



Statement of Basis

Construction Permit

University of South Dakota

Vermillion, South Dakota

TABLE OF CONTENTS

Page

1.0	BACKGROUND	1
1.1	Existing Equipment	1
1.2	Proposed Changes.....	2
2.0	New Source Performance Standards (NSPS)	2
2.1	ARSD 74:36:07:88 – 40 CFR Part 60, Subpart III.....	2
2.2	ARSD 74:36:07 – 40 CFR Part 60, Subpart JJJJ	3
2.3	Other NSPS regulations	3
3.0	New Source Review (NSR).....	4
4.0	Prevention of Significant Deterioration.....	4
4.1	Potential Emissions	5
4.1.1	Potential Emissions – Generator.....	5
5.0	National Emission Standards for Hazardous Air Pollutants	7
6.0	Maximum Achievable Control Technology Standards.....	7
6.1	Potential HAP Emissions.....	7
6.2	MACT Standards.....	7
6.2.1	40 CFR Part 63 Subpart ZZZZ	8
6.2.2	Other MACT standards.....	8
7.0	STATE REQUIREMENTS	8
7.1	State Emission Limits	8
7.2	Compliance Assurance Monitoring.....	8
7.3	Periodic Monitoring.....	9
8.0	Recommendation	9

1.0 BACKGROUND

On January 12, 2015, the South Dakota Department of Environmental & Natural Resources (DENR) received an application for an air quality construction permit from the University of South Dakota (USD), Vermillion South Dakota. The Standard Primary Industrial Classification Code (SIC) for this facility is - 8221.

1.1 Existing Equipment

Table 1.1 provides a list of the units presently permitted which was taken from the current Title V air quality operating permit as amended on August 9, 2013.

Table #1-1 - Description of Permitted Units, Operations, and Processes

Identification	Description	Maximum Operating Rate	Control Device
Unit #1	A 1957 Murray steam boiler with a Peabody burner, model no. MD 445, fired with natural gas and distillate oil.	45,000 pounds of steam per hour heat output	Not Applicable
Unit #2	A 1970 Babcock & Wilcox steam boiler with a Coen burner, model no. FM10, fired with natural gas and distillate oil.	60,000 pounds of steam per hour heat output	Not Applicable
Unit #4	2005 Matthews Cremation Division multiple chamber medical waste incinerator, model Power-Pak II, fired with natural gas. The incinerator will be used to dispose of animal and human tissue.	150 pounds per hour	Not Applicable
Unit #5	2005 Hurst Boiler and Welding Company 100 HP Hurst steam boiler, model 4VT-G-100-150, fired with natural gas.	4.2 million Btus per hour heat input	Not Applicable
Unit #6	2005 Hurst Boiler and Welding Company 100 HP Hurst steam boiler, model 4VT-G-100-150, fired with natural gas.	4.2 million Btus per hour heat input	Not Applicable
Unit #7	2005 Hurst Boiler and Welding Company 100 HP Hurst steam boiler, model 4VT-G-100-150, fired with natural gas.	4.2 million Btus per hour heat input	Not Applicable
Unit #8	2008 York Shipley, Model #5112L-S3W-1000X-S200 steam boiler, fired with natural gas and/or distillate oil.	33.5 million Btus per hour heat input	Not Applicable
Unit #9	2008 York Shipley, Model #5112L-S3W-1000X-S200 steam boiler, fired with natural gas and/or distillate oil.	33.5 million Btus per hour heat input	Not Applicable
Unit #10	Caterpillar 3406 generator fired with distillate oil	400 horsepower	Not Applicable

Identification	Description	Maximum Operating Rate	Control Device
Unit #11	2004 Caterpillar 3412 750 Kw generator fired with distillate oil	7.4 million Btus per hour heat input	Not Applicable
Unit #12	Caterpillar 3408 generator fired with distillate oil	450 horsepower	Not Applicable
Unit #13	Onan 45 EM generator fired with natural gas	60 horsepower	Not Applicable
Unit #14	Onan 8.1 L generator fired with natural gas	225 horsepower	Not Applicable
Unit #15	Onan45EM-4R8 generator fired with natural gas	60 horsepower	Not Applicable
Unit #16	Onan 7.5 generator fired with natural gas	10 horsepower	Not Applicable
Unit #17	Onan 30 generator fired with distillate oil	40 horsepower	Not Applicable
Unit #18	Onan 350 generator fired with distillate oil	470 horsepower	Not Applicable
Unit #23	2010 Caterpillar D60-6 generator fired with distillate fuel	80.5 horsepower	Not Applicable
Unit #24	2010 Cummins 50DGHE generator fired with distillate fuel	82 horsepower	Not Applicable
Unit #25	2010 Kohler 100 REZG generator fired with natural gas	155 horsepower	Not Applicable
Unit #26	Boiler #8 – 2012 Cleaver Brooks 4WG-200-500=200ST steam boiler. The unit is fired with natural gas and distillate oil.	22.5 million Btu per hour heat input	Not applicable
Unit #27	2009 Generac 100 KW generator fired with distillate fuel	100 KW	Not Applicable

1.2 Proposed Changes

On January 12, 2015, USD submitted an application to install a 2015 Caterpillar D40 40 kilowatt diesel generator. Unit #17 has been removed and will be replaced with Unit#17B.

2.0 New Source Performance Standards (NSPS)

DENR reviewed the federal new source performance standards (NSPS) in 40 CFR Part 60 and determined the following may be applicable.

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

DENR review of the NSPS determined 40 CFR Part 60, Subpart IIII may be applicable. 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.

The emergency generator is a compression ignition internal combustion engine and constructed after the April 1, 2006 deadline. Therefore, the generator is applicable to this subpart.

Unit #1 is a 2015 engine that is certified to meet Tier III emission standards for engines (see Table 2-1). Emissions certification forms were submitted in the application.

Table 2-1 – EPA Tier III Emission Standards

Pollutant	Emission Rate	
NO_x + NMHC	4.7	Grams per kWm-hr
TSP/PM10/PM2.5	0.4	Grams per kWm-hr
CO	5.0	Grams per kWm-hr

2.2 ARSD 74:36:07 – 40 CFR Part 60, Subpart JJJJ

DENR review of the NSPS determined 40 CFR Part 60, Subpart JJJJ may be applicable. For the purposes of this subpart, the date construction commences is the date the engine is ordered by the owner or operator. Subpart JJJJ is applicable to owners and operators of stationary spark ignition (SI) internal combustion engines (ICE) that commence construction after June 12, 2006, where the stationary SI ICE are manufactured:

1. On or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 horsepower (except lean burn engines with a maximum engine power greater than or equal to 500 horsepower and less than 1,350 horsepower);
2. On or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 horsepower and less than 1,350 horsepower;
3. On or after July 1, 2008, for engines with a maximum engine power less than 500 horsepower;
4. On or after January 1, 2009, for emergency engines with a maximum engine power greater than 19 kilowatts (25 horsepower); or
5. Owners and operators of stationary SI ICE that commence modification or reconstruction after June 12, 2006.

The generator was constructed after June 12, 2006. However, the generator is fueled with diesel fuel and is not considered a spark ignition engine. Therefore, this generator is not applicable to this subpart.

2.3 Other NSPS regulations

DENR determined no other NSPS regulations are applicable to this emergency generator.

3.0 New Source Review (NSR)

ARSD 74:36:10:01 states 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. USD, located in Vermillion SD, is in attainment or unclassifiable for all the pollutants regulated under the Clean Air Act. Therefore, USD 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 matter with a diameter less than or equal to 10 microns (PM10);
3. Particulate matter 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. Greenhouse gases (carbon dioxide, nitrous oxide, methane, etc.)
10. Fluorides;
11. Sulfuric acid mist;
12. Hydrogen sulfide;
13. Reduced sulfur compounds; and
14. Total reduced sulfur.

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.

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.

On June 24, 2014, the Supreme Court decided greenhouse gases may not be regulated under the PSD program unless the facility requires a PSD permit for the other regulated air pollutants.

4.1 Potential Emissions

DENR 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.

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 USD is required to meet.

4.1.1 Potential Emissions – Generator

Generators produce emissions from the burning of fuel. Table 4-1 displays the sulfur dioxide, nitrogen oxide and volatile organic compounds emission factor are derived from the Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1, Chapter 3, Section 3.3-1, 1996) for gasoline and diesel industrial engines. The particulate matter and carbon monoxide emission factors were derived from the New Source Performance Standard Subpart III requirements.

Table 4-1 – Fuel Emissions Factor for the Proposed Generator

	PM ₁₀	SO ₂ ¹	NOx	CO	VOC
Diesel Fuel – Engine (lb/MMBtu)		0.29	4.41		0.35
Diesel Fuel – Engine (grams/kilowatt-hour)	0.4			5.0	
Diesel Fuel – Engine (pounds/horsepower)	0.00088		0.0152	0.0187	0.0022

¹ – Sulfur oxide emissions are a function of the sulfur content in the fuel (1.01 x Sulfur Content). The New Source Performance Standard Subpart IIII requires the generator to be fueled with ultra-low sulfur fuel 0.0015% sulfur by weight.

DENR converted this unit’s output rating to an estimated heat input rating based on the conversion factors of 3,413 Btus per hour per kilowatt, and 1,000,000 Btus per MMBtus and the generator efficiency in Equation 4-1.

Equation 4-1– Generator Conversion

$$\text{Estimated Heat Input} = \text{Output (Kw)} \times \frac{3,413 \text{ Btu}}{\text{Kw}} \times \frac{1 \text{ MMBtu}}{1,000,000 \text{ Btu}} \times \frac{1}{35\%}$$

Estimated Heat Input = 0.4 MMBtus/hr

DENR used Equation 4-2 and 4-3 to calculate emission. Because the generator will be utilized as an emergency generator, DENR assumed the unit will operate 500 hours per year.

Equation 4-2 Calculating Potential Emissions Using Heat Input

$$\text{PE} = \text{Heat Input} \frac{\text{MM Btus}}{\text{Hour}} \times \text{Emission Factor} \frac{\text{pounds}}{\text{MM Btus}} \times \frac{500 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ pounds}}$$

Equation 4-3 Calculating Potential Emissions Using Subpart IIII Emission Factors

$$\text{PE} = \text{Output(Kw)} \times \text{E F} \frac{\text{grams}}{\text{Kw – hour}} \times \frac{1 \text{ pound}}{454 \text{ grams}} \times \frac{500 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ pounds}}$$

Using the heat input from Equation 4-1 and Equations 4-2, and 4-3, DENR calculated the potential emissions for the generator. The AP-42 emission factor for PM₁₀ was also used to calculate the total suspended particulate and particulate matter less than 2.5 microns. The results are shown in Table 4-3.

Table 4-3 - Potential Uncontrolled Emissions from the Proposed Generator (tons/year)

Unit	TSP	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC
Proposed generator	0.009	0.009	0.009	0.03	0.4	0.1	0.04

Table 4-4 lists the potential emissions for USD’s existing operations as noted in the statement of basis for the November 2012 construction permit and the proposed generator.

Table 4-4 – Facility Potential Uncontrolled Emissions (tons/year)

Unit	TSP	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC
Existing operations	12	12	12	53	171	41	30
Proposed generator	0.009	0.009	0.009	0.03	0.4	0.1	0.04
Facility Total	12	12	12	53	171	41	30

USD is not one of the 28 named PSD source categories; therefore, the potential limit to emit is 250 tons per year for PSD. The potential criteria air pollutant emissions listed in Table 4-4 are less than 250 tons per year. Therefore, USD is not subject to a PSD review. Since USD does not require a PSD permit, a review of the greenhouse gases will not be required.

5.0 National Emission Standards for Hazardous Air Pollutants

DENR reviewed the national emission standards for hazardous standards and determined the generator 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.

DENR 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.

The potential for generators to emit HAPs can be calculated using the same assumptions outlined in section 4.1.1. The emission factors for diesel engines for HAPs with maximum operating rates less than 600 horsepower are in Table 6-1. The total potential emissions can be calculated using Equation 4-2. The results for the proposed generator listed in Table 6-1.

Table 6-1 – Potential HAPs for Proposed Generator

Pollutant	Emission Factor (lbs/MMBtus)	Potential HAPs (tons per year)
Benzene	0.000933	0.0
Toluene	0.000409	0.0
Xylene	0.000285	0.0
Propylene	0.00258	0.0
Formaldehyde	0.00118	0.0
Acetaldehyde	0.000767	0.0
Acrolein	0.0000925	0.0
	Total HAPs	0.0

Based on Table 6-1 and the potential emissions from the existing facility (3 tons per year) as outlined in the statement of basis for the November 2012 construction permit, USD is considered an area source of HAPs.

6.2 MACT Standards

DENR 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.

6.2.1 40 CFR Part 63 Subpart ZZZZ

In accordance with 40 CFR Part 63 Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE) an affected source is 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).

The generator was constructed after June 12, 2006, and is located at an area source. Under section 40 CFR § 63.6590 (c) it states that a new or reconstructed stationary 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 or 40 CFR part 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under this part. Therefore, the generator is subject to Subpart ZZZZ, and must meet requirements of this subpart by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines.

6.2.2 Other MACT standards

DENR determined no other MACT standard is applicable to the proposed generator.

7.0 STATE REQUIREMENTS

7.1 State Emission Limits

Total suspended particulate and sulfur dioxide emission limits are applicable to fuel burning units. The total suspended particulate and sulfur dioxide emission limits for fuel burning units are derived from ARSD 74:36:06. These limits apply to just those units that are required to obtain a permit under ARSD 74:36.

In accordance with ARSD 74:36:06:01, a unit that is subject to a NSPS that contains limits on particulate matter and/or sulfur dioxide is not applicable to the state's particulate matter and/or sulfur dioxide emission limits. The NSPS that are applicable to the emergency generators contains particulate matter and sulfur dioxide emission limits; therefore the state's particulate matter and sulfur dioxide emission limits are not applicable to Unit #17B.

Emergency generators are subject to the opacity limit in ARSD 74:36:12. In accordance with ARSD 74:36:12:01, emergency generators may not emit air emissions of a density equal to or greater than that designated as 20% opacity. DENR has observed visible emissions from emergency generators and believes this unit can meet the opacity limit.

7.2 Compliance Assurance Monitoring

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. 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.

USD does not use a control device to achieve compliance with applicable requirements. Therefore, compliance assurance monitoring for the proposed emergency generator is not applicable to USD.

7.3 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. USD is required to meet NSPS Subpart IIII and JJJJ emission limits as applicable.

Under Subpart IIII, emergency stationary internal combustion engines (ICE) may be operated for the purpose of maintenance checks and readiness testing, provided that the tests are recommended by Federal, State, or local government, the manufacturer, the vendor, or the insurance company associated with the engine. Maintenance checks and readiness testing of such units is limited to 100 hours per year. There is no time limit on the use of emergency stationary ICE in emergency situations. Anyone may petition the Secretary for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency ICE beyond 100 hours per year. For owners and operators of emergency engines meeting standards under 40 CFR §60.4205 but not 40 CFR §60.4204, any operation other than emergency operation, and maintenance and testing as permitted in this section, is prohibited.

Subpart IIII requires that owners/operators of a compression ignited engine must install a non-resettable hour meter prior to start-up of the engine. This requirement along with the recordkeeping will demonstrate compliance with the hourly requirements.

Subpart IIII requires the owner or operator of a compression ignition engine to operate the unit according to the manufacturer's written instructions or procedures developed by the owner/operator that are approved by the engine manufacturer. Owners/operators may only change those settings that are permitted by the manufacturer. Owners/operators must use diesel fuel that conforms with the requirements of 40 CFR §80.501(a) and (b). Recordkeeping requirements will demonstrate compliance with this requirement.

8.0 Recommendation

Any source operating in South Dakota that meets the definition of a minor source under the ARSD 74:36:01:01(38) is required to obtain a minor air quality operating permit. USD is required to operate within the requirements stipulated in the following regulations under the minor air quality operating permit program:

1. ARSD 74:36:04 – Minor Operating Permits;
2. ARSD 74:36:07 – New Source Performance Standards;
3. ARSD 74:36:08 – National Emission Standards for Hazardous Air Pollutants; and
4. ARSD 74:36:12 – Control of Visible Emissions.

Based on information DENR received in the permit application, DENR recommends approval of an air quality construction permit for USD. Questions regarding this permit review should be directed to Keith Gestring, Engineer III.