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ENGINEERING EVALUATION/FACT SHEET

B ACKGROUND INFORMATION

Application No.:	R13-1124B
Plant ID No.:	011-00020
Applicant:	St Mary's Medical Center
Facility Name:	St Mary's Hospital
Location:	Huntington
NAICS Code:	238220
Application Type:	Modification
Received Date:	November 19, 2012
Engineer Assigned:	Edward S. Andrews, P.E.
Fee Amount:	$2000.00
Date Received:	November 19, 2012
Complete Date:	December 13, 2012
Due Date:	March 13, 2012
Applicant Ad Date:	November 19, 2012
Newspaper:	*The Herald-Dispatch*
UTM's:	Easting: 377.5 km Northing: 4,254.5 km Zone: 17
Description:	The application is for the replacement of all of the existing boilers at the hospital with three 500 Bhp Boilers.

DESCRIPTION OF PROCESS

The St. Mary's Medical Center (SMMC) is located at 2900 First Avenue, Huntington, West Virginia. The facility currently has five boilers on site, which are as follows:

- Two Keeler duel fuel boilers rated at 21 MMBtu/hr (Installed in 1958)
- One Bryan natural gas fired boiler rated at 6.4 MMBtu/hr (Installed in 1999)
- Two Unilux natural gas boilers rated at 12 MMBtu/hr (Installed in 2005)

Recently, the two Keeler boilers have suffered tube failures beyond reasonable repair. The Unilux boilers have not proven to provide reliable and consistent operation. Due to the loss

of the Keeler boilers, SMMC has elected to replace all five of these existing boilers as soon as possible.

Based on past steam demand for the medical center, the summer months only required about 350 Bhp to operate the facility. This demand increases up to 800 Bhp for the winter months or the heating season. Thus, SMMC has elected to replace all of these boilers with three (3) 500 Bhp Superior boilers. This arrangement would allow the steam plant operate only two of these units at any given time with the third unit as a spare.

Because these units provide heat energy to a medical treatment facility, the national building code requires each unit to be capable of being operated on a back-up fuel source. Thus, these Superior boilers are natural gas fired as the primary fuel with fuel oil as the secondary or back-up fuel. The rated input of these units is 21 MMBtu/hr.

In addition to this boiler replacement, SMMC has elected to upgrade the facility's fuel oil storage and supply system. This upgrade will include a new 30,000 gallon underground storage tank to store the back-up fuel oil for the boilers and emergency generators. Included with this system is a continuous circulating system that prevents water and other contaminants from building up in the fuel oil.

SITE INSPECTION

On December 12, 2012, the writer visited the site. Mr. Phillip Gentry, P.E., Director of Building Systems for Valley Engineering, was on site during this inspection. SMMC has retained the services of Valley Engineering to design out this project as well as prepare the submitted permit application on SMMC's behalf.

A new structure has been erected to house these new boilers, which is located adjacent to the existing power house. These structures are located behind the main hospital building which borders next to an existing residential area. The writer estimated the nearest residential dwelling being just over 100 feet away the proposed boilers.

The boilers were on site at the time of this visit. The writer recorded the model and serial number of each these units (Model 7X-2500; SN# 17343, 17345, & 17347). The model number corresponds to the one listed in the application. Mr. Gentry pointed out that each of these boilers has an additional heat exchanger built-in them. The purpose of this additional heat exchanger is to allow a slip steam to pass through it to maintain temperature within the unit in a "hot idle" condition without requiring the burner to fire periodically to keep one of the spare boiler ready to be brought on line without any delay.

In addition, the facility has two emergency generator sets, which are covered by Permit R13-1124A. The writer was able to verify that the engines for these generator sets were manufactured in December 2005, which means that these engines are not subject to New Source Performance Standards of Part 60.

ESTIMATE OF EMISSION BY REVIEWING ENGINEER

The applicant supplied emissions estimates from the manufacturer and used emissions factors from Chapters 1.3 (oil fired) and 1.4 (natural gas fired) of AP-42 to estimate emissions from the new dual fuel fired boilers. The emissions listed in the following table are manufacturer's estimates: The proposed boilers are equipped with Weishaupt burners that are designed for low-NO_x operation. In addition, the boiler controller will vary the firing rate to maintain an outlet (exhaust) concentration of 3% oxygen. This would yield a carbon monoxide concentration of less than 50 ppm. An oxygen sensor is going to be installed in the stack to provide input to the boiler controller. These advanced burners and associated controls make the emission estimates using AP-42 factors not realistic and therefore they are not presented in this evaluation.

Table #1 - Emission Estimates one Replacement Boiler

Pollutant	Hourly Rate on Natural Gas (lb/hr)	Hourly Rate on Fuel Oil (lb/hr)	Worst Case Annual Rate (TPY)
Particulate Matter (PM) /Particulate Matter Less Than 10 microns (PM_{10})/Particulate Matter less than 2.5 microns ($PM_{2.5}$)	0.07	0.14	0.61
Sulfur Dioxide (SO_2)	0.01	0.04	0.18
Oxides of Nitrogen (NO_x)	0.76	2.48	10.86
Carbon Monoxide (CO)	0.82	1.74	7.62
Volatile Organic Compounds (VOCs)	0.07	0.14	0.61
Total Hazardous Air Pollutants (HAPs)	0.04	6.24E-3	0.11
Carbon Dioxide Equivalent (CO_2e)	2,436	3,394	14,866

The worst case potential for the new boilers is to be firing on diesel (fuel oil). SMMC has elected only to fire these units on diesel as a back-up fuel supply only if there is an issue with their natural gas supply. Thus, the maximum annual emission from one of these new boilers on natural gas is expected to be less than four tons per year for any regulated pollutant other than carbon dioxide equivalent.

Other emissions sources at the facility are two existing generator sets. SMMC has elected to only use ultra-low sulfur diesel, which will reduce the facility's potential sulfur dioxide emissions by nearly 55 tons per year compared to their existing permit.

Table #2 - Facility New Potential			
Pollutant	Worst Case w/3 New Boilers (TPY)	Facility Total Potential (TPY)	Net Difference Between Permit R13-1124A vs. Proposed (TPY)
Particulate Matter (PM) /Particulate Matter Less Than 10 microns (PM_{10})/Particulate Matter less than 2.5 microns ($PM_{2.5}$)	1.83	2.85	1.83
Sulfur Dioxide (SO_2)	0.54	1.74	-55.12
Oxides of Nitrogen (NO_x)	32.58	58.48	21.98
Carbon Monoxide (CO)	22.86	24.9	13.94
Volatile Organic Compounds (VOCs)	1.83	2.07	-0.83

The SMMC had five boilers of different sizes from 21 MMBtu to 6.4 MMBtu/hr and two existing generator sets. All five of these existing boilers will be decommissioned once the replacement boilers are commissioned. Just considering the NO_x and CO potential of the two existing 21 MMBtu/hr boilers on just natural gas, the actual emission change would be just 4 tons of NO_x increase and one ton of carbon monoxide decrease. If the replacement boilers solely operated on natural gas as intended, this proposed change will result in actual decreases of all the regulatory pollutants.

REGULATORY APPLICABLILITY

This facility is a non-major source subject Title V, which is refer as a "deferred" source. According to the DAQ's policy on Rule 13 Guidance for Natural Gas Combustion Sources, these replacement boilers would not need to obtain a Rule 13 for firing on natural gas. The estimated emissions confirm that none of the hourly emissions are above 6 pounds per hour. However, the burners for these boilers will be capable of being fired with fuel oil as a back-up fuel supply. This voids the application of this policy for this case.

To trigger the Rule 13 modification thresholds, all three of the replacement boilers would have to operate on fuel oil continuously. Valley Engineering has sized these boilers based on meeting the hospital's demand for most situations with only one boiler. Even in stand-by mode, the boiler will not be needed to be fired in a hot idle condition. These boilers are equipped with a separate heat exchanger that keeps the unit at a hot idle condition without the need to fire the burner at any periodic frequency. Basically, steam is routed through this heat exchanger to

maintain the temperature of the idle boiler. Typically a boiler in hot idle condition will have to fire its burner on some sort of frequency to maintain temperature.

It is understood that these sources burning natural gas are significantly below the applicable allowable limitations in Rule 2 and Rule 10, which are the State of West Virginia's rules addressing particulate matter (PM) and sulfur dioxide (SO_2) from boilers, regardless of the size of the unit. This understanding is confirmed with the provisions in Rules 2A and 10A, which exempts such sources for conducting periodic testing and monitoring for the purpose of demonstrating compliance with the limitations under these rules.

SMMC has elected to only burn ultra-low sulfur diesel fuel (distillate oil) as the back-up fuel for these replacement boilers. Firing on this type of fuel, the replacement boiler would only be 8% of the allowable of 0.05lb of PM per MMBtu under Rule 2 and 0.05% of the allowable of 3.1 lb of SO_2 per MMBtu under Rule 10. Thus, compliance with the emission limitation in these two rules is met by using ultra-low sulfur diesel.

The replacement boilers are subject to the sulfur dioxide standard of 40 CFR 60, Subpart Dc. 40CFR§60.42c(d) allows affected sources to comply with the limitation by use of a fuel with a sulfur content of no greater than 0.5% by weight. Ultra-low sulfur diesel has a maximum sulfur content of 15 ppm by weight, which equates to 0.0015% sulfur by weight. Again, the use of this fuel easily allows SMMC to operate in compliance with the standard.

The writer does not understand why combustion of low-sulfur diesel or ultra-low sulfur diesel (ULSD) does not fall with the Rule 13 Guidance for Natural Gas Combustion Sources when the emissions are nearly the same.

Table #3 Compassion of Natural Gas to ULSD		
Pollutant	Natural Gas* (lb/hr)	ULSD (lb/hr)
PM	0.15	0.14
NOx	2.03	2.48
CO	1.71	1.74
SO_2	0.01	0.04

* Emission rates are based on factor published in Chapter 1.4 of AP-42

Clearly, the emissions rates are nearly the same except for NO_x. The agency should consider updating this policy to account for natural gas fired boilers with low-sulfur or ultra-sulfur diesel as back-fuel into the policy. These type of boilers are very common for hospitals, prisons, and other institutional users that require a secondary fuel supply to ensure continuous operations.

The writer is recommending monitoring with the DAQ's policy on Rule 13 Guidance for Natural Gas Combustion Sources and the certified supplier requirements of 40 CFR 60, Subpart Dc.

SMMC prepared and submitted a complete application, paid the filing fee, and published a Class I Legal ad in *The Herald-Dispatch* on November 19, 2012. This proposed modification does not trigger any additional rule or regulations. Under the Area Source Boiler General Achieve Control Technology (GACT) regulation (40 CFR Part 63, Subpart JJJJJ), boilers than burn fuel oil such as diesel as a back-fuel due to natural gas curtailments and gas supply emergency are not defined as oil burning sources under the subpart and therefore are not subject to the emission standard. The writer developed specific language and additional monitoring to ensure these replacement boilers do not trigger this subpart.

Because of potential to emit from this facility is less than 100 tons per year of any regulated pollutant, expect for greenhouse gases which is less than 100,000 tons per year, and less than 10 tons per year of any single hazardous air pollutant with a combined total of less than 25 tons per year. The St. Mary's Medical Center is classified as a non-major source subject to 45 CSR 30 as a "deferred source". These new boilers are subject to a New Source Performance Standard, which bring the facility in to 45 CSR 30. Since the facility is a non-major source under 45 CSR 30, the facility can be classified as a deferred source". This means that the SMMC only has to provide "Certified Emission Statements" and fees on an annual basis in accordance with 45 CSR 30.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

These replacement boilers will not emit any pollutants that aren't already being emitted by another emission source at the facility. Therefore, no information about the toxicity of the hazardous air pollutants (HAPs) is presented in this evaluation.

AIR QUALITY IMPACT ANALYSIS

The writer deemed that an air dispersion modeling study or analysis was not necessary, because the proposed modification does not meet the definition of a major source as defined in 45CSR14.

MONITORING OF OPERATIONS

The writer recommends the following monitoring requirements:

- Facility total fuel usage or delivered by fuel type for each month. This is required by Rule 2, 10, and Subpart Dc.
- Total number of hours that each boiler operates by diesel fuel as part of readiness check. To ensure the boiler(s) does not trigger the Boiler GACT.
- Conduct visible emission checks if the boiler has operated on diesel fuel for 30 consecutive operating days.

CHANGES TO PERMIT R13-1124A

For the most part, the biggest difference between Permit R13-1124A and the proposed draft is that Permit R13-1124A contained redundant limits for the two Unilux Boilers and generators. These emissions sources had restrictions on diesel fuel consumption and hours of operation. The recommended draft adopts hours of operation limits for the generators. Condition 4.1.1.a. of the draft is based on the Boiler GACT definition "Oil Subcategory" that exclude the firing on diesel fuel in the boilers up to 48 hours per year for readiness checks/periodic testing.

The writer recommends focusing on the type of diesel fuel being used than the quantity. As noted earlier in this evaluation, the use of ultra-low sulfur diesel would reduce the permitted limit of sulfur dioxide emissions by nearly 55 tons per year from the facility.

The monitoring and record keeping will remain nearly the same. Permit R13-1124A did not clearly define the reporting period as noted 40CFR§60.48c(j) (six-month period). The writer recommends adopting the Title V reporting time line, which is January to June and July to December. The draft clearly specifies what the reports must contain as required in Subpart Dc and when such reports must be submitted by.

R13-1124A notes that the SMMC is subject to 40 CFR 60, Subpart Dc. However, the permit notes that the SMMC is not subject to Title V. The writer believes that this was over looked during the review of Permit Application R13-1124A. The source is a non-major source subject to a Federal Standard which make the SMMC subject to 45 CSR 30. Because the SMMC is non-major source for both criteria pollutants and hazardous air pollutants, the SMMC should be identified as a "Title V Deferred Source" and be required to submit Certified Emission Statements and pay fees in accordance with 45 CSR 30 instead of 45 CSR 22.

The following table is the specific conditions in Permit R13-1124A and the change recommended by the writer.

Table #4 Summary of Specific Condition Changes to Permit R13-1124A

Condition No. in R13-1124A	Condition in R13-1124A	Proposed Change To/Omission	Remarks
4.1.1.	The amount of natural gas to be burned by the Unilux 12 mm Btu per hour boilers, identified as emission unit B1 and B2 in permit application R13-1124A, shall not exceed 212 mmscf per year of natural gas	Incorporated the new boilers into Condition 4.1.1. The existing units will no longer be operated, thus the Unilux unit were omitted.	Only need to restrict diesel usage for readiness checks (See Boiler GACT)

4.1.2.	The amount of diesel fuel to be burned as a backup fuel by the Unilux 12 mmBtu per hour boilers, identified as emission unit B1 and B2 in permit application R13-1124A, shall not exceed 87,00 gallons per year.	Incorporated the back-by fuel restriction into Condition 4.1.1.a.	No need to restrict total diesel fuel usage in the new boilers, Limiting to ultra-low sulfur diesel limits the maximum potential to emission of SO_2 to 0.54 tons per year.
4.1.3.	The maximum number of hours that diesel fuel may be burned as back up fuel in the boiler shall not exceed 500 hours per year on a per boiler basis.	Omitted	No reason for such a restriction. See above remark.
4.1.4.	The amount of diesel fuel to be burned by the Cummins 12 mmBtu per hour generators, identified as emission unit G1 and G2 in permit application R13-1124A, shall not exceed 43,650 gallons per year on a per generator basis.	Omitted	Existing Condition 4.1.5. restricts each engine to 500 hours of operation per year, which will be retain.
4.1.5.	The maximum number of hours that diesel fuel may be burned in the generators shall not exceed 500 hours per year on a per generator basis.	Retain as Condition 4.1.2.	N/A
4.1.6.	No person shall cause , suffer, allow or permit the discharge of particulate matter into the open air from all fuel burning units located at one plant, measure in terms of pounds per hour in excess of the amount determined as follows: For Type 'b' fuel burning units, the product of 0.09 and the total design heat inputs for such units in millions B.T.U.'s per hour, provide however that no more than six hundred (600) pounds per	Omitted	The proposed permit restricts fuel to only clean burning natural gas expect for supply interruption. Then the source is limit to ultra-low diesel fuel as a back-up. PM emissions due to firing with diesel is 0.007 lb/MMBtu or just 7.4% of the allowable.

	hour of particulate matter shall be discharged into the open air from all such untis;		
4.1.7.	Maximum Allowable Emission Rates for Similar Units in All Priority III Regions Except Region IV. – No Person shall cause, suffer, allow or permit the discharge of sulfur dioxide into the open air from all stacks located at one plant, measured in terms of pounds per hour, in excess of the amount determined as follows: For type 'b' and Type 'c' fuel burning units, the product of 3.2 and the total design heat inputs for such units discharging through those stacks in million BTU's per hour. **[45 CSR §10-3.3.f.]**	Created a restriction to only use ultra-low diesel fuel (maximum of 15 ppm sulfur) as the only authorized oil (diesel fuel) that can be used in the boilers and generators. (Condition 4.1.3.)	This restriction ensure compliance with the sulfur dioxide limitation of Rule 10
4.1.8.	No owner or operator of an affected facility that combusts oil shall combust oil in the affect facility that contains greater than 0.5 weight percent sulfur. **[40 CFR §60.42c(d)]**	Created a restriction to only use ultra-low diesel fuel (maximum of 15 ppm sulfur) as the only authorized oil (diesel fuel) that can be used in the boilers and generators. (Condition 4.1.3.)	This restriction ensures compliance with the sulfur dioxide limitation of Subpart Dc of Part 60.

RECOMMENDATION TO DIRECTOR

The writer recommends that no specific emissions limits are necessary for these replacement boilers. The boilers should in consider as natural gas sources under the "Rule 13 Guidance for National Gas Combustion Sources". The Boiler GACT does not make natural gas fired boilers that use distillate oil as back-fuel affected sources under the Boiler GACT. SMMC has elected to only ultra-low sulfur diesel as the distillate oil for these boilers, which means this exclusion under the Boiler GACT applies to these new boilers. Second, these boilers are only permittee to operate on diesel when there is a natural gas curtailment in effect. The emissions generator

firing on ULSD is nearly the same as a natural gas unit except for NO_x, which only increases by more than 22% (0.45 lb/hr). As requested by the New Source Program Manager, emission limits for CO and NO_x are established in this permit, which are 1.74 lb of CO per hour and 2.45 lb of NO_x per hour in Condition 4.1

The information provided in the permit application indicates the proposed modification of the facility will meet all the requirements of the applicable rules and regulations when operated in accordance with the permit application. Therefore, the writer recommends granting SMMC a Rule 13 modification permit for their medical center located in Huntington, WV.

Edward S. Andrews, P.E.
Engineer

February 4, 2013
Date