Chapter 4

Attainment Strategy for PM2.5

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4. ATTAINMENT STRATEGY FOR PM2.5

This chapter lays out the strategy for attainment of multiple PM2.5 national ambient air quality standards (standards, or NAAQS) of following. Preparing a single Plan addressing multiple standards instead of three separate Plans allows for development of a more robust and health-protective Plan that incorporates stronger control measures on a more expeditious timeframe than may otherwise be required. Furthermore, a focused public process provides greater opportunity for public engagement and participation in the PM2.5 attainment planning process.

1997 PM2.5 Standard (24-hour 65 µg/m³ and Annual 15 µg/m³)

- Plan focus on annual standard – San Joaquin Valley has already attained 24-hour portion of the standard, based on monitoring data from the three year period from 2014 to 2016
- Attainment deadline December 31, 2015
- Serious area 5% Plan with attainment deadline of December 31, 2020

2006 24-hour PM2.5 standard of 35 µg/m³

- Serious area Plan with attainment deadline of December 31, 2024 with 5-year extension request

2012 annual PM2.5 standard of 12 µg/m³:

- Attainment deadline under "Serious" classification of December 31, 2025
- This Plan would be submitted three years ahead of 2022 federal submission deadline

This Plan contains a comprehensive suite of regulatory and incentive-based measures to be implemented by the San Joaquin Valley Air Pollution Control District's (District) and California Air Resources Board (CARB) to achieve the emissions reductions necessary to attain the PM2.5 standards. This plan builds upon comprehensive strategies already in place from previously adopted District plans and CARB State strategies. As such, this attainment strategy relies on existing measures already in place for stationary, area, and mobile sources, as adopted and implemented by the District and CARB. The aggressive regulatory and incentive-based measures proposed by both the District and CARB, combined with existing measures achieving new emissions reductions will achieve the emissions reductions necessary to attain each federal PM2.5 standard as expeditiously as practicable, as evidenced by the photochemical air quality modeling performed by CARB (see Appendix K). This Plan demonstrates the District's ongoing efforts to improve air quality in the Valley through a comprehensive strategy as follows:

Regulatory measures that build off existing stringent requirements, including new stationary source measures to further strengthen NOx and/or PM2.5 requirements to achieve greater emissions reductions from flaring activities, internal combustion engines, boilers/steam generators, glass melting furnaces, agricultural operations, and other local sources.

Incentive-based measures that accelerate the deployment of cleaner vehicles and technologies in a variety of sectors, including residential wood combustion, agricultural internal combustion engines, agricultural equipment, heavy duty trucks, off-road equipment, transit buses, school buses, freight equipment, passenger vehicles, locomotives, commercial lawn and garden equipment, and other sources.

Targeted "hot-spot" strategy that focuses additional regulatory and incentive-based measures for residential wood burning and commercial charbroiling operations in remaining areas of the Valley that requires further regulatory and investment for attainment of the federal PM2.5 standards. Hot-spot areas include Fresno County, Kern County, and other specific areas as necessary for attainment.

State mobile source strategy that reduces emissions from mobile sources under state and federal jurisdiction, including heavy duty trucks, agricultural equipment, locomotives, and off-road equipment.

Public outreach and education that encourages and empowers the public to understand air quality issues, take advantage of District tools to stay informed regarding local air quality, take actions to protect themselves when necessary, understand the Valley's unique air quality challenges, and take actions to reduce emissions and improve the Valley's air quality.

Technology advancement and demonstration efforts to accelerate the deployment of innovative clean air technologies as rapidly as possible.

Call for action by the state and federal governments to do their part in taking responsibility for regulating, and taking actions, to reduce emissions in the Valley. This includes working together to advocate and secure the significant new funding required to achieve the enormous emissions reductions necessary for attainment under this Plan through incentive-based measures.

4.1 Comprehensive Regulatory Control Strategy

Since 1992, the District has adopted nearly 650 rules to implement an aggressive on-going control strategy to reduce emissions in the Valley. Many current rules are fourth or fifth generation, meaning that they have been revised and emission limits have been lowered, as new emission control technology has become available and cost-effective. The District's regulatory authority is limited to stationary sources and some area-wide sources. The District's stringent and innovative rules, such as those for residential fireplaces, glass manufacturing, and agricultural burning, have set benchmarks for California and the nation. States and the federal government, unlike the District, have the authority to directly regulate tailpipe emissions from mobile sources. CARB has adopted tough regulations for heavy-duty trucks, off-road equipment, and other mobile sources. However, the District has also adopted innovative regulations such as the Indirect Source Review and Employer-based Trip Reduction rules to reduce emissions from mobile sources within the District's limited jurisdiction over these sources.

Regulations implemented by the District have reduced emissions from stationary sources by over 80% to date. Air quality improvements in the Valley document the success of the District's innovative and effective rules. The Valley has attained the federal PM10 standard, the revoked one-hour ozone standard, and most recently, the 1997 PM2.5 24-hour standard[1] (65 µg/m^3).

4.1.1 District Rules Contributing to Continued PM2.5 Improvement

The District's current rules and regulations reflect technologies and methods that extend well beyond minimum required control levels. The stringent regulations already adopted under previous attainment plans also serve as control measures for this plan. These adopted regulations will reduce directly emitted PM2.5 and NOx as they are fully implemented in the coming years, contributing to the Valley's progress toward attainment of the multiple PM2.5 standards.

In addition to the significant ongoing reductions achieved and maintained through the District's currently adopted air quality regulations, the following table summarizes District adopted rules achieving new emissions reductions after 2013, the base year for this plan. These and other District and ARB rules already guarantee that emissions will continue to be reduced over the coming years. New control measures identified in this plan combined with other control strategies discussed in Appendices C and D will provide necessary emissions reductions to complement those already being achieved and contribute to PM2.5 air quality improvements in the Valley. Even pre-2013 emissions reductions are contributing and will continue to contribute to the Valley's progress toward attaining federal PM2.5 standards.

Table 4-1 District Regulations Achieving New Emissions Reductions after 2013 (Not Including District Regulations Achieving Ongoing Reductions)

Rule #	Adopted District Rule	Last Adoption Date
4307	Boilers, Steam Generators, and Process Heaters—2.0 MMBtu/hr to 5.0 MMBtu/hr	4/21/2016
4308	Boilers, Steam Generators, and Process Heaters—0.075 MMBtu/hr to less than 2.0 MMBtu/hr	11/14/2013
4311	Flares	6/18/2009
4320	Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	10/16/2008
4354	Glass Melting Furnaces	5/19/2011
4550	Conservation Management Practices	8/18/2004
4702	Internal Combustion Engines	11/14/2013
4901	Wood Burning Fireplaces and Wood Burning Heaters	9/18/2014
4902	Residential Water Heaters	3/19/2009
4905	Natural Gas-Fired, Fan-Type Central Furnaces	6/21/2018
9310	School Bus Fleets	9/21/2006
9410	Employer-based Trip Reduction	12/17/2009
9510	Indirect Source Review	12/21/2017

[1] SJVAPCD. Clean Data Finding to EPA for the 1997 24-Hour PM2.5 Standard and Proposed PM2.5 Attainment Strategy. (2017, August 17).
http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2017/August/agenda.pdf

Rule #	Adopted District Rule	Last Adoption Date
Reg. VIII	Fugitive PM10 Prohibitions	9/16/2004

Rule 4307 Boilers, Steam Generators, and Process Heaters 2 to 5 MMBtu/hr

Rule 4307 is the most stringent rule in the nation for controlling emissions from fuel combustion-producing heat and energy for manufacturing and processing purposes. Emissions from these units are generally controlled through either combustion modification or exhaust gas treatment.

Rule 4308 Boilers, Steam Generators, and Process Heaters 0.075 to < 2 MMBtu/hr

Adopted in 2005 and amended in 2009 and 2013 to include more stringent NOx limits, Rule 4308 controls emissions from boilers, steam generators, and process heaters in the size range of 0.075 to less than 2 MMBtu/hr. As a point-of-sale rule, emissions are reduced when consumers replace older units with new, low-NOx units as of the January 1, 2015, compliance date.

Rule 4311 Flares

Amended on June 18, 2009, Rule 4311 controls emissions from flares used in the Valley at industries including oil and gas production facilities, sewage treatment plants, waste incineration and petroleum refining operations. Flare operators are required to submit Flare Minimization Plans (FMPs), perform extensive monitoring and record keeping, submit reports of planned and unplanned flaring activities to the District, and meet petroleum refinery SO2 performance targets. The District has completed two further studies that analyzed data from FMPs, annual monitoring reports, reportable flaring events reports, and made those studies available on the District web.[2] The District continuously seeks out potential opportunities to reduce emissions from these control and safety devices. The District committed in its *2016 Ozone Plan* to work closely with affected operators to undergo a regulatory amendment process for Rule 4311 to include additional ultra-low NOx flare emission limitations and additional flare minimization requirements to the extent that such controls are determined to be technologically and economically feasible to require in the Valley. The District is undergoing a rule amendment public process concurrently with the development of this attainment plan.

Rule 4320 Boilers, Steam Generators, and Process Heaters > 5 MMBtu/hr

The District adopted Rule 4320 in 2008, with multiple generations of Rules 4305 and 4306 preceding this rule to regulate this source category. This rule is the most stringent rule in the nation for controlling emissions from fuel combustion-producing heat and steam for manufacturing and processing purposes. Facilities generally control emissions from these sources through combustion modification or exhaust gas treatment.

[2] http://valleyair.org/Air_Quality_Plans/PM_Plans.htm

Rule 4354 Glass Melting Furnaces

District Rule 4354, adopted in 1994 and subsequently amended six times, is one of the most stringent rules in the nation for controlling NOx, SOx, and PM emissions from industrial glass manufacturing plants that make flat glass (window and automotive windshields), container glass (bottles and jars), and fiberglass (insulation). Subsequent amendments required more stringent NOx emission limits based on BACT level controls for container glass, fiberglass, and flat glass. The rule gives special consideration to container glass and fiberglass manufacturers who use 30% post-consumer materials under the state glass recycling regulations. The rule also includes a technology forcing limit for flat glass furnaces. As a result of Rule 4354 and continuing efforts on behalf of this industry to reduce emissions, the Valley's glass melting furnaces have significantly reduced NOx, SOx and PM emissions.

Rule 4550 Conservation Management Practices

Rule 4550 is the District's Conservation Management Practices (CMP) rule. Rule 4550 was the first rule of its kind in the nation to reduce fugitive particulate emissions from agricultural operations through the reduction of passes of agricultural equipment and implementation of other conservation practices. Rule 4550 uses a menu approach of control techniques to accommodate the variability of agricultural industries. The selected CMPs are listed on application forms that are submitted to the District for approval as a CMP Plan. Agricultural operations are required to maintain detailed records verifying use of the approved Conservation Management Practices. Approved CMP plans are enforced through onsite inspections and operators are required to submit applications and modify their plans when changing their conservation management practices. Through this rule, PM10 emissions have been reduced by 35.3 tons per day,[3] which is approximately a 24% reduction for this source category.

Rule 4702 Internal Combustion Engines

Adopted in 2003, this rule has subsequently been amended five times to implement stringent NOx limits for agricultural operations and to increase stringency of NOx limit for non-agricultural operations engines, and to extend rule applicability to include units with 25-50 brake horsepower (bhp). With multiple generations of rule amendments, Rule 4702 is the most stringent rule in the nation for this source category. Facilities generally control NOx emissions that result from the fuel combustion of internal combustion engines with advanced technologies, such as selective non-catalytic reduction and selective catalytic reduction.

Rule 4901 Wood-Burning Fireplaces and Wood-Burning Heaters

The District takes a multifaceted and proactive approach to reducing emissions from wood burning fireplaces and wood burning heaters in the Valley. District Rule 4901 reduces emissions from residential burning through stringent curtailment requirements during the wood-burning season. The District most recently amended Rule 4901 in September 2014, two years ahead of the commitment to amend the rule in the *2012 PM2.5 Plan.* Through the District *Check Before You Burn* program, the District has declared and enforced episodic wood burning curtailments, also called "No burn" days,

[3] SJVAPCD. *Conservation Management Practices Program Report for 2005.* (2006, January 19). Retrieved from http://www.valleyair.org/farmpermits/updates/cmp_program_report_for_2005.pdf

since 2003. *Check Before You Burn* and District Rule 4901 reduce harmful species of PM2.5 when and where those reductions are most needed, in impacted urbanized areas when the local weather is forecast to hamper particulate matter dispersion.

The District's Burn Cleaner Wood Stove Change-out Program (Burn Cleaner Program) plays a key role in the success of the transition from older more polluting wood burning heaters and fireplaces to cleaner wood burning heaters. Since 2006, the Burn Cleaner Program has been helping residents overcome some of the financial obstacles in purchasing cleaner alternatives. There are currently more than 30 hearth retailers in the Valley that have partnered with the District to successfully implement the Burn Cleaner Program. Additionally, the District has an extremely successful outreach and education program with regards to residential wood burning and educating Valley residents about air quality, the effects of air pollution on the population's health, and on options they can take to reduce emissions. In the latest wood-burning season (2017-2018) the District took part in 82 media interviews about extreme weather and wood burning.

Rule 4902 Residential Water Heaters

District Rule 4902 controls NOx emissions from natural gas-fired residential water heaters with heat input rates less than or equal to 75,000 Btu/hr by enforcing NOx emissions limit of 40 nanograms of NOx per Joule of heat output (ng/J). The District amended Rule 4902 in 2009 to further reduce emissions by lowering the limit to 10 ng/J for new or replacement water heaters and to a limit of 14 ng/J for instantaneous water heaters. Retailer compliance dates ranged from 2010 through 2012, depending on the unit type. As a point-of-sale rule, compliant units will be installed as the older units are replaced through attrition in the years following 2012. The rule has controlled NOx emissions by approximately 88% for this source category.

Rule 4905 Natural Gas-Fired, Fan-Type Residential Central Furnaces

Rule 4905 limits NOx emissions from residential central furnaces supplied, sold, or installed in the Valley with a rated heat input capacity of less than 175,000 Btu/hour. Amendments lowered the NOx emission limit for residential units from 40 ng/J to 14 ng/J and expanded rule applicability to include non-residential units and units installed in manufactured homes with compliance deadlines in 2018. Due to the limited number of certified compliant units that will be available by the compliance deadline dates, the rule was amended again on June 21, 2018 to extend the emissions fee option period with changes in fee structure to allow additional time necessary to continue technology development and the certification process while providing strong incentive for accelerated deployment of compliant units. As a point-of-sale rule, emissions are reduced when consumers replace older units with newer, low-NOx units through attrition.

Rule 9310 School Bus Fleets

The District adopted Rule 9310 in September 2006 to limit NOx, PM, and diesel toxic air contaminants from school bus fleets. Diesel-fueled school bus fleet operators must replace or retrofit all of their school buses to meet the applicable CARB and U.S. Environmental Protection Agency (EPA) emission standards for engines by 2016. The rule also requires all existing gasoline or alternative-fueled school buses and any diesel school buses manufactured after October 1, 2002 to be operated according to

manufacturer specifications and, if replaced, to meet all applicable CARB and EPA current-year emissions standards for the year of delivery of that school bus engine and fuel type.

Rule 9410 Employer-Based Trip Reduction (eTRIP Rule)

The goal of the eTRIP Rule is to reduce single-occupancy-vehicle work commutes. The eTRIP Rule requires the Valley's larger employers, representing a wide range of locales and sectors, to select and implement workplace measures that make it easier for their employees to choose ridesharing and alternative transportation. Because of the diversity of employers covered by the eTRIP Rule, the rule was built with a flexible, menu-based approach. Employers choose from a list of measures, each contributing to a workplace that encourages employees to reduce their dependence on single-occupancy vehicles. Each eTRIP measure has a point value, and employer eTRIPs must reach specified point targets for each strategy over a phased-in compliance schedule (2010 – 2015). The District has continually provided employer assistance through training, guidance materials, promotional information, and online reporting options.

Rule 9510 Indirect Source Review

District Rule 9510 is the only rule of its kind in the State of California and throughout the nation which applies to new development projects, including residential and commercial development projects, and transportation and transit projects. The District's rule is recognized as the benchmark, or best available control, for regulating these indirect sources of emissions. The purpose of this rule is to reduce the growth in emissions from mobile and area sources associated with construction and operation of new development projects in the Valley, by encouraging clean air designs to be incorporated into the development project, or, if insufficient emissions reductions can be designed into the project, by paying a mitigation fee used to fund off-site emissions reduction projects.

Regulation VIII Fugitive PM10 Prohibitions

The Regulation VIII rules were adopted in November 2001, and subsequently amended in 2004 to incorporate more stringent requirements. These rules reduce fugitive dust from construction sites, earthmoving activities, parking and staging areas, open areas, agricultural operations, carryout and trackout, paved and unpaved roads, and material storage sites.

4.1.2 CARB Rules Contributing to Continued PM2.5 Improvement

Mobile source emissions make up over 85% of the Valley's NOx emissions, the primary driver in the formation of particulate and ozone pollution, and therefore reductions in mobile source emissions have become an ever-increasingly important part of the Valley's attainment strategy of federal air quality standards. Local air districts do not have the authority to implement regulations requiring ultra-low tailpipe emissions standards on mobile sources. With authority to regulate mobile source emissions, CARB has adopted and amended a number of regulations aimed at reducing exposure to diesel particulate matter (PM) and NOx from fuel sources, freight transport sources

like heavy-duty diesel trucks, transportation sources like passenger cars and buses, and off-road sources like large construction equipment. Phased implementation of these regulations will produce emission reduction benefits in the coming years as the regulated fleets are retrofitted, and as older and dirtier fleet units are replaced with newer and cleaner models at an accelerated pace.

4.2 Comprehensive Incentive-Based Strategy

In addition to having the toughest air regulations in the nation, the District also operates the most effective and efficient incentive grants program, investing over $2 billion in public/private funding towards clean air projects to date that have achieved over 151,000 tons of emissions reductions. Through strong advocacy at the state and federal levels, the District has appropriated $350 million in incentive funding in the 2018-2019 District Budget to continue this robust program. Due to the significant investments made by Valley businesses and residents and stringent regulatory programs by the District and CARB, the Valley's ozone and PM2.5 precursor emissions are at historically low levels and air quality over the past few years has been better than any other time on record.

4.2.1 District Incentive-based Strategy Contributing to Continued PM2.5 Improvement

The District administers a comprehensive suite of other highly-successful voluntary incentive programs which are critical to the Valley's attainment of the federal air quality standards. The District operates a diverse variety of voluntary incentive programs, including the following:

- Public transportation subsidies
- Public benefit incentives
- School bus programs
- Drive Clean in the San Joaquin
- Incentive funding for electric vehicles and charging infrastructure
- Technology advancement programs
- Off-road equipment replacement and repowers
- Low-emission locomotive incentives
- Truck replacement programs
- Tractor replacement programs
- The Electrified Dairy Feed Mixing Program
- Measures to support the reduction of single occupant vehicle commutes
- Funding for new zero-emission lawn and garden equipment

In addition the District is also looking into improvements, expansions, and streamlining of these programs to increase accessibility, efficiency, and efficacy of its voluntary incentive programs. One example of a program expansion under consideration is the expansion of the Clean Green Yard Machine program to include commercial lawn and garden equipment bringing the emissions benefits of the program to Valley residents who utilize professional lawn care services. The District is also looking for technology

partners to bring alternatives to open burning of agricultural biomass opportunities to the Valley agricultural sector. Details about the District's voluntary incentive programs can be found in Appendix E.

4.3 New District Emission Reduction Measures

This Plan integrates a comprehensive strategy that contains new potential stationary source measures that will be applied Valleywide and measures focused on reducing emissions in areas with the most difficult attainment challenges. Through the implementation of this comprehensive strategy, the Valley will experience progressive air quality improvements as the region attains the federal PM2.5 standards as expeditiously as practicable.

Under the federal Clean Air Act, the entire Valley is designated as not meeting the standard if any area in the Valley is not able to meet the standard. In developing the control strategies for past attainment plans, the District has used the traditional approach of quantifying reductions needed in areas with the most difficulty in meeting the standards, and then imposing broad controls throughout the Valley. After decades of imposing tough measures throughout the region, and given the significant additional emissions reductions necessary to meet the federal PM2.5 standards, in addition to imposing stringent new measures across all sources throughout the Valley, a targeted approach that focuses additional measures and limited resources in remaining "hot-spot" areas is necessary to meet the federal standards.

Therefore, this plan not only includes a comprehensive suite of regulatory and incentive-based measures for both stationary and mobile sources, but also includes a targeted hot-spot strategy that focuses new residential wood burning and commercial under-fired charbroiling emission reduction measures in Fresno County, Kern County, and other locations as necessary to demonstrate attainment of the standards. Given the innovative nature of this approach, the District has been working with EPA, CARB, and other stakeholders to ensure that the District's strategy is consistent with all applicable regulations.

4.3.1 Evaluating Control Measures for New Control Strategy Opportunities

The District expended extensive efforts to identify and evaluate potential emission reductions opportunities from each control measure source category. As part of the regulatory evaluation, District rules and source categories were compared to federal and state air quality regulations and standards, and the regulations and standards in other air districts. District rules and regulations were compared to such federal regulations and guidance documents as Control Techniques Guidelines (CTG),[4] Alternative Control Techniques (ACT),[5] New Source Performance Standards (NSPS),[6]

[4] EPA. Control Techniques Guidelines. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html
[5] EPA. Alternative Control Techniques. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html
[6] EPA. 40 CFR 60 – Standards of Performance for New Stationary Sources (NSPS). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/60/60hmpg.html

National Emission Standards for Hazardous Air Pollutants (NESHAP),[7] and Maximum Achievable Control Technology (MACT)[8] standards. California state regulations, due to regulatory authority, are primarily applicable to mobile sources and consumer products. State regulations also include the California Health and Safety Code (CH&SC) and CARB Airborne Toxic Control Measures (ATCM) requirements which are applicable to stationary and area sources.[9] The District's regulatory evaluation includes state guidelines that are applicable to the source category. Rule comparison to analogous regulations adopted by California's most progressive air districts are included this comprehensive evaluation as agreed to by EPA for the *2009 RACT SIP*, which includes but not limited to South Coast Air Quality Management District[10], Bay Area Air Quality Management District[11], Sacramento Metropolitan Air Quality Management District[12], and Ventura County Air Pollution Control District.[13]

All potential best available control measures (BACM) and most stringent measures (MSM) identified through this regulatory evaluation were thoroughly evaluated using the key factors defined in EPA's 2016 *Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*, to determine if potential opportunities qualify as BACM/MSM for the Valley. Key factors include a technological feasibility analysis to determine whether new control technologies can be integrated with the existing controls without reducing or delaying the emission reductions from the existing emission control technologies and ensuring that benefit of the new measure is greater than the existing measure.

Potential control determined to be technologically feasible is then evaluated for economic feasibility. The District looked for any control technologies not already required that might be available to further reduce emissions from sources of air pollution in the Valley. This includes new technologies and technologies that may not have been cost-effective in the past. The technologies used in BACT guidelines; permits; and other air districts' rules, regulations, guidelines, and studies were reviewed for their feasibility, including how commercially available the technology currently is and whether the technology has been used in practice. Cost effectiveness analyses of various control measures include examining the added cost, in dollars per year, of the control technology or technique, divided by the emissions reductions achieved, in tons per year. EPA cautions that the threshold for economic feasibility should be addressed on a case-by-case basis. The District does not have a pre-determined cost-effectiveness

[7] EPA. 40 CFR 61 – National Emission Standards for Hazardous Air Pollutants (NESHAPs). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/61/61hmpg.html
[8] EPA. 40 CFR 63 – Maximum Achievable Control Technology (MACT). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/63/63hmpg.html
[9] California Air Resources Board (ARB). Airborne Toxic Control Measures (ATCMs). Retrieved from
[10] South Coast Air Quality Management District (SCAQMD). Rules and Regulations. Retrieved from http://www.aqmd.gov/home/regulations/rules/scagmd-rule-book/table-of-contents
[11] Bay Area Air Quality Management District (BAAQMD). Rules and Regulations. Retrieved from http://www.baaqmd.gov/Divisions/Planning-and-Research/Rules-and-Regulations.aspx
[12] Sacramento Metropolitan Air Quality Management District (SMAQMD). Rules and Regulations. Retrieved from http://www.airquality.org/rules/
[13] Ventura County Air Pollution Control District (VCAPCD). Rules and Regulation. Retrieved from http://www.vcapcd.org/Rulebook/RuleIndex.htm

threshold, but control options with extremely high cost-effectiveness (high dollars per ton of pollutant reduction) are generally unreasonable and not feasible for regulation.

Efforts to identify feasible emission reductions opportunities also includes the evaluation of additional control technologies or practices, if any, not already included in previously mentioned BACM/MSM evaluations for the area. This evaluation process considers any emission reduction opportunities that were previously adopted by the District plans that were determined to be beyond RACT at that time and also any new emission reduction opportunities adopted in California state implementation plans (SIP), SIPs in other states, or achieved in practice in other areas. Any potential BACM/MSM identified were then thoroughly evaluated for technological and economic feasibility. In evaluating the technological and economic feasibility of potential BACM/MSM, the District reviews staff reports and studies from other air districts, EPA technical guidance documents, and applicable study data from the scientific community to assist in evaluating. The District has evaluated all sectors and equipment types for additional emission reduction opportunities, as presented in Appendix C.

This Plan demonstrates that all District rules continue to meet or exceed measures identified by the EPA as reasonably available control measures (RACM), BACM, and MSM, as defined above and demonstrated in Appendix C.

4.3.2 New District Control Measure Commitments

The District and CARB are committing in this state implementation plan to aggregate emission reductions of direct PM2.5 and NOx beyond current measures implemented by the District and CARB (see Table below and Section 4.4). While the tables include estimates of the emission reductions from each individual measure, final measures as proposed for adoption into the SIP may provide more or less emission reductions as will be determined through the extensive public rule development process for each regulatory measure. These aggregate commitments will ensure that the total emission reductions will be achieved by the timeframes necessary under this Plan. While the District projects that the attainment strategy may provide up to 3.447 tons per day of PM2.5 emissions reductions through the combination of potential District measures, the District is committing in the SIP to attain an aggregate amount of 1.04 tons per day of PM2.5 emissions reductions from these new measures, as necessary for expeditious attainment through modeling conducted for this Plan.

Table 4-2 Emission Reductions from Proposed District Measures

Measure	PM2.5 (tpd)	NOx (tpd)
Flares	–	0.05
Boilers, Steam Generators, and Process Heaters - Phase 3	–	1.83
Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr		
Internal Combustion Engines		
Glass Plants		
Solid Fuel-Fired Boilers, Steam Generators And Process Heaters		
Conservation Management Practices*	*0.65**	–
Commercial Charbroiling	0.57	–
Wood Burning Fireplaces and Wood Burning Heaters	0.47	–
Aggregate Emission Reductions Commitment	**1.04 – 1.69**	**1.88**

"–" denotes reductions have not been quantified

* District estimates potential reductions of up to 0.647 tpd PM2.5. Air quality modeling indicates limited attainment value and aggregate commitment does not include a specific reduction target pending further evaluation and research on control techniques and effectiveness as discussed below.

Regulatory Measures		Action Date	Implementation Begins
Rule 4311	Flares	2020	2024
Rule 4306	Boilers, Steam Generators, and Process Heaters – Phase 3	2020	2024
Rule 4320	Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr		
Rule 4702	Internal Combustion Engines	2020	2024
Rule 4354	Glass Melting Furnaces	2021	2024
Rule 4352	Solid Fuel-Fired Boilers, Steam Generators And Process Heaters	2021	2024
Rule 4550	Conservation Management Practices	2022	2024
Rule 4692	Commercial Under-fired Charbroiling (Hot-spot Strategy)	2020	2024
Rule 4901	Wood Burning Fireplaces and Wood Burning Heaters (Hot-spot Strategy)	2019	2019

Incentive Based Measures	Action Date	Implementation Begins
Replacement of Agricultural Internal Combustion Engines	2020	ongoing
Installation of Commercial Under-fired Charbroiling Controls (Hot-spot Strategy)	2020	ongoing
Replacement of Residential Wood Burning Devices (Valleywide and Hot-spot Strategy)	2020	ongoing

Rule 4311 Flares

Rule 4311 controls emissions from flares used in the Valley at facilities such as, but not limited to, oil and gas production facilities, sewage treatment plants, waste incineration and petroleum refining operations. Under Rule 4311, flare operators are required to submit flare minimization plans, perform extensive monitoring and record keeping, submit reports of planned and unplanned flaring activities to the District, and meet petroleum refinery SO2 performance targets.

Flaring activities in the Valley emit 0.55 tpd of NOx emissions, representing 0.22% of the annual average NOx emissions in the Valley. Despite this relatively small amount of emissions, in seeking all potential emission reduction opportunities, the District has invested significant resources into evaluating potential emissions reductions opportunities from flares. The District has made these further study reports available on the District web.[14]

As demonstrated in Appendix C, District Rule 4311 satisfies RACM, BACM, and MSM requirements for this source category.[15] Even though flares are not a significant source of PM2.5 and NOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4311 currently has in place the most stringent measures feasible to implement in the Valley.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities that are projected to provide 0.05 tons NOx per day of additional emissions reductions towards the District's aggregate plan commitment. The District will continue to work closely with affected operators and other stakeholders to undergo a regulatory amendment process for Rule 4311 to include:

- Additional ultra-low NOx flare emission limitations for existing and new flaring activities at Valley facilities to the extent that such controls are technologically achievable and economically feasible, and
- Additional flare minimization requirements to the extent that such controls are technologically achievable and economically feasible
- Expand the applicability of the rule to apply to all sources (not limited to major sources)

Rule 4306 Boilers, Steam Generators, and Process Heaters - Phase 3
Rule 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr

Rules 4306 and 4320 apply to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million British

[14] http://www.valleyair.org/Air_Quality_Plans/PM_Plans.htm
[15] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

thermal units per hour (MMBtu/hr). Facilities with units subject to this rule represent a wide range of industries, including but not limited to electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial processes, food and agricultural processing, and service and commercial facilities. NOx emissions from this source category have been reduced by 96% through District regulations.

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for emissions from boilers, steam generators, and process heaters. As demonstrated in Appendix C, Rules 4306 and 4320 currently have in place the most stringent measures feasible to implement in the Valley and therefore meet or exceed RACM, BACM, and MSM requirements for this source category.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will work with affected operators to further reduce NOx emissions from boilers, steam generators, and process heaters to the extent that such controls are technologically and economically feasible. Technologies with the potential to further reduce emissions include the latest generation of ultra-low NOx burners, SCR, and ultra-low NOx burners combined with SCR. As demonstrated above, some of these technologies may not be cost-effective or feasible at this time. Therefore, the potential measures include lowering the emission limits for the class and category and lowering the more stringent Advanced Emission Reduction Option (AERO) limit further as follows:

- Boilers and process heaters >5.0 MMBtu/hr to ≤ 20 MMBtu/hr
    - Lower current emissions limitations of 6 ppmv (enhanced) and 9 ppmv (standard) to a new limitation as low as 2.5 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Boilers and process heaters > 20 MMBtu/hr
    - Lower current emissions limitations of 5 ppmv (enhanced) and 7 ppmv (standard) to a new limitation as low as 2 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Oil field steam generators >5.0 MMBtu/hr to ≤ 20 MMBtu/hr
    - Lower current emissions limitations of 6 ppmv (enhanced) and 9 ppmv (standard) to a new limitation as low as 3.5 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Oil field steam generators > 20 MMBtu/hr
    - Lower current emissions limitations of 5 ppmv (enhanced) and 7 ppmv (standard) to a new limitation as low as 2 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment

- Oil field steam generators < 50% PUC quality gas
  - Lower current emissions limitations of 12 ppmv (enhanced initial) and 9 ppmv (enhanced final) to a new limitation as low as 3.5 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters >5.0 MMBtu/hr to ≤ 20 MMBtu/hr
  - Lower current emissions limitations of 9 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters >20 MMBtu/hr to ≤ 110 MMBtu/hr
  - Lower current emissions limitations of 6 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters >110 MMBtu/hr
  - Lower current emissions limitations of 5 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters < 50% PUC quality gas
  - Lower current emissions limitations of 9 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment

The above potential measures are projected to provide 0.4 tons NOx per day of additional emissions reductions. The proposed commitments by the District and CARB will each achieve an aggregate emission reduction of direct PM2.5 and NOx. While the commitments include estimates of the emission reductions from each individual measure, final measures as proposed for adoption into the state implementation plan (SIP) may provide more or less emission reductions. The aggregate commitment will guarantee that the total emission reductions will be achieved to attain each NAAQS as expeditiously as practicable.

Rule 4352 Solid Fuel-Fired Boilers, Steam Generators and Process Heaters

Rule 4352 limits NOx and carbon monoxide (CO) emissions from any boiler, steam generator or process heater fired on solid fuel. Boilers, steam generators, and process heaters are used in a broad range of industrial, commercial, and institutional settings. Units subject to this rule fire on a variety of solid fuels: coal, petroleum coke, biomass, tire-derived fuel, and municipal solid waste facilities. This rule limits NOx emissions to 165 ppmv for municipal solid waste facilities, 90 ppmv for biomass facilities, and 65 ppmv for all other solid fuel fired units.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, this measure would further reduce NOx emissions by amending the rule to lower NOx limits for municipal solid waste-fired boilers to the extent that such controls are technologically achievable and economically feasible.

Municipal Waste-Fired Units

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this category. As demonstrated above, Rule 4352 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. The District's evaluation of potential control technologies has found that the Gore De-NOx and Selective Catalytic Reduction technologies demonstrated in Europe are extremely costly, require additional evaluation for feasibility, and are overall economically infeasible in this sector. The District's evaluation of the Covanta LN NOx technology has found that, while costly, installation of this technology may be cost-effective. While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities to reduce NOx emissions for municipal waste-fired units to the extent that additional NOx controls are technologically and economically feasible:

- Lower NOx limit from 165 ppmv @ 12% CO_2 to 110 ppmv @ 12% CO_2 over 24-hr period and 90 ppmv @ 12% CO_2 over annual period
- Evaluate feasibility of lower NOx emission levels

Biomass-Fired Units

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this category. As demonstrated above, Rule 4352 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category.

The proposed commitments by the District and CARB will each achieve an aggregate emission reduction of direct PM2.5 and NOx. While the commitments include estimates of the emission reductions from each individual measure, final measures as proposed for adoption into the state implementation plan (SIP) may provide more or less emission reductions. The aggregate commitment will guarantee that the total emission reductions will be achieved to attain each NAAQS as expeditiously as practicable.

Rule 4354 Glass Melting Furnaces

District Rule 4354, adopted in 1994 and subsequently amended six times, is one of the most stringent rules in the nation for controlling NOx, SOx, and PM emissions from industrial glass manufacturing plants that make flat glass (window and automotive windshields), container glass (bottles and jars), and fiberglass (insulation). The last amendments to the rule included more stringent NOx emission limits based on BACT level controls for container glass, fiberglass, and flat glass. The rule gives special consideration to container glass and fiberglass manufacturers who use 30% post-consumer materials under the state glass recycling regulations. The rule also includes a technology forcing limit for flat glass furnaces. As a result of this stringent prohibitory

rule and continuing efforts on behalf of this industry to reduce emissions, the Valley's glass melting furnaces use low-NOx firing technology.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities to reduce NOx emissions for container glass furnaces to the extent that additional NOx controls are technologically and economically feasible:

- Evaluate feasible ultra low-NOx control technologies (catalytic filtration, oxy-fuel combined with SCR, etc.)
- Lower NOx limit from 1.5 lb/ton to a level ranging from 1.0-1.2 lb-NOx/ton glass pulled or lower, based on a rolling 30-day average

The proposed commitments by the District and CARB will each achieve an aggregate emission reduction of direct PM2.5 and NOx. While the commitments include estimates of the emission reductions from each individual measure, final measures as proposed for adoption into the state implementation plan (SIP) may provide more or less emission reductions. The aggregate commitment will guarantee that the total emission reductions will be achieved to attain each NAAQS as expeditiously as practicable.

Rule 4550 Conservation Management Practices

Rule 4550 was adopted to help bring the Valley into attainment of federal PM10 standards, and applies to on-field farming and agricultural operation sites located within the Valley. Rule 4550 was the first rule of its kind in the nation to target fugitive particulate emissions from agricultural operations, and it has served as a model for other regions. The District worked extensively with numerous stakeholders, growers, and the Agricultural Technical Committee for the San Joaquin Valleywide Air Pollution Study Agency (AgTech) for two years prior to developing the Conservation Management Practices (CMP) Rule. The District also worked with agricultural stakeholders and other agencies, such as the Natural Resources Conservation Service (NRCS), following rule adoption to ensure affected sources were assisted as much as possible in understanding and complying with the requirements of Rule 4550. Implementation of Rule 4550 by agricultural operations has resulted in the reduction of PM2.5 emissions through the reduction of passes of agricultural equipment and implementation of other conservation practices. Through this rule, PM emissions have been reduced by 35.3 tons per day.

The attainment modeling has demonstrated that implementation of additional CMPs will not contribute to attaining the federal PM2.5 standards. However, to further develop the District's understanding of the effectiveness of CMP measures on controlling PM2.5 emissions in the Valley, the District is committing to:

- Undertaking scientific research on the PM2.5 content, constituents, and stability during wind events of the many soil types found throughout the Valley.
- Further evaluate ways to promote conservation tillage practices and to reduce windblown dust from agricultural operations to the extent that they are found to practicably reduce PM2.5, using the following process. The District will launch a

public rule development process and will work with the Agricultural Technical Committee to evaluate amending Rule 4550 (Conservation Management Practices) to potentially require the selection of additional control measures to specifically limit PM2.5 emissions from tilling and other land preparation activities during high wind events based on the research discussed above. The District will evaluate the feasibility of a rule amendment requiring CMPs on fallow lands that are tilled or otherwise worked with implements of husbandry, to reduce windblown PM2.5 emissions from disturbed fallowed acreage. More widespread implementation of conservation tillage practices, such as cover cropping, no till, low till, strip till, and precision agriculture, may help to further limit windblown PM2.5 in the Valley while also supporting State policy goals of promoting healthy soils. To this end, the District will evaluate measures to promote the selection of conservation tillage as a CMP for croplands.

- Evaluate lowering acreage applicability thresholds in order to further reduce PM2.5 emissions from this source category

The District will continue to collaborate with other agencies, including EPA and USDA-NRCS, and agricultural stakeholders to evaluate feasible opportunities to further reduce fugitive dust and emissions from agricultural operations.

As noted above, the existing District Rule 4550 has been found by the District and the federal EPA to establish RACM, BACM, and MSM level PM2.5 requirements for this source category.

While the attainment modeling process has demonstrated that additional CMPs will not significantly contribute to our attainment efforts, to further develop the District's understanding of the effectiveness of CMP measures on controlling PM2.5 emissions in the Valley, the District is committing to undertaking scientific research on the PM2.5 content, constituents, and stability during wind events of the many soil types found throughout the Valley. This research would be conducted in close coordination with USDA-NRCS, agricultural sources, researchers through established processes including the San Joaquin Valleywide Air Pollution Study Agency, Policy Committee, and Agricultural Technical Subcommittee.

Although Rule 4550 already meets BACM and MSM requirements for PM2.5, the District is also committing to further evaluate ways to promote conservation tillage practices and to reduce dust from agricultural operations to the extent that they are found to practicably reduce PM2.5, using the following process. The District will work with the Agricultural Technical Committee to evaluate the feasibility and effectiveness of requiring the selection of additional control measures to achieve additional PM2.5 emissions reductions from tilling and other land preparation activities based on the research discussed above. More widespread implementation of conservation tillage practices such as cover cropping, no till, low till, strip till, and precision agriculture, through additional incentives under Rule 4550, may help to further limit PM2.5 in the Valley. To this end, the District will evaluate measures to promote the selection of conservation tillage as a CMP for croplands.

The District will evaluate the feasibility and effectiveness of CMPs on fallow lands that are tilled or otherwise worked with implements of husbandry, to reduce windblown PM2.5 emissions from disturbed fallowed acreage. This evaluation will rely on additional research, in coordination with USDA-NRCS, agricultural sources, and researchers, that recognizes the Valley's unique soil characteristics and agricultural practices to ensure that Valley-specific solutions are considered in this process.

Rule 4692 Commercial Charbroiling

District Rule 4692 reduces PM emissions by requiring catalytic oxidizers for chain-driven charbroilers, including those used in many typical fast-food restaurants. Rule 4692 is among the most stringent rules in the nation for controlling emissions from commercial charbroiling operations. The original rule, adopted in March 2002, reduced PM2.5 emissions from chain-driven charbroilers by 84%. The September 2009 rule amendment expanded rule applicability to more chain-driven charbroilers. Rule 4692 has been fully implemented since 2011, reducing PM2.5 emissions by 0.018 tpd. The District also created a Charbroiler Incentive Program (CHIP) to fund the installation of PM2.5 controls on under-fired charbroilers and further investigate the economic feasibility and availability of such controls.

In addition to the existing emissions reductions already achieved through control requirements for chain-driven commercial charbroilers, this measure would seek to achieve additional emission reductions from commercial underfired charbroilers. While there are ongoing improvements in the technology available for commercial cooking emissions, the costs of installing controls for commercial underfired charbroilers remain high.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, using new survey and registration information, the District will pursue reductions in commercial underfired charbroiler emissions through an incentive-based approach to fund the installation of controls for commercial underfired charbroilers within urban boundaries in hot-spot areas, with a future year regulatory requirement to encourage participation by Valley businesses.

1. To ensure early and robust use of incentives for installation of controls and related modifications for existing underfired charbroilers within urban boundaries of hot-spots areas supplemented with regulatory backstop to encourage participation.

2. Require installation of control technologies at new larger restaurants within urban boundaries of hot-spot areas supplemented by incentives as feasible.

Rule 4702 Internal Combustion Engines

Rule 4702 applies to any internal combustion (IC) engine rated at 25 brake horsepower (bhp) or greater. The purpose of this rule is to limit NOx, CO, VOC, and SOx emissions from units subject to this rule. The rule originally established NOx limits between 25-50 ppmv achieving 90-96% control for non-agricultural operations rich-burn engines and

65-75 ppmv achieving 85-90% control for non-agricultural operations lean burn engines. In its continuous effort to improve air quality in the Valley, the District has adopted numerous amendments to Rule 4702 that have resulted in significant reductions of NOx and PM emissions. August 2011 amendments implemented more stringent NOx limits as low as 11 ppmv for non-agricultural operations spark-ignited engines.

Substantial emission reductions from agricultural IC engines have also been achieved through a combination of regulatory efforts and incentive actions. Rule 4702 has effectively reduced emissions from agricultural engines by 84% since 2005.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities that are projected to provide 1.4 tons NOx per day of additional emissions reductions towards the District's aggregate plan commitment:

- Non-Agricultural IC Engines: Work with affected operators to further reduce NOx emissions from non-ag IC engines to the extent that such controls are technologically achievable and economically feasible. Technologies evaluated with the potential to further reduce emissions include the installation of 3-way catalytic reduction for rich-burn IC engines and selective catalytic reduction for lean-burn IC engines. While the analysis above shows that many control technologies are not cost-effective, potential emission reduction opportunities for further evaluation include:
  - Rich Burn Engines ("not listed above" category): Lower existing limit of 11 ppmv to as low as 7 ppmv
  - Lean Burn Engines ("not listed above" category): Lower existing limit of 11 ppmv to as low as 5 ppmv
  - Limited Use Rich/Lean Burn: Lower existing limits of 25 and 65 ppmv to as low as 11 ppmv

- Agricultural IC Engines: Work with agricultural sources to further reduce NOx emissions through incentive-based/regulatory approach as technologically and economically feasible. While the analysis above demonstrates that the various control technologies are generally not cost-effective without financial assistance, and may not be technologically feasible for remote ag installations, potential emission reduction opportunities for further evaluation include:
  - Replacement of spark-ignited agricultural engines with electric motors where access to electricity is available, or Tier 4-equivalent engine technologies through incentive-based approach coupled with regulatory backstop to encourage participation.
  - Replacement of Tier 3 compression-ignited agricultural engines with electric motors where access to electricity is available, or Tier 4-equivalent engine technologies through incentive-based approach to achieve additional emissions reductions where cost-effective.

The proposed commitments by the District and CARB will each achieve an aggregate emission reduction of direct PM2.5 and NOx. While the commitments include estimates of the emission reductions from each individual measure, final measures as proposed for adoption into the state implementation plan (SIP) may provide more or less emission reductions. The aggregate commitment will guarantee that the total emission reductions will be achieved to attain each NAAQS as expeditiously as practicable.

Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters

The District takes a multidimensional and proactive approach to reducing emissions in the Valley. This philosophy is especially true for reducing emissions from residential wood burning; with a combination of regulatory controls through Rule 4901, rigorous public outreach and education efforts, *Check Before You Burn* program, and the District's Burn Cleaner Wood Stove Change-out Program (Burn Cleaner Program). The District's approach to reducing emissions from residential wood burning empowers Valley residents to play a major role in reducing emissions at almost no increased cost, and, in many cases, with savings in heating-related energy costs. Control measure analysis in Appendix C confirms this rule implements the most stringent measures feasible in its current form, additional components to the residential wood burning strategy go beyond MSM.

Through the District's *Check Before You Burn* program, the District has declared and enforced episodic wood burning curtailments since 2003. When ambient PM2.5 concentrations in a specific county are forecasted to be at or above 20 µg/m^3, the District only allows registered or exempt units within that county to burn that day. The tiered compliance thresholds in Rule 4901, which allow additional burn days for District registered EPA-certified devices, encourages the transition from high-polluting devices and open hearth fireplaces to cleaner alternatives. *Check Before You Burn* and District Rule 4901 reduce harmful species of PM2.5 when and where those reductions are most needed - in urbanized areas when the local weather conditions are forecast to inhibit particulate matter dispersion.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, this measure would further reduce emissions by implementing a more stringent wood burning curtailment program as follows:

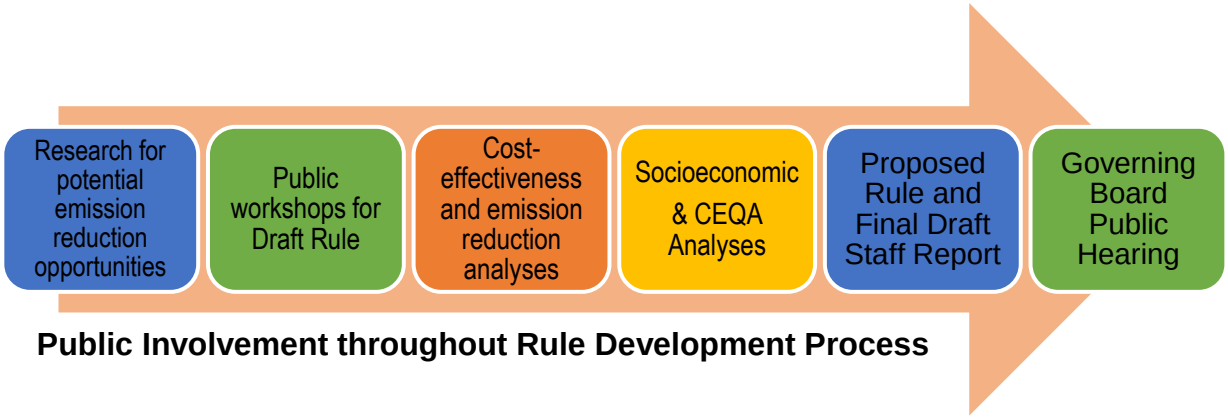
- Lower curtailment levels in targeted hot spot areas (Fresno County, Kern County except Frazier Park, other areas as necessary for attainment)
  - No burn for non-registered units at or above 12 µg/m^3
  - No burn for all devices above 35 µg/m^3
- Maintain current curtailment levels in rest of Valley
  - No burn for non-registered units at or above 20 µg/m^3
  - No burn for all devices above 65 µg/m^3
- Offer enhanced incentives in hot-spot areas
  - In hot-spot areas, incentive will only be provided for natural gas replacements
  - Enhanced levels of incentives provided in hot-spot areas to fund the full replacement of wood burning devices with natural gas units

- Continue to offer current level of incentives Valleywide in non-hot-spot areas
- Prohibit wood-burning devices in new construction (at higher elevations, only allow EPA-certified devices)
- Only allow seasoned wood to be burned
- Enhanced enforcement resources to assure continued high compliance rate
- Enhanced outreach and education efforts to increase awareness of residential wood burning health impacts and District's residential wood burning reduction strategy

4.3.3 RULE DEVELOPMENT PROCESS

After plan adoption, the District adopts or amends rules per the plan's regulatory control measure commitments. In these efforts, the District is committed to a transparent public process that includes stakeholder, industry, and other-agency input at every step possible.

Figure 4-1 Rule Development Process



Contrasting the broader plan development effort, the rule development process allows greater focus on a single sector or technology area. Early in the rule development process, prior to preparing a draft rule, staff researches technologies and explores options for emissions reductions, gathering preliminary data and performing literature reviews of relevant studies. Through a series of public workshops and focus group meetings, staff presents draft rule concepts and receives feedback on specific technology costs, technical insight, and general public comments. Staff uses this information gathering and discussion to refine the rule throughout the rule development process. Using this iterative process of gathering the most up-to-date cost and technical information, staff analyzes cost-effectiveness and potential emissions reductions. These analyses are shared with the public throughout the rule development process.

During the ongoing public workshop process, the District enlists the services of an economic consultant to analyze the proposed rule's socioeconomic impact, pursuant to California Health and Safety Code Section 40728.5. As with draft versions of the rule,

the District gives the public and stakeholders the opportunity to review the analysis and provide further feedback. To the extent possible, the District minimizes significant economic and socioeconomic impacts by evaluating viable alternatives, adjusting proposed limits, or extending compliance schedules.

Staff presents the final draft version of the staff report and proposed rule, including the cost-effectiveness analysis, socioeconomic impact report, emissions reductions analysis, RACT analysis, and California Environmental Quality Assessment (CEQA), to the Governing Board during a public hearing. The Governing Board ultimately determines the balance between air quality improvement and rule impacts when adopting proposed rules.

Once adopted, the District forwards the rule through ARB to EPA for inclusion into the SIP, as appropriate. EPA evaluates the rule, determines if the rule meets federal requirements, and provides an opportunity for further public comment. After this review and comment period, EPA will amend the SIP to include the new rule, as appropriate.

Beyond the rule development and adoption process, District staff will continue to engage the public and affected source operators throughout implementation and compliance. Additionally, District staff continues public outreach and education through notifications to stakeholders of the rule adoption, issuance of compliance bulletins, and assistance through the District's Small Business Assistance program.

4.3.4 Incentive-based Control Measure Commitments

The District's strategy to reach attainment of the federal PM2.5 standards relies heavily on incentive programs to achieve cost-effective emission reductions of direct PM2.5 and PM2.5 precursors. Given the enormity of emissions reductions necessary to bring the Valley into attainment of the 1997, 2006, and 2012 federal PM2.5 standards, the Valley cannot reach attainment through regulatory measures alone, and significant additional emissions reductions through incentive-based measures are necessary. The incentive programs complement regulatory control measures by providing much needed reductions beyond those feasible through regulation, particularly with respect to mobile sources, which the District has limited direct authority to regulate.

District incentive programs have a positive impact on air quality and are also highly successful due to the fact that participation is voluntary and the emission reductions are both highly cost-effective and surplus to the reductions required by the regulatory control measure commitments in attainment plans. Through a combined public/private investment of more than $2 billion, the District has been able to reduce over 140,000 tons of harmful emissions through a variety of cost-effective, voluntary and often first-of-their-kind incentive programs. Recent audits conducted by CARB and Department of Finance (DOF) have confirmed that the District's programs are fiscally sound and are "efficiently and effectively achieving their emission reduction objective."

In crafting the new attainment plans, the District explores all feasible opportunities to further reduce stationary sources emissions. However, due to the maturity and

effectiveness of District prohibitory rules, the Valley is reaching the point of diminishing returns from additional stationary source control measures. The magnitude of potential reductions from stationary sources is minute compared to reductions needed to attain federal PM2.5 and ozone standards. The District, CARB, and EPA agree that the bulk of emission reductions needed for attainment will have to come from mobile sources, primarily through the deployment of incentive-based measures. Additionally, unlike attainment plans for federal ozone standards, attainment plans for PM2.5 standards are not able to rely on "black box" reductions from yet-to-be identified technologies and measures. This plan requires defined and enforceable measures.

Developing aggressive incentive-based control measures that achieve the massive emissions reductions needed to bring the Valley into attainment will require significant funding. While the District has been able to generate significant local funding and successfully advocate for additional state and federal funding, the reductions needed to attain the standards require significant increase in public and private investment. For example, the necessary transition of the heavy duty trucking fleet to near zero emissions technology in the attainment timeline prescribed in the Clean Air Act can only be achieved with significant investment in infrastructure and fleet turnover. Dollars needed are well in excess of current or prospectively scheduled future appropriations.

Historically, states and local air agencies have not been able to obtain SIP credit for incentive-based emissions reductions. When given SIP credit, incentive-based emissions reductions can be used alongside regulatory-based emissions reductions to meet federal CAA requirements, such as demonstrating attainment with federal air quality standards at a future date. The District is proposing to use the emission reductions achieved through three incentives programs for the federal PM2.5 standards attainment demonstration. These measures will include the replacement of agricultural engines with electric motors; a woodstove and fireplace change-out program to emissions from residential wood combustion; and a program to incentivize the installation of pollution control equipment to reduce emissions from commercial underfired charbroilers. In addition, CARB is proposing to adopt SIP-creditable incentive measures for mobile sources in the Valley.

4.4 CARB Emission Reduction Commitment for the San Joaquin Valley

[*This section provided by the California Air Resources Board*]

CALIFORNIA AIR RESOURCES BOARD EMISSION REDUCTION COMMITMENT FOR THE SAN JOAQUIN VALLEY

CARB's existing mobile source control program has achieved substantial reductions in in the Valley, and will continue to provide further emission reductions from ongoing implementation. Since 2000, NOx and PM2.5 emissions from mobile sources have been reduced by over 60 percent. Continued implementation of CARB's current mobile source programs will result in significant further reductions by 2025, reducing NOx

emissions from 2013 levels by 55 percent and PM2.5 emissions by nearly 40 percent.

The *2016 State Strategy for the State Implementation Plan* (2016 State SIP Strategy),[16] adopted by the CARB Board in March 2017, established Valley emission reductions commitments for ozone in 2031 and acknowledged that more emission reductions would be identified to meet PM2.5 standards in the Valley. CARB staff has further refined the final emission reduction needs and strategies, including funding mechanisms, to accelerate turnover to the technologies identified in the 2016 State SIP Strategy. This also includes efforts to reflect the benefits of additional transformational efforts underway in the Valley as part of other planning efforts that are anticipated to provide criteria emission reduction co-benefits. As an outcome of that process, the *San Joaquin Valley Supplement to the 2016 State Strategy for the State Implementation Plan* (Valley State SIP Strategy) includes updates to certain measures in the 2016 State SIP Strategy and proposes additional mobile source measures needed for the Valley's PM2.5 SIP. Appendix ?? further describes the updated 2016 State SIP Strategy measures and the Proposed State Measures for the Valley.

The measures in the Valley State SIP Strategy build upon the regulatory measures in the 2016 State SIP Strategy and accelerate turnover to the next generation of cleaner technologies in the Valley. The updated measures include new requirements that would ensure that on-road, heavy-duty vehicles remain as clean as possible throughout their lifetime, and the new incentive measures accelerate the turnover of agricultural tractors, heavy-duty on-road vehicles, and off-road equipment. Given their contribution to ambient PM2.5 levels in the Valley, District measures to achieve additional reductions from local sources of directly emitted PM2.5 will also be critical.

Combined, the actions in the 2016 State SIP Strategy and the Valley State SIP Strategy provide the share of mobile source reductions needed for attainment. Table 1 summarizes the combined reductions that will accrue through implementation of the current control program, the measures committed to in the 2016 State SIP Strategy, and the measures in the Valley State SIP Strategy. CARB's science-based assessment of a strategy focusing on both direct PM2.5 and NOx suggests emissions will need to be reduced from 2013 levels by 189 tpd NOx and 5.5 tpd PM2.5 in 2024, and 194 tpd NOx and 5.6 tpd PM2.5 in 2025.

Table 4-3 Emission Reductions from State Measures

	2024		2025	
	NOx (tpd)	**PM2.5** (tpd)	**NOx** (tpd)	**PM2.5** (tpd)
Current Control Program	157	4.6	162	4.7
Measures	32	0.9	32	0.9
2016 State SIP Strategy Measures	*9*	*0.1*	*12*	*0.1*

[16] CARB (2017) "Revised Proposed 2016 State Strategy for the State Implementation Plan (State SIP Strategy)" https://www.arb.ca.gov/planning/sip/2016sip/2016sip.htm

	2024		2025	
Proposed State Measures for the Valley	*23*	*0.8*	*20*	*0.8*
Total Reductions	189	5.5	194	5.6

Together with the reductions from the current control program and the 2016 State SIP Strategy, the Valley State SIP Strategy is designed to achieve the mobile source NOx reductions necessary for the Valley's PM2.5 attainment needs.

The CARB commitment consists of two components:

1. A commitment to bring to the CARB Board or take action on the Proposed State Measures for the Valley; and
2. A commitment to achieve aggregate emission reductions in 2024 and 2025.

The commitment for the Valley would be submitted into the California SIP and would become federally enforceable upon approval by U.S. EPA. While the comprehensive mobile strategy for the San Joaquin Valley discussed in this document proposes a range of measures and indicates that CARB will undertake various actions, it remains a CARB staff proposal at this stage. The proposed commitment is subject to CARB's formal approval process and will not be final until the CARB Board formally takes action on the Valley State SIP Strategy.

4.4.1 Commitment to Act on Proposed State Measures for the Valley

Table 2 shows the full list of State measures and schedule for consideration to support attainment of federal PM2.5 standards in the Valley. The CARB Board has already approved the commitment for the 2016 State SIP Strategy measures and CARB is augmenting that commitment with additional State measures for the Valley. CARB staff proposes to commit to bring to the Board or take action on the list of Proposed State Measures for the Valley shown in the bottom portion of Table 2. CARB staff will initiate a SIP-creditable measure development process for each proposed measure according to the schedule outlined. This development process will provide additional opportunity for public and stakeholder input, as well as ongoing technology review, and assessment of costs and environmental impacts.

Table 4-4: State Measures and Schedule for the San Joaquin Valley

Measures	Agency	Action	Implementation Begins
2016 State SIP Strategy Measures			
Advanced Clean Cars 2 Reduced ZEV Brake and Tire Wear	CARB	2020 – 2021	2026
Lower In-Use Emission Performance Level:	CARB	2017 – 2020	2018 +
Lower Opacity Limits for Heavy-Duty Vehicles	CARB	2018	2018 – 2024
Amended Warranty Requirements for Heavy-Duty Vehicles	CARB	2018	2022
Heavy-Duty Vehicle Inspection and Maintenance Program	CARB	2020	2022 +
Low-NOx Engine Standard – California Action	CARB	2019	2023
Low-NOx Engine Standard – Federal Action	U.S. EPA	2019	2024
Innovative Clean Transit	CARB	2018 – 2019	2020
Advanced Clean Local Trucks (Last Mile Delivery)	CARB	2019	2020
Zero-Emission Airport Shuttle Buses	CARB	2018	2023
More Stringent National Locomotive Emission Standards	U.S. EPA	2017	2023 +
Zero-Emission Off-Road Forklift Regulation Phase 1	CARB	2020	2023
Zero-Emission Airport Ground Support Equipment	CARB	2019	2023
Small Off-Road Engines	CARB	2018 – 2020	2022
Transport Refrigeration Units Used for Cold Storage	CARB	2018 – 2019	2020 +
Low-Emission Diesel Fuel Requirement	CARB	by 2020	2023
Proposed State Measures for the Valley			
Accelerated Turnover of Trucks and Buses Existing Incentive Projects New Incentive Projects	CARB / SJVAPCD	by 2021	ongoing
Accelerated Turnover of Agricultural Tractors Existing Incentive Projects New Incentive Projects	CARB / SJVAPCD	by 2020	ongoing
Cleaner In-Use Agricultural Equipment	CARB	2025	2030
Accelerated Turnover of Off-Road Equipment New Incentive Projects	CARB / SJVAPCD	by 2021	ongoing

4.4.2 COMMITMENT TO ACHIEVE AGGREGATE EMISSION REDUCTIONS

The 2016 State SIP Strategy included an initial commitment to achieve an aggregate emission reduction of 8 tpd of NOx in the Valley by 2031, which serves as a down payment on the total emission reductions needed for the Valley's attainment of federal standards. This document proposes a commitment to achieve the aggregate emission reductions specified in Table 3 by 2024 and 2025.
CARB staff proposes to commit to achieve, in aggregate, 32 tpd of NOx emission reductions and 1 tpd of PM2.5 emission reductions in 2024, with those same emission reduction commitments carried through to 2025. These measures, in conjunction with the existing control program, identify all of the reductions required for the Valley's PM2.5 attainment needs. These measures reflect a combination of State actions and petitions for federal action to establish the policy and regulatory mechanisms to bring the needed advanced technologies into the California vehicle and equipment fleet, while pairing these actions with incentive and other programs to strategically accelerate the penetration of the cleanest technologies in each sector.

CARB's aggregate emission reduction commitment may be achieved through a combination of actions including but not limited to: the implementation of control measures; the expenditure of local, State or federal incentive funds; or through the implementation of other enforceable measures. In some cases, actions by federal agencies will be needed. CARB will include these emission reductions in its aggregate commitment to ensure that reductions are achieved regardless of federal action. For example, if a federal heavy-duty low-NOx engine standard is not established, CARB will look to achieve the necessary reductions from other source categories, such as stationary sources. In other cases, programmatic approaches must be developed and funding secured to achieve the reductions outlined.

While Table 3 includes estimates of the emission reductions from each of the individual measures, final measures as proposed by staff to the Board or adopted by the Board may provide more or less than the initial emission reduction estimates. CARB's overall commitment is to achieve the total emission reductions necessary to attain the federal air quality standards while reflecting the combined reductions from the existing control strategy and new measures. Therefore, if a particular measure does not get its expected emission reductions, the State is still committed to achieving the total aggregate emission reductions. If actual emission decreases occur that exceed the projections reflected in the current emissions inventory and the 2016 State SIP Strategy, CARB will submit an updated emissions inventory to U.S. EPA as part of a SIP revision. The SIP revision would outline the changes that have occurred and provide appropriate tracking to demonstrate that aggregate emission reductions sufficient for attainment are being achieved through enforceable emission reduction measures.

Table 4-5: San Joaquin Valley Expected Emission Reductions from State Measures

Reductions shown in tons per day (tpd)

Measures	2024		2025	
	NOx (tpd)	PM2.5 (tpd)	NOx (tpd)	PM2.5 (tpd)
2016 State SIP Strategy Measures				
Advanced Clean Cars 2	--	--	--	--
Reduced ZEV Brake and Tire Wear	--	NYQ	--	NYQ
Lower In-Use Emission Performance Level:	6.8	<0.1	6.8	<0.1
Lower Opacity Limits for Heavy-Duty Vehicles				
Amended Warranty Requirements for Heavy-Duty Vehicles				
Heavy-Duty Vehicle Inspection and Maintenance Program				
Low-NOx Engine Standard – California Action	0.7	--	2	--
Low-NOx Engine Standard – Federal Action	0.7	--	2	--
Innovative Clean Transit	<0.1	<0.1	<0.1	<0.1
Advanced Clean Local Trucks (Last Mile Delivery)	<0.1	<0.1	<0.1	<0.1
Zero-Emission Airport Shuttle Buses	NYQ	NYQ	NYQ	NYQ
More Stringent National Locomotive Emission Standards	0.1	<0.1	0.3	<0.1
Zero-Emission Off-Road Forklift Regulation Phase 1	--	--	--	--
Zero-Emission Airport Ground Support Equipment	<0.1	<0.1	<0.1	<0.1
Small Off-Road Engines	0.1	<0.1	0.2	<0.1
Transport Refrigeration Units Used for Cold Storage	NYQ	NYQ	NYQ	NYQ
Low-Emission Diesel Fuel Requirement	0.8	0.1	1	0.1
Total Reductions from 2016 State SIP Strategy Measures	**9**	**0.1**	**12**	**0.1**
Proposed State Measures for the Valley				
Accelerated Turnover of Trucks and Buses	10	NYQ	8	NYQ
Existing Incentive Projects				
New Incentive Projects				
Accelerated Turnover of Agricultural Tractors				
Existing Incentive Projects	3	0.2	2	0.2
New Incentive Projects	8	0.6	8	0.6
Cleaner In-Use Agricultural Equipment	NYQ	NYQ	NYQ	NYQ
Accelerated Turnover of Off-Road Equipment				
New Incentive Projects	2	NYQ	1.5	NYQ
Total Reductions from Proposed State Measures for Valley	**23**	**0.8**	**20**	**0.8**
Aggregate Emission Reductions	**32**	**1**	**32**	**1**

"NYQ" denotes emission reductions are Not Yet Quantified

"—" denotes no anticipated reductions

The measures as proposed by staff to the Board or adopted by the Board may provide more or less reductions than the amount shown.

4.4.3 Implementing the State Measures for the Valley

Implementation of the current control program and new regulatory actions to establish requirements for cleaner technologies comprise the core of the overall strategy for the Valley. The remaining increment of reductions will be achieved through the suite of actions to accelerate the penetration of cleaner technologies through incentive programs. These actions will also further California's efforts to meet climate and risk reduction goals and enhance the continuing transformation to a cleaner, more efficient transportation system.

4.4.4 2016 State SIP Strategy Measures

4.4.4.1 Advanced Clean Cars 2

The *Advanced Clean Cars 2* measure is designed to ensure that near-zero and zero-emission technology options continue to be commercially available, with electric driving range improvements to address consumer preferences and maximize electric vehicle miles travelled. The regulation may include lowering fleet emissions further beyond the super-ultra-low-emission vehicle standard for the entire light-duty fleet through at least the 2030 model year, and look at ways to improve real world emissions through implementation programs. Additionally, new standards may be considered to further increase the sales of zero-emission vehicles (ZEV) and plug-in hybrid electric vehicles beyond the levels required in 2025.

4.4.4.2 Reduced ZEV Brake and Tire Wear

As an updated element of the *Advanced Clean Cars 2* measure, *Reduced ZEV Brake and Tire Wear* is designed to evaluate and quantify the benefits that will accrue from the expanded number of zero-emission vehicles and plug-in hybrid electric vehicles operating in California. As these vehicles continue to become more commercially available, the new technologies they employ, including regenerative braking and lower rolling resistance tires, can reduce criteria pollutant emissions from brake and tire wear. CARB staff would quantify these previously unaccounted-for criteria pollutant benefits of the Advanced Clean Cars program for SIP purposes in order to better inform future plans.

4.4.4.3 Lower In-Use Emission Performance Level for Heavy-Duty Vehicles

Since the adoption of the 2016 State SIP Strategy in March 2017, CARB staff has made substantial progress in refining its approach to controlling the in-use emissions from the on-road heavy-duty truck fleet, as originally described in the *Lower In-Use Emission Performance Level* 2016 State SIP Strategy measure. The actions initially proposed in the *Lower In-Use Emission Performance Level* measure are now reflected in this document as three separate, but related elements: *Lower Opacity Limits for Heavy-Duty Vehicles*; *Amended Warranty Requirements for Heavy-Duty Vehicles*; and *Heavy-Duty Vehicle Inspection and Maintenance Program*.

4.4.4.4 Lower Opacity Limits for Heavy-Duty Vehicles

The *Lower Opacity Limits for Heavy-Duty Vehicles* element is designed to ensure that in-use, heavy-duty vehicles continue to operate at their cleanest possible level. In May 2018, CARB staff proposed and the Board approved for adoption lower opacity

limits for on-road heavy-duty vehicles which reflect the current emission control technology equipped on today's heavy-duty diesel vehicles. Lowering the opacity limits will ensure that the opacity limits are more representative of current particulate matter emission control technology and that vehicles operating with malfunctioning particulate emission control components are more readily identified and repaired.

4.4.4.5 Amended Warranty Requirements for Heavy-Duty Vehicles

The *Amended Warranty Requirements for Heavy-Duty Vehicles* element is designed to reduce NOx and PM emissions by encouraging vehicle owners to make emission-related repairs. In June 2018, CARB staff proposed and the Board approved for adoption lengthened warranty periods and longer maintenance intervals for on-road heavy-duty vehicles with gross vehicle weight ratings greater than 14,000 pounds. CARB staff plans to develop a second step of lengthened warranty period requirements for on-road heavy-duty vehicles which would be proposed for Board consideration in late 2019. Amendment requirements as described could encourage manufacturers to design more durable components.

4.4.4.6 Heavy-Duty Vehicle Inspection and Maintenance Program

The *Heavy-Duty Vehicle Inspection and Maintenance Program* element is designed to ensure that in-use, heavy-duty vehicle emission control components and systems are properly functioning so that these vehicles continue to operate at their cleanest possible levels. CARB staff would develop and propose a regulatory program that reflects the current state of advanced engine and exhaust emission control technologies including on-board diagnostics.

4.4.4.7 Low-NOx Engine Standard

The *Low-NOx Engine Standard* measure is designed to require engine technologies that will substantially lower NOx emissions from on-road heavy-duty vehicles. CARB began development of a new heavy-duty low-NOx emission standard in California in 2016, and Board action is expected in 2019. A California-only low-NOx standard would apply to all vehicles with new heavy-duty engines sold in California starting in 2023. In order to achieve the maximum emission reductions from this measure, CARB included in the 2016 State SIP Strategy a call for U.S. EPA to establish a new federal heavy-duty engine emission standard. Should U.S. EPA fail to initiate a rule development process, CARB would continue with its development and implementation efforts to establish a California-only low-NOx standard. CARB will coordinate its regulatory development efforts with any U.S. EPA regulatory efforts.

4.4.4.8 Innovative Clean Transit

The *Innovative Clean Transit* measure is designed to continue the transition of transit fleets to cleaner technologies to support NOx and GHG emission reduction goals. The measure will consider a variety of approaches to enhance the deployment of advanced clean technology and increase the penetration of the first wave of zero-emission heavy-duty technology into transit applications that are well suited to its use. CARB staff will develop and propose an Innovative Clean Transit measure with a combination of mechanisms, including incentives, which would result in transit fleets purchasing advanced technology buses during normal replacement and using renewable fuels when contracts are renewed.

4.4.4.9 Advanced Clean Local Trucks (Last Mile Delivery)

The *Advanced Clean Local Trucks* measure is designed to increase the penetration of advanced clean technology into applications that are well suited to its use. CARB staff would develop and propose a regulation that would result in the use of low-NOx engines and the purchase of zero-emission trucks for certain class 3-7 last mile delivery trucks in California. This measure would begin in 2020 with a small scale deployment and gradually ramp up to higher percentages of new vehicles sales.

4.4.4.10 Zero-Emission Airport Shuttle Buses

The *Zero-Emission Airport Shuttle Buses* measure is designed to achieve NOx and GHG emission reductions goals through advanced clean technology, and to increase the penetration of the first wave of zero-emission heavy-duty technology into applications that are well suited to its use. Like transit buses, the inclusion of zero-emission airport shuttles would serve as a stepping stone to encourage broader deployment of zero-emission technologies in the on-road sector. CARB staff would develop and propose a regulation or other measures to deploy zero-emission airport shuttles in order to further support market development of zero-emission technologies in the heavy-duty sector.

4.4.4.11 More Stringent National Locomotive Emission Standards

The *More Stringent National Locomotive Emission Standards* measure is designed to reduce emissions from new and remanufactured locomotives. Pursuant to this measure, in 2017, CARB petitioned U.S. EPA for new Tier 5 national locomotive emission standards for new locomotives and more stringent national requirements for remanufactured locomotives. CARB staff estimates that U.S. EPA could require manufacturers to implement the new locomotive emission regulations as early as 2023 for remanufactured locomotives, and 2025 for newly manufactured locomotives. A new federal standard could also facilitate development and deployment of zero-emission track mile locomotives and zero-emission locomotives by building incentives for those technologies into the regulatory structure.

4.4.4.12 Zero-Emission Off-Road Forklift Regulation Phase 1

The *Zero-Emission Off-Road Forklift Regulation Phase 1* measure is designed to increase penetration of ZEVs in off-road applications, advance ZEV commercialization, and to set a market signal to technology manufacturers and investors. CARB staff would develop and propose a regulation with specific focus on forklifts with lift capacities equal to or less than 8,000 pounds for which zero-emission technologies have already gained appreciable customer acceptance and market penetration.

4.4.4.13 Zero-Emission Airport Ground Support Equipment

The *Zero-Emission Airport Ground Support Equipment* measure is designed to increase the penetration of the first wave of zero-emission heavy-duty technology in applications that are well suited to its use, and to facilitate further technology development and infrastructure expansion. A conservative strategy would rely on incentives and natural turnover, along with current in-use requirements, to replace equipment where electric replacements are readily available. A more aggressive turnover and implementation strategy could utilize a memorandum of understanding, regulation, or a combination thereof, along with incentives for demonstration, to ensure an accelerated transition to

zero-emission equipment. Under this measure, CARB staff would develop and propose a regulation to accelerate the transition of diesel and large spark ignition airport ground support equipment to zero-emission technology.

4.4.4.14 Small Off-Road Engines

The *Small Off-Road Engines* (SORE) measure is designed to reduce emissions from small off-road engines, and to increase the penetration of zero-emission technology. SORE that are subject to CARB regulations are used in residential and commercial lawn and garden equipment, and other utility applications. CARB will develop and propose tighter exhaust and evaporative emission standards, encourage increased use of zero-emission equipment, and enhance enforcement of current emission standards for SORE. Strategies will be developed for transitioning to zero-emission technologies, including an initial focus on incentives for use of zero-emission equipment, coupled with increasingly stringent emission standards for criteria pollutants and GHGs.

4.4.4.15 Transport Refrigeration Units Used for Cold Storage

The *Transport Refrigeration Units Used for Cold Storage* measure is designed to advance zero and near-zero emission technology commercialization by increasing the early penetration of hybrid electric and electric standby-equipped transport refrigeration units used for cold storage, and supporting the needed infrastructure developments. CARB staff would develop a regulation to reduce NOx, PM, and GHG emissions by reducing the amount of time that transport refrigeration units operate using internal combustion engines while refrigerated trucks, trailers, and shipping containers are parked at certain California facilities and other locations.

4.4.4.16 Low-Emission Diesel Fuel Requirement

The *Low-Emission Diesel Fuel Requirement* measure is designed to reduce emissions from the portion of the heavy-duty fleet that will continue to operate on internal combustion engines. CARB staff would bring to the Board a proposed low-emission diesel standard that would require diesel fuel providers to steadily decrease criteria pollutant emissions from their diesel products until 2031. The standard would complement existing CARB programs that incentivize increased use of renewable fuels as substitutes for conventional fuels, and will focus on more completely transitioning the fuel mix to a cleaner mix of diesel substitute fuels.

4.4.5 PROPOSED STATE MEASURES FOR THE VALLEY

4.4.5.1 Accelerated Turnover of Trucks and Buses

The *Accelerated Turnover of Trucks and Buses* measure is designed to provide incentive funding to accelerate the penetration of near-zero and zero-emission engines beyond the rate of natural turnover achieved through implementation of other measures identified for on-road heavy-duty trucks and buses. Using existing funding mechanisms, the measure would target technologies that meet CARB's current optional low-NOx standard and the future low-NOx emission standard requirements. CARB staff would also develop a measure to use innovative funding programs to target technologies that exceed current standards.

4.4.5.2 Accelerated Turnover of Agricultural Tractors

The *Accelerated Turnover of Agricultural Tractors* measure is designed to use existing and new incentive funding programs to help accelerate the penetration of cleaner engines used in agricultural equipment beyond the rate of natural turnover. A portion of these SIP-creditable reductions would come from the quantification of reductions from projects already funded and executed to date that will continue to provide SIP-creditable reductions through 2024 and 2025. The remaining reductions correspond to accelerated turnover of additional tier 0 and 1 tractors using existing and innovative incentive funding programs.

4.4.5.3 Cleaner In-Use Agricultural Equipment

The *Cleaner In-Use Agricultural Equipment* measure is a rule designed to increase the penetration of cleaner agricultural equipment used in California, including advancing zero-emission technology where feasible. CARB staff would develop a regulation to serve as an overall emission reduction target and to act as a catalyst for attracting early replacement of agricultural equipment through incentives. The combination of this rule, incentive programs, and significant lead-time ensure that cleaner agricultural equipment will be used in the Valley.

4.4.5.4 Accelerated Turnover of Off-Road Equipment

The *Accelerated Turnover of Off-Road Equipment* measure is designed to provide incentive funding to accelerate the penetration of near-zero and zero-emission construction equipment, transport refrigeration units, and forklifts beyond the rate of natural turnover achieved through implementation of the other proposed measures identified for off-road equipment. CARB staff would use Carl Moyer and other innovative incentive funding programs to help increase the penetration of cleaner engine technology, achieving additional NOx reductions through accelerating the turnover of off-road engines.

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