777 12th Street, Third Floor

SACRAMENTO METROPOLITAN
AIR QUALITY
MANAGEMENT DISTRICT

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NO.: 142
DATE: October 3, 2016
ENGINEER: Venk Reddy

Category/General Equip Description: Boiler
Equipment Specific Description: Boiler 100 MMBTU/hr with a 4.9 MMBTU/hr pilot, fired on natural gas
Equipment Size/Rating: Major Source BACT
Previous BACT Det. No.: 110

This BACT was determined under the project for A/Cs 24816 and 24818 (CVFA).

BACT ANALYSIS

A: ACHIEVED IN PRACTICE (Rule 202, §205.1a)

The following control technologies are currently employed as BACT for boilers/heaters rated at 100 MMBTU/hr by the following air pollution control districts:

District/Agency	Best Available Control Technology (BACT)/Requirements
US EPA	**BACT** Source: EPA RACT/BACT/LAER Clearinghouse

VOC(A)	1.5 lb/MMCF
NOx (B)	9 lb/mmcf or 7.4 ppm corrected to 3% O2
SOx (C)	0.6 lb/mmcf
PM10 (D)	5 lb/mmcf
PM2.5 (D)	5 lb/mmcf
CO (E)	20 lb/mmcf or 26.7 ppm corrected to 3% O2

(A) VOC Value from NJ-0079 Refer to VOC discussion below.
(B) USEPA BACT determination MN-0070 for Minnesota Steel Industries, LLC shows a NOx emission limit of 0.0035 lb/MMBTU. However, according to the author of the permit, this is a typo and the correct value is 0.035 lb/MMBTU or 35 lb/MMCF (see Attachment #2, e-mail #1). Therefore, BACT determination LA-0204 (Shintech Louisiana for an 90 MMBTU/hr furnace) will be considered the lowest achieved in practice NOx limit.
(C) AP-42 Tables 1.4-2 (07/98) assuming 1,000 btu/scf
(D) Several determinations were found at 5 lb/MMCF. Portland General Electric (BACT determination OR-0048) was found at 2.5 lb/mmcf, but it has never been source tested (see Attachment #2, e-mail #2). Since it has not been shown to be achievable, it is not considered achieved in practice. It could be considered technologically feasible with the use of a bag house. The use of a bag house is discussed in the technologically feasible section of this determination.

District/Agency	Best Available Control Technology (BACT)/Requirements
	(E) William Field Service (BACT determination WY-0067) 84 MMBTU/hr, hot oil heater. **VOC Discussion:** VOC values found in the EPA BACT clearing house that were lower than 3.77 lb/MMCF (the applicant's proposed BACT limit) were projects in Alabama, Maryland, and New Jersey. Those jurisdictions were contacted to confirm the validity of the published project: Alabama and Maryland: Projects in Alabama and Maryland have not been built yet nor source tested (see Attachment #2, e-mails #3 and 4). New Jersey: Of those boilers with an emission rate lower than 3.77 lb/mmcf, only one unit was verified as being built and source tested, New Jersey NJ-0079. The author of the New Jersey determination NJ-0079 was contacted regarding the limit of 0.14 lb/hr or 1.5 lb/MMCF (see Attachment #2, e-mail #5). The emission rate was source tested and verified. The VOC value was achieved with the use of good combustion practices. No add-on control equipment or additional control techniques were used. The applicant simply accepted a lower compliance margin. BACT determination NJ-0079 for a 91.6 MMBTU/hr boiler was posted on 7/25/2012 and set a VOC limit of 1.5 lb/mmcf. On 3/10/2016, New Jersey posted BACT determination NJ-0084 for an 80 MMBTU/hr boiler for PSEG Fossil LLC, setting a BACT limit of 0.32 lb/hr or 4 lb/mmcf. Both projects relied on "good combustion practice" for achieving the BACT standard. The New Jersey BACT determinations are discussed further in Section C – Selection of BACT **RULE REQUIREMENTS**: 40 CFR 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units The regulation applies to steam generating units of greater than 100 MMBTU/hr. The standard is not applicable since this BACT is for a boiler at 100 MMBTU/hr but could be considered technologically feasible and will be discussed in the technologically feasible section. 40 CFR 60 Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units This regulation applies to steam generating units rated at between 10-100 MMBtu/hr. However, no standards within the subpart are applicable to units fired by natural gas only. Therefore, this NSPS is not applicable.
ARB	**BACT** Source: ARB BACT Clearinghouse Note: All BACT determinations for this category published, except for the SMAQMD BACT determination in the ARB BACT Clearinghouse are at least 10 years old. Although in the ARB BACT clearinghouse, SMAQMD BACT determination 110 for a similar sized boiler is not listed since it has not been source tested yet.

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td></td><td>
<table>
<tr><td colspan="2">ARB BACT Clearinghouse</td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>9 ppmvd corrected to 3% O_2 [SCAQMD, BAAQMD]</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>50 ppmvd corrected to 3% O_2 [SCAQMD]</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:
None
</td></tr>
<tr><td>SMAQMD</td><td>
<u>BACT</u>

Although published as BACT, SMAQMD BACT determination 110 for a 108 MMBTU/hr boiler has not been source tested yet, therefore it will not be considered as achieved in practice, It would be considered technologically feasible if emission standards proposed in the BACT were for a lower than the achieved in practice levels for any pollutant. The emission rates for the criteria pollutants are achieved in practice by other sources therefore it will not be further discussed.

<table>
<tr><td colspan="2"></td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>No standard</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:

<u>Rule 411</u>
For units with a rating greater than 20 MMBtu/hr emissions shall not exceed the following levels (except during startups and shutdowns as defined in Rule 411):
1. 9 ppmvd of NOx corrected to 3% O2
2. 400 ppmvd of CO corrected to 3% O2
</td></tr>
<tr><td>South Coast AQMD</td><td>
<u>BACT</u>
Source: <u>SCAQMD BACT Guidelines for Major Polluting Facilities.</u> Application 186624 110 MMBTU/hr 10/29/99

<table>
<tr><td colspan="2"></td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>9 ppmvd corrected to 3% O_2</td></tr>
<tr><td>SOx</td><td>Use of Natural gas</td></tr>
<tr><td>PM10</td><td>Use of Natural gas</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:

<u>XI, Rule 1146</u>
Requirements Table 1146-1
</td></tr>
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<table>
<tr><td>District/Agency</td><td>Best Available Control Technology (BACT)/Requirements</td></tr>
<tr><td></td><td>
<table>
<tr><th>Category</th><th>NOx Limit</th></tr>
<tr><td>Group I Units (rated heat input greater than 75 MMBTU/hr)</td><td>5 ppm or 0.0062 lbs/10^6 BTU</td></tr>
</table>
Where: GROUP I UNIT means any unit burning natural gas with a rated heat input greater than or equal to 75 MMbtu/hr, excluding thermal fluid heater
</td></tr>
<tr><td>San Diego County APCD</td><td>
<u>BACT</u>
Source: NSR Requirements for BACT.

http://www.sdapcd.org/content/dam/sdc/apcd/PDF/Misc/APCD_bact.pdf

<table>
<tr><td></td><td></td></tr>
<tr><td>VOC</td><td>NG or LPG fuel (If using NG or LPG fuel)</td></tr>
<tr><td>NOx</td><td>1. 5 ppmvd corrected to 3% O_2
2. Low NOx burner, FGR, and oxygen controller</td></tr>
<tr><td>SOx</td><td>1. NG or LPG fuel
2. No. 2 fuel oil with <0.05% sulfur content (If using No. 2 oil as a backup fuel)</td></tr>
<tr><td>PM10</td><td>1. 0.10 gr/dscf (verified by use of NG or LPG fuel)
2. NG or LPG fuel (If using NG or LPG fuel)
3. Low ash fuel (If using No. 2 oil as a backup fuel)</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:

<u>Regulation 4, Rule 69.2</u>

http://www.sdapcd.org/content/dam/sdc/apcd/PDF/Rules_and_Regulations/Prohibitions/APCD_R69-2.pdf

For any unit with a heat input rating greater than 50 million Btu/hr and an annual capacity factor 10% or greater, emissions shall not exceed the following levels:
1. 30 ppmvd of NOx when operated on a gaseous fuel, corrected to 3% O_2
2. 40 ppmvd of NOx when operated on a liquid fuel, corrected to 3% O_2
3. 400 ppmvd of CO corrected to 3% O_2
</td></tr>
<tr><td>Bay Area AQMD</td><td>
<u>BACT</u>
Source: BAAQMD BACT Guideline

<table>
<tr><td colspan="2">For boilers with a rating >= 50 MMBTU/hr, 8/4/10</td></tr>
<tr><td>VOC</td><td>Not determined</td></tr>
<tr><td>NOx</td><td>Not determined</td></tr>
<tr><td>SOx</td><td>Natural Gas fuel</td></tr>
<tr><td>PM10</td><td>Natural gas or treated refinery gas fuel</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>50 ppmvd corrected to 3% O_2</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:

<u>Reg 9, Rule 7</u>
For units with a rating of greater than 75 MMBtu/hr or more:
1. NOx limit of 5 ppmvd corrected to 3% O_2
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District/Agency	Best Available Control Technology (BACT)/Requirements
	2. CO limit of 400 ppmvd corrected to 3% O_2
San Joaquin Valley APCD	**BACT** Source: SJVUAPCD BACT Guideline (Rescinded) The boiler BACT determinations listed in the SJVAPCD Clearinghouse have been rescinded. **RULE REQUIREMENTS**: **Rule 4306** For units >20 MMBtu/hr 1. 6 ppm of NOx corrected to 3% O2 2. 400 ppm of CO corrected to 3% O2

The following control technologies have been identified and are ranked based on stringency:

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	1. 1.5 lb/MMCF [USEPA BACT] 2. Natural Gas or LPG fuel (If using Natural Gas or LPG fuel) – [SDCAPCD] 3. No standard – [SMAQMD, SCAQMD, SJVAPCD, BAAQMD]
NOx	1. 5 ppmvd corrected to 3% O_2 – [SCAQMD, SDCAPCD, BAAQMD] 2. 6 ppmvd corrected to 3% O2 [SJVAPCD] 3. 7.4 ppmvd corrected to 3% O2 [USEPA BACT] 4. 9 ppmvd corrected to 3% O2 [SMAQMD]
SOx	1. 0.6 lb/MMCF [USEPA AP-42] 2. Use of natural gas – [SCAQMD, SDCAPCD, BAAQMD] 3. Natural gas or treated refinery gas fuel with ≤100 ppmv total reduced sulfur – [BAAQMD] 4. No standard – [SMAQMD, SJVAPCD]
PM10	1. 5 lb/mmcf [USEPA] 2. Use of natural gas – [SCAQMD] 3. NG or LPG fuel (If using NG or LPG fuel) – [SDCAPCD] 4. Natural gas or treated refinery gas fuel – [BAAQMD] 5. No standard – [SMAQMD, SJVAPCD]
PM2.5	1. 5 lb/mmcf – [USEPA]
CO	1. 26.7 ppmv corrected to 3% O2 2. 50 ppmvd corrected to 3% O_2 – [BAAQMD] 3. 400 ppm of CO corrected to 3% O2 – [SMAQMD, SDCAPCD, & SJVAPCD]

The following control technologies have been identified as the most stringent, achieved in practice control technologies:

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	**Standard**	**Source**
VOC	1.5 lb/ MMCF	USEPA (BACT)
NOx	5 ppmvd corrected to 3% O_2	SDCAPCD (BACT), SCAQMD (Rule 1146.1), BAAQMD (Ref 8, Rule 7)
SOx	0.6 lb/MMCF	USEPA (AP-42)
PM10	5 lb/mmcf	SDCAPCD, SCAQMD, BAAQMD (BACT) USEPA (BACT)
PM2.5	5 lb/mmcf	USEPA (BACT)
CO	26.7 ppmvd corrected to 3% O2	USEPA (BACT)

B. TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):

Technologically Feasible Alternatives:
Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be technologically feasible by the Air Pollution Control Officer.

VOC	Oxidation Catalyst
NOx	No other technologically feasible option identified.
SOx	No other technologically feasible option identified
PM10	Use of a bag house
PM2.5	Use of a bag house
CO	CO will be further analyzed when triggered.

40 CFR 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units
The regulation applies to steam generating units of greater than 100 MMBTU/hr. Although this boiler is not subject to this regulation, the standards will be reviewed to determine if they are technologically feasible for boilers of this size.

The regulation has a NOx standard of 0.10 lb/MMBTU at low heat release and 0.20 lb/MMBTU at high release. These standards are much higher than the 9 ppm NOx, corrected to 3% O2, required by Rule 411 (0.037 lb/MMBTU) or the achieved in practice value of 5 ppm NOx, corrected to 3% O2, (0.006 lb/ MMBTU). Standards for PM10 and SOx are for the combustion of solid fuels such as coal and are not applicable to natural gas combustion. Since the NOx standards from this section are higher than achieved in practice controls and there is no other standards applicable to natural gas combustion, no further review is necessary.

Cost Effective Determination:
After identifying the technologically feasible control options, a cost analysis is performed to take into consideration economic impacts for all technologically feasible controls identified.

Maximum Cost per Ton of Air Pollutants Controlled

1. A control technology is considered to be cost-effective if the cost of controlling one ton of that air pollutant is less than the limits specified below (except coating operations):

Pollutant	Maximum Cost ($/ton)
ROG	17,500
NO_X	24,500
PM_{10}	11,400
SO_X	18,300
CO	TBD if BACT triggered

PM10 and PM2.5 Control
Bag house Cost Effectiveness Determination

The boiler in question will emit 2,620 lbs/year or 1.31 tons of particulate. To be cost effective, the cost per ton controlled, assuming 100% capture would be $11,400/ton * 1.31 tons/year or $14,934/year. Based on the example given in the EPA cost Control Manual 6th edition, the maintenance and operational annual cost for a bag house is estimated to be (operating labor+supervisor+ Maintenance Labor +material) = $81,192/year (EPA cost Control Manual Section 6, table 1.11 Page 1-55, https://www3.epa.gov/ttncatc1/dir1/cs6ch1.pdf . The labor hours proposed for maintenance and operation in the example are not related to the size of the baghouse. The hours of operation for the boiler will be 5,274 or 60% of the total hours per year. Therefore $81,192 * 0.6 = $48,715. Since the prorated annual maintenance and operating cost of $48,715 alone exceed the cost effectiveness threshold adding in equipment cost, installation and utility costs would only increase the total annual cost. With the cost of the control exceeding the maximum cost effectiveness, a bag house is not considered cost effective.

Since the use of a bag house has been shown not to be cost effective, the use of natural gas as the fuel will be considered cost effective. Therefore the use of natural gas will be considered cost effective for the control of PM10 and PM2.5.

VOC Control

Oxidation Catalyst Cost Effectiveness Determination

The boiler is rated at 100 MMBTU/hr which equates to a 29.3 MW. Oxidation catalysts are not covered by the EPA Cost Control Manual however EPA has published information regarding the costs of CO oxidation catalysts which are used for VOC control as well on turbines that can be found at the following link: https://yosemite.epa.gov/ee/epa/ria.nsf/vwAN/A2001-48.pdf/$file/A2001-48.pdf The document states that VOC destruction can be accomplished, with the use of higher temperatures of the exhaust gasses. For this particular situation, the exhaust gasses from the boiler would have to be heated to achieve VOC destruction. The cost of additional fuel to heat the exhaust gasses, or the creation of additional combustion contaminants, were not considered in the referenced EPA document and not considered in the annual cost. This determination will use a similar sized turbine equivalent to estimate the costs of an oxidation catalyst.

The boiler in question will emit 1,988 lbs/year of VOC or 1 ton per year. To be cost effective the equipment costs per year has to be less than $17,500 assuming 100% control. Per the referenced EPA document the annual cost for a similar sized oxidation catalyst with a 6 year life of the catalyst is estimated to be $239,447, similar to a GE LM25000 27 MW turbine. Applying a usage factor based on the operation of the boiler of 60% the revised annual cost is ($239,447 * 0.60 =) $143,668. Ssince the annualized cost alone exceeds the cost effectiveness threshold the control technology is deemed not cost effective.

C. SELECTION OF BACT:

VOC Selection

Additional control strategies have not been shown to be cost effective, as discussed in the above section nor have additional control strategies found to be achieved in practice.

Local California air districts have not set a standard for VOC, except to dictate the use of natural gas or LPG as the fuel. Nationwide,of the determinations published and verified as being source tested in the EPA clearinghouse one was verified as being at lower levels than proposed by the applicant. New Jersey has published a VOC emissions determination that is at 1.5 lb/MMCF in 2012. The agency also published a determination of VOC emissions at 4 lb/mmcf in 2016 for a

similar sized boiler as shown in the table at the end of this determination. This shows that the agency themselves did not set 1.5 lb/mmcf as a standard for VOC for future projects. If the emission standard is not repeatable between boilers in the jurisdiction that it was achieved in, it is questionable if it is repeatable in this BACT determination. Since there was no additional technology used to achieve this lower limit and the agency itself does not use the limit as a standard, the value of 1.5 lb/mmcf will not be considered a transferable BACT standard. As stated by New Jersey, the control technology to achieve a 1.5 lb/MMcf is Good Combustion Practices. Since *Good Combustion Practices* is a vague term that is not quantifiable in a regulatory sense, and the applicant has proposed an emission rate of 3.77 lb/mmcf for VOC (using good combustion practices). The applicant is comfortable that the boiler will meet this standard when source tested to verify the emission limit. The 3.77 lb/mmcf emissions limit for VOCs will be considered BACT. A source test will be required annually to verify ongoing compliance with this standard.

NOx Selection

Many jurisdictions within California use 5 ppmvd of NOx, corrected to 3% O2, as a standard derived from rule making. This is achieved through the use of catalyst and reagent injection. There is no additional control technology known other than the use of a catalyst and reagent injection and there were no emission standards lower than 5 ppm identified for a boiler of similar size. Since no additional control technology was identified, and no lower standards were found, a limit of 5 ppm NOx, corrected to 3% O2, will be considered BACT. A source test will be required annually to verify ongoing compliance with this standard. NOx emissions will also be monitor by the CEM System.

SOx Selection

Similar to the analysis for VOC, jurisdictions within California have not set a standard for SOx but rather a fuel usage standard. The use of natural gas as a fuel, per AP42 1.4-2 (07/98) assuming 1,000 btu/scf, identifies a SOx emission rate of 0.6 lb/MMCF. The US EPA shows BACT standards that are higher than 0.6 lb/MMCF. Although not in this category or range of boiler, SMAQMD has used the value of 0.6 lb/MMCF as a standard for SOx for other natural gas burning equipment. Since it has been historically used as the emission factor and there is no known control technology for the control SOx post combustion, the emission rate of SOx will be based on an AP42 value of 0.6 lb/MMCF. Typically sources are not required to source test to confirm AP-42 emission values.

PM10/PM2.5 Selection

The control of PM10/PM2.5 through the use of a bag house was determined not to be cost effective. Jurisdictions within the state of California have not set an emission standard for PM (San Diego sets a standard equivalent to the grain loading requirements which is verified through the use of natural gas) The USEPA BACT clearinghouse has one emission rate that is lower than the applicant's proposed levels, at 2.5 lb/mmcf (BACT determination OR-0048), but since the boiler has not been tested to verify compliance with this standard, it will not be considered achieved in practice. There are several determinations for PM10 emissions at 5 lb/mmcf (Refer to Attachment A). Since a PM10/PM2.5 emission standard of 5 lb/mmcf has been shown to be achieved in practice, and no additional technologies have been shown to be cost effective, the value from the EPA clearing house of 5 lb/MMCF will be considered BACT for PM10 and PM2.5. A source test will be required annually to verify ongoing compliance with this standard.

CO Selection

BACT for CO is not triggered for this application. Therefore, it will not be evaluated under this BACT determination.

Based on the discussion above the following table is developed.

Summary Of BACT Selection		
Pollutant	**Standard**	**Source**
VOC	3.77 lb/MMCF	Applicant's requested standard
NOx	5 ppm corrected to 3% O_2	SCAQMD (Rule 1146), SDCAPCD (Rule BACT) BAAQMD (Reg 9, Rule 7)
Sox	0.6 lb/MMCF	USEPA (AP-42)
PM10	5 lb/MMCF	USEPA (BACT)
PM2.5	5 lb/MMCF	USEPA (BACT)
CO	To be determined when triggered	Not applicable

Start-up Conditions

It is in the applicant's best interest to bring the boiler to steady state (<5 ppm NOx, corrected to 3% O2) as soon as possible in order to maximize operational time. Quarterly NOx emissions from the boiler are limited to the amount of offsets provided, so the cleaner, shorter and fewer the startups are, the smaller the amount of NOx offsets that will be needed during startups and the greater the amount of NOx offsets that will be available for actual boiler operation and steam production. However, during startups, the boiler needs to be brought up to temperature slowly in order to preserve the integrity of the metal in the system and piping, and to bring the SCR to temperature to be able to meet the continuous NOx BACT standard of 5 ppm corrected to 3% O2. Based on the aforementioned reasons the applicant has determined that as a worst case scenario, the boiler may take up to 3 hours to achieve the continuous 5 ppm corrected to 3% O2 NOx BACT standard. During each startup period, the boiler will be limited to a NOx mass emission limit of 7.3 lb during the first two hours of startup. The 7.3 lb mass emission limit is equivalent to operating for 2 hours at an average 2-hour NOx concentration of 30 ppm corrected to 3% O2. Prior to the end of this two- hour period, the boiler must achieve a NOx emission rate of no more than 9 ppm, corrected to 3% O2, averaged over 15 minutes, which corresponds to the NOx concentration limit specified in the District's Rule 411. Then if needed, the boiler will be allowed up to an additional hour to achieve the continuous NOx BACT emission concentration of 5 ppm, corrected to 3% O2. During this hour, the boiler will be limited to a NOx mass emission limit of 1.1 lb. The 1.1 lb mass emissions is equivalent to operating at full capacity for 1 hour, at a 1-hour average NOx concentration of 9 ppm, corrected to 3 % O2.

Once the boiler achieves the Rule 411 standard of 9 ppm, corrected to 3% O2, averaged over 15 minutes, that portion of the boiler start-up period (i.e. up to two hours) has been completed. Likewise, once the boiler achieves the steady-state NOx BACT level of 5 ppm, corrected to 3% O2, average over 15 minutes, the entire start-up period has been completed and the boiler will be expected to comply with the 5 ppm NOx BACT standard for the rest of the operation, including boiler shutdown.

For CO, the boiler will be required to achieve an average of 400 ppmvd corrected to 3% O2 during the startup period. The averaging time for this emission limit must be calculated as the period between the commencement of gas flow to the boiler unit to the time the boiler achieves a NOx emissions concentration of 5 ppmvd corrected to 3% O2 averaged over 15 minutes or up to 120 minutes total, whichever comes first.

For the other pollutants (SOx, lead, PM10 and PM2.5 and VOC), the applicant has proposed emission standards consistent with steady-state operation.

CVFA has submitted justification for the start-up as described in the evaluation of 24816, Appendix B.

Shut-down Conditions

Shut-down period is defined as the period of time commencing with a reduction in fuel flow to the boiler and ending when all fuel flow to the boiler has ceased, not to exceed 60 minutes. During this period the Nox emissions must not exceed 30 ppmvd corrected to 3% O2 and CO emissions must not exceed 400 ppmvd corrected to 3% O2. Both NOx and CO are measured by the CEMS and averaged over the duration of the shutdown not to exceed 60 minutes and not less than a minimum of 15 minutes.

REVIEWED BY: _____ **DATE:** 11-7-16

APPROVED BY: _____ **DATE:** 11-7-16

Attachment 1

BACTs from the EPA Clearing House

VOC and NOx BACTs from the EPA clearing house

		Size MMBTU/hr	VOC		NOx	
NJ-0084	PSEG Fossil LLC	80	4	lb/mmcf	10	lb/mmcf
FL-0356	Florida Power & Light	99.8			50	lb/mmcf
TX-0772	Jefferson Railport Terminal I Texas LLC	95.7	5.42	tons/year	11	lb/mmcf
TX-0714	NRG Texas Power	80			36	lb/mmcf
MD-0046	Keys Energy Center, LLC*	93	2	lb/mmcf	10	lb/mmcf
MD-0041	CPV Maryland, LLC*	93	2	lb/mmcf	11	lb/mmcf
IN-0158	St. Joseph energy center, llc	80	5	lb/mmcf	32	lb/mmcf
NJ-0079	CPV Shore, LLC**	91.6	1.5	lb/mmcf	10	lb/mmcf
AL-0280	Lenzing Fibers.	100	5.5	lb/MMSCF		
LA-0246	Valero Refining - New Orleans, LLLV	99	3.4	lb/mmcf	40	lb/mmcf
OR-0048	Portland General Electric	91			49	lb/mmcf
LA-0244	Sasol North America, Inc	87.3			80	lb/mmcf
MO-0082	Archer Daniels Midland	85.6	5.5	lb/MMcf		
DE-0020	Valero Energy Corp	99.9			15	lb/mmcf
WY-0067	Williams Field Services Co	72	4	lb/mmcf		
WY-0067	Williams Field Services Co	84	20	lb/mmcf	30	lb/mmcf
LA-0204	Shintech Louisiana	90			9	lb/mmcf
NH-0015	Concord Steam Corporation	76			32	lb/mmcf
OK-0135	Pryor Plant Chemical Co	80	6.9	lb/mmcf	50	lb/mmcf
SC-0115	GP Clarendon LP	75	5.2	lb/mmcf	48	lb/mmcf
OK-0136	Conocophillips	95			36	lb/mmcf
OK-0137	Conocophillips	95			36	lb/mmcf
OK-0137	Conocophillips	95			36	lb/mmcf
MD-0040	Competitive Power Ventures, Inc/ CPV Maryland, LLC*	93	2	lb/mmbtu	11	lb/mmcf
LA-0229	Shintech Louisiana LLC	90			9	lb/mmcf
MN-0070	Minnesota Steel Industries, LLC****	99			3.5	lb/mmcf
AL-0231	Nucor Corporation*****	95	2.6	lb/mmcf	35	lb/mmcf
Fl-0285	Progress energy Florida	99	24.9	lb/mmcf		
FL-0286	Florida Power and Light Company	99.8	24.9	lb/mmcf	50	lb/mcf
WV-0025	Moundsville Power, LLC	100	6	lb/mmcf	20	lb/mmcf
TX-0712	Southern Power CO	110			11.1	lb/mmcf
CA-1212	City of Palmdale	110			10.92	lb/mmcf
SMAQMD	CVFA proposed levels (for reference)		3.77	lb/mmcf	6.07	lb/mmcf

*	Per Maryland, VOC emissions were based on manufacturer's guarantee without the use of additional controls. The project is not completed and has not been source tested
**	Per New Jersey, VOC emissions were source tested, and without the use additional controls, just good combustion practices
****	Per Minnesota, the Nox value entered was a typo the real value should be 35 lb/mmcf
*****	Per Alabama the VOC emission limit is based on the manufacturer's guarantee without the use of additional controls. The Project was never built or source tested.

SOx, PM10, PM2.5 & CO review from USEPA BACT Clearinghouse

		SOx		PM10		PM2.5		CO	
NJ-0084	PSEG Fossil LLC	1.5	lb/mmcf	5	lb/mmcf	5	lb/mmcf	36	lb/mmcf
FL-0356	Florida Power & Light	2489	lb/mmcf			5	lb/mmcf	80	lb/mmcf
TX-0772	Jefferson Railport Terminal I Texas LLC	62	lb/mmcf	7.49	tons/year	7.49	tons/year	37.5	lb/mmcf
TX-0714	NRG Texas Power							37	lb/mmcf
MD-0046	Keys Energy Center, LLC*			7.5	lb/mmcf			80	lb/mmcf
MD-0041	CPV Maryland, LLC			5	lb/mmcf	5	lb/mmcf	20	lb/mmcf
IN-0158	St. Joseph energy center, llc	2.2	lb/mmcf	7.5	lb/mmcf	7.5	lb/mmcf	83	lb/mmcf
NJ-0079	CPV Shore, LLC	1.77	lb/mmcf	5	lb/mmcf	5	lb/mmcf		
AL-0280	Lenzing Fibers.			7.6	lb/mmcf				
LA-0246	Valero Refining - New Orleans, LLLV	25.7	lb/mmcf	7.5	lb/mmcf	7.5	lb/mmcf	82.3	lb/mmcf
OR-0048	Portland General Electric***			2.5	lb/MMCF				
LA-0244	Sasol North America, Inc			8.7	lb/mmcf				
MO-0082	Archer Daniels Midland								
DE-0020	Valero Energy Corp								
WY-0067	Williams Field Services Co								
WY-0067	Williams Field Services Co							20	lb/mmcf
LA-0204	Shintech Louisiana			7	lb/mmcf			46	lb/mmcf
NH-0015	Concord Steam Corporation								
OK-0135	Pryor Plant Chemical Co	2.5	lb/mmcf	6.25	lb/mmcf			66.7	lb/mmcf
SC-0115	GP Clarendon LP	7.1	lb/mmcf	7.2	lb/mmcf			80	lb/mmcf
OK-0136	Conocophillips							40	lb/mmcf
OK-0137	Conocophillips								
OK-0137	Conocophillips							40	lb/mmcf
MD-0040	Competitive Power Ventures, Inc/ CPV Maryland, LLC			5	lb/mmcf			20	lb/mmcf
LA-0229	Shintech Louisiana LLC			7	lb/mmcf			46	lb/mmcf
MN-0070	Minnesota Steel Industries, LLC			30	lb/mmcf			80	lb/mmcf
AL-0231	Nucor Corporation	0.6	lb/mmcf	7.6	lb/mmcf			61	Lb/mmcf
Fl-0285	Progress energy Florida							80	lb/mmcf
FL-0286	Florida Power and Light Company	24.9	lb/mmcf	24.9	lb/mmcf			80	lb/mmcf
WV-0025	Moundsville Power, LLC					5	lb/mmcf	120810	lb/mmcf
TX-0712	Southern Power CO								
CA-1212	City of Palmdale			7.3	lb/mmcf	7.3	lb/mmcf		
SMAQMD	CVFA proposed levels (for reference)	0.6	lb/mmcf	4.97	lb/mmcf	4.97	lb/mmcf	197	lb/mmcf
***	Per Oregon the PM emission rate is based on low sulfur content of pipeline quality natural gas. No additional controls and no source testing of PM is required.								

Attachment 2

E-mail Correspondence

E-mail correspondences

E-mail #1 – From Minnesota Re: NOx Limit of BACT Determination MN-0070:

Venk -

I checked the limit in the RBLC against the permit (see page A-93). The permit lists a value of 0.035 lb/MMBtu compared to the value of 0.0035 lb/MMBtu in the RBLC; the value in the RBLC is a typo.

Please let me know if you need further assistance.

Richard Cordes, P.E.
Principal Engineer
Air Quality Permit Section
Minnesota Pollution Control Agency
richard.cordes@state.mn.us
Phone: (651)757-2291
Fax: (651)296-8717

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E-mail #2 – From Oregon Re: PM10 Limit of BACT Determination OR-0048:

You are correct. The BACT limit for PM emissions from the auxiliary boiler at PGE's Carty facility is based on low sulfur content of the fuel (pipeline quality natural gas) and good combustion practices. There is no baghouse or other add-on particulate control. The emission rate has not been tested and is not scheduled to be tested during this permit term.

Any other questions let me know.

Doug Welch
Oregon Dept. of Environmental Quality
Pendleton Office
(541) 278-4621

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E-mail #3 – From Alabama Re: VOC Limit of BACT Determination AL-0231:

Venk,

In the original PSD Nucor proposed the use of natural gas-fired burners, employing good combustion practices per manufacturer's guidance along with the 0.0026 lb/MMBtu emission limit, but the boiler was never built so the emission limit was never tested. If you have any further questions just let me know.

Ryan Cowart, P.E.
Environmental Engineering Specialist, Senior
Air Division-Energy Branch
Alabama Department of Environmental Management
(334) 271-7889

adem.alabama.gov

ADEM

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E-mail #4 – From Maryland Re: VOC Limit of BACT Determinations MD-0040 & MD-0041, and MD-0046 : Question 1

Hi Venk

The VOC emission rates are vender guarantees w/o additional controls. Initial and annual emission testing is required to demonstrate compliance. Monitoring of CO emissions is used as a surrogate for demonstrating continuous compliance. Both projects are still under construction.

Bill Paul

Question 2

Yes, they are the same project.

On Fri, Oct 21, 2016 at 10:28 AM, VENK REDDY <VReddy@airquality.org> wrote:

HI Bill

Are the two projects listed at the CPV Maryland the same thing (MD-0040 and MD-0041). I took them both as referring the same unit, but I want to make sure.

From New Jersey

Venk:

It uses good combustion practices only.

Thanks
Aliya

From: VENK REDDY [mailto:VReddy@airquality.org]
Sent: Friday, October 07, 2016 3:59 PM
To: Khan, Aliya <Aliya.Khan@dep.nj.gov>
Subject: RE: New Jersey BACT determination in EPA database question

Hi Thanks for the reply, Does it use some technology to meet this limit (Like an oxidation catalyst) or was it done by "good combustion practices"?

Thanks
Venk

From: Khan, Aliya [mailto:Aliya.Khan@dep.nj.gov]
Sent: Friday, October 07, 2016 12:54 PM
To: VENK REDDY
Subject: RE: New Jersey BACT determination in EPA database question

Hi Venk:

The source has been tested and meets the VOC limit of 0.14 lb/hr. This is a LAER limit.

Thanks
Aliya