Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone 304/926-0475

Jim Justice, Governor
Austin Caperton, Cabinet Secretary
www.dep.wv.gov

ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Registration No.:	R13-3352 ***After-the-Fact***
Plant ID No.:	061-00230
Applicant:	West Virginia University
Facility Name:	HSC Campus
Location:	Morgantown, Monongalia County
NAICS Code:	611310
Application Type:	Construction
Received Date:	December 08, 2016
Engineer Assigned:	Thornton E. Martin Jr.
Fee Amount:	$2,000.00
Date Received:	December 12, 2016
Complete Date:	January 24, 2017
Applicant Ad Date:	December 05, 2016
Newspaper:	*The Dominion Post*
UTM's:	Easting: 589.137 km Northing: 4389.919 km Zone: 17
Description:	West Virginia University has applied for a permit for five (5) emergency generators that were installed for the purpose of providing back-up electrical power for critical operating functions.

BACKGROUND DISCUSSION

This is an after-the-fact application for five (5) emergency generators installed for the purpose of allowing key systems to continue to operate without interruption during times of utility power outages. HSC North - Room B6D (G1-HSC) 1500 kW generator was installed in 2004; the HSC South Room G400 (G3-HSC) 600 kW generator was installed in 2016; the HSC North - Animal Facilities Annex (G4-HSC) 600 kW generator was installed in 2013; the HSC Biomedical Research Center (G6-HSC) 750 kW generator was installed in 2008; the HSC Blanchette Rockefeller Neurosciences Institute (G7-HSC) 800 kW generator was installed in 2008. The emergency generators will be operated no more than 500 hours per year and the facility will limit testing and maintenance use to 100 hours per engine per calendar year. The following Table outlines the facility/generator configuration:

Table 1: Generator Location

Emission Unit ID	Emission Unit Location	Detail Make/Model	Year Installed/ Modified	Design Capacity	Type and Date of Change	Control Device[1]
G1-HSC	HSC North - Room B6D	2004 Caterpillar / 3512B	2004	1500 kW 2040 bhp	After-the-Fact	A/F
G3-HSC	HSC South Room G400	2016 Detroit Diesel 92 / 600R02D71	2016	600 kW 816 bhp	After-the-Fact	DOC, DPF, SCR
G4-HSC	HSC North - Animal Facilities Annex	2012 Cummins / DQCA-1209108	2013	600 kW 816 bhp	After-the-Fact	Turbo, After-cooled
G6-HSC	HSC Biomedical Research Center	2007 Cummins / 750DQFAA-7055	2008	700 kW 1020 bhp	After-the-Fact	After-cooled
G7-HSC	HSC Blanchette Rockefeller Neurosciences Institute	2007 Cummins / DQFAB-5776873	2008	800 kW 1088 bhp	After-the-Fact	After-cooled

[1] A/F - Air/ Fuel ratio; DOC - Diesel Oxidation Catalyst; DPF - Diesel Particulate Filter; SCR - Selective Catalyst Reduction

SITE INSPECTION

A site inspection was deemed unnecessary by the writer at this time, however, the facilities will be placed on the emergency generator list of sources from this permitting action.

Directions: From I-79 N, take exit 155 (Star City/Osage exit), turn right and travel Northeast on Chaplin Hill Road towards University Town Center. Bear right onto US-19/WV-7/Jerry West Blvd. (Sheetz is on the right corner) and travel 1.4 miles. Turn left onto Patteson Drive (at WVU Coliseum) and travel East 0.8 miles. Turn slight right onto Elmer Prince Dr., take the first exit ont the roundabout to Medical Center Drive. Parking is located on the left side of the street. The Health Sciences Building is a grey building, located directly behind Ruby Memorial Hospital.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emission estimates for criteria pollutants were derived from the Manufacturer's supplied data. Hazardous and toxic pollutants were determined using emission factors from AP-42, 5th Edition, 1996. Emission estimates were calculated by the applicant and checked for accuracy and completeness by the writer.

West Virginia University's proposed emergency generator installation and operation (*after-the-fact*) will result in the following estimated potential to discharge controlled emissions:

Table 2: Emergency Generator Emission Summary - Criteria Pollutants

Source ID No.	Potential Emissions (lbs/hr)					Potential Emissions (tons/yr)				
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**	**NOx**	**CO**	**VOC**	**SO_2**	**PM_{10}**
G1-HSC	48.960	11.220	1.438	16.504	1.438	12.240	2.805	0.360	4.126	0.357
G3-HSC	19.584	5.451	0.575	1.673	1.795	4.896	1.363	0.144	0.418	0.449
G4-HSC	11.341	4.062	0.575	1.673	1.795	2.835	1.016	0.144	0.418	0.449
G6-HSC	8.717	0.966	0.719	2.091	0.292	2.179	0.242	0.180	0.523	0.073
G7-HSC	9.418	1.078	0.767	2.230	0.288	2.355	0.270	0.192	0.558	0.072
TOTAL	98.02	22.777	4.074	24.171	5.608	24.505	5.696	1.02	6.043	1.4

Table 3: Emergency Generator Emission Summary - Hazardous/Toxic Pollutants

Source	Potential Emissions (lbs/hr)						Potential Emissions (tons/yr)					
	Benzene	**Ethyl-benzene**	**Toluene**	**Xylenes**	**n-Hexane**	**Formal-dehyde**	**Benzene**	**Ethyl-benzene**	**Toluene**	**Xylenes**	**n-Hexane**	**Formal-dehyde**
G1-HSC	0.00484	0	0.00212	0.00148	0	0.00612	0.00121	0	0.00053	0.00037	0	0.00153
G3-HSC	0.00194	0	0.00085	0.00059	0	0.00245	0.00048	0	0.00021	0.00015	0	0.00061
G4-HSC	0.00161	0	0.00058	0.00040	0	0.00016	0.00040	0	0.00015	0.00010	0	0.00041
G6-HSC	0.00201	0	0.00073	0.00050	0	0.00020	0.00050	0	0.00018	0.00012	0	0.00005
G7-HSC	0.00215	0	0.00078	0.00053	0	0.00022	0.00054	0	0.00019	0.00013	0	0.00005
TOTAL	0.013	0.000	0.005	0.004	0.000	0.009	0.003	0.000	0.001	0.001	0.000	0.003

REGULATORY APPLICABILITY

PSD has no applicability to the proposed facility. The facility is subject to the following state and federal rules:

45CSR13 *Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation*

The proposed construction is subject to the requirements of 45CSR13 because there will be a potential to discharge controlled emissions in excess of 6 pph and 10 tpy of a regulated air pollutant (NOx). In addition, the proposed construction is ineligible for a General Permit and therefore requires a Rule 13 Permit to Construct. The applicant has submitted the $2,000 application fee and published a Class I legal advertisement in *The Dominion Post* on December 05, 2016.

45CSR22 *Air Quality Management Fee Program*

This rule establishes a program to collect fees for certificates to operate and for permits to construct, modify or relocate sources of air pollution. Funds collected from these fees will be used to supplement the Director's budget for the purpose of maintaining an effective air quality management program.

45CFR60 *Subpart IIII—Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*

West Virginia University is subject to this subpart because four (4) engines (G3-HSC, G4-HSC, G6-HSC and G7-HSC) were manufactured after April 1, 2006. Engine (G3-HSC) is EPA Tier 4F certified, engine (G4-HSC) is EPA Tier 4 certified and engines (G6-HSC and G7-HSC) are EPA Tier 2 certified. Manufacturer's supplied data indicate these engines will meet their respective certification standard.

40CFR63 *Subpart ZZZZ—National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*

West Virginia University is subject to 40CFR63 Subpart ZZZZ, because Unit (G1-HSC) is considered an existing area source of HAP's since it was constructed or installed before June 12, 2006. Unit G1-HSC, will operate under the U.S. EPA's National Emission Standards for Hazardous Pollutants ("NESHAP") as per 40CFR63 Subpart ZZZZ. Engines operating under the NESHAP cannot use the WV DEP's General Permit for Emergency Engines and therefore, must be permitted through an individual Rule 13 Permit.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Acetaldehyde:
Acetaldehyde is mainly used as an intermediate in the synthesis of other chemicals. It is ubiquitous in the environment and may be formed in the body from the breakdown of ethanol. Acute (short-term) exposure to acetaldehyde results in effects including irritation of the eyes, skin, and respiratory tract. Symptoms of chronic (long-term) intoxication of acetaldehyde resemble those of alcoholism. Acetaldehyde is considered a probable human carcinogen (Group B2) based on inadequate human cancer studies and animal studies that have shown nasal tumors in rats and laryngeal tumors in hamsters.

Benzene:
Benzene is found in the air from emissions from burning coal and oil, gasoline service stations, and motor vehicle exhaust. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidence

of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. EPA has classified benzene as a Group A, human carcinogen.

Ethyl Benzene:
Ethyl benzene is mainly used in the manufacturing of styrene. Acute (short-term) exposure to ethyl benzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects, such as dizziness. Chronic (long-term) exposure to ethyl benzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethyl benzene. Limited information is available on the carcinogenic effects of ethyl benzene in humans. In a study by the National Toxicology Program (NTP), exposure to ethyl benzene by inhalation resulted in an increased incidence of kidney and testicular tumors in rats, and lung and liver tumors in mice. EPA has classified ethyl benzene as a Group D, not classifiable as to human carcinogenicity.

Formaldehyde:
Formaldehyde is used mainly to produce resins used in particle board products and as an intermediate in the synthesis of other chemicals. Exposure to formaldehyde may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Acute (short-term) and chronic (long-term) inhalation exposure to formaldehyde in humans can result in respiratory symptoms, and eye, nose, and throat irritation. Limited human studies have reported an association between formaldehyde exposure and lung and nasopharyngeal cancer. Animal inhalation studies have reported an increased incidence of nasal squamous cell cancer. EPA considers formaldehyde a probable human carcinogen (Group B1).

Toluene:
The acute toxicity of toluene is low. Toluene may cause eye, skin, and respiratory tract irritation. Short-term exposure to high concentrations of toluene (e.g., 600 ppm) may produce fatigue, dizziness, headaches, loss of coordination, nausea, and stupor; 10,000 ppm may cause death from respiratory failure. Ingestion of toluene may cause nausea and vomiting and central nervous system depression. `Contact of liquid toluene with the eyes causes temporary irritation. Toluene is a skin irritant and may cause redness and pain when trapped beneath clothing or shoes; prolonged or repeated contact with toluene may result in dry and cracked skin. Because of its odor and irritant effects, toluene is regarded as having good warning properties. The chronic effects of exposure to toluene are much less severe than those of benzene. No carcinogenic effects were reported in animal studies. Equivocal results were obtained in studies to determine developmental effects in animals. Toluene was not observed to be mutagenic in standard studies.

Xylene:
Commercial or mixed xylene usually contains about 40-65% m-xylene and up to 20% each of o-xylene and p-xylene and ethyl benzene. Xylenes are released into the atmosphere as fugitive emissions from industrial sources, from auto exhaust, and through volatilization from their use as solvents. Acute (short-term) inhalation exposure to mixed xylenes in humans results in irritation of the eyes, nose, and throat, gastrointestinal effects, eye irritation, and neurological effects. Chronic (long-term) inhalation exposure of humans to mixed xylenes results primarily in central nervous system (CNS) effects, such as headache, dizziness, fatigue, tremors, and incoordination; respiratory,

cardiovascular, and kidney effects have also been reported. EPA has classified mixed xylenes as a Group D, not classifiable as to human carcinogenicity.

AIR QUALITY IMPACT ANALYSIS

Air dispersion modeling was not performed as the source is not a 'major source' as defined under Rule 14 and Monongalia County is designated as 'in attainment' for all Regulated Pollutants.

RECOMMENDATION TO DIRECTOR

The information contained in the permit application R13-3352 indicates that compliance with all applicable state rules and federal regulations should be achieved when all proposed control methods are in operation. Therefore, the granting of a permit to West Virginia University for the installation and operation of five (5) emergency generators at the HSC Campus, Morgantown, Monongalia County, WV, is hereby recommended.

Thornton E. Martin Jr.
Permit Engineer

February 08, 2017
Date