from the RICE ULSD limits (MOG), we have chosen, in addition to applying applicable state rule fuel sulfur limits, to estimate the reduction due to RICE and apply the reduction in the future year projection. The RICE limits apply to CI greater than 300 HP.

Based on a summary of Baseline SO2 Emissions by Engine Size for the RICE NESHAP provided by the project lead, Melanie King[3], it was determined that approximately 50% of SO2 emissions are from engines greater than 300 HP.

We assume that CI use high sulfur fuel (3000 ppm) in 2005 and switch to ULSD by the compliance date for this RICE requirement (May 2013). In that we don't have the distribution of SO2 emissions from the various size engines as we do other pollutants (see Table 4-1), we assumed 50% of the SO2 comes from 300 HP and larger engines. Note that for other pollutants the fraction of emissions with size cutoff greater or equal to 300 HP ranges from 14% ($F_{nonE,sizecut,\ major,\ co}$) to 65% ($F_{nonE,sizecut,\ major,\ PM2.5}$)

A switch from a 3000 ppm sulfur content (home heating oil average) to 15 ppm would result in a 99.5% SO2 reduction. We apply this to all diesel RICE and the portion of SO2 emission from RICE-related SCCs that are estimated to be RICE. Using the 2005 point source inventory for industrial, commercial and institutional diesel boilers and internal combustion engines (turbines plus RICE) we computed that 81% of the SO2 emissions from internal combustion engines are from RICE and 12% of the SO2 emissions from engines+boilers are from RICE. For Oil and gas production, there is only one SCC with significant SO2 emissions: SCC=2310000220 (Industrial

[2] Email from Jeff Hertzog, OTAQ, USEPA Nov 22, 2010

[3] Email from Melanie King, OAQPS, USEPA, Nov 23, 2010 (filename: Existing CI RICE NESHAP Impacts 2-16-

10 FINAL 3000 ppm sulfur estimate.xlsx)

Processes;Oil and Gas Production: SIC 13; Drill rigs). Since we have no information to determine the amount of SO2 from RICE versus other SO2-emitting processes associated with drill rigs, we assume that all of the SO2 is associated with RICE and that 50% of the emissions are associated with RICE greater than 300 HP. Therefore, the reductions we apply are the following:

- CI SCCs: 50%*99.5%=49.75%
- CI Boiler+Engine SCCs: 50%*99.5%*12%= 5.97%
- CI RICE + turbine SCCs: 50%*99.5%*81%= 40.30%
- Oil and Gas, SCC=2310000220 (drill rigs): 50%*99.5%=49.75%

Table 9-1. SO2 emissions and reductions resulting from ultra low sulfur fuel requirement (compliance date May 2013) for CI engines greater or equal to 300 HP in the RICE NESHAP (**75 FR 9648, % reductions Based on: 1) A switch from a 3000 ppm sulfur content (home heating oil average) to 15 ppm would result in a 99.5% SO2 reduction and 2) 50% of SO2 from RICE are from engines greater than 300HP, and 3) Percent of RICE from SCCs that include RICE and/or boilers and other engines as a combined SCC was estimated based on analysis of detailed RICE, engine and boiler SCCs in 2005 platform.**

scc	scc_desc	2005 SO2 (tons)	type	percent reduction	SO2 reduced (tons)
2101004000	Stationary Source Fuel Combustion;Electric Utility;Distillate Oil;Total: Boilers and IC Engines	358.6	boilers+engines	5.97%	21
2101004002	Stationary Source Fuel Combustion;Electric Utility;Distillate Oil;All IC Engine Types	84.4	engines	40.30%	34
2102004000	Stationary Source Fuel Combustion;Industrial;Distillate Oil;Total: Boilers and IC Engines	125250.5	boilers+engines	5.97%	7,477
2103004000	Stationary Source Fuel Combustion;Commercial/Institutional;Distillate Oil;Total: Boilers and IC Engines	114818.1	boilers+engines	5.97%	6,855
2199004000	Stationary Source Fuel Combustion;Total Area Source Fuel Combustion;Distillate Oil;Total: Boilers and IC Engines	215.8	boilers+engines	5.97%	13
2199004002	Stationary Source Fuel Combustion;Total Area Source Fuel Combustion;Distillate Oil;All IC Engine Types	17691.0	engines	40.30%	7,129
2310000000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes;Total: All Processes	0.0	oil and gas		-
2310000220	Industrial Processes;Oil and Gas Production: SIC 13; Drill rigs	8749.8	oil and gas	49.75%	4,353
2310000440	Industrial Processes;Oil and Gas Production: SIC 13; Saltwater disposal engines	0.0	oil and gas	49.75%	0
2310001000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes : On-shore;Total: All Processes	0.0	oil and gas		-
2310002000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes : Off-shore;Total: All Processes	0.0	oil and gas		-
20100102	Internal Combustion Engines;Electric Generation;Distillate Oil (Diesel);Reciprocating	267.6	rice	49.75%	133
20100105	Internal Combustion Engines;Electric Generation;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby	7.0	rice	49.75%	3
20100107	Internal Combustion Engines;Electric Generation;Distillate Oil (Diesel);Reciprocating: Exhaust	9.8	rice	49.75%	5
20200102	Internal Combustion Engines;Industrial;Distillate Oil (Diesel);Reciprocating	807.7	rice	49.75%	402
20200104	Internal Combustion Engines;Industrial;Distillate Oil (Diesel);Reciprocating: Cogeneration	18.5	rice	49.75%	9
20200107	Internal Combustion Engines;Industrial;Distillate Oil (Diesel);Reciprocating: Exhaust	14.6	rice	49.75%	7
20300101	Internal Combustion Engines;Commercial/Institutional;Distillate Oil (Diesel);Reciprocating	934.7	rice	49.75%	465
20300105	Internal Combustion Engines;Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby	0.0	rice	49.75%	0
20300106	Internal Combustion Engines;Commercial/Institutional;Distillate Oil	1.0	rice	49.75%	

	(Diesel);Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)				0
20300107	Internal Combustion Engines;Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Exhaust	0.1	rice	49.75%	0
20400402	Internal Combustion Engines;Engine Testing;Reciprocating Engine;Diesel/Kerosene	315.5	rice	49.75%	157
20400403	Internal Combustion Engines;Engine Testing;Reciprocating Engine;Distillate Oil	0.1	rice	49.75%	0
2103004000	Stationary Source Fuel Combustion;Commercial/Institutional;Distillate Oil;Total: Boilers and IC Engines	18.0	boilers+engines	5.97%	1

Total SO2 reduced = **27,066 tons**

Appendix G

Mercury Speciation Fractions Used to Speciate the Future Year EGU Mercury Emissions

Category	Particulate	Divalent Gaseous	Elemental
Bituminous Coal and Pet. Coke, PC Boiler with ESP-CS	0.0117	0.4656	0.5227
Bituminous Coal, Coal Gasification	0.0051	0.0847	0.9102
Bituminous Coal, PC Boiler with Dry Sorbent Injection and ESP-CS	0.0016	0.6710	0.3274
Bituminous Coal, PC Boiler with ESP-CS	0.0611	0.6820	0.2570
Bituminous Coal, PC Boiler with ESP-CS and Wet FGD	0.0022	0.0778	0.9200
Bituminous Coal, PC Boiler with ESP-HS	0.0490	0.5784	0.3726
Bituminous Coal, PC Boiler with ESP-HS and Wet FGD	0.0063	0.2068	0.7870
Bituminous Coal, PC Boiler with FF Baghouse	0.0398	0.6258	0.3344
Bituminous Coal, PC Boiler with FF Baghouse and Wet FGD	0.0648	0.3300	0.6052
Bituminous Coal, PC Boiler with PM Scrubber	0.0180	0.1951	0.7869
Bituminous Coal, PC Boiler with SCR and SDA/FF Baghouse	0.0506	0.4604	0.4890
Bituminous Coal, PC Boiler with SDA/FF Baghouse	0.0917	0.2886	0.6197
Bituminous Coal, PC Boiler with SNCR and ESP-CS	0.2032	0.2712	0.5256
Bituminous Coal, Stoker Boiler with SDA/FF Baghouse	0.1996	0.1794	0.6211
Bituminous Coal/Pet. Coke, Cyclone with ESP-CS and Wet FGD	0.0007	0.1130	0.8863
Bituminous Coal/Pet. Coke, PC Boiler with FF Baghouse	0.0220	0.7841	0.1939
Bituminous Coal/Pet.Coke, Fludized Bed Combustor with SNCR and FF Baghouse	0.4244	0.2787	0.2970
Bituminous Waste, Fludized Bed Combustor with FF Baghouse	0.0212	0.3881	0.5907
Lignite Coal, Cyclone Boiler with ESP-CS	0.0004	0.1699	0.8297
Lignite Coal, Cyclone Boiler with SDA/FF Baghouse	0.0995	0.1707	0.7298
Lignite Coal, Fludized Bed Combustor with ESP-CS	0.0137	0.1164	0.8700
Lignite Coal, Fludized Bed Combustor with FF Baghouse	0.0042	0.7118	0.2840
Lignite Coal, PC Boiler with ESP-CS	0.0009	0.0362	0.9629
Lignite Coal, PC Boiler with ESP-CS and FF Baghouse	0.0019	0.6449	0.3532
Lignite Coal, PC Boiler with ESP-CS and Wet FGD	0.0082	0.1345	0.8574
Lignite Coal, PC Boiler with PM Scrubber	0.0016	0.0298	0.9686
Lignite Coal, PC Boiler with SDA/FF Baghouse	0.0036	0.1262	0.8702
Subbituminous Coal, Fludized Bed Combustor with SNCR and FF Baghouse	0.0027	0.0342	0.9632

Category	Particulate	Divalent Gaseous	Elemental
Subbituminous Coal, PC Boiler with ESP-CS	0.0016	0.3083	0.6901
Subbituminous Coal, PC Boiler with ESP-CS and Wet FGD	0.0043	0.0294	0.9663
Subbituminous Coal, PC Boiler with ESP-HS	0.0006	0.1252	0.8741
Subbituminous Coal, PC Boiler with ESP-HS and Wet FGD	0.0117	0.0446	0.9437
Subbituminous Coal, PC Boiler with FF Baghouse	0.0149	0.8283	0.1568
Subbituminous Coal, PC Boiler with PM Scrubber	0.0145	0.0511	0.9344
Subbituminous Coal, PC Boiler with SDA/ESP	0.0032	0.0382	0.9586
Subbituminous Coal, PC Boiler with SDA/FF Baghouse	0.0099	0.0435	0.9467
Subbituminous Coal/Pet. Coke, Cyclone Boiler with ESP-HS	0.0093	0.0752	0.9155

Appendix H

Details Regarding the PM2.5 Natural Gas Emission Factor error in IPM Post Processing

The error came about by attempting to improve estimates of natural gas emissions based on studies using a new PM test method that directly measures primary PM. Unfortunately, an incorrect value was taken from the study. It should be noted that it was also discovered that the correction factor from those studies, while intended to be used in the 2005 year, was actually not used. Another error was the value for the Gassified Coal turbines, which was intended to be updated to use newer data (unrelated to the natural gas combustion study) but was updated with the wrong value.

The Incorrect Emission factors and the SCCs it affected are listed here. The middle two columns are the emission factors that are consistent with the emission factors that were used for the base year (2005 inventory), as documented in ftp://newftp.epa.gov/air/nei/nei_criteria_summaries/2002summaryfiles/egu2002doc.pdf . The last two columns are the emission factors that would incorporate the improved estimates discussed above, and correctly use the newer data on Gasified Coal /Turbines.

SCC	Description	ERRONEOUS PM_{10} Primary EF Used in IPM Post Processing lb/MMBtu	ERRONEOUS $PM_{2.5}$ Primary EF Used in IPM Post Processing lb/MMBtu	PM10 primary EF consistent with 2005 lb/MMBtu1	PM25 primary EF consistent with 2005 lb/MMBtu	Corrected PM10 Primary EF lb/MMBtu (using 1000 btu/scf)	Corrected PM25 Primary EF lb/MMBtu (using 1000 btu/scf)
10100601	Ext Comb /Electric Gen /Natural Gas /Boilers : 100 Million Btu/hr except Tangential	0.068	0.057	7.51E-03	7.51E-03	5.20E-04	4.30E-04
10100604	Ext Comb /Electric Gen /Natural Gas /Boilers < 100 Million Btu/hr except Tangential	0.068	0.057	7.51E-03	7.51E-03	5.20E-04	4.30E-04
10100701	Ext Comb /Electric Gen /Process Gas /Boilers : 100 Million Btu/hr	0.06	0.058	5.74E-03	5.74E-03	5.20E-04	4.30E-04

SCC	Description	ERRONEOUS PM_{10} Primary EF Used in IPM Post Processing lb/MMBtu	ERRONEOUS $PM_{2.5}$ Primary EF Used in IPM Post Processing lb/MMBtu	PM10 primary EF consistent with 2005 lb/MMBtu1	PM25 primary EF consistent with 2005 lb/MMBtu	Corrected PM10 Primary EF lb/MMBtu (using 1000 btu/scf)	Corrected PM25 Primary EF lb/MMBtu (using 1000 btu/scf)
20100201	Int Comb /Electric Gen /Natural Gas /Turbine	0.046	0.028	6.55E-03	6.55E-03	3.10E-04	1.90E-04
20100301[b]	Int Comb /Electric Gen /Gasified Coal /Turbine	0.11	0.11	1.57E-02	1.57E-02	1.10E-02	1.10E-02

a. . note that it was determined that the 2005 PM emissions used in the 2005v4 andv4.1 platforms were not corrected to use updated information posted at ftp://newftp.epa.gov/air/nei/nei_criteria_summaries/pm_adjustment_2002_nei.pdf . The updates were based on testing using a dilution method that is similar to conditional test method (CTM) 39 (Air Emission Measurement Center) that measures PM10-PRI and PM2.5-PRI directly. The data come from limited testing sponsored by the New York State Energy Research and Development Authority (NYSERDA). See ftp://newftp.epa.gov/air/nei/nei_criteria_summaries/pm_adjustment_2002_nei.pdf for more documentation and ftp://newftp.epa.gov/air/nei/nei_criteria_summaries/ratios_to_adjust_pmvalues_in_nei_for_naturalgas_combustion082005.xls for the SCCs impacted by the adjustment. The updated factors have been recommended by Ron Myers but have not been put into AP-42 (for natural gas, it was last updated in 1998)

b. The corrected value comes from: The EPA Tutorial provided by Gary J. Stiegel, Gasification Technologies Product Manager National Energy Technology Laboratory Nov 5, 2001 (power point presentation), reports 0.002 lbs of PM10/MMBtu for a state-of-the-art IGCC unit; for Polk Power (ORISPL=7242, BLRID=1), they report <0.015 lbs of PM10/MMBtu; for Wabash River, they report <0.012 lbs of PM10/MMBtu; and George Lynch has suggested 0.011 lbs of PM102.MMBtu. It was also recommended to set PM2.5=PM10