SMAQMD BACT CLEARINGHOUSE

ACTIVE

CATEGORY Type: **IC ENGINE COMPRESSION-STANDBY**

BACT Category: Minor and Major Source BACT

BACT Determination Number: 330	**BACT Determination Date:** 9/6/2023

Equipment Information

Permit Number: N/A -- Generic BACT Determination

Equipment Description: IC ENGINE, EMERGENCY STANDBY, DIESEL-FUELED

Unit Size/Rating/Capacity: ≥ 50 HP

Equipment Location:

BACT Determination Information

District Contact: Venk Reddy Phone No.: (279) 207-1146 email: vreddy@airquality.org

ROCs	**Standard:**	Applicable NMHC or NMHC + NOx emission standard
	Technology Description:	Tier 4 emission requirements for electrical generation, New Emergency Standby Direct Drive Fire Pump Engines Table 2: New Emergency Standby Direct Drive Fire pumps of the ATCM for Stationary CI Engines.
	Basis:	Achieved in Practice
NOx	**Standard:**	Applicable NOx or NMHC + NOx emission standard
	Technology Description:	Tier 4 emission requirements for electrical generation, New Emergency Standby Direct Drive Fire Pump Engines Table 2: New Emergency Standby Direct Drive Fire pumps of the ATCM for Stationary CI Engines.
	Basis:	Achieved in Practice
SOx	**Standard:**	CARB Diesel
	Technology Description:	Diesel Fuel with a sulfer content no greater than 0.0015% weight.
	Basis:	Achieved in Practice
PM10	**Standard:**	Applicable PM emission standard
	Technology Description:	Tier 4 emission requirements for electrical generation, New Emergency Standby Direct Drive Fire Pump Engines Table 2: New Emergency Standby Direct Drive Fire pumps of the ATCM for Stationary CI Engines.
	Basis:	Achieved in Practice
PM2.5	**Standard:**	Applicable PM emission standard
	Technology Description:	Tier 4 emission requirements for electrical generation, New Emergency Standby Direct Drive Fire Pump Engines Table 2: New Emergency Standby Direct Drive Fire pumps of the ATCM for Stationary CI Engines.
	Basis:	Achieved in Practice
CO	**Standard:**	Applicable CO emission standard
	Technology Description:	Tier 4 emission requirements for electrical generation, New Emergency Standby Direct Drive Fire Pump Engines Table 2: New Emergency Standby Direct Drive Fire pumps of the ATCM for Stationary CI Engines.
	Basis:	Achieved in Practice
LEAD	**Standard:**	N/A
	Technology Description:	N/A
	Basis:	

Comments: This is a generic BACT determination based on BACT determinations made, and published, by other air agencies in California and/or other States.

Printed: 9/6/2023

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SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NOS.: 330

DATE: 3/14/2023

ENGINEER: Venk Reddy

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

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

Equipment Size/Rating: Minor or Major Source BACT

Previous BACT Det. No.: 281

This BACT determination will update the following determination:
BACT #281 which was made on June 10, 2021 for diesel emergency standby I.C. engines BHP ≥ 50. BACT #281 covered all permittable engines, with different BACT requirements for engines greater than 50 HP but less than 1000 HP and different requirements for engines greater than 1000 HP. The requirements of BACT 281 will be reviewed and revised in the categories identified in the previous BACT determination.

This BACT applies to I.C. engines BHP ≥ 50 which use diesel fuel to provide emergency electrical power, emergency water pumping for flood control or firefighting, emergency potable water pumping, or emergency sewage pumping. Engines permitted as emergency standby are used in two ways: 1) as part of a generator system or 2) as a direct drive pump. As part of a generator typical uses include providing power to life safety systems, building equipment, or computer equipment when there is a loss of power. As part of a direct drive pump typical uses are for fire suppression, potable water supply or sewage pumping the use of which is tied to an emergency event.

This BACT determination is being updated in accordance with District Policy to review BACT determinations once every two (2) years.

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 emergency 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.

US EPA

Projects entered in the EPA RACT/BACT LAER clearinghouse between the period of 12/1/2020 and 3/14/2023 were reviewed for this BACT determination. Forty-one projects were identified and reviewed. A majority of them were found to be consistent with meeting current Tier standards per NSPS 40 CFR 60 Subpart IIII. Projects found to be stricter than the SMAQMD current guidelines, or those that were not previously available for the size category, are discussed below. Projects that were not stricter than previously identified were not updated in the tables below.

BACT

Source: EPA RACT/BACT/LAER Clearinghouse

For Emergency Standby Units with a Rating of 50 ≤ BHP < 175 (A)	
VOC	No limit
NOx	3.5 g/hp-hr
SOx	No limit
PM10	0.3 g/hp-hr
PM2.5	0.3 g/hp-hr
CO	3.73 g/hp-hr

(A) From RBLC ID: KY-0110 – 61 HP Radio Tower Emergency Generator

Although there are engines listed in this range, no engine identified was stricter than shown below, therefore it was not updated. One engine is identified as an Auxiliary Air Compressor Engine (AK-0888) which is a Tier 4 final, but it is not listed since it is unclear if it works in a standby capacity.

For Emergency Standby Units with a Rating of 175 ≤ BHP < 750 (B)	
VOC	0.14 g/hp-hr
NOx	0.3 g/hp-hr
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight (A)
PM10	1.49E-2 g/hp-hr
PM2.5	1.49E-2 g/hp-hr
CO	2.8 g/hp-hr

(A) The referenced RBLC ID does not have a SOx requirement, however many other emergency stand by engines in this category have this requirement.
(B) From RBLC ID: TX-0846 -Toyota Motor 214 KW (~286 HP) – Tier 4 compliant.

For Emergency Standby Units with a Rating of BHP ≥ 750 (A)	
VOC	0.19 g/KW-hr (0.14 g/hp-hr) Based on Tier 4 standards
NOx	3.5 g/KW-hr (2.6 g/hp-hr) Based on Tier 4 standards
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight
PM10	0.04 g/KW-hr (0.02 g/hp-hr) PM10 (filterable); Based on Tier 4 standards
PM2.5	0.20 g/KW-hr (0.02 g/hp-hr) PM2.5 (filterable); Based on Tier 4 standards
CO	3.5 g/KW-hr (2.6 g/hp-hr) CO; Based on Tier 4 standards

(A) From RBLC ID: MI-0452 – 1,341 HP – Tier 4 compliant.

T-BACT

There are no T-BACT standards published in the clearinghouse for this category, but the NESHAP standards (see 40 CFR, Part 63 standards below) represent Maximum Achievable Control Technology (MACT) or Generally Available Control Technology (GACT) for HAPs and can therefore be considered T-BACT.

RULE REQUIREMENTS:

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]

40 CFR §60.4205(b)

Owners and operators of 2007 model year and later emergency stationary Compression Ignition Internal Combustion Engines (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.

40 CFR §60.4205(c)

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.

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 of the date of this determination, new emergency use fire pump engines are subject to the same emission standards as emergency use non-fire pump engines.

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) apply for all pollutants beginning in model year 2007.

40 CFR §89.112 Table 1: Emission Standards in g/kW-hr (g/hp-hr)					
Maximum Engine Power	Tier	Model Year(s)	PM	NMHC + NOx	CO
37 ≤ kW < 75 (50 ≤ hp < 100)	3	2008+	0.40 (0.30)	4.7 (3.5)	5.0 (3.7)
75 ≤ kW < 130 (100≤ hp < 175)	3	2007+	0.30 (0.22)	4.0 (3.0)	5.0 (3.7)
130 ≤ kW < 225 (175 ≤ hp < 300)	3	2006+	0.20 (0.15)	4.0 (3.0)	3.5 (2.6)
225 ≤ kW < 450 (30 0≤ hp < 600)	3	2006+	0.20 (0.15)	4.0 (3.0)	3.5 (2.6)
450 ≤ kW < 560 (600 ≤ hp < 750)	3	2006+	0.20 (0.15)	4.0 (3.0)	3.5 (2.6)
kW > 560 (hp > 750)	2	2006+	0.20 (0.15)	6.4 (4.8)	3.5 (2.6)

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 subpart.

California Air Resource Board (CARB)

BACT

From 12/14/2020 to 3/14/2023 there has been no stationary emergency engine BACT determinations entered under BACT Determinations. CARB clearinghouse for BACT Guidelines shows that BAAQMD has two BACT determinations (96.1.3 & 96.1.5) that are similar to the SMAQMD BACT 281. No other air district BACT guidelines or policies for stationary emergency engines during this time period were published in the CARB BACT clearinghouse.

Source: ARB BACT Clearinghouse

T-BACT

There are no T-BACT standards published in the clearinghouse for this category. However, the ATCM standards (see Rule Requirements Below) represent BACT for toxic air contaminants (TACs) and can therefore be considered T-BACT.

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.

(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+			

Table 1: Emission Standards for New Stationary Emergency Standby Diesel-Fueled CI Engines – g/bhp-hr (g/kW-hr)					
175 ≤ HP < 300 (130 ≤ kW < 225)	3	2007 / 2008+	0.15 (0.20)	3.0 (4.0)	2.6 (3.5)
300 ≤ HP <600 (225 ≤ kW < 450)	3	2007 / 2008+	0.15 (0.20)	3.0 (4.0)	2.6 (3.5)
600 ≤ HP < 750 (450 ≤ kW < 560)	3	2007 / 2008+	0.15 (0.20)	3.0 (4.0)	2.6 (3.5)
HP > 750 (kW > 560)	2	2007 / 2008+	0.15 (0.20)	4.8 (6.4)	2.6 (3.5)

(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)				
Maximum Engine Power	Model year(s)	PM	NMHC + NOx	CO
50 ≤ HP < 100	2010 and earlier	0.60 (0.80)	7.8 (10.5)	3.7 (5.0)

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

Sacramento Metropolitan AQMD

BACT

Source: SMAQMD BACT Clearinghouse: SMAQMD BACT Clearinghouse, BACT Determination Number 281

For Emergency Standby Units with a Rating of ≥ 50 HP & < 1000 HP and all direct drive standby engines.	
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.
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.
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.
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.

For Emergency Standby Units with a Rating of ≥ 50 HP & < 1000 HP and all direct drive standby engines.	
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.
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.

For Emergency Standby Units with a Rating ≥ 1000 HP That are Not Direct Drive Engines	
VOC	0.14 g/bhp-hr (A)
NOx	0.5 g/bhp-hr (A)
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.
PM10	0.02 g/hp-hr (A)
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.
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.

(A) Applicable for IC Engine non-agricultural, non direct drive fire pumps rated ≥ 1000 BHP.

T-BACT

I.C. Engines, Emergency Standby, Diesel-Fueled	
Diesel PM	0.02 g/bhp-hr (A)
	Particulate filter (B)
	Applicable PM emission standard for horsepower range based on the ATCM for Stationary CI Engines (C)

(A) Applicable for IC Engine rated ≥ 1000 BHP.
(B) Applicable to major source.
(C) Applicable for IC Engines rated ≥ 50 BHP and < 1000 BHP

RULE REQUIREMENTS:

Rule 412 Stationary Internal Combustion Engines Located at Major Stationary Sources of NOx (Adopted 06-01-1995) The emission limits of this rule are not applicable to emergency standby engines used for loss of electricity, water pumping for flood or fire control, or the emergency electrical power for emergency incident response. The engine is subject to equipment requirements of providing an hour meter or computerized tracking system.

South Coast AQMD

BACT Source: SCAQMD BACT Guidelines for Non Major Polluting Facilities, from guidelines published September 2, 2022, IC Engine, Stationary, Emergency BACT Rev 7 (9-2-2022)

The BACT for emergency standby diesel-fired engines is to follow the requirements of Rule 1470 as described below. SOx is consistent with Rule 431.2 which requires sulfur content no greater than 0.0015% by weight.

Source: SCAQMD BACT Guidelines for Major Polluting Facilities

374 BHP, (12-10-15) Tier 3 with a particulate trap used for control of toxic emissions
755 BHP, (12-10-15) Tier 2 with a particulate trap used for control of toxic emissions
2,220 BHP, (12-10-15) Tier 2 with a particulate trap used for control of toxic emissions

Since the use of the particulate filter is used to control toxic emissions at major sources, its application will be considered T-BACT for major sources.

RULE REQUIREMENTS:
Reg XI, Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines (Amended November 1, 2019)

Per section (i)(1)(B) Emergency Standby Engines are exempt from the emission limitations of this rule.

Reg XIV, Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines (Amended October 1, 2021)
This rule regulates criteria pollutants as well as diesel PM from stationary diesel engines. The primary purpose of this regulation is for the controlling toxic pollutants around sensitive receptors. Therefore, it will be considered for purposes of establishing T-BACT control levels.

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			
Maximum Engine Power	NMHC + NOx	CO	PM
50 < HP < 100 (37 < kW < 75)	4.7 (3.5)	5.0 (3.7)	(0.15)
100 ≤ HP < 175 (75 ≤ kW < 130)	4.0 (3.0)	5.0 (3.7)	(0.15)
175 ≤ HP ≤ 750 (130 ≤ kW ≤ 560)	4.0 (3.0)	3.5 (2.6)	(0.15)
HP > 750 (kW > 560)	6.4 (4.8)	3.5 (2.6)	(0.15)

For emergency 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)).

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 a 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.

San Joaquin Valley APCD

BACT

Source: SJVAPCD BACT Guideline 3.1.1 (Last Updated: 4/29/22)

Emergency Diesel IC Engine >50 bhp Powering an Electrical Generator	
VOC	EPA Tier 4 Final certification level or equivalent for applicable horsepower range(A)
NOx	EPA Tier 4 Final certification level or equivalent for applicable horsepower range(A)
SOx	Very low sulfur diesel fuel (15 ppmw sulfur or less)
PM10	EPA Tier 4 Final certification level or equivalent for applicable horsepower range(A)
PM2.5	No standard
CO	Latest EPA Tier Certification level for applicable horsepower range

(A) The following emission levels are equivalent to the EPA Tier 4 Final certification levels:
50 - ≤ 75 bhp: 3.5 g-(NOx + VOC)/bhp-hr, 0.02 g-PM/bhp-hr, 3.7 g-CO/bhp-hr
75 - ≤ 175 bhp: 0.30 g-NOx/bhp-hr, 0.015 g-PM/bhp-hr, 3.7 g-CO/bhp-hr, 0.14 g-VOC/bhp-hr
175 - ≤ 750 bhp: 0.30 g-NOx/bhp-hr, 0.015 g-PM/bhp-hr, 2.6 g-CO/bhp-hr, 0.14 g-VOC/bhp-hr
> 750 bhp: 0.50 g-NOx/bhp-hr, 0.02 g-PM/bhp-hr, 2.6 g-CO/bhp-hr, 0.14 g-VOC/bhp-hr

Source: SJVAPCD BACT Guideline 3.1.4 (Last Updated 3/2/2020)

Emergency Diesel I.C. Engine Driving a Fire Pump	
VOC	Latest EPA Tier Certification level for applicable horsepower range
NOx	Latest EPA Tier Certification levels for applicable horsepower range
SOx	Low-sulfur diesel fuel (500 ppmw sulfur or less) or Very Low-sulfur diesel fuel (15 ppmw sulfur or less), where available.

Emergency Diesel I.C. Engine Driving a Fire Pump	
PM10	0.1 grams/bhp-hr (if TBACT is triggered) (corrected 7/16/01) (A) (B) 0.15 grams/bhp-hr (if TBACT is not triggered)
PM2.5	No standard
CO	Latest EPA Tier Certification level for applicable horsepower range

(A) Any engine model included in the ARB or EPA diesel engine certification lists and identified as having a PM10 emission rate of 0.149 grams/bhp-hr or less, based on ISO 8178 test procedure, shall be deemed to meet the 0.1 grams/bhp-hr requirement.
(B) A site-specific Health Risk Analysis is used to determine if TBACT is triggered. (Clarification added 05/07/01)

T-BACT
Source: SJVAPCD BACT Guideline 3.1.4 (3/2/2020)

Emergency Diesel I.C. Engine Driving a Fire Pump	
Diesel PM	0.1 g/hp-hr, if T-BACT is triggered based on a site-specific health risk analysis

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

Per conversation with SJVAPCD engineering staff (Kevin Perez 209-557-6458 on 3/13/23), the agency has fully deployed requirements of Tier 4 (or equivalent emissions with controls) for all engines powering generators and is therefore considered achieved in practice. For direct drive engines, such as fire pumps, the Tier 4 or equivalent standards have not been required and are therefore not considered achieved in practice. Per conversation with Kevin Perez on 5/22/23, a specific BACT determination would have to be done for specific direct drive applications that are not connected to a fire pump.

RULE REQUIREMENTS:

Rule 4701 – INTERNAL COMBUSTION ENGINES – PHASE I (AMENDED August 21, 2003)

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

Rule 4702 – INTERNAL COMBUSTION ENGINES (Amended August 19, 2021)

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

San Diego County APCD

BACT
Source: NSR Requirements for BACT (June 2011)
The engine BACT determinations listed in the SDAPCD Clearinghouse do not apply to emergency standby engines.

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

RULE REQUIREMENTS:
Regulation 4, Rule 69.4.1 – Stationary Reciprocating Internal Combustion Engines – (Rev. adopted & Effective July 8, 2020)
This rule applies to stationary I.C. Engines ≥ 50 BHP located at a stationary source.

New or Replacement Emergency Standby Engines Using Diesel				
	Certified engines, 50 ≤ bhp < 100	Certified engines, 100 ≤ bhp < 170	Certified engines, 175 ≤ bhp < 750	Certified engines, ≥ 750
VOC	No standard	No standard	No standard	No standard
NOx	3.5 g/bhp-hr	3.0 g/bhp-hr	3.0 g/bhp-hr	4.8 g/bhp-hr
SOx	California Diesel Fuel	California Diesel Fuel	California Diesel Fuel	California Diesel Fuel
PM10	No standard	No standard	No standard	No standard
PM2.5	No standard	No standard	No standard	No standard
CO	3.7 g/bhp-hr	3.7 g/bhp-hr	2.6 g/bhp-hr	2.6 g/bhp-hr

Bay Area AQMD

BACT
Source: BAAQMD BACT Guideline 96.1.3 (12/22/20)

IC Engine-Compression Ignition: Stationary Emergency, Non-agricultural, Non-direct Drive Fire Pump rated ≥ 50 BHP and < 1000 BHP	
VOC	ARB ATCM standard for NMHC at applicable horsepower rating
NOx	ARB ATCM standard for NOx at applicable horsepower rating
SOx	Fuel sulfur content not to exceed 0.0015% (wt.) or 15 ppm (wt.)
PM10	0.15 g/bhp-hr
PM2.5	No standard
CO	ARB ATCM standard for CO at applicable horsepower rating

Source: BAAQMD BACT Guideline 96.1.5 (12/22/20)

IC Engine-Compression Ignition: Stationary Emergency, Non-agricultural, Non-direct Drive Fire Pump ≥ 1000 BHP	
VOC	0.14 g/bhp-hr
NOx	0.5 g/bhp-hr
SOx	Fuel sulfur content not to exceed 0.0015% (wt.) or 15 ppm (wt.)
PM10	0.02 g/bhp-hr
PM2.5	No standard
CO	2.6 g/bhp-hr

T-BACT
Source: BAAQMD BACT Guideline 96.1.3 (12/22/20)

IC Engine-Compression Ignition: Stationary Emergency, Non-agricultural, Non-direct Drive Fire Pump ≥ 50 BHP and < 1000 BHP	
Diesel PM	0.15 g/bhp-hr

Source: BAAQMD BACT Guideline 96.1.5 (12/22/20)

IC Engine-Compression Ignition: Stationary Emergency, Non-agricultural, Non-direct Drive Fire Pump ≥ 1000 BHP	
Diesel PM	0.02 g/bhp-hr

RULE REQUIREMENTS:
Reg 9, Rule 8 – Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines (Revised 10/15/2019)

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

Summary of Achieved in Practice Control Technologies

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

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES for Compression Ignition Emergency Standby Engines	
Pollutant	**Standard**
VOC	1. Electrical Generation: Applicable Tier 4 emission requirements for the HP range Direct Drive: NMHC + NOx emission standard for horsepower range [(A),(B)] based on the ATCM for Stationary CI Engines. [EPA, SJVAPCD] 2. Engines ≥ 1000: Tier 4 emission requirements Engines < 1000 HP Applicable NMHC + NOx emission standard for horsepower range [(A),(B)] based on the ATCM for Stationary CI Engines. [EPA, SMAQMD, BAAQMD, ARB] 3. No Standard [SDAPCD]
NOx	1. Electrical Generation: Applicable Tier 4 emission requirements for all HP ranges [SJVAPCD] Direct Drive: NMHC + NOx emission standard for horsepower range [(A),(B)] based on the ATCM for Stationary CI Engines. [EPA, SJVAPCD] 2. Engines ≥ 1000 HP: Tier 4 emission requirements Engines < 1,000 HP: Applicable NMHC + NOx emission standard for horsepower range [(A),(B)] Based on the ATCM for Stationary CI Engines [EPA SMAQMD, BAAQMD, ARB] 3. Applicable NMHC + NOx emission standard for horsepower range [(A),(B)] based on the ATCM for Stationary CI Engines. [SDAPCD]
SOx	1. Diesel fuel with a sulfur content no greater than 0.0015% by weight [EPA, ARB, SMAQMD, SCAQMD, SJVAPCD, SDAPCD, BAAQMD]
PM10	1. Electrical Generation: Applicable Tier 4 emission requirements for all HP ranges [SJVAPCD] Direct Drive: PM10 emission standard for horsepower range [(A),(B)] based on the ATCM for Stationary CI Engines. [EPA, SJVUAPCD] 2. Engines ≥ 1000 HP: Tier 4 emission requirements Engines < 1,000 HP: Applicable PM10 emission standard for horsepower range [(A),(B)] Based on the ATCM for Stationary CI Engines [EPA SMAQMD, BAAQMD, ARB] 3. Applicable PM10 emission standard for horsepower range [(A),(B)] based on the ATCM for Stationary CI Engines. [ARB, EPA SMAQMD, BAAQMD, SJVAPCD] 4. No Standard [SDAPCD]

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES for Compression Ignition Emergency Standby Engines	
Pollutant	**Standard**
PM2.5	1. Electrical Generation: Applicable Tier 4 emission requirements for all HP ranges [SJVAPCD] Direct Drive: PM10 emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [EPA, SJVAPCD] 2. Engines ≥ 1000 HP: Tier 4 emission requirements Engines < 1,000 HP: Applicable PM10 emission standard for horsepower range (A),(B) Based on the ATCM for Stationary CI Engines [EPA SMAQMD, BAAQMD, ARB] 3. 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] 4. No Standard [ARB, SCAQMD, SJVAPCD, SDAPCD, BAAQMD]
CO	1. Applicable CO emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [ARB, SMAQMD, SCAQMD, SJVAPCD, BAAQMD, EPA, SDAPCD]
Diesel PM (T-BACT)	1. Use of a particulate filter [SCAQMD SMAQMD] 2. Compliance with SCAQMD Rule 1470(C) [SCAQMD] 3. 0.1 g/hp-hr if T-BACT is triggered for a direct-drive fire pump [SJVAPCD] 4. Applicable PM emission standard for horsepower range (A),(B) based on the ATCM for Stationary CI Engines. [ARB, BAAQMD, SJVAPCD] 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.

Based on the information previously presented to Sac Metro Air District when developing BACT 281 by Caterpillar and SJVAPCD, Tier 4 engines (including the use of SCR and DPF) are not considered achieved in practice at this time for engines in an agricultural or direct drive fire pump application. The BAAQMD & SMAQMD has shown that Tier 4 engines have been achieved in practice for engines greater than or equal to 1000 HP based on their BACT guidance. SJVAPCD has shown that Tier 4 engines have been achieved for electrical generation for all permitted size engines.

Summary Table

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

BEST CONTROL TECHNOLOGIES ACHIEVED IN PRACTICE for Direct Drive Engines		
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, 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, SJVAPCD, BAAQMD
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.	EPA, ARB, SMAQMD, SCAQMD, SJVAPCD, 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, SJVAPCD, 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 the ATCM for Stationary CI Engines.	ARB, SMAQMD, SCAQMD, SJVAPCD, 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 (A), SJVAPCD, SDAPCD, BAAQMD

(A) 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:

i. 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.
ii. 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.
iii. It allows the use of the engine in Demand Response Programs (DRP). SMAQMD allows emergency operation only during power outages or statewide emergency declarations.

BEST CONTROL TECHNOLOGIES ACHIEVED IN PRACTICE For Standby Engines used for Electrical Generation		
Pollutant	**Standard**	**Source**
VOC	Tier 4 emission standards for the applicable HP range	SJVAPCD, SMAQMD, BAAQMD
NOx	Tier 4 emission standards for the applicable HP range	SJVAPCD, SMAQMD, BAAQMD
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.	EPA, ARB, SMAQMD, SCAQMD, SJVAPCD, SDAPCD, BAAQMD
PM10	Tier 4 emission standards for the applicable HP range	SJVAPCD, SMAQMD, BAAQMD
PM2.5	Tier 4 emission standards for the applicable HP range	SJVAPCD, SMAQMD, BAAQMD
CO	Tier 4 emission standards for the applicable HP range	ARB, SMAQMD, SCAQMD, SJVAPCD, BAAQMD
Diesel PM (T-BACT)	Tier 4 emission standards for the applicable HP range	BAAQMD

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

Discussion:

The three types of engines identified for standby operations include those used for (1) electrical generation, (2) direct drive engine connected to a pump in fire suppression applications and (3) other direct drive engines typically driving emergency pumps.

The use of standby Tier 4 or equivalent engines rated greater than or equal to 50 HP used for electrical generation has been shown to be achieved in practice. Therefore a technologically feasible and cost effective analysis for this category is not required.

The use of Tier 4 or equivalent direct drive engines used for pumps in fire suppression applications are not considered technologically feasible due to other factors such as UL listing requirements and other regulatory agencies that have jurisdiction over use and installation of this type of equipment.

The use of all other Tier 4 direct drive engines will be discussed as technologically feasible and cost effective.

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 for direct drive non fire pump engines.

Pollutant	Technologically Feasible Alternatives
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). 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 of these higher tier engines were consistently higher than those for retrofitting. The results are presented in the below table.

Cost-Effectiveness Associated with the Application of DPF and SCR on Emergency Standby Engines (50 hours/year) (A)							
Regulatory Scenario			HP Range				
			50-174	175-749	750-1,206	1,207-1,999	>2,000
	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	$68,000	$68,000	$68,000
Scenario 3: Tier 4 Final engine	Cost Effectiveness ($/ton)	NOx	$340,000	$260,000	$140,000	$140,000	$100,000

(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. Emission reductions have been adjusted from 31 hours/year of operation to 50 hours/year of operation. Cost effectiveness numbers were converted from dollars per pound to dollars per ton for comparison to the District's cost effectiveness thresholds. Refer to Appendix A for additional details.

As stated in the referenced CARB document, emissions are calculated based on a load factor of 30% and a control factor of 85%. The operational time of the SCR is 20 hrs of the initial 31 hrs/year of operation. Cost effectiveness is calculated based on an equipment life of 25 years of service. Additional information from CARB can be found in the referenced document. SMAQMD cost effective methodology takes into account other factors such as interest rate, labor, insurance, maintenance, energy usage, lower equipment life, etc.. that would increase the costs summarized in the table above. In conclusion, SCR and DPF after treatment equipment costs alone are not considered cost effective since both the cost effectiveness for reducing the pollutants exceeds the District's threshold of $32,900/ton for NOx and $11,400/ton for PM10 for direct drive engines. Adding additional operating costs would drive the cost effectiveness further above the thresholds. The details of this analysis can be found in Appendix A.

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, EMERGENCY STANDBY, DIESEL-FUELED FOR ELECTRICAL GENERATION		
Pollutant	**Standard**	**Source**
VOC	Tier 4 emission standards for the HP range	BAAQMD SJVAPCD, SMAQMD
NOx	Tier 4 emission standards for the HP range	BAAQMD SJVAPCD, SMAQMD
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.	EPA, ARB, SMAQMD, SCAQMD, SJVAPCD, SDAPCD, BAAQMD
PM10	Tier 4 emission standards for the HP range	BAAQMD SJVAPCD, SMAQMD
PM2.5	Tier 4 emission standards for the HP range.	BAAQMD SJVAPCD, SMAQMD
CO	Tier 4 emission standards for the HP range	BAAQMD SJVAPCD, SMAQMD

BACT FOR I.C. ENGINES, EMERGENCY STANDBY, DIESEL-FUELED FOR DIRECT DRIVE ENGINES		
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, SJVAPCD, 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, SJVAPCD, BAAQMD
SOx	Diesel fuel with a sulfur content no greater than 0.0015% by weight.	EPA, ARB, SMAQMD, SCAQMD, SJVAPCD, 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, SJVAPCD, 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, SJVAPCD, BAAQMD

T-BACT FOR I.C. ENGINES, EMERGENCY STANDBY, DIESEL-FUELED		
Pollutant	**Standard**	**Source**
Diesel PM	BACT 330 Standards listed for PM10 & PM2.5 (A)	SMAQMD
	Particulate filter (B)	SCAQMD

(A) Since the current BACT standards are more health protective than previously published T-BACT standards, T-BACT standards will be updated to follow the BACT standards.

(B) Applicable to major sources. This is included in the event that an emergency direct drive pump is placed at a major source which will be determined on a case by case basis if a particulate filter is technologically feasible at the time of application.

APPROVED BY: *Brian F Krebs* **DATE:** **09-05-2023**

Appendix A

Cost Effectiveness Analysis

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 emergency 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 function properly. 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 engine 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. (Initial Statement of Reasons for Proposed Rulemaking: Proposed Amendments to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines, Appendix B, September 2010)

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	750-1,206	1,207-1,999	>2,000
	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	$206,900
	Emission Reductions (lb) (B)	PM	13	53	113	186	305
		NOx	161	666	2240 (C)	3677	6032
	Cost Effectiveness ($/lb)	PM	$341	$342	$341	$340	$339
		NOx	$55	$54	$34	$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.
(C) The referenced table shows the emission of NOx to be based on 0.3 g/hp-hr. The proposed value is based on 0.5 g/hp-hr

Cost-Effectiveness Associated with Installing Tier 4 Final Emergency Standby Engines (50 hours/year)							
Regulatory Scenario			HP Range				
			50-174	175-749	750-1,206	1207-1,999	>2,000
	Average Horsepower:		112	462	978	1604	2630
Tier 4 Final Engine	Cost Increase (A)	NOx	$28,000	$85,008	$156,480	$248,465	$328,750
	Emission Reductions (lb) (B)	NOx	161	666	2,240	3,677	6,032
	Cost Effectiveness ($/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.

Appendix B

Comments and Responses

Comment #1 via e-mail submitted on 7-31-23
Hello All,

I had reached out to your department to find out when Tier 4 was going to be implemented, as we have a potential client interested in a new diesel generator. I spoke with Joanne Chan and she was very helpful and patient in helping me understand the process of BACT approval. We have been installing emergency and standby generators for 5 years now and have been aware that T4 was coming down the pipeline in the Sac area, but with all the air districts enforcing at different times or having slightly requirements, I wanted to be sure.

However, I did want to bring up a few items for consideration:

- Starting January 1st of this year, the state of California has enacted AB 2511, which is a law that requires all 1200 skilled nursing facilities in the state to upgrade their emergency standby systems to now include backing up any and all HVAC in critical/patient care areas. This is a significant requirement because their traditional emergency system was only sized enough to backup the emergency lighting, fire alarm panel, nurse call, etc-typically very light loads (in the realm of 20-30kw) when compared to backing up 75% or more of a facilities Acs (no upwards of 100-400kw, depending on facility size). Along with this, their original onsite fuel requirement was only for 6hrs-now its 96 hrs minimum. On top of it all, they have to meet this compliance by January 1 of 2024! Pretty impossible at this point in time with lead times for generators on average 9-12 mos before shipping.
- These facilities not only need 'Emergency' rated backup systems, but also have to meet stricter OSHPD (now HCAI) building codes for seismic protection. This additional certification is California specific and an added cost to the manufacturer, with relatively low customer demand in relation to other emergency generators they can produce and sell.
- Add to the fact that a 'certified T4' unit isn't acceptable in these critical healthcare facilities, due to their sensitive nature and that due to life safety, they must continue to run even if, for example, the DEF fluid runs out. I can see a parallel to a direct drive fire pump exemption.
- All of this adds up to a very tough marketplace to find a solution for our clients because most manufacturers will not support ALL of these requirements. I have personally called about 6-8 different manufacturers to see what their offerings are and they mostly laugh at me. So far what I have found is: Kohler and Cummins don't make T4 below 600kW; Generac doesn't make smaller than 500kW; and while Blue Star Power Systems actually does make T4 'Emergency' gens down to around 20kW I believe, none of theirs are OSHPD certified.
- The only few options we have then, is hopefully we can size a dual fuel nat gas/propane-which then we have the 96hr fuel reqs to contend with as well-or we have to install aftermarket treatment, which a lot of times can be almost the same cost as the generator itself, especially after paying for third party field evaluation.

I agree that if we have the technology to build something better and cleaner, than it should be the gold standard. However, at this current time, the market is not supporting this in a timely, economic and effective manner for our more critical of facilities, such as hospitals and skilled nursing facilities. Ironically, in trying to help give cleaner air to our most vulnerable of generations, we are limiting their life span during emergency power shutoffs due to wildfires and earthquakes. My only goal in bringing this up is to raise awareness as to the engineering constraints and economic hardship all of these different laws, from multiple agencies, put on Californians of all walks of life and ages, throughout the state.

Thanks,

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Comment #1 Response:

Thank-you for the comment and making the district aware of impending regulation changes in the health care industry that could lead to hardships as a result of requiring Tier IV emission requirements for standby engines. Please note that the BACT requirement is to meet the emission requirements of a Tier IV engine and not to install a certified Tier IV engine. The inducements found in a certified Tier IV engine can be removed and still meet the proposed BACT emission levels. SJVAPCD was contacted to see if they have come across any implementation issues with Tier IV emission requirements for standby engines at OSHPD regulated facilities. San Joaquin confirmed that current projects at OSHPD regulated facilities are being required to implement Tier IV emission standards for standby engines. Therefore, the District is not aware of any projects that are being rejected as a result of implementation of Tier IV emission requirements for standby engines at an OSHPD regulated facility. However if it is found that a Tier IV equivalent solution is not viable for an OSHPD regulated facility, the BACT determination can be reevaluated to address this specific scenario.

Comment #2 Received via e-mail submitted on 8-2-23

Hello, this piggy backs off an earlier comment I sent in. I spoke with John Angi this morning and he was very helpful as we talked about the issues property owners and contractors face when installing new legally required emergency generators for skilled nursing facilities. I did mention to John that there is currently no manufacturer that we have found (we have asked Cat, Kohler, Cummins, Generac, Winco, HiPower and Blue Star Power, just to name a few) that makes a T4 diesel generator that is under 500kW and is also HCAI/OSHPOD certified.

The option offered to us is to oversize the generator to the minimum T4 size, and then add auto load banking. However, this poses challenges and obstacles as well since these are very large generators with very large fuel requirements because of the new law California passed this year. All 1200 skilled nursing facilities (SNFs) in the state have to now have their HVAC backed up on their emergency system. This is a substantial increase in size for their existing generators, so new ones will be required. Despite the larger demand, for a lot of these facilities, it is still well below 500kW; as well as, these facilities are typically built out to maximize their footprints on their parcels. This leaves very little room to place a 20ft long by 6ft wide generator, plus a 5ft clearance around the generator and then an additional fuel tank to meet the 133hrs of required onsite fuel storage they are required to have.

Sure, we can install after-treatment systems to a T3 unit to meet compliance, but with OSHPD/HCAI requirements come very strict seismic certification for equipment. While the generator may meet this certification, the after-treatment systems do not, which means we cannot install them on to the outside of the generator as we could at a non-OSHPD facility. So, we have to install the aftertreatment components on a separate structure next to the generator (OSHPD/HCAI does not view the aftertreatment systems as critical to the operation of the emergency system, so they do not need to be seismic certified). To meet seismic certification, a generator must be tested on a ‘shaker table’-a structural engineer stamp is not acceptable-so we can’t mount any equipment to the generator enclosure or it will void the seismic cert.

Thanks,

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Comment Response #2

Thank-you for the comment. The BACT requirement does not require certified Tier IV engines, but does require that the emission standards of Tier IV engines be met. Aftermarket controls would have to be obtained for engines where OEM options are not available. SJVAPCD was contacted to confirm if there were any implementation issues of requiring Tier IV emission standards with OSHPD projects. They responded that there were no issues and are actively requiring these emission standards. However if it is found that a Tier IV equivalent solution is not viable for an OSHPD regulated facility, the BACT determination can be reevaluated to address this specific scenario.