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Utility Electric Generating Unit Emissions Inventory Report Guidance

This document has been prepared by the Arizona Department of Environmental Quality (ADEQ) to provide guidance on the best practices to follow during preparation of annual emissions inventory (EI) reports for power plants. These reports are submitted to ADEQ via the Environmental Protection Agency's (EPA) Combined Air Emissions Reporting System (CAERS). If you have questions or suggestions about this guidance or EI reporting in general, please email us at EmissionInventory@azdeq.gov. For technical troubleshooting in CAERS, please email NodeHelpDesk@epacdx.net.

1. Types of Emissions & Associated Processes

Table 1 below includes common types of emissions found at power plants and associated CAERS Unit Type Code(s). If a type of emission in Table 1 is not applicable to your facility, then do not include that emission type in your facility's annual emission inventory. On the other hand, if your ADEQ air permit addresses any additional emissions sources not listed in Table 1, or if you are aware of any other emissions sources on-site that routinely emit more than 1 ton of regulated air pollutants per year, please include them in the report. If you are unsure how to include those emissions in the report or how to estimate them, please contact ADEQ at EmissionInventory@azdeq.gov

Table 1: Type of Emissions and Associated Processes

Type of Emission	CAERS Unit Type Code(s)	Description
Boilers	Boiler	External combustion emissions from biomass-fired boilers, steam units, coal-fired diesel or other fuel oil-fired boilers natural gas-fired or propane-fired boilers
Coal Conveying	Coal Conveyor	Fugitive dust from coal conveyance
Coal handling[1]	Transfer Point, Transfer System	Fugitive dust from coal loading, unloading, stacking, etc.
Cooling towers	Cooling Tower	Fugitive draft (or drift) emissions from cooling towers
Crushing and screening[1]	Crusher, Screen	Fugitive dust from crushing or screening coal, lime, biomass, etc.
Reciprocating Internal Combustion Engines	Reciprocating IC Engine	Internal combustion emissions from diesel, natural gas, propane, or other fuel oil starter motors, emergency generators, etc.
Storage[1]	Storage Tank, Storage Bin, Open Storage Pile, Open Tank or Vat	Fugitive emissions from storage piles or tanks (includes storage and dispensing of fuel)

[1] If one type of emission has multiple unit type codes that are applicable to your facility, each should be made into their own emission unit in CAERS. For example, if crusher and screening operations are both present, then two units should be created. One for the crusher and the other screen.

Turbines	Turbine	Internal combustion emissions from diesel, natural gas, propane, or other fuel oil turbines
Vehicle Dust	Other fugitive	Road (and off-road) dust entrained by haul vehicle travel

2. Preferred Source Classification Codes (SCC)

This section includes the preferred SCCs for each type of process found at the power generating stations. The EPA maintains an updated list of SCCs on the following website:

https://sor-scc-api.epa.gov/sccwebservices/sccsearch/

The preferred SCCs for each type of emission are listed in Table 2 below and are accompanied by SCCs that have historically been used by power plants. The SCCs associated with each of the type of emissions have many options based on the type of fuel used, design capacity, etc. and other options in CAERS may be available that are more accurate for your process emissions. Please choose the most applicable SCC for each process when searching in CAERS, they might not be listed on this table due to the number of SCCs available in CAERS. For guidance searching for SCCs, review EPA's guidance document found here.

Table 2: Remapped SCCs by Emission Type

Previously Used SCCs	Preferred SCCs	Preferred SCC Descriptions
Boilers[2]		
N/A	**Biomass-fired boilers**	
	10100901	External Combustion > Electric Generation: Boilers > Wood/Bark Waste > Bark-fired Boiler
	Coal-fired boilers	
	10100101	External Combustion > Electric Generation: Boilers > Anthracite Coal > Anthracite Coal, Pulverized: Boiler
	Diesel-fired boilers - Grades 1 and 2	
	10100501	External Combustion > Electric Generation: Boilers > Distillate Oil > Distillate Oil - Grades 1 and 2: Boiler
	Diesel-fired boilers - Grade 6	
	10100401	External Combustion > Electric Generation: Boilers > Residual Oil > Residual Oil - Grade 6: Boiler, Normal Firing
	Gas-fired boilers	
	10100601	External Combustion > Electric Generation: Boilers > Natural Gas > Boiler, >= 100 Million BTU/hr
Coal handling/storage		
	Conveying	
30510103	30510103	Industrial Processes > Mineral Products > Bulk Materials Conveyors > Coal
	Open Stockpiles	

[2] SCCs will change based on fuel type, firing type, and heat capacity of fuel. Always select the most applicable and most detailed for your facility.

30510303	30510303	Industrial Processes > Mineral Products > Bulk Materials Open Stockpiles > Coal
	Storage Bins	
30510203	30510203	Industrial Processes > Mineral Products > Bulk Materials Storage Bins > Coal
	Loading Operations	
30510503	30510503	Industrial Processes > Mineral Products > Bulk Materials Loading Operation > Coal
	Unloading Operations	
30510403	30510403	Industrial Processes > Mineral Products > Bulk Materials Unloading Operation > Coal
	Bulldozing	
30501046	30501046	Industrial Processes > Mineral Products > Coal Mining, Cleaning, and Material Handling > Bulldozing: Coal
Cooling Towers		
38500110	38500101	Industrial Processes > Cooling Tower > Process Cooling > Mechanical Draft
Crushing and Screening		
39999999	30501010	Industrial Processes > Mineral Products > Coal Mining, Cleaning, and Material Handling > Crushing
39999999	30501012	Industrial Processes > Mineral Products > Coal Mining, Cleaning, and Material Handling > Screening
Reciprocating Internal Combustion Engines[3]		
	Diesel	
N/A	20100106	Internal Combustion Engines > Electric Generation > Distillate Oil (Diesel) > Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)
20200102	20100102	Internal Combustion Engines > Electric Generation > Distillate Oil (Diesel) > Reciprocating
N/A	20100107	Internal Combustion Engines > Electric Generation > Distillate Oil (Diesel) > Reciprocating: Exhaust
	Natural Gas	
N/A	20100206	Internal Combustion Engines > Electric Generation > Natural Gas > Reciprocating: Evaporative Losses (Fuel Delivery System)
20200202	20100202	Internal Combustion Engines > Electric Generation > Natural Gas > Reciprocating
N/A	20100207	Internal Combustion Engines > Electric Generation > Natural Gas > Reciprocating: Exhaust
Storage		
	Open Piles	
N/A	30501043	Industrial Processes > Mineral Products > Coal Mining, Cleaning, and Material Handling > Open Storage Pile: Coal
	Fuel Storage	

[3] Based on each fuel type, each RICE and Turbine should have the three processes: Fuel storage and delivery system, engine process, and exhaust.

N/A	39090003	Industrial Processes > In-process Fuel Use > Fuel Storage - Fixed Roof Tanks > Distillate Oil (No. 2): Breathing Loss
	39090004	Industrial Processes > In-process Fuel Use > Fuel Storage - Fixed Roof Tanks > Distillate Oil (No. 2): Working Loss
	39090011	Industrial Processes > In-process Fuel Use > Fuel Storage - Fixed Roof Tanks > Dual Fuel (Gas/Oil): Breathing Loss
	39090012	Industrial Processes > In-process Fuel Use > Fuel Storage - Fixed Roof Tanks > Dual Fuel (Gas/Oil): Working Loss
Turbine		
	Diesel	
N/A	20100101	Internal Combustion Engines > Electric Generation > Distillate Oil (Diesel) > Turbine
	20100109	Internal Combustion Engines > Electric Generation > Distillate Oil (Diesel) > Turbine: Exhaust
	20100108	Internal Combustion Engines > Electric Generation > Distillate Oil (Diesel) > Turbine: Evaporative Losses (Fuel Storage and Delivery System)
	Natural Gas	
N/A	20100201	Internal Combustion Engines > Electric Generation > Natural Gas > Turbine
	20100209	Internal Combustion Engines > Electric Generation > Natural Gas > Turbine: Exhaust
	20100208	Internal Combustion Engines > Electric Generation > Natural Gas > Turbine: Evaporative Losses (Fuel Delivery System)
Vehicle Dust[4]		
	Unpaved Roads	
N/A	30300519	Industrial Processes > Primary Metal Production > Primary Copper Smelting > Unpaved Road Traffic: Fugitive Emissions
	Paved Roads	
N/A	30301566	Industrial Processes > Primary Metal Production > Integrated Iron and Steel Manufacturing > Paved Roads: All Vehicle Types

3. Acceptable Calculation Methods

The Arizona Administrative Code R18-2-327(C)(1) requires the following order of preference for estimating any given emissions total in the report, as follows. Valid Continuous Emissions Monitoring System (CEMS) readings or else emission factors (EFs) derived from recent, valid on-site performance test results should be used. If test data is not available, it is best practice to use a US EPA- or Vendor developed EFs. In the event that such EFs are not available, EFs that are approved by the EPA or other reputable sources (peer-reviewed journals, etc.) should be employed to reliably estimate emissions. As a last resort, it may be acceptable to estimate emissions via models including mass balance equations. With that being said, supporting calculations and references should accompany **all** non-EPA EFs so that the calculation methodology can be easily understood and verified. Complete this by including

[4] The provided SCCs are in different industry categories; however, they still apply to power plant facilities because the emission release process is the same.

calculation demonstrations in your required attachment on your CAERS report. Note that the calculation methods available within a given process are likely to vary by pollutant. Engineering judgement is not a preferred method for any emissions calculations.

a. Using EFs vis-à-vis Controls

For estimates derived using EFs, a CAERS report must note whether the EF already incorporates the impact of all applicable controls. Please be cautious as the phrasing in CAERS differs from what was used in the previous reporting platform, the State and Local Emissions Inventory System (SLEIS) reports.

a. If the EF does not incorporate the impact of all applicable controls, please select the calculation method that identifies the EF as having "(no control efficiency used)", thus enabling the "Overall Control %" field. Then, enter the impact of any remaining controls in that field (or leave it blank if there are no controls in play for the given emissions). If you are unsure how to derive this percentage, please email ADEQ. Note that this option corresponds to the SLEIS EF calculation methods that included the phrase "pre-control".

b. If the EF already incorporates all applicable controls' impacts, please select a calculation method that classifies the EF as "(pre-control) plus control efficiency". Despite the use of the phrase "pre-control", this option corresponds to the "post-control" EF calculation methods that were available in SLEIS.

If both EF types are available for a given situation, then all other things (EF applicability, quality rating, etc.) being equal, ADEQ would prefer that you use option a and enter the Overall Control % explicitly.

b. Particulate Matter (PM) EFs

CAERS accommodates numerous PM pollutant categories, but there are 5 that ADEQ generally expects to see in the report for any process that has PM emissions: condensable PM (PM-CON), filterable PM10 (PM10-FIL), filterable PM2.5 (PM25-FIL), primary PM10 (PM10-PRI, which is the total consisting of PMCON plus PM10-FIL), and primary PM2.5 (PM25-PRI, similarly PM-CON plus PM25-FIL). Here, "PM10" denotes particles whose equivalent aerodynamic diameters are less than or equal to 10µm, and similarly "PM2.5" (sometimes encoded as "PM25") denotes the subset of those less than or equal to 2.5µm. Since PM-CON is assumed to be under 1µm, it always counts towards both PM2.5 and PM10.

Although there is redundancy and overlap in these categories, you should still provide all of them, if possible, as described below. ADEQ will not double-count your emissions in the emissions billing.

Whenever EPA's AP-42 compendium of EFs provides an EF for any of these PM emissions types, it usually provides more than one. For example, AP-42 may provide PM10-PRI, PM10-FIL, and PM-CON EFs for a given type of emissions process. It may also include a note which allows you to infer some other EF values. For example, a table note might indicate that all of the PM emissions are assumed to be fine (i.e., that PM10-PRI = PM25-PRI and PM10-FIL = PM25-FIL) or coarse (i.e., that PM10-PRI = PM10-FIL and that PM25-PRI = PM25-FIL = PM-CON = 0).

Note that CAERS will <u>not</u> allow an EF value of 0, so if for example 100% of the PM10 emissions from a given process are filterable, you may omit the condensable subtotal rather than explicitly specifying a 0 estimate. Otherwise, please include all of the available PM EFs in your report.

If just a single PM EF is provided, then and only then might it be appropriate to develop your own EFs to fill in the blanks for the various subtotals, based on a speciation profile. When in doubt, email ADEQ.

4. Expected Pollutant(s)

For each of the processes at your facility, please report emissions for the expected criteria air pollutants (CAPs) and hazardous air pollutants (HAPS) provided in the tables below.

If neither CEMS nor performance test data are available for a pollutant, please first reference EPA's *AP-42* to find an EF that is applicable to your facility and process. If the *AP-42* assumptions appear to be unsound or the necessary EF is absent, consult applicable equipment specifications. If they are not available or do not provide sufficient information to estimate EFs, EPA's WebFIRE database may then be utilized to find an appropriate EF. Unlike *AP-42*, EFs in WebFIRE can be gathered efficiently by filtering the search according to SCC and pollutant name. The links to all of these resources are provided below. Please note that some of the generator/vehicle dust/ storage would be available in different sections of the AP-42. If your emission factor calculation method is USEPA, please select that option for each pollutant. If the system produces an error, refer back to how you actually calculated the value. Typically, the emission factor, throughput, or SCC have been slightly different than what is expected because of site-specific data and information. Therefore, please change the emission factor calculation method to site-specific and include the section of AP-42 you are referencing.

EPA's AP-42: https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors-stationary-sources

EPA's WebFIRE: https://cfpub.epa.gov/webfire/SearchEmissionFactor/searchpage.cfm

Reporting full groups of pollutants is preferable; however, this information will only be used for ADEQ's analysis, as well as the possibility to reduce any repeat work needed and provide a bulk upload template. Pollutants will **not** be double counted when full groups of pollutants are submitted. For example, all PM species should be reported however only PM10 Primary (Filterable + Condensable) will be billed.

For power plants that operate control devices for nitrogen oxides that utilize ammonia to reduce emissions of nitrogen oxides, such as selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) systems, emissions of unreacted ammonia (ammonia slip) are anticipated. ADEQ advises utilizing vendor guarantees for ammonia slip if source testing has not been conducted to evaluate unreacted ammonia emissions.

a. Boilers

Boilers	
100027 - 4-Nitrophenol	7440224 - Silver
100414 - Ethyl Benzene	7440360 - Antimony
100425 - Styrene	7440382 - Arsenic
100447 - Benzyl Chloride	7440393 - Barium
106423 - p-Xylene	7440417 - Beryllium
106445 - p-Cresol	7440439 - Cadmium
106467 - 1,4-Dichlorobenzene	7440473 - Chromium

106934 - Ethylene Dibromide	7440484 - Cobalt
106978 - BUTANE	7440508 - COPPER
106990 - 1,3-Butadiene	7440622 - VANADIUM
107028 - Acrolein	7440666 - ZINC (FUME OR DUST)
107062 - Ethylene Dichloride	74839 - Methyl Bromide
107131 - Acrylonitrile	74840 - ETHANE, 1,1-DIBROMO-
108054 - Vinyl Acetate	74873 - Methyl Chloride
108101 - Methyl Isobutyl Ketone	74884 - Methyl Iodide
108383 - m-Xylene	74986 - Propane (Asphyxiant)
108394 - m-Cresol	75003 - Ethyl Chloride
108883 - Toluene	75014 - Vinyl Chloride
108907 - Chlorobenzene	75058 - Acetonitrile
108952 - Phenol	75070 - Acetaldehyde
109660 - PENTANE	75092 - Methylene Chloride
110543 - Hexane	75150 - Carbon Disulfide
117817 - Bis(2-Ethylhexyl)Phthalate	75252 - Bromoform
118741 - Hexachlorobenzene	75354 - Vinylidene Chloride
120127 - Anthracene	7647010 - Hydrochloric Acid
121142 - 2,4-Dinitrotoluene	7664393 - Hydrogen Fluoride
123386 - Propionaldehyde	7664417 - Ammonia
127184 - Tetrachloroethylene	7664939 - Sulfuric Acid Mist
129000 - Pyrene	7723140 - Phosphorus
130498292 - PAH, total	77781 - Dimethyl Sulfate
131113 - Dimethyl Phthalate	7782492 - Selenium
132649 - Dibenzofuran	7782505 - Chlorine
1330207 - Xylenes (Mixed Isomers)	78591 - Isophorone
1336363 - Polychlorinated Biphenyls	78875 - Propylene Dichloride
1634044 - Methyl Tert-Butyl Ether	78933 - Methyl Ethyl Ketone
1746016 - 2,3,7,8-Tetrachlorodibenzo-p-Dioxin	79005 - 1,1,2-Trichloroethane
191242 - Benzo[g,h,i,]Perylene	79016 - Trichloroethylene
192972 - Benzo[e]Pyrene	80626 - Methyl Methacrylate
193395 - Indeno[1,2,3-c,d]Pyrene	83329 - Acenaphthene
198550 - Perylene	84742 - Dibutyl Phthalate
205823 - Benzo[j]fluoranthene	85018 - Phenanthrene
205992 - Benzo[b]Fluoranthene	85449 - Phthalic Anhydride
206440 - Fluoranthene	86737 - Fluorene
207089 - Benzo[k]Fluoranthene	86748 - Carbazole
208968 - Acenaphthylene	87865 - Pentachlorophenol
218019 - Chrysene	88062 - 2,4,6-Trichlorophenol
246 - Polycyclic Organic Matter	91203 - Naphthalene
26914330 - Tetrachlorobiphenyl	91225 - Quinoline
50000 - Formaldehyde	91576 - 2-Methylnaphthalene

50328 - Benzo[a]Pyrene	92524 - Biphenyl
51285 - 2,4-Dinitrophenol	92875 - Benzidine
532274 - 2-Chloroacetophenone	95476 - o-Xylene
53703 - Dibenzo[a,h]Anthracene	95487 - o-Cresol
542756 - 1,3-Dichloropropene	98828 - Cumene
56235 - Carbon Tetrachloride	98862 - Acetophenone
56495 - 3-Methylcholanthrene	CH4 - Methane
56553 - Benz[a]Anthracene	CO - Carbon Monoxide
57125 - Cyanide	CO2 - Carbon Dioxide
57976 - 7,12-Dimethylbenz[a]Anthracene	NH3 - Ammonia
60344 - Methylhydrazine	NO2 - Nitrogen Dioxide
62759 - N-Nitrosodimethylamine	NOX - Nitrogen Oxides
67663 - Chloroform	PM10-FIL - PM10 Filterable
71432 - Benzene	PM10-PRI - PM10 Primary (Filt + Cond)
71556 - Methyl Chloroform	PM25-FIL - PM2.5 Filterable
7439921 - Lead	PM25-PRI - PM2.5 Primary (Filt + Cond)
7439965 - Manganese	PM-CON - PM Condensible
7439976 - Mercury	PM-FIL - PM Filterable
7439987 - MOLYBDENUM	PM-PRI - PM Primary (Filt + Cond)
7440020 - Nickel	SO2 - Sulfur Dioxide
7440097 - POTASSIUM	VOC - Volatile Organic Compounds

b. Coal Conveying and Handling

Coal Conveying and Handling
PM10-FIL - PM10 Filterable
PM10-PRI - PM10 Primary (Filt + Cond)
PM25-FIL - PM2.5 Filterable
PM25-PRI - PM2.5 Primary (Filt + Cond)
PM-CON - PM Condensible

c. Cooling Towers

Cooling Towers
67663 - Chloroform
7439921 - Lead
7439976 - Mercury
7440020 - Nickel
7440360 - Antimony
7440382 - Arsenic
7440439 - Cadmium
7440473 - Chromium

7782492 - Selenium
7782505 - Chlorine
CO - Carbon Monoxide
NH3 - Ammonia
NOX - Nitrogen Oxides
PM10-FIL - PM10 Filterable
PM10-PRI - PM10 Primary (Filt + Cond)
PM25-FIL - PM2.5 Filterable
PM25-PRI - PM2.5 Primary (Filt + Cond)
PM-CON - PM Condensible
PM-PRI - PM Primary (Filt + Cond)
SO2 - Sulfur Dioxide
VOC - Volatile Organic Compounds

d. Storage

Storage
CH4 - Methane
PM - Particulate Matter
PM10-FIL - PM10 Filterable
PM10-PRI - PM10 Primary (Filt + Cond)
PM25-FIL - PM2.5 Filterable
PM25-PRI - PM2.5 Primary (Filt + Cond)
PM-CON - PM Condensible
VOC - Volatile Organic Compounds

e. Turbines

Turbines	
100414 - Ethyl Benzene	7440382 - Arsenic
106990 - 1,3-Butadiene	7440417 - Beryllium
107028 - Acrolein	7440439 - Cadmium
108883 - Toluene	7440473 - Chromium
115071 - Propylene	75070 - Acetaldehyde
120127 - Anthracene	75569 - Propylene Oxide
129000 - Pyrene	7664417 - Ammonia
130498292 - PAH, total	7782492 - Selenium
1330207 - Xylenes (Mixed Isomers)	83329 - Acenaphthene
191242 - Benzo[g,h,i,]Perylene	85018 - Phenanthrene
193395 - Indeno[1,2,3-c,d]Pyrene	86737 - Fluorene

205992 - Benzo[b]Fluoranthene	91203 - Naphthalene
206440 - Fluoranthene	CO - Carbon Monoxide
207089 - Benzo[k]Fluoranthene	NO2 - Nitrogen Dioxide
208968 - Acenaphthylene	NOX - Nitrogen Oxides
218019 - Chrysene	PB - Lead
50000 - Formaldehyde	PM10-FIL - PM10 Filterable
50328 - Benzo[a]Pyrene	PM10-PRI - PM10 Primary (Filt + Cond)
53703 - Dibenzo[a,h]Anthracene	PM25-FIL - PM2.5 Filterable
56553 - Benz[a]Anthracene	PM25-PRI - PM2.5 Primary (Filt + Cond)
71432 - Benzene	PM-CON - PM Condensible
7439921 - Lead	PM-FIL - PM Filterable
7439965 - Manganese	PM-PRI - PM Primary (Filt + Cond)
7439976 - Mercury	SO2 - Sulfur Dioxide
7440020 - Nickel	VOC - Volatile Organic Compounds

f. Vehicle Dust

Coal Conveying and Handling
PM10-FIL - PM10 Filterable
PM10-PRI - PM10 Primary (Filt + Cond)
PM25-FIL - PM2.5 Filterable
PM25-PRI - PM2.5 Primary (Filt + Cond)
PM-CON - PM Condensible

5. Frequently Asked Questions (FAQs)

1. **What calculation code should be used when deriving an EF from a parametric equation found What calculation code should be used when deriving an EF from a parametric equation found in EPA's AP-42?**
   A: It is preferred to label EFs derived from parametric equations in AP-42 using the code for as a site-specific EF as long as the variables are using site-specific data.
2. **Is it okay to calculate PM-CON and PM-FIL as a subset of PM-PRI because PM-CON EFs are not available?**
   A: Since AP-42 provides EFs for condensable, filterable, and primary PM, it is best practice to use the EPA approved EFs. However, if you have stack test data, use that instead of AP-42 EFs. If AP-42 does not have an EF for condensable, it is likely that the process does not emit condensable PM.
3. **If the calculation methods used in the previous year's annual emission inventory do not match those of the permit application, which is the more appropriate calculation method to use?**
   A: Use the calculation method that is most representative of the current state at the facility. If you are ever unsure of which calculation method to use or are having trouble reproducing emissions estimates with the original calculation method, always reach out to ADEQ for guidance.
4. **Who should I reach out to for help with my facility's emissions inventory?**
   A: Please direct your questions to EmissionInventory@azdeq.gov. Inventory preparers are always encouraged to contact ADEQ for questions and assistance with their emissions inventory.
5. **How much reference information should I attached to my CAERS report?**
   A: In order to ensure a timely quality assurance review and approval of your report you should attach any referenced items including stack test results, calculation workbooks, etc. Please also reference the Supporting documentation in a CAERS report on our emission inventory (https://azdeq.gov/emissions-inventories).