



Statement of Basis

Air Quality Permit

**Brentwood Colony
Faulkton, South Dakota**

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1.0 Operational Description

On August 30, 2013, the Department of Environment and Natural Resources (DENR) received a letter of transmittal informing that department that ELM Energy would be conducting a stack test for the generator at Brentwood Colony. On February 24, 2014, Brentwood Colony submitted an application for a minor operating permit and miscellaneous control device. The application was considered complete on March 3, 2014.

Table 1-1 provides a description of the non-emergency generator, as outlined in the March 3, 2014 application form.

Table 1-1 – Equipment Information

Unit	Description	Maximum Operating Rate	Control Device
#1	Brentwood Colony – 2002 MTU compression ignition diesel fueled non-emergency generator, model number 12V200.	700 kilowatt	Catalyst Converter

2.0 New Source Performance Standards

The Department reviewed the new source performance standards (NSPS) in 40 CFR Part 60 and determined that the following NSPS may be applicable to Brentwood Colony.

2.1 ARSD 74:36:07:88 – 40 CFR Part 60, Subpart IIII

Subpart IIII is applicable to owners and operators of stationary compression ignition (CI) internal combustion engines (ICE) that:

1. Commence construction after July 11, 2005 where the stationary CI ICE are manufactured after April 1, 2006 and are not fire pump engines; or
2. Modify or reconstruct their stationary CI ICE after July 11, 2005.

Unit #1 is not applicable to Subpart IIII because the generator was manufactured before April 1, 2006.

2.2 Other NSPS regulations

The Department determined no other NSPS regulation is applicable to the non-emergency generator.

3.0 New Source Review

ARSD 74:36:10:01 states 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. Brentwood Colony is located in Faulkton, South Dakota, which is in attainment or unclassifiable for all the pollutants regulated under the Clean Air Act. Therefore, the Brentwood Colony is not subject to NSR review.

4.0 Prevention of Significant Deterioration

Any stationary source which emits or has the potential to emit 250 tons per year or more of any air pollutant is considered a major source and is subject to prevention of significant deterioration (PSD) requirements (ARSD 74:36:09 – 40 CFR. 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 one of the 28 named PSD source categories is subject to PSD requirements (ARSD 74:36:09 – 40 CFR. Part 52.21(b)(1)). The following is a list of regulated pollutants under the PSD program:

1. Total suspended particulate (PM);
2. Particulate with a diameter less than or equal to 10 microns (PM10);
3. Particulate with a diameter less than or equal to 2.5 microns (PM2.5);
4. Sulfur dioxide (SO₂);
5. Nitrogen oxides (NO_x);
6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOCs);
8. Lead;
9. Fluorides
10. Sulfuric acid mist;
11. Hydrogen sulfide;
12. Reduced sulfur compounds;
13. Total reduced sulfur; and
14. Greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases. Brentwood Colony is not one of the 28 named PSD source categories; therefore, its PSD threshold for pollutants is 250 tons per year, except for greenhouse gas emissions.

According to the Clean Air Act, once a pollutant is regulated under any part of the Act, (as was the case with greenhouse gas emissions after the motor vehicle regulations were finalized in March 2010) major new sources or major modifications are subject to the PSD program and Title V air quality operating permit program. Under the Clean Air Act, PSD and Title V air quality operating permits are required for all sources that emit a regulated air pollutant above 100 or 250 tons per year, depending on the source. This threshold, if applied to greenhouse gases, would greatly increase the number of facilities requiring a PSD review or Title V air quality operating permit. Based on administrative necessity, EPA increased these thresholds through the “Tailoring Rule.”

On May 13, 2010, EPA issued the final version of the “Tailoring Rule” for greenhouse gas emissions. The major source threshold for greenhouse gases is listed below:

1. New PSD source because of a criteria air pollutant, the major source threshold for greenhouse gases is 75,000 tons per year of carbon dioxide equivalent or more;
2. New PSD source if greenhouse gas emissions are 100,000 tons per year of carbon dioxide equivalent or more;
3. For an existing PSD source because of a criteria air pollutant, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more;
4. For an existing non-PSD source that has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more; and
5. In addition to subsection (2) and (4), a specific greenhouse gas, without calculating the carbon dioxide equivalent, also needs to emit greater than 100 or 250 tons per year, whichever is applicable, to be regulated.

4.1 Potential Emissions

The Department uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, the Department relies on manufacturing data, material balance, EPA’s Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant’s application, or other methods to determine potential air emissions.

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, while using the fuel that will emit the greatest emissions. Potential emissions are not realistic of the actual emissions and are used only to identify which air quality permit and requirements are applicable.

4.2 Generators – Criteria Air Pollutants

Generators produce emissions from the burning of fuel. EPA’s Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) lists emission factors for generators based on the manufacturer’s output rating. Units larger than 600 horsepower/448 kilowatts are classified as large, smaller units are classified as industrial. Table 4-1 shows the specific pollutant emission factors associated with the engine classification while burning distillate oil. The emission factors are from Table 3.4-1, 3.4-3, and 3.4-4 October 1996 for large generators.

Table 4-1 – Emission Factors for Stationary Internal Combustion Engines

Unit	Pounds per million Btu					
	TSP	PM10	SO ₂ ^a	NO _x	CO	VOCs
#1	0.0697	0.0573	1.01 x S ₁	3.2	0.85	0.082

^a –The sulfur dioxide emission factor is based on the sulfur content of the fuel in percent. The sulfur content was listed as 15 parts per million or 0.0015 percent.

The application states that the generator is used for emergency use but participates in peak-sharing. Therefore, the unit is considered a non-emergency electrical generator and the potential emissions will be based on the unit operating 8,760 hours per year. Equation 4-2 calculates the generators' potential emissions of each pollutant based on the capacity in Table 1-1, the emission factor in Table 4-1, and 8760 operating hours per year.

The emission factors are based on the heat input of the unit in million Btus per hour. Equation 4-1 calculates the heat input for the generator.

Equation 4-1 – Heat Input Calculations

$$\text{HeatInput} \left[\frac{\text{MMBtu}}{\text{hr}} \right] = \left(\frac{\text{OperatingRate}[\text{kW}] * 3413 \left[\frac{\text{Btu}}{\text{hr} * \text{kW}} \right]}{10^6 \left[\frac{\text{Btu}}{\text{MMBtu}} \right] * 35\%} \right)$$

Unit #1 has a heat input of 6.83 MMBtu/hr.

Equation 4-2 – Generator Potential Emissions

$$\text{Potential} \frac{\text{tons}}{\text{yr}} = \text{Output (hp)} \times \text{Emission Factor} \frac{\text{lbs}}{\text{hp} - \text{hr}} \times 8760 \frac{\text{hrs}}{\text{yr}} \div 2,000 \frac{\text{lbs}}{\text{ton}}$$

The resulting potential emissions from the emergency generator are shown in the Table 4-2.

Table 4-2 –Potential Emissions from Emergency Generator (tons per year)

Unit	TSP	PM10	SO ₂	NO _x	CO	VOCs
#1	2.01	1.71	8.46	95.7	25.4	2.45

4.3 Generators – Greenhouse Gases

The next step is to determine if Brentwood Colony has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more. The six regulated greenhouse gases are the following:

1. Carbon dioxide;
2. Nitrous oxide;
3. Methane;
4. Hydrofluorocarbons;
5. Perfluorocarbons; and
6. Sulfur hexafluoride.

The greenhouse gas emission factors for firing Unit #1 with distillate oil are from AP-42, Table 3.4-1, October 1996 and are listed below:

1. Carbon dioxide = 165 lb/MMBtu

Equation 4-1 will also be used to calculate greenhouse gas emissions. In the case of greenhouse gases, the result of Equation 4-1 needs to be multiplied by 1 for carbon dioxide, to convert the results to carbon dioxide equivalent. The potential emissions for the greenhouse gases are summarized in Table 4-3.

Table 4-3 –Greenhouse Gas Potential Emissions (tons per year)

Unit	Carbon Dioxide	Multiplier	Carbon Dioxide Equivalent
#1	4936	1	4936
Total			4936

4.4 PSD Summary

The potential criteria air pollutant emissions listed in Table 4-2 are less than 250 tons per year and less than 100 tons per year for a single pollutant. The potential carbon dioxide equivalent emissions in Table 4-3 are less than the major source threshold under the PSD program. Therefore, Brentwood Colony is not subject to a PSD review.

5.0 National Emission Standards for Hazardous Air Pollutants

The Department reviewed the national emission standards for hazardous standards and determined the Brentwood Colony is not applicable to any standards under 40 CFR Part 61.

6.0 Maximum Achievable Control Technology Standards

6.1 Potential HAP Emissions

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

The Department uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA’s Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant’s application, or other methods to determine potential air emissions.

Table 3.4-3 and 3.4-3, October 1996, list the hazardous air pollutants emission factors 0.00149 pounds per million Btus for large generators.

Equation 4-1 was used to determine the heat input rate of each generator based on the heat output. The conversion factor was derived from AP-42, Appendix A, page A-29, January 1995, and already accounts for the efficiency of the unit. The heat input for Unit #1 was found to be 6.83 MMBtus/hr.

Using Equation 6-1, the hazardous air pollutant emission factors, the heat input, and assuming 8760 hours of operation per year per non-emergency generator, the potential hazardous air pollutant emissions for the non-emergency generator are included in Table 6-1.

Equation 6-1 – Potential Emissions Based on Heat Input

$$\text{Potential} \frac{\text{tons}}{\text{yr}} = \text{Heat input} \frac{\text{MMBtus}}{\text{hr}} \times 8760 \frac{\text{hrs}}{\text{yr}} \times \text{emission factor} \frac{\text{lbs}}{\text{MMBtus}} \div 2,000 \frac{\text{lbs}}{\text{ton}}$$

Table 6-1 – Potential HAP Emissions

Unit	Total HAPs
#1	0.04 tons per year

Therefore, Brentwood Colony is considered an area source.

The Department reviewed the Maximum Achievable Control Technology (MACT) standards under 40 CFR Part 63 and determined the following need to be reviewed further to determine if they are applicable.

6.2 ARSD 74:36:08:40 – 40 CFR Part 63, Subpart ZZZZ

40 CFR Part 63, Subpart ZZZZ is applicable to any existing, new, or reconstructed stationary reciprocating internal combustion engines located at a major or area source of hazardous air pollutant emissions, excluding stationary reciprocating internal combustion engines being tested at a stationary reciprocating internal combustion engines test cell/stand.

40 CFR § 63.6590(c) states an affected source that is a new stationary reciprocating internal combustion engine located at an area source must meet the requirements of this part by meeting the requirements of 40 CFR Part 60, Subpart IIII for compression ignition engines. No further requirements apply for such engines under this subpart.

Generators constructed prior to June 12, 2006 are considered existing generators. Unit #1 was manufactured in 2002 which makes the generator an existing source. Therefore, Unit #1 is applicable to Subpart ZZZZ.

6.3 Other MACT Standards

The Department determined no other MACT standard is applicable to the non-emergency generator.

7.0 State Requirements

According to ARSD 74:36:05:03, a facility is required to obtain a Title V air quality permit if the source has the potential to emit more than 100 tons of a criteria pollutant (nitrogen oxide, volatile organic compounds, PM10, carbon monoxide, lead and ozone), has the potential to emit more than 10 tons of a single hazardous air pollutant, and has the potential to emit more than 25 tons

of any combination of a hazardous air pollutants, or is applicable to a New Source Performance Standard or a MACT standard. Brentwood Colony's emissions of criteria air pollutants are less than 100 tons per year, carbon dioxide equivalent (CO₂e) are less than 100,000 tons per year and hazardous air pollutant emissions are less than 10 tons per year for a single hazardous air pollutant and 25 tons per year of any combination of hazardous air pollutant. Therefore, a Title V air quality permit is not required due to the criteria pollutant emissions.

The New Source Performance Standard and MACT Standard applicable to the facility were promulgated under sections 111 and 112 of the Clean Air Act. However, ARSD 74:36:07:88 and 40 CFR § 63.6585 (d), an area source (minor) is not required to obtain a Title V permit if the only reason for the Title V permit is the requirement of 40 CFR Part 60 Subpart III and/or 40 CFR Part 63 Subpart ZZZZ. Therefore, A Title V air quality permit is not required due to a federal standard.

Any source operating in South Dakota that meets the definition of a minor source under the ARSD 74:36:04:02 are required to obtain a minor air quality permit. In accordance with ARSD 74:36:04:02.01, a minor source is exempt from obtaining a minor source operating permit if the source has the potential to emit 25 tons per year or less of any criteria pollutant, except lead, before the application of control equipment. The Brentwood Colony's nitrogen oxides, emissions are greater than 25 tons per year. Therefore, Brentwood Colony is required to have a minor air quality permit for the operations at this facility.

7.1 State Restrictions on Visible Emissions

Visible emissions are applicable to any unit that discharges to the ambient air. In accordance with ARSD 74:36:12, a facility may not discharge into the ambient air more than 20 percent opacity for all units. Brentwood Colony must control the opacity at less than 20 percent for the generator.

7.2 State Particulate Emission Limits

Total suspended particulate emission limits are applicable to fuel burning units. Brentwood Colony's operations involve fuel burning units. The total suspended particulate emission limits for fuel burning units are derived from ARSD 74:36:06:02.

The state limits are based on the heat input of the unit in million Btus per hour. Equation 4-1 calculates the heat input for the generator and it was determined to be 6.83 MMBtu/hr.

The maximum heat input value for the Unit #1 is less than 10 million Btus per hour. Based on ARSD 74:36:06:02(1)(a), the state's total suspended particulate emission limit for fuel burning units with a heat input capacity less than 10 million Btus per hour may not exceed 0.6 of particulate matter per million Btus of heat input.

Based on ARSD 74:36:06:02(2), the sulfur dioxide emission limit for a fuel burning unit is 3.0 pounds per million Btus heat input.

Tables 7-1 and 7-2 compare the applicable state total suspended particulate and sulfur dioxide limits with the potential total suspended particulate and sulfur dioxide emission rates

Table 7-1 - Total Suspended Particulate Limit Comparison

Unit	Total Suspended Particulate (lbs/MMBtus)	
	Potential Emission Rate	Emission Limit
#1	0.07	0.6

Table 7-2 - Sulfur Dioxide Limit Comparison

Unit	Sulfur Dioxide (lbs/MMBtus)	
	Potential Emission Rate	Emission Limit
#1	0.002	3.0

Based on the comparison, Brentwood Colony is capable of operating Unit #1 in compliance with the state air emission limits.

8.0 Recommendation

Based on the above findings, Brentwood Colony is not required to obtain a construction permit or Title V air quality operating permit. Brentwood Colony is required to obtain a minor air quality operating permit. Brentwood Colony's non-emergency generator is subject to 40 CFR Part 63, Subpart ZZZZ and must meet those requirements.

Based on information the Department received in the permit application, Brentwood Colony is considered a minor source that does require a minor air quality permit. Questions regarding this permit review should be directed to April Soukup, Engineer I, Air Quality.