Documentation for the Final 1999 National Emissions Inventory (Version 3.0) for Criteria Air Pollutants and Ammonia, Point Sources

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ACRONYMS

CAMD	EPA's Clean Air Markets Division
CEM	Continuous Emissions Monitoring
CHIEF	Clearinghouse for Inventories and Emission Factors
CHP	Combined heat and power
CON	condensible
DOE	Department of Energy
eGRID	Emissions & Generation Resource Integrated Database
EIA	Energy Information Administration
EPA	U.S. Environmental Protection Agency
ETS	Emissions Tracking System
FGD	flue gas desulfurization
FIL	filterable
FIPS	Federal Information Processing Standards
FTP	File Transfer Protocol
GT	gas turbine
HC	hydrocarbon
IC	internal combustion
ITEP	Institute of Tribal Environmental Professionals
MW	megawatt
NEDS	National Emission Data System
NEI	National Emissions Inventory
NH3	ammonia
NIF	NEI Input Format
NMOC	nonmethane organic compound
NMOG	nonmethane organic gases
NOX	oxides of nitrogen
ORIS	Office of the Regulatory Information System
OSD	ozone season day
PM	particulate matter
PMCD	condensible PM
PM10	particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers in diameter
PM2.5	particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers in diameter
PRI	primary
QA	quality assurance
QC	quality control
S/L/T	State/Local/Tribal
SCC	Source Classification Code
SIC	standard industrial classification

SO2   sulfur dioxide
SO4   sulfate
SOX   oxides of sulfur
TOG   total organic gases
TSP   total suspended particulate
U.S.   United States
VOC   volatile organic compound

A. WHAT IS THE PURPOSE OF THIS DOCUMENT?

This document summarizes the procedures the U.S. Environmental Protection Agency (EPA) used in developing Version 3 of the 1999 National Emission Inventory (NEI) and incorporating State/Local/Tribal (S/L/T) agency-submitted point source data. For S/L/T agencies that did not submit an inventory for Version 3 of the NEI, emissions data from final Version 2 of the 1999 NEI are used in Version 3.

B. WHO SUBMITTED POINT SOURCE INVENTORIES TO EPA?

Table 1 identifies the agencies that submitted 1999 point source inventories for the criteria air pollutants. Table 1 also provides information on the geographic and pollutant coverage of each inventory, and identifies States that previously submitted a 1999 inventory that has been included in final Version 2 of the NEI. All of the inventories were submitted to EPA in NEI Input Format (NIF) 2.0. Table 2 identifies states that provided comments on Version 3.

C. WHAT IS EPA'S POLICY FOR ACCEPTING STATE/LOCAL/TRIBAL DATA?

EPA preferentially uses S/L/T point source data in the NEI, except for utility NOX and sulfur dioxide (SO2) emissions and PM emissions. For utilities, EPA uses oxides of nitrogen (NOX) and SO2 and PM emissions that facilities report to the Emissions Tracking System/Continuous Emissions Monitoring (ETS/CEM) Scorecard database. Due to resource constraints associated with preparing Version 3 of the 1999 NEI, the Version 3 inventories for CT, LA, NH, and WV were not included in Version 3 of the NEI because the Version 3 inventories did not substantially differ from their inventories included in Version 2 of the 1999 NEI.

D. WHAT DID EPA DO WITH THE STATE/LOCAL/TRIBAL DATA?

Upon receipt of each inventory, EPA ran its quality control/quality assurance (QC/QA) program on the inventory to identify format errors, missing data required in mandatory fields, duplicate records, and other referential integrity problems. EPA contacted the S/L/T agencies to resolve many of these issues in the Access database submittals. Then the S/L/T inventories were loaded into EPA's Oracle database, and combined into a single data set in NIF 2.0. The following procedures were then applied to the S/L/T inventories prior to merging the NEI into the S/L/T inventories to fill data gaps.

1.   Removed all non-criteria pollutant emissions from the Emission table and associated parent and child records from other tables.

Table 1. Summary of State/Local/Tribal Point Source Inventories for the Criteria Air Pollutants

State	NIF Version	Transaction Type	Inventory Type	Geographic Coverage[1]	Number of Counties	Number of Counties in State	Pollutants in Inventory	Submitted Version 2?
Arizona	2.0	Original	CRITHAP	Statewide	10	15	CO, NH3, NOX, PM10-PRI, SO2, VOC	No
Arizona - Salt River Pima-Maricopa Indian Community (ITEP Tribe ID = 433)	2.0	Original	CRITHAP	Tribal	1	15	CO, NMOC, NOX, PM10-PRI, SO2, SOX, VOC	No
Connecticut[2]	2.0	Original	CRIT	Statewide	8	8	CO, NOX, PM10-PRI, SOX, VOC	Yes
Delaware	2.0	Original	CRITHAP	Statewide	3	3	CO, NH3, NOX, PM10-PRI, PM-PRI, SO2, VOC	No
Georgia	2.0	Original	CRIT	Partial State	29	159	CO, NOX, VOC	No
Idaho	2.0	Original	CRITHAP	Partial State	20	44	CO, NH3, NMOG, NOX, PM10-FIL, PM-FIL, SO2, SOX, VOC, TOG	No
Illinois[3]	2.0	Original	CRIT	Statewide	102	102	CO, NOX, PM10-PRI, PM-PRI, SO2, VOC	Yes
Louisiana[2]	2.0	Original	CRITHAP	Statewide	61	64	CO, NH3, NOX, PM10-FIL, SO2, VOC	Yes
Michigan	2.0	Replace	CRITHAP	Statewide	80	83	CO, NOX, PM10-PRI, PM25-PRI, PM-PRI, SO2, VOC	Yes
Minnesota	2.0	Original	CRIT	Statewide	83	87	CO, NOX, PM10-PRI, SO2, VOC, 7439921	Yes
North Carolina - Beaufort County (County FIPS 013)	2.0	Original	CRITHAP	Local	1	100	CO, NH3, NOX, PM10-PRI, PM-PRI, SO2, VOC	Yes
North Carolina - Forsyth County (County FIPS 067)	2.0	Original	CRITHAP	Local	1	100	CO, NH3, NOX, PM10-PRI, PM-PRI, SO2, VOC	Yes
New Hampshire[2]	2.0	Original	CRITHAP	Statewide	10	10	CO, NOX, PM10-FIL, PM25-FIL, PM-FIL, SO2, VOC	Yes
New Jersey	2.0	Original	CRIT	Statewide	8	21	CO, NOX, PM-PRI, PM10-PRI, SO2, VOC	No
New York	2.0	Original	CRITHAP	Statewide	62	62	CO, NH3, NMOC, NOX, PM-PRI, PM10-PRI, SO2, VOC, 7664417	No
Nevada	2.0	Original	CRITHAP	Statewide	13	17	CO, NH3, NOX, PM10-PRI, PM-PRI, SO2, VOC	No
Oregon[4]	2.0	Original	CRITHAP	Statewide	34	36	CO, NOX, PM10-PRI, SOX, VOC, 7664417	Yes
Oregon - Umatilla (ITEP Tribe ID = 80)	2.0	Original	CRITHAP	Tribal	1	36	PM10-PRI	No

Table 1 (continued)

State	NIF Version	Transaction Type	Inventory Type	Geographic Coverage[1]	Number of Counties	Number of Counties in State	Pollutants in Inventory	Submitted Version 2?
South Carolina	2.0	Original	CRITHAP	Statewide	46	46	CO, HC, NH3, NOX, PM10-FIL, PM25-FIL, PM-FIL, SO2, VOC	Yes
Tennessee	2.0	Original	CRIT	Statewide	80	95	CO, NH3, NOX, PM25-FIL, PM-FIL, SO2, VOC	No
Tennessee - Shelby County (County FIPS 157)[5]	2.0	Original	CRITHAP	Local	1	95	CO, HC, NH3, Nox, PM, PM10, PM10-FIL, PM10-PRI, PM2.5, PM2.5-FIL, PM25-FIL, PM25-PRI, PM-FIL, PM-PRI, S02, SO2, SOX, TSP, VOC	No
Tennessee - Davidson County (County FIPS 037)	2.0	Original	CRITHAP	Local	1		CO, NOX, PM10-PRI, SO2, VOC	No
West Virginia[2]	2	Original	CRITHAP	Statewide	54	55	CO, HC, NH3, NOX, PM10-FIL, PM25-FIL, PM-FIL, SO2, VOC	Yes

[1] Statewide means the inventory was submitted by the State rather than a Local or Tribal agency. It does not mean that the inventory contains data for all counties in a State. Thus, a statewide inventory may exclude counties for which the Local agency prepares its own inventory for the National Emission Inventory (NEI).

[2] Due to time and resource constraints associated with preparing Version 3 of the 1999 NEI, the Version 3 inventories for CT, LA, NH, and WV were not included in Version 3 of the NEI because the Version 3 inventories did not substantially differ from their inventories included in Version 2 of the 1999 NEI.

[3] IL's inventory was for the 2000 base year, and, therefore was not included in Version 3 of the 1999 NEI. IL submitted a 1999 base year inventory that was included in Version 2 of the 1999 NEI.

[4] At the direction of the State of Oregon and Lane County authorities, data for Lane County (FIPS 039) included in the State's inventory were not included in draft Version 3 of the 1999 NEI. The authorities will provide data for Lane County during the comment period. In addition, the State's inventory for other counties contained sites missing from the inventory they provided for Version 2 of the NEI. Therefore, the sites in their Version 3 submittal were added to the sites in their Version 2 submittal for draft Version 3 of the NEI.

[5] The inventory submitted by Shelby County, TN was not included in Version 3 of the NEI due to time and resource constraints associated with resolving referential integrity issues in the inventory submittal.

Table 2. Summary of State/Local/Tribal Point Source Comments for the Criteria Air Pollutants

State	NIF Version	Transaction Type	Inventory Type	Geographic Coverage[1]	Number of Counties	Number of Counties in State	Pollutants in Inventory	Submitted Version 2?
Louisiana[2]	2.0	Original	CRITHAP	Statewide	61	64	CO, NH3, NOX, PM10-FIL, SO2, VOC	Yes
Michigan	2.0	Replace	CRITHAP	Statewide	80	83	CO, NOX, PM10-PRI, PM25-PRI, PM-PRI, SO2, VOC	Yes
Massachusetts	2.0							
Minnesota	2.0							
Nevada	2.0					17		No
NC-Mecklenburg					1			
Ohio	2.0							

Table 2 (continued)

State	NIF Version	Transaction Type	Inventory Type	Geographic Coverage[1]	Number of Counties	Number of Counties in State	Pollutants in Inventory	Submitted Version 2?
PA-Allegheny County	2.0							Yes
South Carolina	2.0	Original	CRITHAP	Statewide	46	46	CO, HC, NH3, NOX, PM10-FIL, PM25-FIL, PM-FIL, SO2, VOC	Yes
Tennessee	2.0	Original	CRIT	Statewide	80	95	CO, NH3, NOX, PM25-FIL, PM-FIL, SO2, VOC	No
Tennessee - Shelby	2.0	Original	CRITHAP	Local	1		CO, NOX, PM10-PRI, SO2, VOC	No
Virginia								
West Virginia	2	Original	CRITHAP	Statewide	54	55	CO, HC, NH3, NOX, PM10-FIL, PM25-FIL, PM-FIL, SO2, VOC	Yes

[1] Statewide means the inventory was submitted by the State rather than a Local or Tribal agency. It does not mean that the inventory contains data for all counties in a State. Thus, a statewide inventory may exclude counties for which the Local agency prepares its own inventory for the National Emission Inventory (NEI).

2. Changed Pollutant Codes as follows: oxides of sulfur (SOX) to SO2, nonmethane organic compounds (NMOC) or hydrocarbon (HC) to volatile organic compounds (VOC), Chemical Abstract Number 7439921 to ammonia (NH3), and made all other pollutant codes upper case. In the NEI, VOC and SO2 are used exclusively, and all pollutants are upper case. If an agency provided NMOC or HC emissions for the same data key (excluding the pollutant code) for which it provided VOC emissions, the NMOC or HC emissions were removed from the NEI. Otherwise, the NMOC or HC codes were changed to VOC. The routines for merging Version 2 of the NEI with S/L/T data in the Emission and Control Equipment tables match on the data key for the tables which include Pollutant Code. Where records matched on the data key, S/L/T data were used. The changes to the pollutant codes were made to avoid inserting NEI records that would otherwise double count emissions. In addition, the pollutant codes need to be consistent to generate reports of national emissions or by State.

3. Identified and analyzed referential integrity issues (i.e., orphan and widow [childless parent] records). Corrected issues with mandatory field data to resolve referential integrity issues. Then resolved remaining issues by adding parent records for orphans and adding the minimum required data to make the record valid. Widow records were removed from the tables, and stored in a separate file. A final analysis was conducted to confirm compliance with referential integrity. Additionally, for the final inventory submissions QA was performed to ensure compliance with submittal flag rules. In general, submittal flag issues were resolved as follows. If a record was coded with a submittal flag of "A" (add), but the record existed in the inventory, the submittal flag was altered to "RA". If the submittal flag was coded as "RA" but the record did not exist in the inventory, the submittal flag was recoded to "A". If records within a table were coded "A" and "D" by key values, these were changed to "RA" and "RD" as appropriate. If duplicates were found, and the record was a true

duplicate (all fields were equal), the first record added to the inventory is kept. If it is an emission record, the record with the higher emission value is kept.

4. Ran additional routines to identify remaining QA issues. Corrections to QA issues were coordinated with the S/L/T agencies when necessary.

E. HOW DO I FIND AND REVIEW MY DATA?

Final Version 3 of the 1999 NEI is available on EPA's File Transfer Protocol (FTP) server (ftp://ftp.epa.gov/EmisInventory/finalnei99ver3/criteria/). The inventory is provided in NIF 2.0 in a separate Access97 database for each State. Note that EPA converted all emissions in S/L/T inventory submittals to "TON" in order to facilitate QA and generation of emission summaries. In the Access97 databases, the units of the emissions are now reported as "TON" for all S/L/T agency inventories.

EPA entered a flag in the second blank field of the Emissions table to identify the source of the emission records included in your inventory. The flags are defined as follows:

Code	Definition
S	State data
S-C	State supplied activity data that EPA used to calculate emissions for pollutants missing from State's inventory
L	Local data
R	Tribal data
E	EPA NEI data
GENPARENT	Parent record added to comply with referential integrity

ETS Augmentation Codes

ETS-I	Record created and inserted into draft Version 3 to hold ETS emissions not included in S/L/T inventory. Note that "ETS_I" was also used; this will be corrected to ETS-I in final Version 3.
ETS-I-NPC	Record created and inserted into draft Version 3 to hold utility pollutant emissions from EPA's 1999 utility inventory that were missing from S/L inventory for the same site and emission unit
ETS-U	Record in S/L/T inventory for which NOX or SO2 emissions are replaced with ETS emissions

Ammonia Augmentation Codes

NH3-NOX	Record created by Ammonia Augmentation - calculated off of NOX
NH3-CO	Record created by Ammonia Augmentation - calculated off of CO
NH3-SO2	Record created by Ammonia Augmentation - calculated off of SO2
NH3-VOC	Record created by Ammonia Augmentation - calculated off of VOC
NH3-PM10-F	Record created by Ammonia Augmentation - calculated off of PM10-FIL

PM Augmentation Codes

AUG-C   Record added for PM10/PM25 emissions estimated using the PM Calculator

AUG-A   Record added for PM10/PM25 emissions estimated using individual estimations

EPA has also prepared the following summaries to assist S/L/T agencies in their review:

Summary	File Name
Annual emissions by State, County, and Sector	CountySumCrit_99FV3_0303
Annual emissions by State, County, and Source Classification Code (SCC)	SCC_SumCrit_99FV3_0303
Annual emissions by State, County, and Tier 1, 2, and 3 Categories	TierSumCrit_99FV3_0303
All Facilities List for 1999 NEI Version 3	SiteSumPointCrit_99FV3_0303

Each of these summaries are in an Access97 database located on EPA's FTP server (ftp://ftp.epa.gov/EmisInventory/).

F.   HOW DID EPA MERGE THE 1999 NEI VERSION 2.0 AND STATE/LOCAL/TRIBAL INVENTORIES?

In general, all of the data in final Version 2 were replaced with S/L/T data on a county-by-county basis. Augmentation procedures were then run to add ETS NOX and SO2 and PM, NH3, and non-utility PM-related pollutants missing from S/L/T inventories. Thus, if a State did not include a county in its inventory for which final Version 2 contained sites, the sites in final Version 2 are included in draft Version 3 of the NEI.

The EPA compared the number of sites by county in each S/L/T inventory to the number of sites by county in final Version 2 of the NEI. The number of sites in some counties in AZ, GA, SC, and NV differed significantly. These States reviewed and identified sites in final Version 2 that were not in their Version 3 inventory submittal to keep in Version 3.

GA did not include any SO2 or PM-related pollutants in their inventory. Since GA provided throughput data with the VOC, NOX, and CO emissions they included in their inventory, EPA selected emission factors from Factor Information Retrieval (FIRE) and AP-42 to calculate SO2 and PM-related pollutant emissions.

G.   HOW DID EPA MERGE LOCAL AND TRIBAL INVENTORIES INTO STATE INVENTORIES?

The following explains how Local and Tribal inventories were merged with State inventories:

• Salt River Pima-Maricopa Indian Community, Arizona: The site data in this inventory were added to the site data in final Version 2 of the NEI submitted by Maricopa County.

- Umatilla Tribe, Oregon: The site data in this inventory were added to the site data that Oregon submitted for final Version 2 and draft Version 3 of the NEI.

- Beaufort County, North Carolina: The county's inventory was added to the inventory that the State of North Carolina supplied for this county for final Version 2 of the NEI.

- Forsyth County, North Carolina: The county's inventory replaced the inventory it submitted for final Version 2 of the NEI.

- Davidson County, Tennessee: The county's inventory replaced the county inventory in final Version 2 of the NEI. The State of Tennessee did not provide any data for this county in its Version 3 inventory submittal.

- Shelby County, Tennessee: The county's inventory replaced the county inventory in final Version 2 of the NEI.

- Mecklenburg County, North Carolina: The county's inventory replaced the county inventory in final Version 2 of the NEI.

H.   HOW DID EPA MERGE STATE/LOCAL ELECTRICITY GENERATING UNIT (EGU) EMISSIONS DATA WITH EPA DATA?

NOX and SO2 and PM emissions data collected by ETS/CEM procedures by EPA's Clean Air Markets Division (CAMD) have been deemed more reliable and accurate than other reported data. Thus, for ETS/CEM units, EPA replaced S/L-supplied NOX and SO2 and PM emissions with the emissions from ETS/CEM when the ETS/CEM emission units could be identified in S/L inventories. This procedure affected only S/L inventories because Tribal inventories did not contain any emission units for utilities that report NOX or SO2 or PM emissions to ETS/CEM.

The EPA prepared a crosswalk to match boilers (for which emissions are reported to ETS/CEM) in its EGU inventory to sites and emission units in the S/L inventories. Process-level NOX and SO2 and PM emissions in S/L inventories were adjusted by the ratio of ETS-to-S/L emission unit-level emissions. By using this approach, site, emission unit, and process IDs and SCCs are not changed in S/L inventories. In addition, EPA included in the crosswalk boilers in its EGU inventory that report to the Energy Information Administration (EIA) but not to ETS/CEM in order to identify the EGU's in the NEI. For the purpose of the crosswalk, these units are termed EIA-Only units. The EPA retained S/L NOX and SO2 emissions in the NEI for the EIA-Only units. PM was updated for all units.

This crosswalk was then used to add the ORIS identification (ID) code to the ORIS Facility Code field in the Site table (if missing from S/L inventories), and the EPA boiler ID to the ORIS Boiler ID field in the Emission Unit table. The EPA is reserving the ORIS Boiler ID field for EPA use to include the boiler ID code from EPA's EGU inventory. Note that EPA removed S/L information from the ORIS Boiler ID field in Version 3 (and final Version 2) of the NEI and added the boiler ID from its inventory. By doing this, EPA can

quickly identify and compare S/L data in the NEI to EPA data for EGUs. Appendix B provides the methods EPA used to prepare the 1999 EGU inventory.

In addition, if a S/L/T agency did not include emissions for pollutants that are included in EPA's EGU inventory for a specific boiler/emission unit, EPA added the emissions for the missing pollutants in its EGU inventory to Version 3. These records are identified with a data source flag of ETS-I-NPC in the EM table of draft Version 3 of the NEI.

1. Utility Crosswalk File

The crosswalk is provided in an Access database named "Utility_Blr_to_NEI_EU_XWalk_DV3. mdb". This file includes the following relationships to link boiler IDs in EPA's EGU inventory and emission units in S/L:

One-to-one match:	One boiler in EPA's EGU inventory matches to one emission unit ID in the NEI;
One-to-many match:	One boiler in EPA's EGU inventory matches to two or more emission unit IDs in the NEI; and
Many-to-one match:	Two or more boilers in EPA's EGU inventory match to one emission unit ID in the NEI.

The crosswalk contains the following fields:

ORIS_FACILITY_CODE	From S/L inventory if supplied by S/L agency; otherwise, EPA entered the ORIS ID
FACILITY_NAME	From S/L inventory if supplied by S/L agency
STATE_FIPS	From S/L inventory if supplied by S/L agency
COUNTY_FIPS	From S/L inventory if supplied by S/L agency
SITE_ID	From S/L inventory if supplied by S/L agency
EMISSION_UNIT_ID	From S/L inventory if supplied by S/L agency
ORIS_BOILER_ID	An ID assigned by EPA that is used in EPA's 1999 utility inventory.
ORIS_BOILER_ID_FLAG	Yes means the ORIS boiler ID is entered in the ORIS_BOILER_ID field in the Emission Unit table of the NEI; No means the boiler ID was not entered in the ORIS_BOILER_ID field in the Emission Unit table of the NEI because more than one boiler matched to only one emission unit in the NEI (many-to-one relationship).
REPORTS_TO	This field uses the following codes: EIA = reports only to the Energy Information Administration (EIA); ETS Only = reports only to the ETS/CEM Scorecard database; ETSEIA = reports to both ETS/CEM and EIA. Note that records with ETSEIA and ETS Only identify the emission units in S/L inventories for which EPA replaced S/L NOX and SO2 emissions with the emissions that are reported to ETS/CEM except when the S/L emissions were within one ton or less of the ETS/CEM emissions.

> Process-level NOX and SO2 and PM emissions in S/L inventories were
> adjusted by the ratio of ETS-to-S/L emission unit-level emissions.

2. QA Issues

The EPA has identified the following QA issues with utility data in draft Version 3 of the 1999 NEI:

• Table 2 shows utilities in Version 3 of the NEI that have a county FIPS code that is different than the code reported in eGRID and EPA's EGU inventory. The utility crosswalk file contains the county FIPS code reported in draft Version 3 of the NEI. The EPA requests that the States identified in Table 2 correct the county FIPS codes in draft Version 3 or provide information that indicates that the county FIPS codes in draft Version 3 are correct.

Table 3. Utilities with Different County FIPS Codes in Draft Version 3 of the NEI and eGRID

ORIS PL ID	State FIPS	State	County FIPS in NEI	County in NEI	Site ID in NEI	Facility Name in NEI	County FIPS in eGRID	County in eGRID	Plant Name in eGRID
1382	21	Kentucky	233	Webster	2123300 001	Western KY Energy Corp	101	Henderson	HMP&L Station Two
2721	37	North Carolina	161	Rutherford	3716100 028	Duke Energy Corp - Cliffside Stea	045	Cleveland	Cliffside

• For Basin Electric Laramie River Station (WY, State FIPS 56, County FIPS 031, site ID 00001), ORIS ID 6204 is used in the NEI and in the utility crosswalk database. In eGRID, the site is divided between two ORIS IDs (6204.1 and 6204.2) because boiler 1 goes to the eastern grid and boilers 2 and 3 go to the western grid. For final Version 3, EPA added the two IDs to make the IDs consistent with eGRID.

• For RG&E ALLEGANY STATION #133 (NY, State FIPS 36, County FIPS 003, site ID 9025800018), the ORIS ID in eGRID is 7784 and the ORIS ID in draft Version 3 of the NEI and the crosswalk database is 10619. The correct ORIS ID for this facility is 7784; therefore, this correction was made in final Version 3 of the NEI.

• Table 3 identifies cases where one ORIS ID has been assigned to two site IDs in draft Version 3 of the NEI.

Table 4. Utilities to Which One ORIS ID is Assigned to Two Site IDs in Version 3 of the NEI

ORISPL ID	State FIPS	State	County FIPS in NEI	County Name in NEI	Site ID in NEI	Facility Name in NEI	Comments[1]
1572	24	Maryland	031	Montgomery	0019	PEPCO - DICKERSON	
1572	24	Maryland	031	Montgomery	1822	PEPCO - STATION H	
6076	30	Montana	087	Rosebud	0008	PPL, MONTANA COLSTRIP UNITS #1 & #2	
6076	30	Montana	087	Rosebud	0014	MPC - COLSTRIP UNITS #3 & #4	
2434	34	New Jersey	011	Cumberland	75507	Vineland Municipal Electric Utility - Down St	
2434	34	New Jersey	011	Cumberland	0020	UNKNOWN	Record in Site table was generated to maintain parentless record in Emission table. This site ID is not included in the utility crosswalk.
2531	36	New York	017	Chenango	708220014	AES JENNISON	
2531	36	New York	017	Chenango	0083	UNKNOWN	Record in Site table was generated to maintain parentless record in Emission table. This site ID is not included in the utility crosswalk.
8906	36	New York	081	Queens	2630100185	ASTORIA (ORION) GENERATING STATION	
8906	36	New York	081	Queens	2630100191	ASTORIA GAS TURBINE POWER- 31-01 20TH AVE	This site ID is not included in the utility crosswalk.

[1] unless otherwise indicated in comments, the site ID is included in the utility crosswalk.

3. Unmatched ETS-Only Unit File

The ETS/CEM Scorecard database contains emission units for which 1999 NOX and SO2 emissions were reported to ETS/CEM but not to the Energy Information Administration (EIA). For the purpose of the NEI, these emission units are referred to as ETS-only units. The EPA matched many of the ETS-only units to S/L site and emission unit IDs in the NEI. This spreadsheet file named "ETS-Only Units to Match to V3.xls" identifies the ETS-only units for which EPA was unable to match to S/L inventories.

I.   WHAT IS THE RELATIONSHIP BETWEEN THE NEI AND eGRID?

The EPA's CAMD prepares the Emissions & Generation Resource Integrated Database (eGRID) which is a comprehensive source of data on the environmental characteristics of all electric power generated in the United States.[1] The latest version, eGRID2000, is the first complete database of emissions and resource mix for virtually every power plant and company that generates electricity in the United States.

The data fields in this database are provided in Table 4. Further definition of the field names is provided in the eGRID technical support documentation (File Name = EGRID00v2TSD.PDF) available at http://www.epa.gov/airmarkets/egrid/index.html. The data included in this database is a subset of the data provided in the eGRID2000 plant-level summary (File Name = EGRD00.xls, spreadsheet name = EGRDPLNT) which is available at http://www.epa.gov/ airmarkets/egrid/index.html. The EPA removed the ORIS IDs for sites that operated in 2000 but not 1999 and added ORIS IDs for sites that operated in 1999 but not 2000. Note that eGRID2002 data for 1996-2000 (in spreadsheet and PC-based data browser format) should be completed by March 31, 2003.

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[1] E-GRID Fact Sheet: http://www.epa.gov/airmarkets/egrid/factsheet.html

Table 5. Field Names and Definitions in ORIS_Facility_Codes Database	
Field Name	**Field Definition**
ORISPL	ORIS Plant Code in eGRID1999
FIPST	State FIPS code (text field for matching to NEI)
FIPSCNY	County FIPS code (text field for matching to NEI)
ORISPL_In_NEI_V300_Draft	Identifies the codes that have been entered in the ORIS Facility Code field in the Site table of draft Version 3 of the 1999 NEI
SiteID_In_NEI_V300_Draft	Identifies the site ID associated with the ORIS Facility Code in the Site table of draft Version 3 of the 1999 NEI
FIPST_NUM	State FIPS code (numeric field)
FIPSCNY_NUM	County FIPS code (numeric field)
PSTATABB	Postal code abbreviation of the State where the plant is located
CNTYNAME	County name
PNAME	Plant name
OPRNAME	Plant operator name
OPPRNAME	Operator parent company name
PCANAME	Physical (operator) based power control area name
PLTYPE	Plant type (utility or nonutility)
PREVUTIL	Previously a utility plant flag (This field has a value of 1 if the plant has been sold by a utility to a nonutility; it has a value of 0 otherwise)
LAT	Plant latitude
LON	Plant longitude
NUMBLR	Number of utility boilers within a plant
NUMGEN	Number of generators within a plant
SOURCEM	The source(s) of emissions data for the plant. The choices are: T = ETS/CEM NOx, SO2, and CO2 emissions reported to EPA; E = Emissions estimated by applying EPA AP-42 emission factors to fuel data from EIA-767, EIA-759/FERC-423, EIA-860B, or default values; and Z = Plant utilizes energy resources with zero emissions.
PLPRIMFL	Plant's primary fuel based on maximum heat input or assignment (if plant is solar, wind, nuclear, geothermal, or hydro) (see eGRID technical support document for definition of codes used in this field).
PLFFLCTG	Plant Fossil Fuel Category (field contains a "C" if PLPRIMPL is derived from coal, "O" if it is derived from oil, or "G" if it is derived from gas. The value is blank otherwise. Fossil Fuel refers to any naturally occurring organic fuel, such as petroleum, coal, and natural gas)
CAPFAC	Plant capacity factor
BOILCAP	Utility plant boiler capacity (MMBtu/hr)
NAMEPCAP	Plant generator capacity (MW)
CHPFLAG	Combined heat and power (CHP) (cogenerator) 1998 plant flag
USETHRMO	CHP plant 1998 useful thermal output (MMBtu)
PWRTOHT	CHP plant 1998 power to heat ratio
ELCALLOC	CHP plant 1998 electric allocation factor
PLNUCONN	Nonutility plant connected to grid flag (Y=Yes, N=No)

J.   HOW DID EPA ADD PM-RELATED POLLUTANT EMISSIONS TO MY INVENTORY?

The NEI requires reporting of primary (PRI) PM10/PM25 emissions, which is the sum of the filterable (FIL) PM10/PM25 and condensible (CON) fractions of PM10/PM25 for each emissions source of PM10/PM25. S/L/T agencies, however, may report any fraction of total PM and/or PM10/PM25 emissions

for the 1999 NEI. The S/L/T inventories included emissions data for either PM-FIL, PM-PRI, PM10-FIL, PM10-PRI, PM25-FIL, PM25-PRI, and/or PM-CON. From any one of these pollutants, the augmentation procedure estimates PM10-PRI, PM10-FIL, PM25-PRI, PM25-FIL, and PM-CON as shown in the following table. If not included in a S/L/T inventory, PM10-PRI and PM25-PRI were calculated by summing the emissions for PM10-FIL and PM-CON or PM25-FIL and PM-CON, respectively. For utilities, PM information was added using the method in section I.

PM Category	Description
PM-PRI	Primary PM (includes filterables and condensibles)
PM-CON	Primary PM, Condensible Portion Only (all less than 1 micron)
PM-FIL	Primary PM, Filterable Portion Only
PM10-PRI	Primary PM10 (includes filterables and condensibles)
PM10-FIL	Primary PM10, Filterable Portion Only
PM25-PRI	Primary PM25 (includes filterables and condensibles)
PM25-FIL	Primary PM25, Filterable Portion Only

The following explains the QA issues identified and resolved in S/L/T inventories prior to applying the augmentation procedures, followed by a summary of the methods for augmenting the point source NEI with PM10-PRI, PM10-FIL, PM25-PRI, PM25-FIL, and PM-CON emissions missing from S/L/T inventories.

1. Resolution of QA Issues Identified for PM-Related Pollutants in S/L/T Inventories

For S/L inventories that contained inconsistent emissions (e.g., PM25>PM10 or PM10>PM), the agencies provided corrections to resolve the inconsistencies prior to applying the augmentation procedures.

All PM-PRI and PM-FIL records were removed from the input file for the PM augmentation procedure if an emission source had any form of PM10, PM25, or PM-CON. PM-CON records with emissions greater than zero were used in the PM augmentation procedure.

2. Methods

The procedures for point source SCCs include the following five steps which are documented in detail in Appendix C to this report:

Step 1: Prepare S/L/T PM and PM10 Emissions for Input to the PM Calculator
Step 2: Develop and Apply Source-Specific Conversion Factors
Step 3: Prepare Factors from PM Calculator
Step 4: Develop and Apply Algorithms to Estimate Emissions from S/L/T Inventory Data
Step 5: Review Results and Update the NEI with Emission Estimates and Control Information

The EPA has reviewed the SCCs for which PM-CON is estimated and eliminated PM-CON from the calculation for any SCCs it decides are not sources of PM-CON.

Additionally, there are a number of SCCs that are not included in the augmentation procedure. For these SCCs the following logic was used to create a complete set of PM values. If the state supplied PM10-PRI, PM10-FIL was set to PM10-PRI. If the state supplied PM10-FIL, PM10-PRI was set to PM10-FIL. Similar logic was followed for PM25. If the state supplied only PM10 or only PM25 value(s), PM10 was set to PM25 or vice versa.

K. HOW DID EPA ADD NH3 EMISSIONS TO STATE/LOCAL INVENTORIES?

In addition to the criteria pollutants, the NEI also houses estimates of NH3 emissions. In 1999, only a few of the S/L/T agencies submitted NH3 emissions. As a consequence, the NH3 emissions from final Version 2 of the 1999 NEI were added. Tribal point source inventories were not affected by this procedure since the sites in Tribal inventories are new additions to the NEI.

For the NH3 augmentation procedure, EPA prepared a crosswalk to match sites with NH3 emissions in final Version 2 of the NEI to sites in the S/L inventories. If the S/L site had NH3 emissions, the S/L NH3 emissions were maintained in Version 3. If a S/L site did not have NH3 emissions but it did have NH3 emissions in final Version 2 of the NEI, the NH3 emissions in final Version 2 were added to the S/L site in Version 3. This required adding process-level records to the Emission table. Site-level emissions from final Version 2 were allocated to the same site in draft Version 3 by using the S/L process-to-site level ratio for the pollutants in the S/L inventory in the following priority order: NOX, CO, VOC, SO2, and PM-related pollutants. The pollutant used to perform the allocation for an individual site is identified in the data source code for the NH3 augmentation procedure in the second blank field of the Access97 database.

The crosswalk that EPA developed to match sites with NH3 emissions in S/L inventories with those in the 1999 NEI is provided in an Access database named "NH3_V2_to_DV3_Xwalk.mdb." Table 5 provides the names and definitions of the fields in the database. This database contains a table NH3_V2_to_DV3_Xwalk that provides links between the site-level emissions in final Version 2 and Version 3 of the 1999 NEI. The match_type field (see the field definitions below) contains the information on the type of match between the final Version 2 site and the Version 3 site. "300_HAS_NH3" Match Type indicates that a site in draft Version 3 has NH3 emissions. If the Version 3 site has NH3 emissions, its NH3 emissions were maintained in the NEI; however, a site match with final Version 2 may still be documented. "300_NO_NH3" Match Type indicates that the Version 3 site does not have NH3 emissions and that the Version 2 site does have NH3 emissions. The Version 3 site was augmented with the final Version 2 emissions as described above. "NONE" Match Type indicates that a final Version 2 site with NH3 emissions did not have a match with a Version 3 site. Additional information concerning multiple matches is stored in the match_multiple field (see field definition in Table 5).

Table 6. Field Names and Definitions in NH3_V2_to_DV3_Xwalk Database

Field Name	Field Definition
P200_STATE_FIPS	State Fips for the 1999 final Version 2 site This field and other Version 2 fields below are null when a match was not found for a Version 3 site.
P200_COUNTY_FIPS	County Fips for the Version 2 site
P200_SITE_ID	Site ID for the Version 2 site
P200_ORIS_FACILITY_CODE	ORIS Facility Code for the Version 2 site
P200_SIC_PRIMARY	Primary SIC for the Version 2 site
P200_FACILITY_NAME	Facility Name of the Version 2 site
P200_SITE_DESCRIPTION	Description of the Version 2 site
P200_STREET_LINE_1	Street Address of the Version 2 site
P200_STREET_LINE_2	Street Address of the Version 2 site
P200_STREET_LINE_3	Street Address of the Version 2 site
P200_CITY	City of the Version 2 site
P200_STATE	State of the Version 2 site
P200_ZIP_CODE	Zip Code of the Version 2 site
P200_NH3_EMISSION_TON_SUM	Site Level Sum of Annual NH3 Emissions from Version 2

MATCH_TYPE	Type of Match between the 1999 Version 2 site and the 1999 Version 3 site.
	Valid Data for this field are as follows:
	300_HAS_NH3
	   This indicates that the Version 3 has NH3 emissions associated with it.
	   If the Version 3 site has NH3 emissions, it will not be augmented, however, a
	   Site match with Version 2 may still be documented.
	300_NO_NH3
	   This indicates that the Version 3 site does not have NH3 emissions.
	NONE
	   This indicates that a Version 2 site with NH3 emissions did not have a match
	   With a Version 3 site.

MATCH_MULTIPLE	Indicates whether the match is a multiple match between the 1999 Version 2 site
	and the 1999 Version 3 site.
	Valid Data for this field are as follows:
	200_M_to_1_300
	   This indicates multiple Version 2 site match to a single Version 3 site.
	200_1_to_M_300
	   This indicates a single Version 2 site matches to multiple Version 3 sites.

MATCH_RATIO	Indicates the ratio used to calculate the NH3 to apply value where a single Version 2 site is applied to multiple Version 3 Sites
NH3_TO_APPLY_EMISSION_TON_SUM	Amount of NH3 emissions to be distributed over a Version 3 Site. This value is null in cases where there is not Version 2 match for a Version 3 Site. It is also null in the case where there is a multiple Version 2 site match to a single Version 3 site match (200_M_to_1_300). In the event of a 200_M_to_1_300 case, the emissions are summed for the multiple sites and place on a single occurrence of the Version 3 site match.
P300_STATE_FIPS	State Fips for the 1999 Version 3 site This field and other Version 3 fields below are null when a match was not found for a Version 2 site.
P300_COUNTY_FIPS	County Fips for the Version 3 site
P300_SITE_ID	Site ID for the Version 3 site
P300_ORIS_FACILITY_CODE	ORIS Facility Code for the Version 3 site
P300_SIC_PRIMARY	Primary SIC for the Version 3 site
P300_FACILITY_NAME	Facility Name of the Version 3 site
P300_SITE_DESCRIPTION	Description of the Version 3 site
P300_STREET_LINE_1	Street Address of the Version 3 site

Table 6. Field Names and Definitions in NH3_V2_to_DV3_Xwalk Database	
Field Name	**Field Definition**
P300_STREET_LINE_2	Street Address of the Version 3 site
P300_STREET_LINE_3	Street Address of the Version 3 site
P300_CITY	City of the Version 3 site
P300_STATE	State of the Version 3 site
P300_ZIP_CODE	Zip Code of the Version 3 site
P300_NH3_EMISSION_TON_SUM	Site Level Sum of Annual NH3 Emissions from Version 3

L. HOW DID EPA FILL IN MISSING OR CORRECT INVALID INFORMATION FOR MANDATORY AND NONMANDATORY FIELDS?

After incorporating S/L/T comments on draft Version 2 of the NEI, some inventories contained invalid NIF 2.0 codes. The following explains how EPA changed invalid codes to make the codes NIF 2.0 compliant:

Standard Industrial Classification (SIC) Code in SI and EU Tables

Invalid pre-1987 codes were corrected to valid 1987 codes if possible (e.g., where there was a one-to-one conversion). Otherwise, invalid codes were changed to the miscellaneous SIC code of 9999.

North American Industry Classification System (NAICS) Code in SI and EU Tables

Invalid codes or unknown codes were changed to 99, 999, 9999, or 99999.

Invalid MACT Code in SI Table

Invalid codes in the MACT Code field were changed to null (blank) values because this is not a mandatory field for the criteria air pollutant NEI.

Design Capacity Unit Numerator/Denominator in the EU Table

Where non-standard units were given (i.e. not in the EPA lookup table) - an effort was made to determine an appropriate translation. If no valid unit replacement was found, the values were nulled.

SCCs in EP Table

During preparation of Version 2 of the NEI, EPA replaced SCCs in a number of states that are not in EPA's master list of SCCs with the generic SCC 79900101. This SCC also appears in the Version 3 inventory submittals for MN, NJ, and SC.   Any generic SCCs that were not replaced during the comment period were removed, with the exception of NJ SCCs which were identified and replaced with an existing SCC.

<u>MACT Compliance Status Code in EP Table</u>

Invalid codes in the MACT Compliance Status Code field were changed to null (blank) values because this is not a mandatory field for the criteria air pollutant NEI.

<u>Stack Parameters</u>

In S/L/T inventories processed for Version 3 of the NEI, the Emission Release Point Type field was frequently left blank. In addition, checks on stack parameters (when provided) frequently did meet EPA QA criteria. Due to time and resource constraints for preparing final Version 3, EPA was unable to address and resolve all of the QA issues identified. Thus, EPA applied the following steps to resolve QA issues with stack parameters:

- If a record contained stack parameters and the Emission Release Point Type field was designated as a "stack", EPA applied the *NEI Quality Assurance and Data Augmentation Steps* to adjust stack parameters to fall within specified ranges, and to fulfill consistency checks.

- If a site had NOX emissions of 1,000 tons or more and the Emission Release Point Type field was null, the Emission Release Point Type field was set to "stack" and the stack parameter fields were filled in with default values using the *NEI Quality Assurance and Data Augmentation Steps*.

- If the Emission Release Point Type field was null and the site had NOX emissions of less than 1,000 tons, the Emission Release Point Type field was set to "fugitive", the stack parameters were erased if they existed, and the fugitive release point parameters were filled in with default values.

In final Version 3, it was determined that certain states had previously submitted data misidentifying the emission release type as fugitives for all emission release points. For these states (NC), their original stack information was reapplied and their emission types reset.

<u>Coordinates in ER Table</u>

For final Version 3, EPA incorporated comments that S/L/T agencies supplied to correct coordinates in draft Version 3. Then EPA used GIS software to map the coordinates, identified coordinates that did not map within the boundary of the designated county, and then either corrected the coordinates using in-house data or corrected the county FIPS code. If the coordinates could not be corrected with in-house data or were missing, coordinates for the county centroid were used in final Version 3 of the 1999 NEI. All coordinates were converted to LATLON.

<u>EM Reliability Indicator, Emission Calculation Method, and Rule Effectiveness Method Code in EM Table</u>

Invalid codes in these field were changed to null values because they are not mandatory fields.

Factor Unit Numerator/Factor Unit Denominator in the EM Table

Where non-standard units were given (i.e. not in the EPA lookup table) - an effort was made to determine an appropriate translation. If no valid unit replacement was found, the values were nulled.

Throughput Unit Numerator in PE Table

Where non-standard units were given (i.e. not in the EPA lookup table) - an effort was made to determine an appropriate translation. If no valid unit replacement was found, the values were nulled.

Material Codes and Material I/O codes in PE and EM Tables

Where material information was provided that was not consistent with EPA standard units this information was altered as appropriate. Where an appropriate value was not able to be determined, these values were nulled out.

Control Efficiency Data and Control Device Codes in the CE Table

The following assumptions were applied to added control efficiency data to the "Total Capture Control Efficiency" field in the CE table:

Primary PCT Control Efficiency (PPCE)	PCT Capture Efficiency (PCE)	Total Capture Control Efficiency (TCCE)	Assumption
Data	Data	No data	TCCE=PPCE x PCE
Data	No data	No data	TCCE=PPCE
No data	Data	No data	Not enough information, assumed uncontrolled
Data	No data	Data	Leave as is
No data	Data	Data	Leave as is
No data	No data	Data	Leave as is

Primary Device Type and Secondary Device Type codes that did not exist in the NIF 2.0 code list were reviewed to determine if the codes could be corrected to those in the NIF 2.0 code list. If the codes could not be corrected, and the S/L/T agency did not provide information on how to correct the codes, the codes were set to 099 for miscellaneous control devices.

2.   Scrubbing of Seasonal Throughput and Operating Parameter Values

Prior to running the scripts to calculate OSD emissions, the fields holding data used in the calculations are reviewed to identify QA issues. The following explains the QA issues that occurred in S/L/T inventories and how the QA issues were resolved (or scrubbed).

Operating Parameters

QA issues with data in the Annual Avg Days Per Week, Annual Avg Hours Per Day, Annual Average Hours Per Year, and Annual Avg Weeks Per Year fields are diagnosed and corrected as follows if the annual emissions are greater than zero. If annual emissions are zero, the values in these fields are set to zero.

Days per week: Value is set to 7 if the existing value is greater than 7, equal to zero, or null.

Hours per day: Value is set to 24 if the existing value is greater than 24, equal to zero, or null.

Hours per year: Value is set to 8760 (non-leap year) or 8784 (leap year) if the existing value is greater than 8760 or 8784, equal to zero, or blank (null).

Weeks per year: Value is calculated using the following equation:

Annual average weeks per year =
(annual average hours per year / annual average hours per day) /
annual average days per week

The fields used in the calculation are scrubbed to correct QA issues before calculating annual average weeks per year. The calculation is completed if the values in each of the three fields are greater than zero, the weeks per year field has a zero or blank (null) value, and the calculated value is less than or equal to 52 weeks per year.

Seasonal Throughputs

QA issues with data in the Winter Throughput Pct, Spring Throughput Pct, Summer Throughput Pct, and Fall Throughput Pct fields in the EP table are diagnosed and corrected as follows:

Step 1 - Sets Winter, Spring, Summer, and Fall Throughput Percentages to positive values if they contain negative values.

Step 2 - If the seasonal throughput percentages are equal to zero or a blank (null) value in all four fields, the seasonal throughput percentages are taken from EPA's Temporal Allocation Factor File (TAFF). The TAFF provides default seasonal throughput fractions by SCC. The fields in the TAFF that are used are as follows:

Winter:	SEA_CODE = 4, and DAY_CODE = 1
Spring:	SEA_CODE = 1, and DAY_CODE = 1
Summer:	SEA_CODE = 2, and DAY_CODE = 1
Fall:	SEA_CODE = 3, and DAY_CODE = 1

Step 3 - If the TAFF does not contain an SCC in the inventory and all four seasonal throughput values are zero or blank (null), the values are set to 25% for each of the four seasons.

Step 4 - If the sum of the seasonal throughput values for all four seasons does not equal 100%, this step normalizes the values to sum to 100%.

Step 5 - All throughput percentages are set to zero if annual emissions are zero.

M. DID EPA REJECT ANY INFORMATION IN STATE/LOCAL INVENTORIES?

Yes. EPA does not recognize "777" as a valid county FIPS code. All records for this FIPS code were removed from the inventories that contained them.

N. WHERE DO I FIND DOCUMENTATION OF EPA POINT SOURCE METHODOLOGIES?

Documentation of S/L inventory submittals prior to this year and methods for growing emissions to prepare the 1999 NEI are provided in "Current Methods Used to Estimate Emissions, 1985-1999 Procedures Document for National Emission Inventory, Criteria Air Pollutants 1985-1999," March 2001, EPA-454/R-01-006. This document is available from the following EPA Web Site: http://www.epa.gov/ttn/chief/trends/index.html.

APPENDIX A
DOCUMENTATION OF CHANGES MADE TO INDIVIDUAL STATE/ LOCAL/TRIBAL INVENTORIES

Arizona: Criteria Pollutants

AZ included annual emissions and related data for carbon monoxide (CO), ammonia (NH3), oxides of nitrogen (NOX), PM10-PRI, sulfur dioxide (SO2), and volatile organic compounds (VOC) for sites in 10 of the 15 counties in AZ. AZ's initial inventory submittal did not include NOX and PM-related pollutant emissions. AZ indicated that their initial submittal excluded these pollutants due to a data base conversion error. Subsequently, AZ provided an inventory that included NOX and PM-related pollutant emissions to replace their original submittal. This replacement inventory was processed and incorporated into Version 3 of the NEI.

A. Initial Submittal Processing

The United States (U.S.) Environmental Protection Agency (EPA) compared the number of sites by county in AZ's inventory to the number of sites by county in final Version 2 (originating from Version 1.5) of the NEI and noticed a significant difference in the number of sites in some counties. AZ noted that its inventory for Version 3 did not include all of the sites that operated in 1999 in some counties. Thus, AZ provided further instructions on what sites in final Version 2 to keep in draft Version 3 of the NEI.

AZ provided corrections to coordinates after submitting their inventory. The coordinates were incorporated into draft Version 3 of the NEI. ORIS IDs were added to the ORIS Facility Code field. Per instruction from AZ a number of SCC changes were made.

B. Comments Processing

AZ did not provide further comments.

Arizona - Salt River Pima-Maricopa Indian Community (ITEP Tribe ID = 433): Criteria Pollutants

The Salt River Pima-Maricopa Indian Community included annual emissions and related data for CO, nonmethane organic compounds (NMOC), NOX, PM10-PRI, SO2, oxides of sulfur (SOX), and VOC for 16 sites.

A. Initial Submittal Processing

Through consultation with the Institute of Tribal Environmental Professionals (ITEP) who submitted this inventory to EPA, it was determined that all of the sites in this inventory are located in Maricopa County (Federal Information Processing Standards [FIPS] code 013). These sites were added to the sites that Maricopa County submitted last year that are included in Final Version 2 of the 1999 NEI. However, the site IDs in the two inventories were similar. Therefore, an "R-" was added as a prefix to site IDs in the inventory for the Salt River Pima-Maricopa Indian Community to avoid duplicating sites in Version 3 of the 1999 NEI.

In addition, the years in the start date and end date of the Salt River Pima-Maricopa Indian Community's inventory were 1997 and 1998. Through consultation with ITEP who prepared the inventory and EPA, it was agreed that the inventory was representative of a 1999 base year.

Added county FIPS code 013. Added an "R-" to beginning of Site IDs. Changed the Inventory Year from 1998 to 1999. Changed the year in the Start Date and End Date fields from 1997 and 1998 to 1999.

B. Comments Processing

Arizona - Salt River Pima-Maricopa Indian Community did not provide further comments.

Delaware: Criteria Pollutants

DE included annual and ozone season day (OSD) emissions and related data for CO, NH3, NOX, PM10-PRI, PM-PRI, SO2, and VOC.

A. Initial Submittal Processing

The inventory submitted by DE replaced the inventory in final Version 2 of the NEI for all three counties in the State.   ORIS IDs were added to the ORIS Facility Code field.   Per instruction from DE several SCC changes were made.

B. Comments Processing

Delaware did not provide further comments.

Georgia: Criteria Pollutants

GA included annual emissions and related data for CO, NOX, and VOC for 29 of its 159 counties.

A. Initial Submittal Processing

For the 29 counties for which GA provided data, GA included annual throughput data in its inventory. Therefore, EPA used the throughput data and selected emission factors from Factor Information Retrieval (FIRE) and AP-42 to calculate SO2 and PM-related pollutant emissions. As a part of this process, GA assisted EPA in resolving SCC issues where the original SCC units did not match emission factor units. GA's inventory was updated to correct the SCCs. In addition, GA identified sites in Version 2 of the NEI to keep in Version 3 because the sites were missing from its original inventory submittal. A limitation associated with the SO2 and PM-related pollutant emission estimates is that GA was unable to provide Control Equipment data for processes that had SO2 or PM controls.

GA supplied a number of updates to facility names and zip codes which were implemented. ORIS IDs were added to the ORIS Facility Code field. Per instruction from GA several SCC changes were made. There were a few SCC and PM combinations missed during the PM Augmentation procedures. In many cases, these PM combinations occurred during the generation of the PM for the state as describe above. These PM combinations were corrected for final Version 3.

B. Comments Processing

Georgia did not provide further comments.

Idaho: Criteria Pollutants

ID included annual emissions and related data for CO, NH3, NMOG, NOX, PM10-FIL, PM-FIL, SO2, SOX, total organic gases (TOG), and VOC

A. Initial Submittal Processing

The inventory submitted by ID replaced the inventory in final Version 2 of the NEI for all of the counties included in ID's inventory submittal. ORIS IDs were added to the ORIS Facility Code field.   Per instruction from ID several SCC changes were made. Three duplicate records were removed from the EP table. The first record inserted into the system was kept. Per instructions from ID, the EM table was revised to correct cases where PM10-FIL emissions were greater than PM-FIL emissions.

B. Comments Processing

Louisiana: Criteria Pollutants

A. Initial Submittal Processing

LA initial submittal was not processed.

B. Comments Processing

Documentation for the Final 1999 National Emissions
Inventory (Version 3) for Criteria Air Pollutants and Ammonia   A-7

Point Source Methodologies

Massachusetts: Criteria Pollutants

A. Initial Submittal Processing

MA did not submit an initial file.

B. Comments Processing

Michigan: Criteria Pollutants

MI included annual emissions and related data for CO, NOX, PM10-PRI, PM25-PRI, PM-PRI, SO2, and VOC.

A. Initial Submittal Processing

The inventory submitted by MI replaced the inventory in final Version 2 of the NEI for all of the counties included in MI's inventory submittal. ORIS IDs were added to the ORIS Facility Code field. Per instruction from MI a number of SCC changes were made. Per instructions from MI, the EM table was revised to correct cases where PM25-PRI emissions were greater than PM10-PRI emissions and cases where PM-PRI emissions were provided which were less than PM10-PRI.

B. Comments Processing

Minnesota: Criteria Pollutants

MN included annual emissions and related data for CO, NOX, NH3, PM10-PRI, SO2, and VOC.

A. Merging of State and NEI Version 2 Inventories

The inventory submitted by MN replaced the inventory in final Version 2 of the NEI for all of the counties included in MN's inventory submittal. ORIS IDs were added to the ORIS Facility Code field. Per instruction from MN several SCC changes were made.

B. Comments Processing

Documentation for the Final 1999 National Emissions
Inventory (Version 3) for Criteria Air Pollutants and Ammonia   A-10

Point Source Methodologies

New Jersey: Criteria Pollutants

NJ included annual, OSD, and CO season day emissions and related data for CO, NOX, PM-PRI, PM10-PRI, SO2, and VOC.

A. Initial Submittal Processing

The inventory submitted by NJ replaced the inventory in final Version 2 of the NEI for all of the counties included in NJ's inventory submittal. The file NJ submitted had several referential integrity inconsistencies. It was determined that the best approach would be to rebuild the inventory from the information in the EM table and then update the resulting parent tables (and CE table).   Per direction from NJ, several updates were made to the primary SIC. ORIS IDs were added to the ORIS Facility Code field. Parent EP records were generated for orphaned EM records. Set primary device type equal to 099 where left blank.

B. Comments Processing

New Jersey did not provide further comments

New York: Criteria Pollutants

NY included annual and OSD emissions and related data for CO, NH3, NMOC, NOX, PM-PRI, PM10-PRI, SO2, and VOC.

A. Initial Submittal Processing

The inventory submitted by NY replaced the inventory in final Version 2 of the NEI for all of the counties included in NY's inventory submittal. Per direction from NY, several updates were made to the primary SIC. ORIS IDs supplied by NY were added to the ORIS Facility Code field. Parent EP records were generated for orphaned EM records. Duplicate records were inactivated. The record inserted into the system first was retained. Several EP records had blank emission release point ID fields. These fields were filled in with the following combination "S-" + Emission Unit ID + "-" + Process ID in order to facilitate the generation of ER parent records for orphaned EP records. Duplicate ER records were deleted. The ER record with the highest exit gas flow rate was kept. Duplicate records were inactivated. The record with the lowest primary key was retained. Pollutant code 7664417 was changed to NH3. Duplicate emission records were removed, keeping the emission record with the highest value. Set primary device type equal to 099 where left blank.

B. Comments Processing

New York did not provide further comments

Nevada: Criteria Pollutants

NV included annual emissions and related data for CO, NH3, NOX, PM-PRI, PM10-PRI, SO2, and VOC.

A. Initial Submittal Processing

The inventory submitted by NV partially replaced the inventory in final Version 2 of the NEI for all of the counties included in NV's inventory submittal. NV provided guidance on what sites in final Version 2 to keep in draft Version 3 because the sites were not included in their submittal for draft Version 3. ORIS IDs were added to the ORIS Facility Code field. Per instruction from NV a number of SCC changes were made.

B. Comments Processing

Ohio: Criteria Pollutants

A. Initial Submittal Processing

OH did not submit an initial file.

B. Comments Processing

North Carolina - Beaufort County (County FIPS 013): Criteria Pollutants

Beaufort County, NC included annual emissions and related data for CO, NH3, NOX, PM10-PRI, PM-PRI, SO2, and VOC for one site (Site ID 3701300071).

A. Initial Submittal Processing

The data for the site were added to the emissions data included in the State of NC's inventory included in final Version 2 of the 1999 NEI.   ORIS ID 50509 was added to the ORIS Facility Code field for the one site.

B. Comments Processing

North Carolina - Beaufort County did not provide further comments.

North Carolina - Forsyth County (County FIPS 067): Criteria Pollutants

Forsyth County, NC included annual emissions and related data for CO, NH3, NOX, PM10-PRI, PM-PRI, SO2, and VOC.

A. Initial Submittal Processing

The emissions data in final Version 2 of the NEI were completely replaced with the emissions data included in Forsyth County's inventory. ORIS IDs were added to the ORIS Facility Code field.

B. Comments Processing

North Carolina - Forsyth County did not provide further comments.

North Carolina - Mecklenburg County: Criteria Pollutants

A. Initial Submittal Processing

Pennsylvania - Allegheny County: Criteria Pollutants

A. Initial Submittal Processing

Pennsylvania - Allegheny County did not submit an initial file.

B. Comments Processing

South Carolina: Criteria Pollutants

SC included annual emissions and related data for CO, hydrocarbon (HC), NH3, NOX, PM10-FIL, PM25-FIL, PM-FIL, SO2, and VOC.

A. Initial Submittal Processing

The inventory submitted by SC replaced the inventory in final Version 2 of the NEI for all three counties in the State. The SC left a few sites out of their V3 inventory submittal, in that case the Version 2 sites were kept. ORIS IDs were added to the ORIS Facility Code field.   Per instruction from SC a number of SCC changes were made.   Pollutant code 7664417 was changed to NH3. PM emissions were adjusted as directed by SC where PM25-FIL was greater than PM10-FIL or PM-FIL was less than PM10-FIL or PM25-FIL.

B. Comments Processing

Tennessee: Criteria Pollutants

TN included annual and OSD emissions and related data for CO, NH3, NOX, PM25-FIL, PM-FIL, SO2, and VOC. After its initial inventory submittal, TN provided a second inventory for 12 companies. This second inventory was combined with TN's initial inventory submittal.

A. Initial Submittal Processing

For the counties that TN included in its inventory, the emissions data in final Version 2 of the NEI were completely replaced with the emissions data included in TN's inventory. ORIS IDs were added to the ORIS Facility Code field. Per instruction from TN a number of SCC changes were made. Additionally a number of area source SCCs were left in the EP table to be reviewed for the final Version 3. Per instruction from TN PM-FIL pollutants were updated to PM10-FIL. PM emissions were adjusted where PM25-FIL was greater than PM10-FIL.

B. Comments Processing

Tennessee - Davidson County (County FIPS 037): Criteria Pollutants

Davidson County, TN included annual and OSD emissions and related data for CO, NOX, PM10-PRI, SO2, and VOC.

A. Initial Submittal Processing

The emissions data in final Version 2 of the NEI were completely replaced with the emissions data included in Davidson County's inventory submittal for Version 3. ORIS IDs were added to the ORIS Facility Code field.

B. Comments Processing

Tennessee - Davidson County did not provide further comments.

Tennessee - Shelby County (County FIPS 157): Criteria Pollutants

Shelby County, TN included annual emissions and related data for CO, HC, NH3, NOX, PM, PM10, PM10-FIL, PM10-PRI, PM2.5, PM2.5-FIL, PM25-FIL, PM25-PRI, PM-FIL, PM-PRI, S02, SO2, SOX, total suspended particulate (TSP), and VOC.

A. Initial Submittal Processing

Due to referential integrity issues that could not be resolved within the timeframe this inventory was not included in Draft Version 3.

B. Comments Processing

Shelby County resubmitted the inventory for final version 3. There were referential integrity issues; however, the focus was on retaining accurate emissions. Therefore referential integrity issues and duplicates were managed as described in section D.

West Virginia: Criteria Pollutants

A. Initial Submittal Processing

West Virginia did not submit an initial file.

B. Comments Processing

APPENDIX B
1999 NEI METHODS FOR ELECTRIC UTILITY STEAM GENERATED FOSSIL FUEL COMBUSTION UNITS

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Point Source Methodologies

A. FUEL COMBUSTION - ELECTRIC UTILITY

1. Which sources does the United States (U.S.) Environmental Protection Agency (EPA) include in the Fuel Combustion - Electric Utility category?

The point and area source categories under the "Electric Utility" heading include the following Tier I and Tier II categories:

Tier I Category	Tier II Category
(01) FUEL COMBUSTION - ELECTRIC UTILITY	(01) Coal
	(02) Oil
	(03) Gas
	(04) Other Fuels including wood, waste, etc.

The emissions from the combustion of fuel by electric utilities are divided into two classifications: (1) steam generated fossil-fuel units (boilers) with Source Classification Codes (SCCs) = 101xxxxx; and (2) non-steam generated fossil-fuel units such as gas turbines (GT) and internal combustion (IC) engines with SCCs = 201xxxxx. Estimating emissions for these two classes requires two very different methodologies, each of which is described separately. Section 2 describes the methodology for fossil-fuel steam utility boilers. The methodology used to estimate emissions for nonsteam generated fossil-fuel units (except for those who report data to EPA's Emissions Tracking System/Continuous Emissions Monitoring (ETS/CEM) – they are included in section 2) is described in section 3.

2. What emissions data for electric utilities are included in the Trends inventory?

The *Trends* databases for fossil-fuel steam electric utility boilers include emission estimates of volatile organic compounds (VOC), oxides of nitrogen (NOX), carbon monoxide (CO), sulfur dioxide (SO2), particulate matter with an aerodynamic diameter less than or equal to a nominal 10 or 2.5 micrometers in diameter (PM10 and PM2.5) for the years 1985 through 1999. In addition, ammonia (NH3) emissions were added in 1996 and primary PM10 and PM2.5 were added in 1996. Table B-1 summarizes the methods applied to estimate emissions for each pollutant for 1989 through 1999. Table B-2 identifies the SCCs by fuel type and boiler firing and bottom type for which emissions were estimated (prior to overlaying non-ETS/CEM data with State data for 1999). Estimates for fossil-fuel steam electric utilities do not include emissions from the combustion of anthracite coal because anthracite coal accounts for less than 1 percent of the overall emissions from fuel combustion by fossil-fuel steam electric utility units. EPA does not develop emissions estimates for sulfates (SO4) because no known utility emission factors exist for this pollutant.

3. How does EPA develop emission estimates for fossil-fuel fired steam electric utilities?

Seven basic factors are used to estimate emissions for fossil-fuel steam electric utility units for the years 1985 through 1999: (1) fuel consumption; (2) the latest (September 6, 2002) EPA-approved emission factor,

which relates the quantity of fuel consumed to the quantity of pollutant emitted; (3) fuel characteristics, such as sulfur content, ash content, and heating value of fuels; (4) control efficiency, which indicates the percent of pollutant emissions not removed through control methods; (5) rule effectiveness (which, according to EPA, measures a regulatory program's ability to achieve all the emissions reductions that could be achieved by full compliance with the applicable regulations at all sources at all times and is used through 1995); (6) whether ETS/CEM data exist for SO2, NOX, and heat input (from 1995 on); and (7) whether State data were submitted (for 1999). Fuel consumption characteristics and control efficiencies are determined at the boiler-level, whereas emission factors are specified at the SCC-level.

To derive 1999 emissions estimates, EPA first estimates the 1999 boiler-level emissions and heat input from EIA data and AP-42 emission factors. ETS/CEM SO2, NOX, and heat input values, if they exist, overlay the EIA-767-based data; and State data, if they were submitted, overlay the EIA-767 data that were not overlaid by ETS/CEM data. An additional 74 boilers with ETS/CEM data were added to the EIA-767 frame from the list of 1999 ETS/CEM-only boilers. These 74 ETS/CEM-only boilers had the largest NOX emissions ($\geq$ 100 tons) or were additional boilers within a plant that had boilers with NOX emissions $\geq$ 100 tons.

4. Where does EPA obtain the utility data necessary for emissions estimates?

Primary utility data collected by the Department of Energy's (DOE) Energy Information Administration (EIA) serves as the basis for the fossil-fuel-fired steam electric utility component of the *Trends* inventory. The EIA uses Form EIA-767 (*Steam-Electric Plant Operation and Design Report*[1]) to collect monthly boiler-level data on a yearly basis. Currently, data from Form EIA-767 are available for the years 1985 through 1999. Note that beginning in 1998, EIA had determined that plants that have previously reported to Form EIA-767 must continue to do so -- even if they have been sold to a nonutility, so that this inventory component does contain some fossil-fuel steam utility boilers that are presently owned by nonutilities. This steam component does not include data from GT or IC engines (which account for a very small share of electric utility fuel use and corresponding emissions) unless companies report that data to EIA, or if the units are among the 74 ETS/CEM-only additional data added (see above).

The steam emission inventory data for 1985 through 1999 are initially based on the aggregated monthly electric utility steam boiler-level data provided by Form EIA-767. All plants of 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 pages of Form EIA-767 containing identification (ID) information (i.e., plant Office of the Regulatory Information System (ORIS) code, State name, county name, plant name, operator name, boiler ID), boiler fuel quantity and quality, and flue gas desulfurization (FGD) information must be completed. Other sources of data for NOX, SO2, and heat input are used in place of the EIA-based estimated data when the data are known to be better: EPA's ETS/CEM annual Scorecard NOX and SO2 emissions and heat input overlay the EIA-based data for affected acid rain utility boilers beginning in 1995 (the data are also available for Phase 1 units for 1994).[2] For 1999, submitted State data were used for those boilers for whom ETS/CEM data were unavailable. These sources are summarized in Table B-3.

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Point Source Methodologies

a. What data does Form EIA-767 contain?

The EIA requires that the operating utility for each plant with fossil-fuel steam utility boilers of 10 MW or greater submit at least some sections of Form EIA-767. This form is designed so that information for each plant is reported on separate pages that relate to different levels of data. 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), FGD unit(s) (SO2 scrubbers), flue gas particulate collectors, flue(s), and stack(s). These do not necessarily have a one-to-one correspondence. In addition, plant name, location, and operating utility are provided.

! Boiler-level: Monthly fuel consumption and quality data (for coal, oil, gas, and other), regulatory data, and design parameters (including NOX control device and annual SO2 operating efficiency).

! Generator-level: Monthly generator and maximum nameplate capacity.

! FGD-level: One page per five FGD units for annual operating data (including SO2 control efficiency) and design parameter data (including type of SO2 control device).

! Flue gas particulate collector-level: One page each for (up to five) collectors with annual operating data [including total suspended particulate (TSP) control efficiency] and design specifications (including type of particulate control device).

! Flue- and stack-level: Design parameter data.

Form EIA-767 data for 1985 through 1999 are processed in a series of steps aimed at converting the mainframe-level computerized data into usable database form. Only certain information is extracted. For example, Form EIA-767 includes fuel-related boiler data such as monthly values for each fuel burned, along with the fuel's associated sulfur, ash, and heat content. Only information regarding coal, oil, and gas fuel type data is processed for the Trends inventory and only data from the first stack associated with a boiler is used. Beginning with the 1998 data, EIA provided 15 database files to include the EIA-767 data, and for the first time, all fuel types' data (including wood and refuse) were processed.

The 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, associated generator generation, and associated stack parameters). 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 database record is on the plant-boiler-SCC level.

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Point Source Methodologies

5. How does EPA develop the necessary data not supplied by the EIA forms?

To obtain data not contained in the computerized EIA data files, or converted to other measurement units, algorithms (utilized since the 1980s) are used to develop values for SCC, heat input, pollutant emissions, and NOX control efficiency.

Although Form EIA-767 reports generator nameplate capacity, this information cannot be used to represent the boiler size when a one-to-one correspondence does not exist between boiler and generator (referred to as a multiheader situation–for example, if one boiler is associated with two or more generators or if 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. (EPA revised the boiler capacity methodology and updated the previous value of 1.25 to 1.36 beginning with the 1997 data year.)

AP-42[3] emission factors are used to calculate emissions (see Table B-4). The emission factor used depends upon the SCC and pollutant, as explained below.

! The appropriate SCC is assigned to each source based on its fuel and boiler characteristics. For sources using coal, the SCC is based on the American Society for Testing and Materials criteria for moisture, mineral-free matter basis (if greater than 11,500 Btu/lb, coal type is designated to be bituminous; if between 8,300 and 11,500 Btu/lb, coal type is designated to be subbituminous; and if less than 8,300 Btu/lb, coal type is designated to be lignite) and the boiler type (firing configuration and bottom type) as specified by AP-42. Fluidized bed combustion boilers have SCCs assigned based on the fuel type. If both coal and oil are burned in the same boiler, it is assumed that the oil is distillate; if coal is not burned, the oil burned is assumed to be residual. See Table B-2 for a complete list of the relationships among fuel type, firing type, bottom type, and SCC.

Since Form EIA-767 does not provide control efficiencies for NOX, PM10, and PM2.5, control efficiencies are derived using the following methods:

! NOX control efficiency is based on the assumption that the boiler would be controlled so that its emission rate would equal its emission limit, expressed on an annual equivalent basis. After calculating the heat input, EPA back-calculates controlled emissions assuming compliance with the applicable standard. The NOX net control efficiency is calculated by dividing the controlled by the uncontrolled NOX emissions.

! Since Form EIA-767 only reports TSP control efficiency, EPA uses the (updated) PM10 Calculator[4] to derive PM10 and PM2.5 control efficiencies. (The PM Calculator estimates PM10 and PM2.5 control efficiencies based on the SCC and the primary and secondary control devices. These device codes are National Emission Data System (NEDS) codes that are derived from EIA-767 reported PM control devices and efficiencies rules as explicated in Table B-5. The control efficiencies from the PM Calculator are based on particle size distribution data from AP-42 for

specific SCCs, where available. These control efficiencies were revised beginning with the 1998 data file.)

EPA computes the SO2 emissions as controlled emissions assuming 100 percent rule effectiveness and using the sulfur content of the fuel as specified in the EIA-767 data. The PM10 and PM2.5 emissions are also computed as controlled emissions assuming 100 percent rule effectiveness. The ash content of the fuel used to calculate uncontrolled PM10 and PM2.5 emissions is also specified in the EIA-767 data. The NOX emissions are computed as controlled emissions assuming 80 percent rule effectiveness for 1985-1994 data; beginning with 1995 data, NOX rule effectiveness is assumed to be 100 percent. The CO and VOC emissions are calculated as uncontrolled emissions. Although no NH3 AP-42 emission factors officially exist for utility fossil-fuels, in 1998 EPA developed coal, oil, and gas NH3 emission factors that are applied to the specified quantity of fuel used (see Table B-4). Thus, beginning with the 1996 data year, NH3 estimates are included in the *Trends* database.

The PM10 and PM2.5 emissions included in the *Trends* inventory for all years through the 1999 data year represent filterable PM10 and PM2.5 emissions. Beginning with data year 1996, condensible PM (PMCD) emissions were estimated and summed with filterable PM10 and PM2.5 emissions to estimate primary PM10 and primary PM2.5 emissions. The rules used to determine the PM condensable emission factors are described in Table B-6.   The algorithms to compute all pollutant emissions are presented in Tables B-7 and B-8.

Since fewer required data elements (identification data, boiler fuel quantity and quality data, and FGD data, if applicable) exist for those 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 values for boiler firing and bottom type are missing (these are needed in the SCC assignment), the default values for wall-fired and dry bottom types are assigned. In the past, discrepancies have occurred in the boiler bottom and firing type data as reported to EIA and CAMD. Based on a coordinated effort in 1996, all differences in bottom and firing types for coal boilers were resolved for previous years (i.e., 1985 through 1995).

6.   What EIA data have been replaced with data from other sources?

EPA replaced the 1985 SO2 emissions and heat input calculated from the 1985 Form EIA-767 data with corresponding boiler-level data (disaggregated to the SCC level) from the National Allowance Data Base Version 3.11 (NADBV311).[5] These data underwent two public comment periods in 1991 and 1992 and are considered the best available data for 1985. Aggregations at the fuel levels (Tier III) are approximations only and are based on the methodology described in Section 1.

In 1996, CAMD completed research on utility coal boiler-level NOX rates. Approximately 90 percent of the rates were based on relative accuracy tests performed in 1993 and 1994 as a requirement for continuous emissions monitor (CEM) certification, while the remaining boilers' rates were obtained from utility stack tests from various years. These coal boiler-specific NOX rates were considered, on the whole, to be significantly better than those calculated from EPA's NOX AP-42 emission factors, which are SCC-category averages.

Thus, whenever these new NOX rates were available, EPA recalculated NOX coal emissions at the coal SCC level, using the heat input (EIA's 767 fuel throughput multiplied by the fuel heat content) and adjusting units, according to the following equation:

$$NOXCOAL_{SCC} = NOXRT_{coal} * HTI_{SCC} * \frac{1}{2000}$$ (Eq. 1)

where: NOXCOAL   =   NOX emissions for the boiler coal SCC (in tons)
         NOXRT   =   CAMD's coal NOX rate for the given boiler (in lbs/MMBtu)
         HTI   =   heat input for the boiler's coal SCC (in MMBtu)

These new NOX SCC-level coal emissions replaced the AP-42 calculated emissions for most of the coal SCCs in the 1985-1994 data years (when ETS/CEM data were unavailable).

As of January 1, 1994, Title IV (Acid Deposition Control) of the Clean Air Act Amendments of 1990 (CAAA) required Phase I affected utility units to report heat input, SO2, and NOX data to EPA. Beginning January 1, 1995, all affected units were required to report heat input and SO2 emissions; most also had to report NOX emissions, although some units received extensions until July 1, 1995 or January 1, 1996 for NOX reporting.

The ETS/CEM data files contain actual, rather than estimated, data. Thus, if a complete set of ETS/CEM annual SO2 and/or NOX emissions and/or heat input data existed for 1994 and 1995, those data values replaced the data estimated from EIA-767 data. This process involved the following steps:

!   Aggregation of ETS/CEM hourly or quarterly data to annual data.

!   Assignment of ETS/CEM data, reported on a monitoring stack or pipe level, to the boiler level.

!   Matching the ETS/CEM boiler-level annual data to the processed EIA-767 annual data.

!   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, SO2, and NOX, respectively. The algorithms used are included in Table B-9.

Beginning with 1996 data, the ETS/CEM annual Scorecard data replaced EIA-derived SO2 and NOX emissions and heat input for all boilers included in EIA-767 and in ETS/CEM. 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, CO_2 and PMCD values are recalculated using the ETS/CEM heat input value, thus also changing the values of TOTPM10 and TOTPM25.

Beginning with 1999 data, submitted State data replaced all other data except for SO2 and NOX data from ETS/CEM.

7.   How does EPA calculate ozone season daily emissions?

Ozone season daily (OSD) emissions are estimated for data years 1990-1999 by assuming the day to be a typical or average summer July day. Emissions for VOC, NOX, CO, SO2, PM10, PM2.5, and NH3 (SO4 is zero) are calculated at the SCC level by taking the ratio of the Form EIA-767 July monthly to annual heat input, dividing it by 31, and then multiplying this value by the already calculated annual emissions. Beginning in data year 1998, a weighted average of the heat inputs for the five ozone season months (July-September) was used in place of the July month heat input. The equation is:

$$EOSD_{SCC} = \frac{HTISUM_{SCC}}{31 * HTIANN_{SCC}} * EANN_{SCC}$$
(Eq. 2)

where:
EOSD	=	Ozone season daily emissions for a given pollutant at the SCC level (in tons)	
HTISUM	=	July monthly or ozone season monthly average Form EIA-767 calculated heat input for the given boiler's SCC (in MMBtu)	
HTIANN	=	annual Form EIA-767 calculated heat input for the given boiler's SCC (in MMBtu)	
EANN	=	Annual emissions for a given pollutant at the SCC level (in tons) for that year	

Beginning with 1999 data, for the OSD SO2 and NOX emissions for the 74 ETS/CEM-only boilers, EPA's hourly data files aggregated to the daily hour were used. The data for July 21 was first chosen for the OSD values; if 0, the next day on either side was chosen (July 20 then July 22) and so on until non-zero values, if they existed during the five months, were found.

8.   What additional emissions estimates adjustments does EPA make?

To derive VOC emissions estimates, an adjustment is made due to the underestimation of aldehydes which are not accounted for in the VOC emission factors for the following SCCs: 10100401, 10100404, 10100501, 10100601, and 10100604. The VOC emissions are augmented according to the methodology used in the Hydrocarbon Preprocessor (HCPREP) of the Flexible Regional Emissions Data System (FREDS).[6] This augmentation was made on steam emission inventories for the years 1985 through 1999.

9.   How does EPA perform its calculations?

The following provides an example calculation for estimating SO2 emissions for a tangentially-fired dry-bottom utility boiler burning bituminous coal. This example shows how the emissions are initially calculated using data reported to EIA-767 and an AP-42 emission factor, and then overlaid with SO2 emissions reported to ETS/CEM. The methods shown in the example calculation are used to estimate emissions for all steam generated fossil-fuel boilers and pollutants. See section 7 for details on what EIA-767 data are replaced with ETS/CEM data for calculating emissions.

!   1995 boiler SCC data:

Variable Description	Variable Name	Value	Units
Source classification code	SCC	10100212	–
Annual fuel throughput	thruput	1300000	SCC units
Heat content of fuel	heatcon	23.18 (really 23.1849046)	MMBtu/SCC units
Sulfur content of fuel	sulfcon	3.17 (really 3.1716)	%
SO2 control efficiency	coneff4	89.3	%
Final emissions for inventory	emiss4	9332.559	tons
Final heat input for inventory	htinpt	31782453.38	MMBtu
Annual heat input calculated from EIA-767 data	eiahti	30140376	MMBtu
Annual SO2 emissions calculated from EIA 767 data	eiaso2	8382.2216	tons
SO2 emission factor	emf4	39 (38 beginning with 1996 data)	lbs SO2/ton coal
Annual SO2 emissions reported to ETS/CEM	so2ets	9332.559	tons
Annual heat input reported to ETS/CEM	htiets	31782453.38	MMBtu

!   Equation:

$$EIASO_2 = \frac{coal\ thruput\ *\ EMF4\ *\ sulfcon\ *\ (1-(coneff4/100))}{2000} \qquad \text{(Eq. 3)}$$

!   Calculation:

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

!   Result:

$EIASO_2$ = 8,382 (tons/year) to nearest integer
But replaced by 1995 ETS/CEM SO_2 emissions (SO_2ets) = 9,332.5590 (tons/year) = final emissions (EMISS4)
Therefore $EIASO_2$ = 8,382 (tons/year); and SO_2ets = EMISS4 = 9,333 (tons/year) in the Inventory

Note that the AP-42 SO2 emission factor for SCC 10100212 was changed from 39 to 38 lbs/ton of coal beginning with data year 1996, reflecting the updated emission factor value.

10. References

1.   *Steam-Electric Plant Operation and Design Report*, Form EIA-767, data files for 1985 - 1999, U.S. Department of Energy, Energy Information Administration, Washington, DC, 2000.

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

3. July 14, 2000 EPA-approved updated *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, NC.

4. *Enhanced Particulate Matter Controlled Emissions Calculator, Draft 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, NC. Prepared by E.H. Pechan & Associates, Inc., Durham, NC under EPA Contract No. 68-D7-0067, Work Assignment No. 3-09, November 1999.

5. *The National Allowance Data Base Version 3.11: Technical Support Document*, Acid Rain Division, Office of Atmospheric Programs, U.S. Environmental Protection Agency, Washington, DC, March 1993.

6. *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, NC, May 1989.

Table B-1. Methods for Developing Annual Emission Estimates for Steam Generated Fossil-Fuel Utility Boilers for the Years 1989-1999

For the data years	For the pollutant(s)	EPA estimated emissions by
1989-1993	NOX	If coal is burned, EIA data and EPA/ARD emission factors and heat input are used; if coal is not burned, EIA data and AP-42 emission factors applied to fuel quantity are used.
1994-1995	NOX	If the boiler reports to both EIA-767 and ETS/CEM, and the ETS/CEM NOX data are complete for the year, then the ETS/CEM data are used. Otherwise, if a boiler burned coal, EIA data and EPA/ARD emission factors and heat input are used; if coal is not burned, EIA data and AP-42 emission factors applied to fuel quantity are used.
1996-1999	NOX	If the boiler reports to both EIA-767 and ETS/CEM, then the ETS/CEM data are used. Otherwise, EIA data and AP-42 emission factors applied to fuel quantity are used. Note that AP-42 emission factors for some SCCs changed from data years 1985-1995 to data year 1996, and again in data year 1997.
1989-1993	SO2	EIA data and AP-42 emission factors applied to fuel quantity are used.
1994-1999	SO2	If the boiler reports to both EIA-767 and ETS/CEM, then the ETS/CEM data are used. Otherwise, EIA data and AP-42 emission factors applied to fuel quantity are used. Note that AP-42 emission factors for some SCCs changed from data years 1985-1995 to data year 1996.
1989-1998	VOC, CO	EIA data and AP-42 emission factors applied to fuel quantity are used. Note that AP-42 emission factors for some SCCs changed from data years 1985-1995 to data year 1996 for VOC and CO.
1989-1997	PM10, PM2.5 (Filterable)	EIA data and AP-42 emission factors applied to fuel quantity are used. Note that AP-42 emission factors for some SCCs changed from data years 1985-1995 to data year 1996 for PM10.
1998	PM10, PM2.5 (Filterable)	EIA data and AP-42 emission factors applied to fuel quantity are used. Note that AP-42 emission factors for some SCCs changed from data year 1996 to data year 1998 for PM10 and PM2.5. Since the PM10 Calculator Program was updated in 1999-2000, updated PM efficiencies are derived for emissions calculations.

For the data years	For the pollutant(s)	EPA estimated emissions by
1996-1999	PM Condensible (PMCD), Primary PM10, Primary PM2.5	EIA data and AP-42 emission factors applied to heat input are used to estimate PMCD. PMCD is summed with filterable PM10 and PM2.5, respectively, to estimate primary PM10 and PM2.5. However, if the boiler reports to both EIA-767 and ETS/CEM, then the ETS/CEM heat input overlays EIA-based heat input, PM condensible is recalculated, and primary PM10 and PM2.5 emissions are updated.
1999	VOC, CO, Filterable and Primary PM10 and PM2.5, NH3	Emissions specified are overlaid by State submitted data when available.
1999	NOX and SO2	Emissions specified are overlaid by State submitted data when available, and if no ETS/CEM data available.
1996-1999	NH3	EIA data and emission factors applied to heat input are used to estimate NH3 emissions. However, if the boiler reports to both EIA-767 and ETS/CEM, then the ETS/CEM heat input overlays EIA-based heat input, NH3 is recalculated, and the emissions are updated. For data years prior to 1996, NH3 emissions were not estimated for utility boilers.
1999	NOX, SO2, VOC, CO, PM10, PM2.5, NH3	State submitted data overlays all emissions except SO2 and NOX ETS/CEM data.

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Point Source Methodologies

Table B-2. Steam Electric Utility Unit Source Classification Code Relationships

Type	Fossil-Fuel	Prime Mover*	Firing Type	Bottom Type	SCC
STEAM					
	Coal				
	Bituminous	ST	No data	No data	10100202
				Wet	10100201
				Dry	10100202
			Wall**	No data	10100202
				Wet	10100201
				Dry	10100202
			Opposed	No data	10100202
				Wet	10100201
				Dry	10100202
			Tangential	No data	10100212
				Wet	10100201
				Dry	10100212
			Stoker	All	10100204
			Cyclone	All	10100203
			Fluidized Bed	N/A	10100217
	Subbituminous	ST	No data	No data	10100222
				Wet	10100221
				Dry	10100222
			Wall	No data	10100222
				Wet	10100221
				Dry	10100222
			Opposed	No data	10100222
				Wet	10100221
				Dry	10100222
			Tangential	No data	10100226
				Wet	10100221
				Dry	10100226
			Stoker	All	10100224
			Cyclone	All	10100223
			Fluidized Bed	N/A	10100238
	Lignite	ST	No data	All	1.0100301101e+55
			Wall	All	
			Opposed	All	
			Tangential	All	
			Stoker	All	
			Cyclone	All	
			Fluidized Bed	N/A	

Type	Fossil-Fuel	Prime Mover*	Firing Type	Bottom Type	SCC
	Residual Oil	ST	No data	All	1.0100401101e+47
			Wall	All	
			Opposed	All	
			Tangential	All	
			Stoker	All	
			Cyclone	All	
	Distillate Oil	ST	No data	All	1.0100501101e+47
			Wall	All	
			Opposed	All	
			Tangential	All	
			Stoker	All	
			Cyclone	All	
	Natural Gas	ST	No data	All	10100601***
			Wall	All	10100601
			Opposed	All	10100601
			Tangential	All	10100604
			Stoker	All	10100601
			Cyclone	All	10100601
	Process Gas	ST	N/A	N/A	10100701
	Petroleum Coke	ST	N/A	N/A	10100801
	Biomass/Wood/Wood Waste	ST	N/A	N/A	10100902
	Paper Pellets	ST	N/A	N/A	10100903
	Propane Oil/LPG	ST	N/A	N/A	10101002
	Other Solid Waste	ST	N/A	N/A	10101201
	Refuse (Tire) Derived Fuel	ST	N/A	N/A	10101202
	Other Liquid/Oil Waste		N/A	N/A	10101302
NONSTEAM					
	Oil	GT, CT	N/A	N/A	2010010120100102
		IC	N/A	N/A	
	Gas	GT, CT	N/A	N/A	2010020120100202
		IC	N/A	N/A	

*ST=Steam, GT=gas turbine, CT=combustion turbine, IC=internal combustion engine (reciprocating)prime mover.

**Wall firing includes front, arch, concentric, rear, side, vertical, and duct burner firing.

***An SCC of 10100601 is used for those few units that are classified as IGCC (internal gasification combined cycle); EPA is planning on creating a new SCC for IGCCs.

Table B-3. Boiler Emissions Data Sources (Other than EIA-767) for NOX, SO2, and Other Pollutant Emissions Data by Year, 1985-1999

Year	NOX	SO2	Other Pollutant Emissions
1985	Overlaid with CAMD coal NOX rate calculations when possible	NADBV311 data	Calculated from EIA-767 data
1986	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1987	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1988	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1989	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1990	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1991	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1992	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1993	Overlaid with CAMD coal NOX rate calculations when possible	Calculated from EIA-767 data	Calculated from EIA-767 data
1994	Overlaid with CAMD coal NOX rate calculations when possible; overlaid ETS/CEM data when possible	Overlaid with ETS/CEM data when possible	Calculated from EIA-767 data
1995	Overlaid with ETS/CEM data when available	Overlaid with ETS/CEM data when possible	Calculated from EIA-767 data
1996	Overlaid with ETS/CEM data when available	Overlaid with ETS/CEM data when possible	Calculated from EIA-767 data; if ETS/CEM heat input are available, PMCD is recalculated using ETS/CEM heat input, and then primary PM10 and primary PM2.5 are recalculated, too
1997	Overlaid with ETS/CEM data when available	Overlaid with ETS/CEM data when possible	Calculated from EIA-767 data; if ETS/CEM heat input are available, PMCD is recalculated using ETS/CEM heat input, and then primary PM10 and primary PM2.5 are recalculated, too
1998	Overlaid with ETS/CEM data when available	Overlaid with ETS/CEM data when possible	Calculated from EIA-767 data; if ETS/CEM heat input are available, PMCD is recalculated using ETS/CEM heat input, and then primary PM10 and primary PM2.5 are recalculated, too
1999	Overlaid with ETS/CEM data when available; otherwise overlaid by State submitted data when available	Overlaid with ETS/CEM data when available; otherwise overlaid by State submitted data when available	Calculated from EIA-767 data; if ETS/CEM heat input are available, PMCD is recalculated using ETS/CEM heat input, and then primary PM10 and primary PM2.5 are recalculated, too. Overlaid with State submitted data when available.

CAMD	=	EPA's Clean Air Markets Division
NADBv311	=	National Allowance Data Base Version 3.11
ETS/CEM	=	EPA's Emissions Tracking System/Continuous Emissions Monitoring data

Table B-4. Emission Factors

SCC	COEF	NOXEF	VOCEF	PM10EF	PM25EF	SO2EF	NH3EF	PMFLAG	SO2FLAG
10100101	0.6000	18.0000	0.0700	2.3000	0.6000	39.0000	0.000565	A	S
10100102	0.6000	9.0000	0.0700	4.8000	2.4000	39.0000	0.000565		S
10100201	0.5000	31.0000	0.0400	2.6000	1.4800	38.0000	0.000565	A	S
10100202	0.5000	22.000 *	0.0600	2.3000	0.6000	38.0000	0.000565	A	S
10100203	0.5000	33.0000	0.1100	0.2600	0.1100	38.0000	0.000565	A	S
10100204	5.0000	11.0000	0.0500	13.2000	4.6000	38.0000	0.000565		S
10100205	6.0000	7.5000	0.0500	6.0000	2.2000	38.0000	0.000565		S
10100211	0.5000	14.0000	0.0400	2.6000	1.4800	38.0000	0.000565	A	S
10100212	0.5000	15.000 *	0.0600	2.3000	0.6000	38.0000	0.000565	A	S
10100215	0.5000	31.0000	0.0600	2.3000	0.6000	38.0000	0.000565	A	S
10100217	18.0000	15.2000	0.0500	7.8000	3.2000	31.0000	0.000565		S
10100218	18.0000	5.0000	0.0500	7.8000	3.2000	31.0000	0.000565		S
10100221	0.5000	24.0000	0.0400	2.6000	1.4800	35.0000	0.000565	A	S
10100222	0.5000	12.000 *	0.0600	2.3000	0.6000	35.0000	0.000565	A	S
10100223	0.5000	17.0000	0.1100	0.2600	0.1100	35.0000	0.000565	A	S
10100224	5.0000	8.8000	0.0500	13.2000	4.6000	35.0000	0.000565		S
10100225	6.0000	7.5000	0.0500	6.0000	2.2000	35.0000	0.000565		S
10100226	0.5000	8.400 *	0.0600	2.3000	0.6000	35.0000	0.000565	A	S
10100235	0.5000	14.0000	0.0600	2.3000	0.6000	35.0000	0.000565	A	S
10100238	18.0000	5.0000	0.0500	7.8000	3.2000	31.0000	0.000565		S
10100300	-9.0000	-9.0000	-9.0000	-9.0000	-9.0000	-9.0000	0.000565		
10100301	0.2500	13.000 *	0.0700	1.8170	0.5214	30.0000	0.000565	A	S
10100302	0.6000	7.1000	0.0700	2.3000	0.6600	30.0000	0.000565	A	S
10100303	0.6000	15.0000	0.0700	0.8700	0.1100	30.0000	0.000565	A	S
10100304	6.0000	6.0000	0.0700	1.6000	0.5600	30.0000	0.000565	A	S
10100306	5.0000	5.8000	0.0700	1.6000	0.5600	30.0000	0.000565	A	S
10100316	0.1500	3.6000	0.0300	12.0000	1.4000	10.0000	0.000565		S
10100317	0.1500	3.6000	0.0300	12.0000	1.4000	10.0000	0.000565		S
10100318	0.1500	3.6000	0.0300	12.0000	1.4000	10.0000	0.000565		S
10100401	5.0000	47.0000	0.7600	5.9000	4.3000	157.0000	0.800000		S
10100404	5.0000	32.0000	0.7600	5.9000	4.3000	157.0000	0.800000		S
10100405	5.0000	47.0000	0.7600	5.9000	4.3000	157.0000	0.800000		S
10100406	5.0000	32.0000	0.7600	5.9000	4.3000	157.0000	0.800000		S
10100501	5.0000	24.0000	0.2000	1.0000	0.2500	143.6000	0.800000		S
10100504	5.0000	47.0000	0.7600	5.9000	4.3000	150.0000	0.800000		S
10100505	5.0000	32.0000	0.7600	5.9000	4.3000	150.0000	0.800000		S
10100601	84.0000	280.000 *	5.5000	1.9000	1.9000	0.6000	3.200000		
10100602	84.0000	100.0000	5.5000	1.9000	1.9000	0.6000	3.200000		
10100604	24.0000	170.0000	5.5000	1.9000	1.9000	0.6000	3.200000		
10100701	84.0000	280.0000	5.5000	1.9000	1.9000	950.0000	-9.000000		S
10100702	84.0000	100.0000	6.0000	1.9000	1.9000	950.0000	-9.000000		S
10100801	0.6000	21.0000	0.0700	7.9000	4.5000	39.0000	-9.000000	A	S
10100901	13.6000	1.5000	1.4000	16.8000	10.0000	0.0750	-9.000000		
10100902	13.6000	1.5000	1.4000	6.4800	5.4700	0.0750	-9.000000		
10100903	13.6000	1.5000	1.4000	7.9000	7.9000	0.0750	-9.000000		

Table B-4 (continued)

SCC	COEF	NOXEF	VOCEF	PM10EF	PM25EF	SO2EF	NH3EF	PMFLAG	SO2FLAG
10101001	3.6000	21.0000	0.2600	0.6000	0.6000	86.5000	-9.000000		S
10101002	3.2000	19.0000	0.2500	0.6000	0.6000	86.5000	-9.000000		S
10101101	2.0000	1.2000	2.0000	5.6000	1.4000	0.0000	-9.000000		
10101201	0.0165	3.8000	2.0000	11.4000	7.8000	3.9000	-9.000000		
10101202	3.6000	5.0000	2.0000	44.0000	11.0000	1.7000	-9.000000		
10101301	5.0000	19.0000	1.0000	51.0000	13.0000	147.0000	-9.000000	A	S
10101302	5.0000	19.0000	1.0000	51.0000	13.0000	147.0000	-9.000000	A	S
20100101	0.4587	122.3200	0.0570	1.6680	1.6680	140.3900	-9.000000		S
20100102	130.0000	604.0000	0.0570	11.2000	10.8000	39.7000	-9.000000		S
20100201	83.6400	326.4000	2.1420	6.7320	6.7320	3.4680	-9.000000		
20100202	399.0000	2840.0000	116.0000	10.0000	10.0000	0.6000	-9.000000		
20100901	6.7200	97.7000	2.3800	8.5400	8.5400	6.2000	-9.000000		
20100902	130.0000	604.0000	49.3000	42.5000	42.5000	6.2000	-9.000000		

* For these 6 SCCs there are two NOx 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. The post-NSPS is below for reference.

Post-NSPS NOx Emission Factors:

10100202	12.0000		10100222	7.4000		10100301	
10100212	10.0000		10100226	7.2000		10100601	

-9 indicates a missing emission factor.

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

If the PM device is missing, then it is defaulted to an electrostatic precipitator (ESP)

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 B-6. PM Condensable Emission Factor (PMCDEF) Rules

Coal

    If SCC = 10100204, 10100205, 10100224, 10100225, 10100304, 10100306, then PMCDEF = .04.
    Else, if SCC = 10100217,10100218, then PMCDEF = .01.
    Else, if SCC = 10100201,10100202,10100212,10100221,10100222,10100223,10100226, AND there is either an SO_2 FGD or a PM wet scrubber, then PMCDEF = .02.
    Else, if SCC = 10100201, 10100202, 10100203,10100212, 10100221, 10100222,10100223, 10100226, 10100301,10100302,10100303 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, then PMCDEF = .1 * sulfur content [as a decimal] - .03.
    And if PMCDEF is less than .01, then PMCDEF=.01.

Light Oil (Distillate)

    If SCC between 10100401 and 10100499 inclusive, then PMCDEF=.01.

Heavy Oil (Residual)

    If SCC between 10100501 and 10100599 inclusive, then PMCDEF=.009.

Natural Gas

    If SCC between 10100601 and 10100699 inclusive, then PMCDEF=.0057.

Processed Gas

    If SCC between 10100701 and 10100799 inclusive, then PMCDEF=.0056.

Petroleum Coke

    If SCC between 10100801 and 10100899 inclusive, then PMCDEF=.01.

Wood/Biomass

    If SCC between 10100901 and 10100999 inclusive, then PMCDEF=.017.

LPG (Propane, Butane)

    If SCC between 10101001 and 10101099 inclusive, then PMCDEF=.0056.

Solid Waste/Refuse

    If SCC between 10101201 and 10101299 inclusive, then PMCDEF=.017.

Liquid Waste

    If SCC between 10101301 and 10101399 inclusive, then PMCDEF=.009.

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Point Source Methodologies

Table B-7. Algorithms Used to Estimate EIA-Based VOC, NOX, CO, SO2, PM10, PM2.5, and NH3 Annual Emissions from Electric Utility 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$_f$)
	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 B-8. Algorithms Used to Estimate EIA-Based Condensible PM, Primary PM10 and Primary PM2.5 Annual Emissions for Electric Utility Boilers

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

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

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 PMCD, TOTPM10, and TOTPM25.

Table B-9. 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

APPENDIX C
METHODOLOGY FOR AUGMENTING STATE/LOCAL/TRIBAL 1999 POINT SOURCE EMISSIONS INVENTORIES WITH PM10 AND PM25 EMISSIONS FOR THE 1999 NEI

1. INTRODUCTION

The NEI requires reporting of primary (PRI) PM10/PM25 emissions, which is the sum of the filterable (FIL) PM10/PM25 and condensible (CON) fractions of PM10/PM25 for each emissions source of PM10/PM25. S/L/T agencies; however, may report any fraction of total PM and/or PM10/PM25 emissions for the 1999 NEI. The S/L/T inventories included emissions data for either PM-FIL, PM-PRI, PM10-FIL, PM10-PRI, PM25-FIL, PM25-PRI, and/or PM-CON. From any one of these pollutants, the augmentation procedure estimates PM10-PRI, PM10-FIL, PM25-PRI, PM25-FIL, and PM-CON as shown in the following table. If not included in a S/L/T inventory, PM10-PRI and PM25-PRI were calculated by adding PM10-FIL and PM-CON or PM25-FIL and PM-CON, respectively.

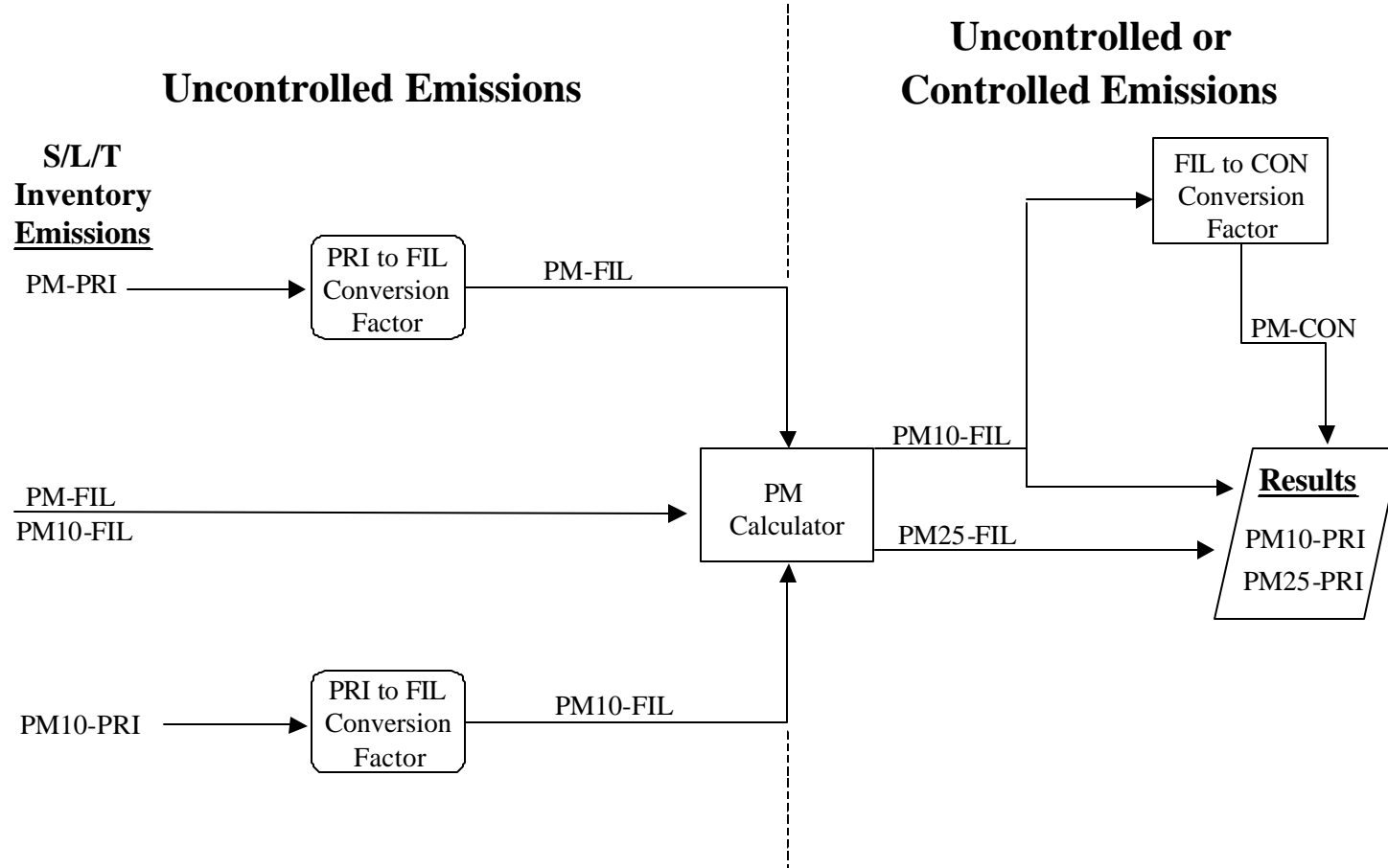| PM Category	Description
PM-PRI	Primary PM (includes filterables and condensibles)
PM-CON	Primary PM, Condensible Portion Only (all less than 1 micron)
PM-FIL	Primary PM, Filterable Portion Only
PM10-PRI	Primary PM10 (includes filterables and condensibles)
PM10-FIL	Primary PM10, Filterable Portion Only
PM25-PRI	Primary PM25 (includes filterables and condensibles)
PM25-FIL	Primary PM25, Filterable Portion Only

2. APPROACH

Figure 1 provides a flow diagram of the procedures for calculating PM10/PM25. The procedures were developed to take advantage of the PM Calculator which calculates uncontrolled and controlled PM10-FIL and PM25-FIL emissions using either uncontrolled PM-FIL or PM10-FIL emissions as inputs. For controlled sources, up to two control devices can be used as input to the PM Calculator. The following steps were taken to prepare S/L/T data for input to the PM Calculator:

Figure 1

Procedures for Calculating PM$_{2.5}$ and PM$_{10}$ Emissions for the NEI

Uncontrolled Emissions

Uncontrolled or Controlled Emissions

S/L/T Inventory Emissions

PM-PRI → | PRI to FIL Conversion Factor | → PM-FIL

PM-FIL
PM10-FIL →

| FIL to CON Conversion Factor | → PM-CON

| PM Calculator |

PM10-FIL
PM25-FIL

Results

PM10-PRI
PM25-PRI

PM10-PRI → | PRI to FIL Conversion Factor | → PM10-FIL

Step 1. Prepare S/L/T PM and PM10 Emissions for Input to the PM Calculator;

Step 2. Develop and apply source-specific factors to convert S/L/T-supplied PM-PRI to PM-FIL or PM10-PRI to PM10-FIL based on uncontrolled data;

Step 3. Prepare Factors from PM Calculator;

Step 4: Develop and apply algorithms to estimate emissions from S/L/T inventory data; and

Step 5: Review Results and Update the NEI with emission estimates and control information.

The remainder of this appendix explains each of these steps in detail. Tables C-1 through C-12, which are referenced in the following text, are provided in a separate Excel Workbook file named "Point_Appendix_C_Tables 1_12.xls."

a. Step 1: Prepare S/L/T PM and PM10 Emissions for Input to the PM Calculator

The first step in the procedure involved back-calculating uncontrolled emissions to prepare the emissions for input to the PM Calculator. Initially, the control efficiencies included in S/L/T inventories were used to back-calculate uncontrolled emissions. However, this approach resulted in inconsistent results for the following reasons:

(1) The PM Calculator uses default control efficiencies from AP-42 for each control device type or combination of two control devices in series. Because the S/L/T control efficiency data typically did not match the default control efficiencies in the PM Calculator that are applied to the back-calculated uncontrolled emissions, the PM Calculator produced estimates for PM25-FIL in some cases that were higher than the PM10-FIL emissions included in S/L/T inventories.

(2) Some S/L/T inventories contained control device codes but did not report control efficiency data for the control devices, or reported efficiencies of 100% for emission sources with emissions above zero.

Thus, the default control efficiencies in the PM Calculator were used to back-calculate uncontrolled emissions by SCC and control device code. Using the default control efficiencies in the PM Calculator ensured that the calculator produced the same PM10-FIL emission values reported in a S/L/T inventory, and provided a consistent basis for estimating PM25-FIL and PM-CON emissions from S/L/T PM10-FIL emissions.

Prior to back-calculating uncontrolled emissions provided in S/L/T inventories, the PM, PM10, and PM25 emissions in S/L/T inventories were reviewed to identify cases where PM10 emissions were less than PM25 emissions. The following rules were applied to correct issues with the different fractions of PM:

If PM25-PRI > PM10-PRI and PM10-PRI is not null or zero, set PM25-PRI = PM10-PRI.
If PM25-FIL > PM10-FIL and PM10-FIL is not null or zero, set PM25-FIL = PM10-FIL.

All PM-PRI and PM-FIL records were removed from the input file for the PM augmentation procedure if an emission source had any form of PM10, PM25, or PM-CON. PM-CON records with emissions greater than zero were used in the PM augmentation procedure. PM-CON records with null or zero emissions were removed and calculated using the PM augmentation procedure.

The PM Calculator does not include particle-size profiles for several control device codes for which S/L/T agencies reported PM or PM10 emissions. Therefore, it was necessary to map records with control codes not in the PM Calculator to codes in the PM Calculator as shown in Table C-1. In addition, some agencies used control device codes that do not comply with the NEI Input Format (NIF) Version 2.0 control device codes. Therefore, EPA changed the codes in S/L/T inventories to comply with NIF 2.0 codes and updated the NEI with the NIF 2.0 compliant codes.

b. Step 2: Develop and Apply Source-Specific Conversion Factors

The PM Calculator was used to estimate missing PM10-FIL and/or PM25-FIL emissions from the S/L/T submitted emissions for PM-PRI, PM-FIL, or PM10-PRI. For this methodology, the emission factors for PM-FIL, PM10-FIL, and PM-CON are most important because the PM calculator can produce the following output from the indicated input:

Uncontrolled Input	Uncontrolled Output	Controlled Output
PM-FIL	PM10-FIL	PM10-FIL
	PM25-FIL	PM25-FIL
PM10-FIL	PM10-FIL	PM10-FIL
	PM25-FIL	PM25-FIL

Using the PM Calculator to produce these emissions estimates narrows the required conversion factors to the following:

Convert S/L/T Emissions From	Convert To (Input to PM Calculator)
PM-PRI	PM-FIL
PM10-PRI	PM10-FIL
PM10-FIL	PM-CON

These conversion factors are calculated with the following equations:

$PM\text{-}PRI_{STATE} \rightarrow PM\text{-}FIL_{STATE}$:

$$PM\text{-}PRI_{STATE} \times \left(\frac{PM\text{-}FIL_{AP\text{-}42}}{PM\text{-}PRI_{AP\text{-}42}} \right) = PM\text{-}FIL_{STATE}, \text{ conversion factor is } \left(\frac{PM\text{-}FIL_{AP\text{-}42}}{PM\text{-}PRI_{AP\text{-}42}} \right) \quad (1)$$

$PM10\text{-}PRI_{STATE} \rightarrow PM10\text{-}FIL_{STATE}$:

$$PM10\text{-}PRI_{STATE} \times \left(\frac{PM10\text{-}FIL_{AP\text{-}42}}{PM10\text{-}PRI_{AP\text{-}42}} \right) = PM10\text{-}FIL_{STATE}, \text{ conversion factor is } \left(\frac{PM10\text{-}FIL_{AP\text{-}42}}{PM10\text{-}PRI_{AP\text{-}42}} \right) \quad (2)$$

$PM10\text{-}FIL_{STATE} \rightarrow PM\text{-}CON_{STATE}$:

$$PM10\text{-}FIL_{STATE} \times \left(\frac{PM\text{-}CON_{AP\text{-}42}}{PM10\text{-}FIL_{AP\text{-}42}} \right) = PM\text{-}CON_{STATE}, \text{ conversion factor is } \left(\frac{PM\text{-}CON_{AP\text{-}42}}{PM10\text{-}FIL_{AP\text{-}42}} \right) \quad (3)$$

With these conversion factors and the PM Calculator, all of the needed emissions values can be produced from S/L/T submitted inputs for each Source Classification Code (SCC) and control device combination. The uncontrolled conversion factors are provided by SCC in the Access database named "Uncontrolled PM Factors.mdb."

Conversion Factors for Stationary External and Internal Combustion Sources (SCCs Starting with 1 and 2)

The emission factors and supporting data available in Chapters 1 and 3 of AP-42 were used to prepare conversion factors for stationary external and internal combustion sources. All AP-42 PM emission factors that were not specified as being CON, FIL, or PRI were assumed to be FIL. When necessary, for coal, sulfur content was always assumed to be 1%, and ash content was always assumed to be 8%. Generally, AP-42 is thorough in allocating the emissions factors for specific SCCs, but it is slightly ambiguous when describing control devices. When there was ambiguity, the emission factor presented was assumed to apply to any NEI control device code. For example, if AP-42 listed the control device for an emission factor as "ESP," the following NEI codes were assumed to apply: 010 (high efficiency ESP), 011 (medium efficiency ESP), 012 (low efficiency ESP), and 128 (ESP).

Analysis of the factors presented in Chapters 1 and 3 of AP-42 revealed that Flue Gas Desulfurization (FGD), NEI control device code 039, was the only control that affected the PM-CON value. For this control only, a separate conversion factor from PM10-FIL to PM-CON is required that differs from the uncontrolled conversion factor. For all other control devices, the conversion of the uncontrolled PM10-FIL emissions to PM-CON emissions will result in the PM-CON value to use for both uncontrolled and controlled PM emissions.

Table C-2 identifies the AP-42 emission factors (in lb/MMBtu) and references used to prepare the conversion factors. For SCCs with complete information in AP-42, emissions factors for PM10-FIL, PM-FIL, PM10-PRI, PM-PRI, and PM-CON were presented individually or could be derived from each other by performing the necessary addition or subtraction. When PM-PRI or PM10-PRI emission factor values were not listed in AP-42, the values were estimated by adding the appropriate FIL and CON factors if they were available. Back calculations to derive missing FIL or CON factors from the PRI value were also performed. An example of calculating conversion factors for SCCs with complete information is as follows:

SCC 10100201 with no controls (000) has the following reported values in AP-42:

PM Category	Emission Factor (lb/MMBtu)	AP-42 Page No.
PM10-FIL	0.8	1.1-21
PM-FIL	2.1538	1.1-21
PM-CON[a]	0.07	1.1-24

[a] Since the value applied to "All PM controls (without FGD controls)" this value was assumed to apply to uncontrolled emissions as well.

$\text{PM-PRI}_{\text{AP-42}}:$

$\text{PM-PRI}_{\text{AP-42}} = \text{PM-FIL}_{\text{AP-42}} + \text{PM-CON}_{\text{AP-42}}$

$\text{PM-PRI}_{\text{AP-42}} = 2.1538 \ \frac{\text{lb}}{\text{MMBtu}} + 0.07 \ \frac{\text{lb}}{\text{MMBtu}} = 2.2238 \ \frac{\text{lb}}{\text{MMBtu}}$

$\text{PM10-PRI}_{\text{AP-42}}:$

$\text{PM10-PRI}_{\text{AP-42}} = \text{PM10-FIL}_{\text{AP-42}} + \text{PM-CON}_{\text{AP-42}}$

$\text{PM10-PRI}_{\text{AP-42}} = 0.8 \ \frac{\text{lb}}{\text{MMBtu}} + 0.07 \ \frac{\text{lb}}{\text{MMBtu}} = 0.87 \ \frac{\text{lb}}{\text{MMBtu}}$

$(\text{PM-PRI}_{\text{STATE}} \rightarrow \text{PM-FIL}_{\text{STATE}})$ conversion factor:

$\dfrac{\text{PM-FIL}_{\text{AP-42}}}{\text{PM-PRI}_{\text{AP-42}}} = \dfrac{2.1538 \ \frac{\text{lb}}{\text{MMBtu}}}{2.2238 \ \frac{\text{lb}}{\text{MMBtu}}} = 0.9685$

$(\text{PM10-PRI}_{\text{STATE}} \rightarrow \text{PM10-FIL}_{\text{STATE}})$ conversion factor:

$\dfrac{\text{PM10-FIL}_{\text{AP-42}}}{\text{PM10-PRI}_{\text{AP-42}}} = \dfrac{0.8 \ \frac{\text{lb}}{\text{MMBtu}}}{0.87 \ \frac{\text{lb}}{\text{MMBtu}}} = 0.9195$

$(\text{PM10-FIL}_{\text{STATE}} \rightarrow \text{PM-CON}_{\text{STATE}})$ conversion factor:

$\dfrac{\text{PM-CON}_{\text{AP-42}}}{\text{PM10-FIL}_{\text{AP-42}}} = \dfrac{0.07 \ \frac{\text{lb}}{\text{MMBtu}}}{0.8 \ \frac{\text{lb}}{\text{MMBtu}}} = 0.0875$

AP-42 does not contain comprehensive data for each 8-digit SCC that is a source of PM10 and PM25 emissions. Thus, for 8-digit SCCs for which emission factor data were not available, average factor values were calculated for the first 6 digits of the SCC code combined with the control type. For example, uncontrolled SCC 10100212 has no reported PM-CON value, therefore, its PM-CON value was assumed to be the average of the 11 SCCs that begin with "101002" and have a reported PM-CON value. SCCs unaccounted for by averaging the known emissions factors values of the first 6 digits of the SCC were accounted for by taking the average of the known emissions factor values' for all SCCs with the same first 5 digits as the SCC, then the first 4 digits, then the first 3 digits, then the first 2 digits, and finally the first digit. Missing FIL (PM10-FIL and PM-FIL) values are accounted for in a similar fashion. The PM-PRI and PM10-PRI values could then be obtained by adding the appropriate FIL value to the CON value.

To account for the effects that the FGD (039) control device has on the PM-CON value, conversion factors also had to be compiled to calculate controlled PM-CON from an uncontrolled PM10-FIL. Analysis of the State data revealed that FGD was used as one of the control devices for only three SCCs: 10100222, 10100202, and 10100501. Only SCC 10100501 did not have a PM-CON value reported in AP-42, so the average value (0.02) of reported PM-CON values with an SCC that began with "10100" was used. The reported values for these factors are as follows:

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SCC	Control Code	PM-CON (lb/MMBtu)	AP-42 Page No.
10100201	039	0.02	1.1-24
10100202	039	0.02	1.1-24
10100203	039	0.02	1.1-24
10100221	039	0.02	1.1-24
10100222	039	0.02	1.1-24
10100223	039	0.02	1.1-24[a]
10100301	039	0.02	1.7-13
10100302	039	0.02	1.7-13
10100303	039	0.02	1.7-13[b]

[a]   From AP-42, page 1.1-25: "No data are available for cyclone boilers (SCCs 1-01-002-03/23, 1-02-002-03/23, 1-03-002-23) ... use the factors provided for pulverized coal-fired boilers and applicable control devices."

[b]   From AP-42, page 1.7-13: "No data available for cyclone boilers (SCCs 1-01-003-03, 1-02-003-03) ... use the factors provided for pulverized coal-fired boilers and applicable controls."

Once the necessary gaps had been filled, conversion factors could easily be calculated by using Equations (1), (2), and (3) as described earlier. Final conversion factors for uncontrolled External Combustion Sources and Stationary Internal Combustion Sources are shown in Table C-3. The conversion factors for uncontrolled PM10-FIL to controlled PM-CON for an FGD control were calculated by using Equation (3), but substituting in the controlled PM-CON value. The final values for the FGD control conversion factors are displayed in Table C-4.

Conversion Factors for Industrial Processes (SCCs Starting with 3)

The procedures for preparing PM factors for SCCs starting with 3 are similar to those for SCCs starting with 1 and 2. However, relative to the procedures for SCCs starting with 1 and 2, fewer particle-size-specific emission factors are available and the units of the emission factors vary considerably more for SCCs starting with 3. Thus, for example, factors developed for an SCC for natural gas burned in a utility or industrial boiler cannot be applied to an industrial process burning natural gas because of the differences in the emission factor units. The procedures for SCCs relied on the use of particle-size-specific emission factors for specific source categories when available in Factor Information Retrieval Information (FIRE) system and AP-42. If particle-size-specific emission factors in FIRE or AP-42, the procedures relied on the use of the generic particle size profiles presented in Appendix B of AP-42.

In FIRE, only 25 SCCs beginning with 3 have emission factors for PM-FIL, PM10-FIL, and PM-CON (see Table C-5). To compute the conversion factors for those 25 SCCs, the emission factors from FIRE were utilized in equations 1, 2, and 3.

AP-42 contains emission factors for 13 SCCs for asphalt concrete operations that have not yet been included in FIRE (see Table C-6). To compute the conversion factors for the 13 SCCs, the emission factors were utilized in equations 1, 2, and 3. If one of the SCCs also appeared in Table C-5, the information from Table C-6 was used to calculate the conversion factors and the Table C-5 information was not used.

For SCCs that did not have enough information in FIRE or AP-42 to generate the conversion factors, the generic weight percent PM profiles located in AP-42 were used to generate the conversion factors. The generic PM profile information is located in Appendix B.1, Appendix B.2, and the individual sections of AP-42. If the relative percent composition of PM emissions for a group of similar SCCs (i.e., processes) is known, then conversion factors can be calculated for that group of SCCs based on the percentages.

Using the generic PM profiles, the necessary assumptions to proceed from this point are as follows:

- Emissions less than or equal to 1 µm are PM-CON emissions.
- Emissions less than or equal to 10 µm are PM10-PRI emissions (since they include emissions less than or equal to 1 µm as well).
- The weight percent for PM-PRI will always be 100%.
- PM-FIL and PM10-FIL weight percentages can be derived by subtracting the PM-CON weight percentages from the PM-PRI and PM10-PRI weight percentage values, respectively.

The compilation of generic PM profiles resulted in two distinct types of profiles. Some of the PM profiles originated from specific sections of AP-42 and were SCC specific. These profiles can be viewed in Table C-7. Other PM profiles originated from the generic profiles found in Appendices B.1 and B.2 of AP-42. These profiles were allocated to more general, 6-digit SCCs; they can be viewed in Table 8. For the 6-digit profiles, if more than one category number in the AP-42 appendix was cited for a given 6-digit SCC, the average value of all the categories was used for cumulative weight percent of PM that was less than 1 µm and less than 10 µm, respectively.

After compiling the generic PM profiles from AP-42, there were still a large number of SCCs beginning with 3 that did not have an attributed profile. To account for these SCCs, the first step was to further augment the 6-digit generic PM profiles. This was accomplished by using the average of the 8-digit generic PM profiles where they had the first 6 digits in common and those 6 digits were not already accounted for by a 6-digit generic PM profile.

The next step was averaging of the 6-digit PM generic profiles to produce more general PM profiles to account for even more SCCs. For example, the following 6-digit SCCs were used to produce a 5-digit SCC profile for '30101' via averaging:

SCC	Cumulative % $\leq 10\ \mu m$	Cumulative % $\leq 1\ \mu m$
301012	51	4
301014	85	6
301015	85	6
301019	94	60
30101	**78.75**	**19**

Following this methodology, generic PM profiles at the 5, 4, 3, 2, and 1-digit level can be derived from the 6-digit generic PM profiles.

Once completed, the generic profile information was then mapped to the appropriate SCCs beginning with '3'. Those SCCs with complete PM information in FIRE and SCCs with 8-digit profiles were excluded from the mapping process. The process started at the 6-digit SCC level and ended at the 1-digit SCC level. If an SCC had its first 6-digits matched to a 6-digit SCC PM generic profile, then it was considered to have the PM percentage composition of that generic profile. For instance, SCC 30101202, Chemical Manufacturing of Hydroflouric Acid (Rotary Kiln: Acid Reactor), was assumed to have the percentage composition of the generic '301012' PM profile from Appendix B.2: 51% ≤ 10 µm and 4% ≤ 1 µm. If the SCC did not match on the 6-digit level, then a match was attempted at the 5-digit level to the calculated 5-digit generic profiles. The process was continued to the 4-digit, 3-digit, 2-digit, and even 1-digit level until a match was made.

Once all of the SCCs beginning with '3' had a PM profile in place, the calculation of conversion factors was performed using the aforementioned assumptions. The equations utilized were as follows:

Conversion Factor from PM-PRI to PM-FIL:
$$\frac{\text{PM-FIL}_{AP-42}}{\text{PM-PRI}_{AP-42}} = \frac{100\% - (\text{Cumulative \%} \leq 1 \, \mu\text{m})}{100\%} \qquad (4)$$

Conversion Factor from PM10-PRI to PM10-FIL:
$$\frac{\text{PM10-FIL}_{AP-42}}{\text{PM10-PRI}_{AP-42}} = \frac{(\text{Cumulative \%} \leq 10 \, \mu\text{m}) - (\text{Cumulative \%} \leq 1 \, \mu\text{m})}{(\text{Cumulative \%} \leq 10 \, \mu\text{m})} \qquad (5)$$

Conversion Factor from PM10-FIL to PM10-CON:
$$\frac{\text{PM-CON}_{AP-42}}{\text{PM10-FIL}_{AP-42}} = \frac{(\text{Cumulative \%} \leq 1 \, \mu\text{m})}{(\text{Cumulative \%} \leq 10 \, \mu\text{m}) - (\text{Cumulative \%} \leq 1 \, \mu\text{m})} \qquad (6)$$

Utilizing these equations, the conversion factors for the example SCC, 30101202, Chemical Manufacturing of Hydroflouric Acid (Rotary Kiln: Acid Reactor) would be as follows:

Conversion Factor from PM-PRI to PM-FIL:
$$\frac{\text{PM-FIL}_{AP-42}}{\text{PM-PRI}_{AP-42}} = \frac{100\% - 4\%}{100\%} = 0.96$$

Conversion Factor from PM10-PRI to PM10-FIL:
$$\frac{\text{PM10-FIL}_{AP-42}}{\text{PM10-PRI}_{AP-42}} = \frac{51\% - 4\%}{51\%} = 0.92$$

Conversion Factor from PM10-FIL to PM10-CON:
$$\frac{\text{PM-CON}_{AP-42}}{\text{PM10-FIL}_{AP-42}} = \frac{4\%}{51\% - 4\%} = 0.085$$

The conversion factors for the other SCCs beginning with 3 were also calculated in this manner. The results were then combined with those conversion factors calculated for the SCCs with 8-digit generic PM profiles, the SCCs with complete PM information in FIRE, and the SCCs with the emission factor information from the AP-42 text. All conversion factors can be viewed in Table C-9.

Conversion Factors for Petroleum and Solvent Evaporation (SCCs Starting with 4)

For Version 2.0 of the NEI, condensible PM emissions were estimated for coating oven heaters and fuel fired equipment used in surface coating operations. Because of the lack of data for estimating PM-CON emissions for these sources, conversion factors for electric utility external combustion boilers were used as surrogate factors. Fuel type was used to match the conversion factors for external combustion boilers to the SCCs for coating oven heaters and fuel fired equipment. Table C-10 shows how the SCCs were matched and the conversion factors.

Conversion Factors for Solid Waste Disposal (SCCs Starting with 5)

An additional complication was presented by the information contained in Solid Waste Disposal (Chapter 2) which generally pertained to point source SCCs beginning with 5. Units for the emission factors were in lbs/ton of fuel. Since the fuel could differ for each SCC, there is no definitive way to interpolate factor values for SCCs that did not have the values directly presented. This was not an issue for the External Combustion Sources and Stationary Internal Combustion Sources, since enough information was provided to convert all of those emissions factors to units of lb/MMBtu. However, the most significant problem for the Solid Waste Disposal emission factors was a complete lack of information on PM-PRI, PM10-PRI, or PM-CON emissions factors. Therefore, the Solid Waste Disposal conversion factors were estimated from the conversion factors for External Combustion Sources and Stationary Internal Combustion Sources.

To estimate conversion factors for the Solid Waste Disposal SCCs, average emissions factors from the External Combustion Sources and Stationary Internal Combustion Sources were used. The average values used (displayed below in lbs/MMBtu) were those calculated directly from information presented in AP-42, previous to filling in information via the truncated SCC averaging method. Conversion factors were calculated as follows:

Average Values Used for Solid Waste Disposal Conversion Factor Calculations

PM Category	Average Emissions Factor (lb/MMBtu)
PM-FIL	1.0728
PM10-FIL	0.3383
PM-CON	0.0342

$(\text{PM-PRI}_{\text{STATE}} \rightarrow \text{PM-FIL}_{\text{STATE}})$ conversion factor:

$$\frac{\text{PM-FIL}_{\text{AP-42}}}{\text{PM-PRI}_{\text{AP-42}}} = \frac{1.0728 \frac{\text{lb}}{\text{MMBtu}}}{1.0728 \frac{\text{lb}}{\text{MMBtu}} + 0.0342 \frac{\text{lb}}{\text{MMBtu}}} = 0.9691$$

$(\text{PM10-PRI}_{\text{STATE}} \rightarrow \text{PM10-FIL}_{\text{STATE}})$ conversion factor:

$$\frac{\text{PM10-FIL}_{\text{AP-42}}}{\text{PM10-PRI}_{\text{AP-42}}} = \frac{0.3383 \frac{\text{lb}}{\text{MMBtu}}}{0.3383 \frac{\text{lb}}{\text{MMBtu}} + 0.0342 \frac{\text{lb}}{\text{MMBtu}}} = 0.9082$$

$(\text{PM10-FIL}_{\text{STATE}} \rightarrow \text{PM-CON}_{\text{STATE}})$ conversion factor:

$$\frac{\text{PM-CON}_{\text{AP-42}}}{\text{PM10-FIL}_{\text{AP-42}}} = \frac{0.0342 \frac{\text{lb}}{\text{MMBtu}}}{0.3383 \frac{\text{lb}}{\text{MMBtu}}} = 0.1011$$

These factors were for all point source SCCs beginning with 5. For documentation purposes, the SCCs of interest are listed along with these factors in Table C-11.

c. Step 3: Prepare Factors from PM Calculator

S/L/T inventory data for PM/PM10/PM25 emissions include thousands of records. The NEI is prepared in a large Oracle data base in NIF 2.0. Consequently, because the PM Calculator is a computer desk-top tool, the PM Calculator could not be used to efficiently process the thousands of records of data in the NEI. Therefore, the PM Augmentation procedure was conducted in Oracle. Oracle scripts were written to use the underlying particle size data in the PM Calculator to produce uncontrolled and controlled emissions for every SCC and control device combination available in the PM Calculator to estimate PM10-FIL and PM25-FIL emissions using 100 tons of uncontrolled PM-FIL as input to the calculator. The emissions output was then used to prepare ratios to apply to S/L/T inventory data. The output table is too large to present in a table in this attachment. Therefore, the output table is stored in an Access 2000 data base named "PM Calculator Generic Output.mdb". This table was subdivided in the Access data base by SCC groups. The table contains the following fields:

SCC
Primary Device Type Code
Secondary Device Type Code
PMCalc_PMFIL_Uncontrolled: Uncontrolled PM-FIL emissions (100 tons)
PMCalc_PM10FIL_Uncontrolled: Uncontrolled PM10-FIL emissions (tons)
PMCalc_PM25FIL_Uncontrolled: Uncontrolled PM25-FIL emissions (tons)
PMCalc_PM10FIL_Controlled: Controlled PM10-FIL emissions (tons)
PMCalc_PM25FIL_Controlled: Controlled PM25-FIL emissions (tons)
PMCalc_PM10FIL_Control_EFF: Overall PM10-FIL control efficiency for control device combinations
                                          specified
PMCalc_PM25FIL_Control_EFF: Overall PM25-FIL control efficiency for control device combinations
                                          specified

d. Step 4: Develop and Apply Algorithms to Estimate Emissions from S/L/T Inventory Data

The S/L/T data were grouped to determine the different combinations of pollutants S/L/T submitted for individual process (SCC) and control device combinations. A total of 14 groups of data were identified, and some of the groups were further divided into uncontrolled and controlled emissions. Table C-12 identifies the 14 groups of data supplied by S/L/T agencies. For each group of data, the second column of Table C-12 identifies the pollutant used as input to each algorithm; all of the pollutants supplied for a process are listed in parenthesis. The third column identifies the control status, and the fourth column identifies the algorithms applied to estimate emissions for missing pollutants. Note that, although not shown in the fourth column in Table C-12, the procedure sums PM10-FIL and PM-CON to estimate PM10-PRI, and sums PM25-FIL and PM-CON to estimate PM25-PRI.

For example, Group 1 identifies emission processes for which S/L/T agencies supplied uncontrolled PM-PRI and PM25-PRI emissions. For this group, PM25-PRI emissions are used as the starting point in the algorithms to calculate uncontrolled PM25-FIL, PM10-FIL, and PM-CON emissions. The following equation was used to estimate PM25-FIL emissions from PM25-PRI emissions for a given SCC:

pm25fil = pm25pri * pm10pri_to_pm10fil

In this equation, PM25-PRI emissions are from the S/L/T inventory. The term "pm10pri_to_pm10fil" identifies where the conversion factor (SCC specific) were used to calculate PM25-FIL from PM25-PRI. Factors to convert PM25-PRI to PM25-FIL were not developed; therefore, S/L/T-supplied PM25-PRI emissions were converted to PM25-FIL emissions using the conversion factors for PM10-PRI_to_PM10-FIL.

The following equation was used to estimate PM10-FIL emissions:

pm10fil = pm25fil * (pmcalc_pm10fil_uncontrolled / pmcalc_pm25fil_uncontrolled)

In this equation, PM25-FIL calculated from the previous equation is multiplied by the term "pmcalc_pm10fil_uncontrolled / pmcalc_pm25fil_uncontrolled" which identifies the fields from the PM Calculator output file ("PM Calculator Generic Output.mdb") used to calculate a ratio to adjust uncontrolled PM25-FIL emissions to uncontrolled PM10-FIL emissions.

The following equation is then used to estimate PM-CON emissions by subtracting calculated PM25-FIL emissions from S/L/T-supplied PM25-PRI emissions.

pmcon = pm25pri - pm25fil

For the Group 1 controlled scenario, the equations are the same as those for the uncontrolled scenario except that the controlled emission fields in the PM Calculator output file are used to adjust controlled PM25-FIL emissions to controlled PM10-FIL emissions for each SCC and control device combination.

e. Step 5: Review Results and Update the NEI with Emission Estimates and Control Information

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After completing the emission estimates for pollutants missing from S/L/T inventories, the emission estimates are compared to the S/L/T inventory data to identify data issues. For example, the procedures resulted in negative PM25 emissions for a small number of emission units even though the algorithms key off of S/L/T-supplied emissions for other pollutants. For these records, negative values are set to zero.

The PM10-FIL to PM-CON conversion factors were developed using uncontrolled emission factors or particle-size data. However, when the factors were applied to uncontrolled PM10-FIL emissions that were back-calculated using control efficiencies, the PM-CON emissions and resulting PM10-PRI and PM25-PRI emissions were overestimated considerably. As a result, EPA applied the conversion factors to controlled PM10-FIL emissions if an emission source was controlled which produced much more realistic emission estimates.

S/L/T-supplied filterable, condensible, and primary PM10 and PM25 emissions are maintained in the NEI. Records for missing pollutants are inserted into the Emission table and populated with the pollutant code and annual emissions estimated using the augmentation procedure. If an emission source is controlled, a records for the missing pollutants are inserted into the Control Equipment table and populated with the pollutant code, overall control efficiency, and control device codes from the PM Calculator. Thus, for a given emission source, the control efficiencies and control device codes associated with S/L/T-supplied pollutants may be different from the pollutants generated by the augmentation procedure and added to the Control Equipment table. This decision was made in order to report the control efficiencies and control device codes upon which the augmented emission estimates are based.

3. UNCERTAINTIES/FUTURE RESEARCH

The most significant uncertainty associated with the PM augmentation procedures applied to populate the NEI with condensible, filterable, and primary PM10 and PM25 is the lack of particle-size-specific emission factors for uncontrolled sources and controlled sources for various types of control equipment combinations. The particle-size-specific emission factors for uncontrolled and controlled stationary external and internal fuel combustion sources in AP-42 are good. However, good data for other SCCs are lacking. Thus, S/L/T agencies should conduct research to prioritize source categories of fine PM emissions and focus on improving the data needed to estimate fine PM emissions for the highest priority categories.

The PM augmentation procedure relies on the use of the PM Calculator to estimate PM10-FIL and PM25-FIL emissions from S/L/T-supplied PM-PRI, PM-FIL, or PM10-PRI emissions. Although the PM Calculator uses particle size data available in AP-42 and FIRE, it will not provide estimates that will be as accurate as applying the emission factors to the activity, operating schedule, and control equipment data for individual sources. Thus, S/L/T agencies are encouraged to use the emission factors in AP-42 and FIRE with source-specific activity, operating schedule, and control equipment data to prepare their inventories in the future.

The PM Calculator does not contain particle size data for several SCCs and control devices for which S/L/T agencies reported PM, PM10, and/or PM25 emissions in their inventories. The augmentation procedures can be improved by updating the PM Calculator to include particle size data for SCCs and control equipment currently not included in the calculator.

S/L/T inventories contain several inaccuracies in the PM data. For example, for NEI Version 2, some agencies did not report the form of PM, PM10, and PM25 emissions requiring EPA to make a decision on if the emissions included condensibles or not when the agency could not be reached to provide clarification. For NEI Version 2 and draft Version 3, some agencies did not report control device codes that complied with NIF 2.0 codes which made it difficult to determine how to match the codes to control equipment codes in the PM Calculator. Mismatching of S/L/T codes to codes in the PM Calculator probably occurred resulting in increasing the inaccuracy of the emission estimates. Several agencies reported PM25 emissions as being significantly higher than PM10 emissions for a given process. For these cases, PM25 emissions were set equal to PM10 emissions if the agency did not provide corrections. However, this correction probably resulted in inaccurate emission estimates. Thus, S/L/T agencies need to compare PM25 and PM10 emission estimates to make sure that PM25 emissions are less than or equal to PM10 emissions.

S/L/T agencies should note that the PM augmentation procedures need further refinement. For example, EPA is aware that the procedures calculate PM-CON for industrial SCCs (e.g., industrial paved and unpaved roads, material handling operations in the mineral products and primary and secondary metal production industries) that should not be sources of condensible emissions. The EPA will review the Industrial Processes (SCCs starting with 3) and Petroleum and Solvent Evaporation (SCCs starting with 4) sectors shown in Tables C-9 and C-10, respectively, for which PM-CON is estimated. For final Version 3, EPA will remove PM-CON emissions for any SCCs it decides are not sources of PM-CON. The EPA requests comments on this issue.

The conversion factors for Solid Waste Disposal PM emissions were produced from the limited data provided in the External Combustion Sources and Stationary Internal Combustion Sources sections of AP-42. Further work is needed to identify alternative sources of data to develop condensible PM emission factors for Solid Waste Disposal SCCs.

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