SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

DRAFT STAFF REPORT

Proposed Amendments to Rule 4702 (Internal Combustion Engines)

July 20, 2021

Prepared by: Madison Perkins, Air Quality Specialist
Ramon Norman, Senior Air Quality Engineer
Kevin M. Wing, Senior Air Quality Specialist

Reviewed By: Jessica Coria, Planning Manager
Nick Peirce, Permit Services Manager
Jason Lawler, Air Quality Compliance Manager
Jonathan Klassen, Director of Air Quality Science and Planning
Brian Clements, Director of Permit Services
Morgan Lambert, Deputy Air Pollution Control Officer
Sheraz Gill, Deputy Air Pollution Control Officer

San Joaquin Valley UNIFIED AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

Table of Contents

I. SUMMARY

The San Joaquin Valley Unified Air Pollution Control District (District) is committed to protecting public health for all residents in the San Joaquin Valley (Valley) through efforts to meet health-based state and federal ambient air quality standards with efficient, effective, and entrepreneurial air quality management strategies. One such strategy includes a commitment in the District's *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* (*2018 PM2.5 Plan*) to amend District Rule 4702 (Internal Combustion Engines) to reduce emissions of oxides of nitrogen (NOx) from this source category.

Proposed amendments to the rule include more stringent NOx and volatile organic compounds (VOC) emission limits for various types of engines, as well as establishing particulate matter (PM) control requirements. In order to provide better service to stakeholders and affected industry, the proposed amendments will also simplify and clarify existing rule language and standards. Proposed amendments are applicable to agricultural and non-agriculture operated internal combustion engines.

A. Reasons for Rule Development and Implementation

The U.S. Environmental Protection Agency (EPA) periodically reviews and establishes health-based air quality standards for ozone, particulates, and other pollutants. Although the Valley's air quality is steadily improving, it experiences unique and significant difficulties in achieving these increasingly stringent standards. The Valley's challenges in meeting National Ambient Air Quality Standards (NAAQS) are unmatched in the nation due to the region's unique geography, meteorology, and topography. In response to the latest federal mandates, and to improve quality of life for Valley residents, the District has developed and implemented multiple generations of rules on various sources of air pollution. Valley businesses are currently subject to the most stringent air quality regulations in the nation. Since 1992, the District has adopted nearly 650 rules to implement an aggressive on-going control strategy to reduce emissions, resulting in air quality benefits throughout the Valley. Similarly, the California Air Resources Board (CARB) has adopted stringent regulations for mobile sources. Together, these efforts represent the nation's toughest air pollution emissions controls and have greatly contributed to reduced ozone and particulate matter concentrations in the Valley.

Due to the significant investments made by Valley businesses and residents, and stringent regulatory programs established by the District and CARB, air quality over the past few years has continued to set new clean air records. Despite the significant progress under these regulations, greatly aided by the efforts of Valley businesses and residents, many air quality challenges remain, including attainment of the federal air quality standards for fine particles less than 2.5 micrometers in diameter (PM2.5), as addressed in the District's recently adopted *2018 PM2.5 Plan*.

The *2018 PM2.5 Plan* contains a comprehensive set of local and state measures that build on existing measures to further reduce air pollution from stationary, area, and mobile sources throughout the Valley. Attaining the multiple federal PM2.5 standards by the mandated deadlines is not possible without significant additional reductions in directly emitted PM2.5 and key PM2.5 precursors like NOx. The attainment strategy includes a suite of innovative regulatory and incentive-based measures, supported by robust public education and outreach efforts to reduce emissions of PM2.5 in the Valley. One of the measures included in the plan is to amend District Rule 4702 (Internal Combustion Engines) as a necessary cost-effective measure for further reducing NOx emissions, and bringing the Valley into attainment with federal PM2.5 standards within the mandated federal deadlines.

Based on a comprehensive technical analysis, in-depth review of local, state, and federal regulations, and a robust public process, District staff are proposing several modifications to Rule 4702 to reduce emissions from stationary internal combustion engines operating in the San Joaquin Valley. This rule amendment project is proposed to satisfy the commitments in the District's *2018 PM2.5 Plan*, and to ensure that Rule 4702 requires the implementation of state and federal standards of Reasonably Available Control Technology (RACT), Best Available Retrofit Control Technology (BARCT), and Most Stringent Measures (MSM).

B. Health Benefits of Implementing Plan Measures

Exposure to PM2.5 and ozone has been linked to a variety of health issues, including aggravated asthma, increased respiratory symptoms (irritation of the airways, coughing, difficulty breathing), decreased lung function in children, development of chronic bronchitis, irregular heartbeat, non-fatal heart attacks, increased respiratory and cardiovascular hospitalizations, lung cancer, and premature death. PM2.5 is a major health risk because it can be inhaled more deeply into the gas exchange tissues of the lungs, where it can be absorbed into the bloodstream and carried to other parts of the body. CARB explains that even short-term exposure of less than 24 hours can cause premature mortality, increased hospital admissions for heart or lung causes, acute and chronic bronchitis, asthma attacks, emergency room visits, respiratory symptoms, and restricted activity days. Children, older adults, and individuals with heart or lung diseases are the most likely to be affected by PM2.5 and ozone.

As NOx emissions are a key precursor in the formation of both ozone and PM2.5, continuing to assess the feasibility of achieving additional NOx reductions across the Valley is critical to improving PM2.5 and ozone throughout the region. PM2.5 emissions are characterized by a unique combination of direct and indirectly formed constituents. NOx emissions are a precursor to the formation of ammonium nitrate, which is a large portion of total PM2.5 during the Valley's peak winter season. NOx is also a precursor to ozone, which is formed when heat and sunlight interact with NOx and VOC's. Harmful ozone is predominantly formed at the surface during the summer season in the

Valley. The District has long worked to reduce NOx emissions as the primary precursor for the formation of ozone and PM2.5 in the Valley.

To address federal health-based standards for ozone and PM2.5 and improve public health, the District develops attainment plans and implements control measures to lower direct and precursor emissions throughout the San Joaquin Valley. The proposed amendments will achieve additional reductions in NOx emissions as requirements are implemented by affected sources, and new technologies are installed. New regulatory and incentive-based measures proposed by both the District and CARB, combined with existing measures achieving new emissions reductions, are necessary to achieve the emissions reductions required to attain the health-based federal standards as expeditiously as practicable, and will improve public health as emissions reductions are realized.

C. Description of Project

The Governing Board first adopted Rule 4702 in August of 2003, and last amended this rule in 2013. Rule 4702 applies to internal combustion (IC) engines rated at 25 brake horsepower (bhp) or greater. Facilities with units subject to this control measure represent a wide range of industries, including but not limited to oil and gas production, petroleum refineries, landfills, wastewater treatment plants, water districts, schools, and electrical power generation facilities. In August 2015, EPA found that this rule implements RACT, as discussed in EPA's Technical Support Document (TSD) for the *Proposed Rulemaking and District Final Rule for the California SIP* for Rule 4702.[1] Furthermore, in February 2020, EPA found that this rule implements Best Available Control Measures (BACM) and MSM, as further discussed in EPA's TSD for the approval of the *San Joaquin Valley PM2.5 Plan for the 2006 PM2.5 NAAQS*.[2]

The proposed amendments to Rule 4702, which satisfy commitments in the *2018 PM2.5 Plan*, include lowering NOx and VOC emissions for spark-ignited IC engines, clarifying definitions, and updating test methods. Through the implementation of the proposed Rule 4702 amendments, from this source category an estimated 43% reduction of NOx emissions will be achieved by 2024, as well as an estimated 72% reduction of VOC emissions. An estimated total 49% reduction of NOx emissions will occur by 2030, as well as an estimated total 75% reduction of VOC emissions. An estimated 0.62 tons per day (tpd) reduction of NOx emissions will be achieved by 2024, with an estimated total 0.70 tpd reduction of NOx emissions by 2030. In addition to these NOx emission reductions, there will be an estimated 0.31 tpd of VOC emission reductions achieved by 2024, with an estimated total 0.32 tpd of VOC emissions

[1] Technical Support Document for EPA's Notice of Proposed Rulemaking and Direct Final Rule for the California State Implementation Plan San Joaquin Valley Unified Air Pollution Control District Rule 4702, Internal Combustion Engines. (November 2015).

[2] U.S. Environmental Protection Agency: Technical Support Document for EPA's Technical Support Document "EPA Evaluation of BACM/MSM" for the San Joaquin Valley PM2.5 Plan for the 2006 PM2.5 NAAQA. February 2020.

reduced by 2030. Emission reductions achieved through the proposed requirements of this rule amendment will contribute towards the Valley's attainment of the health-based federal PM2.5 and ozone standards, and satisfy the commitments in the *2018 PM2.5 Plan.*

Table 1 - Estimated Emission Reductions for Compliance Years

Pollutant	2024 Emission Reductions (tpd)	2030 Emission Reductions (tpd)
NOx	0.62	0.70
VOC	0.31	0.32

Table 2 - Estimated Emission Reductions 2024-2030

Pollutant	2024*	2025*	2026*	2028*	2029*	2030*
NOx	0.62	0.61	0.60	0.59	0.59	0.70
VOC	0.31	0.31	0.30	0.29	0.29	0.32

*Emission Reductions in tons per day

D. Rule Development Process

As part of the rule development process, District staff conducted public workshops to present and discuss proposed amendments to Rule 4702. Information about public meetings was broadly shared to members of the public, source operators, consultants, vendors and manufacturers of control technologies, trade associations, and AB 617 community steering committee members. District staff conducted a public Scoping Meeting on December 5, 2019 and public workshops in September 2020, November 2020, and June 2021. Updates were also presented throughout the rulemaking process at multiple public meetings of the Citizens Advisory Committee, Environmental Justice Advisory Group, and the District Governing Board.

At the public workshops, District staff presented the objectives of the proposed rulemaking project. A draft rule was published for public review on December 9, 2020, and an updated draft was published on June 28, 2021. Throughout the rule development process, District staff solicited information from affected source operators, consultants, vendors and manufacturers of control technologies, and trade associations on the technological feasibility and compliance cost information that would be useful in developing amendments to Rule 4702. The comments received from the public, affected sources, and interested parties during the public outreach and workshop process were incorporated into the draft rule as appropriate.

Pursuant to state law, the District is required to perform a socioeconomic impact analysis prior to adoption, amendment, or repeal of a rule that has significant air quality benefits or that will strengthen emission limitations. As part of the District's

socioeconomic analysis process, the District hired a socioeconomic consultant to prepare a socioeconomic impact report. The results of the socioeconomic analysis are included in this report (Appendix D).

The proposed rule amendments and draft staff report with associated appendices were published for 30-day public review and comment prior to the public hearing to consider the adoption of the proposed amendments to Rule 4702 by the District Governing Board. The public hearing is scheduled on August 19, 2021.

II. DISCUSSION

Internal Combustion (IC) engines operate by compressing and igniting a combustible mixture of fuel and oxygen, generally from ambient air, in the combustion chamber of the engine. An IC engine allows the energy released by ignition of the fuel mixture to be utilized to perform useful work, such as powering equipment. The main types of engines are spark-ignited engines and compression-ignited (or diesel) engines. Spark-ignited engines use a spark plug to ignite the air/fuel mixture, and may use a variety of volatile fuels, such as natural gas, propane, butane, liquefied petroleum gas, oil field gas, gasoline, digester gas, landfill gas, methanol, or ethanol. Compression-ignited engines rely on heating of the inducted air during the compression stroke to ignite injected fuel, usually diesel fuel. In addition to being classified as either compression-ignited or spark-ignited, IC engines can be further divided into two-stroke and four-stroke engines. Large spark-ignited engines are usually four-stroke, but some applications that require smaller lighter-weight engines use two-stroke spark-ignited engines. Most diesel engines are also four-stroke engines.

IC engines may operate as either “rich-burn” or “lean-burn” engines. Rich-burn IC engines operate with an air to fuel ratio that results in stoichiometric or very near stoichiometric combustion of the fuel, and have little excess oxygen in the exhaust. Lean-burn engines combust fuel with excess air and have higher concentrations of oxygen in the exhaust. Diesel compression-ignited IC engines are all lean-burn IC engines, while spark-ignited IC engines may be either rich-burn or lean-burn. The air needed for combustion of fuel in an IC engine may be provided through natural aspiration in which the combustion air is atmospheric pressure, or the IC engine may use a turbocharger to provide greater amounts of combustion air at higher pressure. Turbocharged IC engines have greater power output for the same size engine when compared to naturally aspirated IC engines.

Internal combustion engines are used for numerous activities, such as powering pumps, compressors, or electrical generators. Engines are used by a variety of private businesses and public agencies throughout the Valley. Examples of businesses and industries that use engines that could be affected by this project include schools and universities, agriculture, oil and gas production and pipelines, petroleum refining, manufacturing facilities, food processing, electrical power generation, landfills, waste

water treatment facilities, and water districts. Many of the permitted compression-ignited engines in the District are emergency standby engines that provide backup power when electric service is interrupted.

Stationary IC engines are found throughout the District and can be used in multiple capacities, each with particular considerations and constraints. It's due to these conditions that each engine type has been broken down into multiple categories, each individually evaluated to determine the most feasible emissions limits, as further discussed in the "Proposed Amendments" section of this report. Emissions limits are proposed depending on the type of the engine, with specific limits proposed for spark-ignited engines depending on the air to fuel mixture of the engine.

Rule 4702 has historically established limits for engines used at agricultural operations (AO engines) that are separate from the requirements for engines used at other types of operations (Non-AO engines). Due to the age, location and operational requirements of engines used at agricultural operations, there are a number of considerations that must be taken into account when determining their potential emissions limits and technological feasibility. AO spark-ignited engines are generally located in rural and remote areas. With ongoing farm labor shortages, it is difficult and often economically infeasible for agricultural operators to obtain and retain skilled labor to provide the frequent and complex maintenance required for retrofitted or new engines equipped with advanced emission controls. Lower emissions limits may also lead to increased maintenance requirements and monitoring efforts. Due to these factors, AO engines must be considered in their own category, and were given extensive review when determining the proposed limits and compliance dates. However, even with these challenges, the District has determined that there are lower cost technologies available now that are able to reduce the emissions from these engines with a lower maintenance cost.

A. Emissions Control Technologies

Over the years, the District has adopted numerous generations of rules and rule amendments for engine units greater than or equal to 50 bhp that have significantly reduced NOx and VOC emissions from this source category. As part of these regulatory efforts, hundreds of engines in the Valley have been equipped with the best available NOx and VOC control technologies. Even though significant effort has already been made to reduce emissions from this source category, the possibility of further reducing emissions from units greater than 50 bhp is evaluated in the following discussion.

The two primary methods of controlling NOx emissions from engines is to retrofit them with either a selective catalytic reduction (SCR) system or non-selective catalytic reduction (NSCR) system to reduce NOx formation. NSCR systems are also effective at reducing VOCs, while SCR systems require an additional oxidization catalyst for VOC control. These controls treat the pollutants formed before they are emitted into the

atmosphere. As mentioned above, the District also considered the feasibility of reducing emissions through converting engines to an electric motor.

Selective Catalytic Reduction Systems

A SCR system is a way to reduce NOx from lean-burn engines. NOx is reduced to molecular nitrogen by adding an exhaust gas treatment system consisting of a catalyst module and a reagent injection system to add the reagent to the engine exhaust. SCR systems must operate at a certain temperature range to effectively reduce NOx in the exhaust gas by injecting either ammonia stored in aqueous or anhydrous form and generated on demand or released from urea into the post-combustion zone of the engine. SCR systems have significant initial capital cost. The installed cost of an SCR system for a lean-burn IC engine is estimated to be over $120,000 to $300,000 depending on the size of the unit. Additionally, the annual operation and maintenance cost for a single SCR system is between $16,000 and $60,000, depending on the size of the unit. Due to these factors, SCR systems are not a cost effective control system for many lean-burn engines at this time, such as the typical size range IC engines used in agricultural operations.

Non-Selective Catalytic Reduction Systems

NSCR systems, also known as 3-way catalysts, work as a way to reduce NOx from rich-burn engines. The catalyst oxidizes exhaust gas pollutants - both hydrocarbons and carbon monoxide - and reduce NOx into water, molecular nitrogen and carbon dioxide. The NSCR systems have nominal capital costs. The installation cost of a NSCR is $6,000 to $11,000 depending on the size of the unit. In addition to installation costs, there are additional operation and maintenance costs between $700 and $3,000. Due to these factors, NSCR is the most cost-effective control system for use on rich-burn engines at this time.

Electrification and Solar

To ensure that all potential emission reduction opportunities are evaluated, the District performed a review of electric and solar powered motors. Electric and solar powered motors are commercially available and generally cost about the same as similarly sized spark-ignited units. Economic impacts would also be influenced by the increasing cost of electricity in California as electricity rates rose 48% from 2010 to 2020 (9.8 cents/kW-hr to 14.55 cents/kW-hr) based on annual data for 2020 provided by the U.S. Energy Information Administration.[3] Additionally, for solar powered motors, there is an inconsistency to how much electricity can be produced at any location, based on the availability of direct sunlight and the amount of space a facility is able to designate towards solar panels. The specific consideration of crop land would come into play for

[3] U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report, U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report, U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms.

engines that operate as a part of an agricultural facility, as many farmers would have difficulty designating space for the solar equipment. In addition, there is a lack of existing electric infrastructure in many areas of the Valley, including some farms and oil fields. There would be considerable costs associated with the line extension and other technology necessary to gain access to electricity or solar power in these remote locations.

For facilities that lack the infrastructure needed to connect to the electrical power grid, there are additional technologies that would be necessary in order to operate an electric or solar powered pump motor. These facilities could potentially incur much larger costs because of the need to install excess capacity, and water storage or batteries to store the electrical energy generated when the solar system was not generating electricity. The installation and maintenance of these systems could raise the costs of an electric engine/solar-system exponentially, with estimated cost-effectiveness values of $150,000 - $260,000, or higher, per ton of emissions reduced for each unit installed, depending on the size of the engine.

Due to the technological and economic challenges, it is not feasible for the District to set a standard requiring engines to be replaced with electric motors or solar-powered motors at this time. To promote the use of electric motors where feasible, the District currently offers an incentive funding grant covering up to 85% of the cost to install an electric motor to replace an existing IC engine.

III. CURRENT RULE 4702 AND PROPOSED AMENDMENTS

A. Current Rule 4702

Rule 4702 (Internal Combustion Engines Phase 2) was adopted in August 2003 and was last amended in November 2013. The purpose of Rule 4702 is to limit NOx, CO, and VOC emissions from stationary engines. The rule applies to any stationary engines with a rated brake horsepower (bhp) greater than 25. The rule requirements are organized into two engine categories: those used in agricultural operations and those used in non-agricultural operations. The existing NOx concentration limits in Rule 4702 range from 11 parts per million by volume (ppmv) to 75 ppmv corrected to 15% O_2, depending on engine category. The VOC and CO concentration limits range from 250 to 750 ppmv (depending on engine category) and 2,000 ppmv, each corrected to 15% O_2, respectively.

B. Proposed Amendments to Rule 4702

In an effort to simplify rule language and clarify existing requirements, expired language would be removed, and some rule requirements would be reorganized to other sections of the rule. The following paragraphs detail the proposed modifications to rule

language. For further information on how the proposed limits were determined see the Incremental Cost Analysis in Appendix C. See Proposed Rule 4702 for exact language.

Section 1.0 Purpose
The Purpose Section would be updated to include Particulate Matter. Particulate Matter Emission Control Requirements were added to the rule as Section 5.8, and as such the purpose of the rule was amended to encompass the new requirements.

Section 2.0 Applicability
No changes are proposed for Section 2.0 at this time.

Section 3.0 Definitions
The Definitions Section would be updated by removing expired language, and some existing definitions would be updated for clarity.

Section 4.0 Exemptions
No changes are proposed for Section 4.0 at this time.

Section 5.0 Requirements

Section 5.1 Stationary Engines Rated at Least 25 Brake Horsepower, Up To, and Including 50 Brake Horsepower and Used in Non-Agricultural Operations
Proposed amendments would update this section to remove outdated requirements.

Section 5.2 Engines Rated Greater than 50 Brake Horsepower

Section 5.2.2 Non-AO Spark-Ignited Engine Emission Concentration Limits
Updates in this section would specify the emission concentration limits for non-AO spark-ignited engines greater than 50 bhp, effective pursuant to the compliance schedule specified in Section 7.5. The proposed Table 3 of the rule would create an 11 ppmv NOx limit for categories: Rich-burn Waste Gas Fueled, Cyclic Loaded, Not Listed Above and Limited Use. For categories of Lean-Burn Gas Compression, and Lean-Burn Waste Gas, staff proposes a NOx limit of 40 ppmv. Additionally, the category of Lean-Burn Two-Stroke, Gaseous Fueled, >50 bhp and <100 bhp would be removed, as there are no engines in this category. For VOC limits, District staff proposes a limit of 90 ppmv for all categories. The current CO limit of 2,000 ppmv would be maintained for all categories. Keeping the existing CO emission limits in the current rule would allow engine manufacturers and emission control system manufacturers to have the much-needed flexibility to be able to achieve more stringent NOx emissions limits under varying field operating conditions and applications, without having to overly consider CO emissions levels. Emissions limits were proposed based on the results of a comprehensive review of the existing engine inventory in the Valley, available control technology (including what is currently required for BACT),requirements in other air

districts, and a cost-effectiveness analysis of requiring further controls for existing engines (as further discussed in Appendix C).

Language would be added in Section 5.2.2.2 explaining that after December 31, 2023, the option of paying an annual fee in lieu of complying with the NOx emission limits would sunset, and no longer be applicable within Rule 4702. After 2023, all Non-AO Spark-Ignited engines must meet the limits of the rule's Table 3 and the option detailed in Section 5.6 would no longer be available.

Table 3 - Proposed Limits for Non-AO Spark Ignited Engines, as included in Table 3 of Proposed Rule 4702

Table 3 Emission Limits for a Spark-Ignited Internal Combustion Engine Rated at >50 bhp Used Exclusively in Non-AO (All ppmv limits are corrected to 15% oxygen on a dry basis). Emission Limits are effective according to the compliance schedule specified in Section 7.5, Table 8.			
Engine Type	NOx Limit (ppmv)	CO Limit (ppmv)	VOC Limit (ppmv)
1. Rich-Burn			
a. Waste Gas Fueled (≥ 50% total monthly heat input from waste gas based on hhv)	11	2000	90
b. Cyclic Loaded, Field Gas Fueled	11	2000	90
c. Limited Use	11	2000	90
d. Rich-Burn Engine, not listed above	11	2000	90
2. Lean-Burn Engines			
a. Limited Use	11	2000	90
b Lean-Burn Engine used for gas compression	40	2000	90
c. Waste Gas Fueled (≥ 50% total monthly heat input from waste gas based on hhv)	40	2000	90
d. Lean-Burn Engine, not listed above	11	2000	90

A description would be added to Waste Gas Fueled engines to determine what percent of fuel intake must be waste gas in order to qualify for the category. Additionally, language would be added to clarify the compliance schedule, and control/monitoring requirements.

Section 5.2.3 AO Spark-Ignited Engine Emission Limits
Updates in this section would clarify compliance dates and update emission limits/standards. Table 5 of the rule would be added in connection with new language that specifies the current AO Spark-Ignited Emissions limits would continue to be in effect until the limits of Table 5 take effect. Within the rules Table 5, District staff

proposes a 0.15 g/bhp-hr or 11 ppmv NOx limit for rich-burn engines, a 0.6 g/bhp-hr or 43 ppmv NOx limit for lean-burn engines and a 90 ppmv VOC limit for all engines in this category, effective pursuant to the compliance schedule specified in Section 7.5.

The proposed limits for AO engines were established after extensive research into available control technologies and cost effectiveness analyses, in addition to extensive conversations with manufacturers and business owners as to the capability of engines used to power agricultural irrigation pumps. AO rich-burn engines are proposed at a NOx limit of 11 ppmv, as that has been determined to currently be the most technologically feasible and cost-effective limit. For AO lean-burn engines, the proposed limit of 0.6 g/bhp-hr or 43 ppmv was determined as the most stringent emissions limit feasible for this category, based on a comprehensive review of the lowest currently achievable emissions limits, and due to the technological and economic infeasibility of retrofitting these types of engines with SCR systems. On an engine-by-engine basis, all AO engines in the Valley would be able to meet the proposed limits using one or more of the following techniques: upgrading a NSCR system, converting from lean-burn to rich-burn and retrofitting with NSCR, replacing the engine, or refined tuning of the engine.

Table 4 - Proposed Limits for AO Spark-Ignited Engines, as included in Table 5 of Proposed Rule 4702

Table 5 Emission Limits/Standards for a Spark-Ignited Internal Combustion Engine >50 bhp Used Exclusively in AO (All ppmv limits are corrected to 15% oxygen on a dry basis). Emission Limits are effective according to the compliance schedule specified in Section 7.5, Table 9.			
Engine Type	NOx Limit	CO Limit	VOC Limit
1. Rich-Burn	0.15 g/bhp-hr or 11 ppmv	2000 ppmv	90 ppmv
2. Lean-Burn	0.6 g/bhp-hr or 43 ppmv	2000 ppmv	90 ppmv

Section 5.2.4 Certified Compression-Ignited Engines (AO and non-AO)
Within Section 5.2.4, the table that details the 'Emission Standards and Compliance Schedule for Compression-Ignited Internal Combustion Engine' would be amended to remove the 'Greater than 500 bhp and greater than or equal to 1000 annual operating hours' category of non-certified compression-ignited engines. There are no engines in the District's inventory that fall under the 'Greater than 500 bhp and greater than or equal to 1000 annual operating hours' category, and current rule requirements would not permit the future installation of engines in the category. The current rule requires that all newly installed engines be the cleanest certified engine available at the time of installation, and as such no new non-certified compression-ignited engines can be installed.

The commitment in the *2018 PM2.5 Plan* was for the District to evaluate the amendment of limits for spark-ignited engines (both AO and non-AO). In support of expeditious attainment of the federal standards, District staff performed an analysis to

determine if it would be feasible to amend Compression-Ignited (CI) engines limits, including the possibility of requiring the replacement of Tier 3 and Tier 4-interim engines with Tier 4-final engines. The current requirements of Rule 4702 require that operators of CI engines install the cleanest certified engine at the time of installation. Additionally, the requirements in Rule 4702 also specify that, upon engine replacement, an operator must install the cleanest certified engine available. Due to the stringency of these requirements, and the potentially high cost-effectiveness of replacing an engine that was recently replaced due to the existing requirements in the rule, District staff are not proposing to amend limits for CI engines at this time. Emission limits for CI engines may be further evaluated as a part of future rule development efforts.

Section 5.6 Payment of Annual Fee In Lieu of Complying with a NOx Emission Limit
Language would be added in this section to detail the sunset of the emission fee compliance option by December 31, 2023 and to require that the last emissions fee must be paid by July 1, 2024.

Section 5.7 Sulfur Oxides (SOx) Emission Control Requirements
Language in this section would be updated to require agricultural engines to comply with the current SOx control requirements in place for Non-AO engines. Due to this new requirement, a provision has been added to this section whereby agricultural engines fueled with digester gas which are installed before December 31, 2021, must limit their fuel sulfur content to no more than 250 ppmv. All other agricultural engine types must either limit their gaseous fuel sulfur content to no more than 5 grams of total sulfur per 100 standard cubic feet, or install and properly operate an emission control system that reduces SO2 emissions by at least 95% by weight as determined by the test method specified in Section 6.4.6. It should be noted that the majority of agricultural digester engines comply with the requirements of Section 5.7.6 already due to BACT requirements in place at the time of unit installation, however, this SOx limit was established based on a cost-effectiveness analysis of requiring a retrofit control for the few existing agricultural digester engines that do not currently have an add-on scrubber for SOx.

Section 5.8 Particulate Matter (PM) Emission Control Requirements
This section would be added to the rule to establish particulate matter requirements for IC engines operated in the Valley. The PM control requirements for spark-ignited engines would be based on the SOx requirements of Section 5.7, as PM emissions from spark-ignited engines are primarily due to SOx in the fuel source. Compression-ignited engines would continue to be required to comply with the applicable CARB/EPA Tier certification standard at the time of installation, per Table 6 in the Rule. These requirements would go into effect based on the compliance schedule specified in Sections 5.2.4 and 7.0 of the Rule.

Section 5.9 Monitoring Requirements: Non-AO Spark-Ignited Engines and Engines in an AECP
Language would be added in this section to update the types of emissions required to

be measured using a portable analyzer to specifically include CO and oxygen concentrations, in addition to NOx.

Section 5.10 Monitoring Requirements: All Other Engines
Language would be added in this section to indicate the types of emissions required to be measured using a portable analyzer to include CO and oxygen. Also, additional language would be added to clarify that any engine in this category that has been retrofitted with a NOx exhaust control shall take NOx, CO, and Oxygen readings at least once every 24 months. Language would be added to outline the timeline in which spark-ignited and compression-ignited engines would have to comply with Section 5.10.5, as well as which engines would be exempt.

Section 5.11 SOx Emissions Monitoring Requirements
The language of this section would be amended in order to include AO engines as being subject to the requirements, which had previously only applied to non-AO engines.

Section 6.0 Administrative Requirements
Proposed updates would amend this section to remove outdated requirements. Additionally, table references would be added to clarify engine requirements.

Section 6.1 Emission Control Plan
Proposed amendments update which engines are required to submit an emissions control plan. Engines that fall under the categories of spark-ignited non-AO 'Rich-Burn Engine, not listed above' or 'Lean-Burn engine not listed above' in Table 3 of the rule would not be subject to filing an emission control plan, as they are already required to meet a limit of 11 ppmv NOx. All other categories are required to submit an emission control plan.

Section 6.3 Compliance Testing
Draft amendments clarify which engines would be required to perform compliance testing.

Section 6.5 Inspection and Monitoring (I&M) Plan
Proposed amendments clarify the applicable engines in Section 6.5.1. Additionally, language would be added to Section 6.5.7 to indicate the types of emissions required to be measured during each required portable emissions analyzer monitoring.

Section 7.0 Compliance Schedule
Draft amendments would update this section to update requirements, including reviewing and updating compliance schedules, renumbering Sections as appropriate, and removing language no longer applicable.

Section 7.3 AO Compression-Ignited Engine
Language would be added to this section to indicate that these engines would be subject to the SOx and PM2.5 control requirements in Section 5.7 and 5.8.

Section 7.5 AO and Non-AO Spark-Ignited Engine
Proposed amendments to this section would add language to reference control requirements for both AO and Non-AO Spark-Ignited engines, and associated compliance timelines. Table 8 of the rule is proposed to include the compliance schedule for non-AO spark-ignited engines. The proposed compliance schedule would take place over 2.5 years, with the emission control plan and the authority to construct (ATC), inspection, and monitoring plans due by August 1, 2022, and full compliance with emissions limits required by December 31, 2023.

Table 9 of the rule is proposed to include the compliance schedule for AO Spark-Ignited Internal Combustion Engines. Operators with rich-burn engines would have until December 31, 2023 to bring their engines into full compliance with proposed emissions limits. The emission control plan, the ATC, inspection, and monitoring plan would all be due by August 1, 2022. Operators with lean-burn engines would have to be in full compliance with new emissions limits by December 31, 2029, or 12 years after installation of the unit, whichever comes later. The District determined that later compliance dates were appropriate for AO lean-burn engines due to the high costs incurred by operators to replace these units, and to allow for the useful life of the equipment currently being used to be met.

Table 5 - Proposed Compliance Dates for Non-AO Spark-Ignited Engines, as included in Table 8 of Proposed Rule 4702

Table 8 Compliance Schedule for Non-AO Spark-Ignited Engines Subject to Table 3 Emission Limits, and SOx Control and Monitoring Requirements			
Engines to be in Compliance at a Stationary Source	Emission Control Plan	Authority to Construct and Inspection and Monitoring Plan	Full Compliance
Engines subject to Table 3 emission limits	August 1, 2022	August 1, 2022	December 31,2023

Table 6 - Proposed Compliance Dates for AO Spark-Ignited Engines, as included in Table 9 of Proposed Rule 4702

Table 9 Compliance Schedule for AO Spark-Ignited Internal Combustion Engine Subject to Table 5 Emission Limits			
Engines to be in Compliance at a Stationary Source	Emission Control Plan	Authority to Construct and Inspection and Monitoring Plan	Full Compliance
Rich-Burn AO Engines	August 1, 2022	August 1, 2022	December 31, 2023
Lean-Burn AO Engines	August 1, 2028	August 1, 2028	December 31, 2029 or 12 years after engine installation, whichever comes later

Section 7.6 Operator of Non-AO Spark-Ignited Engine Who Elects to Pay Fees
Language would be added to sunset the emissions fee compliance option after December 31, 2023; this option would no longer be applicable for Rule 4702. Section 7.6.1 from the existing rule, which detailed the Emission Control Plan requirements would also be removed.

Section 8.3 Alternative Emission Control Plan (AECP)
Language in this Section was amended to clarify when an AECP would need to be submitted. This Section would amend the date in which the AECP must be submitted to the APCO from 18 months to 12 months before compliance with the emission limits for consistency with other permitting requirements.

IV. ANALYSIS

A. Emission Reduction Analysis

In order to determine the emission reductions associated with the proposed changes, District staff queried the District Permit Services Database for all non-emergency engines, and then sorted the engines into categories based on the types of operations. The District identified 806 non-emergency, spark-ignited engines in total. Based on the permit limits of engines in the Districts inventory, 594 engines are estimated to exceed proposed rule limits and would be required to be replaced or modified in order to meet proposed emissions limits.

Estimated NOx reductions are based on the permit limits of all spark-ignited engines, and are used for cost-effectiveness purposes. However, for SIP purposes, a percentage reduction from each pollutant is calculated from three-year average data, and that percentage will be used to estimate the emission reductions from the proposed rule. For the years 2024 and 2030, the percentage reductions will be applied to the

emissions inventory data for spark-ignited engines from CEPAM Version 1.5, which was used as the inventory for the *2018 PM2.5 Plan*. These reductions are shown in Table 7 of this report.

Table 7 – SIP Emissions Reductions

	NOx	VOC
2024—2029 Reduction Percentage	43%	72%
2030 and Later Reduction Percentage	49%	75%
2024 Emissions Reductions (tons per day)	0.62	0.31
2030 Emissions Reductions (tons per day)	0.70	0.32

Details of the emissions reduction analysis is contained in Appendix B of this staff report.

B. Cost Effectiveness Analysis

The California Health and Safety Code (CH&SC) Section 40920.6(a) requires the District to conduct both an absolute cost effectiveness analysis and an incremental cost effectiveness analysis of available emission control options before adopting each BARCT rule. The purpose of conducting a cost effectiveness analysis is to evaluate the economic reasonableness of the pollution control measure or rule. The analysis also serves as a guideline in developing the control requirements of a rule. Cost effectiveness will depend on the current level of controls, unit size, fuel usage and final emission levels. Details of the cost effectiveness analysis is contained in Appendix C to this report.

C. Socioeconomic Analysis

State law requires the District to analyze the socioeconomic impacts of any proposed rule or rule amendment that significantly affects air quality or strengthens an emission limitation. The socioeconomic analysis has been used to further refine the rule amendments. The final socioeconomic report is attached to this staff report as Appendix D.

D. Environmental Impact Analysis

The District is proposing to amend existing District Rule 4702. The purpose of this rule amendment project includes lowering the NOx and VOC emission limits for specific classes and categories of IC engines, in order to meet commitments made to the *2018 PM2.5 Plan*.

There are no other actions or rule requirements associated with this project. Based on the District's review, substantial evidence supports the District's conclusion that the amendments will not cause either a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment, and as such is not

a “project” as that term is defined under the California Environmental Quality Act (CEQA) Guidelines § 15378. In addition, substantial evidence supports the District’s conclusion that, if one assumes the amendment is a “project” under CEQA in spite of our conclusion to the contrary, it will not have any significant adverse effects on the environment.

In addition, the amendments to District Rule 4702 is an action taken by a regulatory agency, the San Joaquin Valley Air District, as authorized by state law to assure the maintenance, restoration, enhancement, or protection of air quality in the San Joaquin Valley where the regulatory process involves procedures for protection of air quality.

California Environmental Quality Act (CEQA) Guidelines §15308 (Actions by Regulatory Agencies for Protection of the Environment), provides a categorical exemption for “actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment. Construction activities and relaxation of standards allowing environmental degradation are not included in this exemption.” No construction activities or relaxation of standards are included in this project. Therefore, the rule amendment project is exempt from CEQA.

Finally, according to Section 15061 (b)(3) of the CEQA Guidelines, a project is exempt from CEQA if, “(t)he activity is covered by the common sense exemption that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.” As such, for this additional reason, the District finds that the rule amendment project is exempt from CEQA.

E. Rule Consistency Analysis

Pursuant to CH&SC §40727.2, prior to adopting, amending, or repealing a rule or regulation, the District is required to perform a written analysis that identifies and compares the air pollution control elements of the rule or regulation with corresponding elements of existing or proposed District and EPA rules, regulations, and guidelines that apply to the same source category. District staff has concluded that the proposed rules are not in conflict with nor inconsistent with other District rules, nor are the proposed rules in conflict with nor inconsistent with federal policy, rule, or regulations governing the same source category. The analysis is discussed further in Appendix E of this staff report.

F. Reasonably Available Control Technology (RACT) and Best Available Retrofit Control Technology (BARCT) Analyses

Sections 182(b)(2) and 182(f) of the federal Clean Air Act require ozone nonattainment areas to implement RACT for sources that are subject to Control Techniques Guidelines (CTG) documents issued by EPA and for "major sources" of VOCs and NOx, which are ozone precursors. RACT can be defined as devices, systems, process modifications, or other apparatus or techniques that are reasonably available, taking into account the necessity of imposing such controls in order to attain and maintain a national ambient air quality standard (NAAQS); the social, environmental, and economic impact of such controls; and alternative means of providing for attainment and maintenance of such a standard. These control techniques, which are defined in EPA guidelines for limiting emissions from existing sources in nonattainment areas, are adopted and implemented for nonattainment areas by state analysis.

In September of 2017, the California State Legislature and Governor passed Assembly Bill 617 (AB 617),[4] Non-vehicular Air Pollution: Criteria Air Pollutants and Toxic Air Contaminants. One requirement of AB 617 is for air districts located in non-attainment areas to perform a Best Available Retrofit Control Technology (BARCT) analysis of their existing rules and regulations, and if applicable, propose an expedited schedule for revising rules that are found to not meet BARCT requirements. Most existing stationary sources in non-attainment areas such as the San Joaquin Valley have been subject to Best Available Retrofit Control Technology (BARCT) requirements since the 1980s. California Health and Safety Code (CH&SC) Section 40406 defines BARCT as follows:

"Best Available Retrofit Control Technology (BARCT) is an air emission limit that applies to existing sources and is the maximum degree of reduction achievable, taking into account environmental, energy and economic impacts by each class or category of source."

Appendix F of this report evaluates the requirements of Proposed Rule 4702 in light of the previous definitions of RACT and BARCT.

[4] AB 617, Garcia, C., Chapter 136, Statutes of 2017.