San Joaquin Valley Air Pollution Control District
Best Available Control Technology (BACT) Guideline 3.3.19

Emissions Unit: Stationary Fossil Fuel/Digester Gas-Fired Distributed Power Generation Equipment with Reciprocating Internal Combustion Engine*

Industry Type: All

Equipment Rating: < 3 MW

Last Update: 3/4/2026

Pollutant	Achieved-in-Practice or contained in SIP	Technologically Feasible	Alternate Basic Equipment
NOx	0.07 lb-NOx/MW-hr**		
SOx	Comply with one of the following: 1. Operate the power generation equipment exclusively on PUC-quality natural gas, commercial propane, butane, or liquefied petroleum gas or a combination of such gases; 2. Limit gaseous fuel sulfur content to no more than 5 grains of total sulfur per 100 standard cubic feet; 3. Use California reformulated gasoline for gasoline-fired power generation equipment; 4. Use California reformulated diesel for compression ignited power generation equipment; 5. Operate the power generation equipment on liquid fuel that contains no more than 15 ppm sulfur; or 6. Install and properly operate an emission control system that reduces SO_2 emissions by at least 95% by weight.		
PM10	For diesel fuel-fired power generation equipment: 0.03 lb-PM10/MW-hr For gaseous fuel-fired power generation equipment: 0.20 lb-PM10/MW-hr		
CO	0.20 lb-CO/MW-hr**		
VOC	0.10 lb-VOC/MW-hr**		

*This BACT guideline applies to fuels that contain fossil fuel components, including but not limited to diesel, gasoline, natural gas, propane, kerosene, and other hydrocarbons derived from petroleum or natural gas. It also includes alternative fuels such as biodiesel, biogas, digester gas, and waste gas. Landfill gas fuel, Biomass-derived syngas, other biomass-based fuels, and hydrogen fuel are excluded from this scope. This guideline specifically applies to non-emergency electricity generation equipment that is located at or near the facility of electricity consumption, and is used either to provide complete or partial onsite power to the facility.

**When determining compliance with the lb/MW-hr requirement, units with heat recovery may include one megawatt-hour (MW-hr) for each 3.4 million Btu of useful heat recovered in addition to each MW-hr of net electricity produced.

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved-in-practice (AIP) or contained in a state implementation plan (SIP) must be cost-effective as well as technologically feasible. Economic analysis to demonstrate cost-effectiveness is required for all determinations that are not AIP or contained in an EPA-approved SIP.

This is a Summary Page for this Class of Source

Best Available Control Technology (BACT) Determination for Stationary Fossil Fuel / Digester Gas-Fired Distributed Power Generation Equipment with Reciprocating Internal Combustion Engine (< 3 MW Unit)

District BACT Guideline 3.3.19

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Prepared by:
Matthew Robinson, Air Quality Engineer

Reviewed by:
James Harader, Supervising Air Quality Engineer
Nick Peirce, Permit Services Manager
Erin Scott, Permit Services Manager
Errol Villegas, Permit Services Manager

I. Introduction

The objective of this project is to proactively update Best Available Control Technology (BACT) guideline 3.3.19: Fossil Fuel Fired IC Engines Used for Power (Electricity) Generation, last updated 9/12/22 (Appendix B). The scope of this this guideline is revised to stationary distributed power generation equipment with electrical output less than 3 MW. This BACT guideline is intended to apply to non-emergency electrical power generation operations. It does not apply to emergency power generation operations.

This BACT determination will evaluate and incorporate any applicable emission control standards that have been achieved-in-practice (AIP), in accordance with the District's BACT Policy (APR 1305).

II. Background

Because of the climate and geography of the San Joaquin Valley, the District faces some of the most difficult air quality challenges in the entire nation. The District is a public health agency whose mission is to improve the health and quality of life for all Valley residents through efficient, effective, and entrepreneurial air quality management strategies. The District is responsible for developing plans to continue to improve the air quality in the San Joaquin Valley in order to reach attainment with health-based ambient air quality standards, and these plans become part of state and federal law. As a critical part of these plans to attain the established ambient air quality standards to mitigate adverse health impacts, District Rule 2201 (New and Modified Stationary Source Review Rule), requires the use of BACT to minimize potential emissions from new and modified equipment and processes.

District Rule 2201 defines BACT as the most stringent emission limitation or control technique of the following:

- Achieved in practice for such category and class of source;
- Contained in any State Implementation Plan approved by the Environmental Protection Agency for such category and class of source. A specific limitation or control technique shall not apply if the owner of the proposed emissions unit demonstrates to the satisfaction of the APCO that such a limitation or control technique is not presently achievable; or
- Contained in an applicable federal New Source Performance Standard; or
- Any other emission limitation or control technique, including process and equipment changes of basic or control equipment, found by the Air Pollution Control Officer (APCO) to be cost effective and technologically feasible for such class or category of sources or for a specific source.

In order to determine the most stringent emission limitation or control technique for this BACT determination, the District has reviewed emission limits in federal, state, and local

air District rules and regulations, BACT determinations conducted at federal, state and local level, and source test data for onsite power generation units operating in the San Joaquin Valley Air Pollution Control District (SJVAPCD). This analysis forms the basis for determining AIP BACT standards for onsite electrical power generation units.

This BACT guideline applies to electrical generation sources that are located at or near the facility of electricity consumption and are used to power the facility or supplement electricity from the grid. Onsite electrical power generation may be proposed for various reasons, such as the unavailability of a grid connection, extended delays in establishing a grid connection, or to reduce the cost of electricity purchased from the grid.

This BACT guideline applies to fuels that contain fossil fuel components, including but not limited to diesel, gasoline, natural gas, propane, kerosene, and other hydrocarbons derived from petroleum or natural gas. It also includes alternative fuels such as biodiesel, biogas, digester gas, and waste gas. Combustion of these fuels result in emissions of nitrogen oxides (NOx), sulfur oxides (SOx), particulate matter with aerodynamic diameter less than 10 microns (PM10), carbon monoxide (CO), and volatile organic compounds (VOC).

This guideline is not intended to apply to units that are fueled by biomass, biomass derived syngas, landfill gas, or hydrogen. Additionally, this determination is not intended to apply to units that are required to be transportable, such as electrical generators used to power transportable aggregate plants or electrical generators used for thermal oxidizers in tank degassing operations.

Onsite power generating units typically have smaller capacity than utility scale power generating units. Excluding oil and gas production operations, the largest reciprocating internal combustion engine (RICE) used for onsite power generation within SJVAPCD is 2.6 MW. CARB's *Guidance for the Permitting of Electrical Generation Technologies* (July 2002)[1] notes that larger equipment can achieve lower emission rates (in lb/MW-hr) due to higher thermal efficiency. CARB considered generating capacity cutoffs of 3 MW and 12 MW. Therefore, based on the maximum observed size of onsite power generating units with RICE within SJVAPCD, this guideline will be limited to units rated less than 3 MW.

This proactive BACT determination establishes SJVAPCD guidelines for NOx, SOx, PM10, CO, and VOC from this class and category of operation.

III. Applicable Regulations and Achieved in Practice BACT Requirements

The following BACT clearinghouse references were reviewed to determine what control technologies have been required:

[1] https://ww2.arb.ca.gov/sites/default/files/2020-08/guidelines.pdf

- EPA RACT/BACT/LAER clearinghouse
- California Air Resources Board (CARB) BACT clearinghouse
- California Air Pollution Control Officers Association (CAPCOA) BACT Clearinghouse
- South Coast Air Quality Management District (SCAQMD) BACT clearinghouse
- Ventura County Air Pollution Control District (VCAPCD) BACT clearinghouse
- Bay Area Air District (BAAD) BACT clearinghouse
- Sacramento Metro AQMD (SMAQMD) BACT clearinghouse
- San Joaquin Valley APCD (SJVAPCD) BACT clearinghouse

The following rules were also consulted:

- SJVAPCD Rule 4702, Internal Combustion Engines (8/19/2021)

- SCAQMD Rule 1110.2, Emissions from Gaseous- and Liquid-Fueled Engines (11/1/2019)

- SCAQMD Rule 1109.1, Petroleum Refineries (11/5/2021)

- SCAQMD Rule 1150.3, Emissions of Oxides of Nitrogen from Combustion Equipment at Landfills (2/5/2021)

- SCAQMD Rule 1135, Emissions of Oxides of Nitrogen From Electricity Generating Facilities[2] (1/7/2022)

- SCAQMD Rule 1150.3, Emissions of Oxides of Nitrogen from Combustion Equipment at Landfills (2/5/2021)

- SCAQMD Rule 1179.1, Emission Reductions from Combustion Equipment at Publicly Owned Treatment Works Facilities (1/10/2025)

[2] SCAQMD Rule 1135 (Emissions of Oxides of Nitrogen From Electricity Generating Facilities) applies to investor/ public-owned electric utility facilities with combined generation greater than or equal to 50 MW and does not extend to electricity generation operations subject to Rule 1109.1 (petroleum refineries) or 1179.1 (water treatment). The focus of this BACT determination, onsite power generation, would not fall under SCAQMD Rule 1135.

- BAAD Regulation 9, Rule 8, Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines
  (7/25/2007)

- SMAQMD Rule 412, Stationary Internal Combustion Engines Located at Major Stationary Sources of NOx
  (6/1/1995)

- CARB Distributed Generation Certification Regulation (DG)[3]
  (9/7/2007)

- 40 CFR Part 60 Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
  (8/16/2024)

- 40 CFR 60 Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines,
  (8/30/2024)

- 40 CFR 63 Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines[4]
  (8/30/2024)

A survey of source test results from units of this class and category located in the San Joaquin Valley APCD was also performed. The purpose of the survey was to determine the emission levels that are currently being achieved in practice.

[3] Although this regulation is not applicable to power generation units that require Air District permitting, the CARB Distributed Generation Certification Regulation (DG) includes requirements for power generation units in the source category of onsite power generation, and issues certification of emissions for multiple power generation devices in this source category.

[4] 40 CFR 63 Subpart ZZZZ for reciprocating IC engines is intended to limit formaldehyde emissions. While the regulation mentions CO control requirements, those requirements are surrogates to ensure formaldehyde emissions are reduced through the use of CO catalysts. The requirements of this Subpart are not relevant to this analysis.

A. BACT Analysis for NOx Emissions

The following table summarizes the results of the review of the BACT Clearinghouses and District/State/Federal Rules:

Emission Standard Source	Equipment Rating	NOx Control Technology/Requirement
SJVAPCD BACT 3.3.19 (2022) Fossil Fuel Fired IC Engines Used for Power (Electricity) Generation	RICE >50 bhp	0.07 lb-NOx/MW-hr (with credit for 1 MW-hr for every 3.4 MMBtu/hr of heat recovered)
SJVAPCD BACT 3.3.16 (2025) Ag Stationary Compression-Ignited IC Engine	RICE >50 bhp	EPA Tier 4 Final certification level or equivalent for applicable horsepower range
SJVAPCD Rule 4702	RICE >50 bhp	Spark Ignited: 11 – 43 ppmv @ 15% O2 Compression Ignited: EPA Tier 4
SCAQMD BACT Guidelines Part D IC Engine, Stationary, Non-Emergency, Electrical Generators (9-2-2022)	RICE > 50 HP	Compliance with SCAQMD Rule 1110.2 (2-2-2018)
SCAQMD Rule 1110.2	New RICE > 50 bhp	0.070 lb-NOx/MW-hr (with credit for 1 MW-hr for every 3.4 MMBtu/hr of heat recovered)
SMAQMD BACT Guidelines	N/A	Clearinghouse does not include any BACT Guidelines applicable to this source category.
SMAQMD Rule 412	RICE > 50 BHP	Rich Burn: 25 ppmv @ 15% O_2 Lean Burn:125 ppmv @ 15% O_2
BAAD BACT Workbook Spark Ignition – Natural Gas Fired (Lean Burn)	RICE ≥ 50 BHP	Achieved in Practice 0.15 g/bhp-hr (12 ppmv @ 15% O_2) Technologically Feasible 0.07 g/bhp-hr (6 ppmv @ 15% O_2)
BAAD BACT Workbook Spark Ignition, Natural Gas-Fired (Rich Burn)	RICE ≥ 50 BHP	Achieved in Practice 0.15 g/bhp-hr (9 ppmv @ 15% O_2) Technologically Feasible 0.071 g/bhp-hr (4 ppmv @ 15% O_2)
BAAD BACT Workbook Internal Combustion Engine Stationary prime, Non-Agricultural (Compression Ignited)	RICE > 50 BHP	Latest Tier Standard (Achieved in Practice) 85% reduction of current Tier Standard (Technologically Feasible)

Emission Standard Source	Equipment Rating	NOx Control Technology/Requirement
BAAD Reg 9 Rule 8	RICE > 50 BHP	Lean Burn Engines 70 ppmv @ 15% O_2 Rich Burn Engines 70 ppmv @ 15% O_2 Compression Ignited Engines 51 to 175 BHP: 180 ppmv @ 15% O_2 > 175 BHP: 110 ppmv @ 15% O_2
Monterey Bay Air Resources District (MBARD) (From CARB BACT Clearinghouse) ICE: Spark Ignition, Natural Gas, Rich Burn 528 HP Engines	N/A	0.07 g/bhp-hr (Achieved in Practice)
Santa Barbara APCD (From CARB BACT Clearinghouse) ICE: 881 BHP Lean Burn IC Engine used for Cogeneration (2015)	N/A	0.063 g/bhp-hr (0.154 lb/MW-hr)
California Distributed Generation Certification Program	Small Distributed Generation Units that Do Not Require Air Permit from Districts	0.07 lb-NOx/MW-hr (with credit for 1 MW-hr for every 3.4 MMBtu/hr of heat recovered)
40 CFR 60 Subpart IIII	Compression ignited engines constructed, modified, or reconstructed after July 11, 2005	Compression Ignited Engines meeting EPA Tier Certification Standards (most stringent is Tier 4f)
40 CFR 60 Subpart JJJJ	Spark ignited engines constructed, modified, or reconstructed after June 12, 2006	Varies based on engine size, use, and fuel type, but requirements of Subpart JJJJ have been previously determined to be less stringent than District Rule 4702 requirements

The table above summarizes standards which are expressed in units of exhaust concentration (i.e. ppm), mass of emission per unit of mechanical power output (i.e. g/bhp-hr), and mass of emission per unit of electrical power output (i.e. lb/MW-hr). Because the primary function of equipment in this source category is generation of electrical power, emission standards normalized to electrical power output is most appropriate.

Multiple standards in units of lb/MW-hr give credit for useful heat recovered at a rate of 3.4 MW per MMBtu/hr of heat recovered. If a facility has need for both onsite generation of electrical power and process heat (i.e. boilers or steam generators), recovering waste heat from electrical power generation equipment can reduce the quantity of fuel needed for generating process heat and thereby offset emissions from the heating operations. These standards equate process heat to electrical energy to incentivize combined heat and power production. CARB has recommended permitting authorities provide incentive for combined heat and power operations to achieve overall air quality benefit[5].

Emission standards in units of mass of emissions per unit of mechanical power output (i.e. g/bhp-hr) are frequently applied to reciprocating internal combustion engines. Emission standards on this basis do not account for the final process step where mechanical power is converted to electrical power. The emission standard of 0.07 lb-NOx/MW-hr is translated[6] to 0.02 g-NOx/bhp-hr. Therefore, the standard of 0.07 lb-NOx/MW-hr is more stringent than any of the standards in g-NOx/bhp-hr identified in the table above.

Emission standards in units of exhaust concentration (ppm) are frequently applied because they offer greatest ease of measurement as exhaust concentrations can be directly measured. However, standards on this basis do not account for efficiency converting heat from combusted fuel into electricity and variation in different fuel's exhaust volume per unit of thermal energy (F-factor). By inspection of permitted units within SJVAPCD, the 0.07 lb/MW-hr standard is approximately equivalent to 1.8 ppm @ 15% O2 for natural gas-fired spark-ignited RICE. Therefore, the standard of 0.07 lb-NOx/MW-hr is more stringent than any of the standards in ppm identified in the table above.

The most stringent potential NOx limit listed above is 0.07 lb-NOx/MW-hr (with allowance for credit for useful heat recovery) which is a requirement of SJVAPCD BACT Guideline 3.3.19, SCAQMD Rule 1110.2, and the CARB DG Program.

The results of survey of electric power generating equipment under active permit within SJVAPCD are discussed below:

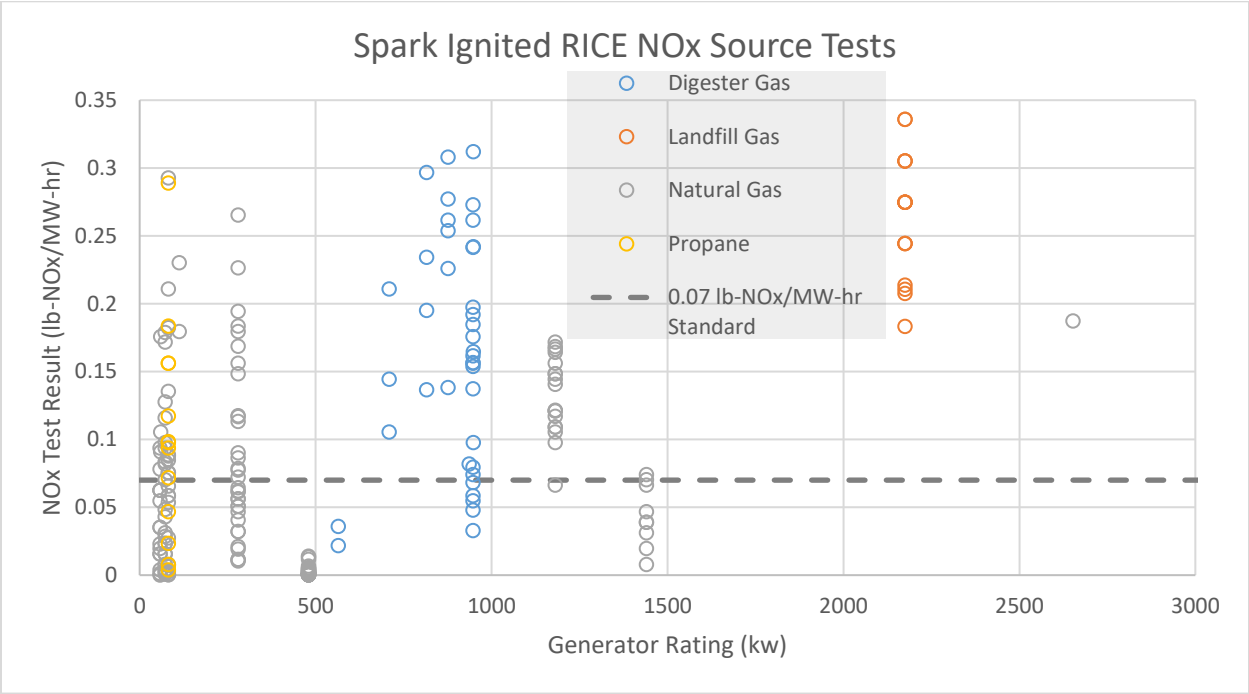
Spark Ignited RICE

RICE NOx source test results versus generator output is shown in the plot below. This plot includes all reviewed source test results from spark ignited RICE currently

[5] CARB (2001) Guidance for the Permitting of Electrical Generation Technologies https://ww2.arb.ca.gov/sites/default/files/2020-08/guidelines.pdf

[6] CARB (2001) Guidance for the Permitting of Electrical Generation Technologies, Appendix C: Procedure for Converting Emission Data to lb/MW-hr (https://ww2.arb.ca.gov/sites/default/files/2020-06/gappc.pdf). A mechanical-electrical conversion efficiency of 95% is assumed resulting in a conversion factor of g/bhp-hr * 3.07 = lb/MW-hr.

under active permit to operate (PTO) in the San Joaquin Valley. Although landfill gas fired equipment is included below for reference purposes, as discussed above, landfill gas fired equipment is outside the intended scope of this guideline. Source test results reported in ppmv were converted to lb-NOx/MW-hr by assuming a thermal efficiency of 32%. Source test results only reported in g/bhp-hr were converted to lb-NOx/MW-hr assuming operation at the rated bhp and electrical output as listed in the equipment description. If the electrical output was not listed in the equipment description, it was estimated assuming a mechanical-to-electrical conversion efficiency of 90%.



As seen in the previous table, gaseous fuel fired spark ignited reciprocating internal combustion engines have been demonstrated meeting 0.07 lb-NOx/MW-hr, without consideration of useful heat recovery, at generating capacity up to approximately 1,500 kW when fueled on natural gas, propane, and digester gas. A total of 55 RICE have shown source tests below 0.07 lb-NOx/MW-hr without consideration of useful heat recovery.

Notable examples of RICE meeting the 0.07 lb-NOx/MW-hr standard without consideration of useful heat recovery are:

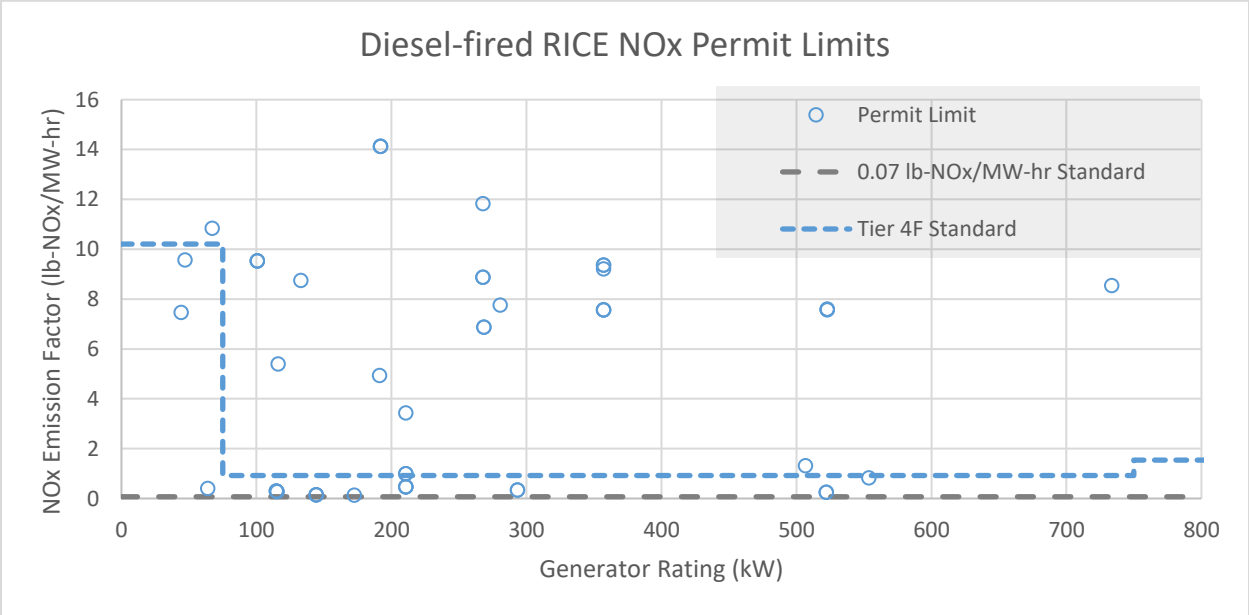
- 243 rich-burn internal combustion engines equipped with 3-way catalysts, each 673 bhp generating 450 kW were installed at facilities N-10240 and N-10241, each permitted at 1.6 ppm NOx (equivalent to 0.07 lb-NOx/MW-hr). Representative testing on 29 of these engines has shown maximum NOx emissions of 0.008 lb-NOx/MW-hr (average 0.002 lb-NOx/MW-hr).

- Three additional permitted engines were identified that consistently achieve 0.07 lb-NOx/MW-hr based on source test results, even without crediting for heat recovered. These satisfying the 0.07 lb-NOx/MW-hr standard were identified with power ratings of 60 kW (Permit to Operate C-3563-11-1), 75 kW (Permit to Operate N-704-11-0), and 1,556 kW (Permit to Operate C-4161-4-0).

Useful heat recovery data was not readily available for many of the installations; however, the addition of an allowance for useful heat recover would result in additional units meeting the standard of 0.07 lb-NOx/MW-hr and is consistent with the most stringent limits discovered during the review of applicable regulations and BACT standards.

Compression Ignited RICE

No source tests performed on diesel-fired engines within SJVAPCD were identified. SJVAPCD does not typically require source testing of diesel-fired engines because specific engine models have emission certifications verified by CARB/EPA, which are based upon representative testing of engines as outlined in CARB/EPA certification requirements. SJVAPCD has historically permitted diesel-fired engines using the emissions factors from the representative testing for certification or using accepted manufacturer's testing/guarantees. Active SJVAPCD permits for diesel-fired non-emergency engines were surveyed for permitted NOx emission limits. Permit limits, expressed in g-NOx/bhp-hr, are converted to lb-NOx/MW-hr by assuming operation at the rated bhp and electrical output. The permit limits of active SJVAPCD permits for diesel-fired non-emergency engines are represented in the plot below.



No diesel-fired engines were found to be permitted at or below 0.07 lb-NOx/MW-hr; the lowest permitted NOx emission factor was 0.13 lb-NOx/MW-hr.

The most stringent standard identified for specifically for diesel-fired RICE is Tier 4F certification. As represented in the plot above, the Tier 4F NOx standard specifies NOx emission rate dependent on the engine rating and Tier 4F certification levels result in higher emissions than a 0.07 lb-NOx/MW-hr standard. Most of these engines are not configured as combined heat and power (CHP) systems; therefore, heat recovery would not be applicable.

Conclusion of BACT Analysis for NOx

The survey of permitted operations within SJVAPCD showed that the 0.07 lb-NOx/MW-hr standard is achievable, with consideration of useful heat recovery, by gaseous fueled RICE. Although diesel-fired RICE were not seen to achieve the 0.07 lb-NOx/MW-hr standard, gaseous-fuel fired RICE achieving the standard suggest it should be considered AIP BACT for this source category. Furthermore, the CARB DG program issues Executive Orders certifying that specific equipment has been demonstrated to meet the DG emission standards. With respect to NOx, the CARB DG emission standard is 0.07 lb-NOx/MW-hr (including any applicable credit for recovered heat energy). The current certified equipment (Appendix C) includes one gaseous-fuel fired RICE with electrical generating capacity of 0.4 MW. Therefore, a BACT standard of 0.07 lb-NOx/MMBtu, with consideration of useful heat recovery, is demonstrated to be Achieved in Practice for this source category.

B. BACT Analysis for SOx Emissions

The following table summarizes the results of the review of the BACT Clearinghouses and District/State/Federal Rules:

Emission Standard	Equipment Rating	SOx Control Technology/Requirement
SJVAPCD BACT 3.3.19 (2022) Fossil Fuel Fired IC Engines Used for Power (Electricity Generation	RICE >50 bhp	Compliance with SJVAPCD Rule 4702 SOx Emission Control Requirements
SJVAPCD BACT 3.3.16 (2025) Ag Stationary Compression-Ignited IC Engine	RICE >50 bhp	Very low sulfur diesel fuel (15 ppmw sulfur or less)
SJVAPCD Rule 4702	RICE >50 bhp	Fuel Sulfur requirements (discussed below)
SCAQMD BACT Guidelines Part D IC Engine, Stationary, Non-Emergency, Electrical Generators (9-2-2022)	RICE > 50 HP	Clean Fuel pursuant to BACT Part C[7]
SCAQMD Rule 1110.2	New non-emergency Electrical Generators > 2/1/2008	No Standard
SMAQMD BACT Guidelines	N/A	Clearinghouse does not include Guideline applicable to this source category.
SMAQMD Rule 412	RICE > 50 BHP	No Standard
BAAD BACT Workbook Spark Ignition – Natural Gas Fired (Lean Burn)	RICE ≥ 50 BHP	Use of natural gas fuel
BAAD BACT Workbook Spark Ignition, Natural Gas-Fired (Rich Burn)	RICE ≥ 50 BHP	Use of natural gas fuel
BAAD BACT Workbook Internal Combustion Engine Stationary prime, Non-Agricultural (Compression Ignited)	RICE > 50 BHP	Use of CARB Certified Fuel
BAAD Reg 9 Rule 8	RICE >50 BHP	No Standard
Santa Barbara APCD (From CARB BACT Clearinghouse) ICE: 881 BHP Lean Burn IC Engine used for Cogeneration (2015)	N/A	No Standard

[7] https://www.aqmd.gov/docs/default-source/bact/bact-guidelines/part-c---policy-and-procedures-for-non-major-polluting-facilities.pdf

Emission Standard	Equipment Rating	SOx Control Technology/Requirement
California Distributed Generation Certification Program	All Distributed Generation Units that Don't Require Air Permit from Districts	No Standard
40 CFR 60 Subpart IIII	Compression ignited engines constructed, modified, or reconstructed after July 11, 2005	Very low sulfur diesel fuel (15 ppmw sulfur or less)

Requirement for post-control of SOx was not identified in the survey of applicable BACT Guidelines and regulations. It is understood that, regardless of the electrical generation technology, SOx emissions are directly related to fuel usage and sulfur content of the fuel combusted. Therefore, SOx requirements are generally written in terms of fuel requirements which would apply to any of the types of electrical generation units that may be proposed.

The SCAQMD Clean Fuels policy defines a Clean Fuel as one that produces air emissions equivalent to or lower than natural gas. The policy lists natural gas, methanol, liquid petroleum gas (LPG), and hydrogen as Clean Fuels. However, the requirement of a Clean Fuel may be withheld based on considerations including engineering feasibility, fuel availability, and safety concerns and, further, the burning of landfill, digester, refinery, and other by-product gases is not subject to the Clean Fuels requirement.

SJVAPCD Rule 4702 Section 5.7 requires the use of one of the following control methods for the reduction of SOx emissions.

1. Operate the engine exclusively on PUC-quality natural gas, commercial propane, butane, or liquefied petroleum gas or a combination of such gases; or
2. Limit gaseous fuel sulfur content to no more than 5 grains of total sulfur per 100 standard cubic feet; or
3. Use California Reformulated gasoline for gasoline-fired spark ignited engines; or
4. Use California Reformulated Diesel for compression ignited engines; or
5. Operate the engine on liquid fuel that contains no more than 15 ppm sulfur; or
6. Install and properly operate an emission control system that reduces SO_2 emissions by at least 95% by weight.

This SJVAPCD requirement identifies the lowest sulfur content formulation of each type of commonly commercially available fuel, specifies an equivalent sulfur content for alternative fuels, and provides an emission control system option for alternative fuels that may have higher intrinsic sulfur content. The SJVAPCD requirement

comprehensively addresses the case-by-case considerations that may be made under the SCAQMD Clean Fuel Policy and extends to by-product fuels which are not subject to the Clean Fuels requirement. Therefore, the SJVAPCD requirement is considered to be the more stringent requirement.

SOx emission source testing is not common amongst these units at these size ranges. Therefore, there is no testing data to evaluate and a survey of SJVAPCD permitted units for source test data was not performed.

Conclusion of BACT Analysis for SOx

As shown above, the following SJVAPCD District Rule 4702 fuel requirements are the most stringent standard that has been achieved in practice for SOx.

1. Operate the engine exclusively on PUC-quality natural gas, commercial propane, butane, or liquefied petroleum gas or a combination of such gases; or
2. Limit gaseous fuel sulfur content to no more than 5 grains of total sulfur per 100 standard cubic feet; or
3. Use California Reformulated gasoline for gasoline-fired spark ignited engines; or
4. Use California Reformulated Diesel for compression ignited engines; or
5. Operate the engine on liquid fuel that contains no more than 15 ppm sulfur; or
6. Install and properly operate an emission control system that reduces SO_2 emissions by at least 95% by weight.

C. BACT Analysis for PM10 Emissions

The following table summarizes the results of the review of the BACT Clearinghouses and District/State/Federal Rules:

Emission Standard Source	Equipment Rating	PM10 Control Technology/Requirement
SJVAPCD BACT 3.3.19 (2022) Fossil Fuel Fired IC Engines Used for Power (Electricity Generation	RICE >50 bhp	1. For Compression Ignited Engines: 0.01 g-PM10/bhp-hr 2. For Spark Ignited Engines: 0.06 g/bhp-hr
SJVAPCD BACT 3.3.16 (2025) Ag Stationary Compression-Ignited IC Engine	RICE >50 bhp	EPA Tier 4 Final certification level or equivalent for applicable horsepower range
SJVAPCD Rule 4702	RICE >50 bhp	Fuel Sulfur Requirements and, if applicable, EPA Tier 4 Certification
SCAQMD BACT Guidelines Part D IC Engine, Stationary, Non-Emergency, Electrical Generators (2-2-2018)	RICE > 50 HP	Compliance with SCAQMD Rule 1110.2 (2-2-2018)
SCAQMD 1110.2	New RICE >50 bhp	Use of a Clean Fuel per South Coast Policy
SMAQMD BACT Guidelines	N/A	Clearinghouse does not include Guideline applicable to this source category.
SMAQMD Rule 412	RICE > 50 BHP	No PM10 requirement listed
Bay Area AD BACT Workbook Spark Ignition – Natural Gas Fired (Lean Burn)	RICE ≥ 50 BHP	Use of natural gas fuel
Bay Area AD BACT Workbook Spark Ignition, Natural Gas-Fired (Rich Burn)	RICE ≥ 50 BHP	Use of natural gas fuel
Bay Area AD BACT Workbook Internal Combustion Engine Stationary prime, Non-Agricultural (Compression Ignited)	RICE > 50 BHP	0.01 g/bhp-hr
Bay Area AD Reg 9 Rule 8	RICE > 50 BHP	No PM10 requirement listed
Santa Barbara APCD (From CARB BACT Clearinghouse) ICE: 881 BHP Lean Burn IC Engine used for Cogeneration (2015)	N/A	No PM10 requirement listed
California Distributed Generation Certification Program	All Distributed Generation Units that Don't Require Air Permit from Districts	No standard

Emission Standard Source	Equipment Rating	PM10 Control Technology/Requirement
40 CFR 60 Subpart IIII	Compression ignited engines constructed, modified, or reconstructed after July 11, 2005	Compression Ignited Engines meeting EPA Tier Certification Standards (most stringent is Tier 4f)

The most stringent PM10 control options, and the calculated lb/MW-hr equivalent[8], are listed below:

- For Compression Ignited Engines: 0.01 g/bhp-hr (equivalent to 0.03 lb/MW-hr)
  - From SJVAPCD BACT 3.3.19 and BAAD BACT Workbook,
- For Spark Ignited Engines: 0.06 g/bhp-hr (equivalent to 0.2 lb/MW-hr)
  - From SJVAPCD BACT 3.3.19

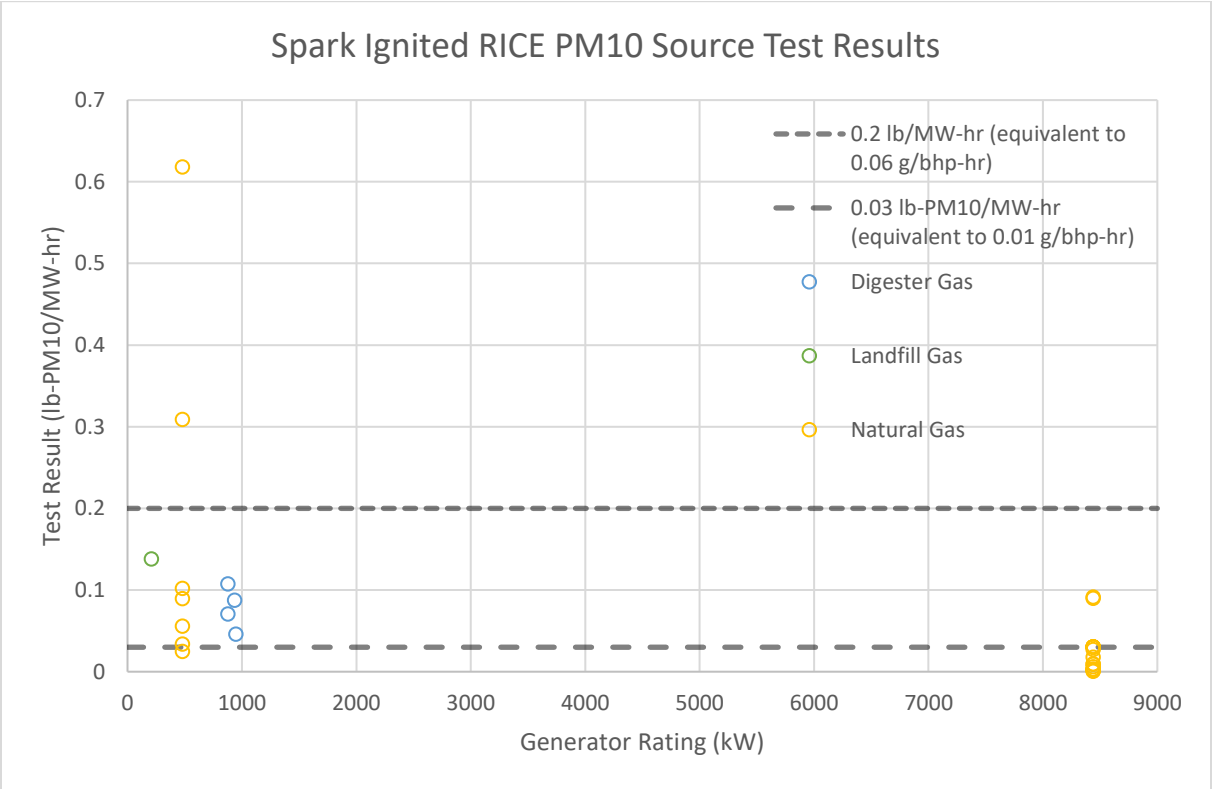
The regulations and BACT guidelines reviewed do not consider useful heat recovery in the context of particulate matter emissions requirements.

The results of survey of electric power generating equipment under active permit within SJVAPCD are discussed below:

Spark Ignited RICE

RICE PM10 source test results versus generator output is shown in the table below. This plot includes all reviewed source test results from spark ignited RICE currently under active permit to operate (PTO) in the San Joaquin Valley. Although landfill gas fired equipment is included below for reference purposes, as discussed above, landfill gas fired equipment is outside the intended scope of this guideline. Source test results, reported in g/bhp-hr, are converted to lb/MW-hr assuming operation at the rated bhp and electrical output.

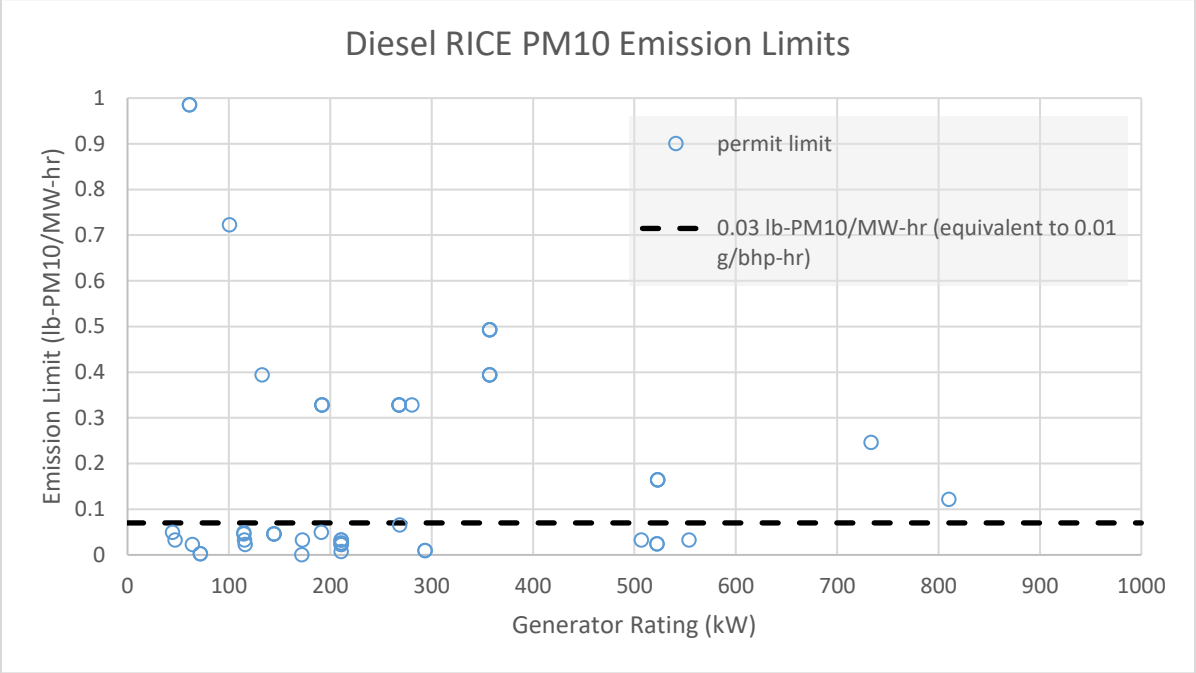
[8] Pursuant to CARB's (2001) Guidance for the Permitting of Electrical Generation Technologies, Appendix C: Procedure for Converting Emission Data to lb/MW-hr (https://ww2.arb.ca.gov/sites/default/files/2020-06/gappc.pdf) a mechanical-electrical conversion efficiency of 95% is assumed resulting in a conversion factor of g/bhp-hr * 3.07 = lb/MW-hr.



As seen in the previous table, gaseous fuel spark ignited RICE are capable of meeting 0.2 lb-PM10/MW-hr over a wide range of power generating capacity when fueled on natural gas, landfill gas, and digester gas. These RICE are not commonly capable of meeting the stricter 0.03 lb-PM10/MW-hr standard applied to diesel fuel fired compression ignited RICE.

Compression Ignited RICE

No source tests performed on diesel-fired engines within SJVAPCD were identified. SJVAPCD does not typically require source testing of diesel-fired engines because specific engine models have emission certifications verified by CARB/EPA. SJVAPCD has historically permitted diesel-fired engines at these certified emission levels. Active SJVAPCD permits for diesel-fired non-emergency engines were surveyed for permitted PM10 emission limits. Permit limits, expressed in g-PM10/bhp-hr, are converted to lb-PM10/MW-hr by assuming operation at the rated bhp and electrical output. The permit limits of active SJVAPCD permits for diesel-fired non-emergency engines are represented in the plot below.



As seen above, diesel fired RICE routinely achieve the emission standard of 0.01 g-PM10/bhp-hr (equivalent to 0.03 lb-PM10/MW-hr). Diesel-fired RICE are often equipped with post control for PM in the form of a particulate filter.

Conclusion of BACT Analysis for PM10

The most stringent requirement identified for PM10 emissions are 0.20 lb/MW-hr for gaseous fueled equipment and 0.03 lb/MW-hr for diesel fueled compression ignited reciprocating internal combustion engines.

The survey of permitted operations within SJVAPCD showed that the gaseous fuel fired equipment RICE are capable of meeting the 0.20 lb-PM10/MW-hr; these gaseous fuel fired equipment are generally not capable of meeting the 0.03 lb-PM10/MW-hr requirement applicable to diesel-fired RICE. Diesel-fired compression ignited RICE within SJVAPCD, which are often equipped with particulate filters, are seen to be achieving the emissions standard of 0.03 lb-PM10/MW-hr.

Note, it is not customary for regulations to give credit for useful heat recovery for particulate matter emissions regulations. Therefore, a PM10 standard without credit for useful heat recovery is recommended. Thus, standards of 0.20 lb-PM10/MW-hr for gaseous fired units and 0.03 lb-PM10/MW-hr for diesel-fired units are achieved in practice.

D. BACT Analysis for CO Emissions

The CO emission standard of 0.20 lb-CO/MW-hr with credit for useful heat recovery, previously established by SJVAPCD BACT Guideline 3.3.19 (9/12/22), is aligned wih the CARB DG emission standard. Additionally, the SJVAPCD is in attainment with federal and state ambient air quality standards for for CO. Therefore, AIP BACT for CO will be retained without further evaluation at this time.

E. BACT Analysis for VOC Emissions

The following table summarizes the results of the review of the BACT Clearinghouses and District Rules:

BACT Guideline Source	Equipment Rating	VOC Control Technology/Requirement
SJVAPCD BACT 3.3.19 (2022, rescinded 2025) Fossil Fuel Fired IC Engines Used for Power (Electricity Generation	RICE >50 bhp	0.10 lb-VOC/MW-hr (with credit for 1 MW-hr for every 3.4 MMBtu/hr of heat recovered)
SJVAPCD BACT 3.3.16 (2025) Ag Stationary Compression-Ignited IC Engine	RICE >50 bhp	EPA Tier 4 Final certification level or equivalent for applicable horsepower range
SJVAPCD Rule 4702	RICE >50 bhp	Spark Ignited: 90 - 750 ppmv @ 15% O2 Compression Ignited: EPA Tier 4 Certification
South Coast BACT Guidelines Part D IC Engine, Stationary, Non-Emergency, Electrical Generators (9-2-2022)	RICE > 50 HP	Compliance with SCAQMD Rule 1110.2 (2-2-2018)
South Coast Rule 1110.2	New non-emergency Electrical Generators > 2/1/2008	VOC Emission Standard: 0.10 lbs/MW-hr (with credit for 1 MW-hr for every 3.4 MMBtu/hr of heat recovered)
SMAQMD BACT Guidelines	N/A	Clearinghouse does not include Guideline applicable to this source category.
SMAQMD Rule 412	RICE > 50 BHP	750 ppmv @ 15% O_2
BAAD BACT Workbook Spark Ignition – Natural Gas Fired (Lean Burn)	RICE ≥ 50 BHP	<u>Achieved in Practice</u> 0.15 g/bhp-hr (32 ppmv @ 15% O_2)

BACT Guideline Source	Equipment Rating	VOC Control Technology/Requirement
Bay Area AD BACT Workbook Spark Ignition, Natural Gas-Fired (Rich Burn)	RICE ≥ 50 BHP	Achieved in Practice 0.15 g/bhp-hr (25 ppmv @ 15% O_2) Technologically Feasible 0.069 g/bhp-hr (12 ppmv @ 15% O_2)
Bay Area AD BACT Workbook Internal Combustion Engine Stationary prime, Non-Agricultural (Compression Ignited)	RICE > 50 BHP	Latest Tier Standard (Achieved in Practice) 50% reduction of current Tier Standard (Technologically Feasible)
BAAD Reg 9 Rule 8	RICE > 50 BHP	No Standard
Santa Barbara APCD (From CARB BACT Clearinghouse) ICE: 881 BHP Lean Burn IC Engine used for Cogeneration (2015)	N/A	0.115 g/bhp-hr
CARB DG Certification Program	All Distributed Generation Units that Don't Require Air Permit from Districts	0.02 lb-VOC/MW-hr (with credit for 1 MW-hr for every 3.4 MMBtu/hr of heat recovered)
40 CFR 60 Subpart IIII	Compression ignited engines constructed, modified, or reconstructed after July 11, 2005	Compression Ignited Engines meeting EPA Tier Certification Standards (most stringent is Tier 4f)
40 CFR 60 Subpart JJJJ	Spark ignited engines constructed, modified, or reconstructed after June 12, 2006	Varies based on engine size, use, and fuel type, but requirements of Subpart JJJJ have been previously determined to be less stringent than District Rule 4702 requirements.

The table above summarizes standards which are expressed in units of exhaust concentration (i.e. ppm), mass of emission per unit of mechanical power output (i.e. g/bhp-hr), and mass of emission per unit of electrical power output (i.e. lb/MW-hr). Because the primary function of equipment in this source category is generation of electrical power, emission standards normalized to electrical power output is most appropriate.

Multiple standards in units of lb/MW-hr give credit for useful heat recovered at a rate of 3.4 MW per MMBtu/hr of useful heat recovered. If a facility has need for both onsite generation of electrical power and process heat (i.e. boilers or steam generators),

recovering waste heat from electrical power generation equipment can reduce the quantity of fuel needed for generating process heat and thereby offset emissions from the heating operations. These standards equate process heat to electrical energy to incentivize combined heat and power production. CARB has recommended permitting authorities provide incentive for combined heat and power operations to achieve overall air quality benefit[9].

Emission standards in units of mass of emissions per unit of mechanical power output (i.e. g/bhp-hr) are frequently applied to reciprocating internal combustion engines. Emission standards on this basis do not account for the final process step where mechanical power is converted to electrical power, and are not relevant to power generation technologies where an intermediate step with discrete mechanical power is not present (i.e. fuel cells) or is not easily measurable (i.e. linear generators). The emission standard, established by the CARB DG program, of 0.02 lb-VOC/MW-hr can be translated[10] to 0.006 g-VOC/bhp-hr. Similarly, the emission standard, established by SCAQMD Rule 1110.2 and the previous SJVAPCD BACT 3.3.19, of 0.10 lb-VOC/MW-hr can be translated to 0.033 g-VOC/bhp-hr. These standards are more stringent than any of the standards in g-VOC/bhp-hr identified in the table above.

Emission standards in units of exhaust concentration (ppm) are frequently applied because they offer greatest ease of measurement as exhaust concentration can be directly measured. However, standards on this basis do not account for efficiency converting heat from combusted fuel into electricity and variation in different fuel's exhaust volume per unit of thermal energy (F-factor). The emission standard, established by the CARB DG program, of 0.02 lb-VOC/MW-hr can be translated[11] to 1.5 ppm @15% O2 for natural gas-fired spark-ignited RICE. Similarly, the emission standard, established by SCAQMD Rule 1110.2 and the previous SJVAPCD BACT 3.3.19, of 0.10 lb-VOC/MW-hr can be translated to 7.5 ppm @15% O2 for natural gas-fired spark-ignited RICE. The 0.02 lb-VOC/MW-hr standard and 0.10 lb-VOC/MW-hr standard are more stringent than any of the standards in ppm identified in the table above.

The most stringent VOC limits identified above are:

- 0.02 lb-VOC/MW-hr (with allowance for credit for useful heat recovery) which is a requirement of the CARB DG Certification Program.
- 0.10 lb-VOC/MW-hr (with allowance for credit for useful heat recovery) which is a requirement of SJVAPCD BACT 3.3.19 (2022) and SCAQMD Rule 1110.2

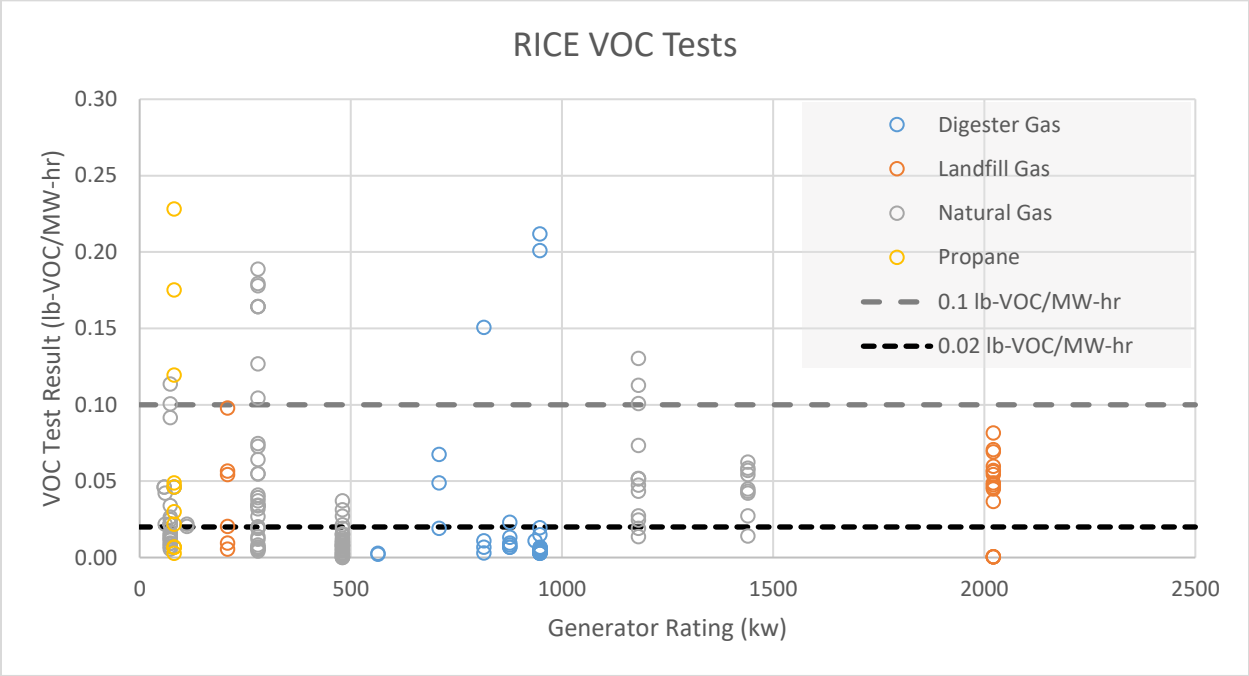
Spark Ignited RICE

[9] CARB (2001) Guidance for the Permitting of Electrical Generation Technologies https://ww2.arb.ca.gov/sites/default/files/2020-08/guidelines.pdf

[10] CARB (2001) Guidance for the Permitting of Electrical Generation Technologies, Appendix C: Procedure for Converting Emission Data to lb/MW-hr (https://ww2.arb.ca.gov/sites/default/files/2020-06/gappc.pdf). A mechanical-electrical conversion efficiency of 95% is assumed resulting in a conversion factor of g/bhp-hr * 3.07 = lb/MW-hr.

[11] By inspection of permitted units within SJVAPCD.

RICE VOC source test results versus generator output is shown in the plot below. This plot includes all reviewed source test results from spark ignited RICE currently under active permit to operate (PTO) in the San Joaquin Valley. Although landfill gas fired equipment is included below for reference purposes, as discussed above, landfill gas fired equipment is outside the intended scope of this guideline. Source test results, reported in in ppm, are converted to lb-VOC/MW-hr by assuming 32% thermal efficiency, f-factor of 8,578 scf/MMBtu, and operation at maximum rated generating capacity.

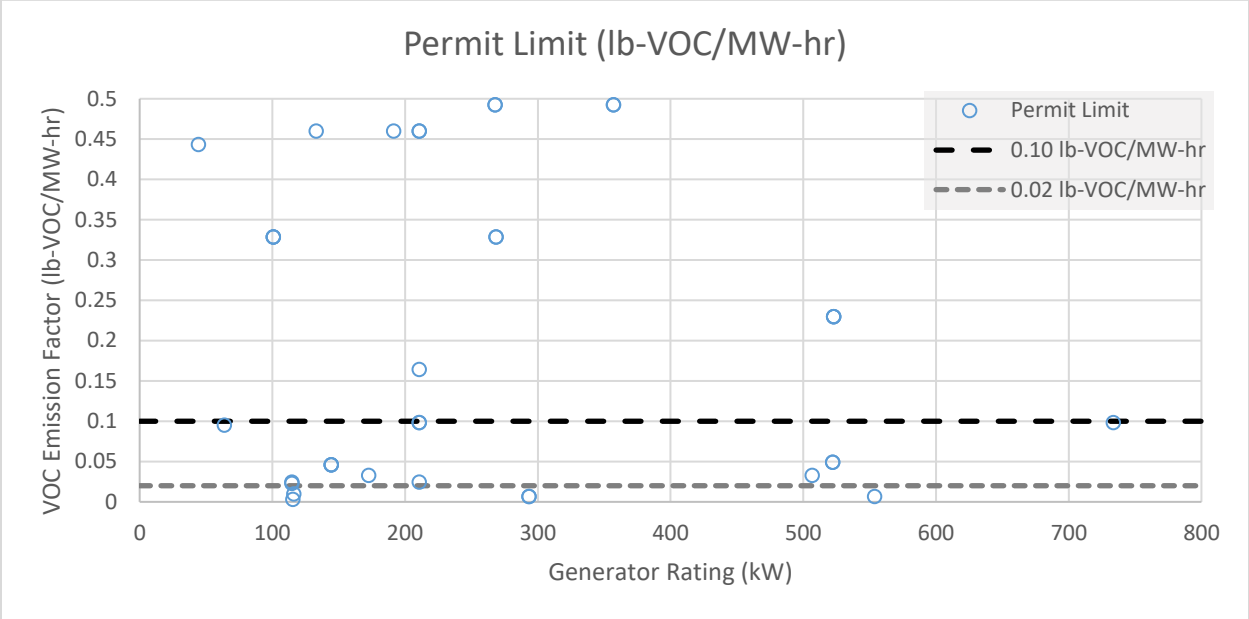


As seen in the plot(s) above, some gaseous fuel spark ignited RICE are capable of meeting 0.10 lb-VOC/MW-hr, without consideration of useful heat recovery, over a wide range of power generating capacity when fueled on natural gas, landfill gas, and digester gas. Although useful heat recovery data was not readily available, consideration of useful heat recovery, where applicable, would result in additional test results meeting the standard of 0.10 lb-VOC/MW-hr standard. Of the 212 source test results reviewed, only 94 were below the 0.02 lb-VOC/MW-hr standard and no units were identified that consistently tested below this standard.

Compression Ignited RICE

No source tests performed on diesel-fired engines within SJVAPCD were identified. SJVAPCD does not typically require source testing of diesel-fired engines because specific engine models have emission certifications verified by CARB/EPA. SJVAPCD has historically permitted diesel-fired engines at these certified emission levels or accepted manufacturer's testing/guarantees. Active SJVAPCD permits for

diesel-fired non-emergency engines were surveyed for permitted VOC emission limits. Permit limits, expressed in g-VOC/bhp-hr, are converted to lb-VOC/MW-hr by assuming operation at the rated bhp and electrical output. The permit limits of active SJVAPCD permits for diesel-fired non-emergency engines are represented in the plot below.



As seen in the plot above, 19 diesel fired compression ignited RICE are permitted at or below 0.10 lb-VOC/MW-hr spanning a large range of generating capacity; only 5 are permitted at or below 0.02 lb-VOC/MW-hr. Most of these engines are not configured as combined heat and power (CHP) systems; therefore, heat recovery would not be applicable.

Conclusion of BACT Analysis for VOC

The most stringent requirements identified for VOC emissions is 0.02 lb/MW-hr with credit for useful heat recovery. However, this standard is not seen to be achieved in practice for all equipment types within the scope of this guideline. SCAQMD originally established a VOC limit of 0.02 lb/MW-hr in Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Internal Combustion Engines, however they later increased the limit to 0.10 lb/MW-hr. As noted in the (Dec 2007) SCAQMD Final Environmental Assessment for Amendments to Rule 1110.2, the standard was established at 0.10 lb/MW-hr following comments from the Engine Manufacturers Association that no internal combustion engines could comply with 0.02 lb/MW-hr.

Survey of permitted operations showed that the 0.10 lb-VOC/MW-hr (with credit for heat recovery) standard is achieved in practice for RICE.

F. Summary of Findings

The most stringent achieved in practice emission standards identified for each criteria pollutant are discussed below.

NOx: 0.07 lb-NOx/MW-hr (with credit for one MW for each 3.4 MMBtu/hr of useful heat recovery)

This emission standard is achieved by CARB DG Certified units. Survey of permitted units within SJVAPCD has shown that this emission standard is also achieved by spark ignited RICE.

SOx: Compliance with one of the following:

1. Operate the engine exclusively on PUC-quality natural gas, commercial propane, butane, or liquefied petroleum gas or a combination of such gases; or
2. Limit gaseous fuel sulfur content to no more than 5 grains of total sulfur per 100 standard cubic feet; or
3. Use California Reformulated gasoline for gasoline-fired spark ignited engines; or
4. Use California Reformulated Diesel for compression ignited engines; or
5. Operate the engine on liquid fuel that contains no more than 15 ppm sulfur; or
6. Install and properly operate an emission control system that reduces SO_2 emissions by at least 95% by weight.

PM10: For diesel fuel fired: 0.03 lb-PM10/MW-hr, without credit for useful heat recovery
For gaseous fuel fired: 0.20 lb-PM10/MW-hr, without credit for useful heat recovery

This emission standard is achieved by CARB DG Certified RICE. Review of permitted units within SJVAPCD has shown that this emission standard is achieved, without consideration of useful heat recovery, by both spark ignited RICE and compression ignited.

CO: 0.20 lb-CO/MW-hr (with credit for one MW for each 3.4 MMBtu/hr of useful heat recovery)

This emission standard is retained from SJVAPCD BACT 3.3.19 (9/12/22).

VOC: 0.10 lb-VOC/MW-hr (with credit for one MW for each 3.4 MMBtu/hr of useful heat recovery)

This emission standard is achieved by CARB DG Certified RICE. Review of

permitted units within SJVAPCD and available source test results has shown that these emission standards are achieved in practice, with consideration of useful heat recovery, by both spark ignited RICE and compression ignited RICE.

IV. Recommendation

Adopt the recommended draft BACT guideline.

Appendices

Appendix A: Draft BACT Guideline 3.3.19
Appendix B: BACT Guideline 3.3.19 (9/12/22)
Appendix C: CARB Distributed Generation Certified Equipment

Appendix A
Draft BACT Guideline

San Joaquin Valley Air Pollution Control District
Best Available Control Technology (BACT) Guideline 3.3.19

Emissions Unit: Stationary Fossil Fuel/Digester Gas-Fired Distributed Power Generation Equipment with Reciprocating Internal Combustion Engine*

Industry Type: All

Equipment Rating: < 3 MW

Last Update: 3/4/2026

Pollutant	Achieved-in-Practice or contained in SIP	Technologically Feasible	Alternate Basic Equipment
NOx	0.07 lb-NOx/MW-hr**		
SOx	Comply with one of the following: 7. Operate the power generation equipment exclusively on PUC-quality natural gas, commercial propane, butane, or liquefied petroleum gas or a combination of such gases; 8. Limit gaseous fuel sulfur content to no more than 5 grains of total sulfur per 100 standard cubic feet; 9. Use California reformulated gasoline for gasoline-fired power generation equipment; 10. Use California reformulated diesel for compression ignited power generation equipment; 11. Operate the power generation equipment on liquid fuel that contains no more than 15 ppm sulfur; or 12. Install and properly operate an emission control system that reduces SO_2 emissions by at least 95% by weight.		
PM10	For diesel fuel-fired power generation equipment: 0.03 lb-PM10/MW-hr For gaseous fuel-fired power generation equipment: 0.20 lb-PM10/MW-hr		
CO	0.20 lb-CO/MW-hr**		
VOC	0.10 lb-VOC/MW-hr**		

*This BACT guideline applies to fuels that contain fossil fuel components, including but not limited to diesel, gasoline, natural gas, propane, kerosene, and other hydrocarbons derived from petroleum or natural gas. It also includes alternative fuels such as biodiesel, biogas, digester gas, and waste gas. Landfill gas fuel, Biomass-derived syngas, other biomass-based fuels, and hydrogen fuel are excluded from this scope. This guideline specifically applies to non-emergency electricity generation equipment that is located at or near the facility of electricity consumption, and is used either to provide complete or partial onsite power to the facility.

**When determining compliance with the lb/MW-hr requirement, units with heat recovery may include one megawatt-hour (MW-hr) for each 3.4 million Btu of useful heat recovered in addition to each MW-hr of net electricity produced.

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved-in-practice (AIP) or contained in a state implementation plan (SIP) must be cost-effective as well as technologically feasible. Economic analysis to demonstrate cost-effectiveness is required for all determinations that are not AIP or contained in an EPA-approved SIP.

This is a Summary Page for this Class of Source

Appendix B
BACT Guideline 3.3.19 (9/12/22)

San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 3.3.19*

Last Update: 9/12/2022

Fossil** Fuel Fired IC Engines Used for Power (Electricity) Generation

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	0.10 lb-VOC/MW-hr***		
SOx	Compliance with District Rule 4702 SOx Emission Control Requirements		
PM10	1.For Compression Ignited Engines: 0.01 g-PM10/bhp-hr 2.For Spark Ignited Engines: 0.06 g/bhp-hr (Total PM10)****		
NOx	0.070 lb-NOx/MW-hr***		
CO	0.20 lb-CO/MW-hr***		

** For the purposes of this determination, fossil fuels includes diesel, gasoline, natural gas, propane, kerosene, and similar hydrocarbon compounds derived from petroleum oil or natural gas. Fossil fuels also include similar synthetic fuels such as biodiesel and/or any fuel containing one or more fossil fuels.

*** When determining compliance with the lb/MW-hr requirement, IC engines with heat recovery may include one megawatt-hour (MW-hr) for each 3.4 million Btu's of useful heat recovered (MWth¬-hr) in addition to each MW-hr of net electricity produced (MWe¬¬-hr)

****The total PM10 emission limit is based on EPA Method 5 (front half and back half) testing, which typically yields results as much as four times higher than when using the ISO 8178 Test Method. The ISO 8178 Test Method only reports filterable (i.e. front half) emissions.

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a State Implementation Plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

***This is a Summary Page for this Class of Source**

Appendix B
CARB Distributed Generation Certified Equipment

CARB DG Program Certified Equipment List (as of 6/11/2025)			
Company Name	**Technology**	**Fuel**	**Executive Order**
Capstone Green Energy Corporation	65 kW, C65-ICHP Microturbine	Natural Gas	DG-018
Capstone Green Energy Corporation	200 kW, C200S Natural Gas CARB Microturbine	Natural Gas	DG-049
Bloom Energy	300 kW, ES-5 Fuel Cell	Landfill Gas	DG-051
Bloom Energy	300 kW, ES-5 Fuel Cell	Digester Gas	DG-050
Bloom Energy	300 kW, ES-5 Fuel Cell	Natural Gas	DG-044
Bloom Energy	325kW, ES-6.5 Fuel Cell	Natural Gas	DG-058
FlexEnergy Energy Systems	330 kW, Recuperated GT333SM Microturbine	Natural Gas	DG-045
Enchanted Rock LLC	400 kW, NGE21.9L-CA Generator	Natural Gas	DG-052
HyAxiom, Inc.	460 kW, PureCell® System Model 400 Fuel Cell	Natural Gas	DG-047
Capstone Green Energy Corporation	600 kW, C600S Natural Gas CARB Microturbine	Natural Gas	DG-053
Capstone Green Energy Corporation	800 kW, C800S Natural Gas CARB Microturbine	Natural Gas	DG-054
Capstone Green Energy Corporation	1000 kW, C1000S Natural Gas CARB Microturbine	Natural Gas	DG-055
FuelCell Energy, Inc.	1.4 MW, SureSource 1500 Fuel Cell	Natural Gas	DG-034
FuelCell Energy, Inc.	1400 kW, SureSource 1500 Fuel Cell	Digester Gas	DG-056
FuelCell Energy, Inc.	2.8 MW, SureSource3000 Fuel Cell	Natural Gas	DG-033
FuelCell Energy, Inc.	2800 kW, SureSource 3000 Fuel Cell	Digester Gas	DG-057