EXPIRED SMAQMD BACT CLEARINGHOUSE

CATEGORY: **IC ENGINE COMPRESSION-STANDBY**

BACT Size: Minor Source BACT **IC ENGINE STANDBY**

BACT Determination Number: 116	**BACT Determination Date:** 2/11/2016

Equipment Information

Permit Number: 24758
Equipment Description: IC ENGINE STANDBY
Unit Size/Rating/Capacity: I.C. Engine, Standby, Diesel-fueled >=50 HP
Equipment Location: PHILLIPS 66 COMPANY
76 BROADWAY
SACRAMENTO, CA

BACT Determination Information

ROCs	**Standard:**	Applicable NMHC + NOx Tier Standard
	Technology Description:	Applicable NMHC + NOx emission standard for horsepower range based on the ATCM for Stationary CI Engines
	Basis:	Achieved in Practice
NOx	**Standard:**	Applicable NMHC + NOx Tier Standard
	Technology Description:	Applicable NMHC + NOx emission standard for horsepower range based on the ATCM for Stationary CI Engines
	Basis:	Achieved in Practice
SOx	**Standard:**	CARB Diesel
	Technology Description:	Diesel fuel with a sulfur content no greater than 0.0015% by weight
	Basis:	Achieved in Practice
PM10	**Standard:**	Applicable PM Tier Standard
	Technology Description:	Applicable PM emission standard for horsepower range based on the ATCM for Stationary CI Engines
	Basis:	Achieved in Practice
PM2.5	**Standard:**	Applicable PM Tier Standard
	Technology Description:	Applicable PM emission standard for horsepower range based on the ATCM for Stationary CI Engines
	Basis:	Achieved in Practice
CO	**Standard:**	Applicable CO Tier Standard
	Technology Description:	Applicable CO emission standard for horsepower range based the ATCM for Stationary CI Engines
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: For emergency engines 50 ≤ bhp < 75, Tier 4 Interim certification is the requirement; for emergency engines 75 <= bhp < 750, Tier 3 certification is the requirement; for emergency engines => 750 bhp, Tier 2 certification is the requirement.

District Contact: Isam Boulad Phone No.: (916) 874 - 4859 email: iboulad@airquality.org

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NO.: 116

DATE: Jan 14, 2016

ENGINEER: Matt Baldwin

Category/General Equip Description: Internal Combustion (I.C.) Engine

Equipment Specific Description: I.C. Engine, Standby, Diesel-fueled

Equipment Size/Rating: Minor Source BACT

Previous BACT Det. No.: No. 111

This BACT determination will update the following determinations:

#111 which was made on August 13, 2015 for diesel standby I.C. engines BHP ≥ 50

This BACT determination is being updated to include direct-drive fire pump engines, which are subject to different emissions standards pursuant to state and federal regulations. Additionally, this determination is being updated to include T-BACT for diesel particulate matter (diesel PM).

BACT/T-BACT ANALYSIS

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

The following control technologies are currently employed as BACT/T-BACT for diesel-fueled standby engines by the following agencies and air pollution control districts:

Note: Diesel PM is the primary driver for health risks associated with diesel engines. Diesel PM is emitted as PM10 and PM2.5, and the same control technologies that control PM10 and PM2.5 also control diesel PM.

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>US EPA</td><td><u>BACT</u>
Source: EPA RACT/BACT/LAER Clearinghouse

<table>
<tr><td colspan="2">For standby units with a rating of 50 ≤ BHP < 175</td></tr>
<tr><td>VOC</td><td>N/A – No BACT determinations found in the 50 ≤ BHP < 175 range</td></tr>
<tr><td>NOx</td><td>N/A – No BACT determinations found in the 50 ≤ BHP < 175 range</td></tr>
<tr><td>SOx</td><td>N/A – No BACT determinations found in the 50 ≤ BHP < 175 range</td></tr>
<tr><td>PM10</td><td>N/A – No BACT determinations found in the 50 ≤ BHP < 175 range</td></tr>
<tr><td>PM2.5</td><td>N/A – No BACT determinations found in the 50 ≤ BHP < 175 range</td></tr>
<tr><td>CO</td><td>N/A – No BACT determinations found in the 50 ≤ BHP < 175 range</td></tr>
</table>
RBLC ID: N/A</td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>US EPA
(continued)</td><td>
<table>
<tr><td colspan="2">For standby units with a rating of 175 ≤ BHP < 750</td></tr>
<tr><td>VOC</td><td>4.0 g/KW-hr (3.0 g/hp-hr) NMHC + NOx; Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>NOx</td><td>4.0 g/KW-hr (3.0 g/hp-hr) NMHC + NOx; Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>SOx</td><td>Diesel fuel with a sulfur content no greater than 0.0015% by weight</td></tr>
<tr><td>PM10</td><td>0.20 g/KW-hr (0.15 g/hp-hr) PM10 (filterable); Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>PM2.5</td><td>0.20 g/KW-hr (0.15 g/hp-hr) PM2.5 (filterable); Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>CO</td><td>3.5 g/KW-hr (2.6 g/hp-hr) CO; Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
</table>
RBLC ID: See Attachment A

<table>
<tr><td colspan="2">For standby units with a rating of BHP ≥ 750</td></tr>
<tr><td>VOC</td><td>6.4 g/KW-hr (4.8 g/hp-hr) NMHC + NOx; Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>NOx</td><td>6.4 g/KW-hr (4.8 g/hp-hr) NMHC + NOx; Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>SOx</td><td>Diesel fuel with a sulfur content no greater than 0.0015% by weight</td></tr>
<tr><td>PM10</td><td>0.20 g/KW-hr (0.15 g/hp-hr) PM10 (filterable); Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>PM2.5</td><td>0.20 g/KW-hr (0.15 g/hp-hr) PM2.5 (filterable); Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
<tr><td>CO</td><td>3.5 g/KW-hr (2.6 g/hp-hr) CO; Emission Standards based on 40 CFR Part 60, Subpart IIII</td></tr>
</table>
RBLC ID: See Attachment A

<u>T-BACT</u>
There are no T-BACT standards published in the clearinghouse for this category.

<u>RULE REQUIREMENTS:</u>
40 CFR Part 60 Subpart IIII – Standards of Performance for Stationary Compression Internal Combustion Engines: This regulation applies to owners/operators of new stationary compression ignition engines that commenced construction after July 11, 2005. [40 CFR §60.4200]

<u>40 CFR §60.4205(b)</u>
Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder that are not fire pump engines must comply with the emission standards for new nonroad CI engines in §60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.

<u>40 CFR §60.4205(c)</u>
Owners and operators of fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in table 4 to this subpart, for all pollutants.
</td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>US EPA
(continued)</td><td>
Note: The emission standards listed in Table 4 of Subpart IIII are the same as those listed in the Table below, except that fire pumps were given an additional three years to comply with those standards. As the date of this determination, new emergency use fire pumps are subject to the same emissions standards as emergency use non-fire pumps.

40 CFR §60.4202(a)(2)
For engines with a maximum engine power greater than or equal to 37 KW (50 HP), the certification emission standards for new nonroad CI engines for the same model year and maximum engine power in 40 CFR 89.112 (emission standards) and 40 CFR 89.113 (smoke standards) for all pollutants beginning in model year 2007.

<table>
<tr><th colspan="6">40 CFR §89.112 Table 1: Emission Standards in g/kW-hr (g/hp-hr)</th></tr>
<tr><th>Maximum engine power</th><th>Tier</th><th>Model year(s)</th><th>PM</th><th>NMHC + NOx</th><th>CO</th></tr>
<tr><td>37≤kW<75 (50≤hp<100)</td><td>3</td><td>2008+</td><td>0.40 (0.30)</td><td>4.7 (3.5)</td><td>5.0 (3.7)</td></tr>
<tr><td>75≤kW<130 (100≤hp<175)</td><td>3</td><td>2007+</td><td>0.30 (0.22)</td><td>4.0 (3.0)</td><td>5.0 (3.7)</td></tr>
<tr><td>130≤kW<225 (175≤hp<300)</td><td>3</td><td>2006+</td><td>0.20 (0.15)</td><td>4.0 (3.0)</td><td>3.5 (2.6)</td></tr>
<tr><td>225≤kW<450 (300≤hp<600)</td><td>3</td><td>2006+</td><td>0.20 (0.15)</td><td>4.0 (3.0)</td><td>3.5 (2.6)</td></tr>
<tr><td>450≤kW<560 (600≤hp<750)</td><td>3</td><td>2006+</td><td>0.20 (0.15)</td><td>4.0 (3.0)</td><td>3.5 (2.6)</td></tr>
<tr><td>kW>560 (hp>750)</td><td>2</td><td>2006+</td><td>0.20 (0.15)</td><td>6.4 (4.8)</td><td>3.5 (2.6)</td></tr>
</table>

40 CFR Part 63 Subpart ZZZZ – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines: This regulation applies to new and existing stationary IC engines. New emergency engines that comply with 40 CFR 60 Subpart IIII already meet the requirements of this NESHAP, as noted below.

40 CFR §63.6590(c)
Stationary RICE subject to Regulations under 40 CFR Part 60. An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section 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.
</td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>Air Resources Board (ARB)</td><td>

BACT
Source: ARB BACT Clearinghouse

<table>
<tr><td colspan="2">For standby units with a rating of BHP < 175</td></tr>
<tr><td>VOC</td><td>N/A – No BACT determinations found in the BHP < 175 range</td></tr>
<tr><td>NOx</td><td>N/A – No BACT determinations found in the BHP < 175 range</td></tr>
<tr><td>SOx</td><td>N/A – No BACT determinations found in the BHP < 175 range</td></tr>
<tr><td>PM10</td><td>N/A – No BACT determinations found in the BHP < 175 range</td></tr>
<tr><td>PM2.5</td><td>N/A – No BACT determinations found in the BHP < 175 range</td></tr>
<tr><td>CO</td><td>N/A – No BACT determinations found in the BHP < 175 range</td></tr>
</table>

<table>
<tr><td colspan="2">For standby units with a rating of BHP ≥ 175</td></tr>
<tr><td>VOC</td><td>N/A – No BACT determinations found in the BHP ≥ 175 range</td></tr>
<tr><td>NOx</td><td>N/A – No BACT determinations found in the BHP ≥ 175 range</td></tr>
<tr><td>SOx</td><td>N/A – No BACT determinations found in the BHP ≥ 175 range</td></tr>
<tr><td>PM10</td><td>N/A – No BACT determinations found in the BHP ≥ 175 range</td></tr>
<tr><td>PM2.5</td><td>N/A – No BACT determinations found in the BHP ≥ 175 range</td></tr>
<tr><td>CO</td><td>N/A – No BACT determinations found in the BHP ≥ 175 range</td></tr>
</table>

Note: As of the date of this determination, the ARB BACT Clearinghouse has three listings for engines ≥ 175 BHP. All three were for prime-use engines and therefore deemed not applicable.

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
Title 17, Cal. Code Regs. Sections 93115 through 93115.15 – Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition (CI) Engines: This regulation applies to owners/operators of new and existing stationary compression ignition engines greater than 50 bhp.

§93115.6(a): New Emergency Standby Diesel-Fueled CI Engine Emission Standards.
(1) At-School and Near-School Provisions. No owner or operator shall operate a new stationary emergency standby diesel-fueled CI engine for non-emergency use, including maintenance and testing, during the following periods:
(A) whenever there is a school sponsored activity, if the engine is located on school grounds, and
(B) between 7:30 a.m. and 3:30 p.m. on days when school is in session, if the engine is located within 500 feet of school grounds. Section 93115.6(a)(1) does not apply if the engine emits no more than 0.01 g/bhp-hr of diesel PM.

</td></tr>
</table>

District/Agency	Best Available Control Technology (BACT)/Requirements
ARB (continued)	(3) New Engines: As of January 1, 2005, except as provided in section 93115.3, no person shall sell, offer for sale, purchase, or lease for use in California any new stationary emergency standby diesel-fueled CI engine that has a rated brake horsepower greater than 50 unless it meets the following applicable emission standards, and no person shall operate any new stationary emergency standby diesel-fueled CI engine that has a rated brake horsepower greater than 50, unless it meets all of the following applicable operating requirements and emission standards specified in 93115.6(a)(3). (A) Emissions Standards and Hours of Operating Requirements. 1. New stationary emergency standby diesel-fueled engines (>50 bhp) shall: a. meet the applicable emission standards for all pollutants for the same model year and maximum horsepower rating as specified in Table 1 Emission Standards for New Stationary Emergency Standby Diesel-Fueled CI Engines, in effect on the date of acquisition or submittal, as defined in section 93115.4, and b. after December 31, 2008, be certified to the new nonroad compression-ignition (CI) engine emission standards for all pollutants for 2007 and later model year engines as specified in 40 CFR, Part 60, Subpart III-Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (2006);

Table 1: Emission Standards for New Stationary Emergency Standby Diesel-Fueled CI Engines – g/bhp-hr (g/kW-hr)

Maximum engine power	Tier	Model year(s)	PM	NMHC + NOx	CO
50≤HP<75 (37≤kW<56)	2	2007	0.15 (0.20)	5.6 (7.5)	3.7 (5.0)
	4i	2008+		3.5 (4.7)	
75≤HP<100 (56≤kW<75)	2	2007	0.15 (0.20)	5.6 (7.5)	3.7 (5.0)
	3	2008+		3.5 (4.7)	
100≤HP<175 (130≤kW<225)	3	2007	0.15 (0.20)	3.0 (4.0)	3.7 (5.0)
		2008+			
175≤HP<300 (130≤kW<225)	3	2007	0.15 (0.20)	3.0 (4.0)	2.6 (3.5)
		2008+			
300≤HP<600 (225≤kW<450)	3	2007	0.15 (0.20)	3.0 (4.0)	2.6 (3.5)
		2008+			
600≤HP<750 (450≤kW<560)	3	2007	0.15 (0.20)	3.0 (4.0)	2.6 (3.5)
		2008+			
HP>750 (kW>560)	2	2007	0.15 (0.20)	4.8 (6.4)	2.6 (3.5)
		2008+			

<table>
<tr><td>District/Agency</td><td>Best Available Control Technology (BACT)/Requirements</td></tr>
<tr><td>ARB (continued)</td><td>
(4) New Direct-Drive Emergency Standby Fire Pump Engines: Except as provided in section 93115.3, no person shall sell, offer for sale, purchase, or lease for use in California any new stationary emergency standby diesel-fueled direct-drive fire-pump CI engine that has a rated brake horsepower greater than 50 unless the fire-pump engine meets the applicable emission standards and certification requirements specified in section 93115.6(a)(4), and no person shall operate any new stationary emergency standby diesel-fueled direct-drive fire pump CI engine that has a rated brake horsepower greater than 50, unless it meets all of the applicable operating requirements and emission standards specified in 93115.6(a)(4).
(A) Standards and Hours of Operating Requirements.
1. New direct-drive emergency standby diesel-fueled fire-pump engines (>50 bhp) shall:
a. meet the applicable emissions standards for all pollutants as specified in Table 2 Emissions Standards for New Stationary Emergency Standby Direct-Drive Fire Pump Engines for the model year and NFPA nameplate power rating; and
b. meet the new fire pump engine certification requirements and emission standards required by 40 CFR § 60.4202(d.) Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (2006); and
c. not operate more than the number of hours necessary to comply with the testing requirements of the National Fire Protection Association (NFPA) 25 - "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2002 edition, which is incorporated herein by reference. This subsection does not limit engine operation for emergency use and for emission testing to show compliance with 93115.6(a)(4)

Table 2: Emission Standards for New Stationary Emergency Standby Direct-Drive Fire Pump Engines > 50 BHP – g/bhp-hr (g/kW-hr)
<table>
<tr><th>Maximum engine power</th><th>Model year(s)</th><th>PM</th><th>NMHC + NOx</th><th>CO</th></tr>
<tr><td rowspan="2">50≤HP<100 (37≤kW<75)</td><td>2010 and earlier</td><td>0.60 (0.80)</td><td>7.8 (10.5)</td><td rowspan="2">3.7 (5.0)</td></tr>
<tr><td>2011+</td><td>0.30 (0.40)</td><td>3.5 (4.7)</td></tr>
<tr><td rowspan="2">100≤HP<175 (75≤kW<130)</td><td>2009 and earlier</td><td>0.60 (0.80)</td><td>7.8 (10.5)</td><td rowspan="2">3.7 (5.0)</td></tr>
<tr><td>2010+</td><td>0.22 (0.30)</td><td>3.0 (4.0)</td></tr>
<tr><td rowspan="2">175≤HP<300 (130≤kW<225)</td><td>2008 and earlier</td><td>0.40 (0.54)</td><td>7.8 (10.5)</td><td rowspan="2">2.6 (3.5)</td></tr>
<tr><td>2009+</td><td>0.15 (0.20)</td><td>3.0 (4.0)</td></tr>
<tr><td rowspan="2">300≤HP<600 (225≤kW<450)</td><td>2008 and earlier</td><td>0.40 (0.54)</td><td>7.8 (10.5)</td><td rowspan="2">2.6 (3.5)</td></tr>
<tr><td>2009+</td><td>0.15 (0.20)</td><td>3.0 (4.0)</td></tr>
<tr><td rowspan="2">600≤HP<750 (450≤kW<560)</td><td>2008 and earlier</td><td>0.40 (0.54)</td><td>7.8 (10.5)</td><td rowspan="2">2.6 (3.5)</td></tr>
<tr><td>2009+</td><td>0.15 (0.20)</td><td>3.0 (4.0)</td></tr>
<tr><td rowspan="2">HP>750 (kW>560)</td><td>2007 and earlier</td><td>0.40 (0.54)</td><td>7.8 (10.5)</td><td rowspan="2">2.6 (3.5)</td></tr>
<tr><td>2008+</td><td>0.15 (0.20)</td><td>4.8 (6.4)</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>SMAQMD</td><td>

BACT

Source: SMAQMD BACT Clearinghouse, BACT Determination Number 111

<table>
<tr><th colspan="2">For standby units with a rating of ≥ 50 HP</th></tr>
<tr><td>VOC</td><td>Applicable NMHC + NOx Standard for horsepower range; Compliance with the emissions standards based on NSPS, Subpart IIII; Compliance with the emission standards based on the ATCM for Stationary CI Engines</td></tr>
<tr><td>NOx</td><td>Applicable NMHC + NOx Standard for horsepower range; Compliance with the emissions standards based on NSPS, Subpart IIII; Compliance with the emission standards based on the ATCM for Stationary CI Engines</td></tr>
<tr><td>SOx</td><td>CARB Diesel; Diesel fuel with a sulfur content no greater than 0.0015% by weight</td></tr>
<tr><td>PM10</td><td>0.15 g/bhp-hr (filterable)*, Compliance with the emission standards based on NSPS, Subpart IIII, Compliance with the emission standards based on the ATCM for Stationary Engines</td></tr>
<tr><td>PM2.5</td><td>0.15 g/bhp-hr (filterable)*, Compliance with the emission standards based on NSPS, Subpart IIII, Compliance with the emission standards based on the ATCM for Stationary Engines</td></tr>
<tr><td>CO</td><td>Applicable NMHC + NOx Standard for horsepower range; Compliance with the emissions standards based on NSPS, Subpart IIII; Compliance with the emission standards based on the ATCM for Stationary CI Engines</td></tr>
</table>

*Note: BACT Determination Number 111 did not discuss the different requirements for direct drive fire-pump engines. Because direct-drive fire pumps less than 175 hp have different operation requirements, state and federal regulations require them to meet a standard greater than 0.15 g/hp-hr, and therefore, 0.15 g/hp-hr is not achieved in practice for direct-drive fire pump engines less than 175 hp.

T-BACT

The current BACT determination does not address T-BACT. However, the District's Stationary Internal Combustion Engine Policy Manual (May 2012) requires:

1. Engines located within 1000 feet of a K-12 school shall not operate for maintenance purposes between the hours of 7:30 AM and 3:30 PM on days when school is in session. Engines meeting a PM emissions standard of 0.01 g/hp-hr or less are not subject to this restriction. This requirement applies only to maintenance operation and in no way limits operation of the engine for emergency purposes or operation at the request of SMAQMD staff for the purposes of determining compliance with emissions limits.
2. Engines located on the grounds of a K-12 school are further prohibited from maintenance operation during any school sponsored activity. This requirement applies only to maintenance operation and in no way limits operation of the engine for emergency purposes or operation at the request of SMAQMD staff for the purposes of determining compliance with emissions limits.

RULE REQUIREMENTS:

None

</td></tr>
</table>

<table>
<tr><td>District/Agency</td><td>Best Available Control Technology (BACT)/Requirements</td></tr>
<tr><td>South Coast AQMD</td><td>

BACT
Source: SCAQMD BACT Guidelines for Non-Major Polluting Facilities, page 69-72

<table>
<tr><td colspan="6">BACT Guideline, I.C. Engine, Stationary, Emergency – g/kW-hr (g/bhp-hr)</td></tr>
<tr><td>Maximum engine power</td><td>Tier</td><td>NMHC + NOx</td><td>SOx</td><td>CO</td><td>PM</td></tr>
<tr><td>50≤HP<100</td><td>3</td><td>4.7 (3.5)</td><td rowspan="5">0.0015% S by weight in fuel</td><td>5.0 (3.7)</td><td>0.40 (0.30)</td></tr>
<tr><td>100≤HP<175</td><td>3</td><td>4.0 (3.0)</td><td>5.0 (3.7)</td><td>0.30 (0.22)</td></tr>
<tr><td>175≤HP<300</td><td>3</td><td>4.0 (3.0)</td><td>3.5 (2.6)</td><td>0.20 (0.75)</td></tr>
<tr><td>300≤HP<750</td><td>3</td><td>4.0 (3.0)</td><td>3.5 (2.6)</td><td>0.20 (0.75)</td></tr>
<tr><td>HP>750</td><td>2</td><td>6.4 (4.8)</td><td>3.5 (2.6)</td><td>0.20 (0.75)</td></tr>
</table>

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
Reg XI, Rule 1110.2 – Emissions From Gaseous- and Liquid-Fueled Engines
Standby Engines are exempt from the emission limitations of this rule.
Reg XVI, Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines
This rule regulates criteria pollutants as well as diesel PM from stationary diesel engines. Rule 1470 is not a SIP-approved rule so the standards below will only be considered for purposes of establishing “achieved in practice” T-BACT control levels or techniques.

<table>
<tr><td colspan="4">SCAQMD Rule 1470 Emission Standards – g/kW-hr (g/bhp-hr)
Rule 1470 §(c)(2)(C)(vi) for PM
Rule 1470 §(c)(2)(C)(vii), Table 2 for NMHC + NOx, and CO</td></tr>
<tr><td>Maximum engine power</td><td>NMHC + NOx</td><td>CO</td><td>PM</td></tr>
<tr><td>50 < HP < 100
(37 < kW < 75)</td><td>4.7 (3.5)</td><td>5.0 (3.7)</td><td>(0.15)</td></tr>
<tr><td>100 < HP < 175
(75 < kW < 130)</td><td>4.0 (3.0)</td><td>5.0 (3.7)</td><td>(0.15)</td></tr>
<tr><td>175 < HP ≤ 750
(130 < kW ≤ 560)</td><td>4.0 (3.0)</td><td>3.5 (2.6)</td><td>(0.15)</td></tr>
<tr><td>HP > 750
(kW > 560)</td><td>6.4 (4.8)</td><td>3.5 (2.6)</td><td>(0.15)</td></tr>
</table>

For standby diesel fueled direct drive fire pump engines, SCAQMD Rule 1470 requires the engine to meet the same emission standards as Table 2 of the Stationary Diesel ATCM (Title 17, Cal. Code Regs., §93116(a)(4))

</td></tr>
</table>

<table>
<tr><td>District/Agency</td><td>Best Available Control Technology (BACT)/Requirements</td></tr>
<tr><td>South Coast AQMD (continued)</td><td>Rule 1470, §§(c)(2)(A), (c)(2)(C)(iv), and (c)(2)(C)(v) place additional restrictions on engines located on school grounds, within 100 meters of a school, within 500 feet of a school, and within 50 meters of a sensitive receptor. For engines located within 100 meters of a school or on school grounds, the engine must emit diesel PM at a rate less than or equal to 0.01 g/hp-hr, unless the owner/operator accepts restrictions on non-emergency operation (7:30 a.m. to 4:30 p.m. when school is in session or during school activities) in most cases. New engines located within 500 feet of as school must meet an emission standard of 0.15 g/hp-hr and not operate for non-emergency use between the hours of 7:30 a.m. and 3:30 p.m. when school is in session. Except for replacement engines, new stationary emergency engines located within 50 meters of a sensitive receptor are required to meet Tier 4 PM standards for nonroad engines.</td></tr>
<tr><td>San Joaquin Valley Unified APCD APCD</td><td><u>BACT</u>
Source: SJVUAPCD BACT Guideline 3.1.1

<table>
<tr><td colspan="2">Emergency Diesel IC engine</td></tr>
<tr><td>VOC</td><td>Latest EPA Tier Certification level for applicable horsepower range*</td></tr>
<tr><td>NOx</td><td>Latest EPA Tier Certification level for applicable horsepower range*</td></tr>
<tr><td>SOx</td><td>Very low sulfur diesel fuel (15 ppmw sulfur or less)</td></tr>
<tr><td>PM10</td><td>0.15 g/bhp-hr or the Latest EPA Tier Certification level for applicable horsepower range, whichever is more stringent. (ATCM)</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>Latest EPA Tier Certification level for applicable horsepower range*</td></tr>
</table>
*Note: for emergency engines 50 ≤ bhp < 75, Tier 4 Interim certification is the requirement; for emergency engines 75 <= bhp < 750, Tier 3 certification is the requirement; for emergency engines => 750 bhp, Tier 2 certification is the requirement.

<u>BACT</u>
Source: SJVUAPCD BACT Guideline 3.1.4

<table>
<tr><td colspan="2">Emergency Diesel I.C. Engine Driving a Fire Pump</td></tr>
<tr><td>VOC</td><td>Positive crankcase ventilation [unless it voids the Underwriters Laboratories (UL) certification]</td></tr>
<tr><td>NOx</td><td>Certified NOx emissions of 6.9 g/bhp-hr or less</td></tr>
<tr><td>SOx</td><td>Low-sulfur diesel fuel (500 ppmw sulfur or less) or Very Low-sulfur diesel fuel (15 ppmw sulfur or less), where available.</td></tr>
<tr><td>PM10</td><td>0.4 g/bhp-hr</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>San Joaquin Valley Unified APCD (continued)</td><td>
<u>T-BACT</u>
Source: SJVUAPCD BACT Guideline 3.1.4

<table>
<tr><td colspan="2">Emergency Diesel I.C. Engine Driving a Fire Pump</td></tr>
<tr><td>Diesel PM</td><td>0.149 g/hp-hr, if T-BACT is triggered based on a site-specific health risk analysis</td></tr>
</table>

There are no T-BACT standards published in the clearinghouse for non-fire pump emergency diesel I.C. engines.

<u>RULE REQUIREMENTS:</u>
Rule 4702 – INTERNAL COMBUSTION ENGINES

Standby Engines are exempt from the emission limitations of this rule.
</td></tr>
<tr><td>San Diego County APCD</td><td>
<u>BACT</u>
Source: NSR Requirements for BACT
The engine BACT determinations listed in the SDAPCD Clearinghouse do not apply to standby engines.

<u>T-BACT</u>
There are no T-BACT standards published in the clearinghouse for this category.

<u>RULE REQUIREMENTS:</u>
Regulation 4, Rule 69.4 – Stationary Reciprocating Internal Combustion Engines – Reasonably Available Control Technology
This rule applies to stationary I.C. Engines ≥ 50 BHP located at a stationary source which emits or has a potential to emit 50 tons per year or more of NOx.

Standby Engines are exempt from the emission limitations of this rule.

Regulation 4, Rule 69.4.1 – Stationary Reciprocating Internal Combustion Engines – Best Available Retrofit Control Technology
This rule applies to stationary I.C. Engines ≥ 50 BHP.

<table>
<tr><td colspan="2">New or replacement low-use engines using diesel or kerosene fuel</td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>6.9 g/bhp-hr or 535 ppmv</td></tr>
<tr><td>SOx</td><td>California Diesel Fuel</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>
</td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>Bay Area AQMD</td><td>
<u>BACT</u>
Source: BAAQMD BACT Guideline 96.1.3

<table>
<tr><td colspan="2">IC Engine-Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump ≥ 50 BHP</td></tr>
<tr><td>VOC</td><td>ARB ATCM standard for NMHC at applicable horsepower rating</td></tr>
<tr><td>NOx</td><td>ARB ATCM standard for NOx at applicable horsepower rating</td></tr>
<tr><td>SOx</td><td>Fuel sulfur content not to exceed 0.0015% (wt) or 15 ppm (wt)</td></tr>
<tr><td>PM10</td><td>0.15 g/bhp-hr</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>ARB ATCM standard for CO at applicable horsepower rating</td></tr>
</table>

<u>T-BACT</u>
Source: BAAQMD BACT Guideline 96.1.3

<table>
<tr><td colspan="2">IC Engine-Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump ≥ 50 BHP</td></tr>
<tr><td>Diesel PM</td><td>0.15 g/bhp-hr</td></tr>
</table>

<u>RULE REQUIREMENTS:</u>
Reg 9, Rule 8 – Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines

Standby Engines are exempt from the emission limitations of this rule.
</td></tr>
</table>

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

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	1. Applicable NMHC + NOx emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD] 2. Applicable NMHC + NOx emission standard for horsepower range based on 40 CFR 60 Subpart IIII [EPA]. 3. No Standard [SDAPCD]
NOx	1. Applicable NMHC + NOx emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD] 2. Applicable NMHC + NOx emission standard for horsepower range based on 40 CFR 60 Subpart IIII [EPA]. 3. 6.9 g/bhp-hr or 535 ppmv [SDAPCD]
SOx	1. Diesel fuel with a sulfur content no greater than 0.0015% by weight [EPA, ARB, SMAQMD, SCAQMD, SJVUAPCD, SDAPCD, BAAQMD]
PM10	1. Applicable PM emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [ARB, SMAQMD, SJVUAPCD, BAAQMD] 2. Applicable PM emission standard for horsepower range based on 40 CFR 60 Subpart IIII or 40 CFR 63 Subpart ZZZZ, whichever is more stringent. [EPA] 3. No Standard [SDAPCD]
PM2.5	1. Applicable PM emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [SMAQMD] 2. Applicable PM emission standard for horsepower range based on 40 CFR 60 Subpart IIII or 40 CFR 63 Subpart ZZZZ, whichever is more stringent [EPA] 3. No Standard [ARB, SCAQMD, SJVUAPCD, SDAPCD, BAAQMD]
CO	1. Applicable CO emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD] 2. Applicable CO emission standard for horsepower range based on 40 CFR 60 Subpart IIII. [EPA] 3. No Standard [SDAPCD]
Diesel PM (T-BACT)	1. Compliance with SCAQMD Rule 1470(C) [SCAQMD] 2. 0.149 g/hp-hr if T-BACT is triggered for a direct-drive fire pump [SJVUAPCD] 3. 0.15 g/bhp-hr for stationary emergency, non-agricultural, non-direct drive fire pump ≥ 50 BHP 4. Applicable PM emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [ARB, BAAQMD, SJVUAPCD] 5. Applicable PM emission standard for horsepower range based on 40 CFR 60 subpart IIII, 40 CFR 63 Subpart ZZZZ. [EPA]

(A) for non-direct drive fire pump emergency engines 50 ≤ bhp < 75, Tier 4 Interim certification is the requirement; for emergency engines 75 <= bhp < 750, Tier 3 certification is the requirement; for emergency engines => 750 bhp, Tier 2 certification is the requirement.

(B) for direct-drive fire pump emergency engines, the applicable standards are those listed in Table 2 of the Stationary Diesel ATCM (Title 17, Cal. Code Regs., §93116(a)(4))

(C) SCAQMD Rule 1470 requires new engines (as of January 1, 2013) located within 50 meters of a sensitive receptor that are not replacement engines to meet Tier 4 emission standards for PM.

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

BEST CONTROL TECHNOLOGIES ACHIEVED IN PRACTICE		
Pollutant	**Standard**	**Source**
VOC	Applicable NMHC + NOx emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD
NOx	Applicable NMHC + NOx emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.	EPA, ARB, SMAQMD, SCAQMD, SJVUAPCD, SDAPCD, BAAQMD
PM10	Applicable PM emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD
PM2.5	Applicable PM emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	SMAQMD; EPA
CO	Applicable CO emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD
Diesel PM (T-BACT)	Applicable PM emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	EPA, ARB, SMAQMD, SCAQMD [B], SJVUAPCD [A], SDAPCD, BAAQMD

- On 6/30/2001, SJVUAPCD last updated their T-BACT standard for diesel PM. This standard requires direct-drive fire pump engines to meet a PM standard of 0.1 g/hp-hr (later clarified to be 0.149 g/bhp-hr). Subsequent to this (September 27, 2004), the Air Resources Board adopted the ATCM for stationary diesel engines. During the rulemaking process, ARB initially proposed 0.1 g/hp-hr as the standard, but eventually established the PM standards to be 0.15 g/hp-hr, which was discussed during a public workshop on April 4, 2002. Also subsequent to this, South Coast AQMD determined in their analysis on Rule 1470 (May 4, 2012) that, except in certain cases, due to NFPA requirements, requiring PM standards more stringent than the NSPS is cost prohibitive because manufacturers cannot justify different PM standards on fire pumps for such a small market. As a result Rule 1470 allows direct-drive fire pump engines to meet the NSPS standards, except when installed within 100 meters of a school. For these reasons, the District has determined that the PM

standard of SJVUAPCD T-BACT Guideline 3.4.1 is not achieved in practice and therefore is not listed in the above table.

- SCAQMD Rule 1470 requires a more stringent PM emission standard for engines greater or equal to 175 HP if the engine is going to be located within 50 meters from a sensitive receptor. The rule analysis states that cancer risk from emergency diesel engines could be as high as 11 per million for receptors within 50 meters of the release point. This is greater than the 10 in a million significance level for the SCAQMD. Therefore, SCAQMD justified the requirement that most new emergency-use diesel engines meet more stringent standards for PM when installed within 50 meters of a sensitive receptor. Rule 1470 is not considered achieved in practice for SMAQMD for the following reasons:
  - It requires more stringent PM standards for engines ≥ 175 HP when installed within 50 meters from sensitive receptors because the cancer risk may exceed 10 in one million. SMAQMD does not allow a cancer risk in excess of 10 in one million.
  - It allows operation of the engine for emergency purposes if the electrical operating reserves fall below 5% (Stage II). SMAQMD allows emergency operation only during unforeseeable power outages.
  - It allows the use of the engine in Demand Response Programs (DRP). SMAQMD allows emergency operation only during unforeseeable power outages.

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

Discussion

During the most recent rulemaking for updates to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines (Title 17, Cal. Code. Regs., §93115 to §93115.15), ARB conducted a cost effectiveness analysis to determine if selective catalytic reduction (SCR) and/or diesel particulate filters (DPF) were technologically feasible and cost effective for emergency use applications. (Initial Statement of Reasons for Proposed Rulemaking: Proposed Amendments to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines, Appendix B, September 2010)

The analysis concluded that DPFs were technologically feasible with some additional operational and monitoring conditions. These conditions would include either operating the engine for additional hours to allow the filter to regenerate (Passive DPF) or regenerating the filter during scheduled down-time (active DPF), and monitoring for backpressure, cold starts, and 30-minute idle sessions.

The analysis also concluded that SCR was technologically feasible, but had some additional challenges. Because standby engines routinely operate only for scheduled maintenance and testing, the engines do not operate more than 15-30 minutes, and do operate at no or low load. Because of this the exhaust would not likely reach the temperature (260 °C to 540 °C) required for the catalyst to operate. To circumvent this problem, the engine would need to be operated with higher loads and in many cases for longer periods of time. This could be a challenge for most emergency standby applications as most businesses do not have load banks in house and would have to create a larger load on the engine to get the catalyst up to operational temperature.

Urea handling and maintenance is also an important consideration. Urea crystallization in the lines can cause damage to the SCR system and to the engine itself. Crystallization in the lines is more likely in emergency standby engines due to their periodic and low hours of usage. Urea also has a shelf life of approximately two years. This could increase the cost of operating a SCR for emergency standby engines since the low number of annual hours of operation experienced by most emergency standby engines could lead to urea expiration. The urea would then have to be drained and replaced, creating an extra maintenance step and an increased cost to the end user.

ARB staff determined that while, SCR systems may be technically feasible, there are significant operational hurdles to overcome before routine use of SCR on emergency standby engines is practical. This is because the majority of operating hours for emergency standby engines occur during short 15 to 30 minute maintenance and testing checks are at low engine loads. In most cases, the temperature needed for the SCR catalyst to function will not be reached during this operation and the SCR will not provide the expected NOx reductions.

ARB staff also reviewed the feasibility of requiring Tier 4 final engines in lieu of aftermarket treatment. ARB concluded that Tier 4 engines that rely on after-treatment technology for emergency standby applications will not be available from the original equipment manufacturers. Representatives from the Engine Manufacturer's Association (EMA) have indicated that it will not be economically viable for engine manufacturers to develop and maintain a Tier 4 emergency standby engine platform for California. At the time, ARB staff

concluded that Tier 4 engines for emergency standby applications will not be available "off-the-shelf." Rather, each owner or operator will need to purchase a new Tier 2 or Tier 3 engines and then work with suppliers to retrofit the engine with a DPF and/or SCR to meet the Tier 4 emission standards for all pollutants. Subsequent to this "off-the-shelf" Tier 4 final engines have become available for emergency purposes, and the District determined that Tier 4 final engines are technologically feasible. The District reviewed some engine list prices and determined that these prices were generally in line with the prices listed in Appendix 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.

The table below shows the technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be "Achieved in Practice" as per Rule 202, §205.1.a.

VOC	Tier 4 standard
NOx	Selective Catalytic Reduction (SCR) Tier 4 standard
SOx	No other technologically feasible option identified
PM10	Diesel Particulate Filter (DPF) Tier 4 standard
PM2.5	Diesel Particulate Filter (DPF) Tier 4 standard
CO	Tier 4 standard

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.

The District reviewed cost information from the September 2010 amendments to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines and adjusted the assumptions to reflect permitted emissions for maintenance and testing (50 hr/year) and a 15-year life for the control equipment. The District concluded that conducting the cost analysis using 200 hours per year for total operation (maintenance, testing, and emergency use) was not representative of actual engine operation, since emergency use is not predictable or routine. Cost effectiveness for PM reductions from a Tier 4 interim or Tier 4 final are not presented below, since the cost increases due to controls were consistently higher than those for retrofitting. The results are presented in the below tables.

Cost-Effectiveness Associated with the Application of DPF and SCR on Emergency Standby Engines (50 hours/year)							
Regulatory Scenario			HP Range				
			50-174	175-749	750-1206	1207-1999	>2000
	Average Horsepower:		112	462	978	1604	2630
Scenario 1: DPF Retrofit of Tier 2/3 engine	Cost Increase Due to Controls (A)	PM	$4,300	$17,600	$37,200	$60,900	$99,900
		NOx	N/A	N/A	N/A	N/A	N/A
	Emission Reductions (lb) (B)	PM	13	53	113	186	305
		NOx	N/A	N/A	N/A	N/A	N/A
	Cost Effectiveness ($/lb)	PM	$333	$331	$329	$328	$328
		NOx	N/A	N/A	N/A	N/A	N/A
Scenario 2: DPF/SCR Retrofit of Tier 2/3 engine	Cost Increase Due to Controls (A)	PM	$4,400	$18,200	$38,500	$63,100	$103,400
		NOx	$8,800	$36,300	$76,900	$126,100	$206,900
	Emission Reductions (lb) (B)	PM	13	53	113	186	305
		NOx	161	666	2348	3677	6032
	Cost Effectiveness ($/lb)	PM	$341	$342	$341	$340	$339
		NOx	$55	$54	$33	$34	$34

(A) Cost increases due to controls are from Table B-7 of the Initial Statement of Reasons for Proposed Rulemaking: Proposed Amendments to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines, Appendix B, September 2010.

(B) Emission reductions have been adjusted from 31 hours/year of operation to 50 hours/year of operation.

Cost-Effectiveness Associated with installing Tier 4 Final Emergency Standby Engines (50 hours/year)							
Regulatory Scenario			HP Range				
			50-174	175-749	750-1206	1207-1999	>2000
	Average Horsepower:		112	462	978	1604	2630
Tier 4 Final Engine	Cost Increase (A)	NOx	$28,000	$85,008	$156,480	$248,465	$328,750
	Emission Reductions (lb) (B)	NOx	161	666	2,348	3,677	6,032
	Cost Effectiveness ($/lb)	NOx	$170	$130	$70	$70	$50

(A) Cost increases due to controls are from Table B-7 of the Initial Statement of Reasons for Proposed Rulemaking: Proposed Amendments to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines, Appendix B, September 2010.

(B) Emission reductions have been adjusted from 31 hours/year of operation to 50 hours/year of operation.

The above cost effectiveness numbers were converted from cost per pound to cost per ton for comparison to the District's cost effectiveness thresholds.

Cost-Effectiveness Associated with the Application of DPF and SCR on Emergency Standby Engines (50 hours/year)							
Regulatory Scenario			HP Range				
			50-174	175-749	750-1206	1207-1999	>2000
	Average Horsepower:		112	462	978	1604	2630
Scenario 1: DPF Retrofit of Tier 2/3 engine	Cost Effectiveness ($/ton)	PM	$660,000	$662,000	$658,000	$656,000	$656,000
		NOx	N/A	N/A	N/A	N/A	N/A
Scenario 2: DPF/SCR Retrofit of Tier 2/3 engine	Cost Effectiveness ($/ton)	PM	$682,000	$684,000	$682,000	$680,000	$678,000
		NOx	$110,000	$108,000	$66,000	$68,000	$68,000
Scenario 3: Tier 4 Final engine	Cost Effectiveness ($/ton)	NOx	$340,000	$260,000	$140,000	$140,000	$100,000

As demonstrated above, SCR and DPF after treatment is not considered cost effective since both the cost effectiveness for reducing the pollutants exceeds the District's threshold of $24,500 for NOx and $11,400 for PM10.

C. SELECTION OF BACT:

Based on the above analysis, BACT for VOC, NOx, SOx, PM10, and CO will remain at what is currently achieved in practice and BACT for PM2.5 will be set to be the same as for PM10.

BACT FOR I.C. ENGINES, STANDBY, DIESEL-FUELED		
Pollutant	**Standard**	**Source**
VOC	Applicable NMHC + NOx emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD
NOx	Applicable NMHC + NOx emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.	EPA, ARB, SMAQMD, SCAQMD, SJVUAPCD, SDAPCD, BAAQMD
PM10	Applicable PM emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD
PM2.5	Applicable PM emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	SMAQMD; EPA
CO	Applicable CO emission standard for horsepower range based on Table 1: New Emergency Standby Diesel-Fueled CI Engines and Table 2: New Emergency Standby Direct-Drive Fire Pump Engines of the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVUAPCD, BAAQMD

T-BACT FOR I.C. ENGINES, STANDBY, DIESEL-FUELED		
Pollutant	**Standard**	**Source**
Diesel PM	Applicable PM emission standard for horsepower range based on the ATCM for Stationary CI Engines	EPA, ARB, SMAQMD, SCAQMD, SJVUAPCD, SDAPCD, BAAQMD

REVIEWED BY: _____ **DATE:** _____

APPROVED BY: _____ **DATE:** **1/12/16**

Attachment A

Review of BACT Determinations published by EPA

List of BACT determinations published in EPA's RACT/BACT/LAER Clearinghouse (RBLC) for I.C. Engines 175 ≥ HP > 750 [A]:

RBLC#	Permit Date	Process Code [B], [C]	Rating	Pollutant	Standard	Case-By-Case Basis
AK-0081	6/12/2013	17.110	610 BHP	PM2.5	0.1500 g/KW-hr	Other Case-by-Case; NSPS [D]
AK-0081	6/12/2013	17.210	493 BHP	PM2.5	0.2000 g/KW-hr	Other Case-by-Case: NSPS [D]
IA-0105	10/26/2012	17.110	2,682 BHP	PM	0.2000 g/KW-hr	BACT-PSD
IA-0105	10/26/2012	17.110	2,682 BHP	PM10	0.2000 g/KW-hr	BACT-PSD
IA-0105	10/26/2012	17.110	2,682 BHP	PM2.5	0.2000 g/KW-hr	BACT-PSD
IA-0105	10/26/2012	17.110	2,682 BHP	NOx	6.0000 g/KW-hr	BACT-PSD [E]
IA-0105	10/26/2012	17.110	2,682 BHP	VOC	0.4000 g/KW-hr	BACT-PSD [E]
IA-0105	10/26/2012	17.110	2,682 BHP	CO	3.5000 g/KW-hr	BACT-PSD
AK-0076	8/20/2012	17.110	2,347 BHP	NOx	6.4000 g/KW-hr	BACT-PSD; NSPS
AK-0076	8/20/2012	17.110	2,347 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS
AK-0076	8/20/2012	17.110	2,347 BHP	PM2.5	0.2000 g/KW-hr	BACT-PSD; NSPS
MI-0395	7/13/2012	17.110	4,035 BHP	NOx	5.9800 g/KW-hr	BACT-PSD; NSPS, NESHAP, SIP, OPERATING PERMIT [F]
MI-0395	7/13/2012	17.110	3,634 BHP	NOx	7.1300 g/KW-hr	BACT-PSD; NSPS, NESHAP, SIP, OPERATING PERMIT [G]
SC-0159	7/9/2012	17.110	1,341 BHP	VOC	6.4000 g/KW-hr	BACT-PSD; NSPS [D]
SC-0113	2/28/2012	17.110	757 BHP	NOx	4.0000 g/KW-hr	BACT-PSD; NSPS [D]
SC-0113	2/28/2012	17.110	757 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS [D]
SC-0113	2/28/2012	17.110	757 BHP	VOC	4.0000 g/KW-hr	BACT-PSD; NSPS [D]
SC-0113	2/28/2012	17.110	757 BHP	SOx	0.0015% Sulfur	BACT-PSD
MI-0394	2/26/2012	17.110	4,035 BHP	NOx	5.9800 g/KW-hr	BACT-PSD; NSPS, NESHAP, SIP, OPERATING PERMIT [F]
MI-0394	2/26/2012	17.110	3,058 BHP	NOx	6.9300 g/KW-hr	BACT-PSD; NSPS, NESHAP, SIP, OPERATING PERMIT [G]

RBLC#	Permit Date	Process Code (B), (C)	Rating	Pollutant	Standard	Case-By-Case Basis
SC-0113	2/8/2012	17.210	500 BHP	NOx	4.0000 g/KW-hr	BACT-PSD; NSPS (D)
SC-0113	2/8/2012	17.210	500 BHP	SOx	0.0015% Sulfur	BACT-PSD
SC-0113	2/8/2012	17.210	500 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS (D)
SC-0113	2/8/2012	17.210	500 BHP	VOC	4.0000 g/KW-hr	BACT-PSD; NSPS (D)
CA-1212	10/18/2011	17.210	182 BHP	NOx	4.0000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.210	182 BHP	CO	3.5000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.210	182 BHP	PM10	0.2000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.210	182 BHP	PM2.5	0.2000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.110	2,683 BHP	NOx	6.4000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.110	2,683 BHP	CO	3.5000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.110	2,683 BHP	PM (TSP)	0.2000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.110	2,683 BHP	PM10	0.2000 g/KW-hr	BACT-PSD (H)
CA-1212	10/18/2011	17.110	2,683 BHP	PM2.5	0.2000 g/KW-hr	BACT-PSD (H)
FL-0332	9/23/2011	17.110	600 BHP	NOx + NMHC	3.000 g/hp-hr	BACT-PSD; NSPS (D)
FL-0332	9/23/2011	17.110	600 BHP	SOx	0.0015% Sulfur	BACT-PSD; NSPS
FL-0332	9/23/2011	17.110	600 BHP	PM (TSP)	0.1500 g/hp-hr	BACT-PSD; NSPS (D)
FL-0332	9/23/2011	17.110	600 BHP	CO	2.600 g/hp-hr	BACT-PSD; NSPS (D)
FL-0332	9/23/2011	17.110	2,682 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS (D)
FL-0332	9/23/2011	17.110	2,682 BHP	PM	0.2000 g/KW-hr	BACT-PSD; NSPS (D)
FL-0332	9/23/2011	17.110	2,682 BHP	NOx	6.4000 g/KW-hr	BACT-PSD; NSPS (D)
FL-0332	9/23/2011	17.110	2,682 BHP	SOx	0.0015% Sulfur	BACT-PSD
LA-0254	8/16/2011	17.210	350 BHP	PM10	0.1500 g/hp-hr	BACT-PSD; NSPS (I)
LA-0254	8/16/2011	17.210	350 BHP	PM2.5	0.1500 g/hp-hr	BACT-PSD; NSPS (I)
LA-0254	8/16/2011	17.210	350 BHP	CO	2.6000 g/hp-hr	BACT-PSD; NSPS (I)

RBLC#	Permit Date	Process Code [B], [C]	Rating	Pollutant	Standard	Case-By-Case Basis
LA-0254	8/16/2011	17.210	350 BHP	VOC	1.0000 g/hp-hr	BACT-PSD; NSPS [I]
LA-0254	8/16/2011	17.110	1,250 BHP	PM2.5	0.1500 g/hp-hr	BACT-PSD; NSPS [I]
LA-0254	8/16/2011	17.110	1,250 BHP	PM10	0.1500 g/hp-hr	BACT-PSD; NSPS [I]
LA-0254	8/16/2011	17.110	1,250 BHP	CO	2.6000 g/hp-hr	BACT-PSD; NSPS [I]
LA-0254	8/16/2011	17.110	1,250 BHP	VOC	1.0000 g/hp-hr	BACT-PSD; NSPS [I]
CA-1192	6/21/2011	17.210	288 BHP	CO	0.4470 g/hp-hr	BACT-PSD; NSPS [J]
CA-1192	6/21/2011	17.210	288 BHP	NOx	3.4000 g/hp-hr	BACT-PSD; NSPS [J]
CA-1192	6/21/2011	17.210	288 BHP	PM (TSP)	NA	BACT-PSD; NSPS [J]
CA-1192	6/21/2011	17.210	288 BHP	PM10	NA	BACT-PSD; NSPS [J]
LA-0251	4/26/2011	17.110	591 BHP	NOx + NMHC	6.4000 g/KW-hr	LAER; NSPS
LA-0251	4/26/2011	17.110	591 BHP	PM10	0.2000 g/KW-hr	BACT-PSD; NSPS
LA-0251	4/26/2011	17.110	591 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS
LA-0251	4/26/2011	17.210	193 BHP	PM10	0.2000 g/KW-hr	BACT-PSD; NSPS
LA-0251	4/26/2011	17.210	193 BHP	NOx + NMHC	4.0000 g/KW-hr	BACT-PSD; NSPS
LA-0251	4/26/2011	17.210	193 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS
LA-0251	4/26/2011	17.110	1,175 BHP	PM10	0.2000 g/KW-hr	BACT-PSD; NSPS
LA-0251	4/26/2011	17.110	1,175 BHP	NOx	6.4000 g/KW-hr	LAER; NSPS
LA-0251	4/26/2011	17.110	1,175 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS
FL-0324	12/23/2010	17.210	400 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS [K]
FL-0324	12/23/2010	17.210	400 BHP	PM	0.2000 g/KW-hr	BACT-PSD; NSPS [K]
FL-0324	12/23/2010	17.210	400 BHP	SOx	0.0015% Sulfur	BACT-PSD; NSPS [K]
FL-0324	12/23/2010	17.210	400 BHP	NOx	4.0000 g/KW-hr	BACT-PSD; NSPS [K]
FL-0322	12/23/2010	17.110	2,682 BHP	CO	3.5000 g/KW-hr	BACT-PSD
FL-0322	12/23/2010	17.110	2,682 BHP	PM	0.2000 g/KW-hr	BACT-PSD

RBLC#	Permit Date	Process Code (B), (C)	Rating	Pollutant	Standard	Case-By-Case Basis
FL-0322	12/23/2010	17.110	2,682 BHP	NOx	6.4000 g/KW-hr	BACT-PSD
ID-0018	6/25/2010	17.110	1,006 BHP	NOx	6.4000 g/KW-hr	BACT-PSD; NSPS
ID-0018	6/25/2010	17.110	1,006 BHP	VOC	6.4000 g/KW-hr	BACT-PSD; NSPS
ID-0018	6/25/2010	17.110	1,006 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS
ID-0018	6/25/2010	17.110	1,006 BHP	PM	0.2000 g/KW-hr	BACT-PSD; NSPS
CA-1191	3/11/2010	17.210	182 BHP	CO	3.5000 g/KW-hr	BACT-PSD
CA-1191	3/11/2010	17.210	182 BHP	NOx	3.8000 g/KW-hr	BACT-PSD; NSPS (L)
CA-1191	3/11/2010	17.210	182 BHP	PM (TSP)	0.2000 g/KW-hr	BACT-PSD
CA-1191	3/11/2010	17.210	182 BHP	PM2.5	0.2000 g/KW-hr	BACT-PSD
CA-1191	3/11/2010	17.110	2,683 BHP	CO	3.5000 g/KW-hr	BACT-PSD; NSPS
CA-1191	3/11/2010	17.110	2,683 BHP	NOx	6.0000 g/KW-hr	BACT-PSD; NSPS (L)
CA-1191	3/11/2010	17.110	2,683 BHP	PM (TSP)	0.2000 g/KW-hr	BACT-PSD

(A) Due to the large number of entries only determinations made (based on Permit Date) entered since 01/01/2010 are included in the above table.

(B) Process Code 17.110 includes Large Internal Combustion Engines (> 500 BHP) fueled using Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel. Determinations for engines ≥ 750 HP were exclude.

(C) Process Code 17.210 includes Small Internal Combustion Engines (≤ 500 BHP) fueled using Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel. Determinations for engines < 175 HP were excluded.

(D) Emission Limits are based on 40 CFR Part 60 Subpart IIII – Standards of Performance for Stationary Compression Internal Combustion Engines. (NSPS, Subpart IIII)

(E) Emission standards for NOx and VOC based on the NSPS, Subpart IIII and the California Tier Emission Standards are based on the sum of NOx and non-methane hydrocarbons (NMHC). Emission standard assumes 6.0 g/KW-hr NOx and 0.4 g/KW-hr VOC and will be based on source testing. Source Iowa DNR, PSD Permit 12-219.

(F) No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. DRUPS stands for Diesel Rotary Uninterruptable Power supply system. The system provides for zero down-time in electrical energy supply at the onset of a power outage. The system stores energy in a fly-wheel that powers the generator until the diesel engine starts up.

(G) No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation.

(H) Emission Limits are based on based on NSPS Subpart IIII emission standards and California Air Resources Board Tier 3 emission standards. Source: EPA Region IX PSD Permit Number SE 09-01 for Palmdale Hybrid Power Project.

(I) BACT was determined to be the use of a Tier 2 (non-road) engine, ultra low sulfur diesel and good combustion practices to achieve the emission limits on an annual basis. Source: Louisiana Department of Environmental Quality Permit PSD-LA-752 for Ninemile Point Electical

Generating Plant

(J) The Ninth Circuit Court of Appeals issued a decision on 8/12/2014 that vacated the permit decision and remanded it to EPA. Therefore, this BACT determination has not yet been achieved in practice. Source: EPA Region IX, Avenal Energy Product.

(K) Emission Limits are based on based on NSPS Subpart IIII emission standards. Source: Florida Department of Environmental Protection Permit PSD-FL-413 for the Solid Waste Authority of Palm Beach County.

(L) Emission standards for NOx in the NSPS, Subpart IIII and the California Tier Emission Standards are based on the sum of NOx and non-methane hydrocarbons (NMHC). For the NOx emission limits, the applicant assumes NMHC + NOx emissions from the engine are 95% NOx. Source: EPA Region IX PSD Permit Number SE 07-02 for Victorville 2 Hybrid Power Project.

= Not enough information provided to determine if engine is used for standby purposes.

= Not applicable to this determination. Equipment has not yet been achieved in practice or is for a specific purpose outside of the scope of this determination.

= Selected as the most stringent BACT determination achieved in practice.

Note: The above BACT determinations were compared to the emissions limits required by NSPS, Subpart IIII. The above emissions limits are the same as the NSPS, Subpart III requirements for the same model year and horsepower range. Therefore, the most stringent BACT is compliance with NSPS, Subpart IIII.

Attachment B

Review of BACT Determinations published by ARB

List of BACT determinations published in ARB's BACT Clearinghouse for engines > 50 HP:

Capacity	Source	Date	NOx	VOC	CO	PM10
2,835 BHP	SCAQMD	8/26/2003	50 ppmvd @ 15% O_2 (A)	39 ppmvd @ 15% O_2 (A)	89 ppmvd @ 15% O_2 (A)	0.045 g/bhp-hr (A)
1,030 BHP	SDAPCD	6/14/2001	54 ppmvd @ 15% O_2 (A)	NA	450 ppmvd @ 15% O_2 (A)	NA
450 BHP	SCAQMD	8/23/2012	1.8 g/KW-hr (B)	NA	NA	NA

(A) Add-on control – SCR system and diesel particulate filter.
(B) Tier 4 Interim Certified

= Engines outside the range (Not in the 175 ≤ BHP <750 range)

= Engines not used for standby puposes

= Selected as the most stringent BACT determination achieved in practice.

Note: All three BACT determinations are for prime-use engines and are therefore not applicable to standby engines.

Attachment C
Cost Effectiveness Calculations