Rombough, Kyrik

From: Rombough, Kyrik
Sent: Monday, August 27, 2007 9:44 AM
To: 'keen@rtpenv.com'
Subject: RE: Response to Questions

Dave:

For the most part, yes the potential emissions assume operations as 8,760 hours per year. Unfortunately, not in all cases. In the case of University of South Dakota and Basin Electric, the potential emissions were based on 8,760 hours of operation. In the case of Northwestern Public Service, the potential emissions sent to you for Units #1 through #3 were based on 8,760 hours per year and Unit #4 was based on 1,120 hours per year.

I have attached a copy of Northwestern Public Service Company's statement of basis that should help with the breakdown. There is a table that contains the uncontrolled (no operational limits) for all four units that you can divide to obtain the hourly rates.

I apologize for the piece mealing your requested information.

Please let me know if you need anything else.

Kyrik

Kyrik Rombough
Natural Resources Engineering Director
Air Quality Program
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Email: Kyrik.Rombough@state.sd.us
Fax: 605-773-5286

-Original Message-----
From: David Keen [mailto:keen@rtpenv.com]
Sent: Wednesday, August 22, 2007 12:48 PM
To: Rombough, Kyrik
Subject: RE: Response to Questions

> Thanks very much Kyrik. Did the estimates of potential to emit that you provided to me for the TV sources assume 8760 hr/yr operation at the potential hourly emission rates? I need to model potential hourly rates so I will take the ton/yr potentials you provided and divide by 8760 (if indeed the ton/yr PTEs were based upon 8760).
>
> Thanks again,
> Dave

From: Kyrik.Rombough@state.sd.us [mailto:Kyrik.Rombough@state.sd.us]
Sent: Tuesday, August 21, 2007 5:28 PM
To: keen@rtpenv.com; campbell@rtpenv.com

Cc: Brian.Gustafson@state.sd.us; Brad.Schultz@state.sd.us
Subject: Response to Questions

Dave and Colin:

I have attached 7 files in response to questions that have been raised. The files are as follows:

1) The word document contains responses to Dave's inventory questions and Colin's ESA consultation question.
2) The three Excel Spreadsheet identify the specific emissions per unit as requested.
3) The three PDF files are the Title V permits for the identified sources to cover the information on heat inputs, etc.

I apologize for the randomness of the files. If you need anything clarified or need additional information, please let me know

Kyrik

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Statement of Basis
Renewal for Title V Air Quality Operating Permit
Northwestern Public Service Company – Yankton, South Dakota
South Dakota Department of Environment and Natural Resources

Background

Northwestern Public Service's Title V air quality operating permit #28.0801-07 expired on December 20, 2001. Permit condition 4.2 states that if a timely and complete application for a permit renewal is submitted six months prior to the date of expiration, then the existing permit shall not expire and the conditions of that permit shall remain in effect until the Secretary takes final action on the permit renewal application. On March 1, 2001, the Department of Environment and Natural Resources (DENR) received Northwestern Public Service's renewal application to operate its electric engine - generators. Therefore, Northwestern Public Service is able to operate under the expired permit.

Operational Description

Currently, the facility is permitted to operate four electric engine - generators. The following is a list of equipment and processes in the renewal application that will be reviewed:

Unit #1 Generator #1 – 1970 Fairbanks – Morse electric engine - generator, model number 38TDD 8 -1/8 / 871017. The engine is fired with natural gas and distillate oil. The engine - generator has a maximum design operating rate of 21 million Btus per hour heat input.

Unit #2 Generator #2 - 1970 Fairbanks – Morse electric engine - generator, model number 38TDD 8 -1/8 / 869075. The engine is fired with distillate oil. The engine - generator has a maximum design operating rate of 28.9 million Btus per hour heat input.

Unit #3 Generator #3 - 1974 Fairbanks – Morse electric engine - generator, model number PC – 2, 18cyl/54-205920. The engine is fired with distillate oil. The engine - generator has a maximum design operating rate of 66.7 million Btus per hour heat input.

Unit #4 Generator 4 - 1989 Fairbanks – Morse electric engine – generator, model number 38TDD 8 -1/8 / 869075. The engine is fired with distillate oil. The engine – generator has a maximum design operating rate of 21.2 million Btus per hour heat input.

Northwestern Public Service listed two vertical above ground storage tanks used to store distillate oil as insignificant activities based on the volatile organic compound (VOC) emissions from each tank being less than two tons per year. The tanks are identified as Tank #1 and #2 and both have a maximum design storage capacity of 200,004 gallons. To determine if these storage tanks are subject to a new source performance standard, Northwestern Public Service was contacted about the date the storage tanks were constructed. During telephone conversation in August 2004, Dennis Wagner with Northwestern Public Service stated that the tanks were built in 1977.

Emission Factors

An engine – generator with a capacity greater than 600 horsepower is defined as a large diesel generator. Based on the previous review, the maximum generating capacity of each engine – generator is equal to or greater than 2,200 kilowatts (approximately 2,950 horsepower). Therefore, the engine - generators are defined as large diesel generators.

The emission factors are derived from AP-42 Tables 3.4-1, 3.4-3, and 3.4-4 (10/96) for Large Stationary Diesel and All Stationary Dual-fuel Engines.

Total suspended particulate (TSP)	= 0.0697 pounds per MMBtu
PM10 [1]	= 0.0573 pounds per MMBtu
Sulfur dioxide (SO_2) [2]	= 1.01 x S_1 pounds per MMBtu
	= 1.01 x 0.5 pounds per MMBtu
	= 0.51 pounds per MMBtu
Nitrogen oxide (NOx)	= 3.2 pounds per MMBtu
Volatile organic compound (VOC)	= 0.082 pounds per MMBtu
Carbon monoxide (CO)	= 0.85 pounds per MMBtu
Hazardous air pollutants (HAPs)	= 0.00156 pounds per MMBtu

[1] – PM10 stands for particulate matter 10 microns in diameter or less;
[2] – The sulfur dioxide emission rate is based on the sulfur content (S_1) in the distillate oil being equal to 0.5 weight percent.

Potential Emission Calculations

Potential emissions for each applicable pollutant are calculated from the maximum design capacity listed in the application and assuming the unit operates every hour of every day of the year. Northwestern Public Service does not have control equipment associated with the electric engine – generators; therefore, the potential uncontrolled and controlled emissions are the same.

The calculations for the potential emissions are in Appendix A. Table #1 provides a summary of the potential emissions

Table #1
Potential Emissions

	TSP	PM10	SO_2	NO_X	VOC	HAPs	CO
Description	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**
Generator #1	6.4	5.3	46.4	294.3	7.5	0.1	78.2
Generator #2	8.8	7.3	63.9	405.1	10.4	0.2	107.6

	TSP	PM10	SO_2	NO_X	VOC	HAPs	CO
Description	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**
Generator #3	20.4	16.7	147.5	934.9	24.0	0.5	248.3
Subtotal	**36**	**29**	**258**	**1,634**	**42**	**1**	**434**
Generator #4	6.5	5.3	46.9	297.1	7.6	0.1	78.9
Total Emissions	**42**	**35**	**305**	**1,931**	**49**	**1**	**513**

Permit Requirements

New Source Review (NSR)

The ARSD 74:36:10:01 notes that New Source Review (NSR) regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. Northwestern Public Service is located in Yankton, South Dakota, which is in attainment for all the pollutants regulated under the Clean Air Act. Therefore, Northwestern Public Service is not applicable to NSR review.

Prevention of Significant Deterioration (PSD)

Any stationary source which constructed or modified after August 7, 1977, and emits or has the potential to emit 250 tons per year or more of any air pollutant is subject to Prevention of Significant Deterioration (PSD) requirements *(ARSD 74:36:09 – 40 C.F.R. Part 52.21(b)(1)).* Any stationary source which emits, or has the potential to emit, 100 tons per year or more of any air pollutant and is subject to one of the 28 named PSD source categories is subject to PSD requirements *(ARSD 74:36:09 – 40 C.F.R. Part 52.21(b)(1)).* Northwestern Public Service is not one of the 28 named PSD source categories. Therefore, the major source threshold is 250 tons per year.

The electric generators were not installed at the same time. The first three generators were constructed before August 7, 1977. The potential to emit sulfur dioxide, nitrogen oxide, and carbon monoxide emissions from the first three generators is greater than 250 tons per year. Therefore, Northwestern Public Service's Yankton facility is considered a major source under the PSD program but not subject to a PSD permit because the first three generators were constructed before the PSD program was promulgated. Any future changes at the facility must be evaluated to determine if the change is considered a major modification.

A major modification occurs when a change at a source that is considered a major source under the PSD program creates an increase in the sources air emissions above a significant threshold. In 1989, Northwestern Public Service installed a fourth electrical generator (Unit #4). The potential to emit from Unit #4 exceeded the significant threshold of 40 tons per year for sulfur dioxide and nitrogen oxide. Therefore, the installation of Unit #4 is considered a major modification. However, Northwestern Public Service accepted federally enforceable permit

conditions which restrict its potential emissions of sulfur dioxide and nitrogen oxide from Unit #4 below the significant threshold of 40 tons per year.

The federally enforceable limit for Unit #4 was 1,240 hours per 12-month rolling period. The number of hours Unit #4 may operate in a 12-month rolling period was reviewed to ensure the potential emissions from Unit #4 are below 40 tons per year. An annual limit will be established in the permit that limits the amount of sulfur dioxide and nitrogen oxide emissions at or below 38 tons per 12-month rolling period per pollutant. To ensure compliance with the sulfur dioxide and nitrogen oxide 12-month rolling period limits will be based on the hourly limit. The hourly limit will be based on the emission limit for nitrogen oxide since it is greater than the sulfur dioxide emission rate. The emission limit for nitrogen oxide of 3.2 million Btus per hour heat input will be based on the emission factor derived from AP-42. The equation for determining the hourly limit may be viewed below:

Hourly Limit: emission factor x heat input x hourly limit / 2,000 lbs/ton = 38 tons/yr
3.2 lbs/MMBtus x 21.2 MMBtus/hr x X hrs/yr / 2,000 lbs/ton = 38 tons/yr
X hrs/yr = 38 tons/yr x 2,000 lbs/ton / (3.2 lbs/MMBtus x 21.2 MMBtus/hr)
X = 1,120 hrs/yr

The difference between the two hourly limits is the results of a slight difference in the emission factor and the actual limit being adjusted down from 39.9 to 38 tons per year.

New Source Performance Standards (NSPS)

The department reviewed the new source performance standards and determined that the following may be applicable:

> ***ARSD 74:36:07:012 - 40 CFR, Part 60, Subpart K - Standards of Performance for storage vessels of petroleum liquids constructed after June 11, 1973, and before May 19, 1978.***

The provisions of this subpart are applicable to each storage vessel for which:
1. Construction, reconstruction, or modification commenced after June 11, 1973 and before May 19, 1978; and
2. The tank has a capacity greater than or equal to 151,412 liters (40,000 gallons) that is used to store petroleum liquids.

Northwestern Public Service started construction of two 200,004 gallon petroleum storage tanks in 1977. Since the storage capacity is greater than 40,000 gallons, this subpart is applicable to the storage tanks. Northwestern Public Service is storing distillate oil in the tanks, which has a maximum true vapor pressure of 0.0048 pounds per square inch absolute (0.04 kilopascals). Therefore, the tanks are not subject to the standards for volatile organic compounds (40 CFR § 60.112) and the monitoring of operations (40 CFR § 60.113). Even though the tank is applicable to the standard, Northwestern Public Service does not have to meet any of the requirements provided the type of petroleum stored in the tanks maintains a maximum true vapor pressure less

than 1.0 pounds per square inch absolute (0.69 kilopascals). Therefore, Northwestern Public Service will be required to notify the department and modify the permit if it plans on changing the type of petroleum product stored in the tanks.

National Emission Standards for Hazardous Air Pollutants (NESHAP – Part 61)

Presently, there are no finalized or promulgated National Emissions Standards for Hazardous Air Pollutants standards for the type of operations used by Northwestern Public Service.

Maximum Achievable Control Technology (MACT – Part 63)

The department reviewed the maximum achievable control technology standards and determined that the following may be applicable:

40 CFR, Part 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

This rule was finalized on June 15, 2004. The provisions of this subpart are applicable to each stationary reciprocating internal combustion engine which is located at a major source for hazardous air pollutants. Northwestern Public Service's operations in Yankton are not major for hazardous air pollutants (see Table #1). Therefore, this national emission standard for hazardous air pollutants is not applicable.

Title V Air Quality Operating Permit

Northwestern Public Service was issued a Title V air quality operating permit in September 1996, because its potential emissions were greater than 100 tons per year. Northwestern Public Service's potential sulfur dioxide, nitrogen oxide, and carbon monoxide emissions are greater than 100 tons per year. Therefore, Northwestern Public Service is still required to maintain a Title V air quality operating permit.

Insignificant Activities

In accordance with ARSD 74:36:05:04.01(7), any unit that has the potential to emit two tons or less per year of any criteria pollutant before the application of control equipment is considered an insignificant activity and is exempt from inclusion in the Title V air quality operating permit. Northwestern Public Service listed Tank #1 and #2 as insignificant activities because it has been demonstrated in the past that the VOC emissions from these tanks are less than two tons per year. However, these two tanks are subject to a New Source Performance Standard. Therefore, the two tanks can not be listed as an insignificant activity.

State Particulate and Sulfur Dioxide Emission Limits

Particulate and sulfur dioxide emission limits are derived from ARSD 74:36:06. Potential emission rates and allowable emissions for each unit were calculated in Appendix B. Tables #2

and #3 compare the potential emission rates to the allowable emission limits for particulate and sulfur dioxide, respectively.

Table #2
Particulate (TSP) Comparison

Unit	Potential Emission Rate	Emission Limit
#1	0.07 pounds/MMBtu	0.50 pounds/MMBtu
#2	0.07 pounds/MMBtu	0.50 pounds/MMBtu
#3	0.07 pounds/MMBtu	0.50 pounds/MMBtu
#4	0.07 pounds/MMBtu	0.50 pounds/MMBtu

Table #3
Sulfur Dioxide Comparison

Unit	Potential Emission Rate	Emission Limit
#1	0.5 pounds/MMBtu	3.0 pounds/MMBtu
#2	0.5 pounds/MMBtu	3.0 pounds/MMBtu
#3	0.5 pounds/MMBtu	3.0 pounds/MMBtu
#4	0.5 pounds/MMBtu	3.0 pounds/MMBtu

Northwestern Public Service has accepted federally enforceable permit limits which maintain its sulfur dioxide emissions from Unit #4 to less than 38 tons per 12-month rolling period. The limit is based on an hourly limit for a 12-month rolling period and a sulfur content of 0.5 percent by weight. The following equation was used to ensure that the state sulfur limit will not allow an exceedance of the 38 tons per 12-month rolling period.

SO_2 emissions = 21.2 MMBtus/hour x 3.0 lbs/MMBtu x 1,120 hrs/12-month ÷ 2000 lbs/ton
= 36 tons/12-month

The state's sulfur dioxide emission limit combined with the hourly emission limit ensures that the sulfur dioxide emissions from Unit #4 will not exceed 38 tons per 12-month period.

Compliance Assurance Monitoring (CAM)

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from major sources applying for a Title V air quality operating permit. Northwestern Public Service's renewal application was received on March 1, 2001. Therefore, compliance assurance monitoring is applicable to any unit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;

2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

Northwestern Public Service does not use a control device to achieve compliance with applicable requirements. Therefore, compliance assurance monitoring is not applicable to Northwestern Public Service.

Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to Title V of the federal Clean Air Act. Northwestern Public Service is required to meet unit specific opacity, particulate, and sulfur dioxide emission limits. In addition, Northwestern Public Service is required to meet an hourly limit for Unit #4 and a plant wide sulfur dioxide and nitrogen oxide emission limit.

Periodic monitoring for the opacity and particulate emission limits may consist of visible emission readings, stack tests, pressure drop readings for the appropriate control device, implementation of a maintenance plan for the appropriate control device, etc. Northwestern Public Service typically operates the diesel engine – generators less than 100 hours in a calendar year. Therefore, stack testing is not considered economical. Northwestern Public Service will be required to perform periodic visible emission readings when the unit is in operation to ensure the unit can meet its opacity and particulate emission limits. The permit contains sufficient language which allows the department to require Northwestern Public Service to conduct a stack test if visible emission readings or hours of operation warrant a stack test.

Periodic monitoring for sulfur dioxide emission limits and Unit #4's 12-month rolling total emission limit shall be based on the amount of distillate burned in Unit #4 and the sulfur content of the distillate oil.

Periodic monitoring for Unit #4's nitrogen oxide emission rate and hours of operation limit shall be based on a stack test, monitoring the hours of operation, and annual reporting. Northwestern Public Service will be required to install and operate a non re-settable clock on Unit #4 and maintain a logbook documenting the number of hours the engine is operated each month.

Air Fees

Title V sources are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants that are charged are particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds and hazardous air pollutants. Presently, the air emission fee is $6.10 per ton of pollutant actually emitted. The actual emissions are calculated by the department and are based on information provided by the source.

Summary of Applicable Requirements

Northwestern Public Service will be required to operate within the requirements stipulated in the following regulations:

ARSD 74:36:05 - Operating Permits for Part 70 Sources;
ARSD 74:36:06 - Regulated Air Pollutant Emissions;
ARSD 74:36:11 - Performance Testing;
ARSD 74:36:12 - Control of Visible Emissions; and
ARSD 74:37:01 - Air Pollution Control Program Fees.

Recommendation

Based on the information submitted in the air permit renewal application, DENR recommends conditional approval of a Title V air quality operating permit. Any questions pertaining to this permit recommendation should be directed to Jason Knapp, Natural Resources Engineer.

Appendix A

Potential Emission Calculations

Northwestern Public Service -- Yankton

Diesel Engine -- Generator #1 (1971)

Given information		Emission Factor			Emission Calculations: Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	6.4	tons TSP/year
21	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	5.3	tons PM-10/year
		SO_2	0.505	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	46.4	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	294.3	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	7.5	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.1	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	78.2	tons CO/year

The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.

2200 kilowatts 21.0 MMBtu/hour (675 kilowatts) x (3413 Btu / hour - kilowatts) / (1000000 Btus/MMBtu) / (0.35%)

35% Efficiency

Diesel Engine -- Generator #2 (1970)

Given information		Emission Factor			Emission Calculations: Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	8.8	tons TSP/year
28.9	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	7.3	tons PM-10/year
		SO_2	0.505	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	63.9	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	405.1	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	10.4	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.2	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	107.6	tons CO/year

The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.

3000 kilowatts 28.9 MMBtu/hour (1360 kilowatts) x (3413 Btu / hour - kilowatts) / (1000000 Btus/MMBtu) / (0.35%)

35% Efficiency

Diesel Engine -- Generator #3 (1974)

Given information		Emission Factor			Emission Calculations: Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	20.4	tons TSP/year
66.7	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	16.7	tons PM-10/year
		SO_2	0.505	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	147.5	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	934.9	tons NO_X/year

8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	24.0	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.5	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	248.3	tons CO/year

The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.

6800 kilowatts 66.7 MMBtu/hour (2750 kilowatts) x (3413 Btu / hour - kilowatts) / (1000000 Btus/MMBtu) / (0.35%)

35% Efficiency

Diesel Engine -- Generator #4 (1963)

Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	6.5	tons TSP/year
21.2	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	5.3	tons PM-10/year
		SO_2	0.505	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	46.9	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	297.1	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	7.6	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.1	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	78.9	tons CO/year

The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.

2,200 kilowatts 21.2 MMBtu/hour (2750 kilowatts) x (3413 Btu / hour - kilowatts) / (1000000 Btus/MMBtu) / (0.35%)

35% Efficiency

Appendix B

Emission Limit Calculations

Particulate Limit Derivation

Diesel Engine - Generator #1

Heat Capacity = 21 *million Btus per hour heat input*

The following calculation was performed to determine the particulate limit for the unit

Particulate Limit Formula -- ARSD 74:36:06:02 1(b)

E = 0.811 x H-0.131

where E = the rate of emission in pounds per million Btus of heat input

H = heat input in millions of Btus per hour

E = 0.811 x 13.3^-0.131

E = 0.544 pounds per million Btus of heat input

or 11.43 pounds per hour

Diesel Engine - Generator #2

Heat Capacity = 28.9 million Btus per hour heat input

The following calculation was performed to determine the particulate limit for the unit

Particulate Limit Formula -- ARSD 74:36:06:02 1(b)

E = 0.811 x H-0.131

where E = the rate of emission in pounds per million Btus of heat input

H = heat input in millions of Btus per hour

E = 0.811 x 13.3^-0.131

E = 0.522 pounds per million Btus of heat input

or 15.08 pounds per hour

Diesel Engine - Generator #3

Heat Capacity = 66.7 million Btus per hour heat input

The following calculation was performed to determine the particulate limit for the unit

Particulate Limit Formula -- ARSD 74:36:06:02 1(b)

E = 0.811 x H-0.131

where E = the rate of emission in pounds per million Btus of heat input

H = heat input in millions of Btus per hour

E = 0.811 x 26.8^-0.131

E = 0.468 pounds per million Btus of heat input

or 31.20 pounds per hour

Diesel Engine - Generator #4

Heat Capacity = 21.2 million Btus per hour heat input

The following calculation was performed to determine the particulate limit for the unit

Particulate Limit Formula -- ARSD 74:36:06:02 1(b)

E = 0.811 x H-0.131

where E = the rate of emission in pounds per million Btus of heat input

H = heat input in millions of Btus per hour

E = 0.811 x 26.8^-0.131

E = 0.544 pounds per million Btus of heat input

or 11.52 pounds per hour

Sulfur Dioxide Limit Derivation
Diesel Engine - Generator #1
Heat Capacity = 21 million Btus per hour heat input per dryer The following calculation was performed to determine the sulfur dioxide limit for the unit Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2 Emission Limit = 3 pounds per million Btus of heat input
Diesel Engine - Generator #2
Heat Capacity = 28.9 million Btus per hour heat input per dryer The following calculation was performed to determine the sulfur dioxide limit for the unit Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2 Emission Limit = 3 pounds per million Btus of heat input
Diesel Engine - Generator #3
Heat Capacity = 66.7 million Btus per hour heat input per dryer The following calculation was performed to determine the sulfur dioxide limit for the unit Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2 Emission Limit = 3 pounds per million Btus of heat input
Diesel Engine - Generator #4
Heat Capacity = 21.2 million Btus per hour heat input per dryer The following calculation was performed to determine the sulfur dioxide limit for the unit Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2 Emission Limit = 3 pounds per million Btus of heat input