DOCUMENTATION FOR THE 2002 ELECTRIC GENERATING UNIT (EGU) NATIONAL EMISSIONS INVENTORY (NEI)

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1.0 What Sources Are Included in the EGU Inventory?

The point source categories considered Electric Generating Units (EGUs) include the following Tier I and Tier II categories:

Tier I Category		Tier II Category	
(01)	Fuel Combustion - EGU	(01)	Coal
		(02)	Oil
		(03)	Gas
		(04)	Other Fuels including wood, waste, etc.

The emissions from the combustion of fuel by EGU are divided into two classifications: (1) steam EGUs (boilers) with Source Classification Codes (SCCs) = 101xxxxx; and (2) non-steam EGUs such as gas turbines and internal combustion engines with SCCs = 201xxxxx. This section describes the emission estimation methodology for EGUs that are included in either the Department of Energy's (DOE's) Energy Information Administration (EIA)-767[1] or the U.S. Environmental Protection Agency's (EPA's) Emission Tracking System/Continuous Emissions Monitoring (ETS/CEM) programs.[2]

2.0 Where Does EPA Obtain the EGU Data Needed for Emission Estimates?

The EIA-767 electric power survey is the primary basis for the National Emission Inventory (NEI) EGU inventory. The most recent EIA-767 data set (for 2002) now includes not only fossil fuel-fired boilers, but also renewable steam generating utility and nonutility generating units (called boilers). The NEI EGU inventory includes data for gas turbines, internal combustion engines, and combined cycles (including heat recovery steam generators [HRSGs]) if the data are reported to EIA, or if the units are among the ETS/CEM units added to the EGU inventory. For the 2002 EGU inventory, ETS/CEM units (primarily nonsteam turbines) are included if they meet specified conditions.

The EIA uses Form EIA-767, *Steam-Electric Plant Operation and Design Report,*[1] to collect monthly boiler-level data on an annual basis from steam EGUs, whether they are utility (regulated) or nonutility (unregulated) entities. The 2002 data were collected by EIA beginning in 2003; companies either filled out and mailed back paper copies of the form for each plant, or responded on-line. EIA's Office of Coal, Nuclear, Electric and Alternate Fuels (CNEAF)'s Electric Power group collects and disseminates the data. The data are available on the EIA website at http://www.eia.doe.gov/cneaf/electricity/page/eia767.html.

The EIA requires that the operating utility for each plant whose steam operating capacity is 10 megawatts (MW) or greater submit at least some sections of Form EIA-767. This form is designed so that information for each plant is reported in separate sections that relate to different data levels. The relevant levels of data include the following:

- Plant-level: Delineation of the plant configuration, which establishes the number of boilers and the IDs for each boiler, as well as the associated generator(s), flue

gas desulfurization (FGD) unit(s) (sulfur dioxide [SO_2] scrubbers), flue gas particulate collectors (FGP), flue(s), and stack(s). These do not necessarily have a one-to-one correspondence with a boiler. In addition, plant name and location, and operating company are provided.

- Boiler-level: Monthly fuel consumption and quality data for all fuel types, regulatory data, and design parameters including nitrogen oxides (NO_x) control devices and controlled NO_x controlled emissions rate in lbs/MMBtu, and mercury controls.

- Flue Gas Desulfurization (FGD) Unit-level: FGD units for annual operating data (including SO_2 control efficiency) and design parameter data (including types of SO_2 control devices and sorbents).

- Flue Gas Particulate (FGP) Collector-level: Particulate matter (PM) units for operating data (including PM control efficiency) and design specifications (including type of particulate control devices).

- Stack- and flue-level: Design parameter data (including temperature, height, velocity, flow, and cross sectional area [from which diameter values are derived]).

All plants whose steam operating capacity is at least 10 megawatts (MW) that have at least one operating boiler are required to provide this information to EIA, although the amount of data required from plants with less than 100 MW of steam-electric generating capacity is not as extensive as the amount required from those plants of at least 100 MW. For plants with a generator nameplate rating from 10 MW to less than 100 MW, only those sections of Form EIA-767 containing identification (ID) information (i.e., plant code (ORISPL), State name, county name, plant name, operating company name, boiler ID), boiler fuel quantity and quality, and control device information for SO_2, NO_x, and PM must be completed.

The EPA's ETS/CEM and DOE's Form EIA-767 data are used to develop the 2002 EGU inventory. The EPA's Clean Air Markets Division (CAMD) collects the ETS/CEM data and provides annual and ozone season data.[3] The annual data for SO_2, NO_x, and heat input have been collected since 1995 as a result of implementation of Title IV of the 1990 Clean Air Act Amendments and can be found at http://cfpub.epa.gov/gdm/. The sources which must report ETS/CEM data to EPA are called "affected sources," as determined by CAMD in accordance with the Code of Federal Regulations (CFR). Specifically, the 40CFR Part 72.6 applicability rules can be found at http://www.access.gpo.gov/nara/cfr/waisidx_00/40cfr72_00.html.

3.0 How Does EPA Develop Emission Estimates for EGUs?

The 2002 EGU inventory includes annual emission estimates of SO_2, NO_x, filterable PM_{10}, filterable $PM_{2.5}$, condensible PM, primary $PM_{10,}$ primary $PM_{2.5}$, volatile organic compounds (VOC), carbon monoxide (CO), ammonia ($NH_{3,}$), and hazardous air pollutants (HAPs). HAP emission estimates are only included for coal, oil, gas, and wood-fired boilers, turbines and internal combustion engines. EPA does not develop emissions estimates for sulfates

(SO_4) because no known EGU emission factors exist for this pollutant. Ozone season day emissions and heat input are also developed and included in the EGU inventory for NO_x, CO, and VOCs. Table 1 summarizes the methods used to estimate emissions for each pollutant for 2002.

To estimate emissions for the 2002 EGU inventory, the following are considered: (1) 2002 EIA-767 reported fuel consumption; (2) the latest (April 23, 2004) EPA-approved uncontrolled emission factors for criteria pollutants, which relate the quantity of fuel consumed to the quantity of pollutant emitted;[4] (3) HAP emission factors approved by EPA's Emissions Standards Divison[5] and obtained from *AP-42*;[6] (4) fuel quality characteristics, such as sulfur content, ash content, and heating value; (5) control efficiency, which indicates the percent of pollutant emissions not removed through control methods (and controlled emission rates for NO_x); and (6) the available ETS/CEM 2002 data for SO_2, NO_x, and heat input.

To derive 2002 emissions estimates, EPA first estimates the 2002 boiler-SCC-level emissions and heat input from EIA data and EPA-approved emission factors. The algorithms to compute all pollutant emissions are presented in Tables 2 and 3.

Form EIA-767 data are available in 14 data files from the EIA website. The monthly data are aggregated for each fuel to produce annual estimates for each boiler before they are combined with other data such as control devices and efficiencies, plant location data, and associated stack parameters. An SCC, which has eight digits, is assigned to each fuel. This EGU SCC list[7] is developed by EPA, which creates new SCCs as needed to reflect the additional boiler-fuel combinations in the EIA-767. A complete list of the EGU SCCs is included in Table 4. Once SCCs are assigned to each boiler's fuel data in a given plant, the SCC-specific data are then separated so that each new data record is on the plant-boiler-SCC level.

Algorithms are used to develop calculated values for heat input and other fuel quality values, PM control efficiencies for data not contained in the computerized EIA data files, or to convert data to other measurement units.

Although Form EIA-767 reports generator nameplate capacity, the information cannot be used to represent the boiler size when a one-to-one correspondence does not exist between boiler and generator. (This is referred to as a multiheader situation. For example, one boiler is associated with two or more generators or several boilers are reciprocally associated with several generators.) Therefore, EPA developed a boiler design capacity variable (in MMBtu/hr) based on the reported maximum continuous boiler steam flow at 100 percent load (in thousand pounds per hour) by multiplying the steam flow value by a units conversion of 1.36.

Since Form EIA-767 does not provide sufficient control information for NO_x, PM_{10}, or $PM_{2.5}$, control efficiencies, if needed, are derived using the following methods:

- For 2002, because some NO_x control information is still inconsistent, an approach developed for the 2001 data was formulated as follows:

  (1) If a boiler had no positive NO_x control device in-service hours – regardless if it reported an operating control device or controlled rate – it

was treated as if there were no NO_x controls and the emissions were assumed to be uncontrolled.

(2) If a boiler had positive NO_x control device in-service hours and it also had an annual NO_x controlled rate in lbs/MMBtu, the controlled NO_x emissions (in tons) were estimated by multiplying the heat input (in MMBtu), which is the product of the fuel quantity burned and the fuel heat content, and the NO_x controlled rate.

(3) If a boiler reported positive NO_x control device in-service hours of at least 4,000 hours, but an annual NO_x controlled rate was not provided; or if the boiler had positive NO_x control device in-service hours but the annual NO_x controlled rate was greater than 1.27 (the highest annual NO_x emission rate in the 2002 ETS/CEM file), it was considered to be a controlled unit, and a device-related removal rate obtained from Table A-4 of EIA's *Electric Power Annual 2001*[8] was used after calculating uncontrolled emissions to estimate controlled emissions.

- Since Form EIA-767 only reports PM control efficiency, EPA uses the PM_{10} Calculator[9] to derive filterable PM_{10} and $PM_{2.5}$ control efficiencies. The PM Calculator estimates PM_{10} and $PM_{2.5}$ control efficiencies based on the SCC and the primary and secondary control devices. These device codes are NEDS codes that are derived from EIA-767 reported PM control devices and efficiencies rules as explained in documentation for the PM Calculator and shown in Table 5. The control efficiencies from the PM Calculator are based on particle size distribution data from *AP-42* for specific SCCs, where available. Note that if a coal boiler does not have a PM efficiency, it is assumed that there is an electrostatic precipitator PM control device, and a default PM_{10} and $PM_{2.5}$ efficiency of 99.2% is assigned; similarly, if a wood burning boiler does not have a PM efficiency, it is assumed that there is a multicyclone PM control device, and a default PM_{10} and $PM_{2.5}$ efficiency of 65% is assigned.

Since fewer required data elements (only identification data, boiler fuel quantity and quality data, and FGD data, if applicable) exist for those steam plants with a total capacity between 10 MW and 100 MW, many values are missing. Most data elements are assigned a default value of zero; however, if information on boiler firing and bottom type are missing, default values of wall (front)-fired and dry bottom types are assigned. One exception is that if the unit is included in the ETS/CEM data file and boiler firing and/or bottom types are provided, those values are used instead of the default values (flags are provided to indicate these cases).

The annual fuel quality values (heat content, sulfur content, and ash content) are calculated as a fuel quantity-weighted average if data values for each month are available. If, for a given boiler and fuel type, there is a positive monthly fuel quantity value but no fuel quality value, the missing value(s) are populated with the boiler fuel quantity-weighted average. If that is missing because there are no fuel quality values at all for the boiler, the missing value(s) are

populated with the 2002 EIA-767 fuel quantity-weighted average for the entire file. If need be, the EPA-provided default ash content values from Footnote 3 in Table 6 are used.

Table 6 presents the EPA-approved criteria pollutant emission factors. EPA computes SO_2 emissions using uncontrolled EPA-approved emissions factors, and fuel use and sulfur content of the fuel as specified in the EIA-767 data. Controlled emissions are estimated if there are control efficiencies provided in the EIA-767.

EPA computes NO_x emissions using uncontrolled EPA-approved emissions factors and fuel use as specified in the EIA-767 data. Controlled NO_x emissions are estimated if the boiler record in the EIA database shows NO_x control device in-service hours and it also has an annual NO_x controlled rate in lbs/million British thermal units (MMBtu). The controlled NO_x emissions are estimated by multiplying the heat input (in MMBtu, the product of the fuel quantity burned and the fuel heat content) and the NO_x controlled rate. (The methodology for calculating controlled NO_x emissions when the control data are inconsistent was discussed earlier.)

Filterable PM_{10} and $PM_{2.5}$ emissions are estimated using uncontrolled EPA-approved emissions factors, and fuel use and ash content of the fuel as specified in the EIA-767 data. Controlled emissions are estimated if there are control efficiencies provided by the PM Calculator,[8] based on EIA-767 data. The PM_{10} and $PM_{2.5}$ emissions included in the EGU inventory represent filterable PM_{10} and $PM_{2.5}$ emissions. Condensible PM emissions are estimated as the product of heat input and an EPA-approved emissions factor in lbs/MMBtu, and summed with filterable PM_{10} and $PM_{2.5}$ emissions to estimate primary PM_{10} and primary $PM_{2.5}$ emissions. The methods used to develop the PM condensible emission factors are described in Table 7.

The VOC and CO emission estimates are calculated as uncontrolled emissions because there are no control device data available. For oil and gas boilers, VOC is augmented using aldehyde and methane weight percents by SCC profile. An adjustment is made to account for the underestimation of aldehydes, which are not included in the VOC emission factors for the following SCCs: 10100401, 10100404, 10100501, 10100601, and 10100604. The VOC emissions for these SCCs are augmented according to the methodology used in the Hydrocarbon Preprocessor (HCPREP) of the Flexible Regional Emissions Data System (FREDS).[10]

No adjustments are made to any emissions for a combined heat and power (CHP)/ cogenerator unit.

New NH_3 emission factors have been proposed to EPA for EGUs; these emission factors for boilers are applied to the specified quantity of fuel used (no control efficiency data are provided).[11]

Emission estimates for HAPs are calculated based on the available fuel use and heat input data and HAP emission factors approved by EPA's Emissions Standards Division and obtained from *AP-42*. (See Tables 8-14.)

The following provides an example calculation for estimating annual SO_2 emissions for a tangentially-fired dry-bottom EGU boiler burning bituminous coal. This example shows how the emissions are calculated using data reported to EIA-767 and an EPA-approved uncontrolled emission factor, and adjusted for the control device efficiency.

Variable Description	Value	Units
Source classification code	10100212	–
Annual fuel throughput	1300000	SCC units
SO_2 control efficiency	89.30	%
Sulfur content of fuel	3.1716	%
SO_2 emission factor	38	lbs SO_2/ton coal

- Equation:

$$EIASO_2 = \frac{\text{coal thruput} * \text{SO2EF} * \text{sulfcon} * (1 - (\text{coneff} / 100)}{2000}$$

- Calculation:

$$EIASO_2 = \frac{(1{,}300{,}000)\ (38)\ (3.1716)\ (1 - 0.893)}{2000}$$

- Result: $EIASO_2 = 8{,}382$ tons

4.0 What EIA Data Have Been Replaced With Data From Other Sources?

After all 2002 emissions for the EIA-767 boilers are estimated (and given a flag value of '767,' 2002 ETS/CEM boiler-level annual estimates for SO_2 and NO_x, and heat input values, if they exist, are disaggregated to the boiler-SCC level based on their EIA heat input, and overlay the EIA-767-based data (and are re-flagged as '767/CAMD'). Additional units from the 2002 ETS/CEM data file were added (and flagged 'CAMD') if they were not in the 2002 EIA-767. The ETS/CEM units added were only those included in the 2002 projected EGU NEI, with records eliminated if they were included in the 2002 EIA-767.

The ETS/CEM data files contain heat input and emissions that are generally based on monitoring data, which is preferable to calculating values using EIA-767 data and *AP-42* emission factors. EPA requires that all coal units have continuous emission monitors (CEMs) to report hourly data. Oil and gas units in general may, but are not required to, have CEMs; for additional information about EPA's requirements, see http://www.epa.gov/airmarket/monitoring/factsheet.html. Note that for missing data or when units are not meeting EPA rules, estimation procedures are used; see

http://www.epa.gov/airmarket/monitoring/cemtbl2.html for details. The annual data undergo quality assurance/quality control (QA/QC) to verify that current ORIS plant and boiler IDs are used, to see whether there are any significant changes from the previous year, and to check that the annual NO_x and heat input values for a boiler are not less than the ozone season day value. The data concerns, if any, are compiled and then discussed with EPA/CAMD to obtain data resolution where possible. If that is not possible, reasonable assumptions are made.

If units are included in both the EIA-767 and ETS/CEM data files with positive values for ETS/CEM annual SO_2 and/or NO_x emissions and/or heat input data, those data values replaced the data estimated from EIA-767 data. This process involves (1) matching the ETS/CEM boiler-level annual data to the processed EIA-767 annual data, and (2) disaggregating the boiler-level ETS/CEM data to the boiler SCC level based on each SCC's fractional share of the boiler EIA-based heat input, SO_2, and NO_x, respectively. The algorithms used are included in Table 15.

During QA/QC of the 2002 EIA-767 and 2002 CAMD ETS/CEM data, an increasing number of ETS/CEM combined cycle units (a combination of a combustion turbine [CT] and a steam turbine [ST]) at a given plant, but with different unit IDs from those in the EIA-767, were found. On further examination, it was determined that the EIA-767 data were reported for only the steam part of the combined cycles (CC) (and if there was auxiliary firing of fossil fuel), while the ETS/CEM data were reported for the combined steam plus combustion turbine. In these cases, the EIA-767 data were replaced by the ETS/CEM data and given a flag of '767/CAMD1' if the steam portion is from an HRSG or '767/CAMD2' if the steam portion is from a more general steam turbine.

For those records in which the ETS/CEM heat input replaces the EIA-calculated value, the heat input does not equal the product of the EIA-reported fuel throughput and heat content. Additionally, condensible PM values are then recalculated using the ETS/CEM heat input value, thus also changing the values of primary PM_{10} and primary $PM_{2.5}$.

Note that extensive QA/QC reviews are conducted. Items that are checked include ORIS plant, boiler, and generator IDs (matching across EIA-767 years as well as between EIA-767 and ETS/CEM); fuel quantity outliers; missing values for fuel quality data (heat input, sulfur content, and ash content); calculated emissions and heat input outliers; fuel and generation comparisons with EIA-906 data;[12] comparison of boilers that are included or excluded in relation to previous year's EIA-767, same year's EIA-860,[13] and same year's ETS/CEM; and ETS/CEM annual heat input and NO_x values in relation to their ozone season values. Whenever possible, data resolution is obtained by working with EIA/CNEAF and EPA/CAMD staff, and documented.

5.0 How Are The Data Sources and ETS/CEM Data Quality Identified?

The data source is delineated in the inventory NEI Input Format (NIF) files in the Emission record. The data source is flagged as:

- 767: Record only in the 2002 Form EIA-767; all emissions estimated.

- 767/CAMD: Record in both 2002 Form EIA-767 and 2002 ETS/CEM; with SO_2, NO_x, and heat input values from ETS/CEM; condensible PM, and primary PM_{10} and $PM_{2.5}$ are recalculated.

- CAMD: Record only in 2002 ETS/CEM for SO_2, NO_x, and heat input values; other emissions estimated.

- 767/CAMD1: CC record (HRSG+CT) in 2002 ETS/CEM used; the HRSG record in 2002 Form EIA-767 eliminated. SO_2, NO_x, and heat input values from ETS/CEM; other emissions estimated.

- 767/CAMD2: CC record (ST+CT) in 2002 ETS/CEM used; the steam record in 2002 Form EIA-767 eliminated. SO_2, NO_x, and heat input values from ETS/CEM; other emissions estimated.

In order to provide an indication as to whether most ETS/CEM SO_2, NO_x, and flow (used to calculate heat input) values are "good" (measured) data, beginning with the 2002 data year, data related to Method of Determination Codes (MODCs) for each of these three parameters were included in EGU inventory files. The frequency of MODC values of 01 through 04 (which meant good, measured data) and the total number of MODCs for a given stack was provided by EPA/CAMD. With assistance from their staff, the stack-level MODCs were mapped and matched to boilers with ETS/CEM data. Percents of "good" 2002 MODCs for each of the three variables were calculated.

The quality of the ETS/CEM NO_x and SO_2 values is delineated in the NIF files in the emission record as "ETS/CEM Data Rating." It is represented as "NO_x percent of good values|flow percent of good values" and "SO_2 percent of good values|flow percent of good values."

6.0 How Does EPA Calculate Ozone Season Daily Emissions?

For 2002, ozone season daily values are estimated for NO_x, CO, and VOC as described below:

- NO_x: For units with ETS/CEM NO_x ozone season emissions, divide the value by 153. Otherwise, for the units with EIA-767 data only, divide the EIA-767 NO_x ozone season value by 153.

- CO and VOC: For units with EIA-767 data (regardless of whether they also have ETS/CEM data), since CO and VOC are calculated using EIA-767 fuel quantity, multiply the EIA-767 based annual emissions by the ratio of the EIA-767 based ozone season to annual heat input and then divide by 153. Otherwise, for those units only with ETS/CEM data, multiply the annual emissions by the ratio of the ETS/CEM ozone season to annual heat input and then divide by 153. Or, if the ETS/CEM ozone season heat input is not reported (which is acceptable for plants in some States), take the annual emissions and divide by 365.

7.0 How Does EPA Augment Missing Stack Parameters?

As described in the EPA report "NEI Quality Assurance and Data Augmentation for Point Sources," a routine was implemented to assess the validity of the stack parameters, to replace values as necessary, and to fill-in missing data points.

The approach taken to QA and augment the EGU stack parameters is described in EPA, 2004,[14] with one exceptions: the EPA report does not address the need for EGU stack-specific national (or MACT) default parameters. If no SCC or SIC code match is possible, the following (MACT code) defaults are applied:

Stack Height:	235 ft
Stack Temperature:	390°F
Stack Diameter:	10 ft
Stack Velocity:	56 ft/sec
Stack Flow:	4,398 ft^3/sec

8.0 References

1. *Steam-Electric Plant Operation and Design Report,* Form EIA-767, data files for 1985 - 2002, U.S. Department of Energy, Energy Information Administration, Washington, D.C., 2003.

2. *Acid Rain Program CEMS Submissions Instructions for Monitoring Plans, Certification Test Notifications, and Quarterly Reports,* U.S. Environmental Protection Agency, Washington, D.C., May 1995.

3. 2002 Emission Tracking System/Continuous Emissions Monitoring (ETS/CEM) Annual and Ozone Season Data Files, U.S. Environmental Protection Agency/Clean Air Markets Division (CAMD), Washington, D.C., June 14 and 17, 2004.

4. EPA-approved April 23, 2004 updated EGU Uncontrolled Emission Factor File, U.S. Environmental Protection Agency/Emission Factor and Inventory Group (EFIG), Research Triangle Park, North Carolina.

5. Porter, F., 1998. Memorandum to Anne Pope, U.S. Environmental Protection Agency, Emission Factor and Inventory Group. "Recommended Emission Factors for Boilers, Turbines, and Electric Utilities." November 13, 1998.

6. *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, AP-42,* U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

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8. *Electric Power Annual 2001*. DOE/EIA-0348 (2001). The Energy Information Administration, Washington, D.C., March 2003.

9. *Enhanced Particulate Matter Controlled Emissions Calculator, User's Manual*, Emission Factor and Inventory Group, Emissions Monitoring and Analysis Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. September 2000.

10. *The Flexible Regional Emissions Data System (FREDS) Documentation for the 1985 NAPAP Emission Inventory: Preparation for the National Acid Precipitation Assessment Program*. Appendix A. EPA-600/9-89-047. U.S. Environmental Protection Agency, Office of Research and Development, Air and Energy Engineering Research Laboratory, Research Triangle Park, North Carolina, May 1989.

11. Roe, S., et al., 2004: "Estimating Ammonia Emissions from Anthropogenic Sources," Draft Report to U.S. Environmental Protection Agency, Emission Factor and Inventory Group, El Dorado, California, March 18, 2004.

12. *Form EIA-906 Database Monthly Utility Plant Database.* U.S. Department of Energy, Energy Information Administration, Washington, D.C.

13. *Annual Electric Generator Report*, Form EIA-860. U.S. Department of Energy, Energy Information Administration, Washington, D.C.

14. NEI Quality Assurance and Data Augmentation for Point Sources. U.S. Environmental Protection Agency, Emission Factor and Inventory Group, Research Triangle Park, N.C. June 2004. http://www.epa.gov.ttn/chief/net/2002 NEI_qaaugmentation 062004.pdf

Table 1. Methods for Developing Annual Emission Estimates for EGUs

For the pollutant(s)	EPA estimated emissions by
NO_x	If the boiler is reported in both EIA-767 and ETS/CEM, then the ETS/CEM data are used. Otherwise, EIA data and uncontrolled EPA-approved emission factors (and control efficiencies if applicable) applied to fuel quantity are used.
SO_2	If the boiler is reported in both EIA-767 and ETS/CEM, then the ETS/CEM data are used. Otherwise, EIA data and uncontrolled EPA-approved emission factors (and control efficiencies if applicable) applied to fuel quantity are used.
VOC, CO	EIA data and EPA-approved emission factors applied to fuel quantity are used. If only ETS/CEM data used, fuel quantity estimated from heat input and default fuel heat content.
PM_{10}, $PM_{2.5}$ (Filterable)	EIA data and uncontrolled EPA-approved emission factors (and control efficiencies if applicable) applied to fuel quantity are used. Since the PM_{10} Calculator Program was updated in 1999-2000, updated PM efficiencies are derived for emissions calculations.
PM Condensible, Primary PM_{10}, Primary $PM_{2.5}$	EIA data and EPA-approved emission factors applied to heat input are used to estimate condensible PM. Condensible PM is summed with filterable PM_{10} and $PM_{2.5}$, respectively, to estimate primary PM_{10} and $PM_{2.5}$. However, if the boiler is reported in both EIA-767 and ETS/CEM, then the ETS/CEM heat input overlays EIA-based heat input, condensible PM is recalculated, and primary PM_{10} and $PM_{2.5}$ emissions are updated.
NH_3	EIA data and new default emission factors applied to fuel content are used to estimate ammonia emissions.
HAPs	EIA data and EPA-approved and *AP-42* emission factors applied to fuel quantity are used.

Table 2. Algorithms Used to Estimate EIA-Based VOC, NO_x, CO, SO_2, Filterable PM_{10} and $PM_{2.5}$, and NH_3 Annual Emissions from EGU Boilers

$$E_{NO_x,\ SCC} = FC_{SCC} * EF_{NO_x,\ SCC} * (1 - CE_{NO_x,b}) * UCF$$

$$E_{CO\ or\ VOC,}\dagger_{SCC} = FC_{SCC} * EF_{CO\ or\ VOC,\ SCC}$$

$$E_{PM_{10}\ or\ PM_{2.5},\ SCC} = FC_{SCC} * EF_{PM_{10}\ or\ PM_{2.5},\ SCC} * A_f * (1 - CE_{PM_{10}\ or\ PM_{2.5},b}) * UCF$$

$$E_{SO_2,\ SCC} = FC_{SCC} * EF_{SO_2,\ SCC} * S_f * (1 - CE_{SO_2,b}) * UCF$$

$$E_{NH_3,\ SCC} = FC_{SCC} * EF_{NH_3,\ SCC} * UCF$$

where:

E	=	annual estimated emission (in tons/year)
FC	=	annual fuel consumption (in units/year)
EF	=	emission factor (in lbs/$unit_f$)
S	=	sulfur content (expressed as a decimal)
A	=	ash content (expressed as a decimal)
CE	=	control efficiency (expressed as a decimal)
b	=	boiler
f	=	fuel type
UCF	=	units conversion factor (1 ton/2000 lbs)
$unit_{coal}$	=	tons burned
$unit_{oil}$	=	1000 gallons burned
$unit_{gas}$	=	million cubic feet burned

†Note that VOC also undergoes an augmentation procedure.

Table 3. Algorithms Used to Estimate EIA-Based Condensible PM, and Primary PM_{10} and $PM_{2.5}$ Annual Emissions for EGU Boilers

$$E_{PMCD,\ SCC} = HTI_{SCC} * EF_{PMCD,\ SCC} * CF$$

$$E_{TotPM_{10}\ or\ TotPM_{2.5},\ SCC} = E_{PM_{10}\ or\ PM_{2.5},\ SCC} * E_{PMCD,\ SCC}$$

where:

PMCD	=	particulate matter condensible
E	=	annual estimated emissions (in tons/year)
HTI	=	annual heat input (in MMBtu/year)[$]
EF	=	emission factor (in tons/MMBtu)

†Note that VOC also undergoes an augmentation procedure.
$Calculate using EIA fuel consumption and heat content values, but use ETS/CEM heat input data if available and recalculate condensible PM, PM_{10}, and $PM_{2.5}$.

Table 4. EGU Source Classification Code (SCC) List

SCC	SCC1_desc	SCC3_desc	SCC6_desc	SCC8_desc	Measure	Material
10100101	External Combustion Boilers	Electric Generation	Anthracite Coal	Pulverized Coal	Tons	Anthracite
10100102	External Combustion Boilers	Electric Generation	Anthracite Coal	Traveling Grate (Overfeed) Stoker	Tons	Anthracite
10100201	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Pulverized Coal: Wet Bottom (Bituminous Coal)	Tons	Bituminous Coal
10100202	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Pulverized Coal: Dry Bottom (Bituminous Coal)	Tons	Bituminous Coal
10100203	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Cyclone Furnace (Bituminous Coal)	Tons	Bituminous Coal
10100204	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Spreader Stoker (Bituminous Coal)	Tons	Bituminous Coal
10100205	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Traveling Grate (Overfeed) Stoker (Bituminous Coal)	Tons	Bituminous Coal
10100211	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Wet Bottom (Tangential) (Bituminous Coal)	Tons	Bituminous Coal
10100212	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Pulverized Coal: Dry Bottom (Tangential) (Bituminous Coal)	Tons	Bituminous Coal
10100215	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Cell Burner (Bituminous Coal)	Tons	Bituminous Coal
10100217	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Atmospheric Fluidized Bed Combustion: Bubbling Bed (Bituminous Coal)	Tons	Bituminous Coal
10100218	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Atmospheric Fluidized Bed Combustion: Circulating Bed (Bitum. Coal)	Tons	Bituminous Coal
10100221	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Pulverized Coal: Wet Bottom (Subbituminous Coal)	Tons	Subbituminous Coal
10100222	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Pulverized Coal: Dry Bottom (Subbituminous Coal)	Tons	Subbituminous Coal
10100223	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Cyclone Furnace (Subbituminous Coal)	Tons	Subbituminous Coal
10100224	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Spreader Stoker (Subbituminous Coal)	Tons	Subbituminous Coal
10100225	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Traveling Grate (Overfeed) Stoker (Subbituminous Coal)	Tons	Subbituminous Coal
10100226	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Pulverized Coal: Dry Bottom Tangential (Subbituminous Coal)	Tons	Subbituminous Coal
10100235	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Cell Burner (Subbituminous Coal)	Tons	Subbituminous Coal
10100237	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Atmospheric Fluidized Bed Combustion: Bubbling Bed (Subbitum Coal)	Tons	Subbituminous Coal

Table 4. EGU Source Classification Code (SCC) List (Continued)

SCC	SCC1_desc	SCC3_desc	SCC6_desc	SCC8_desc	Measure	Material
10100238	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal	Atmospheric Fluidized Bed Combustion - Circulating Bed (subbitum coal)	Tons	Subbituminous Coal
10100300	External Combustion Boilers	Electric Generation	Lignite	Pulverized Coal: Wet Bottom	Tons	Lignite
10100301	External Combustion Boilers	Electric Generation	Lignite	Pulverized Coal: Dry Bottom, Wall Fired	Tons	Lignite
10100302	External Combustion Boilers	Electric Generation	Lignite	Pulverized Coal: Dry Bottom, Tangential Fired	Tons	Lignite
10100303	External Combustion Boilers	Electric Generation	Lignite	Cyclone Furnace	Tons	Lignite
10100304	External Combustion Boilers	Electric Generation	Lignite	Traveling Grate (Overfeed) Stoker	Tons	Lignite
10100306	External Combustion Boilers	Electric Generation	Lignite	Spreader Stoker	Tons	Lignite
10100316	External Combustion Boilers	Electric Generation	Lignite	Atmospheric Fluidized Bed ** (See 101003-17 & -18)	Tons	Lignite
10100317	External Combustion Boilers	Electric Generation	Lignite	Atmospheric Fluidized Bed Combustion - Bubbling Bed	Tons	Lignite
10100318	External Combustion Boilers	Electric Generation	Lignite	Atmospheric Fluidized Bed Combustion - Circulating Bed	Tons	Lignite
10100401	External Combustion Boilers	Electric Generation	Residual Oil	Grade 6 Oil: Normal Firing	1000 Gallons	Residual Oil (No. 6)
10100404	External Combustion Boilers	Electric Generation	Residual Oil	Grade 6 Oil: Tangential Firing	1000 Gallons	Residual Oil (No. 6)
10100405	External Combustion Boilers	Electric Generation	Residual Oil	Grade 5 Oil: Normal Firing	1000 Gallons	Residual Oil (No. 5)
10100406	External Combustion Boilers	Electric Generation	Residual Oil	Grade 5 Oil: Tangential Firing	1000 Gallons	Residual Oil (No. 5)
10100501	External Combustion Boilers	Electric Generation	Distillate Oil	Grades 1 and 2 Oil	1000 Gallons	Distillate Oil (No. 1 & 2)
10100504	External Combustion Boilers	Electric Generation	Distillate Oil	Grade 4 Oil: Normal Firing	1000 Gallons	Distillate Oil (No. 4)
10100505	External Combustion Boilers	Electric Generation	Distillate Oil	Grade 4 Oil: Tangential Firing	1000 Gallons	Distillate Oil (No. 4)
10100601	External Combustion Boilers	Electric Generation	Natural Gas	Boilers > 100 Million Btu/hr except Tangential	Million Cubic Feet	Natural Gas
10100602	External Combustion Boilers	Electric Generation	Natural Gas	Boilers < 100 Million Btu/hr except Tangential	Million Cubic Feet	Natural Gas
10100604	External Combustion Boilers	Electric Generation	Natural Gas	Tangentially Fired Units	Million Cubic Feet	Natural Gas

Table 4. EGU Source Classification Code (SCC) List (Continued)

SCC	SCC1_desc	SCC3_desc	SCC6_desc	SCC8_desc	Measure	Material
10100701	External Combustion Boilers	Electric Generation	Process Gas	Boilers > 100 Million Btu/hr	Million Cubic Feet	Process Gas
10100702	External Combustion Boilers	Electric Generation	Process Gas	Boilers < 100 Million Btu/hr	Million Cubic Feet	Process Gas
10100703	External Combustion Boilers	Electric Generation	Process Gas	Petroleum Refinery Gas	Million Cubic Feet	Process Gas
10100704	External Combustion Boilers	Electric Generation	Process Gas	Blast Furnace Gas	Million Cubic Feet	Process Gas
10100707	External Combustion Boilers	Electric Generation	Process Gas	Coke Oven Gas	Million Cubic Feet	Process Gas
10100711	External Combustion Boilers	Electric Generation	Process Gas	Landfill Gas	Million Cubic Feet	Process Gas
10100712	External Combustion Boilers	Electric Generation	Process Gas	Digester Gas	Million Cubic Feet	Process Gas
10100801	External Combustion Boilers	Electric Generation	Coke	All Boiler Sizes	Tons	Coke
10100818	External Combustion Boilers	Electric Generation	Coke	Atmospheric Fluidized Bed Combustion	Tons	Coke
10100901	External Combustion Boilers	Electric Generation	Wood/Bark Waste	Bark-fired Boiler	Tons	Bark
10100902	External Combustion Boilers	Electric Generation	Wood/Bark Waste	Wood/Bark Fired Boiler	Tons	Wood/Bark
10100903	External Combustion Boilers	Electric Generation	Wood/Bark Waste	Wood-fired Boiler	Tons	Wood
10100910	External Combustion Boilers	Electric Generation	Wood/Bark Waste	Fuel cell/Dutch oven boilers	Tons	Wood/Bark
10100911	External Combustion Boilers	Electric Generation	Wood/Bark Waste	Stoker boilers	Tons	Wood/Bark
10100912	External Combustion Boilers	Electric Generation	Wood/Bark Waste	Fluidized bed combustion boilers	Tons	Wood/Bark
10101001	External Combustion Boilers	Electric Generation	Liquified Petroleum Gas (LPG)	Butane	1000 Gallons	Butane
10101002	External Combustion Boilers	Electric Generation	Liquified Petroleum Gas (LPG)	Propane	1000 Gallons	Propane
10101003	External Combustion Boilers	Electric Generation	Liquified Petroleum Gas (LPG)	Butane/Propane Mixture: Specify Percent Butane in Comments	1000 Gallons	Propane/Butane
10101101	External Combustion Boilers	Electric Generation	Bagasse	All Boiler Sizes	Tons	Bagasse
10101201	External Combustion Boilers	Electric Generation	Solid Waste	Specify Waste Material in Comments	Tons	Solid Waste
10101202	External Combustion Boilers	Electric Generation	Solid Waste	Refuse Derived Fuel	Tons	Refuse Derived Fuel

Table 4. EGU Source Classification Code (SCC) List (Continued)

SCC	SCC1_desc	SCC3_desc	SCC6_desc	SCC8_desc	Measure	Material
10101204	External Combustion Boilers	Electric Generation	Solid Waste	Tire Derived Fuel : Shredded	Tons	Tire Derived Fuel : Shredded
10101205	External Combustion Boilers	Electric Generation	Solid Waste	Sludge Waste	Tons	Sludge Waste
10101206	External Combustion Boilers	Electric Generation	Solid Waste	Agricultural Byproducts (rice or peanut hulls, shells, cow manure, etc	Tons	Agricultural Byproducts
10101207	External Combustion Boilers	Electric Generation	Solid Waste	Other Biomass Solids	Tons	Other Biomass Solids
10101208	External Combustion Boilers	Electric Generation	Solid Waste	Paper Pellets	Tons	Paper Pellets
10101301	External Combustion Boilers	Electric Generation	Liquid Waste	Specify Waste Material in Comments	1000 Gallons	Liquid Waste
10101302	External Combustion Boilers	Electric Generation	Liquid Waste	Waste Oil	1000 Gallons	Waste Oil
10101304	External Combustion Boilers	Electric Generation	Liquid Waste	Black Liquor	1000 Gallons	Black Liquor
10101305	External Combustion Boilers	Electric Generation	Liquid Waste	Red Liquor	1000 Gallons	Red Liquor
10101306	External Combustion Boilers	Electric Generation	Liquid Waste	Spent Sulfite Liquor	1000 Gallons	Spent Sulfite Liquor
10101307	External Combustion Boilers	Electric Generation	Liquid Waste	Tall Oil	1000 Gallons	Tall Oil
10101308	External Combustion Boilers	Electric Generation	Liquid Waste	Wood/Wood Waste Liquid	1000 Gallons	Wood/Wood Waste Liquid
10101501	External Combustion Boilers	Electric Generation	Geothermal Power Plants	Geothermal Power Plant: Off-gas Ejectors	Megawatt-Hour	Electricity
10101502	External Combustion Boilers	Electric Generation	Geothermal Power Plants	Geothermal Power Plant: Cooling Tower Exhaust	Megawatt-Hour	Electricity
10101601	External Combustion Boilers	Electric Generation	Methanol	All	1000 Gallons	Methanol
10101801	External Combustion Boilers	Electric Generation	Hydrogen	All	Million Cubic Feet	Hydrogen
10101901	External Combustion Boilers	Electric Generation	Coal-based Synfuel	All	Tons	Coal-based Synfuel
10102001	External Combustion Boilers	Electric Generation	Waste Coal	All	Tons	Waste Coal
10102018	External Combustion Boilers	Electric Generation	Waste Coal	Atmospheric Fluidized Bed Combustion	Tons	Waste Coal
10102101	External Combustion Boilers	Electric Generation	Other Oil	All	1000 Gallons	Other Oil

Table 4. EGU Source Classification Code (SCC) List (Continued)

SCC	SCC1_desc	SCC3_desc	SCC6_desc	SCC8_desc	Measure	Material
20100101	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Turbine	1000 Gallons	Distillate Oil (Diesel)
20100102	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating	1000 Gallons	Distillate Oil (Diesel)
20100105	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Crankcase Blowby	1000 Gallons	Distillate Oil (Diesel)
20100106	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	1000 Gallons	Distillate Oil (Diesel)
20100107	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Exhaust	1000 Gallons	Distillate Oil (Diesel)
20100108	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Turbine: Evaporative Losses (Fuel Storage and Delivery System)	1000 Gallons	Distillate Oil (Diesel)
20100109	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Turbine: Exhaust	1000 Gallons	Distillate Oil (Diesel)
20100201	Internal Combustion Engines	Electric Generation	Natural Gas	Turbine	Million Cubic Feet	Natural Gas
20100202	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating	Million Cubic Feet	Natural Gas
20100205	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Crankcase Blowby	Million Cubic Feet	Natural Gas
20100206	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Evaporative Losses (Fuel Delivery System)	Million Cubic Feet	Natural Gas
20100207	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Exhaust	Million Cubic Feet	Natural Gas
20100208	Internal Combustion Engines	Electric Generation	Natural Gas	Turbine: Evaporative Losses (Fuel Delivery System)	Million Cubic Feet	Natural Gas
20100209	Internal Combustion Engines	Electric Generation	Natural Gas	Turbine: Exhaust	Million Cubic Feet	Natural Gas
20100301	Internal Combustion Engines	Electric Generation	Gasified Coal	Turbine		Gasified Coal
20100702	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating	Million Cubic Feet	Process Gas
20100705	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating: Crankcase Blowby	Million Cubic Feet	Process Gas
20100706	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating: Evaporative Losses (Fuel Delivery System)	Million Cubic Feet	Process Gas
20100707	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating: Exhaust	Million Cubic Feet	Process Gas
20100801	Internal Combustion Engines	Electric Generation	Landfill Gas	Turbine	Million Cubic Feet	Landfill Gas
20100802	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating	Million Cubic Feet	Landfill Gas

Table 4. EGU Source Classification Code (SCC) List (Continued)

SCC	SCC1_desc	SCC3_desc	SCC6_desc	SCC8_desc	Measure	Material
20100805	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating: Crankcase Blowby	Million Cubic Feet	Landfill Gas
20100806	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating: Evaporative Losses (Fuel Delivery System)	Million Cubic Feet	Landfill Gas
20100807	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating: Exhaust	Million Cubic Feet	Landfill Gas
20100808	Internal Combustion Engines	Electric Generation	Landfill Gas	Turbine: Evaporative Losses (Fuel Delivery System)	Million Cubic Feet	Landfill Gas
20100809	Internal Combustion Engines	Electric Generation	Landfill Gas	Turbine: Exhaust	Million Cubic Feet	Landfill Gas
20100901	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Turbine	1000 Gallons	Jet Fuel
20100902	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating	1000 Gallons	Jet Fuel
20100905	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating: Crankcase Blowby	1000 Gallons	Jet Fuel
20100906	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating: Evaporative Losses (Fuel Delivery System)	1000 Gallons	Jet Fuel
20100907	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating: Exhaust	1000 Gallons	Jet Fuel
20100908	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Turbine: Evaporative Losses (Fuel Storage and Delivery System)	1000 Gallons	Jet Fuel
20100909	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Turbine: Exhaust	1000 Gallons	Jet Fuel
20101001	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Steam Turbine	Tons	Steam
20101010	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Well Drilling: Steam Emissions	Tons	Steam
20101020	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Well Pad Fugitives: Blowdown	Tons	Steam
20101030	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Pipeline Fugitives: Blowdown	Tons	Steam
20101031	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Pipeline Fugitives: Vents/Leaks	Tons	Steam
20101302	Internal Combustion Engines	Electric Generation	Liquid Waste	Waste Oil - Turbine	1000 Gallons	Waste Oil
20180001	Internal Combustion Engines	Electric Generation	Equipment Leaks	Equipment Leaks	Each-Year	Facility
20182001	Internal Combustion Engines	Electric Generation	Wastewater, Aggregate	Process Area Drains	1000 Gallons	Wastewater
20182002	Internal Combustion Engines	Electric Generation	Wastewater, Aggregate	Process Equipment Drains	1000 Gallons	Wastewater

Table 4. EGU Source Classification Code (SCC) List (Continued)

SCC	SCC1_desc	SCC3_desc	SCC6_desc	SCC8_desc	Measure	Material
20182599	Internal Combustion Engines	Electric Generation	Wastewater, Points of Generation	Specify Point of Generation	1000 Gallons	Wastewater
20190099	Internal Combustion Engines	Electric Generation	Flares	Heavy Water	1000 Gallons	Heavy Water

Table 5. Rules for Assigning Primary and Secondary PM Control Device Codes

If the PM device is an electrostatic precipitator (ESP) and the PM control efficiency is at least 95 percent, then the NEDS control device code = 10.
If the PM device is an electrostatic precipitator (ESP) and the PM control efficiency is at least 80 but less than 95 percent, then the NEDS control device code = 11.
If the PM device is an electrostatic precipitator (ESP) and the PM control efficiency is less than 80 percent, then the NEDS control device code = 12.
If the PM device is a wet scrubber and the PM control efficiency is at least 95 percent, then the NEDS control device code = 1.
If the PM device is a wet scrubber and the PM control efficiency is at least at least 80 but less than 95 percent, then the NEDS control device code = 2.
If the PM device is a wet scrubber and the PM control efficiency is less than 80 percent, then the NEDS control device code = 3.
If the PM device is a baghouse, then the NEDS control device code = 17.
If the PM device is a single cyclone, then the NEDS control device code = 75.
If the PM device is a multiple cyclone, then the NEDS control device code = 76.
If the PM device is other, then the NEDS control device code = 99.

Table 6. EPA-Approved EGU Uncontrolled Emission Factors for Criteria Pollutants

SCC	Fuel	CO Emission Factor	NO_x Emission Factor[2]	VOC Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	SO_2 Emission Factor	NH_3 Emission Factor	PM Flag[3]	SO_2 Flag[3]
10100101	ANT	0.6000	18.0000	0.0700	2.3000	0.6000	39.0000	0.030000	A	S
10100102	ANT	0.6000	9.0000	0.0700	4.8000	2.5000	39.0000	0.030000		S
10100201	BIT	0.5000	31.0000	0.0400	2.6000	1.4800	38.0000	0.030000	A	S
10100202	BIT [4]	0.5000	22.0000	0.0600	2.3000	0.6000	38.0000	0.030000	A	S
10100203	BIT	0.5000	33.0000	0.1100	0.2600	0.1100	38.0000	0.030000	A	S
10100204	BIT	5.0000	11.0000	0.0500	13.2000	4.6000	38.0000	0.030000		S
10100205	BIT	6.0000	7.5000	0.0500	6.0000	2.2000	38.0000	0.030000		S
10100211	BIT	0.5000	14.0000	0.0400	2.6000	1.4800	38.0000	0.030000	A	S
10100212	BIT [4]	0.5000	15.0000	0.0600	2.3000	0.6000	38.0000	0.030000	A	S
10100215	BIT	0.5000	31.0000	0.0600	2.3000	0.6000	38.0000	0.030000	A	S
10100217	BIT	18.0000	15.2000	0.0500	12.4000	1.3640	31.0000	0.030000		S
10100218	BIT	18.0000	5.0000	0.0500	12.4000	1.3640	31.0000	0.030000		S
10100221	SUB	0.5000	24.0000	0.0400	2.6000	1.4800	35.0000	0.030000	A	S
10100222	SUB [4]	0.5000	12.0000	0.0600	2.3000	0.6000	35.0000	0.030000	A	S
10100223	SUB	0.5000	17.0000	0.1100	0.2600	0.1100	35.0000	0.030000	A	S
10100224	SUB	5.0000	8.8000	0.0500	13.2000	4.6000	35.0000	0.030000		S
10100225	SUB	6.0000	7.5000	0.0500	6.0000	2.2000	35.0000	0.030000		S
10100226	SUB [4]	0.5000	8.4000	0.0600	2.3000	0.6000	35.0000	0.030000	A	S
10100235	SUB	0.5000	14.0000	0.0600	2.3000	0.6000	35.0000	0.030000	A	S
10100237	SUB	18.0000	15.2000	0.0500	16.1000	4.2000	31.0000	0.030000		S
10100238	SUB	18.0000	5.0000	0.0500	16.1000	4.2000	31.0000	0.030000		S
10100300	LIG	N/A	N/A	N/A	N/A	N/A	N/A	0.030000		
10100301	LIG [4]	0.2500	13.0000	0.0700	1.8170	0.5214	30.0000	0.030000	A	S
10100302	LIG	0.6000	7.1000	0.0700	2.3000	0.6600	30.0000	0.030000	A	S
10100303	LIG	0.6000	15.0000	0.0700	0.8710	0.3690	30.0000	0.030000	A	S
10100304	LIG	6.0000	6.0000	0.0700	1.0700	0.4066	30.0000	0.030000	A	S
10100306	LIG	5.0000	5.8000	0.0700	1.6000	0.5600	30.0000	0.030000	A	S
10100316	LIG	0.1500	3.6000	0.0300	12.0000	1.4000	10.0000	0.030000		S
10100317	LIG	0.1500	3.6000	0.0300	12.0000	1.4000	10.0000	0.030000		S
10100318	LIG	0.1500	3.6000	0.0300	12.0000	1.4000	10.0000	0.030000		S
10100401	RFO	5.0000	47.0000	0.7600	[5]	[6]	157.0000	0.800000		S
10100404	RFO	5.0000	32.0000	0.7600	[5]	[6]	157.0000	0.800000		S
10100405	RFO	5.0000	47.0000	0.7600	5.9000	4.3000	157.0000	0.800000	A	S

Table 6. EPA-Approved EGU Uncontrolled Emission Factors (Continued)

SCC	Fuel	CO Emission Factor	NO_x Emission Factor[2]	VOC Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	SO_2 Emission Factor	NH_3 Emission Factor	PM Flag[3]	SO_2 Flag[3]
10100406	RFO	5.0000	32.0000	0.7600	5.9000	4.3000	157.0000	0.800000	A	S
10100501	DFO	5.0000	24.0000	0.2000	1.0000	0.2500	142.0000	0.800000		S
10100504	DFO	5.0000	47.0000	0.7600	5.9000	4.3000	150.0000	0.800000	A	S
10100505	DFO	5.0000	32.0000	0.7600	5.0000	3.6000	150.0000	0.800000		S
10100601	NG [4]	84.0000	190.0000	5.5000	1.9000	1.9000	3.5000	7.740000		
10100602	NG	84.0000	100.0000	5.5000	1.9000	1.9000	3.5000	7.740000		
10100604	NG	24.0000	170.0000	5.5000	1.9000	1.9000	3.5000	7.740000		
10100602	ME [7]	81.0400	183.3048	5.3062	1.8330	1.8330	3.5000	7.740000		
10100701	PRG [7]	6.5718	14.8647	0.4303	0.1486	0.1486	3.5000	1.200000		
10100702	PRG [7]	6.5718	14.8647	0.4303	0.1486	0.1486	3.5000	1.200000		
10100702	OG [7]	67.5644	152.8242	4.4239	1.5282	1.5282	3.5000	1.200000		
10100703	RG [7]	66.9620	151.4617	4.3844	1.5146	1.5146	3.5000	1.200000		
10100704	BFG [7]	6.8064	15.3955	0.4457	0.1540	0.1540	3.5000	1.200000		
10100707	COG [7]	41.0024	92.7435	2.6847	0.9274	0.9274	3.5000	1.200000		
10100711	LFG [7]	32.0274	72.4429	2.0970	0.7244	0.7244	3.5000	1.200000		
10100712	DG [7]	49.8809	112.8258	3.2660	1.1283	1.1283	3.5000	1.200000		
10100801	PC	0.6000	21.0000	0.0700	7.9000	4.5000	39.0000	0.397000	A	S
10100818	PC [8]	18.0000	5.0000	0.0500	12.4000	1.3640	31.0000	0.397000		S
10100901	Bark	6.8459	2.5102	0.1940	5.7049	4.9062	0.2852	0.086000		
10100902	WDS	6.8459	2.5102	0.1940	5.7049	4.9062	0.2852	0.086000		
10100903	Wood	6.8459	2.5102	0.1940	4.1075	3.5370	0.2852	0.086000		
10100911	WDS [23]	13.6000	1.5000	0.1940	5.7049	4.9062	0.0750	0.086000		
10100912	WDS [8]	1.4000	2.0000	0.1940	5.7049	4.9062	0.0750	0.086000		
10101001	BL	3.6000	21.0000	0.2600	0.6000	0.6000	96.8000	N/A		S
10101001	BU [7, 9]	269.6000	609.8095	17.6524	6.0981	6.0981	3.5000	N/A		
10101002	PG [7, 9]	67.5644	152.8242	4.4239	4.6867	4.6867	3.5000	N/A		
10101002	PL [10]	207.2000	468.6667	13.5667	0.1636	0.1636	0.1222	N/A		
10101101	Bagasse	2.0000	1.2000	2.0000	12.3200	7.0200	0.0000	N/A		
10101201	OTS [11, 12]	1.2992	1.2000	0.7218	22.8089	12.9924	0.0800	1.190000		
10101201	Solid waste	0.0165	3.8000	2.0000	11.4000	7.8000	3.9000	1.190000		
10101202	MSW [22]	3.6000	5.0000	2.0000	63.2000	36.0000	1.7000	1.190000		
10101204	TDF [13]	0.5000	22.0000	0.0600	2.3000	0.6000	38.0000	1.190000	A	S

Table 6. EPA-Approved EGU Uncontrolled Emission Factors (Continued)

SCC	Fuel	CO Emission Factor	NO_x Emission Factor[2]	VOC Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	SO_2 Emission Factor	NH_3 Emission Factor	PM Flag[3]	SO_2 Flag[3]
10101205	SLW [11]	0.3958	5.0000	0.2199	6.9484	3.9580	2.8000	1.190000		
10101206	AB [14]	0.6000	1.2000	0.1700	15.6000	15.6000	0.0800	1.190000		
10101207	OBS [11]	0.8741	2.0000	0.4856	15.3452	8.7408	0.2300	1.190000		
10101208	PP [15]	6.8459	2.5102	0.1940	5.7049	4.9062	0.2852	1.190000		
10101301	LB [16]	3.7232	17.8714	0.1489	0.7446	0.1862	142.0000	N/A		S
10101301	Liquid waste	5.0000	19.0000	1.0000	51.0000	13.0000	142.0000	N/A	A	S
10101301	OTL [16]	0.2857	1.3714	0.0114	0.0571	0.0143	142.0000	N/A		S
10101302	OW [24]	5.0000	19.0000	1.0000	33.1500	18.7200	147.0000	N/A		S
10101304	BLQ [11]	0.7627	1.5000	0.4237	13.3898	7.6271	7.0000	N/A		
10101305	RL [16]	1.1179	5.3657	0.0447	0.2236	0.0559	142.0000	N/A		S
10101306	SS [16]	1.6071	7.7143	0.0643	0.3214	0.0804	142.0000	N/A		S
10101307	TO [16]	4.4571	1.5000	0.1783	0.8914	0.2229	142.0000	N/A		S
10101308	WDL [16, 18]	1.1316	5.4315	0.0453	0.2263	0.0566	142.0000	N/A		S
10101601	MH [16]	0.3464	1.6629	0.0139	0.0693	0.0173	142.0000	N/A		S
10101801	HY [9, 19]	0.0000	32.0000	0.0000	0.0000	0.0000	0.0000	N/A		
10101901	SC [13]	0.5000	22.0000	0.0600	2.3000	0.6000	38.0000	0.030000	A	S
10102001	WC [20]	0.2500	13.0000	0.0700	1.8170	0.5214	30.0000	0.030000	A	S
10102018	WC [8, 20, 21]	0.1500	3.6000	0.0300	12.0000	1.4000	10.0000	0.030000		S
10102101	OO [17]	5.0000	24.0000	0.2000	1.0000	0.2500	142.0000	N/A		S
20100101	DFO	0.4598	122.6256	0.0571	0.6020	0.6020	140.7408	6.620000		S
20100102	DFO [25]	130.0000	448.0000	0.0570	6.8000	6.5500	142.0000	6.620000		S
20100201	NG	83.8628	327.2694	2.1477	1.9380	1.9380	3.5000	6.560000		
20100202	NG	399.0000	2840.0000	116.0000	10.0000	10.0000	3.5000	0.600000		
20100301	IGCC [26]	34.6500	327.2694	2.2050	11.5500	11.5500	3.5000	6.560000		
20100901	KE, JF [17]	0.4455	122.3200	2.3800	8.5400	8.5400	142.0000	N/A		S

[1] For SCCs beginning with 101001, 101002, or 101003 (coal), 101008 (coke), 101009 (wood), 101011 (bagasse), 101012 (solid waste), 101019 (synfuel), or 101020 (waste coal), emission factors are in pounds per ton; for SCCs beginning with 101004, 101005, and 201001 (oil), 101010 (propane/butane), 101013 (liquid waste), 101016 (methanol), 101021 (other oil), or 201009 (kerosene/jet fuel), emission factors are in pounds per thousand gallons; for SCCs beginning with 101006 or 201002 (natural gas), 101007 (process gas), 101018 (hydrogen), or 201003 (IGCC) emission factors are in pounds per million cubic feet.

Table 6. EPA-Approved EGU Uncontrolled Emission Factors (Continued)

[2] For DG (Digester Gas), LFG (Landfill Gas), and ME (Methane), only the steam NO_X EFs are shown; different factors are used for GT and IC records. In eGRID, these factors are offset by a flare burnoff EF (for example, for DG/ST the NO_X EF in eGRID2002 was 39.0 (65.0 minus 26.0 for flare burnoff)), BUT per Roy Huntley on 5/9/03, we are NOT incorporating these offsets for the NEI.

[3] When plant specific ash or sulfur content is not available, fuel average ash and sulfur content are used; if fuel average ash or sulfur content is not available 8 percent ash content and 2 percent sulfur content are used for solid fuels and 1 percent sulfur content is used for liquid fuels, per Roy Huntley on 5/15/03.

[4] For these 6 SCCs there are two NO_X emission factors, one representing pre-NSPS and one representing post-NSPS. Pre-NSPS is before 1974, while post-NSPS is 1974 and beyond. The pre-NSPS is used as the default when the date of operation is not known (except for 10100601, where the post-NSPS is used as the default). The post-NSPS NO_X Emission Factors are below for reference (except for 10100601, where the pre-NSPS is shown below for reference).

10100202	12.0000		10100222	7.4000		10100301	6.3000			
10100212	10.0000		10100226	7.2000		1010061	280.0000			

[5] From FIRE 6.23, the equation for this PM_{10} EF is [5.9*(1.12*S+0.37)]

[6] From FIRE 6.23, the equation for this $PM_{2.5}$ EF is [4.3*(1.12*S+0.37)]

[7] BFG (Blast Furnace Gas), BG (Butane (gas)), COG (Coke Oven Gas), DG (Digester Gas), LFG (Landfill Gas), ME (Methane), OG (Other Gas), PG (Propane (gas)), PRG (Process Gas), and RG (Refinery Gas) are similar to NG (Natural Gas) boiler. For these fuels' EFs, per Roy Huntley on 5/12/03 and 5/15/03, we are using NG EFs adjusted by the ratio of each fuels' heat content divided by NG's heat content (assuming NG has a heat content of 1050 btu/cf); however, for these fuels' SO2 EFs, NG's SO2 EF is used without modification.

[8] PC (Petroleum Coke), WC (Waste Coal), and WDS (Wood/Wood Waste Solid) with circulating fluidized beds (CFB) were added (SCCs for PC and WC were approved by Ron Ryan on 8/12/03) with EFs provided by Roy Huntley on 8/12/03 and 8/13/03. For PC, bituminous coal CFB EFs are used; for WC, lignite coal CFB EFS are used. For WDS, WDS CFB EFs are used from FIRE 6.23 for CO, NOx, and SO_2; for all other EFs, standard WDS EFs are used.

[9] BU (Butane (gas), HY (Hydrogen), ME (Methane), and PG (Propane (gas) heat contents were provided by Roy Huntley on 5/15/03.

[10]Per Roy Huntley on 5/12/03, PL (Propane (liquid)) is converted into PG (Propane (gas)) before being used as a fuel. Therefore, we use the PG EFs after converting from PL in gallons to PG in cubic feet (the conversion factor is multiplying by 34.9 -- see Roy's 5/12/03 email for details of this conversion factor). Also, since PL is in thousand gallons and PG is in million cubic feet we must divide by 1000.

[11]BLQ (Black Liquor), OBS (Other Biomass Solids), OTS (Other Solids), and SLW (Sludge Waste) are similar to solid waste. For these fuels' EFs, per Roy Huntley on 5/12/03, we are using solid waste EFs adjusted by the ratio of each fuels' heat content divided by solid waste's heat content (assuming solid waste has a heat content of 26,000 btus/pound); however, NO_X and SO2 EFs are not ratioed as they are available for these fuels. Recalculated for 4/19/04 file.

[12]The heat content for OTS (Other Solids) is derived from the 2000 EIA-860B and is documented in Jason Radgowski's 5/6/03 email.

[13]SC (Synfuel) and TDF (Tires) are similar to BIT (Bituminous Coal). For these fuels' EFs, per Roy Huntley on 5/9/03 and 5/12/03, we are using all of the BIT EFs.

[14]AB (Agricultural Byproducts) EFs were provided by Roy Huntley on 5/9/03; they are based on bagasse EFs.

[15]PP (Paper Pellets) is similar to WDS (Wood/Wood Waste Solid). For this fuels' EFs, per Roy Huntley on 5/12/03, we are using all of the WDS EFs. Recalculated for 4/19/04 file.

[16]LB (Liquid Byproduct), MH (Methanol), OTL (Other Liquid), RL (Red Liquor), SS (Spent Sulfite Liquor), TO (Tall Oil), and WDL (Wood/Wood Waste Liquid) are similar to DFO (Distillate Fuel Oil). For these fuels' EFs, per Roy Huntley on 5/12/03 and 5/15/03, we are using DFO EFs adjusted by the ratio of each fuels' heat content divided by DFO's heat content (assuming DFO has a heat content of 140,000 btus/gallon); however, for these fuels' SO2 EFs, DFO's SO2 EF is used without modification.

Table 6. EPA-Approved EGU Uncontrolled Emission Factors (Continued)

[17]JF (Jet Fuel), KE (Kerosene), and OO (Other Oil) are similar to DFO (Distillate Fuel Oil) boiler. For these fuels' EFs, per Roy Huntley on 5/12/03, we are using all of the DFO EFs.

[18]In all previous EF files, EFs for WDS (Wood/Wood Waste Solid) were used for WDL (Wood/Wood Waste Liquid); this was incorrect as the units are different for these two fuels.

[19]HY (Hydrogen) EFs were provided by Roy Huntley on 5/9/03 and 5/15/03.
[20]WC (Waste Coal) is similar to LIG (Lignite Coal). For this fuels' EFs, per Roy Huntley on 8/12/03, we are using all of the LIG EFs.

[21]In files dated 8/13/03 and 12/08/03, SCC listed incorrectly as 10100218.

[22]As of 4/19/04, 10101202, MSW, elim.; 10101202, rdf, only fuelcode name changed to MSW.

[23]As of 4/19/04, 10100911 added. Fire EFs used for CO, NOx, and SO2; rest use 10100902's Efs.

[24]An ash content of 0.65 was used to calculate PM10EF and PM25EF. Ash content taken from Roy Huntley's 4/21/04 email.

[25]PM10EF and PM25EF values were taken from Roy Huntley's 4/21/04 email.

[26]IGCC Efs for CO, VOC, PM10, and PM25 are from EPA-accepted email from Pechan on 12/17/02.

N/A indicates no available emission factor.

FUEL	Fuel Description
AB	Agricultural Byproducts (bagasse, rice hulls, peanut hulls, nut shells, cow manure)
ANT	Anthracite Coal
BFG	Blast Furnace Gas
BIT	Bituminous Coal
BL	Butane (liquid)
BLQ	Black Liquor
BU	Butane (gas)
COG	Coke Oven Gas
DFO	Distillate Fuel Oil/Light Oil
DG	Digester Gas
HY	Hydrogen
IGCC	Integrated Gasification Combined Cycle
JF	Jet Fuel
KE	Kerosene
LB	Liquid Byproduct
LFG	Landfill Gas
LIG	Lignite Coal
ME	Methane
MH	Methanol
MSW	Municipal Solid Waste (refuse)

Table 6. EPA-Approved EGU Uncontrolled Emission Factors (Continued)

FUEL	Fuel Description
NG	Natural Gas
OBS	Other biomass Solids (Animal Manure and Waste, Solid Byproducts, and other solid biomass not specified)
OG	Other Gas (blast furnace, coke oven, refinery, and process)
OO	Other Oil
OTL	Other Liquid (originally 'OTH' – could not be further classified)
OTS	Other Solids (originally 'OTH' -- could not be further classified)
OW	Oil Waste
PC	Petroleum Coke
PG	Propane (gas)
PL	Propane (liquid)
PP	Paper Pellets
PRG	Process Gas
PUR	Purchased Steam
RDF	Refuse Derived Fuel
RFO	Heavy Oil/Residual Fuel Oil
RG	Refinery Gas
RL	Red Liquor
SC	Coal-based Synfuel
SLW	Sludge Waste
SS	Spent Sulfite Liquor
SUB	Subbituminous Coal
TDF	Tires
TO	Tall Oil
WC	Waste Coal
WDL	Wood/Wood Waste Liquid
WDS	Wood/Wood Waste Solid

Table 7. Condensible PM Emission Factors

Fuel	Applicable Source Classification Codes	PM Condensible Emission Factor (lb/MMBtu)
BOILERS		
Coal (including waste coal and syn coal)*	10100204, 10100205, 10100224, 10100225, 10100304, 10100306	0.04
	10100217, 10100218, 10100237,10100238, 10100317, 10100318, 10102017, 10102018	0.01
	10100201, 10100202, 10100203, 10100212, 10100221, 10100222, 10100223, 10100226, 10100301, 10100302, 10100303, 10101901, 10102001	0.02**
	10100201, 10100202, 10100203,10100212, 10100221, 10100222,10100223, 10100226, 10100301, 10100302, 10100303, 10101901, 10102001, 10100101	(0.1 * sulfur content [as a decimal] - .03)***
Light Oil (Distillate, Diesel)	10100401 - 10100499	0.01
Heavy Oil (Residual)	10100501 - 10100599	0.009
Natural Gas	10100601 - 10100699	0.0057
Other Process Gases	10100701 - 10100799	0.0056
Petroleum Coke	10100801 - 10100899	0.01
Wood, Biomass (including Black Liquor), Waste/Refuse	10100901 - 10100999, 10101201 - 10101299, 10101304	0.017
LPG (Propane, Butane)	10101001 - 10101099	0.0056
Other Liquid Waste/Oil, Methanol	10101301, 10101302, 10101305, 10101306, 10101307, 10101308, 10101601, 10102101	0.009
TURBINES		
Combustion Turbines, Oil	20100101	0.0072
Internal Combustion Engine, Oil	20100102	0.0077
Combustion Turbine, Gas and IGCC	20100201, 20100301	0.0047
Internal Combustion Engine, Gas	20100202	0.0099

*If the emission factor is less than 0.01, then it is set equal to 0.01.
**AND there is either an SO_2 FGD or a PM wet scrubber.
***And there is any PM control other than a wet scrubber and there is no SO_2 control, OR SCC = 10100222 and there is no PM control.

Table 8. Coal HAP Emission Factors

NEI Pollutant Name	HAP Category	Emission Factor (lb/ton)
Naphthalene	Naphthalene	1.30E-05
Indeno[1,2,3-c,d]Pyrene	Polycyclic Organic Matter as 7-PAH	6.10E-08
Benzo[g,h,i,]Perylene	Polycyclic Organic Matter as 15-PAH	2.70E-08
Benzo[a]Pyrene	Polycyclic Organic Matter as 7-PAH	3.80E-08
Hydrogen Fluoride	Hydrogen Fluoride (Hydrofluoric Acid)	1.50E-01
Acrolein	Acrolein	2.90E-04
Hexane	Hexane	6.70E-05
Dioxins, Total, w/o Individ. Isomers Reported {PCDDs}	Dioxins/Furans (total, non TEQ)	3.50E-12
Ethyl Benzene	Ethylbenzene	9.40E-05
Ethylene Dichloride	Ethylene Dichloride (1,2-Dichloroethane)	4.00E-05
Beryllium	Beryllium Compounds	2.10E-05
Antimony	Antimony Compounds	1.80E-05
Manganese	Manganese Compounds	4.90E-04
Arsenic	Arsenic Compounds	4.10E-04
Benzene	Benzene	1.30E-03
Chlorobenzene	Chlorobenzene	2.20E-05
Carbon Disulfide	Carbon Disulfide	1.30E-04
Cadmium	Cadmium Compounds	5.10E-05
Bis(2-Ethylhexyl)Phthalate	Bis(2-Ethylhexyl)Phthalate	7.30E-05
Cobalt	Cobalt Compounds	1.00E-04
Lead	Lead Compounds	4.20E-04
Styrene	Styrene	2.50E-05
Selenium	Selenium Compounds	1.30E-03
Formaldehyde	Formaldehyde	2.40E-04
Propionaldehyde	Propionaldehyde	3.80E-04
Phenol	Phenol	1.60E-05
Isophorone	Isophorone	5.80E-04
Tetrachloroethylene	Tetrachloroethylene (Perchloroethylene)	4.30E-05
Toluene	Toluene	2.40E-04
Nickel	Nickel Compounds	2.80E-04
Methylene Chloride	Methylene Chloride (Dichloromethane)	2.90E-04
Acetaldehyde	Acetaldehyde	5.70E-04
Acetophenone	Acetophenone	1.50E-05
Methyl Ethyl Ketone	Methyl Ethyl Ketone (2-Butanone)	3.90E-04
Methyl Chloride	Methyl Chloride (Chloromethane)	5.30E-04
Methyl Bromide	Methyl Bromide (Bromomethane)	1.60E-04
Chromium	Chromium Compounds	2.60E-04
Fluorene	Polycyclic Organic Matter as 15-PAH	9.10E-07
Anthracene	Polycyclic Organic Matter as 15-PAH	2.10E-07
Acenaphthylene	Polycyclic Organic Matter as 15-PAH	2.50E-07
Acenaphthene	Polycyclic Organic Matter as 15-PAH	5.10E-07
Biphenyl	Biphenyl	1.70E-06
Pyrene	Polycyclic Organic Matter as 15-PAH	3.30E-07
Phenanthrene	Polycyclic Organic Matter as 15-PAH	2.70E-06

Table 8. Coal HAP Emission Factors (Continued)

NEI Pollutant Name	HAP Category	Emission Factor (lb/ton)
Fluoranthene	Polycyclic Organic Matter as 15-PAH	7.10E-07
Chrysene	Polycyclic Organic Matter as 7-PAH	1.00E-07
Cyanide	Cyanide Compounds	2.50E-03
Vinyl Acetate	Vinyl Acetate	7.60E-06
Methylhydrazine	Methylhydrazine	1.70E-04
Methyl Tert-Butyl Ether	Methyl Tert-Butyl Ether	3.50E-05
Methyl Methacrylate	Methyl Methacrylate	2.00E-05
Dimethyl Sulfate	Dimethyl Sulfate	4.80E-05
Ethylene Dibromide	Ethylene Dibromide (Dibromoethane)	4.00E-05
2-Chloroacetophenone	2-Chloroacetophenone	7.00E-06
Cumene	Cumene	5.30E-06
Xylenes (Mixture of o, m, and p Isomers)	Xylenes (Mixed Isomers)	3.70E-05
Chloroform	Chloroform	5.90E-05
Bromoform	Bromoform	3.90E-05
Benzyl Chloride	Benzyl Chloride	7.00E-04
2,4-Dinitrotoluene	2,4-Dinitrotoluene	2.80E-07
Ethyl Chloride	Ethyl Chloride	4.20E-05
Hydrochloric Acid	Hydrochloric Acid (Hydrogen Chloride [Gas Only])	1.20E+00
Chromium (VI)	Chromium Compounds	7.90E-05
Benz[a]Anthracene	Polycyclic Organic Matter as 7-PAH	8.00E-08
5-Methylchrysene	Polycyclic Organic Matter	2.20E-08

Table 9. Distillate Oil HAP Emission Factors

NEI Pollutant Name	HAP Category	Emission Factor (lb/e3gal)
1,3-Butadiene	1,3-Butadiene	2.24E-03
Formaldehyde	Formaldehyde	3.36E-02
Benzene	Benzene	2.10E-04
Lead	Lead Compounds	1.26E-03
Manganese	Manganese Compounds	8.40E-04
Mercury	Mercury Compounds	4.20E-04
Nickel	Nickel Compounds	4.20E-04
Arsenic	Arsenic Compounds	5.60E-04
Beryllium	Beryllium Compounds	4.20E-04
Cadmium	Cadmium Compounds	4.20E-04
Chromium	Chromium Compounds	4.20E-04
Acetaldehyde	Acetaldehyde	4.90E-03
Selenium	Selenium Compounds	2.10E-03

Table 10. Residual Oil HAP Emission Factors

NEI Pollutant Name	HAP Category	Emission Factor (lb/e3gal)
Acenaphthene	Polycyclic Organic Matter as 15-PAH	2.11E-05
Acenaphthylene	Polycyclic Organic Matter as 15-PAH	2.53E-07
Acetaldehyde	Acetaldehyde	5.25E-03
Anthracene	Polycyclic Organic Matter as 15-PAH	1.22E-06
Antimony	Antimony Compounds	5.25E-03
Arsenic	Arsenic Compounds	1.41E-03
Benz[a]Anthracene	Polycyclic Organic Matter as 7-PAH	4.01E-06
Benzene	Benzene (Including Benzene From Gasoline)	2.25E-04
Benzo[b+k]Fluoranthene	Polycyclic Organic Matter as 7-PAH	1.48E-06
Benzo[g,h,i,]Perylene	Polycyclic Organic Matter as 15-PAH	2.26E-06
Beryllium	Beryllium Compounds	3.00E-05
Cadmium	Cadmium Compounds	4.20E-04
Chromium	Chromium Compounds	9.00E-04
Chrysene	Polycyclic Organic Matter as 7-PAH	2.38E-06
Cobalt	Cobalt Compounds	6.02E-03
Dibenzo[a,h]Anthracene	Polycyclic Organic Matter as 7-PAH	1.67E-06
Ethyl Benzene	Ethylbenzene	6.36E-05
Fluoranthene	Polycyclic Organic Matter as 15-PAH	4.84E-06
Fluorene	Polycyclic Organic Matter as 15-PAH	4.47E-06
Formaldehyde	Formaldehyde	3.60E-02
Indeno[1,2,3-c,d]Pyrene	Polycyclic Organic Matter as 7-PAH	2.14E-06
Lead	Lead Compounds	1.65E-03
Manganese	Manganese Compounds	3.15E-03
Mercury	Mercury Compounds	1.22E-04
Naphthalene	Naphthalene	1.13E-03
Nickel	Nickel Compounds	9.00E-02
o-Xylene	Xylenes (Mixed Isomers)	1.09E-04
Phenanthrene	Polycyclic Organic Matter as 15-PAH	1.05E-05
Phosphorus	Phosphorus Compounds	9.46E-03
Pyrene	Polycyclic Organic Matter as 15-PAH	4.25E-06
Selenium	Selenium Compounds	7.35E-04
Toluene	Toluene	6.20E-03

Table 11. Wood HAP Emission Factors

NEI Pollutant Name	HAP Category	Emission Factor (lb/MMBtu)
2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2.20E-08
2,4-Dinitrophenol	2,4-Dinitrophenol	1.80E-07
2-Chloronaphthalene	Polycyclic Organic Matter	2.40E-09
2-Methylnaphthalene	Polycyclic Organic Matter	1.60E-07
4-Nitrophenol	4-Nitrophenol	1.10E-07
Acenaphthene	Polycyclic Organic Matter as 15-PAH	9.10E-07
Acenaphthylene	Polycyclic Organic Matter as 15-PAH	5.00E-06
Acetaldehyde	Acetaldehyde	8.30E-04
Acetophenone	Acetophenone	3.20E-09
Acrolein	Acrolein	4.00E-03
Anthracene	Polycyclic Organic Matter as 15-PAH	3.00E-06
Antimony	Antimony Compounds	7.90E-06
Arsenic	Arsenic Compounds	2.20E-05
Benz[a]Anthracene	Polycyclic Organic Matter as 7-PAH	6.50E-08
Benzene	Benzene	4.20E-03
Benzo[a]Pyrene	Polycyclic Organic Matter as 7-PAH	2.60E-06
Benzo[b]Fluoranthene	Polycyclic Organic Matter as 7-PAH	1.00E-07
Benzo[e]Pyrene	Polycyclic Organic Matter	2.60E-09
Benzo[g,h,i,]Perylene	Polycyclic Organic Matter as 15-PAH	9.30E-08
Benzo[k]Fluoranthene	Polycyclic Organic Matter as 7-PAH	3.60E-08
Beryllium	Beryllium Compounds	1.10E-06
Bis(2-Ethylhexyl) Phthalate	Bis(2-Ethylhexyl)Phthalate	4.70E-08
Cadmium	Cadmium Compounds	4.10E-06
Carbon Tetrachloride	Carbon Tetrachloride	4.50E-05
Chlorine	Chlorine	7.90E-04
Chlorobenzene	Chlorobenzene	3.30E-05
Chloroform	Chloroform	2.80E-05
Chromium	Chromium Compounds	2.10E-05
Chromium IV	Chormium Compounds	3.50E-06
Chrysene	Polycyclic Organic Matter as 7-PAH	3.80E-08
Cobalt	Cobalt Compounds	6.50E-06
Dibenzo[a,h]Anthracene	Polycyclic Organic Matter as 7-PAH	9.10E-09
Ethyl Benzene	Ethylbenzene	3.10E-05
Ethyl Chloride	Ethyl Chloride	8.60E-04
Ethylene Dichloride	Ethylene Dichloride (1,2-Dichloroethane)	2.90E-05
Fluoranthene	Polycyclic Organic Matter as 15-PAH	1.60E-07
Fluorene	Polycyclic Organic Matter as 15-PAH	3.40E-06
Formaldehyde	Formaldehyde	4.40E-03
Hexachlorodibenzo-p-Dioxin	Dioxins/Furans (total, non TEQ)	1.60E-06
Hydrochloric Acid	Hydrochloric Acid (Hydrogen Chloride [Gas Only])	1.90E-02
Indeno[1,2,3-c,d]Pyrene	Polycyclic Organic Matter as 7-PAH	8.70E-08
Lead	Lead Compounds	4.80E-05
Manganese	Manganese Compounds	1.60E-03
Mercury	Mercury Compounds	3.50E-06
Methyl Bromide	Methyl Bromide	1.50E-05
Methly Chloride	Methyl Choride	2.30E-05
Methyl Chloroform	Methyl Chloroform	3.10E-05
Methly Ethyl Ketone	Methyl Ethyl Ketone	5.40E-06
Methylene Chloride	Methylene Chloride	2.90E-04
Naphthalene	Naphthalene	9.70E-05
Nickel	Nickel Compounds	3.30E-05

Table 11. Wood HAP Emission Factors (Continued)

NEI Pollutant Name	HAP Category	Emission Factor (lb/MMBtu)
Octachlorodibenzofuran	Dioxins/Furans as 2,3,7,8-TCDD TEQs	8.80E-11
Octachlorodibenzo-p-Dioxin	Dioxins/Furans as 2,3,7,8-TCDD TEQs	6.60E-08
o-Xylene	Xylenes (Mixed Isomers)	2.50E-05
Pentachlorophenol	Pentachlorophenol	5.10E-08
Perylene	Polycyclic Organic Matter	5.20E-10
Phenanthrene	Polycyclic Organic Matter as 15-PAH	7.00E-06
Phenol	Phenol	5.10E-05
Phosphorus	Phosphorus	2.70E-05
Propionaldehyde	Propionaldehyde	6.10E-05
Propylene Dichloride	Propylene Dichloride (1,2-Dichloropropane	3.30E-05
Pyrene	Polycyclic Organic Matter as 15-PAH	3.70E-06
Selenium	Selenium Compounds	2.80E-06
Styrene	Styrene	1.90E-03
Tetrachloroethylene	Tetrachloroethylene	3.80E-05
Toluene	Toluene	9.20E-04
Trichloroethylene	Trichloroethylene	3.00E-05
Vinyl Chloride	Vinyl Chloride	1.80E-05
Xylenes	Xylenes (Mixed Isomers)	5.36E-06
2,3,7,8-Tetrachlorodibenzofuran	Dioxins/Furans as 2,3,7,8-TCDD TEQs	9.00E-11
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Dioxins/Furans as 2,3,7,8-TCDD TEQs	8.60E-12

Table 12. Natural Gas HAP Emission Factors

NEI Pollutant Name	HAP Category	Emission Factor (lb/MMscf)
2-Methylnaphthalene	Polycyclic Organic Matter	2.40E-05
3-Methylcholanthrene	Polycyclic Organic Matter	1.80E-06
7,12-Dimethylbenz[a]Anthracene	Polycyclic Organic Matter	1.60E-05
Acenaphthene	Polycyclic Organic Matter as 15-PAH	1.80E-06
Acenaphthylene	Polycyclic Organic Matter as 15-PAH	1.80E-06
Acetaldehyde	Acetaldehyde	4.20E-03
Anthracene	Polycyclic Organic Matter as 15-PAH	2.40E-06
Arsenic	Arsenic Compounds	2.00E-04
Benz[a]Anthracene	Polycyclic Organic Matter as 7-PAH	1.80E-06
Benzene	Benzene	2.10E-03
Benzo[a]Pyrene	Polycyclic Organic Matter as 7-PAH	1.20E-06
Benzo[b]Fluoranthene	Polycyclic Organic Matter as 7-PAH	1.80E-06
Benzo[g,h,i,]Perylene	Polycyclic Organic Matter as 15-PAH	1.20E-06
Benzo[k]Fluoranthene	Polycyclic Organic Matter as 7-PAH	1.80E-06
Beryllium	Beryllium Compounds	1.20E-05
Cadmium	Cadmium Compounds	1.10E-03
Chromium	Chromium Compounds	1.40E-03
Chrysene	Polycyclic Organic Matter as 7-PAH	1.80E-06
Cobalt	Cobalt Compounds	8.40E-05
Dibenzo[a,h]Anthracene	Polycyclic Organic Matter as 7-PAH	1.20E-06
Fluoranthene	Polycyclic Organic Matter as 15-PAH	3.00E-06
Fluorene	Polycyclic Organic Matter as 15-PAH	2.80E-06
Formaldehyde	Formaldehyde	7.50E-02
Hexane	Hexane	1.80E+00
Indeno[1,2,3-c,d]Pyrene	Polycyclic Organic Matter as 7-PAH	1.80E-06
Manganese	Manganese Compounds	3.80E-04
Mercury	Mercury Compounds	2.60E-04
Naphthalene	Naphthalene	6.10E-04
Nickel	Nickel Compounds	2.10E-03
Pyrene	Polycyclic Organic Matter as 15-PAH	5.00E-06
Selenium	Selenium Compounds	2.40E-05
Toluene	Toluene	3.40E-03

Table 13. Natural Gas Turbine HAP Emission Factors

NEI Pollutant Name	HAP Category	Emission Factor (lb/MMBtu)
1,3-Butadiene	1,3-Butadiene	4.30E-07
Acetaldehyde	Acetaldehyde	9.10E-05
Acrolein	Acrolein	6.40E-06
Benzene	Benzene	
Ethyl Benzene	Ethylbenzene	3.20E-05
Naphthalene	Naphthalene	1.30E-06
PAH, Total	Polycyclic Organic Matter as 7-PAH	2.20E-06
Propylene Oxide	Propylene Oxide	2.90E-05
Toluene	Toluene	1.30E-04
Xylenes (Mixture of o, m, and p Isomers)	Xylenes (Mixed Isomers)	6.40E-05

Table 14. Diesel Turbine HAP Emission Factors

NEI Pollutant Name	HAP Category	Emission Factor (lb/e3gal)
PAH, Total	Polycyclic Organic Matter as 7-PAH	5.60E-03
Xylenes (Mixture of o, m, and p Isomers)	Xylenes (Mixed Isomers)	2.64E-02
Toluene	Toluene	3.85E-02
Formaldehyde	Formaldehyde	1.08E-02
Acetaldehyde	Acetaldehyde	3.45E-03
Acrolein	Acrolein	1.08E-03
Benzene	Benzene (Including Benzene From Gasoline)	1.06E-01
Benzo[g,h,i,]Perylene	Polycyclic Organic Matter as 15-PAH	7.62E-05
Fluorene	Polycyclic Organic Matter as 15-PAH	1.75E-03
Acenaphthene	Polycyclic Organic Matter as 15-PAH	6.41E-04
Acenaphthylene	Polycyclic Organic Matter as 15-PAH	1.26E-03
Anthracene	Polycyclic Organic Matter as 15-PAH	1.69E-04
Benz[a]Anthracene	Polycyclic Organic Matter as 7-PAH	8.52E-05
Fluoranthene	Polycyclic Organic Matter as 15-PAH	5.52E-04
Benzo[b]Fluoranthene	Polycyclic Organic Matter as 7-PAH	1.52E-04
Benzo[k]Fluoranthene	Polycyclic Organic Matter as 7-PAH	2.99E-05
Chrysene	Polycyclic Organic Matter as 7-PAH	2.10E-04
Dibenzo[a,h]Anthracene	Polycyclic Organic Matter as 7-PAH	4.74E-05
Indeno[1,2,3-c,d]Pyrene	Polycyclic Organic Matter as 7-PAH	5.67E-05
Naphthalene	Naphthalene	1.78E-02
Phenanthrene	Polycyclic Organic Matter as 15-PAH	5.59E-03
Pyrene	Polycyclic Organic Matter as 15-PAH	5.08E-04
Benzo[a]Pyrene	Polycyclic Organic Matter as 7-PAH	3.52E-05

Table 15. Algorithms Used to Disaggregate ETS/CEM Boiler Data to the Boiler-SCC Level

$$CEMSO2_{SCC} = \left(\frac{767SO2_{SCC,b}}{767SO2_{b}} \right) * CEMSO2_{b}$$

$$CEMNOX_{SCC} = \left(\frac{767NOX_{SCC,b}}{767NOX_{b}} \right) * CEMNOX_{b}$$

$$CEMHTI_{SCC} = \left(\frac{767HTI_{SCC,b}}{767HTI_{b}} \right) * CEMHTI_{b}$$

where:	b	=	boiler-level
	CEMSO2, CEMNOX, CEMHTI	=	ETS/CEM annual boiler data for given parameter
	767SO2, 767NOX, 767HTI	=	Form EIA-767-based calculated data for given parameter