

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

FINAL DRAFT STAFF REPORT

**Proposed Amendments to Rule 4352 (Solid Fuel Fired Boilers, Steam Generators,
and Process Heaters)**

December 16, 2021

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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 PM_{2.5} Standards (2018 PM_{2.5} Plan)* to amend District Rule 4352 (Solid Fuel Fired Boilers) to reduce emissions of oxides of nitrogen (NO_x) from units fired on municipal solid waste (MSW).

In support of this commitment, District staff have conducted a comprehensive technical evaluation of controls capable of further reducing emissions from solid fuel fired boilers operating in the Valley, as well as an in-depth review of air district, state, and federal regulations for this source category, and a robust public process. Proposed amendments to the rule include more stringent NO_x for units fired on MSW, biomass, and other fuels, as well as establishing particulate matter (PM) and oxides of sulfur (SO_x) control requirements. Full compliance with the proposed requirements would be required by 2024. The proposed amendments are applicable to all boilers, steam generators, and process heaters fired on solid fuel.

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 San Joaquin Valley's (Valley) air quality is steadily improving, the Valley experiences unique and significant difficulties in achieving these increasingly stringent standards. The Valley's challenges in meeting national ambient air quality standards 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 in the Valley, 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, the Valley's ozone and PM_{2.5} (particulate matter that is 2.5 microns or less in diameter) emissions are at historically low levels, and air quality over the past few years has continued to set new clean air records. Despite the significant progress under these regulations, greatly

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aided by the efforts of Valley businesses and residents, many air quality challenges remain, including attainment of the federal air quality standards for PM_{2.5} that are addressed in the District's *2018 PM_{2.5} Plan*.

The *2018 PM_{2.5} 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 PM_{2.5} standards by the mandated deadlines is not possible without significant additional reductions in directly emitted PM_{2.5} and key PM_{2.5} precursors like NO_x. 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 PM_{2.5} in the Valley. One of the measures included in the plan is to amend District Rule 4352 (Solid Fuel Fired Boilers, Steam Generators, and Process Heaters) as a necessary measure for further reducing NO_x and bringing the Valley into attainment with federal PM_{2.5} standards within the mandated federal deadlines. Solid-fuel fired boilers operating in the Valley account for 1.7% of the total NO_x emissions inventory in the region, and contribute 12.1% of the NO_x emissions coming from stationary sources under the regulatory jurisdiction of the District.

In addition, through the District's implementation of AB 617 and the development of the South Central Fresno Community Emissions Reduction Program (CERP) and Stockton CERP, the District heard concerns from community residents and other community stakeholders regarding solid fuel fired boilers, steam generators, and process heater operations. These discussions with the community led to specific measures being included within the South Central Fresno CERP and Stockton CERP to evaluate Rule 4352 for potential further emissions reductions. The proposed amendments to Rule 4352 address these measures within the CERPs for South Central Fresno and Stockton.

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 4352 to reduce emissions from solid fuel fired boilers, steam generators, and process heaters operating in the San Joaquin Valley. The proposed Rule 4352 goes above and beyond federal standards of Reasonably Available Control Technology (RACT), Best Available Retrofit Control Technology (BARCT), and Most Stringent Measures (MSM). This rule amendment project is proposed to satisfy the commitments in the District's *2018 PM_{2.5} Plan*. In addition, the proposed amendments address commitments included in Board/CARB-approved South Central Fresno and Stockton Community Emissions Reduction Programs developed through the AB 617 community engagement process.

B. Health Benefits of Implementing Plan Measures

Exposure to PM_{2.5} 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 District Governing Board first adopted Rule 4352 on September 14, 1994, and the rule has subsequently been amended three times, with the last amendment occurring in 2011. Rule 4352 currently limits NOx and carbon monoxide (CO) emissions from any boiler, steam generator or process heater fired on solid fuel. Through recent federal review, Rule 4352 has been found to implement or exceed RACT levels of control.¹ In February 2020, EPA also found that this rule implements Best Available Control

¹ U.S. Environmental Protection Agency: Air Plan Approval; California; San Joaquin Valley Unified Air Pollution Control District; Reasonably Available Control Technology Demonstration. August 2018.

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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

During the development of the *2018 PM2.5 Plan*, the District evaluated all potential control technologies and all control technologies achieved in practice in other areas, as well as those included in other state implementation plans for this category. While the District rule currently meets or exceeds federal and state levels of emissions controls requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District committed in the *2018 PM2.5 Plan* to go beyond MSM and pursue the following potential opportunities to reduce NOx emissions for municipal waste-fired units, to the extent that additional controls are technologically and economically feasible, with commitments in the Plan to:

- Lower the existing NOx limit from 165 ppmv @ 12% CO₂ to 110 ppmv @ 12% CO₂ over 24-hr period and 90 ppmv @ 12% CO₂ over annual period
- Evaluate the feasibility of lower NOx emission levels

The proposed amendments to Rule 4352, which satisfy commitments in the *2018 PM2.5 Plan*, include lowering NOx emission limits for units fired on municipal solid waste and biomass, establishing PM10 and SOx emissions limits, clarifying definitions, and updating test methods. The proposed emissions limits and compliance timeframes have been established based on the results of a comprehensive technical evaluation, as further discussed later in this staff report and associated appendices. The limits proposed would require the installation of advanced combustion technology and permit modification. An evaluation was also conducted as to the feasibility of requiring alternative technologies.

Through the implementation of the proposed Rule 4352 amendments, from this source category an estimated 15% reduction of NOx, 28.2% reduction in PM2.5, 28% reduction of PM10, and a 51% reduction in SOx emissions will be achieved by 2024. The proposed rule amendments would result in estimated emissions reductions of 0.71 tpd NOx, 0.28 tpd PM2.5, 0.31 tpd PM10, and 0.27 tpd SOx being achieved by 2024. 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*.

D. Rule Development Process

District staff conducted a public Scoping Meeting in December 2020, and held public workshops in September 2021, and November 2021. Information about public meetings was shared with members of the public, affected sources, manufacturers of control technologies, and other interested stakeholders. Information about the regulatory amendments and workshops were also made available at meetings of the Citizens' Advisory Committee, Environmental Justice Advisory Group, and AB 617 Community

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.

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Steering Committees. Workshop announcements and public notices were provided in both English and Spanish, and interpretation services were made available upon request. At the public workshops, District staff presented the emission reduction and public health objectives of the proposed rulemaking project, and solicited feedback from the public on potential amendments. Initial draft amendments to Rule 4352 were published for public review on November 4, 2021, and an updated draft was published on November 16, 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 4352. The comments received from the public, affected sources, and interested parties during the public outreach and workshop process were incorporated into the rule or addressed in the staff report as appropriate.

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 4352 by the District Governing Board. A summary of significant comments and District responses is available in Appendix A of the final draft staff report.

In addition, 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).

II. DISCUSSION

A. Source Category

Boilers, steam generators, and process heaters are used in a broad range of industrial, commercial, and institutional settings. The units currently operating in the Valley are fired on biomass and municipal solid waste (MSW). Although the output from units subject to the rule could be utilized in many settings, all of the operators within the San Joaquin Valley use the units' output to generate electricity. There are currently two municipal solid waste-fired boilers permitted at one facility, and another ten biomass-fired boilers permitted at nine facilities within the District. However, five of the biomass-fired boilers are currently dormant and not operating. Emissions from these facilities are currently well controlled through the installation of control technologies required to meet the emissions limits currently contained in Rule 4352 and to comply with District permitting requirements.

B. Solid Fuel Fired Boilers in the Valley

Municipal Solid Waste

One facility in the Valley operates two municipal solid waste-fired units in the Valley. Each unit is equipped with a baghouse for PM10 control, a dry lime scrubber for SOx control, and a selective non-catalytic reduction system for NOx control. This facility has been in operation since 1989 and has an electricity generating capacity of 22.5 megawatts. The two MSW fired units are capable of processing 800 tons of refuse per day that would alternately have been sent to local landfills. This helps the county that the facility is operated in to meet state requirements and policy goals to reduce landfill waste.

Biomass

There are currently five biomass fired units at five facilities operating in the District with a combined rating of 158 megawatts (MW). There are also an additional five units at four facilities that are non-operational, but have active permits with the District. The non-operational units have a combined rating of 130 MW.

Historically, the presence of biomass facilities in the Valley has played a vital role in reducing NOx and PM emissions from open burning practices. However, the biomass industry has indicated that given current energy policy in California there is concern that biomass power facilities are in jeopardy. Many biomass plants in the Valley are nearing, or have come to, the end of their long-term contracts with utilities and find themselves in a position where the power that they provide is not the type of power that utilities are seeking (base load vs. intermittent) and that the prices being offered for new contracts are too low to support their operations.

C. Emissions Control Technologies

Over the years, the District has adopted numerous generations of rules and rule amendments for solid fuel fired boilers that have significantly reduced emissions from this source category. As part of these regulatory efforts, solid fuel fired units in the Valley have been equipped with the best available NOx, SOx and PM control technologies.

The two primary methods of controlling NOx emissions from solid-fuel fired boilers is either to change the combustion parameters (i.e., combustion modification) to reduce NOx formation, or to treat the NOx formed before it is emitted into the atmosphere with the use of a post-combustion control system. The primary method of controlling particulate matter emissions (PM, PM10, PM2.5) from solid-fuel fired boilers is to capture the particulate matter before the particulate matter is emitted into the atmosphere. The primary method of controlling SOx emissions from solid fuel fired boilers is injecting a sorbent into the combustion exhaust stream. The sorbent adsorbs sulfur oxides and through a chemical reaction forms particulate, which is then captured using an electrostatic precipitator or baghouse.

Currently, nearly all of the permitted solid-fuel fired boilers utilize a combination of selective non-catalytic reduction (SNCR) system and an electrostatic precipitator (ESP), or SNCR and a fabric filter baghouse for NOx and particulate matter control. Nearly all facilities currently control SOx with dry sorbent injection with sorbents such as limestone or sodium bicarbonate. A further description of the control technologies currently in-use by facilities operating in the Valley, including SNCR, ESP, Fabric Filter Baghouses, and Dry Sorbent Injection systems, is provided below, as well as further control technologies that District staff evaluated as a part of this rule development project.

NOx Emission Control Technologies

Selective Non-Catalytic Reduction

Selective non-catalytic reduction is a post-combustion control for NOx that involves injecting either ammonia or urea into the solid fuel-fired boiler at a location where the flue gas is between 1,400 and 2,000 °F. The injected ammonia reacts with NOx and O₂ in the flue gas to form molecular nitrogen and water. Nine of the currently permitted biomass-fired boilers utilize SNCR to reduce NOx emissions, and both of the permitted municipal solid-waste fired boilers are equipped with SNCR systems. Emission levels typically achieved through the installation of SNCR range from between 70 ppmv to 135 ppmv referenced at 3% O₂, depending on the type of boiler and fuel used in firing.

Selective Catalytic Reduction

Selective catalytic reduction (SCR) is a post-combustion control for NOx that involves the injection of anhydrous ammonia, aqueous ammonia, or urea solution into the

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exhaust gas to reduce NO_x emissions. Unlike SNCR, SCR uses a catalyst consisting of base metals (such as vanadium, molybdenum, or tungsten) to promote chemical reactions that reduce NO_x emissions into N₂ and water. The chemical reactions in an SCR system can occur at temperatures between 450 to 800 °F, much lower than the temperatures used to reduce NO_x in an SNCR system.

SCR systems for large boilers are quite costly, with costs varying widely depending on the scope of work required to install the control system at each facility. Generally, total capital costs to install an SCR system can range from \$5 million to \$15 million per solid-fuel fired boiler. Costs will be on the higher end of this range if the installation of the SCR system requires building modifications to accommodate the SCR systems' large footprint, or if the installation requires any modifications to the boiler tubes to accommodate the SCR unit. Additionally, SCR systems require adequate control of both PM₁₀ and SO_x to prevent plugging and fouling of the SCR catalyst materials, and may require the installation of an auxiliary burner to maintain the proper temperature of the exhaust gas for proper operation of the system.

Due to the cost and the complexity of retrofitting an existing unit with SCR, retrofits of existing solid-fuel fired boilers with an SCR is uncommon. Currently, one biomass boiler in the District operates with an SCR system to control NO_x emissions; however, this was a new installation rather than a retrofit of an existing unit. For biomass-fired boilers, SCR systems can achieve emission rates as low as 65 ppmv NO_x referenced to 3% O₂, while SCR systems can reduce emissions from municipal solid-waste fired boilers to levels as low as 50 ppmv NO_x referenced to 12% CO₂.

Gore De-NO_x Catalytic Filter Bags

Gore De-NO_x catalytic filter bags is a retrofit control technology that effectually converts an existing pulse-jet baghouse into a selective catalytic reduction control system. The Gore catalytic filter bags consist of an outer layer ePTFE membrane for particulate removal, plus an inner layer of felt catalyst that promotes the same chemical reactions as the catalyst in an SCR system. The retrofit of an existing baghouse consists of removing the existing baghouse bags and replacing them with the Gore De-NO_x filter bags. An additional ammonia injection is typically not required when retrofitting a solid-fuel fired boiler equipped with an SNCR system.

The capital cost to retrofit an existing solid-fuel fired boiler equipped with a pulse-jet baghouse and SNCR with the Gore De-NO_x filters is generally much lower than retrofitting the same boiler with SNCR technology. However, on-going maintenance costs are generally higher than SNCR technology, due to more frequent replacement of costly catalytic filter bags. Furthermore, several of the solid-fuel fired boilers in the Valley are equipped with an electrostatic precipitator or reverse-air baghouse for control of particulate matter emissions. In order to utilize Gore De-NO_x filter bags, it is necessary to convert the electrostatic precipitator/reverse-air baghouse into a pulse-jet baghouse. Furthermore, this control technology requires a minimum baghouse inlet

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temperature of at least 350 °F for the control technology to be effective, which some solid-fuel fired boilers do not achieve regularly. Finally, the boilers should be equipped with SO_x controls that reduce raw SO_x ppmv to less than 10 ppmv, in order to prevent fouling of the SCR catalyst materials. Larger SO_x ppmv inlet concentrations are possible, but can decrease the catalyst life and result in more frequent replacement of the costly filter bags.

Combustion Modification – Covanta LN

Covanta Low-NO_x (LN) is a proprietary retrofit control technology available for municipal solid-waste combustors that involves modifications to the combustion air system of a combustor, modifications to the combustion monitoring and control systems, and modifications to the existing SNCR system to reduce NO_x emissions. This system is not applicable to boilers fired on other solid-waste streams.

Typical municipal solid waste combustion units use a moving grate with two sources of combustion air. Primary air (or underfire air) is supplied through plenums located under the moving grate and is used to dry and combust the waste. The level of primary air is typically adjusted to minimize excess air used in the combustion of the waste on the grate, while still ensuring full combustion of the carbon-containing waste. Secondary air (or overfire air) is injected into the combustor through nozzles located in the furnace waterwalls immediately above the moving grate. The secondary air provides the majority of the excess air to the combustion process, and provides turbulent mixing to complete the combustion process.

With the Covanta LN combustion modifications, a portion of the secondary air is diverted to a new series of tertiary nozzles, installed in the combustor waterwalls at a higher elevation in the furnace. The total air flow requirement for the furnace is not changed. The tertiary air further completes the combustion process and yields uniform flue gas temperature and velocity profiles which improves the performance and reliability of downstream boiler equipment. The primary, secondary, and tertiary streams are then controlled with an updated control system to minimize NO_x and control combustion.

When used without an SNCR system, Covanta LN does not achieve lower NO_x emissions rates than those currently required by District Rule 4352. However, Covanta LN can be paired with SNCR to meet NO_x limits lower than the current District Rule 4352 limits. For facilities currently equipped with SNCR, the installation of Covanta LN requires relocation of the existing ammonia/urea injectors to enhance the reduction of NO_x emissions. Additionally, the SNCR control system must be integrated with the Covanta LN combustion controls, allowing the operator to maximize the NO_x reductions and minimize the ammonia slip. When paired with SNCR, Covanta LN can reduce NO_x emissions to levels as low as 90 ppmvd @ 12% CO₂.

PM Emission Control Technology

Fabric Filter Baghouse

Baghouse dust collectors are a type of fabric filter air material separator used to filter and collect particulates before the particulate matter can be emitted into the atmosphere. Typically, an induced draft blower is used to pass particulate-laden gas stream through the fabric filters. The gasses pass through the filters, while the particulate is collected on the filter surface. Over time, the dust begins to build up and form a filter cake on the filter surface, eventually reducing the effectiveness of the filters. Thus, the filters must be periodically cleaned using a pulse-jet, shaker, or reverse-air-style filter cleaning process.

In solid fuel-fired boilers, pulse-jet and reverse-air cleaning mechanisms are the most common. Pulse-jet cleaning uses sequential pulses of compressed air in the reverse direction of filtering. To blow dust off the bag surface and drop the caked dust into a hopper at the base of the baghouse. Reverse-air baghouses work in a similar method, however, with much longer pulses of air with lower air pressures. Pulse-jet baghouses require stronger bags due to the shorter pulses and higher air pressures. Both pulse-jet and reverse-air baghouses typically achieve high levels of particulate control, with PM10 control efficiencies greater than 99%. Seven of the currently permitted biomass units and both of the municipal solid waste combustors are equipped with baghouses for particulate control.

Ceramic Filters

With traditional fabric baghouse filters described above, particulate matter is captured on the surface of the filter; however, some particulate matter penetrates deeply into the filter walls and the body of the fabric filter and may be emitted during the baghouse's internal filter cleaning process. Ceramic filters, such as Tri-Mer ceramic filters, have special qualities on the filter surface that result in all of the particulate matter being captured on the face of the filter tubes. This allows for complete cleaning of the filter surface with no emissions of deeply embedded particulate matter into the atmosphere during the filter cleaning process. Therefore, ceramic filters can generally achieve lower particulate matter emission rates than fabric filters. However, ceramic filters are much more expensive than fabric filters. Additionally, ceramic filter systems like the Tri-Mer system would require the existing baghouse/ESP to be removed and new ceramic filter modules to be installed.

Electrostatic Precipitator

An electrostatic precipitator (ESP) is a particulate control device that uses an electrostatic force to capture dust and other particles. The ESP consists primarily of wires and collection plates, with a high voltage applied from an electrostatic field between the wires and the collecting plate, charging the air electrically and ionizing them in the process. When airborne particles pass between the collecting plates, the

particles become charged, which causes them to attach to the collecting plates. The particles that have been collected are then shaken loose from the collecting plates and collected below. Electrostatic precipitators are highly effective in controlling particulate matter, so long as the particulate matter can hold an electrical charge.

Three of the currently permitted biomass plants are equipped with electrostatic precipitators. These types of control technologies typically have PM10 control efficiencies greater than 99%.

SO_x Emission Control Technology

Wet Fluid Gas Desulfurization (FGD)

Wet Fluid Gas Desulfurization controls SO₂ emissions using wet solutions containing alkali reagents such as limestone, lime, sodium-based alkaline, or dual alkali-based sorbents. Typically, the unit consists of sorbent storage and preparation equipment, an absorber vessel, a mist eliminator, and waste collection and treatment vessels. Wet FGD normally removes SO₂ by 98%. Wastewater generated by wet FGD systems often contain metal hazardous air pollutants (HAPS), as well as other HAPS and must be disposed of properly. Additionally, wet FGD systems can result in acid mist (H₂SO₄) in the flue gas, which is corrosive. Thus, retrofits with this technology may require corrosive resistant liners on downstream control equipment. In some cases the cost of corrosion resistant liners is more costly than replacing the existing equipment with new corrosion resistant equipment.

Semi-Dry Absorbers (SDA)

Semi-Dry Absorbers operate by mixing a small amount of water with the sorbent. These are considered to be dry scrubber units, since the sorbent is dry when the reaction takes place. Lime is usually the sorbent, but hydrated lime may be used and can provide greater SO₂ removal. A slurry containing lime and recycled solids is atomized and sprayed into the absorber. The SO₂ is absorbed into the slurry and reacts to form calcium salts. The scrubbed gas then passes through a particulate control (baghouse or electro static precipitator) downstream, where additional reactions and SO₂ absorption may occur. Typical SO₂ removal for an SDA control system is 95%.

Dry Sorbent Injection

Dry Sorbent Injection is not a standalone system, like the other systems mentioned above. In dry sorbent injection, dry sorbent is injected into the combustion unit itself, or the ductwork immediately following the combustor. The sorbent adsorbs the SO₂ and forms particulate, which is then captured using an electro static precipitator or

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baghouse. This type of system achieves between 50% to 70% SO₂ control, depending on operating conditions and parameters.

III. PROPOSED AMENDMENTS TO RULE 4352

A. Existing Rule 4352

District Rule 4352 was last amended in May 2006. Rule 4352 currently applies to any boiler, steam generator, or process heater fired on solid fuel that has a potential to emit more than 10 tons per year (tpy) of NO_x or VOC. The rule places limits on NO_x and CO based on three types of solid fuels, as summarized in Table 1. Facilities that emit less than 10 tpy are exempt from complying with the emission limits, but are required to keep records.

Operators are subject to monitoring, source testing, and reporting requirements to demonstrate ongoing compliance with the rule emission limits.

Fuel Type	NO_x Limit	CO Limit
Municipal Solid Waste	165 ppmv corrected to 12% CO ₂	400 ppmv corrected to 3% O ₂
Biomass using Multiple Hearth Furnace	90 ppmv corrected to 3% O ₂	
All Others	65 ppmv corrected to 3% O ₂	

B. Summary of Proposed Amendments to Rule 4352

As a result of the comprehensive regulatory analysis conducted in support of the commitments in the *2018 PM_{2.5} Plan*, District staff are recommending several amendments to existing Rule 4352. The following paragraphs detail the proposed modifications to existing rule language and requirements. For further information on how proposed limits were determined, please see the Incremental Cost Analysis in Appendix C. Additionally, in an effort to simplify rule language and clarify existing requirements,

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expired language would be removed in several sections of the rule. See Proposed Rule 4352 for exact language.

Purpose (Section 1.0)

This section will be updated to specify that this rule will now also establish emissions limits for particulate matter and sulfur oxides.

Applicability - Section 2.0

No changes proposed at this time.

Definitions (Section 3.0)

New definitions for Carbon Monoxide, PM10, SOx, and gr/dscf will be added, as well as minor clarifications to existing definitions. The new definitions included are as follows:

Carbon Monoxide (CO): emissions of carbon monoxide, a colorless and odorless gas resulting from incomplete combustion of fuel.

PM10: as defined in Rule 1020 (Definitions).

- Per Rule 1020: *PM-10: particulate matter with an aerodynamic diameter smaller than or equal to a nominal ten (10) microns as measured by the applicable state and federal reference test methods.*

SOx: emissions of sulfur dioxide (SO2).

gr/dscf: grains of particulate matter per dry standard cubic foot.

Exemptions (Existing Section 4.0)

The exemptions section is being removed. Units with the potential to emit less than 10 tons per year of NOx or volatile organic compounds (VOC) are no longer exempt from the requirements of Rule 4352. There are currently two facilities in the Valley that will be newly subject to the requirements of this rule through the removal of this exemption.

Requirements (Existing Section 5.0/Proposed Section 4.0)

Updates in this section specify the proposed updated emission limits for the pollutants controlled through the rule, including newly established proposed PM10 and SOx emissions limits for subject sources. The proposed emissions limits included in this section of the rule are based on an in-depth technical analysis and a thorough public process. District staff have found control technologies necessary to achieve the proposed limits to be reasonably available, economically feasible, and cost effective.

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This section, and subsequent sections of the rule, will also be renumbered to reflect the deletion of the current rule Section 4.0.

Section 4.1 NO_x, CO, PM₁₀, and SO_x Limits

Existing Table 1 has been modified to clarify that the NO_x and CO limits are effective until December 31, 2023.

Table 2 has been added to the rule to specify the NO_x, CO, PM₁₀, and SO_x emission limits effective on and after January 1, 2024. See the discussion below.

The NO_x limit for units fired on municipal solid waste are proposed to be lowered from 165 ppmv, corrected to 12% CO₂, to 90 ppmv, corrected to 12% CO₂. The NO_x limit for units fired on biomass will be lowered from 90 ppmv, corrected to 3% O₂, to 65 ppmv, corrected to 3% O₂.

New PM₁₀ limits are proposed to be established for municipal solid waste units at 0.04 lbs/MMBtu or 0.02 gr/dscf at 12% O₂, and for all other units at 0.03 lbs/MMBtu/hr. The proposed PM₁₀ limits will also reduce PM_{2.5} emissions significantly, due to 90-95% of the PM₁₀ emitted from solid fuel fired boilers being PM_{2.5}.

New SO_x limits are proposed to be established for municipal solid waste units at 0.03 lbs/MMBtu or 12 ppmv at 12% CO₂ on a rolling 12-month average, and 0.064 lbs/MMBtu or 25 ppmv at 12% CO₂ on a block 24-hour average, and for all other units at 0.02 lbs/MMBtu/hr on a rolling 30-day average, and 0.035 on a block 24-hour average.

The current CO limit included in the rule would be maintained for all categories. Keeping the existing CO emission limit in the current rule would allow operators the much-needed flexibility to be able to achieve more stringent NO_x, SO_x and PM₁₀ emissions limits under varying field operating conditions and applications.

The emission limits proposed in Section 4.1 have been established based on a comprehensive review of available emissions control technology, the technological feasibility of further controls, and the cost-effectiveness of technologically feasible additional controls. The cost-effectiveness evaluation is further discussed in Appendix C of this staff report. The proposed emissions limits for NO_x, CO, PM₁₀, and SO_x are summarized in Table 2.

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Table 2 Proposed Rule 4352 Emission Limits				
Fuel Type	NOx Limit	CO Limit	PM10 Limit	SOx Limit
Municipal Solid Waste	110 ppmv corrected to 12% CO ₂ ^A 90 ppmv corrected to 12% CO ₂ ^C	400 ppmv corrected to 3% O ₂ ^A	0.04 lbs/MMBtu or 0.02 gr/dscf @ 12% CO ₂	0.03 lbs/MMBtu ^C or 12 ppmv at 12% CO ₂ ^C 0.064 lbs/MMBtu ^A or 25 ppmv at 12% CO ₂ ^A
Biomass	65 ppmv corrected to 3% O ₂ ^A		0.03 lbs/MMBtu	0.02 lbs/MMBtu ^B 0.035 lbs/MMBtu ^A
All Others	65 ppmv corrected to 3% O ₂ ^A		0.03 lbs/MMBtu	0.02 lbs/MMBtu ^B 0.035 lbs/MMBtu ^A

- ^A Block 24-hour average
- ^B Rolling 30-day average
- ^C Rolling 12-month average

SOx emissions limits are proposed to be established on both a short-term 24-hour basis, as well as on a longer averaging period of 30-days for biomass fired units, and annually for MSW fired units. This is to allow for variability in emissions that may result from different fuel sources on a short-term basis, while still requiring the units to achieve significantly lower SOx emissions on a longer term average.

The proposed emission limits for units fired on municipal solid waste are higher than the proposed emission limits for biomass (wood) fired units. Municipal solid waste is a lower quality fuel, as it is less energy dense than biomass. Additionally, municipal solid waste often includes materials that contain impurities that cause higher emissions, such as drywall which contains sulfur that is oxidized into SO₂ when combusted. Due to the lower fuel quality and higher levels of materials with impurities, municipal solid waste plants have higher emission rates than biomass plants.

Section 4.4 Monitoring Provisions

Requirements were added to require the use of Continuous Emissions Monitoring Systems for SOx.

Administrative Requirements (Section 5.0)

Section 5.3 Test Methods

The existing test method references in the rule have been updated to reflect the latest version of test methodology available. Test methods were also added for PM₁₀, SO_x, and CO₂.

Compliance Schedule (Section 6.0)

This section is being added to the rule to establish a schedule for when operators must submit an authority to construct and a deadline for compliance with the proposed NO_x, PM₁₀, and SO_x emission limits. A compliance schedule is necessary to identify the compliance dates for the emission limits on and after January 1, 2024. The compliance date for the proposed limits was determined based on the rule development commitment in the *2018 PM_{2.5} Plan*.

Timeframes established in the proposed rule reflect the time necessary for facilities to plan for full compliance with the proposed emission limits, including budgeting for any required modifications to the facility or facility operations, and modifying existing controls or facility control practices, and installing any required further control technologies. Along with the tables outlining the proposed compliance timeframes, language in this section has been added or modified to provide more clarity with the proposed changes to the rule, including definitions for Authority to Construct and Compliance Deadlines referenced in the compliance tables.

IV. ANALYSIS

The following analysis implement or reference requirements in the California Health and Safety Code, federal Clean Air Act, and the California Environmental Protection Act.

A. Emission Reduction Analysis

In order to determine the emission reductions associated with the proposed changes, District staff queried the District Permit Services Databases for all solid fuel fired units operating in the Valley, and then sorted the units into categories based on the types of fuel utilized (municipal solid waste and biomass). Based on existing permitted limits, District staff calculated the potential to emit for each affected unit, and then, based on the proposed new emissions limit for each pollutant, calculated the percent reduction that would be achieved through compliance with the proposed rule updates.

For State Implementation Plan (SIP) purposes, the percent reduction achieved through compliance with the proposed rule was applied to the baseline emissions inventory used in the District's *2018 PM_{2.5} Plan*. Based on these calculations, the SIP-creditable emission reductions estimated to be achieved from the proposed amendments to Rule

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4352 are illustrated in the table below, in tons per day (tpd) on an annual average basis. Please see Appendix B of this draft staff report for further details.

Table 3 – Summary of NO_x, PM₁₀, PM_{2.5} and SO_x Emission Reductions

	NO_x	PM₁₀	PM_{2.5}	SO_x
2024 Reduction Percentage - MSW	45.5%	24.5%	23.2%	64.7%
2024 Reduction Percentage - Biomass	8.7%	28.4%	25.4%	48.9%
2024 Emission Reduction (tons/day) - MSW	0.395	0.019	0.018	0.058
2024 Emission Reduction (tons/day) - Biomass	0.316	0.295	0.264	0.213
Total Emission Reductions by 2024 (tons/day)	0.711	0.313	0.282	0.271

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 of 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. 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.

E. Environmental Impacts

Based on the District’s assessment of the Rule Amendment, the District concludes that the Rule Amendment 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 CEQA Guidelines § 15378.

The Rule Amendment to Rule 4352 is estimated to reduce NOx emissions by 0.711 tons per day (tpd), PM10 emissions by 0.313 tpd, PM2.5 emissions by 0.282 tpd, and SOx emissions by 0.271 tpd. According to Section 15061 (b)(3) of the CEQA Guidelines, a project is exempt from CEQA if, “(t)he activity is covered by the general rule 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, substantial evidence supports the District’s assessment that assuming the Rule Amendment is a “project” under CEQA, it will not have any significant adverse effects on the environment.

In Furthermore, the Rule Amendment is an action taken by a regulatory agency, the San Joaquin Valley Air Pollution Control 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. 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 Rule Amendment.

Therefore, for all the above reasons, the Rule Amendment is exempt from CEQA. Pursuant to Section 15062 of the CEQA Guidelines, District staff will file a Notice of Exemption upon Governing Board approval of Rule Amendment.

F. Most Stringent Measures (MSM) and Best Available Retrofit Control Technology (BARCT) Analyses

As previously discussed, on November 15, 2018, the District adopted the District’s 2018 *PM2.5 Plan* to satisfy Clean Air Act requirements for the PM2.5 national ambient air quality standards. As a part of the 2018 *PM2.5 Plan*, the District demonstrated that Rule 4352 satisfies Best Available Control Measures (BACM) and performed a Most Stringent Measures (MSM) analysis for all rules that contain emission limits or requirements for NOx or PM. EPA defines MSM as, “*the maximum degree of emission reductions that has been required or achieved from a source or source category in any*

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other attainment plans or in practice in any other states and that can feasibly be implemented in the area.”

In February 2020, EPA published the *Technical Support Document - EPA Evaluation of BACM/MSM, San Joaquin Valley PM2.5 Plan for the 2006 PM2.5 NAAQS*,³ and determined that, “*Rule 4352 implements BACM and MSM for this category at this time. We recommend that SJVUAPCD continue evaluating the technical and economic feasibility of the Covanta LN installation for MSW boilers.*”

In addition to federal control requirements, most existing stationary sources in California non-attainment areas such as the San Joaquin Valley have been subject to state Best Available Retrofit Control Technology (BARCT) requirements since the 1980s. California Health and Safety Code 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.”

As discussed above, EPA has determined that the requirements of Rule 4352 currently satisfy MSM and BACM/BACT (Best Available Control Technology). Furthermore, the proposed amendments to the municipal solid waste-fired boilers will require the use of Covanta LN, or a similar technology, to achieve the proposed emission limits, and require more stringent limits for biomass units operating in the Valley. Based on a review of requirements in other California air districts, District staff have found that the proposed rule implements BARCT levels of emissions control. Adoption of the proposed amendments will also ensure that Rule 4352 continues to meet or exceed BACM and MSM levels of emissions control.

³ Technical Support Document - EPA Evaluation of BACM/MSM, San Joaquin Valley PM2.5 Plan for the 2006 PM2.5 NAAQS (February 2020)