



2006 Area Source Emissions Inventory Methodology

020 – COGENERATION - NG

I. Purpose

This document describes the Area Source Methodology used to estimate emissions of carbon monoxide (CO), nitrogen oxides (NO_x), fine particulate matter less than 10 microns (PM₁₀), volatile organic compounds (VOC), sulfur oxides (SO_x), and ammonia (NH₃) from cogeneration operations in the San Joaquin Valley Air Basin. An area source is a collection of similar emission units within a geographic area (ie., a County). Area sources collectively represent individual sources that are small and numerous, and that may not have been inventoried as specific point, mobile, or biogenic sources. The California Air Resources Board (CARB) has grouped these individual sources with other like sources into area source categories. These source categories are grouped in such a way that they can be estimated collectively using one methodology.

II. Applicability

The emission calculations from this Area Source Methodology apply to facilities that are identified by the following Category of Emission Source (CES) code and Reconciliation Emission Inventory Code (REIC):

Table 1. Emission inventory codes.

CES	REIC	Description
74682	020-995-0012-0000	Cogeneration - Other (Unspecified)

III. Point Source Reconciliation

Emissions from the area source inventory and point source inventory are reconciled against each other to prevent double counting. This is done using relationships created by the California Air Resources Board (ARB) between the area source REIC and the point sources' Standard Industry Classification (SIC) code and emissions process Source Category Code (SCC) combinations. The area sources in this methodology reconcile against processes in our point source inventory with the SIC/SCC combinations listed in Appendix A.

IV. Methodology Description

Cogeneration is the production of both electricity and useful heat. Conventional power plants generate heat as a by-product of their electricity generation. Cogeneration captures that heat by-product and uses it for domestic or industrial heating purposes. The California Energy Commission has a database of all cogeneration plants in the state and type of fuels used at each facility. The Energy Commission's database (CEC, 2007) was checked against the District's Permit database to insure that all cogeneration facilities operating in the District are under permit. All the facilities within the District have been determined to use fuel types assigned to individual EIC categories. Therefore, this EIC category will be filled and reconciled with point source data from the District's emissions inventory system.

V. Activity Data

The activity data for each facility associated with this source category is reported through the District's point source inventory.

VI. Emission Factors

The emission factors for each cogeneration process at each facility associated with this source category are reported through the District's point source inventory and are derived from continuous emission monitor (CEMS) equipment, source tests, or approved emission factors.

VII. Emissions Calculations

A. Assumptions

1. The California Energy Commission's database of cogeneration plants in California is accurate and complete.
2. All cogeneration facilities within the District are permitted, and data for each facility is collected annually by the District.

B. Sample Calculations

Not applicable

VIII. Temporal Variation

The temporal data for each facility associated with this source category is reported through the District's point sources inventory.

IX. Spatial Variation

The spatial data for each facility associated with this source category is reported through the District's point sources inventory.

X. Growth Factor

Growth factors are developed by either the District's Planning Department or CARB for each EIC. These factors are used to estimate emissions in future years. The growth factors associated with this emissions category may be obtained from the Air Quality Analysis Section of the District's Planning Department.

XI. Control Level

Control levels are developed by either the District's Planning Department or CARB for each EIC. Control levels are used to estimate emissions reductions in future years due to implementation of District rules. These control levels take into account the effect of control technology, compliance and exemptions at full implementation of the rules. The control factors associated with this emissions category may be obtained from the Air Quality Analysis Section of the District's Planning Department.

XII. ARB Chemical Speciation

CARB has developed organic gas profiles in order to calculate reactive organic gasses (ROG), volatile organic compounds (VOC) or total organic gas (TOG) given any one of the three values. For each speciation profile, the fraction of TOG that is ROG and VOC is given. The organic gas profile codes can also be used to lookup associated toxics. Organic gas profile #600 (species unknown - all categories composite) is applied to REIC 020-995-0012-0000. CARB's organic gas speciation profiles for cogeneration operations are presented in Table 2. These speciation profiles are only used by the District in the absence of better emissions data. CARB only uses these speciation profiles to estimate emissions if the emissions are not already reported by the District.

Table 2. CARB chemical speciation profiles for REIC 020-995-0012-0000.

Profile Description	ARB Profile#	Fractions	
	Organic Gas	ROG	VOC
Species unknown-all categories composite	600	0.6986	0.6986

CARB has developed particulate matter speciation profiles in order to calculate particulate matter (PM), particulate matter with a diameter less than or equal to 10 microns (PM₁₀) or particulate matter with a diameter less than or equal to 2.5 microns (PM_{2.5}) given any one of the three values. For each speciation profile, the fraction of PM that is PM₁₀ and PM_{2.5} is given. The particulate matter profile codes can also be used to lookup associated toxics. CARB's PM speciation profile for

020 - Cogeneration

cogeneration operations is presented in Table 3. PM profile #900 (unspecified) is applied to REIC 020-995-0012-0000. These speciation profiles are only used by the District in the absence of better emissions data. CARB only uses these speciation profiles to estimate emissions if the emissions are not already reported by the District.

Table 3. CARB chemical speciation profiles for REIC 020-995-0012-0000.

Profile Description	ARB Profile#	Fractions	
	PM	PM ₁₀	PM _{2.5}
Unspecified	900	0.7	0.42

XIII. Assessment Of Methodology

Since all cogeneration facilities in the San Joaquin Valley Air Basin are permitted, there are no area source emissions in this category. All cogeneration emissions are reported through the District's point source inventory.

XIV. Emissions

Following is the 2006 area source emissions inventory for REIC 020-995-0012-0000 estimated by this methodology. Emissions are reported for each county in the District.

Table 4. Area source emissions for REIC 020-995-0012-0000 (2006).

County	Criteria Emissions (tons/year)						Toxic Emissions (lbs/year)
	NO _x	CO	SO _x	VOC ⁽¹⁾	PM ₁₀	PM _{2.5} ⁽²⁾	NH ₃
Fresno	0	0	0	0	0	N/A	0
Kern	0	0	0	0	0	N/A	0
Kings	0	0	0	0	0	N/A	0
Madera	0	0	0	0	0	N/A	0
Merced	0	0	0	0	0	N/A	0
San Joaquin	0	0	0	0	0	N/A	0
Stanislaus	0	0	0	0	0	N/A	0
Tulare	0	0	0	0	0	N/A	0
TOTAL	0	0	0	0	0	N/A	0

(1) The District only reports ROG to ARB. As noted in Section XII, ROG is the same as VOC.

(2) At this time, the District does not calculate PM_{2.5} emissions. PM_{2.5} emissions can be estimated using the speciation profiles found in Section XII.

Following is the 2006 point source emissions inventory for REIC 020-995-0012-0000 as reported to the District by our permit holders. Emissions are reported for each county in the District.

Table 5. Point source emissions for REIC 020-995-0012-0000 (2006).

County	Criteria Emissions (tons/year)						Toxic Emissions (lbs/year)
	NO _x	CO	SO _x	VOC ⁽¹⁾	PM ₁₀	PM _{2.5} ⁽²⁾	NH ₃
Fresno	2.81	17.43	0.06	1.33	1.27	N/A	0.00
Kern	55.79	59.52	3.03	3.58	15.02	N/A	3,570.73
Kings	0	0	0	0	0	N/A	0.00
Madera	0	0	0	0	0	N/A	0.00
Merced	0	0	0	0	0	N/A	0.00
San Joaquin	38.98	59.09	0.26	0.70	2.10	N/A	0.00
Stanislaus	0	0	0	0	0	N/A	0.00
Tulare	14.41	3.56	6.17	5.89	45.16	N/A	8,933.50
TOTAL	111.99	139.62	9.52	11.50	63.54	N/A	12,504.23

(1) The District only reports ROG to ARB. As noted in Section XII, ROG is the same as VOC.

(2) At this time, the District does not calculate PM_{2.5} emissions. PM_{2.5} emissions can be estimated using the speciation profiles found in Section XII.

020 - Cogeneration

Following is the 2006 total unreconciled (point source plus area source) emissions inventory for REIC 020-995-0012-0000. Emissions are reported for each county in the District.

Table 6. Total emissions for REIC 020-995-0012-0000 (2006).

County	Criteria Emissions (tons/year)						Toxic Emissions (lbs/year)
	NO _x	CO	SO _x	VOC ⁽¹⁾	PM ₁₀	PM _{2.5} ⁽²⁾	NH ₃
Fresno	2.81	17.43	0.06	1.33	1.27	N/A	0
Kern	55.79	59.52	3.03	3.58	15.02	N/A	0
Kings	0	0	0	0	0	N/A	0
Madera	0	0	0	0	0	N/A	0
Merced	0	0	0	0	0	N/A	0
San Joaquin	38.98	59.09	0.26	0.70	2.10	N/A	0
Stanislaus	0	0	0	0	0	N/A	0
Tulare	14.41	3.56	6.17	5.89	45.16	N/A	0
TOTAL	111.99	139.62	9.52	11.50	63.54	N/A	0

(1) The District only reports ROG to ARB. As noted in Section XII, ROG is the same as VOC.

(2) At this time, the District does not calculate PM2.5 emissions. PM2.5 emissions can be estimated using the speciation profiles found in Section XII.

Following is the net change in total unreconciled emissions between this update (2006 inventory year) and the previous update (2005 inventory year) for REIC 020-995-0012-0000. The change in emissions are reported for each county in the District.

Table 7. Net emissions change for REIC 020-995-0012-0000 (2005 to 2006).

County	Criteria Emissions (tons/year)						Toxic Emissions (lbs/year)
	NO _x	CO	SO _x	VOC ⁽¹⁾	PM ₁₀	PM _{2.5} ⁽²⁾	NH ₃
Fresno	-0.18	0.03	0	0	-0.01	N/A	0.00
Kern	-101.91	-10.48	-19.17	-26.12	1.42	N/A	3,570.73
Kings	0	0	0	0	0	N/A	0.00
Madera	0	0	0	0	0	N/A	0.00
Merced	0	0	0	0	0	N/A	0.00
San Joaquin	22.18	54.19	0.19	0.53	2.10	N/A	0.00
Stanislaus	-2.17	0	-3.3	-7.7	0	N/A	0.00
Tulare	14.41	3.54	4.97	5.88	45.16	N/A	8,933.50
TOTAL	-67.67	47.3	-17.31	-27.41	48.66	N/A	12,504.23

(1) The District only reports ROG to ARB. As noted in Section XII, ROG is the same as VOC.

(2) At this time, the District does not calculate PM2.5 emissions. PM2.5 emissions can be estimated using the speciation profiles found in Section XII.

XV. Revision History

2007. The methodology was reformatted to the new District standard. Process rates were updated.

2006. This is a new District methodology based on the District's Point Source Inventory and the list of known cogeneration facilities in the District (obtained by the California Energy Commission).

XVI. Update Schedule

In an effort to provide inventory information to ARB and other District programs and maximize limited resources, the District has developed an update cycle based on emissions within the source category as shown in Table 8.

Table 8. Area source update frequency criteria.

Total Emissions (tons/day)	Update Cycle (years)
<=1	4
>1 and <= 2.5	3
>2.5 and <=5	2
>5	1

Since the cogeneration EIC has emissions of less than one ton per day, this area source estimate will be updated every four years.

Table 9. District methodology update frequency.

EIC	Frequency (In years)	Source of Emissions (Point Source Inventory / Data Gathering)
020-995-0012-0000	4	Point Source Inventory

XVII. References

1. California Energy Commission (CEC), Power Plants in California, 2007.
http://www.energyalmanac.ca.gov/powerplants/POWER_PLANTS.XLS.
Accessed on May 5, 2008.

XVIII. Appendices

Appendix A. Emission Inventory Codes

Appendix A. Emission Inventory Codes

Table 10. EIC, SCC and SIC codes in the District's 2006 point source inventory that reconciled to REIC 020-995-0012-0000.

EIC	SCC	Point Source Type	SIC
20-040-0110-0000	20200204	INTERNALCOMBUSTION - INDUSTRIAL - NATURAL GAS - ENGINE-COGENERATN	2037, 3999
20-040-0110-0000	20300204	INTERNALCOMBUSTION - COMMERCL-INSTUTNL - NATURAL GAS - ENGINE-COGENERATN	4931, 8062, 9199
20-045-0110-0000	20200203	INTERNALCOMBUSTION - INDUSTRIAL - NATURAL GAS - TURBINE-COGENERATN	1321, 2096, 2099, 2911, 4931
20-045-0110-0000	20300203	INTERNALCOMBUSTION - COMMERCL-INSTUTNL - NATURAL GAS - TURBINE-COGENERATN	8062, 9223