



**Year 2011**  
**Air Quality Division**

*ANNUAL AIR EMISSIONS INVENTORY QUESTIONNAIRE*

*Boilers*

The 2011 Boiler Annual Emissions Inventory Questionnaire includes 4 forms that are required to be completed and submitted to the Air Quality Division. Instructions for each form are included below. Upon completion, submit all forms along with the signature by the Responsible Official of the facility within 90 days of receipt of a letter from the Department to the address below.

**FORM 1: Facility General Information**

Complete all information as requested.

**FORM 2: Equipment, Process & Stack Data**

- Table 1: List all the boilers and generators that are operated at the facility. Include the Authorization To Operate (ATO) number for all the permitted equipment. Indicate, if not available.
- Table 2: List details of each stack on the equipment.

**FORM 3A & 3B: Emissions Data     Input all calculation results in the appropriate spaces provided in the form.**

Based on the type of fuel used (Gasoline, Diesel, or Natural Gas/Liquid Propane), choose the appropriate table to input the equipment heat input rate (MMBTU/hr) and the hours operated in the year 2011 for each boiler. To calculate the emission, you will take the heat input rate, multiply by hours of operation, multiply by the emission factor, and divide by 2000 for each pollutant. Depending on the type of fuel used for the generator, input the horsepower and hours of operation into the form. To calculate the emission you will take the horsepower, multiply by hours operated multiply by emission factor, and divide by 2000. A sample of the calculations are provided on Form 2.

**FORM 4: Summary & Certification**

A summarization of all the emissions by each pollutant will be listed within this form. All reports submitted to the Department should be certified true and accurate by the Responsible Official of the facility. This person is the owner or operator of the facility. **If there is a change of the Responsible Official of the facility, please notify the Department with an additional letter stating the change.**

If you have any question or have difficulty completing this form, please contact Darlene Celaya at (602) 771-7662. Remember to make photocopies of the completed questionnaire prior to mailing for your records/reference. Please mail the emission inventory questionnaire form to the following address:

**Arizona Department of Environmental Quality  
Attention: Darlene Celaya, Emission Inventory Team  
Air Quality Division, Compliance Section 3415A-3  
1110 West Washington Street  
Phoenix, AZ 85007**

**SECTION I: Plant Identification & Mailing Information**

Company Name: \_\_\_\_\_

Place Name: \_\_\_\_\_ Place ID # : \_\_\_\_\_

Mailing Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_

County: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Permit # or LTF #: \_\_\_\_\_ General Permit: Yes  No

**SECTION II: Emissions Inventory Contact**

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

**SECTION III: Confidential Request**

Pursuant to Arizona Revised Statutes §49-432 and §49-201, do you claim the Emissions Inventory data submittal confidential. Yes  No

If yes include which portions of the inventory are confidential along with a brief explanation:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Table 1: Equipment Information**

	Boiler #1	Boiler #2	Boiler #3	Boiler #4	Boiler #5	Generator #1	Generator #2	Generator #3
Equipment ID								
ATO#								
Rated Capacity								
Actual Hours Operated (hours/year)								

**Table 2: Stack Information**

	Stack #1	Stack#2	Stack #3	Stack #4	Stack #5	Stack #6	Stack #7	Stack #8
Height (feet)								
Diameter (feet)								
Velocity (feet/second)								
Exhaust Gas Temperature (F)								
Flow Rate (actual cubic feet per minute)								

Sample Emission Calculation: Emissions = Maximum Heat Input Rate (MM Btu per hr) x Hours of Operation (hrs) x Emission Factor (pounds per MM Btu per hr)  
 2000 pounds per ton

For a Boiler with a maximum heat input rate of 20MM Btu per and using Natural Gas fuel and operated for 1500 hours during the year 2011, the emissions of Nitrogen Oxides (Nox) will be as follows:

$$\text{Emissions} = \underline{20 \text{ MM Btu per hr} \times 1500 \text{ hours} \times 0.0952 \text{ pounds per MM Btu per hr}} = 1.428 \text{ tons per year}$$

2000 pounds per ton

**FORM 3A: EMISSIONS CALCULATIONS FOR BOILERS**

**YEAR 2011**

Conversion Factors - MM = 1,000,000 M = 1,000 1 Therm = 100,000 BTUs. 1 MMBTU = 1,000,000 BTUs. 1HP-hr = 2546.15 BTUs

	FUEL - NATURAL GAS				FUEL - DIESEL			
	Boiler #1		Boiler #2		Boiler #1		Boiler #2	
	Max. Rated Capacity MMBtu-hour (1)	Operational Hours hours/year (2)	Max. Rated Capacity MMBtu-hour (4)	Operational Hours hours/year (5)	Max. Rated Capacity MMBtu-hr (1)	Operational Hours hours/year (2)	Max. Rated Capacity MMBtu-hr (4)	Operational Hours hours/year (5)
Pollutants	Emission Factor (3) pounds/MMBtu	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/MMBtu	Emissions = (4)x(5)x(6)/2000 tons/year	Emission Factor (3) pounds/MMBtu	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/MMBtu	Emissions = (4)x(5)x(6)/2000 tons/year
PM	0.0075		0.0075		0.0240		0.0240	
PM10	0.0075		0.0075		1.56E-06		1.56E-06	
NOx	0.0980		0.0980		0.1460		0.1460	
SOx	0.0006		0.0006		0.8290		0.8290	
VOC	0.0054		0.0054		0.0025		0.0025	
CO	0.0824		0.0824		0.0365		0.0365	
Acenaphthene	1.76E-09		1.76E-09		1.54E-07		1.54E-07	
Acenaphthylene	1.76E-09		1.76E-09		1.85E-09		1.85E-09	
Anthracene	2.35E-09		2.35E-09		8.91E-09		8.91E-09	
Arsenic	1.96E-07		1.96E-07		-	-	-	-
Benz(a)anthracene	1.76E-09		1.76E-09		2.93E-08		2.93E-08	
Benzene	2.06E-06		2.06E-06		1.56E-06		1.56E-06	
Benzo(b)fluoranthene	1.76E-09		1.76E-09		-	-	-	-
Benzo(b,k)fluoranthene	-	-	-	-	1.08E-08		1.08E-08	
Benzo(g,h,i)perylene	1.18E-09		1.18E-09		1.65E-08		1.65E-08	
Benzo(k)fluoranthene	1.76E-09		1.76E-09		-	-	-	-
Beryllium	1.18E-08		1.18E-08		-	-	-	-
Butane	2.06E-03		2.06E-03		-	-	-	-
Cadmium	1.08E-06		1.08E-06		-	-	-	-
Chromium	1.37E-06		1.37E-06		-	-	-	-
Chrysene	1.76E-09		1.76E-09		-	-	-	-
Dibenzo(a,h)anthracene	1.18E-09		1.18E-09		1.22E-08		1.22E-08	
Dichlorobenzene	1.18E-06		1.18E-06		-	-	-	-
Ethane	3.04E-03		3.04E-03		-	-	-	-
Ethylbenzene	-	-	-	-	4.64E-07		4.64E-07	
Fluoranthene	2.94E-09		2.94E-09		3.53E-08		3.53E-08	
Fluorene	2.75E-09		2.75E-09		3.26E-08		3.26E-08	
Formaldehyde	7.35E-05		7.35E-05		2.41E-04		2.41E-04	
Hexane	1.76E-03		1.76E-03		-	-	-	-
Indeno(1,2,3-cd)pyrene	1.76E-09		1.76E-09		1.56E-08		1.56E-08	
Lead	4.90E-07		4.90E-07		-	-	-	-
2-Methylnaphthalene	2.35E-08		2.35E-08		-	-	-	-
Manganese	3.73E-07		3.73E-07		-	-	-	-
Mercury	2.55E-07		2.55E-07		-	-	-	-
Methane	2.25E-03		2.25E-03		1.58E-03		1.58E-03	
Molybdenum	1.08E-06		1.08E-06		-	-	-	-
Naphthalene	5.98E-07		5.98E-07		8.25E-06		8.25E-06	
O-Xylene	-	-	-	-	7.96E-07		7.96E-07	
Selenium	2.35E-08		2.35E-08		-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	1.72E-06		1.72E-06	
Toluene	3.33E-06		3.33E-06		4.53E-05		4.53E-05	

**FORM 3A: EMISSIONS CALCULATIONS FOR BOILERS**

**YEAR 2011**

	<i>FUEL - BUTANE</i>				<i>FUEL - PROPANE</i>			
	<b>Boiler #1</b>		<b>Boiler #2</b>		<b>Boiler #1</b>		<b>Boiler #2</b>	
	Max. Rated Capacity MMBtu-hour (1)	Operational Hours hours/year (2)	Max. Rated Capacity MMBtu- hour (4)	Operational Hours hours/year (5)	Max. Rated Capacity MMBtu-hour (1)	Operational Hours hours/year (2)	Max. Rated Capacity MMBtu- hr (4)	Operational Hours hours/year (5)
Pollutants	Emission Factor (3) pounds/MMBtu	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/MMBtu	Emissions = (4)x(5)x(6)/2000 tons/year	Emission Factor (3) pounds/MMBtu	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/MMBtu	Emissions = (4)x(5)x(6)/2000 tons/year
PM	0.0059		0.0059		0.0066		0.0066	
PM10	0.0059		0.0059		0.0066		0.0066	
NOx	0.2059		0.2059		0.2077		0.2077	
VOC	0.0041		0.0041		0.0033		0.0033	
CO	0.0353		0.0353		0.0350		0.0350	
Methane	0.0020		0.0020		0.0022		0.0022	

**FORM 3B: EMISSIONS CALCULATIONS FOR GENERATORS**

**YEAR 2011**

	<i>FUEL - DIESEL - LESS THAN OR EQUAL TO 600 HP</i>				<i>FUEL - DIESEL - GREATER THAN 600 HP</i>			
	<b>Generator #1</b>		<b>Generator #2</b>		<b>Generator #1</b>		<b>Generator #2</b>	
	Max. Capacity - Horsepower (1)	Operational Hours hours/year (2)	Max. Capacity Horsepower (4)	Operational Hours hours/year (5)	Max. Capacity Horsepower (1)	Operational Hours hours/year (2)	Max. Capacity Horsepower (4)	Operational Hours hours/year (5)
Pollutants	Emission Factor (3) pounds/hp-hour	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/hp-hour	Emissions = (4)x(5)x(6)/2000 tons/year	Emission Factor (3) pounds/hp-hour	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/hp-hour	Emissions = (4)x(5)x(6)/2000 tons/year
PM	0.0022		0.0022		0.0007		0.0007	
PM10	0.0022		0.0022		0.0006		0.0006	
NOx	0.0310		0.0310		0.0240		0.0240	
SOx	0.0021		0.0021		0.0073		0.0073	
VOC	0.0025		0.0025		0.0007		0.0007	
CO	0.0067		0.0067		0.0055		0.0055	
Acenaphthene	9.94E-09		9.94E-09		3.28E-08		3.28E-08	
Acenaphthylene	3.54E-08		3.54E-08		6.46E-08		6.46E-08	
Acetaldehyde	5.37E-06		5.37E-06		1.76E-07		1.76E-07	
Acrolein	6.48E-07		6.48E-07		5.52E-08		5.52E-08	
Anthracene	1.31E-08		1.31E-08		8.61E-09		8.61E-09	
Benzene	6.53E-06		6.53E-06		5.43E-06		5.43E-06	
Benzo(a)anthracene	1.18E-08		1.18E-08		4.35E-09		4.35E-09	
Benzo(a)pyrene	1.32E-09		1.32E-09		1.80E-09		1.80E-09	
Benzo(b)fluoranthene	6.94E-10		6.94E-10		7.77E-09		7.77E-09	
Benzo(g,h,i)perylene	3.42E-09		3.42E-09		3.89E-09		3.89E-09	
Benzo(k)fluoranthene	1.09E-09		1.09E-09		1.53E-09		1.53E-09	
1,3-Butadiene	2.74E-07		2.74E-07		-	-	-	-
Chrysene	2.47E-09		2.47E-09		1.07E-08		1.07E-08	
Dibenz(a,h)anthracene	4.08E-09		4.08E-09		2.42E-09		2.42E-09	
Fluoranthene	5.33E-08		5.33E-08		2.82E-08		2.82E-08	
Fluorene	2.04E-07		2.04E-07		8.96E-08		8.96E-08	
Formaldehyde	8.26E-06		8.26E-06		5.52E-07		5.52E-07	
Indeno(1,2,3-cd)pyrene	2.63E-09		2.63E-09		2.90E-09		2.90E-09	
Naphthalene	5.94E-07		5.94E-07		9.10E-07		9.10E-07	
Phenanthrene	2.06E-07		2.06E-07		2.86E-07		2.86E-07	
Propylene	1.81E-05		1.81E-05		1.95E-05		1.95E-05	
Pyrene	3.35E-08		3.35E-08		2.60E-08		2.60E-08	
Toluene	2.86E-06		2.86E-06		1.97E-06		1.97E-06	
Xylene	2.00E-06		2.00E-06		1.35E-06		1.35E-06	

**FORM 3B: EMISSIONS CALCULATIONS FOR GENERATORS**

**YEAR 2011**

	<i>FUEL - GASOLINE</i>				<i>FUEL - NATURAL GAS OR LIQUIFIED PETROLEUM GAS</i>			
	<b>Generator #1</b>		<b>Generator #2</b>		<b>Generator #1</b>		<b>Generator #2</b>	
	Max. Capacity - Horsepower (1)	Operational Hours hours/year (2)	Max. Capacity Horsepower (4)	Operational Hours hours/year (5)	Max. Capacity Horsepower (1)	Operational Hours hours/year (2)	Max. Capacity Horsepower (4)	Operational Hours hours/year (5)
Pollutants	Emission Factor (3) pounds/hp-hour	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/hp-hour	Emissions = (4)x(5)x(6)/2000 tons/year	Emission Factor (3) pounds/hp-hour	Emissions = (1)x(2)x(3)/2000 tons/year	Emission Factor (6) pounds/hp-hour	Emissions = (4)x(5)x(6)/2000 tons/year
PM	0.0007		0.0007		0.0001		0.0001	
PM10	0.0007		0.0007		0.0001		0.0001	
NOx	0.0110		0.0110		0.0206		0.0206	
SOx	0.0060		0.0060		4.35E-06		4.35E-06	
VOC	0.0220		0.0220		0.0008		0.0008	
CO	0.4390		0.4390		0.0029		0.0029	
1,3-Butadiene	-	-	-	-	1.69E-06		1.69E-06	
Acetaldehyde	-	-	-	-	7.10E-06		7.10E-06	
Acrolein	-	-	-	-	6.70E-06		6.70E-06	
Benzene	-	-	-	-	4.02E-06		4.02E-06	
Butyr/isobutyraldehyde	-	-	-	-	1.24E-07		1.24E-07	
Carbon Tetrachloride	-	-	-	-	4.51E-08		4.51E-08	
Chlorobenzene	-	-	-	-	3.28E-08		3.28E-08	
Chloroform	-	-	-	-	3.49E-08		3.49E-08	
1,1-Dichloroethane	-	-	-	-	2.88E-08		2.88E-08	
1,2-Dichloroethane	-	-	-	-	2.88E-08		2.88E-08	
1,2-Dichloropropane	-	-	-	-	3.31E-09		3.31E-09	
1,3-Dichloropropene	-	-	-	-	3.23E-08		3.23E-08	
Ethane	-	-	-	-	1.79E-04		1.79E-04	
Ethylbenzene	-	-	-	-	6.31E-08		6.31E-08	
Ethylene Dibromide	-	-	-	-	5.42E-08		5.42E-08	
Formaldehyde	-	-	-	-	5.22E-05		5.22E-05	
Methane	-	-	-	-	5.86E-04		5.86E-04	
Methanol	-	-	-	-	7.79E-06		7.79E-06	
Methylene Chloride	-	-	-	-	1.05E-07		1.05E-07	
Naphthalene	-	-	-	-	2.47E-07		2.47E-07	
Styrene	-	-	-	-	3.03E-08		3.03E-08	
1,1,2,2-Tetrachloroethane	-	-	-	-	6.44E-08		6.44E-08	
1,1,2-Trichloroethane	-	-	-	-	3.90E-08		3.90E-08	
Toluene	-	-	-	-	1.42E-06		1.42E-06	
Vinyl Chloride	-	-	-	-	1.83E-08		1.83E-08	
Xylene	-	-	-	-	4.96E-07		4.96E-07	

All the emissions for each pollutant are totalled and entered in the table below.

Pollutant	Tonnage (tons per year)
Particulate Matter (PM)	
Particulate Matter Less Than 10 Microns (PM10)	
Nitrogen Oxides (NOx)	
Sulfur Oxides (SOx)	
Volatile Organic Compounds (VOC)	
Carbon Monoxide (CO)	
Hazard Air Pollutants (HAPs)	

**Certification of Truth & Accuracy**

I certify that based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

All information not identified by me as confidential in nature shall be treated by the Arizona Department of Environmental Quality as public record.

Signature of Responsible Official:

Date:

Print Name:

Title:

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