

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT



Appendix IV-A

SCAQMD's Stationary and Mobile Source Control Measures

2016 AIR QUALITY MANAGEMENT PLAN



March 2017

**FINAL 2016 AQMP
APPENDIX IV-A**

**SCAQMD'S STATIONARY AND MOBILE SOURCE CONTROL
MEASURES**

MARCH 2017

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Introduction

This Appendix describes the South Coast Air Quality Management District (SCAQMD or District) staff's proposed stationary and mobile source control measures to be included in the Draft 2016 AQMP. Control measures presented in this appendix are 8-hour ozone control measures and PM_{2.5} control measures designed to achieve the ozone and PM_{2.5} National Ambient Air Quality Standards (NAAQS) by statutory deadlines. The proposed 8-hour ozone control measures are further divided into stationary source ozone measures and mobile source ozone measures that are designed to reduce the reliance on long-term federal Clean Air Act (CAA) Section 182(e)(5) emission reductions in the 2007 AQMP. The measures are based on a variety of incentive programs and control strategies that are at or near commercial availability and/or are deemed technologically feasible in the next few years. The SCAQMD will prioritize distribution of incentive funding in Environmental Justice (EJ) areas and seek opportunities to expand funding to benefit the most disadvantaged communities.

8-Hour Ozone Control Measures

Fifteen stationary source measures and 15 mobile source measures, anticipated to be adopted and implemented within the next 10 to 15 years will assist in attainment of the 8-hour ozone standard by 2031 together with CARB's measures and reductions from federal sources. Twelve stationary source measures target NO_x reductions that are further grouped into measure types: stationary source regulatory measures, co-benefits from climate programs, incentive measures, and other measures. Three stationary source measures focus on limited, strategic VOC reductions and four additional measures have corresponding VOC reductions from other ozone or PM measures. SCAQMD's mobile source measures include one emission growth management measure and 14 mobile source measures that are further grouped into four facility-based mobile source measures, five on-road and four off-road source measures, and one incentive program measure. Section 182(e)(5) of the CAA allows "extreme" ozone areas to include measures in their Plan that rely on the development of new technology or advancement of existing technology. These are sometimes referred to as "black box" measures. The 8-hour ozone measures in the 2016 AQMP specify current opportunities for emission reductions and thus are designed to reduce the reliance on the Section 182(e)(5) commitments in the 2007 AQMP.

The 30 proposed 8-hour ozone control measures (15 stationary and 15 mobile) are either new measures or revised measures from previous AQMPs. Tables IV-A-1 and IV-A-2 provide the expected adoption and implementation period, implementing agency, and expected emission reductions achieved for SCAQMD proposed stationary source and mobile source 8-hour ozone measures.

TABLE IV-A-1
SCAQMD Proposed Stationary Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
SCAQMD Stationary Source NOx Measures:					
Stationary Source Regulatory Measures:					
CMB-01	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources [NOx, VOC]	N/A	Ongoing	SCAQMD	2.5 / 6
CMB-02	Emission Reductions from Replacement with Zero or Near-Zero NOx Appliances in Commercial and Residential Applications [NOx]	2018	2020–2031	SCAQMD	1.1 / 2.8
CMB-03	Emission Reductions from Non-Refinery Flares [NOx, VOC]	2018	2020	SCAQMD	1.4 / 1.5
CMB-04	Emission Reductions from Restaurant Burners and Residential Cooking [NOx]	2018	2022	SCAQMD	0.8 / 1.6
CMB-05	Further NOx Reductions from RECLAIM Assessment [NOx]	2022	2025	SCAQMD	0 / 5 ^a
Recognition of Co-Benefits:					
ECC-01	Co-Benefit Emission Reductions from GHG Programs, Policies, and Incentives [All Pollutants]	N/A	Ongoing	Various Agencies	TBD ^b
ECC-02	Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures [NOx, VOC]	N/A	Ongoing	SCAQMD, CEC	0.3 / 1.1
ECC-04	Reduced Ozone Formation and Emission Reductions from Cool Roof Technology [All Pollutants]	N/A	Ongoing	SCAQMD, CEC	TBD ^b
Incentive-Based Measure:					
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [NOx, VOC]	N/A	Ongoing	SCAQMD	1.2 / 2.1

TABLE IV-A-1 (CONCLUDED)
 SCAQMD Proposed Stationary Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
SCAQMD Stationary Source NO_x Measures (continued):					
Other Measures:					
FLX-01	Improved Education and Public Outreach [All Pollutants]	N/A	Ongoing	SCAQMD, Other Parties	N/A ^c
MCS-01	Improved Breakdown Procedures and Process Re-Design [All Pollutants]	TBD	TBD	SCAQMD	N/A ^c
MCS-02	Application of All Feasible Measures [All Pollutants]	TBD	TBD	SCAQMD	TBD ^b
SCAQMD Stationary Source VOC Measures:					
Corresponding VOC Reductions from NO_x and PM Measures:					
ECC-02	Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures [NO _x , VOC]	N/A	Ongoing	SCAQMD	0.07 / 0.29
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [All Pollutants]	N/A	Ongoing	SCAQMD	0.2 / 0.3
CMB-01	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources [NO _x , VOC]	N/A	Ongoing	SCAQMD	1.2 / 2.8
CMB-03	Emission Reductions from Non-Refinery Flares [NO _x , VOC]	2018	2020	SCAQMD	0.4 / 0.4
BCM-10	Emission Reductions from Greenwaste Composting [VOC, NH ₃]	2019	2020	SCAQMD	1.5 / 1.8
Limited, Strategic VOC Control:					
FUG-01	Improved Leak Detection and Repair [VOC]	2019	2022	SCAQMD	2 / 2
CTS-01	Further Emission Reductions from Coatings, Solvents, Adhesives, and Sealants [VOC]	2017/2021	2020–2031	SCAQMD	1 / 2
FLX-02	Stationary Source VOC Incentives [VOC]	N/A	Ongoing	SCAQMD	TBD ^b

^a 5 tpd reduction by 2025

^b TBD are reductions to be determined once the measure is further evaluated, the technical assessment is complete, and inventories and cost-effective control approaches are identified, and are not relied upon for attainment demonstration purposes

^c N/A are reductions that cannot be quantified due to the nature of the measure (e.g., outreach) or if the measure is designed to ensure reductions that have been assumed to occur will in fact occur

TABLE IV-A-2
SCAQMD Proposed Mobile Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
<i>Emission Growth Management Measure:</i>					
EGM-01	Emission Reductions from New Development and Redevelopment Projects [All Pollutants]	2018	2019–2031	SCAQMD	TBD ^a
<i>Facility-Based Mobile Source Measures:</i>					
MOB-01	Emission Reductions at Commercial Marine Ports [NOx, SOx, PM]	2018	2019–2031	SCAQMD	TBD ^b
MOB-02	Emission Reduction at Rail Yards and Intermodal Facilities [NOx, PM]	2018	2019–2031	SCAQMD	TBD ^a
MOB-03	Emission Reductions at Warehouse Distribution Centers [All Pollutants]	2018	2019–2031	SCAQMD	TBD ^a
MOB-04	Emission Reductions at Commercial Airports [All Pollutants]	2018	2019–2031	SCAQMD	TBD ^b
<i>On-Road Mobile Source Measures:</i>					
MOB-05	Accelerated Penetration of Partial Zero-Emission and Zero-Emission Vehicles [VOC, NOx, CO]	N/A	Ongoing	CARB, SCAQMD	TBD ^a
MOB-06	Accelerated Retirement of Older Light-Duty and Medium-Duty Vehicles [VOC, NOx, CO]	N/A	Ongoing	CARB, Bureau of Automotive Repair, SCAQMD	TBD ^a
MOB-07	Accelerated Penetration of Partial Zero-Emission and Zero-Emission Light-Heavy- and Medium-Heavy-Duty Vehicles [NOx, PM]	N/A	Ongoing	CARB, SCAQMD	TBD ^a
MOB-08	Accelerated Retirement of Older On-Road Heavy-Duty Vehicles [NOx, PM]	2018	2019–2031	CARB, SCAQMD	TBD ^a
MOB-09	On-Road Mobile Source Emission Reduction Credit Generation Program [NOx, PM]	2018	2019–2027	CARB, SCAQMD	TBD ^a

TABLE IV-A-2 (CONCLUDED)

SCAQMD Proposed Mobile Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
Off-Road Mobile Source Measures:					
MOB-10	Extension of the SOON Provision for Construction/Industrial Equipment [NOx]	N/A	Ongoing	SCAQMD	2.0 / 2.0
MOB-11	Extended Exchange Program [VOC, NOx, CO]	N/A	Ongoing	SCAQMD	2.9 / 1.0 [NOx]
MOB-12	Further Emission Reductions from Passenger Locomotives [NOx, PM]	Ongoing	2017–2023	SoCal Regional Rail Authority	TBD ^b
MOB-13	Off-Road Mobile Source Emission Reduction Credit Generation Program [NOx, SOx, PM]	2018	2019–2027	SCAQMD	TBD ^a
Incentive Programs Measure:					
MOB-14	Emission Reductions from Incentive Programs [NOx, PM]	N/A	2016–2024	SCAQMD	11 / 7.8 [NOx]

^a Emission reductions will be determined after projects are identified and implemented

^b Submitted into the SIP as part of Rate-of-Progress reporting or in baseline inventories for future AQMP/SIP Revisions

The following sections provide a brief overview of the measure categories for the 8-hour ozone control measures. Detailed descriptions of each measure can be found in Section 1 of this Appendix.

Stationary Source Ozone Measures

Stationary Source Regulatory Measures

There are five proposed stationary source regulatory measures for NOx reductions. The first measure is to reduce NOx emissions from traditional combustion sources, such as diesel back-up generators, by replacing older, high-emitting equipment with new, lower or zero-emitting equipment. The second measure seeks NOx emission reductions from unregulated commercial space heating furnaces and from regulations and incentives to replace existing older boilers, water heaters, and space heating furnaces and other natural gas or liquefied petroleum gas (LPG) equipment with zero emitting or lower NOx technologies. The third measure seeks to utilize excess gas from non-refinery flares in renewable applications. The fourth measure is to seek reductions from commercial restaurant burners and residential cooking appliances, and the last measure would seek NOx reductions transitioning the RECLAIM program into a command and control regulatory structure. These measures call for a priority on maximizing emission reductions utilizing zero-emission technologies where feasible and cost-effective, and near-zero technologies in other applications. Where appropriate, these measures also include the use of incentive funding to complement regulations and accelerate deployment of clean technologies.

Recognition of Co-Benefits

This category includes three co-benefit emission reduction measures from energy and climate change related programs. The first measure seeks emission reductions from existing and further GHG reduction programs and the second measure seeks co-benefits from the improvement of energy efficiency for existing residential and commercial buildings. The third measure seeks reduced ozone formation and emission reductions from cool roof technology.

Incentive-Based Measure

This category includes one proposed incentive-based measure that would seek NO_x reductions through additional enhancements in reducing existing residential building energy use.

Other Measures

There are three proposed “other” measures. One measure would seek improved education, public outreach, and incentives for consumers to contribute to clean air efforts. The second measure proposes breakdown limitations that comply with U.S. EPA policy. The third measure would require all feasible measures for stationary sources on an ongoing basis.

Corresponding VOC Reductions from NO_x and PM Measures

There are a total of four 8-hour ozone measures in this category. These measures are co-benefits from four NO_x measures (ECC-02: Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures, ECC-03: Additional Enhancements in Reducing Existing Residential Building Energy Use, CMB-01: Transition to Zero and Near-Zero Emission Technologies for Stationary Sources, and CMB-03: Emission Reductions from Non-Refinery Flares) and one PM_{2.5} measure (BCM-10: Emission Reductions from Greenwaste Composting).

Limited, Strategic VOC Control Measures

Three VOC control measures are proposed in this category. One control measure targets fugitive VOC emissions with improved leak detection and repair. Another focuses on reducing VOC emissions from VOC-containing products such as coatings, solvents, adhesives, and sealants. A final measure involves incentives to lower VOC emissions from stationary sources.

Mobile Source Ozone Measures

SCAQMD staff analyzed the need to accelerate the penetration of cleaner engine technologies and assist in implementing CARB’s proposed mobile source strategy. Specifically, there are several measures under the proposed State SIP Strategy that are titled “Further Deployment of Cleaner Technologies” (see Appendix IV-B), which identify the SCAQMD as an implementing agency along with CARB and U.S. EPA. CARB indicated that the implementation of the “Further Deployment” measures is based on a combination of incentive funding, development of regulations, and quantification of emission reduction benefits from operational efficiency actions and deployment of autonomous vehicles, connected vehicles, and intelligent transportation systems. As such, the SCAQMD mobile source measures proposed in this Appendix will help implement the “Further Development” measures. In addition, the SCAQMD is implementing several incentives funding programs that have resulted in

early emission reductions (e.g., the Carl Moyer Memorial Air Quality Standards Attainment Program, the Surplus Off-Road Opt-In for NO_x (SOON) program, and Proposition 1B – Goods Movement Emissions Reduction Program). The emission reduction benefits of the funding programs are quantified and are proposed to be included as part of the overall emission reductions for attainment of the NAAQS.

The proposed SCAQMD mobile source measures are based on a variety of control technologies that are commercially available and/or technologically feasible to implement in the next several years. The focus of these measures includes accelerated retrofits or replacement of existing vehicles or equipment, acceleration of vehicle turnover through voluntary vehicle retirement programs, and greater use of cleaner fuels in the near-term. The measures will encourage greater deployment of commercially-available zero-emission vehicle and equipment technologies such as plug-in hybrids, battery-electric, and fuel cells to the maximum extent feasible as such technologies are commercialized, and near-zero emission technologies everywhere else. In the longer-term, there is a need to significantly increase the penetration and deployment of near-zero and zero-emission vehicles, greater use of cleaner, renewable fuels (either alternative fuels or new formulations of gasoline and diesel fuels), and additional emission reductions from federal and international sources such as locomotives, ocean-going vessels, and aircraft.

In implementing the SCAQMD mobile source measures, the SCAQMD will focus on collaborative approaches to achieve additional emission reductions to help implement the proposed State “Further Deployment” measures. During the public process (which is, for all intents and purposes, the same SCAQMD process to develop rules to implement the AQMP control measures), SCAQMD staff will assess progress in identifying actions (voluntary and regulatory) that will result in additional emission reductions. SCAQMD staff will report to the Governing Board on the progress on a routine basis, but no later than six months after the adoption of the Final 2016 AQMP. If progress is not made in identifying specific actions within one year from adoption of the Final 2016 AQMP, the SCAQMD staff will recommend whether the Governing Board consider proceeding with the development of rules within its existing legal authority or seek additional authority to adopt and implement measures to cost-effectively reduce mobile source emissions. Such authority includes development of new or expanded clean vehicle fleet rules or indirect source regulations. Table IV-A-3 provides a schedule for the public process, which includes periodic progress reports to the SCAQMD Mobile Source Committee, convening working groups, and milestones to achieve during the one year period.

TABLE IV-A-3

Schedule and Milestones for the Mobile Source Measure Public Process

Public Process Activity	Time from Final Approval of the 2016 AQMP
Report to SCAQMD Mobile Source Committee on Process to Move Forward	<ul style="list-style-type: none"> • Within One Month
Convene Working Groups for MOB-01 through MOB-05 and EGM-01	<ul style="list-style-type: none"> • Within One Month
Working Group Meeting <ul style="list-style-type: none"> • Define Objectives • Seek initial input on the types of actions with potential criteria pollutant reductions • Identify existing actions with potential emission reductions • Identify future actions with potential emission reductions • Develop model quantification methodologies for emission reductions associated with identified actions • Quantify potential emission reductions • Develop mechanisms to ensure reductions are real, surplus, and enforceable 	<ul style="list-style-type: none"> • Ongoing on a Monthly Basis
Report to SCAQMD Mobile Source Committee on progress	<ul style="list-style-type: none"> • Six Months
Report to SCAQMD Mobile Source Committee/Governing Board on progress and whether to continue with process or recommend formal rule development	<ul style="list-style-type: none"> • 12 Months

Emission Growth Management Measure

There is one proposed control measure within this category. A provision under state law requires the SCAQMD to implement “all feasible measures” including evaluating rules and regulations adopted by other agencies. The San Joaquin Valley Air Pollution Control District (SJVAPCD) adopted Rule 9510 – Indirect Source Review. As such, the measure proposed in this category will evaluate the applicability of Rule 9510 in the South Coast Air Basin and Coachella Valley. The proposed measure addresses emission reductions (as compared to emission increases that would otherwise occur) from new or redevelopment projects. The SCAQMD will encourage or require developers and local agencies to participate in a mitigation program and potentially further reduce criteria pollutant emissions. If necessary, the SCAQMD may adopt a rule similar to SJVAPCD Rule 9510 or a similar rule.

Facility-Based Mobile Source Measures

With economic growth projected out to 2040 by SCAG, there may be potential increases in emissions associated with mobile sources in the goods movement sector even with the deployment of newer, cleaner vehicles and equipment. As such, four facility-based mobile source control measures are proposed. The first measure focuses on commercial marine ports in the South Coast Air Basin (Basin). Port-related emission sources include on-road heavy-duty trucks, locomotives, ocean-going vessels, commercial harbor craft, and cargo handling equipment. The Ports of Los Angeles and Long Beach (Ports) have been implementing the San Pedro Bay Ports Clean Air Action Plan (CAAP) since 2006. Implementation of strategies under the CAAP has led to early emission reductions as State, federal, and international regulations are developed. The Ports are in the process of updating the CAAP to implement long-term sustainable strategies that potentially could result in criteria pollutant and greenhouse gas emission reductions, while improving operational efficiencies and reducing dependence on fossil-based fuels. To the extent that criteria pollutant emission reductions associated with such actions can be quantified, a mechanism will be developed that recognizes the actions and credits the associated emission reductions into the SIP. To the extent that the reductions are SIP creditable, enforceable commitments must be made to ensure that the reductions are real, surplus, and enforceable (as defined by U.S. EPA). Such commitments may take the form of a regulation or other enforceable mechanisms that will be approvable by U.S. EPA.

The second measure focuses on mobile source related vehicles and equipment operating in rail yards and intermodal facilities in the Basin. Such vehicles and equipment include cargo handling equipment, locomotives, on-road heavy-duty trucks, and passenger cars. The third and fourth measures focus on warehouse distribution centers and commercial airports. An approach similar to the marine ports measure will be taken to quantify criteria pollutant emission reductions associated with activities occurring at these facilities.

As part of the public process in implementing the four measures, the SCAQMD staff will be assessing the progress in identifying and quantifying emission reductions that occur at the various facilities. If after one year from the date of adoption of the 2016 AQMP, voluntary actions or actions from CARB (since these measures are to help implement CARB's "Further Development" measures) or U.S. EPA are not identified to any significant extent or the identified actions are not implemented in a timely manner to help meet federal air quality standards, the SCAQMD staff may recommend that the SCAQMD Governing Board consider regulatory approaches or other enforceable mechanisms to achieve the emission reductions from the mobile source sectors associated with the various facilities.

On-Road Mobile Source Measures

Five on-road mobile source control measures are proposed. The first two measures focus on on-road light- and medium-duty vehicles operating in the Basin. The first measure would implement programs to accelerate the penetration and deployment of partial zero-emission and zero-emission vehicles in the light- and medium-duty vehicles categories. The second control measure would seek to accelerate retirement of older gasoline and diesel powered vehicles up to 8,500 pounds gross vehicle weight rating (GVWR). These vehicles include passenger cars, sports utility vehicles, vans, and light-duty pick-up trucks.

The remaining three measures focus on heavy-duty vehicles. The first of these measures seeks additional emission reductions from the early deployment of partial zero-emission and zero-emission light- and medium-heavy-duty vehicles with gross vehicle weights between 8,501 pounds to 33,000 pounds. The second control measure for heavy-duty vehicles seeks additional emission reductions from older, pre-2010 heavy-duty vehicles beyond the

emission reductions targeted in CARB's Truck and Bus Regulation. Additional emission reductions beyond the compliance requirements of the Truck and Bus Regulation could be achieved as affected fleets purchase trucks with engines that meet an optional NOx emissions standard to replace their existing heavy-duty vehicles. In addition, fleets or trucks that are not subject to the Truck and Bus Regulation would be targeted through incentives or through regulatory actions that are within the SCAQMD's legal authority such as the SCAQMD's Rule 1190 series clean vehicle fleet rules, to purchase trucks with engines meeting an optional NOx emissions standard. The third measure will seek to accelerate the introduction of zero and near-zero emission on-road heavy-duty trucks through mobile source emission reduction credits generating programs. SCAQMD Credit Rules 1612 and 1612.1 have been in place since 1995 and 2001, respectively. However, the current versions of the rules must be revised to reflect heavy-duty vehicle technologies available today and the near-future. Mobile source emission reduction credits generated under these rules would only be available to help facilities affected by the facility-based measures (MOB-01 through MOB-04 and EGM-01). The credits are proposed to not be eligible for offset stationary source emissions.

Off-Road Mobile Source Measures

Four control measures are proposed to seek further emission reductions from off-road mobile sources and industrial equipment. The first measure calls for the continuation of the SOON provision of the Statewide In-Use Off-Road Diesel Fleet Regulation beyond 2023. The SOON provision implemented to-date has realized additional NOx reductions beyond the Statewide regulation. The second measure seeks to continue the successful lawnmower and leaf blower exchange programs and expand the programs to include a greater variety of zero-emission equipment into the commercial lawn and garden maintenance activities. A significant portion of the NOx emissions from lawn and garden equipment are attributed to larger equipment operating on diesel fuel. The extended exchange program will focus on replacing these equipment with newer equipment. The third measure calls for additional emission reductions from passenger locomotives. The Southern California Regional Rail Authority (SCRRA or Metrolink), the region's commuter rail service, is in the process of procuring 40 Tier 4 passenger locomotives. This measure will recognize these efforts and continue the purchase of Tier 4 cleaner locomotives. The fourth measure seeks to accelerate the introduction of zero and near-zero emission off-road equipment through mobile source emission reduction credits generating programs. SCAQMD Rule 1620 has been in place since 1995. However, the current version of the rule needs to be revised to reflect current off-road equipment technologies available today and the near-future. Mobile source emission reduction credits generated under these rules would only be available to help facilities affected by the facility-based measures (MOB-01 through MOB-04 and EGM-01). The credits are proposed to not be eligible for offset stationary source emissions.

Incentive Programs Measure

A measure is proposed to recognize the emission benefits resulting from incentive funding programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program and Proposition 1B. The San Joaquin Valley Air Pollution Control District (SJVAPCD) adopted Rule 9610 to recognize the emission reduction benefits of incentive programs in their region. A similar action is proposed under the current measure. The SCAQMD staff has been working with U.S. EPA and CARB to identify the information and supporting documentation needed in order for U.S. EPA to consider approval of the emission reduction benefits into the SIP. The proposed measure describes six general elements initially identified by U.S. EPA that need to be addressed in order for such benefits to be accounted for in the SIP. Additional documentation and commitments to ensure that the reductions will be maintained may need to be developed as U.S. EPA considers the approvability of the emission reduction benefits.

PM2.5 Control Measures

The Draft 2016 AQMP includes 10 stationary source control measures designed to reduce PM2.5 levels that are to be adopted and implemented in the next several years. Table IV-A-4 provides the expected adoption and implementation period, implementing agency, and expected emission reductions achieved. There are two measures that were carried over from the 2012 AQMP. The remaining eight control measures are new ideas or strengthening of existing rules or measures in previous Plans.

These measures involve Best Available Control Measures (BACM) as required. The first measure would seek PM reductions from restaurant under-fired charbroiling operations and the second measure would seek PM reductions from industrial cooling towers. The third measure seeks further PM emission reductions from paved road dust sources. The fourth measure would seek to reduce ammonia emissions from livestock waste, especially dairies and the fifth measure would seek reductions of ammonia slip from NOx control devices. The sixth measure would seek potential PM reductions from abrasive blasting through voluntary applications aided with incentives, and the seventh measure would seek PM emission reductions from stone fabricating operations. The eighth measure considers further emission reductions from Basin-wide curtailment of wood-burning devices and the ninth measure seeks further emission reductions from open burning. The last measure would propose reductions of VOC and ammonia emissions from chipped and ground but uncomposted greenwaste composting.

It should be noted that the emission reduction targets for the proposed control measures (those with quantified reductions) are established based on available or anticipated control methods or technologies. Once the SIP commitment is accepted, should there be emission reduction shortfalls in any given year, the SCAQMD would identify and adopt other measures to make up the shortfall. Similarly, if excess emission reductions are achieved in a year, they can be used in that year or carried over to subsequent years if necessary to meet reduction goals. More detailed discussion on the SCAQMD's SIP commitment is included in Chapter 4 of the Draft 2016 AQMP.

TABLE IV-A-4
SCAQMD Proposed Stationary Source PM_{2.5} Control Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2021/2025)
BCM-01 ¹	Further Emission Reductions from Commercial Cooking [PM]	2018	2025	SCAQMD	0 / 3.3*
BCM-02	Emission Reductions from Cooling Towers [PM]	TBD	TBD	SCAQMD	TBD ^a
BCM-03	Further Emission Reductions from Paved Road Dust Sources [PM]	TBD	TBD	SCAQMD	TBD ^a
BCM-04 ²	Emission Reductions from Manure Management Strategies [NH ₃]	2019	2020	SCAQMD	0.26 / 0.2 [NH ₃]
BCM-05	Ammonia Emission Reductions from NO _x Controls [NH ₃]	TBD	TBD	SCAQMD	TBD ^a
BCM-06	Emission Reductions from Abrasive Blasting Operations [PM]	TBD	TBD	SCAQMD	TBD ^a
BCM-07	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM]	TBD	TBD	SCAQMD	TBD ^a
BCM-08	Further Emission Reductions from Agricultural, Prescribed and Training Burning [PM]	TBD	TBD	SCAQMD	TBD ^a
BCM-09	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves [PM]	TBD	TBD	SCAQMD	TBD ^a
BCM-10	Emission Reductions from Greenwaste Composting [VOC, NH ₃]	2019	2020	SCAQMD	0.1 / 0.1 [NH ₃]

* Contingency measure

^a TBD are reductions to be determined once the measure is further evaluated, the technical assessment is complete, and inventories and cost-effective control approaches are identified, and are not relied upon for attainment demonstration purposes

¹ Formerly BCM-03 in the 2012 AQMP and BCM-05 in the 2007 AQMP.

² Formerly BCM-04 in the 2012 AQMP.

Rule Effectiveness

The 1990 federal Clean Air Act requires that emissions inventories be adjusted to reflect the rule effectiveness. As defined by U.S. EPA, rule effectiveness reflects how emission reductions, due to implementation of a regulatory program, are estimated. It describes a method to account for the reality that not all facilities covered by a rule are reasonably in compliance with the rule 100 percent of the time. In 1992, U.S. EPA suggested a default value of 80 percent³ if emission reductions are estimated based on projected control device efficiencies. If a higher rule effectiveness value is used, the SCAQMD needs to demonstrate how these emission reductions will be achieved. In 2005, U.S. EPA revised its policy⁴ in recognition that rule effectiveness can vary widely between different types of industries. So, instead of assuming a broad 80 percent default value for rule effectiveness, a list of factors should be considered that are most likely to affect rule effectiveness when developing emission inventories and attainment demonstrations. According to the U.S. EPA⁵, it is not necessary to adjust the rule effectiveness when emissions can be calculated by means of a direct determination because the emissions estimate is not contingent on the effectiveness of controls. A direct determination is one in which emissions are calculated directly (e.g., based on explicit records of coating or solvent types used) rather than from estimates of uncontrolled emissions and level of control. In a recent U.S. EPA response⁶ to a comment on this issue, requiring stringent compliance monitoring and reporting requirements also supports the use of the highest range of rule effectiveness factors in projecting emissions.

As described below under Rule Compliance and Test Methods, the compliance demonstration for each proposed control measure, where the SCAQMD accounted for emission reductions, identifies the compliance mechanisms such as recordkeeping, inspection and maintenance activities, etc., and test methods such as SCAQMD, CARB, and U.S. EPA approved test methods. In some cases, such as emission reductions from architectural coatings, the emissions are calculated by means of direct determination. The SCAQMD's ongoing source testing and on-site inspection programs also strengthen the status of compliance verification. In addition, the SCAQMD conducts workshops, and compliance education programs to inform facility operators of rule requirements and assist them in performing recordkeeping and self-inspections. These compliance tools are designed to ensure that rule compliance would be achieved on a continued basis. As a result, the majority of control measures proposed in this appendix with quantifiable emission reductions are based on a rule effectiveness of 100 percent. With respect to implementation of existing rules, emissions reported through the SCAQMD's Annual Emission Reporting (AER) program are based on actual emissions, substantiated by source testing or other processing data. Any upset conditions or emissions under variance are also included in the AER. Where there is potential non-compliance, emissions are adjusted to reflect that knowledge. For example, a 75 percent compliance rate is assumed for residential wood burning curtailments.

³ "Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CP State Implementation Plan Base Year Inventories." EPA-452/R-92-010, November 1992.

⁴ "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations," EPA-454/R-05-001, August 2005, Appendix B.

⁵ "Rule Effectiveness Guidance: Integration of Inventory, Compliance and Assessment Applications," EPA 452/R-94-001, January 2004.

⁶ "Approval of Air Quality Implementation Plans; California; South Coast; Attainment Plan for 1997 8-Hour Ozone Standards," EPA-R09-OAR-2011-0622, Final Rule, March 1, 2012.

SIP Approvability for Incentive-Based Measures

The 2016 AQMP includes voluntary incentive measures that are part of the overall Plan to satisfy the CAA emission reduction requirements needed to achieve attainment of the federal ozone standards by 2023 and 2031. Prior AQMPs relied primarily on the adoption of rules to implement the measures provided in those AQMPs. Such regulations involve mandatory requirements and result in generally straightforward and enforceable reductions. With heavy reliance on voluntary incentive measures to achieve attainment of the federal air quality standards and for those measures to be SIP approved, the SCAQMD must design programs such that the emission reductions from these incentive measures are proven to be real, quantifiable, surplus, enforceable, and permanent.

There are key components required of a SIP submittal in order to rely on discretionary incentive programs to satisfy the CAA emission reduction requirements. The components include a demonstration addressing the “integrity elements (the five requirements listed above),” federally enforceable “backstop” commitments, technical support, funding, legal authority, public disclosure and provisions to track results that are common among the various voluntary incentive programs (VIPs). The “backstop” commitments are required to monitor emission reductions achieved by the voluntary incentive measures and to rectify any shortfalls of the commitment in the future, no later than the statutory implementation deadline. SCAQMD is committed to developing detailed guidelines for VIPs for individual incentive measures in accordance with the U.S. EPA’s economic incentive programs (EIP) guidelines.⁷ The following describes the necessary criteria that will be included in each of the incentive measures:

Integrity Elements

Emission reductions that are projected to be achieved from voluntary incentive measures must be real, quantifiable, surplus, enforceable, and permanent. This demonstration must include project type(s); project life; applicable incentive program guidelines by title and year; and analysis of applicable incentive program guidelines for consistency with the integrity elements. For the purposes of this demonstration, the following defines and provides examples of the key elements:

Quantifiable: Emission reductions are quantitatively measureable, supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. There must be procedures to evaluate and verify over time the level of emission reductions actually achieved.

⁷ References:

- “Guidance on Incorporating Voluntary Mobile Source Emission Reduction Programs in State Implementation Plans (SIPs),” October 24, 1997.
- “Improving Air Quality with Economic Incentive Programs,” January 2001.
- “Guidance on SIP Credits for Emission Reductions from Electric-Sector Energy Efficiency and Renewable Energy Measures,” August 5, 2004.
- “Incorporating Emerging and Voluntary Measure in a State Implementation Plan (SIP),” October 4, 2004.
- “Guidance on Incorporating Bundled Measures in a State Implementation Plan,” August 16, 2005.
- “Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans,” July 2012.
- “Diesel Retrofits: Quantifying and Using Their Emission Benefits in SIPs and Conformity: Guidance for State and Local Air and Transportation Agencies,” February 2014.

Example (1): Affected equipment in industrial sector buildings currently in use have X tons of NO_x emissions from centralized heating and power sources with usage rate R . If these affected units are replaced with new equipment (e.g., fuel cells) providing combined heat and power that are Y percent more efficient overall than the original units, overall emission reductions are calculated to be $\sum_{i,j}^{n,m} (X_i \times R \times Y_j)$, where $i = 1, \dots, n$ and $j = 1, \dots, m$.

Example (2): Within a project there are X number of affected units (e.g., equipment, processes, homes, etc.) currently in use. If they are replaced with higher efficiency units (e.g., new equipment, controls, weatherization) with Y dollars of incentives per unit, resulting in Z tons of emission reductions per day during the “project life,” the overall cost-effectiveness is calculated to be $(X \times Y)/Z$.

Surplus: Emission reductions must be above and beyond all current and known future District, State, or federal regulations already included in the SIP. Annual tracking will account for any potential overlapping future regulations that could be in conflict with the surplus reductions. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the SIP, SIP-related requirements, and other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that a VIP’s emission reductions are already relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced had a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP or conformity purposes under this guidance only for five years).

Example (1): Co-benefits beyond existing federal, State, or local regulations (e.g., regional greenhouse gas targets) already included in SIP baseline (e.g., ECC-03), as well as co-benefits from regulations not in the baseline (e.g., ECC-02).

Example (2): Targeting older, high polluting permitted equipment exempt from existing regulation or no legal mandate to be replaced or retrofitted.

Example (3): Sources the SCAQMD has not regulated or may not have authority to regulate, such as residential equipment.

Enforceable: The SCAQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:

- They are independently verifiable.
- Program violations are defined.
- Those liable can be identified.
- SCAQMD and U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable.
- The general public has access to the emissions-related information obtained from the source.
- The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes).
- They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.

Actual emission reductions, for example, can be assured through replacement equipment registration, recordkeeping and reporting, and inspections (initial inspection after installation and subsequent inspections on a

regular basis thereafter, if needed) throughout the term of project. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

Permanent: The measure has to be permanent throughout the term for which the reduction is generated. The emission reductions are permanent if these reductions are ensured to occur over the duration of the VIP, and for as long as they are relied on in the SIP. For example, those awarded incentives would need to ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Thus, recipients of the incentive awards would agree to contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment would not be removed without concurrence of SCAQMD (i.e., permanent placement) and the proof that the replaced equipment would be destroyed or at least not be operated any more in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the individual incentive measures.

Commitment (Federal Enforceability)

Federally enforceable commitments will be written in the Resolution of the SCAQMD Governing Board approval for the Final 2016 AQMP. These commitments will “backstop” any shortfalls in the committed reductions, and/or the incentive funding no later than the statutory implementation deadlines. The enforceable commitment must include: (1) a commitment to monitor, assess, and regularly report on emission reductions achieved; and (2) a commitment to adopt and submit substitute measures to U.S. EPA by specific dates if necessary to remedy any emission reduction shortfall. Federally enforceable commitments would include:

- The Governing Board’s direction to develop guidelines for each of the source-specific VIPs that would include: integrity elements; enforceable commitment; technical analyses/support; demonstration of funding and legal authority; procedures for public disclosure of information; provisions to measure and track programmatic results, and the Governing Board’s approval of the adoption of the guidelines.
- The Governing Board’s approval of the adoption of VIPs as an implementation tool for the incentive measures as part of the 2016 AQMP.
- Committing to spend incentive moneys to implement projects in accordance with corresponding VIP guidelines.
- Identifying the source and the amount of incentive funding for projects.
- Adjusting program implementation and updating programs if there are any changes in the proposed source of funding, such that reduction commitments are still met and any shortfall is fulfilled.
- Quantification of emission reductions by project through implementation of these projects or substitute measures.
- Reporting to the U.S. EPA via an annual demonstration including all the supporting documentation and data.
- The Governing Board’s adoption and submission of substitute rules and/or measures to address any shortfall as expeditiously as practicable in case the information the SCAQMD submitted is determined to be insufficient to demonstrate that the required reductions will occur on schedule.

Technical Analyses

Appropriate documentation supports the emission inventory of the affected sources, the estimated reductions, and projected costs to achieve reductions. Quantifying emissions and estimated reductions can rely upon a variety of data sources, including, but not limited to, SCAQMD's AER program, approved AQMP emissions inventory (Chapter 3 and Appendix III of 2016 AQMP), approved CARB's GHG reporting/inventory program emissions database, archived equipment statistics obtained from the SCAQMD's past rulemaking, and data libraries of public energy policy and planning agencies and utility businesses (e.g., CPUC, CEC, SCE, etc.). SCAQMD can use, and has used in the past, internal audit procedures to verify emissions and reductions.

Funding

Adequate funding for the project needs to be shown that the funds are committed already or are reasonably expected to be available to generate committed reductions. The funding may originate from one or more of the following sources including, but not limited to: emission reduction mitigation fees (e.g., existing Rule 1304.1 offset fees, Rule 1111, etc.), penalty fees and settlement, California Department of Motor Vehicle fees, the greenhouse gas reduction fund (GGRF) as part of AB 32's Cap-and-Trade program, national funding grants from Diesel Emission Reduction Program (DERA), and any committed State or federal funding (e.g., budget line item). The amount of funding available for the project should be estimated and reported to the U.S. EPA in the form of annual average dollars.

Resources

The SCAQMD can adequately demonstrate that staff (personnel) resources from a variety of existing departments—Planning, Technology Advancement Office (TAO), and Legislative and Public Affairs (LPA)—are sufficient to prepare guidelines, conduct outreach, process/award applications, issue contracts, perform inspection, track programs, and report to the U.S. EPA.

Outreach

Outreach is critical to the success of the program to educate the public and persuade potential participants. Outreach can be conducted in a number of forms including emails, brochures, TV and radio ads, and announcements at meetings. Modern methods can also be employed via social media. In addition, the administrator of the VIP must commit to disclosing information to the public demonstrating the emission reductions achieved. The SCAQMD has many well established routes for disseminating information including the SCAQMD website and Subscribers lists. The public process could involve working groups, public workshops, and Governing Board adoption of guidelines for the programs.

Legal Authority

The SCAQMD has authority under State law to carry out incentive programs in order to satisfy the CAA emission reduction requirements. Section 40701(f) of the California Health and Safety Code provides that a district shall have power to *“cooperate and contract with any federal, state, or local governmental agencies, private industries, or civic groups necessary or proper to the accomplishment of the purposes of this division.”* In addition, pursuant

to Section 40702 of the California Health and Safety Code, the SCAQMD “shall adopt rules and regulations and do such acts as may be necessary or proper to execute the powers and duties granted to, and imposed upon” the SCAQMD. Moreover, the SCAQMD is not prohibited by any provision of Federal or State law from carrying out the incentive measures that are contained in the SIP. In fact, the CAA recognizes that an economic incentive programs can be used in combination with other elements of a SIP to achieve the applicable emission reduction milestone [CAA Section 182(g)(4)].

Guidelines for Measure-Specific Voluntary Incentive Programs

Each VIP needs to have detailed and comprehensive guidelines that are approved by the SCAQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability. The guidelines will have the following specifications:

Specifications:

- Demonstrate compliance with the four key elements of the VIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance and permanent reductions.
- Working groups will be established to solicit public input and feedback during VIP guideline development.
- Processes and procedures to apply for incentives should be clearly explained in the guideline.
- Clearly describe how incentives would be awarded. Public working groups or workshops will take place to discuss the guidelines and incentives. Facilities or individuals qualifying for incentives shall submit applications during an open enrollment period. Projects shall be evaluated on, but not limited by, high emission reductions, incentive effectiveness, age of equipment, remaining useful life of existing equipment, Environmental Justice (EJ) area priority, and small business status.
- Conditions for contracts including tracking to ensure permanent reductions. The following forms should be prepared:
 - Application Forms (samples are required).
 - Contracts with Conditions (samples are required).
 - Product Example.
- Tracking mechanism is required to ensure overall effectiveness of program and procedures to verify and correct emission projections, such as reductions by the committed target date (e.g., 2023, 2031) and submittal to U.S. EPA annually. Tracking checklist should, at a minimum, include:
 - Project Title.
 - Product (e.g., equipment type, size, fuel use, hours operated, emissions, source test reports).
 - Annual Emission Reductions (e.g., from 2017 to 2027, incremented by one year).
 - Life of project (e.g., 10 years).
 - Installation dates (e.g., fixed year 2017 or multiple installation years 2017 and 2018).
- Recordkeeping, reporting, and monitoring requirements. These requirements need to be addressed.
- Individual outreach efforts (e.g., social media, email blasts) to promote the program, announcement(s) of application deadlines, and announcement(s) of public workshops.
- SCAQMD Governing Board approval of program guidelines and made publicly available.

Format of Control Measures

Included in each control measure description is the title, a summary table, a description of the source category (including background and regulatory history), the proposed method of control, estimated emission reductions, rule compliance, test methods, cost-effectiveness, and references. The information that can be found under each of these subheadings is described below.

Control Measure Number

Each control measure is identified by a control measure number such as “CM # CTS-01” located at the upper right hand corner of every page. “CM #” signifies “control measure number” and is immediately followed a three-letter designation, such as “CTS,” which represents the abbreviation for a source category or specific programs. For example “CTS” is an abbreviation for “Coatings and Solvents.” The following provides a description of the abbreviations for each of the measures.

- ECC Energy and Climate Change Sources
- CMB Combustion Sources
- BCM Best Available Control Measures
- FUG Fugitive VOC Emissions
- CTS Coatings and Solvents
- MCS Multiple Component Sources
- FLX Compliance Flexibility Sources
- MOB Mobile Sources
- EGM Emission Growth Management Sources

If the measure is based on a control measure from the previous AQMPs, the former control measure number is footnoted.

Title

The title contains the control measure name and the major pollutant(s) controlled by the measure. Titles that state “Control of Emissions from...” indicate that the measure is regulating a new source category, not presently regulated by an existing source- specific SCAQMD rule. Titles that state “Further Emission Reductions of” imply that the measure would likely result in an amendment to an existing SCAQMD rule.

Summary Table

Each measure contains a table that summarizes the measure and is designed to identify the key components of the control measure. The table contains a brief explanation of the source category, control method, baseline emissions, emission reductions, control costs, and implementing agency.

Some measures in the summary table are listed as “TBD” (to be determined) for emission inventory, emission reductions and/or cost control. The “TBD” measures require further technical and feasibility evaluations to determine the emission reduction potential and thus, the attainment demonstration is not dependent on these

measures. However, they are included in the AQMP as part of a comprehensive plan with all feasible measures. These measures will require further development after the approval of the Plan, but could be proposed for rule or program development at a later date. Emission reductions achieved and quantified by these measures can be applied toward contingency requirements, make up for any shortfalls in reductions from other quantified measures, be credited towards rate-of-progress reporting, and/or be incorporated into future Plan revisions.

Description of Source Category

This section provides an overall description of the source category and the intent of the control measure. The source category is presented in two sections, background and regulatory history. The background has basic information about the source category such as the number of sources in the Basin, description of emission sources, and pollutants.

The regulatory history contains information regarding existing regulatory control of the source category such as applicable SCAQMD rules or regulations and whether the source category was identified in prior AQMPs.

Proposed Method of Control

The purpose of this section is to identify potential control options an emission source can use to achieve emission reductions. If an expected performance level for a control option is provided, it is intended for informational purposes only and should not be interpreted as the targeted overall control efficiency for the proposed control measure. To the extent feasible, the overall control efficiency for a control measure should take into account achievable controls in the field by various subcategories within the control measure. A more detailed type of this analysis is typically conducted during rulemaking, not in the planning stage. It has been the SCAQMD's long standing policy not to exclude any control technology and to intentionally identify as many control options as possible to spur further technology development.

In addition to the proposed control methods discussed in each control measure, affected sources may have the option of partially satisfying the emission reduction requirements of each control measure with incentive programs that will become available in the future from the implementation of control measure CM # FLX-01. Examples of incentive programs currently available and future enhancements to those incentive programs would be described in this section.

Emission Reductions

The emission reductions are estimated based on the baseline inventories prepared for the 2016 AQMP and are provided in the Control Measure Summary Table. For PM_{2.5} measures, the emissions data are based on the annual average inventory. For ozone measures, the summer planning inventories are used. The emissions section of the control measure summary table includes the 2012 base year inventory and the 2021 and 2025 projected inventories for PM_{2.5} control measures. For 8-hour ozone control measures, the 2012 base year and 2022, 2023, and 2031 future year inventories are included (2022 is the attainment year of the revoked but unattained previous 1-hour ozone NAAQS). The 2021, 2022, 2023, 2025, and 2031 inventory projections reflect implementation of existing adopted rules.

The emission reductions listed in the control measure summary table represent the current best estimates, which are subject to change during rule development. As demonstrated in previous rulemakings, the SCAQMD is always seeking maximum emission reductions when proven technically feasible and cost-effective. For emission accounting purposes, a weighted average control efficiency is calculated based on the targeted controls. The concept of a weighted average acknowledges the fact that a control measure or rule may consist of several subcategories, and the emission reduction potential for each subcategory is a function of proposed emission limitation and the associated emission inventory. Therefore, the use of control efficiency to estimate emission reductions does not represent a commitment by the SCAQMD to require emission reductions uniformly across source categories. In addition, due to the current structure of emission inventory reporting system, a control measure may partially affect an inventory source category (e.g., certain size of equipment or certain level of material usage). In this case, an impact factor is incorporated into the calculation of a control efficiency to account for the fraction of inventory affected. During the rule development, the most current inventory will be used. However, for tracking rate-of-progress for the SIP emission reduction commitment, the approved AQMP inventory will be used. More specifically, emission reductions due to mandatory or voluntary, but enforceable, actions will be credited towards SIP obligations.

Rule Compliance

This section addresses requirements in the 1990 Clean Air Act by which U.S. EPA has indicated that it is necessary to have a discussion of rule compliance with each control measure. This section discusses the recordkeeping and monitoring requirements envisioned for the control measure. In general the SCAQMD would continue to verify rule compliance through site inspections, recordkeeping, and submittal of compliance plans (when applicable).

Test Methods

In addition to requiring recordkeeping and monitoring requirements, U.S. EPA has stated that “An enforceable regulation must also contain test procedures in order to determine whether sources are in compliance.” This section identifies appropriate approved SCAQMD, CARB, and U.S. EPA source test methods.

Cost-Effectiveness

Discounted Cash Flow (DCF) is a Governing Board approved method used to calculate the cost-effectiveness of each control measure. Having been used over the past decades, it provides an effective tool to compare cost-effectiveness with past regulatory actions. As control measures undergo the rule making process, more detailed control costs will be developed.

The cost-effectiveness values contained herein represent the best available information at this time. As additional information regarding technology, affected facilities, and existing processes becomes available, the cost-effectiveness will be revised and analyzed during rulemaking.

Implementing Agency

This section identifies the agency(ies) responsible for implementing the control measure. Also included in this section is a description of any legal or jurisdictional issues that may affect the control measure’s implementation.

References

This section identifies directly cited references, or those references used for general background information.

SECTION 1

8-HOUR OZONE CONTROL MEASURES

GROUP 1

SCAQMD STATIONARY SOURCE CONTROL MEASURES

**CMB-01: TRANSITION TO ZERO AND NEAR-ZERO EMISSION TECHNOLOGIES FOR
STATIONARY SOURCES
[NO_x, VOC]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	COMBUSTION SOURCES SUCH AS ENGINES, TURBINES, MICROTURBINES, BOILERS, AND FLARES AT COMMERCIAL, INDUSTRIAL AND TRANSPORTATION SOURCES			
CONTROL METHODS:	ZERO AND NEAR-ZERO EMISSION TECHNOLOGIES AND FINANCIAL INCENTIVE PROGRAMS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NO _x INVENTORY	21.6	17.5	17.5	17.6
NO _x REDUCTION			2.4	5.8
NO _x REMAINING			15.1	11.8
SUMMER PLANNING	2012	2022	2023	2031
NO _x INVENTORY	22.3	18.6	18.1	18.1
NO _x REDUCTION			2.5	6
NO _x REMAINING			15.6	12.1
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	8.3	8.3	8.3	8.4
VOC REDUCTION			1.1	2.8
VOC REMAINING			7.2	5.6
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	8.4	8.4	8.4	8.5
VOC REDUCTION			1.2	2.8
VOC REMAINING			7.2	5.7
INCENTIVE COST:	APPROXIMATELY \$54,000/TON			
TOTAL INCENTIVE:	\$450,000,000			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

This proposed control measure reduces emissions of NO_x and VOCs from traditional combustion sources by replacement or retrofits with zero and near-zero emission technologies. Facility modernization efforts will also be

aligned with other targets, such as, increasing renewable fuels for power and transportation sources. Many businesses and facilities have opportunities to update and modernize their facilities using cleaner, lower emission, less toxic alternative technologies, processes, and materials along with increasing energy efficiency. However, since many of these cleaner options may not have affordable upfront costs, the installation and use of these cleaner and more efficient choices may need to be incentivized and, when possible, combined with existing credit based programs to provide additional sources of revenue. Regulations combined with incentive-based approaches will require lower emission technologies and encourage businesses to invest in cleaner equipment sooner while minimizing cost impacts. Zero-emission technology will be utilized to maximize emission reductions whenever and wherever technically feasible and cost-effective, otherwise near-zero technology will be required.

A Business Case for Clean Air Strategies White Paper was developed to discuss principles and concepts for control measures and related programs to be included in the 2016 AQMP that, to the extent possible, create a business case for deployment of needed technologies and efficiency measures towards attaining upcoming federal air quality standards. A business case exists where a technology, fuel, or other strategy reduces emissions and also improves energy efficiency, reduces fuel or maintenance costs, creates new job opportunities, or has other economic benefits. In addition to seeking to minimize potential adverse impacts, the SCAQMD staff will explore means to maximize emission control strategies that have a business case for implementation.

Although large utilities are currently subject to the RECLAIM program and not an intended source for this control measure, it should be noted that in the industrial and commercial sectors, natural gas-fired engines, turbines, microturbines, and boilers are widely utilized for the production of facility power, heating, and steam production. Further, landfills and wastewater treatment facilities that flare biogas may be able to utilize alternative technologies as lower emissions alternatives to flare combustion, including beneficial use of gas or producing electricity for their operations through microturbines and boilers (as noted in CMB-03 – Non-Refinery Flares). Incentives may help provide the funds needed to implement gas cleanup technologies to better utilize waste gas for zero and near-zero emission technologies such as sale and injection into the natural gas (NG) pipeline or as a renewable transportation fuel.

Incorporating newer technologies such as energy storage along with biogas development, distributed energy resources, and improved efficiencies can reduce the need for redundant energy infrastructures, provide for greater grid reliability (less possibility for blackouts), and reduce the need for new fossil-based generation. Better utilizing waste streams will provide sources of energy such as biogas that can help supply near-zero emission transportation technologies, improve the Basin's NG infrastructure, and provide carbon neutral fuels.

Background

The SCAQMD has adopted a series of regulations to promote clean, lower emission technologies while encouraging economic growth and providing compliance flexibility. In addition, the SCAQMD implements incentive programs to help promote efficient, clean equipment purchases, efficiency projects, and conservation techniques that provide toxic and criteria pollutant emissions benefits, as well as greenhouse gas (GHG) emission reductions. The manufacturing and deployment of zero and near-zero emission technologies will help reduce criteria pollutant emissions in the region, accelerate removal of higher-emitting equipment that can otherwise last for many decades, and advance economic development and job opportunities in the region. In addition, this equipment is often located in or near environmental justice (EJ) communities and sensitive receptors.

Over the anticipated timeline of the Plan, as emerging technologies become more widely available and costs decline, the SCAQMD will undertake rulemaking to maximize emission reductions utilizing zero emission equipment where technically feasible and cost-effective, and near-zero emission technologies in all other applications.

Zero and Near-Zero Emission Technologies

For existing sources, replacing older higher-emitting equipment with newer zero and near-zero emitting equipment can apply to a single source or an entire facility. New businesses can be required to install and operate zero-emission equipment, technology and processes to meet the current BACT requirements. Fuel cells, efficiency improvements, electrification, along with better utilization of waste gases are ways to shift away from combustion sources generating NO_x emissions wherever feasible. Combustion equipment includes engines, turbines, boilers, ovens/kilns, flares, microturbines, etc. located at industrial and commercial facilities. The modification of residential and commercial equipment for space/water heating and for energy conservation is addressed by Control Measures CMB-02 and ECC-03.

Fuel cells are capable of producing power with very low pollutant emissions while producing electricity much more efficiently (between 45–50 percent efficiency) than single-cycle combustion-based engines and turbines (between 25–35 percent efficiency). There are many installations of fuel cells across many source categories as an alternative to traditional combustion methods, resulting in a reduction of NO_x emissions with co-benefit of reducing other criteria air pollutants and greenhouse gases (GHG). Current combustion units, such as some boilers, might be suitable for this application because fuel cells are capable of producing high pressure steam that can serve the demands of the facility, in addition to producing electricity that can be used by the facility. Many buildings have hot water boilers along with high electricity usage. The addition of a fuel cell can provide waste heat for hot water, generate electricity, and, in some applications, also provide building cooling with absorption chillers. These applications help reduce electrical utility load charges and can reduce the need for backup generation during outages. This type of project is currently in operation and demonstration at the University of California, Irvine Medical Center in Orange, CA.

Fuel cells have also been used to replace smaller emergency diesel engines for telecommunication companies or cellular communications sites. Some fuel cells units are modular; therefore, providing greater flexibility for a facility's power demands to be increased or decreased as needed. This type of technology has been used at the California Institute of Technology in Pasadena, CA.

An example of another technology, tri-generation (heat, power, and hydrogen), is being demonstrated at the Orange County Sanitation District showing that the gas cleanup system is capable of removing contaminants such as siloxanes, sulfur, and hydrocarbons while also providing transportation fuels.

As energy storage technologies become more widely available and less costly there will be applications in the near future in which storage technologies can replace and/or complement backup generation systems. These applications may combine onsite renewable power generation, fuel cells, and/or smaller onsite backup generation resources. Additionally, onsite storage systems will play other roles such as helping reduce electrical utility rates, integrating other onsite renewable generation sources, and help with utility grid services. Some essential back-up power applications (hospitals, communications, transportation, essential public services, etc.) may require capabilities for long-term power and fuel storage or delivery under extreme emergency conditions (earthquakes, long-term power outages, natural gas pipeline disruption, etc.). Other applications are more conducive to battery

storage or fuel cell solutions if short-term back-up power is sufficient to smoothly halt commercial or industrial operations.

Energy Sector

The electrical utility grid maintains stability by matching generation with demand. Maintaining grid stability is becoming difficult with increasingly higher percentages of power generation coming from intermittent renewable generation sources along with increasingly higher electrical load demands from electric transportation. These new variables on the grid require dispatchable and flexible resources that add load and provide power when needed. Peaking generation units typically provide these resources but have low utilization factors, are less efficient than base load plants, can be difficult to site, and are emission sources. The use of energy storage provides a flexible and dispatchable resource with zero emissions. Grid based storage systems can replace the need for new peaking generation, be coupled with renewable generation, and reduce the need for additional energy infrastructure. Although the applications for using energy storage are vast, some of the most valuable uses include reducing demand charges, providing backup power, reducing infrastructure needs to incorporate electric transportation, demand response capabilities, and short-term dispatchability. Additionally, implementing new hardware such as renewable generation and storage along with other energy resources increasingly requires implementation of smarter grid control technologies.

Under SB 350 (Clean Energy Pollution Reduction Act of 2015), California has increased the renewable portfolio standard from 33 percent by 2020 to 50 percent by 2030. Due to the large amounts of solar generation already providing power on the electrical grid, there are periods of over generation that later lead to high power ramp rates for fossil powered generation sources. Rather than curtail renewable power generation, the use of storage provides a flexible and dispatchable grid resource. California adopted AB 2514 (Energy Storage Systems) to start the integration and development of at least 1.3 gigawatts (GW) of energy storage within the State's investor owned utilities.

Several different technologies are being utilized for energy storage systems which include: batteries, fuel production, flywheels, pumped hydro, and compressed air. Currently, the most widely used storage systems utilize different battery chemistries along with using second life electric vehicle batteries. Grid scale energy storage systems are starting to be implemented that replace the need for new peaking generation plants and can minimize the need for additional transmission lines along with other electrical utility infrastructure. Additionally, the California Independent System Operator (CAISO) is developing a distributed energy resource program (DERP) that allows the aggregation of several smart grid systems to bid into the wholesale electricity power market. This will provide an additional market and incentive for the installation of these systems. To ensure storage technology projects are effective and successful, all affected entities could participate in and complete an in-depth analysis that will meet California Public Utilities Commission (CPUC) regulations.

Further development and utilization of biogas is being targeted by State agencies to help achieve the State's GHG targets and waste diversion goals. Biogas is included as an energy source to help achieve the renewable portfolio targets, is incentivized as a transportation fuel under the Low Carbon Fuel Standard (LCFS) and federal Renewable Fuel Standard (RFS), can help reduce the need for large NG storage facilities, and provides resiliency towards fluctuating fossil energy markets.

Combined heat and power (CHP), also known as cogeneration, is the production of electricity or power and thermal energy (heating/cooling) from a single source of energy. This can include technology such as fuel cells, gas turbines,

microturbines, reciprocating engines, and steam turbines. Incentivizing towards lower emitting CHP, with certain technology applications, can produce high efficiency power and thermal energy (often at 65–75 percent efficiency). Providing facilities with incentives towards CHP can help meet environmental policy goals for CHP targets, such as President Obama’s Executive Order to add 40 GW by 2020, CARB’s target to add 4 GW by 2020, and Governor Brown’s Clean Energy Jobs Plan to add 6.5 GW by 2030. CHP can provide facility operators lower operating costs, enhanced energy security, greater energy efficiency, and reduce GHGs along with other criteria pollutants. Newer CHP systems being tested include a micro-CHP internal combustion (IC), organic rankine cycles (ORC), and an engine based CHP system coupled with thermal energy storage to provide electricity or heat. Additionally there are renewable energy technologies that are being developed that have both power and thermal energy outputs. Incentives are expected to make new CHP systems more cost-effective and as technology evolves, the costs are expected to decrease.

Incentive and Regulatory History

Incentives

SCAQMD currently offers a number of funding/grant resources to encourage the immediate use of clean, lower emission technologies. The incentive programs, which include incremental funding or subsidies, are designed to promote voluntary introduction of alternative improved practices and new technologies on an accelerated schedule. Examples of such funding programs, in part, include:

- Financial Assistance for Alternative Dry Cleaning Equipment Purchases;
- Wood Stove & Fireplace Change-Out Incentive Program;
- Carl Moyer Memorial Air Quality Standards Attainment Program for vehicle retrofit and replacement;
- Proposition 1B – Goods Movement Emission Reduction Program;
- Residential and Commercial electric vehicle charger incentives; and
- Enhanced Fleet Modernization Program (EFMP) for retirement of older higher polluting vehicles.

Additionally, regulatory relief incentives have been incorporated into several SCAQMD rules including:

- Reduced recordkeeping for Super-Compliant coatings, adhesives and solvents in Rule 109 – Recordkeeping for Volatile Organic Compound Emissions;
- Exemption from fees for ultra-low VOC architectural coatings in Rule 314 – Fees for Architectural Coatings;
- Less frequent source testing for low-emitting point sources in Rule 1420.2 – Emission Standards for Lead from Metal Melting Facilities; and
- Less frequent inspection schedules for high-compliance facilities in Rule 1173 – Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants.

Regulations

This control measure can create new regulations or lead to changes in existing regulations, including the following:

- Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines

- Rules 1146 and 1146.1 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters
- Rule 1146.2 – Emissions of Oxides Of Nitrogen from Large Water Heaters and Small Boilers And Process Heaters
- Rule 1147 – NOx Reductions from Miscellaneous Sources
- Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines

Incentivizing the use of much cleaner, less polluting, products and equipment will require additional efforts to broaden the scope of stationary source incentives.

Proposed Method of Control

CMB-01 is designed to maximize emission reductions utilizing zero emission technologies where and when technically feasible and cost-effective, and near-zero emission technologies in all other applications. In assessing the cost-effectiveness of these technologies, the life-cycle in-Basin emissions under current and future energy productions and transmission portfolios must be considered. As the energy supply and distribution system change over time, certain technologies may become more or less effective at reducing emissions. GHG emissions and toxic impacts must also be considered. This measure will achieve the committed NOx emission reductions through a combination of regulations and incentives. Regulations will set standards for new equipment installations in some applications, and incentives will accelerate the change out of existing equipment before regulatory compliance deadlines. The SCAQMD strives to remain fuel neutral and this control measure is not intended to incentivize one technology over another. Incentives will also help develop and reduce costs for technologies that currently may not be cost-effective, but could become more attractive with lower costs or with a different energy portfolio. For these emerging technologies, regulatory requirements can become feasible in the future. As regulations are amended to include new or more stringent standards for equipment installations, certain zero or near-zero technologies may not yet be cost-effective to be included as part of the regulatory requirements. Thus incentives will encourage and/or play a significant role in making it cost-effective for facilities or equipment owners to lean towards zero or near-zero technologies or replace equipment earlier. For example, this measure anticipates regulatory requirements for facilities applying for new permits for diesel backup generators such that the facility will have to demonstrate why zero or near-zero emitting alternatives are not technically feasible or cost-effective prior to approving a new permit. Incentives can be applied to encourage the replacement of existing diesel backup generators to battery storage for example, in applications where longer-term back-up power is not required, or may be used for new equipment at facilities that go above and beyond regulatory requirements to use zero and near-zero technologies that may not otherwise be cost-effective. The incentives will be targeted to EJ areas and near sensitive receptors such as schools, hospital, etc.

This measure of control addresses non-power plant combustion sources such as engines, turbines, and boilers that generate power for electricity for distributed generation, facility power, process heating, and/or steam production, and replacing these stationary sources with zero or near-zero emission technologies. Some specific sources include industrial and commercial facilities operating NG, diesel and liquid petroleum gas (LPG) stationary and emergency engines, as well as NOx point sources from the service/commercial and manufacturing/industrial sectors. The combustion units currently installed have been in operation for many years and most have already undergone post-

combustion retrofits in order to meet current emission standards. An implementation schedule based on equipment age can be adopted to ensure that the existing units serve their useful equipment life or provide incentives to allow early retirement and advanced replacement or retrofits with zero or near-zero emission technologies, that go beyond current emissions standards. Incentivizing the replacement of higher-emitting equipment with lower-emitting technology or equipment that goes beyond current emission standards can allow facilities to be more efficient and lessen grid dependence. Facility modernization will include equipment replacement or infrastructure improvements to utilize zero and near-zero technology. As regulations are being developed, incentive programs will be implemented to encourage implementation of zero or near-zero technologies where they are not technically and economically feasible.

The SCAQMD will work with agencies, utilities, businesses and other stakeholders to implement smart grid systems, energy storage, and integration of electric transportation by establishing working group meetings. As an example, the SCAQMD could help facilitate dialogue between businesses that want to replace equipment or modernize their facilities with utility companies or agencies that may need to provide infrastructure. Working group meetings could help affected or interested stakeholders address potential concerns that may arise from new technology and equipment replacement. An example could be the coordination of a landfill facility with a city to provide biogas as a transportation fuel. In some cases, however, conversion of back-up power supplies for some sources, such as essential public services like hospitals, water and wastewater facilities, hazardous operations and transportation sources, that rely on constant power to avoid potential life-threatening consequences will need to be ensured of an available supply of electricity in case the primary source of power is compromised. For all others, energy storage and smart grid will prove beneficial. High value grid and rate reduction applications are being developed and demonstrated to provide emission reductions.

SCAQMD's tool for the annual emission reporting (AER) program requires reporting emissions at permit unit/equipment/device levels. The reporting tool classifies the type of emission source (e.g., external combustion, IC, coatings, tanks, etc.) and requires fuel type, throughput, pollutant and emission factors.

Staff used a bottom up approach to compile an emissions inventory from combustion sources in the AER program, excluding facilities subject to the RECLAIM program. The emissions inventory identified older, higher-emitting categories including ICEs, afterburners, boilers, dryers/ovens/furnaces, and flares. Table 1 identifies the largest sources of NOx emissions based on aggregating the combustion equipment that have been permitted from 1978 to 2015.

TABLE 1
Permitted NOx Combustion Sources

Equipment Type	NOx Emissions (tpd)	# of Units
Afterburners	0.5	372
Boilers	8.3	2,511
Dryers	0.2	218
Flares	0.7	175
Furnaces	0.5	753
Heaters	0.2	770
Incinerators	1.7	192
Ovens	1.0	2,174
Stationary Emergency ICEs	3.3	11,814
Stationary Non-Emergency ICEs	2.2	544
Turbines	2.4	215

Staff conducted a further evaluation of the permitted ICEs based on age and fuel type, which is shown in Table 2.

TABLE 2
Breakdown of Permitted ICEs

Category	Pieces of Equipment	Total NOx Emissions (tpd)
All ICEs	12,358	5.5
Older ICEs (permit dates ≤2010)	8,669	3.3
Older ICEs with permit modifications*	1,476	0.90
Newer ICEs (permit dates >2010)*	2,213	1.3
Older ICEs	10,145	4.2
Non-Diesel Engines	1,430	2.0
Diesel Engines	8,715	2.2
Tier I or unknown	3,570	0.9
Tier II	2,144	0.5

* Pieces of equipment and emissions were further refined. The previously categorized newer ICEs revealed that 60 percent of the new (>2010) permits represented new pieces of equipment and 40 percent primarily represented old ICEs with administrative changes to the permit.

In addition to the SCAQMD permitted ICEs, staff estimates the following emissions for permit exempt ICEs (25–50 bhp units) and ICEs in the Statewide Portable Equipment Registration Program (PERP) as shown in Table 3.

TABLE 3
ICEs not Permitted by SCAQMD

Equipment Type	Pieces of Equipment	Total NOx Emissions (tpd)
Permit Exempt (25–50 bhp) ¹	2,565	0.1
PERP ²	11,026	12.0 ³
Total	13,591	12.1

1. CARB's Off-Road 2007 inventory model.
2. Emissions estimated of 200 hours per year.
3. Current emissions are 12.0 tpd, with projections of 6.5 tpd in 2023 and 4 tpd in 2031.

Equipment Replacement or Retrofits

Engines

Internal combustion engines (ICEs) are typically used to power generators or fire pumps and used for emergency back-up or non-emergency purposes. Engines use a variety of different fuel types such as diesel, NG, or LPG. ICEs currently permitted in the Basin are greater than 50 bhp and stationary. Staff has identified approximately 13,000 ICEs in the permitting system and of this 5,800 are diesel fired ICEs meeting Tier 1 (or unknown) or Tier 2 requirements. These are older (permitted before 2010) and higher-emitting pieces of equipment that will be replaced with cleaner technology. Based on this analysis, staff expects a number of older diesel ICEs to be replaced with zero or near-zero technology, but meeting at a minimum Tier 4 emission standards. The majority of the permitted stationary ICEs are diesel emergency backup generators and emissions per piece of equipment is primarily from testing and maintenance; however, due to the large quantity of ICEs in the Basin, the cumulative emissions from the ICE category is a large source of NOx emissions. Non-diesel ICEs can be replaced by powering equipment with near-zero emissions CHP systems with catalyst, electrical energy, fuel cells, or backup battery storage units. In addition to the permitted stationary ICEs, there are also portable ICEs in the PERP program and permit exempt ICEs (greater than 25 bhp and less than 50 bhp) that operate within the Basin. These ICEs can be used as emergency backup generators but are also used for prime power generation at construction sites, large scale lighting at festivals, sporting events, concerts, and parking lots along with other applications. They are available at rental yards and unlike emergency backup generators may run five to 12 hours a day and be combined with other similar sized units. Since these ICEs are portable, if incentive funding is provided, a registration for the replacement of equipment could be required to ensure the equipment remains within the SCAQMD. During development of the incentive program, staff will refine the emissions inventory and a regulatory measure may be implemented in the future for the 25–50 bhp units after the implementation of the incentive programs and the cost of technologies decline. Emission reductions from ICEs are expected to be 1.3 tpd for 2023. It is anticipated the costs will decrease and as market acceptance increases for fuel cells and/or backup battery storage units, units running on alternative fuels, and improved emission control devices, and thus greater emission reductions will be achieved by 2031.

Regulations will be developed to ensure new installations of emergency back-up ICEs use the cleanest technology possible. In some applications, zero-emission technologies are available, meet the demand profile of a facility, and will be required to be installed. For existing equipment, a business or facility can be provided incentives for replacement or retrofits. Incentives can include the reduced cost of back-up generator testing and SCAQMD permitting fees. Examples of lower NOx emitting replacement or retrofit technologies for diesel ICEs are fuel cells, battery storage systems, NG fired engines, and the usage of renewable fuels. Battery storage will allow electricity to be stored at off-peak hours and utilized when needed. These types of systems not only provide uninterrupted energy supply for a period of time, they can be used to reduce peak demand utility charges and provide grid stability. Smaller engines such as those located at cellular towers may be viable options for batteries. Another example of near-zero technology that ICEs can be replaced with are fuel cells. This technology works well for smaller engines (less than 134 brake horsepower (bhp)) at cellular communication sites. This type of equipment is modular; therefore, it is convenient if a facility would like to increase or decrease their power usage. Approximately 400 diesel ICEs have been identified at communications facilities. A more in-depth analysis will be required to identify which ICEs are at cellular communication towers and if they are less than 134 bhp. Another type of technology includes retrofitting

diesel engines with a bi-fuel system and substituting diesel usage with NG. This engine conversion currently works best with engines that are Tier 3 or lower. Sites that do not have NG pipeline readily available, or are concerned about pipeline supply disruption during an emergency, can bring in NG trailers similar to diesel fuel tanks. These NG trailers can be connected to form a virtual pipeline to meet a facility's ICE fuel demand. After conversion, these bi-fuel systems are expected to reduce the existing diesel ICEs NOx emission levels by 30 percent. If these technologies prove impractical for a particular application, a lower Tier diesel fired ICE can be replaced with a diesel-fired ICE meeting, at a minimum, Tier 4 standards. There are also opportunities for these unavoidable remaining back-up diesel generators to utilize 100 percent bio-diesel fuel for their periodic testing. The use of these fuels has been shown to reduce direct PM emissions, and may have some nominal NOx reductions benefits as well.

Although fewer NG fired engines were identified in the permitting system than diesel engines, many older NG engines still represent a large portion of NOx emissions because they are often run for non-emergency purposes. Wherever technically feasible and cost-effective, engines in this population can be replaced with zero or near-zero technology such as fuel cell or battery storage technology. For NG fired engines, there is a potential for further NOx reductions, based on existing technology that has been achieved in practice. The current NOx emission limit established in Rule 1110.2, which applies to stationary engines above 50 bhp is 11 ppm at 15 percent oxygen. There are more stringent emission limits in the rule for new electrical generators that are based on California Air Resources Board (CARB's) Distributed Generation standards. The NOx levels for these units are about 80 percent less than the 11 ppm NOx emission limit (less than 2 ppm). This further reduction can be achieved for rich-burn engines by using catalyst technology that employs a multi-step approach to achieve lower emissions that are comparable to those of fuel cells. Two facilities have already installed this technology in the SCAQMD region and permit applications have been submitted at another location. For engines that are operated for CHP, existing systems up to 500 kW (670 bhp) can be replaced with a new engine and emission control system to achieve near-zero emissions. For non-CHP applications such as pumps, compressors, etc., a retrofit application can be installed which can be advantageous because the basic equipment can be retained, thereby lowering the costs substantially compared to the replacement of an existing engine and accompanying control system with a fuel cell. This would apply to engines of varying sizes. Since this technology has been achieved in practice, these emission levels can be established in future regulations. Engine operators will be encouraged to participate in the incentive program towards zero and near-zero technology and become early adopters of these technologies before regulatory compliance deadlines.

Staff will target commercial engines and will work closely with stakeholders during the rule making process. In certain applications, technology assessments may need to be completed to ensure a viable solution for replacements or retrofits of older existing ICEs. Given the complexity of each facility and ICE usage; different technologies are available to be implemented and not one solution is appropriate for all ICE replacements or retrofits.

Boilers

Boilers are used to produce steam for various processes, for electricity or heat generation. The SCAQMD regulates boilers greater than 5 million British thermal units (MMBtu) under Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters. During the 2008 amendment for Rule 1146, approximately 133 low fuel usage NG boilers (operating at a heat input of less than or equal to 90,000 therms per calendar year) were identified. These boilers are between 5

and 75 MMBtu per hour. These boilers are expected to meet the NOx limit of 30 ppm by January 1, 2015 or during burner replacement, whichever is later, through the use of low NOx burners. However, these older boilers can be upgraded to advanced boilers meeting 9 ppm or install selective catalytic reduction (SCR) to reach greater NOx emissions that are above and beyond the current regulatory requirements. Emissions as low as 5 ppm can be achieved with ultra-low NOx burner technology in some steady state applications where there are no substantial load changes. For the December 2015 amendments to the NOx RECLAIM regulation, a Best Available Retrofit Control Technology (BARCT) emission factor of 2 ppm was established for refinery boilers and heaters above 40 MMBtu/hr, with SCR as the primary technology. There are also other emerging technologies that can achieve the same emission level without the use of catalytic after-treatment. One of the technologies includes a flameless heater that has been achieved-in-practice, is commercially available, and can be designed to reach two ppmv NOx (at 3 percent oxygen) without the use of a SCR. Another technology has been demonstrated with SJVAPCD and can be used without the need for flue gas recirculation, SCR, or high excess air operation. If regulatory changes are not cost-effective at the time they are proposed, incentives will help facilities change out older higher-emitting equipment to newer lower-emitting equipment prior to the establishment of new regulatory limits.

Ovens/Furnaces/Kilns

Staff estimates there are 1,000 permit exempt ovens/furnaces/kilns at permitted facilities throughout the Basin. Small, permit exempt pieces of equipment may have relatively low NOx emissions; however, the relatively low replacement cost may make replacement very cost-effective if incentives for small businesses are applied appropriately.

Facility Modernization by Sector

Facility modernization can result in substantial emission reductions, especially if the cleaner equipment is at zero or near-zero emission levels. Efforts to encourage clean facilities to site and operate in the Basin can result in emission reduction benefits as well as other co-benefits to the local economy, particularly to the surrounding community. Consistent with this effort, there are three objectives:

1. Establish regulatory requirements that call for a priority on maximizing emission reductions utilizing zero emission technology, where technically feasible and cost-effective, and near-zero technologies in other applications.
2. Provide incentives for existing businesses to maximize emission reductions by accelerating replacement of older equipment with zero emission technologies, where technically feasible and cost-effective, and near-zero emission technologies in other applications.
3. Encourage new businesses that use and/or manufacture zero and near-zero emission technologies to site in the Basin.

In the past, a variety of incentive programs have been implemented, such as exempting electric equipment from permitting, implementing measures to streamline permit processing for cleaner equipment, using short-term mobile source credits, mitigation fee programs, the Air Quality Investment Program (AQIP), and emissions averaging provisions in rules.

Incentivizing emission reductions from various stationary and area sources through incentive programs through the use of zero and near-zero emission technologies is an effective approach in achieving immediate NO_x reduction in the short term. Facilities will be able to qualify for incentive funding if they utilize equipment and/or accept permit conditions, which result in cost-effective emission reductions that are beyond existing requirements. The program will establish procedures for quantifying emissions benefits from clean technology implementation and develop cost-effectiveness thresholds for funding eligibility. Mechanisms will be explored to incentivize businesses and facilities to choose the cleanest technologies, as they replace or retrofit equipment and upgrade facilities, and to provide incentives to encourage businesses to move into these technologies sooner. This will include creating a guideline for equipment that ranks technology or equipment with lower emissions with lesser incentive amounts. This can be a top-down approach, where a facility has to demonstrate why other lower-emitting technologies are not feasible, before receiving incentives for an equipment replacement with higher emissions. Although replacement or retrofitting of older, higher-emitting sources is expected to have the greatest potential for emission reductions, providing incentives and eliminating barriers for new sources to manufacture and use ultra clean technologies is also important. It is advantageous for facilities to use the incentive program to modernize facilities towards zero and near-zero technologies before regulations come into effect.

Using AER, staff identified the largest non-RECLAIM NO_x emitting facilities. Sixty six facilities were identified consisting of municipal solid waste (MSW) incinerators, landfill gas, and wastewater treatment facilities, and together these facilities emit 2.3 tons per day (tpd) of NO_x. Waste streams from MSW facilities and landfills are anticipated to be reduced as the State strives to meet the 75 percent recycling goal by 2020 under AB 341 (Chesbro, Chapter 476, Statutes of 2011). These facilities can be analyzed to determine where the greatest emission reductions can be achieved and replaced with zero or near-zero equipment or emission technology including the diversion of waste streams to be cleaned up or processed, or biogas to be routed to pipelines or used for transportation fuels. Facilities will be identified that are closer to pipelines with corresponding lower costs for pipeline injection infrastructure. Pipeline infrastructure and biogas cleanup play a large factor in the costs for pipeline injection. Depending on the type of technology or equipment receiving biogas, biogas cleanup can be removal of nitrogen, siloxanes, hydrogen sulfides, high levels of oxygen, and other trace constituents.

Incentives for infrastructure and biogas cleanup will help these sources find beneficial uses with co-benefits for these waste streams. Given uncertainties in the current markets, reductions are targeted for the long-term (2031). It is expected advancements in technology will continue and become more cost-effective once established. A facility that has a low level of biogas output may be able to work together with other facilities by combining multiple throughputs or outputs together to create more cost-effective systems, such as coupling pipelines for reinjection or for transportation fuel. These facilities working together may be able to more effectively qualify for incentives and other market based renewable fuel credits. Staff also anticipates technology will evolve to address waste streams for facilities that produce low levels of biogas, making it easier to utilize biogas for other beneficial usage instead of flaring.

Municipal Solid Waste (MSW) Facilities

Two MSW facilities in the Basin were designed in the 1980s to demonstrate that waste can be converted to energy as a method to manage solid waste. Although these facilities have some NO_x controls with existing selective non-catalytic reduction (SNCR), they have been identified in the SCAQMD's permitting system as being among the top emitters of NO_x. These facilities have existing thirty-year contracts with energy companies that make their business model profitable; however, those contracts will expire over the next few years and burning MSW may no longer be profitable. If these types of facilities continue operation, there is a potential for NO_x emission reductions up to

80 percent by installing of a back-end low temperature SCR. However, other waste diversion and digestion options can lower emissions even more.

Landfills and Wastewater Facilities

Anaerobic digestion of organic material from wastewater treatment facilities and the decomposition of waste at landfills are sources of biogas. Often the biogas is routed to engines or flares and burned. Integrated planning between the SCAQMD and other agencies can determine other uses for the biomethane generated that will result in lower NO_x emissions. A top-down analysis of the top emitting facilities can determine whether or not waste streams can be cleaned up or processed, and routed to pipelines or used for transportation fuels. A working group will be formed that will strive to overcome obstacles and include interested parties, such as The Gas Company, the sanitation districts, landfill operators, and the CPUC. Costs from pipeline infrastructure and biogas cleanup are one of the barriers for pipeline injection; however, these costs can be reduced through incentive programs. Waste gas that would otherwise be flared, can also be directed to microturbines or boilers that use ORC to provide some power to the facility. New power producing technologies, such as the ORC, shows the ability to consume gas that would otherwise be flared and provides a co-benefit by producing power. This technology utilizes heat recovery from gas combustion to operate the ORC loop to make power. Landfills and wastewater facilities investing in zero and near-zero technology may qualify for incentives for biogas cleanup or pipeline infrastructure costs.

Potential Incentives

The SCAQMD staff has compiled a list of potential incentives for stationary sources to encourage businesses to use zero or near-zero emission technologies or enhancements to the SCAQMD's existing programs to reduce or eliminate barriers to implement state of the art technologies. The list below represents an initial list of potential concepts. It is expected that as the SCAQMD staff and stakeholders further explore incentive approaches, additional concepts may be identified while others may be removed. Further, the SCAQMD staff is committed to further investigating all concepts.

- ☑ **Incentive Funding:** Incentive funding involves the creation of economic incentives to reduce the cost and encourage businesses to replace their existing high emitting equipment with equipment that is zero or near-zero emitting. It includes mechanisms such as loans and grants. Funding for these programs can derive from mitigation fees, penalty or settlement fees, or federal or State grants and programs.
- ☑ **Permitting and Fee Incentives and Enhancements:** Permitting and fee incentives and enhancements would include the expansion of the existing equipment certification program and pre-approved permit program to include additional equipment categories. Incentives involving reduced permitting fee programs for advanced technologies which significantly reduce emissions as well as other permitting enhancements identified as part of the 2012/2013 priority projects are also discussed in this incentive approach.
- ☑ **NSR Incentives and Enhancements:** The mechanism of credit offsets and NSR incentives includes expanding the number of exemptions under Rule 1304 – Exemptions and expanding the use of the priority reserve under Rule 1309.1 – Priority Reserve. In addition this mechanism includes the adoption of a Clean Air Investment Fund and potential short-term leasing of offset credits.
- ☑ **CEQA Incentives:** CEQA incentives will focus on mechanisms the SCAQMD staff can provide in the CEQA process such as expedited review.

☑ **Branding Incentives:** Branding incentives can recognize businesses or equipment that reach a superior level of air quality excellence. Branding incentives can vary from recognition awards to specific labeling or certification.

☑ **Recordkeeping and Reporting Incentives:** Recordkeeping and reporting incentives can reduce the recordkeeping and reporting requirements for specific zero and near-zero emission technologies.

An example of a recordkeeping and reporting incentive can come from replacing a diesel ICE with a fuel cell or battery storage. This diesel ICE may currently be required to keep fuel usage records, operation and weekly maintenance logs, and/or a fuel meter; however, if the facility changed to a fuel cell or battery storage they may need to only maintain maintenance records. Fuel usage records, hour meter records, and operation logs would no longer be needed to be maintained and reported to enforcement to ensure compliance.

☑ **Emission Reduction Credit Incentives:** An alternative incentive can be the generation of area or point source emission reduction credits that can be used by other entities for compliance with other SCAQMD rules. The emission reduction credits can be discounted to provide additional emission reductions to help meet air quality standards.

In 1997, the SCAQMD adopted an area source credit rule for NO_x and SO_x (Rule 2506) to encourage emission reductions and technology advancement for unpermitted sources, provide incentives for the accelerated turnover of old, higher-emitting equipment, and generate low-cost NO_x and SO_x emission credits. Emission credits created under Rule 2506 may be used as an alternate means of compliance with specified District regulations. In addition, Rule 2507 provides opportunities to generate NO_x area source credits for use in RECLAIM through the voluntary electrification of agricultural pumps.

Incentives Implementation

Emission reductions credits that are projected to be achieved from incentive programs must be demonstrated to be real, quantifiable, surplus, enforceable, and permanent as defined by the U.S. EPA. Compliance will be based on tracking, recordkeeping, and reporting requirements that will be established in the guidelines protocol for the incentive measure. In addition, compliance can be verified through inspections and other recordkeeping and reporting requirements. These demonstrations must include project type(s); project life; applicable incentive program guidelines by title, year, chapter; and analysis of applicable incentive program guidelines for consistency with integrity elements. The following describes the key elements of such a demonstration:

- **Quantifiable:** Emission reductions are quantitatively measureable, supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. There must be procedures to evaluate and verify over time the level of emission reductions actually achieved.
- **Surplus:** Emission reductions must be above and beyond any district, State, or federal regulation already included in the SIP. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the SIP, SIP-related requirements, and other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that an incentive program's emission reductions are already relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are

available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced has a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP purposes under this guidance for only five years).

Targeting older, higher polluting permitted equipment, such as ovens, furnaces, dryers, and low fuel usage NG boilers, that are exempt from existing regulation or under no legal mandate to be replaced or retrofitted with newer more efficient and lower polluting equipment. Older ICEs with remaining usable life can be replaced with zero and near-zero technologies, while taking advantage of incentives before regulations are adopted. The SCAQMD will be able to use the reductions for SIP purposes and reach attainment earlier.

- Enforceable: The SCAQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:
 - They are independently verifiable;
 - Program violations are defined;
 - Those liable can be identified;
 - SCAQMD, CARB and U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable;
 - The general public has access to all the emissions-related information obtained from the source;
 - The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes); and
 - They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.

Actual emission reductions, for example, can be assured through replacement or retrofit equipment registration, recordkeeping and reporting, and inspections (initial after installation and subsequent on a regular basis thereafter, if needed) throughout the term. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

- Permanent: The emission reductions need to be permanent throughout the term for which the credit is generated. The emission reductions are permanent if these reductions are ensured to occur over the duration of the incentive program, and for as long as they are relied on in the SIP.

For example, those awarded incentives will need to ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Thus, recipients of the incentive awards will agree to contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment will not be removed without concurrence with SCAQMD (i.e., permanent placement) and the proof that the replaced equipment will be destroyed or at least not be operated any more in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the individual incentive measures.

Guidelines

The incentive program needs to develop detailed and comprehensive guidelines that are approved by the SCAQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability. The guidelines will have the following:

- Demonstrate compliance with the four key elements of the incentive program: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance and permanent reductions.
- Working groups will be established to solicit public input and feedback during the incentive program guideline development.
- Processes and procedures to apply for incentives will be clearly explained in the guidelines.
- Clearly describe how incentives will be awarded. Public working groups or workshops will take place to discuss the guidelines and incentives. Facilities qualifying for incentives shall submit applications during an open enrollment period. Projects shall be evaluated on criteria, including but not limited to, emission reductions, incentive effectiveness, age of equipment, remaining useful life of existing equipment, EJ area priority, local business, and small business status.
- Conditions for contracts including tracking to ensure permanent reductions. The following forms will be prepared:
 - Application Forms (samples are required);
 - Contracts with Conditions (samples are required); and
 - Product Example.
- Tracking mechanism to ensure overall effectiveness of program and procedures to verify and correct emission projections, such as reductions by the committed target date (e.g., 2023, 2031) and submittal to U.S. EPA annually. Tracking checklist will at a minimum include:
 - Project Title;
 - Product (e.g. equipment type, size, fuel use, hours operated, emissions, source test reports);
 - Annual Emission Reductions (e.g., from 2017 to 2027, incremented by one year);
 - Life of project (e.g., 10 years); and
 - Installation dates (e.g., fixed year 2017 or multiple installation years 2017 and 2018).
- Recordkeeping, reporting, and monitoring requirements. These requirements need to be addressed.
- Individual outreach efforts (e.g., social media, email blasts) to promote the program, announcement(s) of application deadlines, and announcement(s) of public workshops.
- SCAQMD Governing Board approval of program guidelines and made publicly available.
- Facilities must provide documentation (i.e., Permits, operating and maintenance records, inspection reports, etc.) to validate equipment qualifying for the incentive program has been operating within the SCAQMD jurisdiction for a minimum of five years.
- Demonstrate that existing equipment qualifying for the incentive program has at least five years of remaining useful life.
- Replacement or control equipment incentivized through the incentive program must comply with applicable permitting requirements (e.g., BACT, NSR, modeling) to ensure equipment meets all federal, State, and SCAQMD regulations and has enforceable conditions.

- ☑ New equipment can be source tested after initial operation to ensure equipment has been installed correctly. Periodic testing and parametric monitoring can be conducted to ensure the equipment continues to operate effectively and efficiently.
- ☑ The incentive program shall take into consideration any additional operating and maintenance costs or efficiency improvements associated with the new equipment in the incentive effectiveness.
- ☑ Facilities operating new or modified equipment shall continue to pay an annual permitting fee to ensure the equipment maintains a permit. The annual permitting fee shall be similar to the equipment being replaced.
- ☑ New or modified equipment will result in less NO_x and/or VOC emissions than the equipment being replaced. In many cases, this will result in lower annual emissions fees.
- ☑ New equipment will undergo a CEQA analysis to ensure significant health risks and environmental hazards are not created.
- ☑ Old equipment will be removed and destroyed to prevent additional emissions.

Emission Reductions

Facility modernization can take place in the both the short- and long-term. The feasibility of regulations and the amount of available incentives will directly affect the level of emission reductions achieved. At a minimum, an estimated 14 percent NO_x reduction from the baseline will be achieved by 2023 from converting some existing stationary combustion sources to zero and near-zero emission technologies. An effort to modernize with a combination of regulatory and incentive-based approaches will result in at least a 27 percent NO_x emission reduction from the baseline by 2031. As new technologies become more established, the cost of the technology is expected to decrease; therefore providing more opportunities to transition to zero and near-zero technologies by 2031 and for regulations to also be established. Emission benefits from incentives will be quantified based on program participation, technology penetration, and other assessment and inventory methods. Implementing additional incentive programs will include a means to quantify these benefits as they are developed. Updated emission reductions achieved from these activities will be incorporated into the subsequent SIP revisions as projects are implemented.

The following potential emission reductions have been identified through an analysis of AER and permitting systems:

TABLE 4
Emission Categories Identified for Potential Reductions

Category	# Units/ Facilities	Current Emissions	2023 Reductions (tpd)	2031 Reductions (tpd)
ICEs (<2010) – (Permitted)	10,145	4.2	0.6	1.4
ICEs – (Permit exempt and PERP)	13,591	12.1	0.7	1.5
Ovens/Furnaces/Kilns – (Permit exempt)	1,000	0.8	0.4	0.4
Boilers (Low fuel usage NG)	133	TBD	0.1	0.1
Landfills	29	0.7	0.1	0.6
Wastewater Treatment Facilities	35	0.5	0.1	0.3
Municipal Solid Waste Facilities	<5	1.1	-	0.6
Total	24,937	19.4	2.0	4.9

The emission reductions identified in Table 4 are based on the annual average emissions and not the summer planning inventory because the emissions were quantified using annual emission data from the AER and permitting systems.

Rule Compliance and Test Methods

Local

Source test methods vary depending on the type of source and quality of emissions (e.g. criteria pollutant and toxic emissions). Source test methods may include, but are not limited to SCAQMD Methods 5.1, 25.1 25.3, 100.1, 207.1 or other SCAQMD-approved test methods.

Energy Sector

Mandates for increasing the renewable power generation and fuel sources, energy storage, and smart grid implementation are being implemented through the California Energy Commission (CEC), CalRecycle, CPUC, CARB and California Independent System Operator (CAISO). The SCAQMD will work with these agencies along with businesses and facilities in identifying applications that provide emission reductions. As the technologies evolve, there may be applications that warrant SCAQMD to enact regulations and/or require their use.

Cost-Effectiveness

The decision regarding when to replace existing equipment can vary; some operators may replace equipment when it is no longer operable, while other operators may replace equipment well before it reaches that point. An operator's decision to replace older equipment or purchase new controls may also include anticipation of regulatory changes or cost savings from increased process efficiency. Regardless, equipment replacement and/or installation of pollution controls can represent a significant financial decision where the operator must assess the capital cost to purchase new equipment, installation, operating and maintenance costs.

The SCAQMD has implemented several funding incentive programs to help facilitate specific technologies and compliance with SCAQMD rules. As an example the Rule 1470 Risk Reduction Fund was established in May 2012. This fund was adopted by the SCAQMD Governing Board to set aside \$2.5 million to offset the cost of purchasing diesel particulate filters for new diesel emergency standby engines as required under Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines. Another program is the Dry Cleaner Financial Incentive Grant Program which was designed to assist local dry cleaners to switch to non-perchloroethylene dry cleaning systems to comply with Rule 1421 – Control of Perchloroethylene Emissions from Dry Cleaning Systems. Up to \$20,000 was available for CO₂ machines and \$10,000 for water-base system machines. For a limited time, \$5,000 was available for hydrocarbon machines. Since 2008, the program has provided approximately \$265,000 to local dry cleaners in order to upgrade their systems. In addition, there are several existing incentive programs which help promote higher efficiency and lower-emitting technologies such as the: Lawn Mower and Leaf Blower Exchange; SOON Program; Carl Moyer Memorial Air Quality Standards Attainment Program; Mobile Source Emission Reduction Credits (MSERC) Programs; and Voucher Incentive Program. Fuel cell technology may qualify for State funding incentives for self-generation of power.

Given the potential variety of regulations, programs and projects that will be developed, the incentive effectiveness is only an estimate based on the specific equipment and facilities identified. Once a working group is established, staff expects additional types of equipment and processes improvements to be identified for facility modernization. The equipment/industries identified are only an example of a pathway to the 4.9 tpd (6 tpd based on the summer planning inventory) reductions based on the data in the AER, permitting systems, and assumptions on the number of permit exempt combustion sources in the SCAQMD. Upon implementation, the incentives will be allocated based on pre-defined criteria developed by the working group (e.g., incentive effectiveness, funding partnership opportunities, capital cost of equipment, maximum NO_x reductions, location in or near EJ areas, small business, etc.). The incentive effectiveness for specific incentive programs will be determined as they are developed and implemented by the SCAQMD. It is anticipated that \$450 million dollars will be allocated to achieve 4.9 tpd (6 tpd based on the summer planning inventory) of NO_x emission reductions from this incentive programs. Incentives for facilities are based on biogas cleanup costs and do not include infrastructure costs. Incentives may include grants for the new purchase of equipment as well as loan programs in areas where capital costs are high, but long-term cost savings from increased efficiency are achieved. Public funding or public-private partnerships can be used to tip the balance towards a business case for investments when equipment upgrades do not offer sufficient returns for private investment. The purpose of incentives is to create opportunities or make it more cost-effective to replace equipment or transition to zero or near-zero technology or encourage earlier change-out of higher-emitting equipment and drive technology development and cost reductions. The SCAQMD will work together with businesses, other government agencies, public utilities, the public, and other interested stakeholders to implement incentive programs that will reduce the most emissions with the least amount of cost.

Table 5 is a demonstration of the incentive effectiveness for the identified sources of emissions. The cost-effective analysis is only a demonstration of source categories staff identified for potential emission reductions through incentive funding and costs for replacement or control equipment currently available. Upon implementation and formation of a working group, new zero and near-zero emitting technologies can be identified as well as other sources for potential NOx reductions. Staff anticipates many facilities and stakeholders will come forth and participate once a working group is established and it will be determined the most cost-effective means for distribution of funds to achieve emission reductions. The replacement equipment or control technology identified in Table 5 demonstrates the type(s) of available zero or near-zero technology to reduce NOx emissions from the stationary combustion source categories. Staff acknowledges that for each category, other solutions or technology can exist to help achieve NOx emissions reductions. References to specific lower-emitting technologies is not to favor one technology over another as the SCAQMD strives to maintain a fuel neutral policy.

TABLE 5
Incentive Effectiveness by Category

Category	Replacement Equipment Identified	\$/Unit or Facility	# Units/Facilities Identified for Incentive	Average \$/tpy Reduction
Diesel ICE	Meet Tier 4 or Higher	\$155,000	1,750	\$54,000
	Fuel Cell (to replace smaller ICEs)	\$180,000	1,750	\$23,000
	Retrofit to NG ICE (Bi-fuel)	\$38,000	50	\$42,000
Natural Gas ICE	Fuel Cell	\$3,200,000	10	\$80,000
	Near-Zero Replacement	\$3,800,000	10	\$120,000
	Control Equipment	\$180,000	220	\$6,000
Ovens/furnaces/kilns	New Lower-Emitting Equipment	\$40,000	1,000	\$12,000
Boilers (15 MMBtu/hr) (50 MMBtu/hr)	New Lower-Emitting Equipment	\$270,000	130	\$53,000
	New Lower-Emitting Equipment	\$790,000	6	
Landfills	Biogas Cleanup	\$21,000,000	29	\$110,000
Wastewater Treatment Facilities	Biogas Cleanup	\$6,700,000	35	\$86,000
Municipal Solid Waste Facilities	Control Equipment	\$3,700,000	4	\$3,000
			Average	\$54,000/ton

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources and will implement the transition of existing combustion sources into operating zero and near-zero emission technologies in cooperation with other local governments, agencies, businesses, technology manufacturers and distributors, and community groups, through incentive programs and potential regulations if required.

To develop, demonstrate, and implement energy storage or smart grid systems to assist in powering electrified sources, the SCAQMD will work with the California Energy Commission, local utilities, and other stakeholders.

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September 16, 2016.

**CMB-02: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO OR NEAR-ZERO
NO_x APPLIANCES IN COMMERCIAL AND RESIDENTIAL APPLICATIONS
[NO_x]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	COMMERCIAL/RESIDENTIAL NO _x APPLIANCES			
CONTROL METHODS:	ZERO AND NEAR-ZERO EMISSION BURNERS AND INCENTIVES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NO _x INVENTORY	15.7	9.6	14.7	10.3
NO _x REDUCTION		TBD	1.8	3.98
NO _x REMAINING		TBD	12.9	6.3
SUMMER PLANNING	2012	2022	2023	2031
NO _x INVENTORY	9.4	5.8	10.2	9.5
NO _x REDUCTION		TBD	1.1	2.84
NO _x REMAINING		TBD	9.1	6.7
CONTROL COST:	\$15,000 to \$30,000 PER TON NO _x REDUCED			
TOTAL INCENTIVE (% OF COST)	\$520,000,000 (17% TO 22%)			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

Background

Currently the SCAQMD regulates boilers and small residential and commercial furnaces used for space and water heating. Boilers, depending on size, are subject to Rule 1146, 1146.1 or 1146.2. Residential and small commercial fan-type central furnaces are regulated by SCAQMD Rule 1111. Residential tank type water heaters are regulated by SCAQMD Rule 1121. Large commercial space heating furnaces are not currently regulated by the SCAQMD unless they have a heat input rating of more than 2 million BTU per hour. Units with a rating of more than 2 million BTU per hour require a SCAQMD permit and are subject to a NO_x BACT limit of 30 ppm (at a reference level of 3 percent oxygen). This control measure seeks emission reductions from unregulated commercial space heating furnaces and reductions through regulations and incentive programs to replace older boilers, water heaters and space heating furnaces with a priority on maximizing emission reductions utilizing zero emission technologies where cost-effective and feasible, and near-zero emission technologies in all other applications. This control measure will apply to manufacturers, distributors, sellers, installers and purchasers of residential and commercial

water heaters, boilers and heating furnaces used for water or space heating. The primary focus of this control measure is on commercial and residential water and space heating appliances, but the SCAQMD will consider regulations for other appliances such as clothes dryers, pool heaters, etc. This control measure has evaluated an incentive program for replacing old pool heaters with new lower emission units, which is reflected in emission reduction potential found in the table on page IV-A-53.

Regulatory History

Large commercial space heating furnaces are not currently regulated by the SCAQMD unless they have a heat input rating of more than 2 million BTU per hour. Units with a rating of more than 2 million BTU per hour require a SCAQMD permit and are subject to new source review and a NO_x BACT limit of 30 ppm (at a reference level of 3 percent oxygen). The smallest commercial boilers and larger water heaters subject to Rule 1146.2 must comply with a NO_x emission limit of 20 ppm. Larger boilers meet more stringent emission limits. Residential tank type water heaters are regulated by SCAQMD Rule 1121 and single family residence space heating units are subject to SCAQMD Rule 1111.

Proposed Method of Control

This control measure seeks annual average NO_x emission reductions of about 1.1 tons per day by 2023 and 2.8 tons per day by 2031 from: (1) regulations for currently unregulated commercial furnaces used for space heating; and (2) a combination of long-term regulation and shorter-term incentives to replace existing commercial and residential NO_x appliances such as boilers, water heaters and space heating furnaces with new zero or near-zero emission units. This control measure will apply to manufacturers, distributors, sellers, installers and purchasers of commercial boilers, water heaters and furnaces used for space heating. The focus of this control measure is on commercial and residential water and space heating appliances. This measure will focus on maximizing emission reductions utilizing cost effective zero emission technologies wherever and whenever feasible and near-zero technologies in other applications. In assessing the cost-effectiveness of these technologies, the life-cycle in-basin emissions under current and future energy productions and transmission portfolios will be considered. As the energy supply and distribution system change over time, certain technologies may become more or less effective at reducing emissions. GHG emissions and toxic impacts must also be considered.

During the development of future regulations and incentives, staff will consider technical, economical, and legal feasibility, of requiring new developments to install cost effective zero emission technologies (e.g., solar or electric water heaters, zero emission space heaters, and smaller scale fuel cells).

Implementation of this measure could occur through direct SCAQMD regulation and/or through other regulatory paths including building codes, EGM-01, or energy regulations, such as California's Title 24 standards. Title 24 targets include achieving Zero Net Energy consumption for new residential housing by 2020 and new commercial construction by 2030. Implementation, incentivizing, and any potential future regulations in this measure would be coordinated with utilities and other agencies to leverage and enhance existing programs, maximize energy savings, and emission reductions.

If zero-emission technologies are not cost-effective or feasible, one component of this control measure may be to require residential water heaters to meet the heat input based emission limit in Rules 1121 and 1146.2 (pounds per million BTU of heat input or parts per million [ppm] NO_x). This would ensure that energy efficiency incentive programs for these residential appliances also achieve NO_x emission reductions. While higher efficiency units will

emit less carbon dioxide, SCAQMD rules allow manufacturers of water heaters the option of meeting a heat input based emission limit or a heat output based emission limit (nanograms of NO_x per Joule [ng/J] of useful heat output). The heat output option of the emission standard allows high efficiency water heaters to emit the same amount of NO_x as standard units heating the same amount of water because high efficiency units are allowed to emit higher concentrations of NO_x. This results in the same amount of NO_x emitted over time regardless of the efficiency of a unit. All manufacturers have chosen to use the heat output based NO_x limit of 10 ng/J. The emissions test data available to the SCAQMD for these types of units does not indicate that high efficiency units emit less NO_x. Because manufacturers use the output based emission limit, replacement of standard efficiency water heaters with high efficiency units does reduce carbon dioxide emissions, but apparently does not currently result in lower NO_x emissions.

Another component of this control measure is to continue to implement the Rule 1111 emission limit of NO_x for residential space heaters, which is 14 ng/J (20 ppm) starting in 2014. In addition, the technology to reduce emissions from commercial space heating equipment is transferrable from residential space heating furnaces and other heating and drying equipment. Currently, most commercial space heaters are unregulated and have NO_x emissions in the range of 90 to 110 ppm. The SCAQMD has required residential space heaters to meet a limit of 40 ng/J of heat output (55 ppm) since 1984 under Rule 1111. The original rule passed in 1978 included regulation of commercial sized units. Starting in 2014, the Rule 1111 emission limit for residential space heaters is 14 ng/J (20 ppm). Low NO_x burners are also available for a variety of commercial and industrial heating and drying applications and achieve NO_x emission levels of 10 to 30 ppm. There are also burner technologies available in the near future that can achieve NO_x emissions of 5 to 10 ppm. Assuming a future NO_x emission limit of between 20 ppm to 30 ppm, emissions from a commercial heating unit can be reduced by 60 to 80 percent. The emission reduction targets in the control measure summary above can be achieved in part by a rule implemented starting in 2020–2022 with rule adoption in 2017–2018.

A significant component of this control measure is to incentivize the early replacement of older boilers, water heaters and space heaters with zero-emitting alternative technology, or new lower emission and more efficient low NO_x boilers, water heaters and space heaters. Incentivizing replacement of old equipment will be voluntary and result in emission reductions that are real, quantifiable, surplus, enforceable and permanent as described in the Incentives Implementation section. The new boilers and water heaters will comply with SCAQMD rule emission limits and new commercial space heaters would need to meet a specified emission limit. An alternative incentive could be the generation of area source emission reduction credits that can be used by other entities for compliance with other SCAQMD rules. The emission reduction credits will be discounted to provide additional emission reductions to help meet air quality standards.

One readily available option is to use electric water and space heaters. The initial purchase price of these units is typically less than gas water heaters and furnaces. In addition, there are other alternatives for water and space heating. Air to air and ground to air heat pump systems are used to produce hot water and heat buildings. Air to air heat pump water heaters are reasonably priced and are a cost-effective option for reducing NO_x and heating water for residences and small commercial properties. A typical price at a hardware supply store is \$1,000 to \$1,800 for a residential or small unit with warranties longer than for the average gas water heater. A 50 gallon residential heat pump water heater can be purchased for about \$1,000. These units are energy efficient and are direct replacements for both gas and standard electric water heaters. These water heaters can also be used for comfort heating by using a hot water to air heat exchanger instead of a gas furnace. Moreover, ground to air and air to air heat pump based space heaters have been available for many decades and are produced by a large

number of manufacturers. In assessing the cost-effectiveness of these technologies, the life-cycle in-basin emissions under current and future energy productions and transmission portfolios will be considered. As the energy supply and distribution system change over time, certain technologies may become more or less effective at reducing emissions. GHG emissions and toxic impacts will be evaluated.

There are a variety of zero and near-zero options that are or will become available in the future including solar, heat pumps, and ultra-low NOx burners. The SCAQMD will develop both regulatory and incentive programs to support replacement of older higher emitting water and space heating units with zero and near-zero and lower emission technologies. The SCAQMD is proposing to incentivize replacement of older units with these low emission technologies. However, to achieve reductions in the near future, the SCAQMD also proposes replacement of older water and space heating systems with new lower emission units that would result in significant emission reductions.

For swimming pool heaters, early reductions for 2023 can be achieved by incentivizing replacement of working pool heaters manufactured prior to the year 2001 (less than 25 years old), which do not meet the current NOx emission limit. This program would replace working pool heaters at single and multifamily residences. Based on gas utility data, staff estimates there are approximately 200,000 to 240,000 residential swimming pools in the SCAQMD (4 to 6 percent of single family residences). Replacing 50,000 working noncompliant pool heaters by 2023 with new units will result in an early reduction of NOx for 2023 of 0.1 ton per day. The average installed cost for a pool heater is about \$2,500. An incentive of \$1,000 will pay for the installation cost and a portion of the equipment cost. The cost of replacing 50,000 non-compliant working pool heaters with an incentive of at least \$1,000 is \$50,000,000 or more. The cost-effectiveness for this program, assuming a 25 year equipment life, is \$55,000 per ton or more depending upon the incentive.

For commercial water heaters and small boilers, a number of options can be used. One option is to incentivize early replacement of small Rule 1146.2 Type 1 units (≤ 0.4 mmBtu/hour) manufactured since January 1, 2001 and less than 15 years old that meet the original rule NOx emission limit of 55 ppm. New replacement units will meet the current rule limit of 20 ppm NOx. This will result in early NOx reductions for the year 2023. Staff estimates that there are about 64,000 Type 1 units in the SCAQMD. Early replacement of 20,000 working units manufactured after January 1, 2001 and prior to 2012 with new units meeting the current emission limit of 20 ppm NOx will result in 0.42 ton per day of early reductions by 2023. An average size Type 1 unit (0.175 to 0.200 mmBtu/hour) costs about \$5,500 to \$6,000. An average incentive of about 25–30 percent of the cost (\$2,000 for an average sized unit of 0.2 mmBtu/hour) or more could be used to stimulate early replacement of units meeting the old NOx emission limit. The cost for early replacement of 20,000 units is \$40,000,000 or more. The cost-effectiveness of the incentive, assuming an average 15 year equipment life, is \$17,400 per ton or higher depending upon the incentive.

In addition, 40,000 Type 1 existing units meeting the current NOx emission limit of 20 ppm can also be replaced with lower emission units achieving 12 ppm. Alternatively the previous 20,000 Type 1 units can be further incentivized to purchase units with NOx emissions of 12 ppm or less instead of those meeting the current rule limit of 20 ppm. Assuming an incentive of at least \$1,000 per unit and a cost of \$40,000,000 or more, an additional emission reduction of 0.62 tons per day can be achieved for 2031 for incentivizing the purchase of 40,000 units with emission levels of 12 ppm. Assuming a 15 year equipment life, the cost-effectiveness of the incentive for this component is \$36,500 per ton or greater depending upon incentive.

An additional 0.07 tons per day can be reduced for 2023 by replacing 2,000 Type 1 units (with certified emissions of 55 ppm) with solar thermal, electric, or heat pump water heaters powered with renewable energy using a partial

incentive of at least \$10,000 per unit. This replacement will also result in 0.024 ton per day reduction for 2031 (the difference between 20 ppm and fuel cell, solar or green electric). The cost to replace 2,000 units is \$20,000,000 or more depending upon the incentive. The cost-effectiveness of this level of incentive is about \$55,000 per ton over the lifetime of the equipment.

For further reductions in 2031, the 20,000 Type 1 units with starting emissions of 55 ppm and replaced with 20 ppm units discussed previously can be replaced with fuel cell, solar thermal, electric or heat pump water heaters powered by renewable energy. For an incentive of at least \$2,000 (or \$4,000 for direct conversion from a 55 ppm unit) an additional 0.24 ton per day reduction can be achieved for a cost of \$40,000,000 or more depending upon incentive. This partial funding incentive has a cost-effectiveness of about \$30,400 per ton.

In addition, for 2031 40,000 Type 1 units with starting NOx emissions of 20 ppm that are replaced with units achieving 12 ppm can be replaced with fuel cell, solar thermal, electric or heat pump water heaters powered by green energy. For an incentive of at least \$1,000 (or \$2,000 for direct conversion from a 20 ppm unit) an additional 0.29 tons per day reduction can be achieved in 2031 for an additional cost of \$40,000,000 or more depending upon incentive. The cost-effectiveness for this conversion at \$1,000 per unit is about \$25,400 per ton.

For larger Rule 1146.2 commercial water heaters and boilers > 0.4 mmBtu/hour (Type 2 units), the SCAQMD can incentivize the early replacement of units meeting the original rule limit of 30 ppm NOx with units whose certified NOx emissions are 12 ppm NOx. Units achieving this emission level are currently available. This emission rate is less than the current rule limit of 20 ppm. Staff estimates there are about 32,000 larger Type 2 Rule 1146.2 units in the SCAQMD. Early replacement of 10,000 Type 2 units less than 20 years old with units achieving an emission rate of 12 ppm NOx will result in early NOx reductions for 2023 of about 0.5 ton per day based on an average sized unit (0.900 mmBtu/hour). The cost difference between an average sized 20 ppm Type 2 unit and a 12 ppm unit is about \$10,000. An average incentive of at least \$5,000 per unit with replacement of 10,000 units results in a cost for this component of \$50,000,000 or more. The cost will be higher for a greater incentive. The cost-effectiveness for the incentive, assuming an average equipment life of 25 years, is \$18,200 per ton or more for 2023. In addition, approximately 0.22 ton per day of these reductions (the difference between 20 ppm and 12 ppm) are beyond current rule limits. This 0.22 ton per day reduction for 2031 has a cost-effectiveness of about \$24,600.

An additional 0.45 tons per day of NOx reductions can be achieved for 2031 by incentivizing the early replacement of an additional 20,000 Type 2 units meeting the current rule limit (20 ppm) with units achieving certified NOx emissions of 12 ppm or replacing very old working units manufactured prior to January 1, 2000 with 12 ppm units. The cost of this program at an average incentive of at least \$5,000 per unit for a 0.9 mmBtu per hour average sized unit is \$100,000,000 or more. The cost-effectiveness of the incentive, based on an average equipment life of 25 years, is about \$24,600 per ton.

For 2031, an additional 1 ton per day can be achieved by replacing 30,000 large Type 2 Rule 1146.2 units at emission levels of 12 ppm NOx with fuel cell, solar and/or electric systems powered by renewable energy sources. An incentive with an average cost of about \$10,000 could be used to promote this switch in technology at the end of a unit's useful life. The total cost would be about \$300,000,000 with a cost-effectiveness for the incentive of about \$32,900 per ton. The cost-effectiveness is lower if units meeting the current rule limit of 55 ppm NOx are converted at the same total cost.

These various incentives result in approximately 1.1 tons of early NOx reductions in 2023 and about 2.8 tons per day of permanent reductions in 2031. Many of the emission reductions for 2023 are not permanent because Rule

1146.2 is expected to be fully implemented by 2031. However, additional reductions can be achieved for 2031 by replacement with existing lower NOx and alternative technologies.

The SCAQMD will evaluate the need to amend existing rules regulating these sources or develop a new rule for regulation of NOx emissions from commercial and residential space heating furnaces. The SCAQMD will propose regulatory requirements based on maximizing emission reductions utilizing zero emission technologies where feasible and cost effective, and near-zero emission technologies in other applications. Based on previous rule development projects staff estimates the cost-effectiveness for a heating furnace rule for equipment not regulated under Rule 1121 to be about \$15,000 to \$30,000 per ton. The SCAQMD will also need to continue to implement the Rule 1111 NOx emission limit for residential space heaters of 14 ng/J (20 ppm) and will evaluate revising the emission limits for residential water and space heating units to achieve further emission reductions from these sources.

Incentives Implementation

Integrity Elements

Emission reductions that are projected to be achieved from the voluntary incentive measures must be demonstrated to be quantifiable, surplus, enforceable, and permanent. This demonstration must include project type(s); project life; applicable incentive program guideline(s), by title, year, chapter(s); and analysis of applicable incentive program guideline(s) for consistency with integrity elements. The following describes the definitions and provides examples of the key elements of such a demonstration:

- **Quantifiable:** Emission reductions are quantitatively measureable—supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. There must be procedures to evaluate and verify over time the level of emission reductions actually achieved.

Potential emission reductions associated with various equipment types are discussed in the Proposed Method of Control section. The following table provides an overview of the sources, emission reductions, and proposed incentives for targeted sources.

Emission Reduction Potential and Incentives for CMB-02 Components

Emission Reduction Component of CMB-02	Number of units	2023 Reduction (T/d)	Avg Size Unit Cost (\$)	Average Incentive (\$)	Incentive Cost (mm\$)	2031 Reduction (T/d)	Average Incentive (\$)	Incentive Cost (mm\$)
1146.2 Type 1 (< 0.4 mmBtu/hr)								
Replace post Jan 1, 2001 units < 15 years old. (55 to 20 ppm)	20,000	0.42	\$6,000	\$2,000	40			
Replace Type 1 20 ppm units with 12 ppm units (20 to 12 ppm) (Also replaces pre rule 2001 with 12 ppm))	40,000		\$6,000			0.62	\$1,000	40
1146.2 Type 2 (> 0.4 mmBtu/hr)								
Replace Type 2 30 ppm with 12 ppm (Current limit is 20 ppm)	10,000	0.50	\$18,000 to \$28,000	\$5,000	50	0.22		
Replace Type 2 20 ppm with 12 ppm (& replace pre 2000 with 12 ppm)	20,000					0.45	\$5,000	100
1146.2 Type 1 (< 0.4 mmBtu/hr)								
Rule 11146.2 replace Type 1 with Solar or Heat Pump (55 ppm to green for 2023, 20 ppm to green for 2031)	2,000	0.07	\$16,000	\$10,000	20	0.02		
1146.2 Pool Heaters (< 0.4 mmBtu/hr)								
(uncontrolled units prior to 2001)	50,000	0.10	\$1,500 to \$2,500	\$1,000	50			
Replace 1146.2 Type 1 20 ppm units with Solar/Heat Pump (20 ppm to green) (Units in first component above)	20,000		\$16,000			0.24	\$2,000	40
							(\$4,000 if direct)	
Replace 1146.2 Type 1 12 ppm units with Solar/Heat Pump (12 ppm to green) (Units in second component above)	40,000		\$16,000			0.29	\$1,000	40
							(\$2,000 if direct)	
1146.2 Type 2 (> 0.4 mmBtu/hr)								
Convert 1146.2 Type 2 to Fuel Cell/Solar/Heat Pump/Electric (12 ppm to green) (From both groups above or direct)	30,000		\$28,000			1.00	\$10,000	300
							(\$15,000 direct)	
Total		1.1			160	2.84		520
		T/d			mm\$	T/d		mm\$

Reductions Based on calculations for average sized units.

Assumes a daily capacity factor for 1146.2 units of 21.5% based on Rule 1146.2 survey/analysis and CEC and Gas Company reports.

Rule 1146.2 units --> ~64,000 small Type 1 units and ~ 32,000 larger Type 2 units

Rule 1146.2 pool heaters --> ~200,000 to 240,000 units

- **Surplus:** Emission reductions must be above and beyond any district, State, or federal regulation. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the SIP, SIP-related requirement, other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that VIP emission reductions are relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced had a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP or conformity purposes under this guidance for only five years).
- **Enforceable:** The SCAQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:
 - They are independently verifiable.
 - Program violations are defined.
 - Those liable can be identified.
 - SCAQMD and U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable.
 - The general public have access to all the emissions-related information obtained from the source.

- The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes).
- They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability

Actual emission reductions, for example, can be assured through the replacement equipment registration, recordkeeping and reporting, and inspections (initial inspection after installation and subsequent on a regular basis thereafter, if needed) throughout the term. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

- **Permanent:** The emission reductions need to be permanent throughout the term for which the credit is generated. The emission reductions are permanent if these reductions are ensured to occur over the duration of the VIP program, and for as long as they are relied on in the SIP.

For example, those awarded incentives would need to ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Thus, recipients of the incentive awards would agree to contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment would not be removed without concurrence with SCAQMD (i.e., permanent placement) and the proof that the replaced equipment would be destructed or at least not be operated any more in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the individual incentive measures.

Guidelines

Each VIP needs to have detailed and comprehensive guidelines that are approved by the SCAQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability:

- VIP should demonstrate compliance with the four key elements of the VIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance and permanent reductions.
- Working group should be established to solicit public input and feedback during VIP guideline development.
- Process and procedures to apply for incentives should be clearly explained in the guideline.
- It needs to clearly describe how incentives would be awarded (e.g., priority to high emitters and/or age of equipment, tiered process, first come first serve, or EJ area priority).
- It should have conditions of some form for agreement (e.g., contracts) including tracking and ensuring permanent reductions. The following forms should be prepared:
 - Application Forms (samples are required).
 - Contracts with Conditions (samples are required).
 - Product Example.
- Tracking mechanism is required to ensure overall effectiveness of program and procedures to correct emission projections, such as reductions by the committed target date (e.g., 2023, 2031) and submittal to U.S. EPA annually. Tracking checklist should include:
 - Project Title.
 - Product.

- Annual Emission Reductions (e.g., from 2017 to 2027, incremented by one year).
- Life of project (e.g., 10 years).
- Installation dates (e.g., fixed year 2017 or multiple installation years 2017 and 2018).
- Possible recordkeeping, reporting, and monitoring requirements need to be addressed.
- Individual outreach efforts (e.g., social media, email blasts) to promote the program, make aware of deadlines to apply, and provide timing locations of workshops.
- Program guidelines should be approved by the SCAQMD Governing Board and published online.

Emission Reductions

This control measure seeks 20 percent NO_x emission reductions of 1.1 tons per day⁸ by 2023 and 30 percent NO_x emission reductions of 1.5 tons per day by 2031 from early replacement of space heating furnaces, boilers and water heaters with new lower or zero emission and higher efficiency units through incentives with new rule for commercial space heating units and amendments to the residential water and space heating rules (Rules 1121 and 1111). The potential emission reductions from incentive programs are discussed in the preceding section on proposed methods of control. Emission benefits expected from actions going beyond SB 350 and Title 24 building energy standards are not yet within the 2016 AQMP future year emission inventory.

Another important component is to continue to implement the Rule 1111 emission limit of NO_x for residential space heaters which is 14 ng/J (20 ppm) starting in 2014. Growth and energy efficiency programs will affect the anticipated reduction from this control measure. For instance, equipment may be replaced on an accelerated schedule due to regulations or incentives to increase the efficiency of these units. Reduced fuel use due to increased efficiency may also lower NO_x emissions. For development of a commercial space heater rule, the commercial space heating inventory must be refined in order to clarify the amount of natural gas used by commercial space heaters compared to hydronic (boiler-based) space heating. However, based on national estimates of floor space for different types of buildings and uses, staff estimates that 45 to 60 percent of all commercial, light manufacturing, warehouse, office, school and government building floor space is heated by commercial forced air and radiant heating units. In addition, approximately half of the residences in the SCAQMD are in multi-unit buildings and are not heated by units subject to Rule 1111.

Rule Compliance and Test Methods

SCAQMD Method 100.1

Cost-Effectiveness

Based on the cost-effectiveness of rules for other heating equipment (Rules 1111, 1121, 1146.2 and 1147), staff estimates the cost-effectiveness for a rule regulating commercial and multiunit residential space heaters at \$15,000 to \$30,000 per ton. The cost and cost effectiveness for incentive programs will vary depending upon the incentives required for replacement of equipment with lower emission technologies. Amendment of Rules 1111 and 1121 to

⁸ Summer planning inventory.

require manufacturers meet the optional heat input based emission limits is expected to be significantly less than \$20,000 per ton.

Implementing Agency

The SCAQMD has the authority to regulate emissions from these stationary sources.

References

SCAQMD Rule 1111 – Reduction of NO_x Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces

SCAQMD Rule 1121 – Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters

SCAQMD Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters

U.S. Department of Energy (April 2012). INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2010, Table 3.2.2 – Principal Commercial Building Types, as of 2003 (Percent of Total Floorspace)

AB-1257 Energy: State Energy Resources Conservation and Development Commission: natural gas (2013-2014): http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB1257

California Energy Commission, 2015 Integrated Energy Policy Report: http://www.energy.ca.gov/2015_energy_policy/index.html

U.S. EPA, “Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans,” 2012.

SCAQMD, Residential and Commercial Energy, 2016 AQMP White Paper

SB350 Clean Energy and Pollution Reduction Act of 2015: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

California’s Existing Buildings Energy Efficiency Action Plan: <http://www.energy.ca.gov/ab758/>

2015 Draft Integrated Energy Policy Report (CEC-100-2015-001-CMD): http://www.energy.ca.gov/2015_energy_policy/

2015-2025 California Energy Demand Updated Forecast (CEC-200-2014-009-CMF): <http://www.energy.ca.gov/2014publications/CEC-200-2014-009/CEC-200-2014-009-CMF.pdf>

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High Efficiency Water Heater Ready: 2013 California Building Energy Efficiency Standards, California Utilities Statewide Codes and Standards Team, October 2011.

Energy Efficiency Design Options for Residential Water Heaters: Economic Impacts on Consumers: presented at 2011 ASHRAE Winter Conference, Lawrence Berkeley National Laboratory, January, 2011.

**CMB-03: EMISSION REDUCTIONS FROM NON-REFINERY FLARES
[NOx, VOC]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	LANDFILLS, WASTEWATER TREATMENT PLANTS, OIL AND GAS FACILITIES			
CONTROL METHODS:	VARIOUS PATHWAYS WITH INITIAL EFFORTS FOR BENEFICIAL GAS USE SUCH AS TRANSPORTATION FUEL, MICROTURBINES, BOILERS, FUEL CELLS, GAS CLEANUP FOR SALE, AND/OR GAS CLEANUP FOR PIPELINE INJECTION. IF ABOVE IS NOT FEASIBLE, REQUIRE THE INSTALLATION AND OPERATION OF BACT CLEAN ENCLOSED BURNERS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NOx INVENTORY	2.1	2.4	2.4	2.6
NOx REDUCTION		N/A	1.2	1.3
NOx REMAINING		N/A	1.2	1.3
SUMMER PLANNING	2012	2022	2023	2031
NOx INVENTORY	2.3	2.7	2.7	2.9
NOx REDUCTION		N/A	1.4	1.5
NOx REMAINING		N/A	1.4	1.5
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	0.6	0.7	0.7	0.7
VOC REDUCTION		N/A	0.4	0.4
VOC REMAINING		N/A	0.3	0.3
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	0.6	0.7	0.7	0.8
VOC REDUCTION		N/A	0.4	0.4
VOC REMAINING		N/A	0.3	0.4
CONTROL COST:	< \$20,000 PER TON NOx REDUCED			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

This proposed control measure will seek reductions of NO_x and VOC from gas handling at non-refinery sources such as organic liquid loading stations, tank farms, oil and gas production facilities, landfills, and wastewater treatment facilities.

Background

A survey of permits for landfill and wastewater treatment plant flares indicates NO_x emissions range from 0.12 to 0.025 pounds per million British Thermal Units (BTU) (Best Available Control Technology (BACT) since 2006) depending on the age of the flare used to handle gas. Flare NO_x emissions, as well as VOC, CO and PM emissions, are currently regulated through the BACT determination process in SCAQMD Rules 1303 and 1701, but there are currently no source-specific rules regulating NO_x emissions from non-refinery flares. During the rulemaking for the 2012 amendments to Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines, biogas facility operators suggested that biogas-powered internal combustion (IC) engines that cannot be retrofitted to meet the January 1, 2017 emission standards could revert to burning biogas through flaring. Additionally other cost effective technology options, policies, and rule changes may result in an increase in non-refinery flare emissions. Even without a potential increase in flaring, flares have been identified as significant emission sources of NO_x and other pollutants. These industries are also often located in or near environmental justice (EJ) communities; the emission reductions have direct benefits for the EJ communities surrounding these types of industries.

Waste streams from landfills are anticipated to be reduced as the State strives to meet the 75 percent recycling, composting, or source reduction of waste goal by 2020 under AB 341 (Chesbro, Chapter 476, Statutes of 2011). These waste diversion efforts may eventually decrease landfill gas, but lead to additional biogas from wastewater treatment plants and other facilities organic waste may be diverted towards. Lastly, efforts and technologies identified under the Zero Routine Flaring by 2030 initiative being undertaken by the World Bank (for oil and gas facilities) will be taken into consideration during rule development. The Governor's office has endorsed this initiative and more details of the program are provided online at <http://www.worldbank.org/en/programs/gasflaringreduction#5>.

Regulatory History

There are no source specific rules regulating NO_x emissions from the handling of gas with non-refinery flares. It should be noted SCAQMD Rule 1150.1 (*Control Of Gaseous Emissions From Municipal Solid Waste Landfills*) regulates organic compound and toxic air contaminant emissions from municipal solid waste landfills during gas collection and handling.

Proposed Method of Control

This control measure will create a source specific rule for non-refinery flares, specifically those used for, but not limited to, oil and gas facilities, landfills, and wastewater treatment plants. Industries that can be potentially affected include sewage treatment, incineration, soil remediation, waste disposal, and industries that utilize portable flares. For the purposes of this control measure, oil and gas facilities that operate non-refinery flares are those that are not on the same property as the petroleum refining facilities that are in the SCAQMD's RECLAIM program. The proposed method of control will consist of two levels:

- 1) Cleaning the gas that would typically be flared and using it as follows:
 - a. Using it as a transportation fuel directly or through gas to liquid conversion, and/or injection into a pipeline as a renewable energy source (biogas facilities) or, if not feasible,
 - b. Directing it to equipment that can be converted to power and/or heat.
- 2) If all other options are infeasible, requiring the installation of newer flares implementing the best available control technology.

Certain applications may warrant both approaches. Staff acknowledges that there are different technology options and challenges with the different source categories included in this control measure (oil and gas, landfill, and wastewater treatment). Each source category may require a different approach with the overall goal of reducing NO_x and other emissions from non-refinery flares. A technology assessment may be required to validate the feasibility of the technology for different source categories and exemptions may be considered during the rule making process.

Waste gas from sites with consistent waste streams can be harnessed and conditioned for a variety of uses, but generally requires gas clean up. Alternatives to flaring include utilizing fuel cells to create electricity and hydrogen; using microturbines and boilers to create power for the facility; using boilers for heat in anaerobic digesters; selling the gas to be used in transportation; converting the gas to liquids for transportation; and/ or natural gas pipeline injection. Sites such as oil and gas facilities that do not produce enough gas or are not located near appropriate pipelines for injection could route the gas towards power generation, such as microturbines, and/or capture for use in transportation. Use of microturbines has been demonstrated at the West Newport Oil facility, in Orange County.

Utilization of waste gas as a transportation fuel can be both economically and environmentally beneficial. The gas will be required to undergo treatment to remove any impurities, such as sulfurous compounds, siloxanes, carbon dioxide, and nitrogen (landfill gas), and to raise the heating value to specification. For example, the gas from landfills and wastewater treatment plants is often about half the heating value of pipeline quality natural gas. Federal and State market based programs provide revenue sources from selling biogas as a transportation fuel. These programs include the Low Carbon Fuel Standard (LCFS) in California and the federal Renewable Fuel Standard (RFS) Program. Under these programs, credits are generated for the sale of renewable transportation fuels and, dependent on market prices, have provided funding for equipment and lower fuel costs. In addition, AB 2773 or results from other future legislation(s), such as SB 840, may change the minimum higher heating value or maximum siloxane requirements for pipeline injection making it easier for facilities to use biogas for transportation fuels.

If a site owner or operator would like to modernize their facility towards zero and near-zero emission technology, such as pipeline reinjection or fuel cell technology, but it is not cost effective; they may qualify for incentives from the SCAQMD as described in CMB-01 – Transition to Zero and Near-Zero Emission Technologies for Stationary Sources. Biogas cleanup technology has been used to prevent engines or turbines from fouling; therefore, the same technology can be utilized to clean the gas before it is reinjected into a pipeline. Interconnection costs are expected to be higher than for biogas cleanup. Incentives and credits may help offset the costs for biogas cleanup and implementation of pipeline infrastructure.

Wastewater treatment plants may have lower waste streams and the options for pipeline injection may be limited; however, this category has been identified as a source of possible emission reductions. Other lower emitting options are available such as boilers, microturbines, or fuel cells. In addition, SJVAPCD has a source specific rule for flares that includes wastewater treatment plants, oil and gas production, combustion, incinerators, petroleum refining, and VOC control. Although the SJVAPCD flare rule emission limit requirements for NO_x are less stringent than SCAQMD's 2006 BACT requirements, their rule primarily targets VOC emission reductions. Thus, a regulatory measure is necessary to address existing flares at non-refinery sources and meet limits at least as stringent as other air districts. Wastewater treatment plants inventory will be examined to determine the scope of applicable regulatory requirements during rule making. Current inventory estimates indicate that flaring at sewage treatment plants accounts for only 0.01 tpd of NO_x. While each potential category experiences growth over time, sewage treatment is estimated to remain at 0.01 tpd of NO_x for 2023 and 2031. The emissions inventory will be further refined during the rulemaking process, rules are expected to focus on the most cost-effective emission reduction and feasible alternatives. The intent of rulemaking is not just to regulate current equipment, but also address new facilities and modifications at existing facilities.

Other alternative methods of harnessing waste gas that would otherwise be flared are: cleaning the gas and utilizing fuel cells to create electricity and hydrogen; using microturbines to create electricity; cleaning the gas to utility specifications and selling the gas, or injecting the gas into a natural gas pipeline.

New power producing technologies, such as the organic rankine cycle (ORC), has shown the ability to consume the gas that would otherwise be flared and provide a co-benefit by producing power. This technology utilizes heat recovery from gas combustion to operate the ORC loop to make power. For an oil and gas facility, for example, this is accomplished by installing a skid-mounted boiler on site to combust the gas and provide hot water for the ORC. The amount of power generated is not a high enough quantity to sell to the grid, but will be able to meet some of the facility's power needs and/or heat needs. These boilers emit either 9 ppm (at 3 percent oxygen) or 5 ppm (at 3 percent oxygen with selective catalytic reduction), depending on the size, which will result in 40 to 67 percent less NO_x emissions than a clean enclosed burner (CEB) flare. For a wastewater treatment facility that currently utilizes boilers for providing heat to the anaerobic digesters, the same boiler can be utilized to process any excess gas that would otherwise be flared. In addition, a landfill can potentially utilize this technology to use the landfill gas that would otherwise be flared.

Microturbine technology with regenerative thermal oxidation can be used to produce power without the necessity of biogas cleanup. This type of technology can be used at landfills with low methane gas. Toyon Landfill in Los Angeles is currently in the permitting phase using this approach. The Toyon landfill previously utilized internal combustion (IC) engines to make power, but the methane content of the gas was below the operability limit for the engines. This newer technology will take the low quality landfill gas and make power with ultra-low criteria pollutant emissions and without expensive biogas cleanup.

If there is no option for a facility to employ any of the above mentioned methods of waste gas utilization, the gas will need to be combusted through flares. However, many existing flares are older and higher emitting than new technologies. An equipment survey of existing non-refinery flares in the Basin showed a typical emission rate of 0.025 pounds of NO_x per million BTU is achievable by non-refinery flares. There are new flaring units with cleaner combustion capable of achieving emissions of 0.011 pounds of NO_x per million BTU, and concentrations of 6.69 ppm NO_x at 3 percent oxygen, when firing on biogas from a wastewater facility or process gas from oil and gas production facilities. These emission rates were verified through District-approved source testing procedures. These devices utilize a CEB system that premixes the gas and combustion air prior to injection onto a permeable

metal mesh, where it is ignited. These units have been installed across a range of applications, including the source categories targeted by this control measure. These devices achieve the VOC destruction of the fuel stream, while producing lower NOx emissions. These units are currently guaranteed at emitting at 0.018 pounds of NOx per million BTU (or 15 ppm NOx at 3 percent oxygen). These units have demonstrated VOC and methane destruction efficiencies of 99.8–99.9 percent, and VOC mass emissions (as methane) of 0.006 pounds per million BTU.

This control measure proposes that, consistent with all feasible control measures, all non-refinery flares meet current NOx emissions levels and thermal oxidation of VOC efficiencies that have been achieved in practice. Consideration will need to be given for any circumstances whereby there is a need for an emergency or backup handling of the gas.

Emission Reductions

Based on facility reported emissions in 2010, the annual average emissions for non-refinery flares are about 2 tons per day of NOx. The average emission factor for biogas flares at facilities within the Basin is 0.056 pounds per million BTU (unweighted average), higher than the most stringent emission rate for biogas. Emissions vary by season and are affected by other operations at landfills and wastewater treatment plants. Staff estimates an average emission reduction of about 50 percent is achievable if all flares meet the most stringent current permitted limit of 0.025 pounds NOx per million BTU of biogas, and 0.023 pounds NOx per million BTU of oil and gas production process gas. Lower emission levels are estimated based on the installation of CEBs, microturbines, or boilers. CEBs are designed to accommodate varying gas compositions and feed rates while maintaining emissions at low levels. Fuel cells can achieve substantially lower level emissions than combustion based methods, and cleaning up waste gas for sale or for pipeline injection will produce near-zero emissions. This NOx reduction will also be achievable for source categories such as oil and gas production wells, tank farms, and even with the replacement of traditional thermal oxidizers.

Rule Compliance and Test Methods

SCAQMD Methods 25.1, 25.3 and 100.1, or other SCAQMD-approved equivalent test methods.

Cost-Effectiveness

Based on cost information used for the 2006 SCAQMD BACT determination for biogas flares, the average cost-effectiveness for meeting an emission limit of 0.025 pounds per million BTU of biogas is less than \$20,000 per ton of NOx reduced. It is estimated that a similar cost-effectiveness would pertain to other non-refinery sources.

Implementing Agency

The SCAQMD has the authority to regulate emissions from these sources.

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**CMB-04: EMISSION REDUCTIONS FROM RESTAURANT BURNERS AND RESIDENTIAL
COOKING
[NOx]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	COMMERCIAL AND RESIDENTIAL COOKING APPLIANCES			
CONTROL METHODS:	EFFICIENCY METHODS, LOW NOX EMISSION BURNERS, AND INCENTIVES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NOX INVENTORY	4.3	3.1	3.0	3.0
NOX REDUCTION		TBD	0.8	1.5
NOX REMAINING		TBD	2.2	1.5
SUMMER PLANNING	2012	2022	2023	2031
NOX INVENTORY	4.4	3.3	3.2	3.1
NOX REDUCTION		TBD	0.8	1.6
NOX REMAINING		TBD	2.3	1.5
CONTROL COST:	\$15,000 TO \$30,000 PER TON NOx REDUCED			
TOTAL INCENTIVE (% OF COST)	\$250,000,000 (10% TO 20%)			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

Background

The SCAQMD does not currently regulate NOx emissions from restaurant and residential charbroilers, fryers, ranges and ovens. This proposed control measure would seek NOx reductions from residences, retail restaurants and quick service establishments utilizing cooking ovens, ranges, fryers and charbroilers.

Regulatory History

NOx emissions from residential and restaurant fryers, ranges and ovens are not currently regulated by the SCAQMD. However, charbroilers are required to be registered with the SCAQMD and PM emissions from chain driven charbroilers are regulated by SCAQMD Rule 1138.

Proposed Method of Control

This proposed control measure would seek NO_x reductions from residences, retail restaurants and quick service establishments utilizing commercial cooking ovens, ranges, fryers and charbroilers by funding development of, and promoting and incentivizing the use and installation of low NO_x burner technologies. The reductions could be achieved through regulatory approaches, incentives and/or efficiency standards. Partnerships with other entities who have energy efficiency incentive programs could have benefits once the emission reductions from the efficiency efforts are quantified. Additional research and technical assessment is warranted to determine the current NO_x emission level of various appliance types in each of the equipment categories. The initial focus of this control measure is on commercial cooking equipment. However, a program to incentivize higher efficiency or lower emission residential appliances will also be considered. In addition, the SCAQMD will also evaluate options for rules regulating NO_x emissions from new commercial and residential cooking units including requirements for new construction of commercial and residential buildings. It should be noted that direct PM emissions from meat cooking on under-fired charbroilers are sought for control under control measure BCM-01 – Further Emission Reductions from Commercial Cooking.

Based on a California Energy Commission analysis of commercial and institutional cooking equipment and energy efficiency across the State, up to about 44 million therms of natural gas could potentially be saved annually in the SCAQMD with currently available high efficiency cooking equipment. Based on this energy savings, replacement of all standard units with high efficiency units could result in annual NO_x emission reductions from commercial and institutional cooking of up to 300 tons annually or 0.8 tons/day. This is approximately half of the reductions the SCAQMD is proposing for this category of equipment. However, the gas utilities have already included some energy efficiency reductions in the AQMP inventory from their energy efficiency programs so the reductions available for SCAQMD funded programs may be less than this amount.

However, an alternative approach is to fund replacement with currently available lower emission technology in order to reduce NO_x emissions from fuel fired cooking equipment. Current technology could reduce emissions from cooking units by 40 to 70 percent depending upon the type of equipment. In addition, there are electrically heated units with no direct NO_x emissions. The currently available lower NO_x burner technologies include: ribbon burners with NO_x emissions of 25 to 60 ppm, in-shot burner technology with emissions less than 55 ppm NO_x, radiant burners with emissions of 15 to 30 ppm, and modern power burners with NO_x emissions of 25 to 60 ppm. These technologies can be used in ovens, broilers, fryers, and griddles which constitute the majority of the equipment in use. In addition, the larger units with power burners can be retrofit with lower NO_x burners. There are some types of equipment which could not be readily replaced by these types of burners, but the SCAQMD could support development of low NO_x burner technologies for these systems.

Emission Reductions

The 2016 AQMP inventory identifies NO_x emissions from fuel combustion in residential, service and commercial operations. A significant portion of those emissions are from cooking operations. The NO_x emissions from residential and commercial cooking operations resulted in daily emissions of about 4.3 tons of NO_x in 2012. The emission reduction targeted by this control measure is 1.5 tons per day by 2031, which is a 50 percent NO_x reduction goal with half of the reductions by 2023 and the remainder continuing through 2031. SCAQMD Staff will also seek to develop a more refined baseline inventory and conduct technology assessment of the latest affected equipment.

Replacing existing burner technology with currently available lower emission burners could reduce NOx emissions from this category by an average of 50 percent or more. This would result in emission reductions of about 1.5 tons per day by 2031 and would achieve the reductions targeted for this source of NOx emissions.

Rule Compliance and Test Methods

SCAQMD Method 100.1

Cost-Effectiveness

Based on cost-effectiveness for other SCAQMD rules regulating NOx emissions from small combustion sources such as water heaters, space heating furnaces and small boilers, staff estimates the cost-effectiveness for a rule limiting NOx emissions based on this control measure will be in the range of \$15,000 to \$30,000 per ton. The cost for an incentive based program will vary depending upon the incentive and the number and type of equipment replaced. An incentive program to reduce emissions by 1.5 tons per day by funding low NOx technology incentives for \$250,000,000 has a cost-effectiveness over the lifetime of the equipment of about \$30,400 per ton for the incentive. The cost effectiveness of the difference in cost between a standard unit and a lower emission, zero or near-zero technology will vary and may be higher depending upon the cost of standard equipment and units with lower emission technology. In addition, the cost of replacing existing equipment early (e.g., at about two thirds of a unit's useful life) would have a cost impact.

Implementing Agency

The SCAQMD has the authority to regulate emissions from these stationary sources.

References

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CMB-05: FURTHER NOX REDUCTIONS FROM RECLAIM ASSESSMENT
[NOx]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	VARIOUS RECLAIM NOX SOURCES			
CONTROL METHODS:	VARIOUS CONTROL TECHNOLOGIES AND METHODS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2025
NOX INVENTORY	26.51	15.6*	14.51*	14.51*
NOX REDUCTION				5
NOX REMAINING				9.51
SUMMER PLANNING	2012	2022	2023	2025
NOX INVENTORY	26.51	15.6	14.51	14.51
NOX REDUCTION				5
NOX REMAINING				9.51
CONTROL COST:	\$13,500–\$21,000 PER TON NOX REDUCED			
IMPLEMENTING AGENCY:	SCAQMD			

* Up to 0.71 tons/day of NOx inventory will be used to fund the Regional NSR Holding Account and therefore not included as part of the SIP submittal.

Description of Source Category

There were approximately 275 facilities in the REgional CLean Air Incentives Market (RECLAIM) program as of the end of compliance year 2013. The RECLAIM program includes facilities with NOx or SOx emissions greater than or equal to 4 tons per year in 1990 or any subsequent year. A wide range of equipment such as fluid catalytic cracking units, boilers, heaters, furnaces, ovens, kilns, coke calciner, internal combustion engines, and turbines are major sources of NOx or SOx emissions at the RECLAIM facilities. This control measure identifies a series of approaches that can be explored to make the program more effective in ensuring equivalency with command and control regulations implementing BARCT, and to generate further NOx emission reductions at RECLAIM facilities. This would be achieved in two ways: 1) the 5 tpd NOx emission reduction commitment as soon as feasible, and no later than 2025, and 2) a transition to a command and control regulatory structure requiring BARCT level controls as soon as practicable. As many of the program's original advantages appear to be diminishing, an orderly sunset of the RECLAIM program may be the best way to create more regulatory certainty and reduce compliance burdens for RECLAIM facilities, while also achieving more actual and SIP creditable emissions reductions. A NOx RECLAIM re-assessment working group will be convened in the spring of 2017 to examine the functionality, benefits, and challenges of the RECLAIM program and options for an orderly transition to command and control.

Background

On October 15, 1993, the SCAQMD's Governing Board adopted Regulation XX – RECLAIM. Regulation XX includes rules that specify the applicability and procedures for determining NO_x and SO_x facility emissions allocations, program requirements, as well as monitoring, reporting, and recordkeeping requirements for sources located at RECLAIM facilities. RECLAIM was designed to provide Best Available Control Retrofit Technology (BARCT)-equivalent emission reductions in the aggregate for the facilities in the program, with flexibility for each facility to find the most cost-effective approach. At the beginning of this program, facilities were issued NO_x and SO_x allocations, also known as RECLAIM Trading Credits (RTCs) or facility emission caps, which declined over time. To meet the declining annual facility caps, RECLAIM facilities have the option of installing pollution control equipment, changing operations, or purchasing RTCs from other facilities on the RECLAIM market. The program requires robust monitoring to ensure compliance. Over the past more than 20 years, the program has resulted in significant emission reductions.

The RECLAIM program is subject to several legal mandates. The Health and Safety Code requires the SCAQMD to monitor the advancement in BARCT, and if BARCT advances, the SCAQMD is required to periodically re-assess the overall facility caps, and to reduce the RTC holdings to a level equivalent to command-and-control BARCT levels. The emission reductions resulting from the programmatic RTC reductions will help the basin attain the National Ambient Air Quality Standards (NAAQS) for ozone and PM_{2.5} as expeditiously as practicable. The periodic BARCT evaluations must include an evaluation of the maximum degree of reduction achievable with advanced control technologies taking into account the environmental, energy, and economic impacts for each class or category of source.

The 2013 audited actual emissions were 20 tons per day (tpd) from RECLAIM facilities (59 percent from the refineries and 41 percent from the non-refinery sector). The RTC holdings for the RECLAIM universe in 2013 were 26.6 tpd, for which the refinery sector held 51 percent of the RTCs, electricity generating facilities (EGF) 16 percent, investors 5 percent and other RECLAIM facilities 20 percent.

Regulatory History

On October 15, 1993, the SCAQMD's Governing Board adopted Regulation XX – RECLAIM. The RECLAIM program at its inception included 392 NO_x facilities. RECLAIM Regulation XX includes 15 rules that specify the applicability, definitions, allocations, trading and operational requirements, as well as monitoring, reporting, and recordkeeping requirements. The NO_x RECLAIM regulation has been revised several times, and two significant amendments (2005 and 2015) reflected a BARCT re-assessment. SO_x RECLAIM allocations were re-assessed in 2010 based on BARCT. The January 2005 amendment resulted in a NO_x RTC reduction target of 7.7 tons per day (tpd), approximately a 22.5 percent reduction of the RTC holdings, which was implemented in five phases: 4 tpd by 2007 and an additional 0.925 tpd in each of the following four years.

The December 2015 NO_x amendments included a total RTC reduction of 12 tpd, including a Regional RTC Holding account for EGFs to meet their NSR holding obligations. The intent of the December 2015 amendments was to ensure the RECLAIM program would maintain programmatic equivalency with BARCT-based command and control regulations as required by State law. The amendments also contained an optional off-ramp from RECLAIM for EGFs at BACT or BARCT. A Governing Board adopted resolution directed staff to further examine the issue of equipment shut-downs at RECLAIM facilities and the fate of the associated RTCs. This led to amendments in October 2016 that significantly reduced NO_x RTC holdings upon facility shutdowns.

Proposed Method of Control

Several potential actions and analyses can help to address this issue and other issues that arose during recent NOx RECLAIM amendments, including a sunset of the NOx RECLAIM program. The measures listed below are designed to achieve additional actual and/or SIP creditable emission reductions from the RECLAIM Program and ensure future equivalency with command-and-control regulations:

- Assess how the program could be sunset in an orderly and equitable manner as soon as practicable. The cost-effectiveness benefits that the RECLAIM market was intended to provide may cease to exist given the need for all feasible NOx reductions and the potential lack of lower-cost control options. As many of the program's original advantages appear to be diminishing, an orderly sunset of the RECLAIM program may be the best way to maximize emissions reductions, and create more regulatory certainty while potentially reducing compliance burdens for RECLAIM facilities. Many of the approaches listed below, alone or in combination, may serve as interim steps in a long-term elimination of the program.
- Consider options for facilities at BACT or BARCT and/or facilities with no allocations (structural buyers) to exit the program and be subject to command and control regulations. The most recent NOx amendment allowed EGFs to voluntarily opt-out of RECLAIM. Such an option could be extended to other facilities, and potentially lead to more AQMP creditable emission reductions.
- Consider command-and-control regulation overlays to certain RECLAIM facilities. For some RECLAIM facilities a command-and-control overlay may be the best way to reduce NOx emissions while maintaining the required equivalency with command and control.
- Consider BARCT-based individual facility emission caps for some or all RECLAIM facilities. For some RECLAIM facilities, an emissions cap may be the best way to ensure BARCT equivalency while affording some intra-facility flexibility and technological innovation.
- Assess the need for and the size of the differential between RTC holdings and actual emissions. The size of this unused RTC margin is affected by the possible need for a compliance margin, uncertainties in the growth projections for existing and new businesses, facility and equipment shutdowns, and holdings by investors. A full assessment may allow for an optimization of the size of the margin that could allow for further RTC reductions.
- Perform additional or more frequent BARCT assessments and adjust allocations as control technologies improve and are implemented in practice. Based on past experience, a maximum of five years between BARCT assessments is appropriate to reflect the latest technological advances and ensure equivalency with command and control. Given that RECLAIM shaves have tended to be implemented over five to seven years, it is likely that facilities may experience a moving target, facing new RTC reductions as they are implementing controls to meet the previous shave. This lack of regulatory certainty could be addressed through command-and-control regulations, where previous investments can be more readily considered.
- Re-examination of the RECLAIM program if RTC prices hit the upper or lower threshold amounts. The current NOx RECLAIM regulation has a lower price threshold of \$200,000 per ton (infinite year block) and upper price thresholds of \$22,500 and \$35,000 per ton (discrete year; annual and 3-month average, respectively). The

levels of these thresholds or additional thresholds could be modified commensurate with future BARCT assessments and attainment needs.

- Assess the impacts of investors holding RTCs. Investors have historically played an important role in the RECLAIM program. However, their holding of RTCs have posed problems with the trading and identification of reductions because they are not RECLAIM facilities that have an initial allocation or a potential to reduce NOx emissions.

A NOx RECLAIM working group will be convened in the spring of 2017 to develop options for the future of the RECLAIM program. Members will include RECLAIM facilities, RECLAIM investors and brokers, environmental organizations, the California Air Resources Board, U.S. EPA, and other interested members of the public. Input will be sought from economists and market analysts regarding the functionality of the NOx RECLAIM market, the benefits and challenges to facilities and regulators, and options and timing for orderly transitions to command-and-control regulatory structures. The emissions, RTC holdings, and control technology status of as many individual facilities as practical will be analyzed. The working group, analyses, and public process is anticipated to be completed in one year, at which time a report to the Governing Board with findings and recommendations for the future of RECLAIM will be made.

Emission Reductions

Projected creditable emission reductions from the implementation of the NOx RECLAIM assessment efforts is targeted to generate 5 tons per day of NOx emission reductions by 2025.

Rule Compliance and Test Methods

Compliance with the provisions of this control measure would be based on monitoring, recordkeeping, and reporting requirements that have been established in either the RECLAIM program or existing source specific rules and regulations. Compliance would be verified through inspections and other recordkeeping and reporting requirements.

Cost-Effectiveness

The overall average cost-effectiveness for the December 4, 2015 amendment was \$9,000 to \$14,000 per ton of NOx reduced. Assuming further reductions from already controlled equipment, it is expected that the cost-effectiveness for this control measure would be about 50 percent higher or \$13,500–\$21,000 per ton.

Implementing Agency

The SCAQMD has the authority to regulate emissions from RECLAIM facilities.

References

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**ECC-01: CO-BENEFIT EMISSION REDUCTIONS FROM GHG PROGRAMS, POLICIES,
AND INCENTIVES
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	GHG PROGRAMS, POLICIES AND INCENTIVES			
CONTROL METHODS:	REDUCTIONS FROM PROGRAMS THAT REDUCE GHGS ALSO REDUCE CRITERIA POLLUTANTS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
POLLUTANT INVENTORY	N/A	N/A	N/A	N/A
POLLUTANT REDUCTION		TBD	TBD	TBD
POLLUTANT REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
POLLUTANT INVENTORY	N/A	N/A	N/A	N/A
POLLUTANT REDUCTION		TBD	TBD	TBD
POLLUTANT REMAINING		TBD	TBD	TBD
CONTROL COST:	N/A			
IMPLEMENTING AGENCY:	VARIOUS AGENCIES			

Description of Source Category

Sources of greenhouse gases (GHG) also are typically emission sources of criteria pollutants. Federal, State, and local mandates and programs to reduce GHG emissions will provide co-benefit criteria pollutant reductions.

Background

Significant efforts are currently being undertaken and planned to reduce GHGs under the State's 2020, 2030 and 2050 targets. Under the 2006 California Global Warming Solutions Act (AB 32) the State established a 2020 GHG target to reduce emissions 20 percent from 1990 levels. Additionally, in 2006, Governor Arnold Schwarzenegger set a course towards reducing California's GHG emissions 80 percent below 1990 levels by 2050 through executive order S-3-05. The 2050 target was established based on the emissions limits needed to prevent catastrophic warming and limit earth's warming to below two degrees Celsius. To help achieve the 2050 target, a midterm 2030 GHG target of 40 percent below 1990 levels was set by Governor Jerry Brown in 2015.

In 2006, the passage of AB 32 also authorized establishing a Cap and Trade program in California. Under the Cap and Trade program, an emissions limit is placed on the largest stationary sources of GHGs, fuel providers, and imports of electricity. The emissions cap on these sources is lowered over time and entities under the cap may choose to reduce their emissions or purchase allowances from the market to cover their emissions.

At the federal level, the U.S. EPA is establishing regulations to limit the emissions of GHGs from stationary and transportation sources. Most recently the U.S. EPA enacted the Clean Power Plan which, calls upon states to adopt plans to limits GHG emissions from power generation in each state.

To help achieve GHG reductions, many different regulations, market mechanisms, and incentive programs are being implemented in California. As these GHG reduction efforts are undertaken across all sectors, the co-benefit reductions of criteria pollutants will be accounted for under this control measure.

Regulatory History

The State of California adopted the Global Warming Solutions Act of 2006 (AB 32) to develop regulations and programs that reduce California's GHG emissions 20 percent below 1990 levels by 2020 along with authorizing a Cap and Trade program. Under AB 32, CARB must develop a Scoping Plan every five years that describes the approach to meeting the State's GHG reduction targets. Since the adoption of AB 32 several regulations and programs have been implemented along with executive orders to reduce GHG levels in California 80 percent by 2050 and a midterm target of 40 percent by 2030 below 1990 levels. Prior to the adoption of AB 32, California established a 20 percent renewable portfolio standard (RPS) mandate for investor owned utilities in 2010. The RPS mandate was then expanded in 2011 to include municipal owned utilities along with establishing a new mandate of 33 percent by 2020. Recently, as part of SB 350, the RPS mandate was expanded to be 50 percent by 2030 along with increasing efficiency of existing buildings (see ECC-02).

In 2009, the U.S. EPA issued a declaration known as the "endangerment finding", that GHG emissions cause and contribute to adverse impacts on public health and welfare under Section 202(a) of the Clean Air Act. Under this declaration the U.S. EPA has enacted several regulations that seek to limit GHG emissions from facilities, power plants (e.g. Clean Power Plan), and the transportation sector (e.g. proposed Tier II standards, light-duty CAFE standards, and heavy-duty vehicle standards).

Additional regulations, policies, and programs currently being implemented and possible future programs can be found within the 2016 AQMP white papers.

Proposed Method of Control

GHG reductions being implemented through federal, State, and local programs are being implemented across multiple energy sectors and are generally mandated by law. The GHG emission reductions are being implemented through several mechanisms such as market programs, renewable energy targets, incentive and rebate programs, and promoting implementation and development of new technologies.

Within California, market mechanisms such as the Cap and Trade program provide GHG emissions monitoring, emissions caps, and emissions trading for required entities. Revenues generated from the Cap and Trade program are mandated to be further invested in GHG reductions. Other programs such as the Renewable Portfolio Standards require the procurement of renewable power onto the electrical grid. While many regulations are already in place, more regulations will likely be implemented at the State and federal levels along with new mechanisms for GHG emission reductions.

Under this control measure, the criteria pollutant co-benefits associated with GHG reductions will be quantified and utilized towards attainment of federal ozone and PM2.5 standards. Existing and future incentives, programs, and partnerships will be evaluated for reduction of emissions of both GHGs and criteria pollutants. SCAQMD will also work closely with other agencies and stakeholders to focus GHG reduction programs within the South Coast Basin to maximize emission reductions across all pollutants.

Emission Reductions

TBD.

Rule Compliance and Test Methods

Performance of GHG reductions and criteria pollutant co-benefits will be measured through the relevant agencies' enforcement of GHG requirements as well as the SCAQMD and State agencies emission inventories along with reductions achieved through specific programs.

Cost-Effectiveness

Cost-effectiveness has been or will be assessed in each regulation or program. Because this control measure relies on other programs, no additional costs other than relatively minor administrative costs are anticipated as a direct result of this control measure.

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources and will work with other regulatory agencies, businesses, and other stakeholders in implementation and program enhancements for the both the transportation and stationary sectors.

References

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California Global Warming Solutions Act of 2006 (AB 32): <http://www.arb.ca.gov/cc/ab32/ab32.htm>.

AB 32 Scoping Plans (first and second updates): <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>.

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2016 AQMP White Papers: <http://www.aqmd.gov/home/about/groups-committees/aqmp-advisory-group/2016-aqmp-white-papers>.

**ECC-02: CO-BENEFITS FROM EXISTING RESIDENTIAL AND COMMERCIAL BUILDING
ENERGY EFFICIENCY MEASURES**

[NO_x, VOC]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		EXISTING RESIDENTIAL AND COMMERCIAL POWER AND FUEL USE		
CONTROL METHODS:		REDUCED ENERGY USE		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NO _x INVENTORY	21.7	14.2	13.5	11.9
NO _x REDUCTION			0.4	1.3
NO _x REMAINING			13.1	10.6
SUMMER PLANNING	2012	2022	2023	2031
NO _x INVENTORY	15.6	10.8	10.3	9.7
NO _x REDUCTION			0.3	1.1
NO _x REMAINING			10.0	8.6
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	9.1	8.9	8.9	8.9
VOC REDUCTION			0.23	1.0
VOC REMAINING			8.7	7.9
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	2.8	2.64	2.63	2.65
VOC REDUCTION			0.07	0.29
VOC REMAINING			2.56	2.36
CONTROL COST:	N/A			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

Energy consumption in existing residential and commercial buildings results in direct and indirect emissions of criteria pollutants, toxics, and greenhouse gases. Direct emissions result from combustion of fuels such as natural gas, propane, and wood. Indirect emissions are a result of energy use requiring electricity production from power sources, many of which burn fossil fuels. Improvements in residential weatherization and other efficiency measures provide emission reductions through reduced energy use for heating, cooling, lighting, cooking, and other needs.

Background

Weatherization and other demand side energy measures, to date, have proven to reduce the need for new power plants and additional energy infrastructure. In 1978, California adopted the Title 24 building energy standards. The building energy standards adopted within Title 24 have been routinely made stronger and by 2020 the target for Title 24 standards will be to achieve zero net energy consumption for new residential buildings. The strengthening of Title 24 standards along with new building materials and more efficient appliances has resulted in newly constructed residences and commercial buildings being more efficient than previous construction.

In addition to the Title 24 building energy standards, there are multiple programs that provide incentives, rebates, and loans for efficiency projects on residential and commercial structures. These assistance programs are largely administered through servicing utilities for the property and are voluntary. Despite the availability of multiple assistance programs and the many benefits from undertaking energy savings measures, there remain many barriers to overcome. One of the challenges is increasing energy efficiency within rental and leased properties where tenants are often responsible for utility costs. Within the Basin it is estimated that 48 percent of the residential properties are occupied by tenants. Other barriers to undertaking these projects are identifying the most worthwhile and cost-effective projects, finding suited contractors, and capital to fund the projects.

In California and the Basin there is significant potential to achieve large energy reductions from retrofitting existing buildings. Within the Basin, 64 percent of the residential structures were constructed before 1979 when the California Title 24 building energy standard was first implemented. Additionally, energy efficiency measures provide cumulative benefits when implemented. Increased deployment and accelerating the rate of implementation of existing programs provides benefits in reduced energy costs, energy infrastructure needs, and emissions of greenhouse gases, toxics, and criteria pollutants. To further realize these benefits the State of California passed the Clean Energy Pollution Reduction Act of 2015 (SB 350) that sets a path to double the energy efficiency savings for electricity and natural gas use by retail customers and increase renewable energy sources from 33 to 50 percent by 2030. The bill establishes a legal mandate by requiring the State Energy Resources Conservation and Development Commission (California Energy Commission or CEC) to establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030. The bill would require the Public Utilities Commission to establish efficiency targets for electrical and gas corporations consistent with this goal. The bill would also require local publicly owned electric utilities to establish annual targets for energy efficiency savings and demand reduction consistent with this goal.

Regulatory History

The U.S. EPA has recognized the importance of efficiency and renewable energy efforts in reducing emissions. In July 2012, the U.S. EPA released the *Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans*. Under the guidance of this document, the emissions benefits not yet accounted for within the baseline inventory from efficiency measures set into action can be accounted for within State Implementation Plans as control measures. Emission reductions from efficiency efforts beyond the baseline inventory will primarily be gained from new efforts under the requirements of SB 350.

Proposed Method of Control

Implementing and achieving the goals of SB 350 is expected to be administered through State agencies and implemented, in part, through electrical and natural gas utilities. The SCAQMD has worked with the local utilities and implemented weatherization programs within the Environmental Justice Communities of Coachella Valley, Boyle Heights, and San Bernardino areas.

The SCAQMD staff will work with agencies, utilities, and other stakeholders to further implement weatherization and other measures that provide energy savings along with emission reductions within the Basin. The SCAQMD staff will also assist in developing new tools that help effectively implement efficiency measures along with quantifying energy savings and criteria pollutant emissions benefits.

To allow emission reductions resulting from the SB 350 legislation to be credited in the SIP, the following integrity elements required by the U.S. EPA must be satisfied as described below.

Integrity Elements

Emission reductions that are projected to be achieved from the implementation of SB 350 must be quantifiable, surplus, enforceable, and permanent. As part of its support of the State's renewable energy goals and policies including SB 350 targets, the California Energy Commission provides a regular update of statewide progress toward renewable energy goals. The latest report was released in December 2015 (http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf).

- **Quantifiable:** Emission reductions are quantitatively measureable in the CEC Tracking Progress report and are supported by existing and acceptable technical data. The quantification is well-established, publicly available, and based on approved emission factors and accepted calculation methodology. The ongoing tracking progress reports evaluate and verify, over time, the programs being proposed, and implemented, resulting in corresponding electricity and natural gas savings, which can be directly related to emission reductions.
- **Surplus:** While corresponding emission reductions are the result of the State regulation, these emission reductions are not part of the baseline emissions inventory in the SIP. Thus, these emission reductions are part of the control strategy and surplus to the baseline emissions.
- **Enforceable:** The State agencies are responsible for assuring that the goals of SB 350 are achieved and the SCAQMD is responsible to properly track that the corresponding emission reductions are occurring in parallel to the efficiency programs. In general, emission reductions and other required actions are enforceable if:
 - They are independently verifiable;
 - Program violations are defined;
 - Those liable can be identified;
 - SCAQMD and U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable;
 - The general public have access to all the emissions-related information obtained from the source;
 - The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes); and

- They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.
- **Permanent:** The measure has to be permanent throughout the term for which the credit is generated. Unless the State legislature overturns SB 350, then the renewable energy goals will be met and the corresponding emission reductions will be achieved and permanent.

Emission Reductions

Weatherization and other efficiency measures are typically permanent measures that provide cumulative benefits. The existing energy efficiency programs are having impacts on emission reductions and are generally taken into account within the baseline emissions inventory. The recent passage of SB 350 significantly enhances the State's renewable energy and efficiency targets. Emission benefits expected from the implementation of SB 350 are not yet within the 2016 AQMP future year emission inventory. The emission benefits from implementing SB 350 through accelerated deployment, additional programs, and tools within the Basin are expected to achieve approximately 2–3 percent reduction by 2023 and 11 percent reduction in NO_x emissions by 2031. The reduction in NO_x emissions would be the result of less natural gas usage. The emission reductions were generated from the following source categories whose baseline emissions can be found in Appendix III (Base and Future Year Emission Inventory). Some categories have been grouped together for simplicity:

- Residential Natural Gas Combustion – *Space and Water Heating*
- Commercial Natural Gas Combustion – *Space and Water Heating*
- Residential LPG Combustion - *Space and Water Heating*
- Commercial LPG Combustion - *Space and Water Heating*
- Residential Natural Gas Combustion – *Other (e.g., Dryers, Pools, Fireplaces)*
- Residential Wood Combustion – *Wood Stoves and Fireplaces*
- Residential LPG Combustion - *Other (e.g., Dryers, Cooking)*
- Commercial LPG Combustion - *Other (e.g., Dryers, Cooking)*
- Commercial Natural Gas External Combustion – *Other*
- Residential Distillate Oil Combustion – *Space Heating*

Rule Compliance and Test Methods

N/A

Cost-Effectiveness

No additional costs are anticipated beyond those that would otherwise be allocated to reduce GHG emissions through State programs. This measure seeks merely to quantify criteria pollutant reductions from these GHG programs. Furthermore, weatherization and efficiency measures, when appropriately applied, can realize short payback periods from reduced energy costs (two–seven years).

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources and will work with other regulatory agencies to help implement this control measure.

References

California's 2030 Climate Commitment: Double Energy Savings in Existing Buildings & Develop Cleaner Heating Fuels by 2030: http://www.arb.ca.gov/html/fact_sheets/2030_energyefficiency.pdf

U.S. EPA, "Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans," 2012.

SB350 Clean Energy and Pollution Reduction Act of 2015:
http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

California's Existing Buildings Energy Efficiency Action Plan: <http://www.energy.ca.gov/ab758/>

2015 Draft Integrated Energy Policy Report (CEC-100-2015-001-CMD):
http://www.energy.ca.gov/2015_energypolicy/

2015-2025 California Energy Demand Updated Forecast (CEC-200-2014-009-CMF):
<http://www.energy.ca.gov/2014publications/CEC-200-2014-009/CEC-200-2014-009-CMF.pdf>

ECC-03: ADDITIONAL ENHANCEMENTS IN REDUCING EXISTING RESIDENTIAL BUILDING ENERGY USE

[NO_x, VOC]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		EXISTING RESIDENTIAL POWER AND FUEL USE		
CONTROL METHODS:		REDUCED ENERGY USE BEYOND EXISTING REGULATIONS		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NOX INVENTORY	18.2	11.6	11.0	9.0
NOX REDUCTION			1.7	2.7
NOX REMAINING			9.4	6.3
SUMMER PLANNING	2012	2022	2023	2031
NOX INVENTORY	12.4	8.2	7.8	7.0
NOX REDUCTION			1.2	2.1
NOX REMAINING			6.6	4.9
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	3.2	3.0	2.9	2.93
VOC REDUCTION			0.4	0.9
VOC REMAINING			2.5	2.1
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	1.2	1.1	1.0	1.0
VOC REDUCTION			0.2	0.3
VOC REMAINING			0.9	0.7
CONTROL COST:		\$45,000 TO \$50,000 PER TON		
INCENTIVE COST:		\$230 TO \$860 MILLION PER TPD NO _x (BY 2031)		
IMPLEMENTING AGENCY:		SCAQMD		

Description of Source Category

Energy consumption in existing residential and commercial buildings results in direct and indirect emissions of criteria pollutants, toxics, and greenhouse gases. Direct emissions result from combustion of fuels such as natural gas, propane, and wood. Indirect emissions largely result from energy use causing emissions associated with electricity production. Efficiency improvements within the residential sector provide emission reductions along with reducing energy costs and help alleviate the need for additional energy infrastructure. Efforts in the residential sector under this control measure include weatherization, improvements in appliance efficiency and

addition of solar thermal and solar photovoltaic systems. This control measure is focused upon existing residences and goes beyond existing regulations. Co-benefit reductions from current building codes with targets established in SB 350 (Clean Energy Pollution Reduction Act of 2015) are accounted for in control measure ECC-02 (Co-benefits from Existing Residential and Commercial Building Energy Efficiency Measures).

Emission reductions from ECC-03 set a path to maximize emission reductions by implementing advanced highly efficient zero-emission appliance technologies and efficiency measures when cost effective and feasible, including weatherization along with renewable energy sources, and near-zero emission technologies, such as renewable gas, in all other applications. Targets in this measure are planned to achieve increases in efficiency along with increased renewable energy sources within the residential sectors to achieve category emissions reductions of 15 percent by 2023 and 30 percent by 2031. This measure is designed to reduce end use energy consumption and provide emission reductions within existing residences along with SCAQMD participating in the Title 24 2020 Zero Net Energy (ZNE) efficiency development process for new residential construction. Implementation and incentivizing in this measure will be coordinated with utilities and other agencies to leverage and enhance existing programs, and maximize energy savings and emission reductions.

Background

Improved appliance efficiencies, declining renewable energy prices, weatherization and other demand side energy measures, have recently been shown to reduce the need for new energy infrastructure such as power plants. The building energy standards adopted within California's Title 24, along with Title 20 appliance efficiency standards have routinely become more efficient with targets toward achieving zero net energy consumption for new residential housing by 2020 and new commercial construction by 2030. Achieving these ambitious targets is being made possible with new building materials, more efficient appliances, new technologies, and declining renewable energy costs. In California the strengthening of these building energy and appliance codes has resulted in newly constructed residences and buildings being more efficient than previous construction. Within the Basin, there is extremely high potential to reduce end use residential and commercial energy usage. Over 64 percent of the residential structures in Southern California were built before 1979 when the California Title 24 building energy standard was first implemented.

There are multiple programs that provide incentives, rebates, and loans for efficiency projects on residential and commercial structures that can assist in going beyond current regulations and enhance existing programs. One such opportunity could be targeting increasing energy efficiency within rental and leased properties (approximately 48 percent in the region) where tenants are often responsible for utility costs. In California and the Basin, there is significant potential to achieve large energy reductions from retrofitting existing buildings. Additionally, energy efficiency measures provide cumulative long term benefits once implemented. Increased deployment and accelerating the rate of implementation beyond existing programs provides additional benefits in reduced energy costs, energy infrastructure needs, and reductions of emissions of greenhouse gases, toxics, and criteria pollutants.

Combustion appliances within residences account for the majority of direct emissions within the residential sector. Appliances are considered durable goods and most appliances last one or two decades before needing replacement. The SCAQMD has several regulations which include Rules 1121, 1146.2, and 1111, which, in part, established limits on NOx emissions from combustion sources such as water heaters, pool heaters, and furnaces. Other residential combustion sources include cook stoves, and fireplaces. While the SCAQMD regulations established NOx emission thresholds, there are more efficient appliances with zero and near-zero emitting applications that can provide significant emission reductions and efficiency benefits beyond most existing

appliances and those implemented as a typical appliance replacement. This is especially true when appliances are coupled with renewable resources such as solar panel and/or solar thermal systems. Payback periods from these actions with small incentives can be as short as 2 to 3 years depending on the cost of the equipment, available incentives, efficiency gains, and energy prices.

Many appliances such as water heaters are now available with energy factors (EF) greater than 0.8 for natural gas pilotless storage and EF levels over 2.4 for heat pump storage systems. While these highly efficient water heaters have higher upfront costs, their present value savings from efficiency gains often make them attractive options. These longer term benefits from higher efficiency appliances are often not apparent to consumers who generally look at upfront purchase prices. Therefore the voluntary incentive program will encourage the purchase of these higher efficiency appliances in the Basin. High efficiency appliances are also available for pool heaters, furnaces, and cook stoves.

Declining costs in renewable energy and solar thermal heating sources can be coupled with existing appliances and/or be implemented with new appliances along with weatherization efforts. In the residential sector, solar thermal heating can help offset heating energy needs from water heaters, pool heaters, and, in some instances, clothes dryers. Solar thermal energy sources can range from rooftop heating systems to pool covers.

Traditionally adding solar photovoltaics was done after load reductions occurred through weatherization and appliance upgrades. However, rapidly declining costs in solar photovoltaics provides an inexpensive technology to add electrical generation that can be coupled with highly efficient appliances such as heat pump furnaces and water heaters along with helping reduce electricity costs. Review of a households' potential for improving appliance efficiency along with weatherization potential could be coupled with conventional evaluation of solar opportunities when solar contractors review residences for solar panel additions. Sizing of the solar panel installations could then be adjusted for efficiency gains or increased electrical loads resulting from appliance replacements. A similar approach can be taken with solar thermal hot water heaters.

The increased appliance efficiencies and emission reductions within this measure will incentivize equipment beyond current SCAQMD regulations and existing efficiency programs. This measure will be implemented in conjunction with State agencies and local utilities to develop collaborative incentive efforts. Additionally, other technologies and market programs, such as energy storage and smart grid measures like grid connected electric water heaters will become less costly and more widely incentivized by utilities. These technologies and use of appliances as grid resources will be evaluated and considered during the development and implementation phases of this measure. Other residential combustion types will also be evaluated for energy efficiency such as fireplaces, furnaces, space heaters, outdoor heaters, etc. Staff will also evaluate potential incentives to encourage any identified additional energy efficiency. As shown in Chapter 10 the energy infrastructure in the Basin is changing rapidly, resulting from single point failures such as San Onofre and Aliso Canyon along with new policies, such as, moving towards a 50 percent renewable portfolio standard by 2030. This is expected to change the utility rate structures. Electricity rate pricing will likely more closely reflect real time generation and demand to reflect periods of over generation from renewables or high end use demand.

The Building Energy Title 24 standards currently being developed for 2020 are being established to require new residential construction have ZNE usage based on time dependent valuations (TDV). The SCAQMD will participate in the Title 24 residential ZNE rulemaking to advocate for criteria pollutant and GHG emissions consideration.

Note that control measure CMB-01 focuses specifically on NO_x reduction opportunities, rather than the fuel savings and efficiency gains considered in this measure. However, all regulations, actions, and incentive programs directed at residential appliances will need to consider both energy efficiency and NO_x emissions. Zero emission and high efficiency applications will be prioritized to the extent they are feasible and cost-effective at the time of implementation. The SCAQMD will be convening a workgroup to better understand the in-Basin lifecycle criteria pollutant emissions from different energy choices and technologies in current and future years. Assessments from this workgroup will help focus the implementation of incentives. Lastly, the SCAQMD will collaborate with utilities, agencies, and other organizations to help leverage funding and coordinate incentives with similar existing programs.

Regulatory History

The U.S. EPA has provided guidance documents allowing emissions benefits not yet accounted for within the baseline inventory from efficiency and renewable energy measures set into action can be accounted for within State Implementation Plans (SIPs) as control measures. Emission reductions from efficiency efforts beyond the current requirements and use of smart grid technology will primarily be gained from ambitious incentives and outreach.

Proposed Method of Control

The SCAQMD has worked with the local utilities and implemented weatherization, renewable energy, and smart grid programs, in part, within the Coachella Valley, Boyle Heights, and San Bernardino areas. Implementation of weatherization and smart grid programs has helped lower the barrier to implementing weatherization and smart grid efforts within Environmental Justice Communities.

The SCAQMD staff will work with agencies, utilities, and other stakeholders to further implement weatherization and other measures that provide energy savings focused on emission reductions within the Basin. The SCAQMD staff will also assist in developing new tools that help effectively implement efficiency measures along with quantifying energy savings, emissions benefits along with educating consumers about short payback periods and cost savings opportunities.

Implementation of smart grid technology and other energy efficiency weatherization measures at affected residential buildings would be incentivized through voluntary public participation. To obtain credit in the SIP with emission reductions resulting from this implementation, the integrity elements must be satisfied that are described in detail in the Incentives Implementation of this control measure.

Incentives Implementation

The proposed weatherization, smart grid and efficiency measures would be implemented through voluntary incentive programs (VIPs) and resulting emission reductions must satisfy the following certain *Integrity Elements* criteria for SIP credit to be given for emission reductions. In addition, individual VIPs should be developed according to specific guidelines.

Integrity Elements

Emission reductions that are projected to be achieved from the voluntary incentive measures must be demonstrated to be quantifiable, surplus, enforceable, and permanent. This demonstration must include project type(s); project life; applicable incentive program guideline(s), by title, year, chapter(s); and analysis of applicable incentive program guideline(s) for consistency with integrity elements. For the purposes of this demonstration, the following provides examples of the key elements:

- **Quantifiable:** Emission reductions are quantitatively measureable—supported by existing and acceptable technical data. The quantification should use well-established, publicly available, and approved emission factors and accepted calculation methodology. In developing the quantification methodologies, the guidance provided within the *EPA Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans* will be followed. There must be procedures to evaluate and verify over time the level of emission reductions actually achieved.

Example (1): A residence is having solar panels installed and has an older gas storage water heater. The SCAQMD, through outreach and/or partnerships with solar panel installation companies, is incentivizing the replacement of older inefficient water heaters. The panel installers while installing panels can also provide a quote for a new water heater and/or pool heater then install if the homeowner agrees with the appropriate contractor. Knowing the make and model of the existing water heater along with the efficiency and any emissions of the new high efficiency water heater provides a basis for calculating the reductions.

Example (2): Within an area, there are older existing residences that are in need of weatherization along with other efficiency efforts and have rooftops conducive for solar panels and/or solar thermal systems. Undertaking this control measure within large residential areas can be quantified before and after implementation from aggregated utility data.

- **Surplus:** Emission reductions must be above and beyond any existing district, State, or federal regulation and not included in the baseline inventory. Emission reductions used to meet air quality attainment requirements are surplus as long as they are not otherwise relied on in the SIP, SIP-related requirement, other State air quality programs adopted but not in the SIP, a consent decree, or federal rules that focus on reducing criteria pollutants or their precursors. In the event that a VIP's emission reductions are relied on to meet air quality-related program requirements, they are no longer surplus. In addition, the emission reductions are available only for the remaining useful life of the equipment being replaced (e.g., if the equipment being replaced had a remaining useful life of five years, the additional emission reductions from the new equipment are available for SIP purposes under this guidance only for five years).
- **Enforceable:** The SCAQMD will be responsible for assuring that the emission reductions credited in the SIP will occur. Emission reductions and other required actions are enforceable if:
 - They are independently verifiable;
 - Program violations are defined;
 - Those liable can be identified;
 - SCAQMD and U.S. EPA maintain the ability to apply penalties and secure appropriate corrective action where applicable;

- The general public have access to all the emissions-related information obtained from the source;
- The general public can file suits against sources for violations (with the exception of those owned and operated by Tribes); and
- They are practically enforceable in accordance with other U.S. EPA guidance on practicable enforceability.

Actual emission reductions, for example, can be assured through replacement equipment registration, recordkeeping and reporting, and inspections (initial inspection after installation and subsequent on a regular basis thereafter, if needed) throughout the term. Specific enforcement mechanisms will be addressed in the guidelines for the individual incentive measures.

- **Permanent:** The emission reductions need to be permanent throughout the term for which the credit is generated. The emission reductions are permanent if these reductions are ensured to occur over the duration of the VIP, and for as long as they are relied upon in the SIP.

For example, those awarded incentives will ensure the projects are properly implemented and the reductions are occurring and will continue to occur. Thus, recipients of the incentive awards would agree to a third party inspection along with contract provisions, such as recordkeeping and reporting to track reductions and agreements that newly installed equipment would not be removed without concurrence with SCAQMD (i.e., permanent placement) and the proof that the replaced equipment would be destroyed or at least not be operated in the Basin (e.g., pictures, certification). Detailed procedures to ensure permanent reductions will be described in the guidelines for the Individual Incentive Program.

Guidelines

Each VIP needs to have detailed and comprehensive guidelines that are approved by the SCAQMD Governing Board. The guidelines will include the protocol to implement the program, to ensure SIP approvability:

- VIP should demonstrate compliance with the four key elements of the VIP: quantifiable emission reductions plus incentive costs, surplus reductions, enforceable compliance and permanent reductions.
- Working group should be established to solicit public input and feedback during VIP guideline development.
- Process and procedures to apply for incentives should be clearly explained in the guideline.
- It needs to clearly describe how incentives would be awarded (e.g., priority to high emitters and/or age of equipment, tiered process, first come first serve, or EJ area priority).
- It should have conditions of some form for agreement (e.g., contracts) including tracking and ensuring permanent reductions. The following forms should be prepared:
 - Application Forms (samples are required).
 - Contracts with Conditions (samples are required).
 - Product Example.
- Tracking mechanism is required to ensure overall effectiveness of program and procedures to correct emission projections, such as reductions by the committed target date (e.g., 2023, 2031) and submittal to U.S. EPA annually. Tracking checklist should include:
 - Project Title.
 - Product.

- Annual Emission Reductions (e.g., from 2017 to 2027, incremented by one year).
- Life of project (e.g., 10 years).
- Installation dates (e.g., fixed year 2017 or multiple installation years 2017 and 2018).
- Possible recordkeeping, reporting, and monitoring requirements need to be addressed.
- Individual outreach efforts (e.g., social media, email blasts) to promote the program, make aware of deadlines to apply, and provide timing locations of workshops.
- Program guidelines should be approved by the SCAQMD Governing Board and published online.

Emission Reductions

Weatherization, high efficiency appliances, renewable energy and smart grid measures are typically long term and permanent measures that provide cumulative benefits. Existing energy efficiency programs are having impacts on emission reductions and are generally taken into account within the baseline emissions inventory. Emission benefits expected from actions going beyond SB 350 and Title 24 building energy standards are not yet within the 2016 AQMP future year emission inventory. Accelerated focused deployment, additional programs, and additional incentives within the Basin can achieve an additional 15 percent reduction in NOx emissions by 2023 and 30 percent reduction by 2031 beyond existing efficiency programs and regulations. The reduction in NOx emissions would largely be the result of less natural gas and electricity usage.

Rule Compliance and Test Methods

N/A

Cost-Effectiveness

Weatherization, renewable energy, appliance efficiency and smart grid measures when appropriately applied can realize short payback periods from reduced energy costs. Staff estimates costs for a residential energy efficiency incentive program at about \$230 to \$860 million to reduce emissions by 2.1 tons per day by 2031. The incentive program range is dependent on the type of equipment replacements. Types of equipment identified for this measure include: water heaters, heat pump storage systems, pool heater and covers, weatherization and clothes dryers. Incentivizing the purchase of a pool cover is the most cost-effective option at the lower end of the incentive cost range while weatherizing an entire existing home or installing a solar thermal pool heating system is at the higher end of the incentive cost range. The average cost-effectiveness over the lifetime of the equipment is between \$45,000 and \$50,000 per ton. For some technologies the payback period can be as short as two to three years depending on the cost of the equipment, available incentives, efficiency gains, and energy prices.

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources and will work with other regulatory agencies, utilities, industry groups, and stakeholders to help develop and implement incentives under this control measure.

References

California's 2030 Climate Commitment: Double Energy Savings in Existing Buildings & Develop Cleaner Heating Fuels by 2030: http://www.arb.ca.gov/html/fact_sheets/2030_energyefficiency.pdf

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High Efficiency Water Heater Ready: 2013 California Building Energy Efficiency Standards, California Utilities Statewide Codes and Standards Team, October 2011.

Energy Efficiency Design Options for Residential Water Heaters: Economic Impacts on Consumers: presented at 2011 ASHRAE Winter Conference, Lawrence Berkeley National Laboratory, January 2011.

**ECC-04: REDUCED OZONE FORMATION AND EMISSION REDUCTIONS FROM COOL
ROOF TECHNOLOGY
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		ELECTRIC UTILITIES		
CONTROL METHODS:		EXPANSION OF STATE STANDARDS, SUBSIDY PROGRAM		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
POLLUTANT INVENTORY	TBD	TBD	TBD	TBD
POLLUTANT REDUCTION		TBD	TBD	TBD
POLLUTANT REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
POLLUTANT INVENTORY	TBD	TBD	TBD	TBD
POLLUTANT REDUCTION		TBD	TBD	TBD
POLLUTANT REMAINING		TBD	TBD	TBD
CONTROL COST:		TBD		
IMPLEMENTING AGENCY:		SCAQMD AND CEC		

Description of Source Category

Background

Cool roofs reflect a higher fraction of incident sunlight than traditional roofing materials. Widespread adoption of cool roofs can mitigate the urban heat island effect and lower daytime ambient temperatures, thus slowing the rate of ozone formation. In addition, buildings equipped with cool roofs require less energy for cooling, leading to reduced emissions from the power generation sector. However, installation of some cool roof surfaces can increase the fraction of reflected UV light and potentially increase ozone formation rates. This control measure is designed to leverage the air quality benefits of cool roof technology, while minimizing potential ozone increases when installing cool roof materials. This control measure has the potential to reduce ambient ozone concentrations directly along with NO_x, CO, PM, and CO₂ emissions from the power generation sector. Evaporative emissions of VOCs will also be reduced under lower ambient temperatures.

Regulatory History

Title 24, part of California's Energy Efficiency Standards for Residential and Nonresidential Buildings (2013) requires that new or replacement roofs are cool roofs. The standards are based on the minimum three-year aged solar reflectance, the thermal emittance, and the minimum solar reflectance index for the roofing materials. The specific requirements are dependent on the roof slope (high-slope vs. low slope), the climate zone, and the building use

(non-residential, residential, high-rise residential, hotel/motel). The Cool Roof Rating Council has developed methods to measure the radiative properties of roofing products. Test data is readily available for different roofing materials. Several municipalities within the Basin such as Glendale, Los Angeles, and Pasadena have ordinances that expand Title 24 requirements.

Proposed Method of Control

There are three possible aspects of this control measure. Each aspect will be investigated in the technical modeling analysis to quantify the impact on air quality.

- 1) **Solar Reflectance:** In order to qualify as a cool roof, roofing materials must meet certain radiative property requirements. Solar reflectance is an important property that quantifies the fraction of solar energy that is radiated back into space. A roof with a large solar reflectance can keep a building cool. However, ultra-violet solar energy can also be reflected, leading to increased ozone formation in the air column above the building. Therefore, to minimize inadvertent ozone formation, a rooftop with a minimal ultra-violet solar reflectance and a large reflectance of visible and infra-red light is preferable. This control measure would require that ultra-violet solar reflectance is also considered when selecting roofing materials that meet Title 24 cool roof standards.
- 2) **Radiative Properties:** Title 24 mandates that new or replacement residential roofs meet prescribed radiative properties in select climate zones within California. Depending on the resulting air quality benefits, the expansion of residential Title 24 requirements to climate zones within the Basin that are currently exempt may be an effective method to reduce air pollution. Low-slope high-rise residential and hotel/motel rooftops within the Basin in climate zones 6 and 8 are currently unregulated.⁹ Low-slope residential rooftops are not regulated in climate zones 6, 8, 9 and 10 while high-slope residential rooftops are not regulated in climate zones 6, 8, and 9.¹⁰
- 3) **Roof Replacements:** Since Title 24 does not cover existing rooftops, full implementation is not expected until it is necessary to replace all existing rooftops. If the technical modeling analysis shows significant improvements in ambient ozone concentrations if all rooftops meet Title 24 standards, subsidies for the replacement of roofs not meeting Title 24 standards could be a cost-effective method to accelerate air quality benefits.

Emission Reductions

The meteorological and air quality effects of the proposed methods of control are complicated and non-linear. A technical modeling analysis to quantify the effects of this control measure is currently being conducted. This measure has the potential to reduce ozone directly by slowing the rate of ozone formation in the Basin. Reduced

⁹ Climate zone 6 covers all of coastal Los Angeles and Orange Counties. Climate zone 8 covers inland Orange County and the southern portion of inland Los Angeles County.

¹⁰ Climate zone 9 encompasses the majority of inland Los Angeles County and climate zone 10 covers portions of south western San Bernardino County and western Riverside County.

energy consumption for building cooling will lead to reductions in NO_x, PM_{2.5}, CO, CO₂, and air toxics emissions from the power generation sector. Evaporative VOC emissions will be reduced due to lower ambient temperatures in the urban areas of the Basin.

Rule Compliance and Test Methods

Local building enforcement agencies are primarily responsible for compliance and enforcement of Title 24. (See Title 24 Residential and Nonresidential compliance manuals). The Cool Roof Rating Council develops test methods for measuring the radiative properties of roofing products. It may be possible to expand American National Standard Institutes/Cool Roof Rating Council (ANSI/CRRC) S100 – Standard Test Methods for Determining Radiative Properties of Materials so that it covers the testing of ultra-violet solar reflectance.

Cost-Effectiveness

Determination of the cost-effectiveness of this control measure will require a complete technical modeling analysis of the meteorological, air quality, and energy use changes. However, the costs of many cool roof materials are comparable to traditional roofing materials. The added energy savings over the lifetime of the cool roof can lead to significant cost savings to the building owner.

Implementing Agency

SCAQMD will seek to influence Title 24 Standards and/or to develop incentive mechanisms to encourage implementing cool roofs, in conjunction with other stakeholders.

References

2013 Nonresidential Compliance Manual, California Energy Commission.

2013 California Energy Efficiency Standards Nonresidential Compliance Manual

2013 Residential Compliance Manual, California Energy Commission.

2013 California Energy Efficiency Standards Residential Compliance Manual

"Cool Roof Rating Council." from <http://coolroofs.org/>.

(2012). 2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, California Energy Commission. CEC-400-2012-004-CMF-REV2.

(2015). "Energy Maps of California." from http://www.energy.ca.gov/maps/renewable/building_climate_zones.html.

Council, C. R. R. (2008). Standard Test Methods for Determining Radiative Properties of Materials. ANSI/CRRC S100.

FUG-01: IMPROVED LEAK DETECTION AND REPAIR [VOC]

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		FUGITIVE EMISSION SOURCES		
CONTROL METHODS:		IMPROVED/EXPANDED LEAK DETECTION PROGRAMS		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY*	14	7.7	7.1	6.2
VOC REDUCTION		N/A	2	2
VOC REMAINING		7.7	5.1	4.2
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY*	14	7.7	7.1	6.2
VOC REDUCTION		N/A	2	2
VOC REMAINING		7.7	5.1	4.2
CONTROL COST:		\$4,000 TO \$5,000 PER TON VOC REDUCED		
IMPLEMENTING AGENCY:		SCAQMD		

* Inventory will be re-assessed as part of rulemaking process.

Description of Source Category

This proposed control measure would reduce emissions from a variety of VOC emissions sources including, but not limited to, oil and gas production facilities, petroleum refining and chemical products processing, storage and transfer facilities, marine terminals, and other sources, where VOC emissions occur from fugitive leaks in piping components, wastewater system components, and process and storage equipment. Most of these facilities are already required under SCAQMD and federal rules to maintain a leak detection and repair (LDAR) program that involves individual screening of all of their piping components and periodic inspection programs of equipment to control and minimize VOC emissions. This measure would utilize more efficient and effective leak detection systems known as advanced remote sensing techniques (Smart LDAR), such as Fourier transform infrared spectroscopy (FTIR), Ultraviolet Differential Optical Absorption Spectroscopy (UV-DOAS), Solar Occultation Flux (SOF) and infrared cameras, that can identify, quantify, and locate VOC leaks in real time, allowing for faster repair in a manner that is less time consuming and labor intensive than traditional LDAR.

Background

Fugitive VOC leaks have been the subject of control measures in previous AQMPs since VOCs are ozone and PM_{2.5} precursors and some VOCs have toxic properties. Several SCAQMD rules that affect petroleum and chemical-related industries, such as oil refineries, oil and gas production fields, natural gas processing plants, pipeline transfer stations and chemical plants have requirements involving the periodic inspection of piping components

and the detection and repair of leaks. These industries are often located in or near EJ communities, and the reduction of toxic VOCs has direct benefits for the communities surrounding them.

Fugitive leaks are generally detected with a handheld organic vapor analyzer (OVA) that measures the leak rate for each component, using U.S. EPA Reference Method 21. In the early 1970s, U.S. EPA initiated the Petroleum Refinery Assessment Study, which developed average emission factors for each type of piping component (valve, flange, pump, etc.) and concluded that mass emission rates are dependent on the phase of the process stream (gas/vapor, light liquid and heavy liquid) and the relative volatility of the liquid stream. Mass emissions from fugitive leaks can be calculated based on correlation equations developed by the U.S. EPA based on data from the 1994 Refinery Equipment Leak Report, which are specific to each type of component, such as valve, flange, pump, compressor, etc. The current LDAR program has been successful in significantly reducing fugitive VOC emissions from a variety of sources. However, the latest technology provides opportunities for further improvements in the efficiency of the conventional LDAR program and for further emissions and cost reductions.

In the past few years, SCAQMD staff performed two pilot studies to ascertain feasibility of different optical remote sensing (ORS) techniques for air quality and emissions monitoring from large refinery complexes in the Basin. Overall, these projects have demonstrated that ORS techniques can be successfully used to accurately characterize and quantify emissions from refineries. It was also concluded that longer term measurements (e.g. one month to a year), combined with more detailed wind profile information are needed in order to increase robustness of emissions estimates.

In September 2014, U.S. EPA finalized a rule imposing more stringent fugitive emission control requirements of hazardous air pollutants (HAPs) for flares, coking units and catalytic reforming unit vents of petroleum refineries (<http://www.epa.gov/ttn/atw/petref.html>). To ensure that proposed standards are being met, and to protect the public from exposure to HAPs, no later than three years after the effective date of the final rule, U.S. EPA will require monitoring of benzene concentrations at the fenceline of refineries using passive sensors networks, collecting 2-week rolling averaged benzene concentrations. The not to exceed two-week rolling average benzene concentration at the refinery fenceline is set at $9 \mu\text{g}/\text{m}^3$ (equivalent to approximately 3 ppb). In recognition of recent advances in ORS technology, the new rule also allows facilities to use alternative test methods in order to satisfy the benzene monitoring requirements.

Based on experience gained from previous remote sensing fenceline monitoring studies and a pressing need for early detection capabilities and improved estimates of fugitive emissions, it is prudent to continue to expand SCAQMD remote sensing capabilities. To accomplish this goal, in September – October 2015 SCAQMD conducted a comprehensive measurement campaign aimed to fully characterize technologies that quantify fugitive and stack emissions from large refineries and other important VOC sources in the Basin such as oil wells and gas stations. The analysis of collected data is in progress.

Regulatory History

Fugitive emissions are currently regulated under various SCAQMD rules that range from a simple inspection/maintenance program, to self-inspection programs or an LDAR program. The following rules address fugitive emissions in this manner: Rules 462 – Organic Liquid Loading, 463 – Storage of Organic Liquids, 1142 – Marine Vessel Tank Operations, 1148.1 Oil Well Enhanced Drilling, 1173 – Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum and Chemical Plants, 1176 – Sumps and Wastewater Separators, and 1178 – Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities.

Proposed Method of Control

There are numerous U.S. EPA air pollution standards as well as SCAQMD rules that require specific work practices for equipment LDAR. The current work practice requires the use of a monitor which meets required performance specifications. This work practice is based on 30-year-old technology. While such work practices have been extremely successful in reducing fugitive emissions, recent developments in optical gas imaging provide opportunities for further improvements in efficiency, cost, and effectiveness of the leak detection systems.

This control measure will pursue two goals. The first, as described below, is to upgrade inspection/maintenance rules to require, at a minimum, a self-inspection program, or utilization of an optical gas imaging-assisted LDAR program where feasible. Second, to explore the use of new technologies to detect VOC fugitive emissions in order to supplement existing programs and achieve additional emission reductions. Both goals will be pursued in a public process allowing interested stakeholders to participate in pilot projects and the rule development process.

Rules 462 – Organic Liquid Loading, and 1142 – Marine Vessel Tank Operations and 1148.1 – Oil Well Enhanced Drilling require owner/operators to inspect and to repair and maintain equipment in good operating order when the equipment is operating. Under this control measure, the work practices for these rules would be upgraded to require repairs and maintenance to be documented with records and, where appropriate, reported. Some of these programs could be enhanced by adding some or all of the requirements of an LDAR program.

Rule 463 – Storage of Organic Liquids and 1178 – Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities are two rules that utilize a self-inspection program. Rules 1173 – Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum and Chemical Plants and 1176 – Sumps and Wastewater Separators incorporate an LDAR program. Under this control measure, these rules would be candidates for further improvements in current work practices through the use of new detection technology.

For new detection technology this control measure will be implemented in two phases: Phase I will be a pilot Smart LDAR program to demonstrate feasibility with the new technology and to establish implementation protocols. The completion of Phase I will result in the identification of facilities/industries currently subject to LDAR programs and identification of those where the new Smart LDAR technology is not yet ready to be utilized. Based on the results of Phase I, fugitive VOC rules will be amended as appropriate under the subsequent phase (Phase II) to enhance their applicability and effectiveness, and to further achieve emission reductions. Consideration will be made, where appropriate, for the use of Smart LDAR as a substitute for existing LDAR programs. Some smart LDAR technologies are qualitative only and the lack of quantitative information would require the continued use of existing LDAR programs in those situations.

Emission Reductions

Implementing an LDAR program to source categories that are currently not subject to such programs and/or revising existing LDAR programs with the optical gas imaging capabilities could reduce fugitive emissions by improving operators' ability to detect leaking components and accelerate repairs. The current VOC inventory for applicable sites is 7.1 tons per day (4.5 tons per day at petroleum refineries and 2.6 tons per day at oil and gas production sites). Emission reductions are estimated at 2 tons per day with 1 ton per day being reduced at petroleum refineries (22 percent reduction) and 1 ton per day from oil and gas production sites (38 percent reduction). Emission reduction estimates are preliminary and are based on earlier detection and repair of larger

leaks ($\geq 10,000$ ppm). As noted earlier, many of the VOCs emitted by these industries are toxic as well. Therefore, the VOC reductions realized by this measure will also decrease exposure to toxic VOCs in nearby EJ communities.

Rule Compliance

Rule compliance would be similar to compliance requirements under existing Rules 462, 463, 1142, 1148.1 1173, 1176, and 1178. Recordkeeping and monitoring requirements would be similar to Rule 109.

Test Methods

Test methods include the following:

U.S. EPA Reference Method 21 - Determination of Volatile Organic Compounds Leaks.

Federal Register Vol. 71, No. 66 April 6, 2006 - Alternative Work Practice to Detect Leaks from Equipment.

Cost-Effectiveness

Smart LDAR technology would be deployed at six refineries and 27 oil and gas production sites. Using SOF technology for cost estimates, each unit would cost approximately \$300,000 and require \$75,075 in annual labor, maintenance and electrical costs. Cost-effectiveness for this control measure is approximately \$4,000 to \$5,000 per ton VOC reduced.

Implementing Agency

The SCAQMD has authority to regulate fugitive VOC emissions sources from non-vehicular sources.

References

SCAQMD – VOC Controls White Paper, 2015

U.S. EPA – Protocol for Equipment Leak Emission Estimates, November 1995.

Federal Register/Vol. 71, No. 66/April 6, 2006, Alternative Work Practice to Detect Leaks from Equipment.

**CTS-01: FURTHER EMISSION REDUCTIONS FROM COATINGS, SOLVENTS,
ADHESIVES, AND SEALANTS
[VOC]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	MISCELLANEOUS COATINGS, SOLVENTS, ADHESIVES AND SEALANTS			
CONTROL METHODS:	REDUCE THE ALLOWABLE VOC CONTENT IN PRODUCT FORMULATIONS OR PROVIDE INCENTIVES FOR VOLUNTARY REDUCTIONS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	47	56	57	62
VOC REDUCTION		N/A	1	2
VOC REMAINING		56	56	60
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	49	58	59	64
VOC REDUCTION		N/A	1	2
VOC REMAINING		58	58	62
CONTROL COST:	\$8,000 TO \$12,000 PER TON VOC REDUCED			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

This proposed control measure seeks volatile organic compound (VOC) emission reductions by focusing on select coating, adhesive, solvent and sealant categories by further limiting the allowable VOC content in formulations or incentivizing the use of super-compliant technologies. Examples of the categories to be considered include but are not limited to, coatings used in aerospace applications; adhesives used in a variety of sealing applications; and solvents for graffiti abatement activities. Reductions could be achieved by lowering the VOC content of the coatings, solvents, adhesives and sealants where possible, but reductions could also be achieved by promoting the use of alternative low-VOC products or non-VOC product/equipment at industrial facilities.

Background

Use of super-compliant zero and near-zero VOC materials, such as some ultraviolet light, electron beam, and light emitting diode cured coatings, eliminate or substantially reduce emissions compared to similar products that are not zero or near-zero products. There are several product categories where these materials perform as well as traditional products and are widely available in the market.

Over the years, the SCAQMD Governing Board has adopted numerous rules to reduce the VOC emissions from the use of coatings, solvents, adhesives, and sealants in commercial and industrial applications. Subsequent amendments to these rules achieved further VOC emission reductions primarily through product reformulations using low-VOC technologies including alternative resin chemistries, aqueous and bio-based products, and exempt solvents.

Recent sales and emissions reporting programs have led to improved understanding of the VOC inventory, incentivized clean technology through fee structures, and better-focused future enforcement and regulatory actions. These approaches not only ensure that the reductions assumed in the AQMP are actually occurring, but also allow analysis of market trends and compliance margins that go beyond the regulatory requirements.

The 2016 AQMP control strategy continues to focus on NO_x reductions, with additional strategic and cost-effective VOC reductions, as the best way to minimize the general public's exposure to unhealthy ozone pollution not only in the target attainment year, but also during the course of the control effort. The analysis in the VOC Controls White Paper (SCAQMD, 2015) indicates that a NO_x-heavy strategy accompanied by more modest VOC reductions will help to avoid temporary increases in ozone concentrations in the western side of the Basin. This finding reaffirms the previous NO_x-heavy State Implementation Plan (SIP) strategies to meet both PM_{2.5} and ozone standards. A strategic VOC control program is recommended for the 2016 AQMP to first maximize co-benefits of NO_x, greenhouse gases (GHGs), and air toxic controls, followed by controls that could create a "win-win" "business case" for the affected entities, incentives for super-compliant products, while ensuring and capturing benefits from implementation of existing rules. Particular VOC reductions that lead to the increased use of chemicals that are known or suspected to be toxic should be avoided until it can be demonstrated that these replacement products do not lead to increased toxic risk for workers or the general public. When additional VOC controls are still needed, it is recommended to prioritize controls that will produce co-benefits for air toxics and GHGs, with a focus on VOC species that are most reactive in ozone and/or PM_{2.5} formation.

Regulatory History

The majority of the VOC emission reductions are projected to come from continuing the Rule 1168 amendment that was suspended in 2014. In addition, the following VOC rules may be affected by this control measure due to toxicity concerns, reasonably available control technology (RACT) evaluations and potential loophole elimination:

- **Rules 1106 – Marine Coating Operations and 1106.1 – Pleasure Craft Coating Operations**
The Governing Board did not adopt proposed amendments in 2015 due to proposed recordkeeping requirements, but staff still intends to combine the rules to promote clarity and evaluate whether the rules satisfy RACT requirements.
- **Rule 1124 – Aerospace Assembly and Component Manufacturing Operations**
Evaluate whether the rule satisfies RACT requirements.
- **Rule 1128 – Paper, Fabric, and Film Coating Operations**
Evaluate applicability of spray booths or non-coating line processes used in paper, fabric, and film coating operations.
- **Rules 1107 – Coating of Metal Parts and 1168 – Adhesive and Sealant Applications**
Amendments to both rules were suspended until the Health Risk Assessment (HRA) on tertiary-Butyl Acetate (tBAC) is finalized. Once the HRA is finalized, the amendments will resume.

- **Rule 1136 – Wood Product Coatings**
Consider restriction or elimination of potential loopholes and evaluate toxic emissions resulting from furniture stripping.
- **Rules 314 – Fees for Architectural Coatings, 1113 – Architectural Coatings, 1143 – Consumer Paint Thinners and Multi-Purpose Solvents, and 1171 – Solvent Cleaning Operations**
Assess the potential to achieve SIP reductions through certification programs (e.g. Clean Air Solvent, Clean Air Choices Cleaner Product Certification, or a coatings certification program) or reporting programs.

Proposed Method of Control

Reductions would be achieved by tightening regulatory exemptions that may be used as loopholes and lowering the VOC content for a select few categories where most products are already meeting lower VOC limits. SIP credit may also be achieved through contractual agreements with manufacturers of near-zero VOC SCAQMD certified products. The proposal is anticipated to be accomplished with a multi-phase adoption and implementation schedule. Enhanced enforcement can also lead to reduced emissions.

Emission Reductions

Current estimates are that there is a potential VOC emission reduction of 2 tons per day by 2031.

Rule Compliance and Test Methods

Rule compliance would be achieved by amending select SCAQMD rules on coatings, adhesives, solvents, and sealants.

Cost-Effectiveness

The cost-effectiveness of this control measure is estimated at \$8,000 to \$12,000 per ton of VOC reduced.

Implementing Agency

The SCAQMD has the authority to regulate emissions from area sources and stationary point sources.

References

VOC Controls White Paper (2015)

SCAQMD Staff Reports for Coatings, Solvents, Adhesive and Sealant Rules

Material Safety Data Sheets

Product and Technical Data Sheets

**BCM-10: EMISSION REDUCTIONS FROM GREENWASTE COMPOSTING
[VOC, NH3]**

CONTROL MEASURE SUMMARY					
SOURCE CATEGORY:	GREENWASTE AND/OR FOODWASTE COMPOSTING EMISSION REDUCTIONS				
CONTROL METHODS:	INCREASED ANAEROBIC DIGESTION, ORGANIC WASTE PROCESSING TECHNOLOGY, AND RESTRICTION ON THE USE OF UNCOMPOSTED GREENWASTE				
EMISSIONS (TONS/DAY):					
ANNUAL AVERAGE	2012	2021	2023	2025	2031
VOC INVENTORY*	2.94	3.86	4.23	4.63	4.89
VOC REDUCTION		1.40	1.54	1.68	1.78
VOC REMAINING		2.46	2.69	2.95	3.11
NH3 INVENTORY*	0.42	0.54	0.60	0.65	0.69
NH3 REDUCTION		0.08	0.08	0.09	0.10
NH3 REMAINING		0.46	0.52	0.56	0.59
CONTROL COST:	\$3,400 PER TON OF VOC REDUCED				
	\$61,500 PER TON OF NH3 REDUCED				
IMPLEMENTING AGENCY:	SCAQMD				

* Inventory is based on a subset of the existing emission source category.

Description of Source Category

Greenwaste, once collected and screened, is chipped and ground to produce multiple products, including, but not limited to, composting feedstock, biomass, alternative daily cover (ADC), and mulch. Mulch is compostable and when used as a ground cover, it may produce VOC and NH3 emissions over time due to microbial decomposition activity. Compostable mulch is typically not well managed or controlled once applied to land and therefore, could become a potential source of emissions. Composting is a controlled process to convert greenwaste and foodwaste into beneficial soil amendments. Precursor VOC and NH3 gases are emitted from greenwaste and foodwaste composting and these emissions are addressed by SCAQMD Rule 1133.3 – Greenwaste Composting Operations. Although Rule 1133.3 covers foodwaste composting, the level of emissions from foodwaste composting has not been fully characterized, mainly due to the lack of related emissions test data.

This control measure proposes (1) potential emission reductions through increased diversion to anaerobic digestion, (2) potential emission minimization through organic waste processing technology and (3) potential emission reductions through the restricted use of chipped and ground uncomposted greenwaste.

Background

The California Integrated Waste Management Act of 1989 (Assembly Bill [AB] 939) established a new direction for waste management in the State of California and set up a new mandate for local jurisdictions to meet a solid waste diversion goal of 50 percent by 2000 to conserve resources and extend landfill capacity. California's Statewide landfill diversion rate has steadily increased to 54 percent in 2006 and to 65 percent in 2011.

With the enactment of the California Mandatory Commercial Recycling Law (AB 341, Chesbro) in 2011, CalRecycle developed a discussion paper, "California's New Goal: 75 percent Recycling" in May 2012 that requires the State and CalRecycle to take a Statewide approach to achieving a 75 percent recycling, composting or source reduction of solid waste by 2020 to decrease California's reliance on landfills. Along with adoption of the Solid Waste per Capita Disposal Measurement Act (Senate Bill [SB] 1016) in 2008, a "diversion rate equivalent" of disposal reduction, expressed as pounds of solid waste disposed per person per day, is presently employed to measure the achievement toward the 75 percent Statewide recycling goal established by AB 341.

Two pieces of legislation, AB 1826 (Chesbro) and AB 1594 (Williams), signed in 2014, are expected to lead to significant increases in the amount of organic waste available for composting and anaerobic digestion. AB 1826 requires the State's commercial sector to recycle their organic waste (food scraps and yard trimmings) on and after April 1, 2016, depending on the amount of waste they generate per week. The minimum threshold of organic waste generation by businesses will decrease over time. On and after January 1, 2016, this law also requires local jurisdictions to have an organic waste recycling program in place to divert organic waste generated by businesses. Under AB 1594, commencing January 1, 2020, use of green material as an ADC at landfills no longer would constitute diversion, and would be considered to be disposal for purposes of compliance with the State's mandated 50 percent diversion from disposal required by AB 939. Commencing August 1, 2018, local jurisdictions are required to include information in an annual report to CalRecycle on how the local jurisdiction intends to address these diversion requirements and divert green material that is being used as ADC. In addition to these bills, CARB Short-Lived Climate Pollutant (SLCP) Reduction Strategy outlines a goal of 90 percent organic waste diversion by 2025, which includes foodwaste prevention and rescue programs with a target of 10 percent and 20 percent foodwaste diversion by 2020 and 2025, respectively, with rulemaking to be completed by 2018. To help achieve this goal, the SLCP Reduction Strategy proposes that CARB and CalRecycle consider developing a regulation by 2018 for waste management agencies to effectively eliminate the disposal of organic waste in landfills by 2025.

Currently, an estimated 35 million tons of waste are disposed of in California's landfills annually, of which 32 percent is compostable organic materials, 29 percent is construction and demolition debris, and 17 percent is paper. Among the organic materials disposed of, about 20 percent is food scraps and green materials, such as grass, leaves, prunings, and trimmings. With the State's 75 percent organic recycling goal by 2020 and AB 1826, and also with the CARB SLCP Reduction Strategy, processing of food scraps and greenwaste is expected to grow via composting or anaerobic digestion. Greenwaste chipping and grinding activities are expected to grow concurrently.

Regulatory History

Under SCAQMD Rule 1133 – Composting and Related Operations-General Administrative Requirements, greenwaste disposal facilities, including, but not limited to, composting facilities, chipping and grinding facilities, and material recovery facilities (MRF), are required to register once and update annually thereafter their material processing activities with incoming throughput and outgoing products tonnage. According to Rule 1133 registration of chipping and grinding activities for the 2012 reporting year, an average of 32 percent (Basin-wide) is compostable mulch, 31 percent is ADC, 21 percent is composting feedstock, 12 percent is biomass, and 4 percent is “others” for which woodchips, palm, land application, or other residual material constitutes.

SCAQMD Rule 1133.3 – Greenwaste Composting Operations, established best management practices (BMPs) and VOC and NH₃ emission reduction requirements for greenwaste composting operations that process greenwaste and foodwaste. Rule 1133.3 requires BMPs for composting of greenwaste only and greenwaste mixed with foodwaste for a facility receiving foodwaste up to 5,000 tons/year. The required BMPs are to use at least 6 inches of finished compost layer on top of the composting pile and watering the pile, as needed, for the first 15 days of the active phase composting. These BMPs are equivalent to 40 percent control of VOCs and 20 percent control of NH₃. An add-on emission control is required for a facility receiving foodwaste greater than 5,000 tons/year and on an active phase composting windrow containing greater than 10 percent foodwaste, by weight. The required control efficiency of an add-on control device is 80 percent for VOC and NH₃.

While providing the obvious environmental benefits, the potential negative environmental impacts of composting food scraps have not been fully researched. Foodwaste composting is known to emit more VOCs than greenwaste-only composting; however there are limited emissions data from composting of food materials. Thus, emission inventories and emission factors should be developed to improve emissions characterization of foodwaste composting. Foodwaste composting emissions may vary depending on the recipes of foodwaste and greenwaste mix and the composition of foodwaste. When more emissions data become available by different foodwaste recipes, different levels of emission control requirements could be developed for composting of foodwaste mixed with greenwaste, if necessary. Foodwaste is odorous and anaerobic digestion may increase as foodwaste diversion increases.

Proposed Method of Control

This proposed control measure would seek reductions in VOC and NH₃ emissions through increased anaerobic digestion, using emerging organic waste processing technology, and via restrictions on the use of chipped and ground uncomposted greenwaste, such as mulch, used for direct land application (DLA).

- **Increased Anaerobic Digestion:** Capacity at existing digestion facilities at Sanitation Districts could lower emissions of NH₃ and VOC for certain waste streams, and no NO_x emissions would occur if the biogas produced is used in pipeline or as transportation fuel.
- **Emerging Organic Waste Processing Technology:** An emerging organic waste processing technology (e.g., Regreen Technologies) is in the process of becoming commercially available to process foodwaste, greenwaste, and palm fronds into beneficial soil amendments, fuels for power generation, and animal feeds. This technology is able to process these waste materials without going through the microbial decomposition of organic materials, concurrently killing harmful pathogens in the waste materials and thereby minimizing VOC

and ammonia generation from the process. Diverting organic waste materials from landfills also contributes to emission reductions of methane, a potent SLCP. This technology, if implemented, can be leveraged as a co-benefit measure of the CARB's statewide efforts to reduce methane emissions by 90 percent in 2025 from California's landfills. Estimated equipment costs for this technology is expected to range between \$300,000 for smaller application (0.5 tons/hour) and up to \$3.6 million for larger, full scale application (5 tons/hour).

- **Restrictions on the Use of Chipped and Ground Uncomposted Greenwaste:** Curbside and non-curbside greenwaste is chipped and ground to produce mulch that is used as a ground cover material on public land (e.g., for erosion control or soil reclamation). There is high potential to emit air pollutants from land applied mulch as the material may undergo microbial decomposition over time because it would not be well managed or controlled once being spread. If uncomposted and untreated, mulched greenwaste may cause not only airborne emissions, but also threaten the environment and public health from possible pathogen contamination. A recent study showed that DLA of chipped and screened but uncomposted greenwaste had significant VOC emissions occurring from greenwaste applied on soil surface. In addition, uncontrolled mulch application piles may go through anaerobic decomposition stages, potentially resulting in methane emissions. This control method proposes controlled aerobic decomposition of chipped and ground mulch, therefore contributing to a reduction in methane emissions from land applied greenwaste.

This proposed control method would seek restrictions on the use of compostable (both curbside and non-curbside) chipped and ground mulch on public land. Potential restrictions include, but are not limited to, requiring minimum composting BMPs for chipped and ground uncomposted mulch before DLA, such as six inches of finished compost cover and watering, as needed, for the first 15 days of the active phase composting, as established in Rule 1133.3. About 40 percent of VOC and 20 percent of NH₃ reductions are estimated from implementing the proposed composting BMPs. This proposed time period is equivalent to a pathogen reduction period for windrow composting that is required in California Code of Regulations (CCR) Title 14, Chapter 3.1,11 and is shorter than the full composting process of at least 62 days. The proposed control method would require pseudo-biofilter cover material (e.g., compost overs or finished compost) and watering, as necessary, for the first 15 days of the active composting period. This does not conflict with or duplicate Title 14 pathogen reduction requirements. This proposed control method also supports the Statewide SLCP Reduction Strategy developing appropriate standards to guide the DLA of organic materials.

Another potential control method is to incorporate chipped and ground uncomposted greenwaste into soil from which emission reductions resulted compared to surface application in the recent study. This study result would need thorough examination to see if this is a viable option to reduce air emissions from land applied uncomposted greenwaste.

Emission Reductions

- **Increased Diversion to Anaerobic Digestion:** Increased use of anaerobic digestion could help lower VOC and ammonia emissions from treatment of organic waste, such as foodwaste, biosolids, or manure where feasible.

¹¹ The 14 CCR, Chapter 3.1, section 17852(a)(24.5) has specific requirements that on and after January 1, 2018, the compostable material meet certain pathogen density limits, as specified in section 17868.3(b)(1). To meet pathogen concentration limits, active composting is required for 3 days (for aerated static pile composting with 6–12 inches of insulating cover material) or 15 days (for windrow composting).

The biogas produced can be used to fuel a combined heat and power (CHP) system to produce electrical energy, recover thermal energy, and fuel transportation.

- **Emerging Organic Waste Processing Technology:** This technology does not go through composting process and thus, if implemented, forgoes possible future emissions of air pollutants (VOCs and ammonia) or odorous gases. Although waste diversion would result in an emissions benefit, the actual reductions are not quantifiable at this time.
- **Restrictions on the Use of Uncomposted Greenwaste:** Baseline VOC and NH₃ inventories are estimated using the 2012 base year throughput of mulch as a product of greenwaste chipping and grinding and baseline greenwaste composting emission factors. Projected VOC and NH₃ inventories are estimated by considering the 2012 base year throughput, baseline emission factors, and growth factors, including the anticipated mulch throughput growth due to the Statewide landfill diversion goals (75 percent by 2020 and 90 percent by 2025) and the countywide household growth. Mulch is part of the greenwaste chipping/grinding products. Therefore, to make the estimates more realistic, staff factored the incremental organic waste diversion rates from 2011 to 2020 (i.e., 1.11 percent increase each year) and from 2021 to 2025 (i.e., 3 percent increase each year) in the calculation of the overall mulch throughput growth. By implementing the proposed composting BMPs, 40 percent of VOC and 20 percent of NH₃ reductions are estimated from the active phase composting of chipped and ground mulch. To fully assess this item, an additional emission source test may be needed to improve emissions characterization from chipped and ground uncomposted mulch. An industry survey may also be needed to obtain how much material is processed through what means to better characterize material disposal methods.

Rule Compliance and Test Methods

A SCAQMD regulation or other enforceable instrument will be considered to ensure emission reductions. The most effective regulatory tool will be selected. Implementation of this control measure will not conflict with efforts under AB 939. SCAQMD staff will work with CalRecycle and CARB to develop appropriate test methods based on the methods of control.

Cost-Effectiveness

Cost-effectiveness for this control measure is estimated based on the proposed BMPs (i.e., compost cover and watering) in which greenwaste mulch producers would do mulch composting to achieve pathogen reduction for the first 15 days. Among 21 facilities likely subject to this proposed control, eight facilities are greenwaste composting facilities that already produce finished compost on-site and 13 facilities are greenwaste chipping and grinding facilities that do not produce finished compost on-site. Estimating compliance costs and cost effectiveness of the proposed control measure is based on these 21 facilities.

Thirteen chipping and grinding facilities would need to purchase cover material (finished compost or compost overs) from local composting facilities. To reduce the cover material purchasing cost, which could be high depending on the size of mulch throughput, it is assumed that they would purchase it only for the first year and then would produce finished compost on-site in the following years. Therefore, material cost is considered a one-time cost, annualized over 15 years of a facility's lifetime. In addition to the cover material cost, watering, covering, and recordkeeping costs are also included.

Eight composting facilities would also need to do mulch composting to achieve pathogen reduction for the first 15 days using the proposed BMPs. However, since the cover material is readily available on-site, the cover material purchasing is not needed. Recordkeeping is not considered because it is not a new requirement.

Cost effectiveness is, on average, estimated to be \$3,400 per ton of VOC reduced and \$61,500 per ton of NH₃ reduced as a co-benefit. Note that cost-effectiveness figure for NH₃ is high because emission reductions are low. However because the reductions are derived from the same control method targeted for VOC reductions, the concurrent co-benefit would not result in a net increase in overall cost for control.

Due to the increased statewide diversion requirements, it is currently unknown how many new facilities will be created, particularly because it is unknown how many facilities may process material through digesters to generate biomethane energy. Therefore, cost considerations do not include these factors which could raise overall cost.

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources.

References

1. Edgar & Associates, 2013. Beyond Waste – A Regulatory and Market Report by Edgar & Associates, Inc. A Comment Letter to CalRecycle’s 75 Percent Initiatives, April 2013.
2. CARB, 2015. Draft Short-Lived Climate Pollutant Reduction Strategy, September 2015.
3. California, 2008. Statewide Waste Characterization Study, Contractor’s Report to the Board, CalRecycle, IWMB-2009-0023, August 2009.
4. SCAQMD, Rule 1133 – Composting and Related Operations-General Administrative Requirements, Adopted January 10, 2003.
5. SCAQMD, Final Staff Report for Proposed Amended Rule 1133.1 and Proposed Rule 1133.3, July 2011.
6. Burger et al., 2015. Research to Evaluate Environmental Impacts of Direct Land Application of Uncomposted Green and Woody Waste on Air and Water Quality, Contractor’s Report, CalRecycle, DRRR-2015-1531, March 30, 2015.

**MCS-01: IMPROVED BREAKDOWN PROCEDURES AND PROCESS RE-DESIGN
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	ALL SOURCE CATEGORIES			
CONTROL METHODS:	REVISED PROCEDURES FOR BREAKDOWNS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE*	2012	2022	2023	2031
NOX INVENTORY	N/A	N/A	N/A	N/A
NOX REDUCTION		N/A	N/A	N/A
NOX REMAINING		N/A	N/A	N/A
SUMMER PLANNING*	2012	2022	2023	2031
NOX INVENTORY	N/A	N/A	N/A	N/A
NOX REDUCTION		N/A	N/A	N/A
NOX REMAINING		N/A	N/A	N/A
CONTROL COST*:	NONE			
IMPLEMENTING AGENCY:	SCAQMD			

** Emission reductions and cost-effectiveness cannot be determined due to the nature of the measure (breakdown procedures)*

Description of Source Category

The purpose of this control measure is to revise the current breakdown procedures in Rule 430 – Breakdown Provisions, which would result in a process re-design that would apply to breakdowns from all emission sources.

Background

SCAQMD Rule 430 – Breakdown Provisions, applies to breakdowns that result in a violation of any rule or permit conditions, with some exceptions, and stipulates reporting requirements. The rule provides relief from violations from breakdowns under specific criteria. Breakdown events that are not caused by operator error, neglect, improper operation or maintenance procedures are not considered rule violations.

The period covered under this relief is limited to a maximum of 24 hours from the time the owner or operator knew or reasonably should have known of the breakdown, or to the end of the operating cycle, whichever is sooner. The operator is required to submit a written follow-up report, and SCAQMD staff promptly investigates the site to determine whether the occurrence meets all SCAQMD criteria to qualify as a breakdown.

Regulatory History

SCAQMD Rule 430 was originally adopted by the Governing Board in May 1976 to provide relief from violations of Regulation IV – Prohibitions, (except Rule 402 – Nuisance, or Rule 430), and Regulation XI – Source Specific Standards, for breakdowns that meet certain criteria. This rule was subsequently amended in October 1976, December 1977, May 1978, and July 1996 to improve its enforceability. However, Rule 430 is not approved for inclusion in the State Implementation Plan (SIP) because it does not meet U.S. EPA’s policy for startups, shutdowns, and malfunctions (SSM). U.S. EPA’s May 2015 final action on SSM stipulates that exemptions from excess emissions during periods of breakdown are not allowed. A piece of equipment may experience a breakdown repeatedly and still comply under Rule 430, but each breakdown event may have associated excess emissions, which have no cap or incidence limit under the current rule.

Proposed Method of Control

U.S. EPA is currently addressing rule-specific breakdown provisions on a rule-by-rule basis when they are considered for SIP approval. This control measure would introduce improved breakdown procedures and/or process re-designs that would apply to breakdowns from all emission sources, providing pollutant concentration and/or incidence limits to comply with U.S. EPA’s SSM policy.

For each equipment category, an incidence limit could be applied for a given time period (e.g. per calendar year or calendar quarter). In addition, pollutant concentration limits will be introduced that signify when a breakdown condition occurs. This would apply for combustion equipment that can be tested readily with a portable analyzer such as boilers, engines, and some ovens and furnaces, along with associated control equipment such as Selective Catalytic Reduction (SCR).

Emission Reductions

There are no SIP-creditable reductions from this control measure. This control measure is designed to mitigate excess emissions outside of normal operation.

Rule Compliance and Test Methods

Combustion Gas Periodic Monitoring Protocol for the Periodic Monitoring of Nitrogen Oxides, Carbon Monoxide, and Oxygen from Combustion Sources Subject to Rules 1110.2, 1146, and 1146.1.

Cost-Effectiveness

Due to the nature of this control measure, cost-effectiveness cannot be calculated.

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources.

References

SCAQMD Rule 430 – Breakdown Provisions, Amended July 12, 1996.

**MCS-02: APPLICATION OF ALL FEASIBLE MEASURES
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	ALL SOURCE CATEGORIES			
CONTROL METHODS:	ALL AVAILABLE CONTROL METHODS			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE*	2012	2021	2023	2031
POLLUTANT INVENTORY	TBD	TBD	TBD	TBD
POLLUTANT REDUCTION		TBD	TBD	TBD
POLLUTANT REMAINING		TBD	TBD	TBD
SUMMER PLANNING*	2012	2021	2023	2031
POLLUTANT INVENTORY	TBD	TBD	TBD	TBD
POLLUTANT REDUCTION		TBD	TBD	TBD
POLLUTANT REMAINING		TBD	TBD	TBD
CONTROL COST*:	NOT DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD			

** Emission reductions and cost-effectiveness will be determined after a source category and feasible controls are identified.*

Description of Source Category

This control measure is to address the State law requirement for all feasible measures for ozone. Existing rules and regulations for pollutants such as VOC, NOx, SOx and PM reflect current best available retrofit control technology (BARCT). However, BARCT continually evolves as new technology becomes available that is feasible and cost-effective. SCAQMD staff would continue to review actions taken by other air districts for applicability in our region. Through this proposed control measure, the SCAQMD would commit to consider the adoption and implementation of the new retrofit control technology standards, as well as new controls or limits on existing operations.

Background

This control measure serves as a placeholder for any future control measures that may become feasible, prior to subsequent State Implementation Plan (SIP) revisions, through technology advances and/or cost decreases. The SCAQMD staff continually monitors evolving control technologies, price changes, and the actions of other air quality agencies to determine the feasibility of implementing additional controls to achieve emission reductions. For example, almost all processes (pulping machines, press and dryers to convert waste-paper (newspaper, cardboard, etc.) back into cardboard paper) in the pulp and recycled paper mills are sources of fugitive VOC

emissions, yet currently there is no known feasible control potentially available for fugitive VOC emissions generated by these type of sources. Very high air flow of vent gases makes it impractical and not cost-effective to vent the exhaust gas to a control device. Similarly, breweries, wineries, distillers and other similar operations that store and process grains, ferment, age, store and package the spirits (beer, wine, whiskey, etc.,) and treat the wastewater on site generate VOC and PM emissions. Known feasible methods of control are not cost-effective based on the current emissions inventory. However, in the future, industry growth and affordable cost-effective control could make these sources viable future control measures.

Regulatory History

The California Clean Air Act (CCAA) requires air districts to achieve and maintain State standards by the earliest practicable date and for extreme nonattainment areas, to include all feasible measures in the California Health and Safety Code (H&SC) §§40913, 40914, and 40920.5. While this statute is not applicable to PM, the federal Clean Air Act requires attainment of the NAAQS as early as “practicable” and, as a serious nonattainment area for PM_{2.5}, implementation of Best Available Control Measures (BACM). The term “feasible” is defined in the 14 California Code of Regulations, section 15364, as a measure “capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.” CARB guidance states that this definition, found in the CEQA Guidelines, applies to the requirements under air pollution laws. The required use of BARCT for existing stationary sources is one of the specified feasible measures. H&SC §40440 (b)(1) requires the SCAQMD to adopt rules requiring best available retrofit control technology for existing sources. H&SC §40406 specifically defines BARCT as “...best available retrofit technology means an emission limitation that is based on the maximum degree of reduction achievable taking into account environmental, energy, and economic impacts by each class or category of source.”

Existing rules and regulations on VOC coatings and solvents as well as regulations for pollutants such as NO_x, SO_x and PM reflect current BARCT. However, BARCT evolves as new control methods become available that are feasible and cost-effective. Through this control measure, the SCAQMD commits to consider the adoption and implementation of new retrofit control technology standards as technology develops.

Proposed Method of Control

The SCAQMD staff will continue to review new emission limits or controls introduced through federal, State or local regulations to determine if SCAQMD regulations remain equivalent or more stringent than rules in other regions. If not, a rulemaking process will be initiated to perform a BARCT analysis with potential rule amendments if deemed feasible. In addition, the SCAQMD will consider adopting and implementing new retrofit technology control standards, based on research and development and other information, that are feasible and cost-effective.

Emission Reductions

Further emission reductions would be sought from the adoption of new rules or amendment of existing rules and regulations to reflect new BARCT standards that may become available in the future prior to subsequent AQMP revisions.

Rule Compliance and Test Methods

Compliance with this measure would be based on monitoring, recordkeeping, and reporting requirements that have been established in existing source specific rules and regulations. In addition, compliance would be verified through inspections and recordkeeping and reporting requirements.

Cost-Effectiveness

Cost-effectives for this control measure cannot be determined because the future set of “all feasible” measures are not known. The SCAQMD will continue to analyze the potential cost impact associated with implementing this control measure, conduct research on new control technologies, and provide cost-effectiveness information during any future rule making processes.

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources.

References

California Health and Safety Code: Sections 40913, 40914, 40920.5, 40406, and 40440 (b)(1)

14 California Code of Regulations, Section 15364

**FLX-01: IMPROVED EDUCATION AND PUBLIC OUTREACH
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	RESIDENTIAL, COMMERCIAL, INDUSTRIAL, AND TRANSPORTATION SOURCES			
CONTROL METHODS:	INCREASED AWARENESS, INCENTIVE PROGRAMS, AND TECHNICAL ASSISTANCE IN MAKING LOW EMITTING PURCHASES, IMPLEMENTING EFFICIENCY PROJECTS, AND CONSERVATION TECHNIQUES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE*	2012	2022	2023	2031
POLLUTANT INVENTORY	N/A	N/A	N/A	N/A
POLLUTANT REDUCTION		N/A	N/A	N/A
POLLUTANT REMAINING		N/A	N/A	N/A
SUMMER PLANNING*	2012	2022	2023	2031
POLLUTANT INVENTORY	N/A	N/A	N/A	N/A
POLLUTANT REDUCTION		N/A	N/A	N/A
POLLUTANT REMAINING		N/A	N/A	N/A
CONTROL COST:	N/A			
IMPLEMENTING AGENCY:	SCAQMD & OTHER PARTIES			

* Emissions inventory and reductions cannot be quantified due to the nature of the measure (e.g., outreach).

Description of Source Category

This proposed control measure seeks to provide education, outreach, and incentives for consumers to contribute to clean air efforts. Examples include consumer choices such as the use of energy efficient products, new lighting technology, "super-compliant" coatings, tree planting, transportation choices, and the use of lighter colored roofing and paving materials which reduce energy usage by lowering the ambient temperature. In addition, this proposed measure intends to increase the effectiveness of energy conservation programs through public education and awareness as to the environmental and economic benefits of conservation. Educational and incentive tools to be used include social comparison applications (comparing your personal environmental impacts with other individuals), social media, and public/private partnerships. Further improvement of outreach allows the public to alert staff of any environmental problems that need attention.

Background

Energy efficiency and conservation have been included in the SCAQMD's Air Quality Management Plans since 1991. The SCAQMD continues to implement incentive and education programs to help promote clean air purchases, efficiency projects, and conservation techniques that provide criteria pollutant emissions benefits. The SCAQMD has since adopted policies such as the Air Quality Related Energy Policy, Climate Change Policy, and Green Policy that help further define the SCAQMD's efforts in these areas.

This measure seeks to increase awareness of the benefits of purchasing low emitting products and promote further implementation of efficiency and conservation projects. When making purchases such as new cars, yard equipment, or household products, there are several factors consumers consider, but emissions and health benefits are typically not considerations. To help make emissions an important factor in purchasers' decision-making process, the SCAQMD has several existing outreach and education programs in place such as Clean Air Choices,¹² educational materials, conferences, and outreach to specific communities throughout the Basin. Providing additional outreach and education regarding clean air choices will help consumers consider the emission benefits of their purchases. In some instances, these purchases include efficiency gains that will decrease longer term operating costs, and thus provide a built-in financial incentive. Providing specific outreach and education on these potential cost savings will help increase penetration of such low emitting technologies and practices.

Furthermore, there are several existing incentive programs to help promote higher efficiency and lower emitting technologies such as the utility administered rebate programs for purchases of high efficiency appliances. Some of these existing programs are established for reasons other than emissions benefits. For instance, the electric utility rebate program was established to reduce electricity demand to help decrease the need for additional generation plants. However, this program also provides emission benefits that might be implemented faster with further education and outreach by the SCAQMD.

The outreach and education regarding these existing programs will include information on co-benefits such as emission reductions and cost savings to promote accelerated implementation of these existing programs. The SCAQMD will also offer additional incentive programs to complement existing programs or promote specific efficient low emitting technologies. For instance, the SCAQMD's Lawn Mower and Leaf Blower Exchange program provides a good example of the significant impacts incentive programs can have. To date, SCAQMD has scrapped more than 55,000 highly polluting gasoline mowers, removing almost 114 tons of smog-forming pollutants from the Southland's air. Similarly, the total number of old, polluting leaf blowers that have been scrapped exceeds 10,000.¹³

The SCAQMD will also help to promote potential efficiency benefits for existing equipment and structures. There are several reasons why many efficiency projects are not undertaken. In many instances tools, incentive programs, and loan programs for efficiency upgrades are not adequately described, advertised, or consolidated. Certain projects require high initial capital costs, despite relatively fast payback periods, which serves as a barrier to implementation. In addition, technical barriers prevent many system operators, home owners, and building maintenance crews from utilizing existing tools and implementing efficiency projects. The SCAQMD staff will help

¹² <http://www.cleanairchoices.org/>.

¹³ <http://www.aqmd.gov/home/programs/community/community-detail?title=lawn-equipment>.

develop technical outreach to residents and businesses to help implement projects that have emission benefits and short payback periods. The SCAQMD staff may also examine ways to provide assistance through additional incentive programs and/or loan products to defray or amortize capital costs on certain efficiency projects.

Regulatory History

As this measure is not a regulatory item that will be implemented via rulemaking, there is no relevant regulatory history in this area. However, as mentioned above, the SCAQMD has developed and implemented a wide array of education, outreach, technical assistance, and incentive programs designed to achieve emission reductions on a voluntary basis. A discretionary economic incentive program (EIP) could be established that provides funding for outreach and incentives to promote the use of efficient low emitting technologies. In order to get emission reduction credit as part of the State Implementation Plan (SIP) submittal, guidelines would be required that demonstrate the emission reductions from the EIP are quantifiable, surplus, enforceable, and permanent.

Proposed Method of Control

This control measure is a voluntary program that provides education and outreach to consumers, business owners, and residences regarding the benefits of making clean air choices in purchases, conducting efficiency upgrades, installing clean energy sources, and approaches to conservation. These efforts will be complemented with helping implement currently available incentive programs and developing additional incentive programs. Lastly, the SCAQMD staff may develop an EIP to offer technical and financial assistance to help implement efficiency measures and other low emission technologies.

Emission Reductions

Predicting emission reductions from these activities is not possible at this time due to the voluntary nature of the control measure. Outreach and education components will have emission benefits that can perhaps be quantified later based on program evaluation, technology penetration, and other assessment and inventory methods. Implementing additional incentive programs will provide a means to quantify these benefits as they are developed. Emission reductions achieved from these activities will be incorporated into the subsequent SIP revisions once projects are implemented.

Rule Compliance and Test Methods

Not applicable.

Cost-Effectiveness

The cost-effectiveness of this measure cannot be determined, given the variety of programs and projects that will be developed. The SCAQMD staff will continually analyze costs associated for with education and outreach, and where possible quantify resulting emission reductions. The cost-effectiveness for specific incentive programs can be determined as they are developed and implemented by the SCAQMD.

Implementing Agency

The implementing agency will be the SCAQMD, in cooperation with other local governments, agencies, technology manufacturers and distributors, and utility service providers.

References

South Coast Air Quality Management, Air Quality Related Energy Policy, Sept. 2011.

South Coast Air Quality Management, Climate Change Policy, Sept. 2008.

South Coast Air Quality Management, Green Policy, Oct, 2009.

National Academy of Sciences, Real Prospects for Energy Efficiency in the United States, 2010.

American Council for an Energy-Efficient Economy (ACEE), Energy-Efficiency: The Slip Switch to a New Track Toward Compliance with Federal Air Regulations, January 2012, Report # E122.

McKinsey and Co., Unlocking Energy Efficiency in the U.S. Economy, July 2009.

**FLX-02: STATIONARY SOURCE VOC INCENTIVES
[VOC]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	RESIDENTIAL, COMMERCIAL, INDUSTRIAL, AND TRANSPORTATION SOURCES			
CONTROL METHODS:	FINANCIAL INCENTIVE PROGRAMS			
EMISSIONS (TONS/DAY):	TBD			
ANNUAL AVERAGE*	2012	2022	2023	2031
VOC INVENTORY	213	223	224	230
VOC REDUCTION		N/A	TBD	TBD
VOC REMAINING		N/A	TBD	TBD
SUMMER PLANNING*	2012	2022	2023	2031
VOC INVENTORY	209	220	221	227
VOC REDUCTION		N/A	TBD	TBD
VOC REMAINING		N/A	TBD	TBD
CONTROL COST:	NOT DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD			

* Emissions inventory and reductions cannot be quantified at this time due to the nature of the measure as it is uncertain exactly what programs will be implemented.

Description of Source Category

Many existing homes and businesses will, in the future, update and improve their facilities and many have the option to modernize using cleaner, lower emission, less toxic alternative processes and materials. However, since many of these cleaner options may not be the lowest-cost option, their use may need to be incentivized.

The focus of the measure is to incentivize lower polluting and less toxic alternative processes and materials for existing residential, commercial, and industrial modernization. Using an incentives-based approach will encourage businesses to make choices that will reduce emissions while minimizing cost impacts. An incentive-based approach is also consistent with business retention efforts, particularly in regards to replacing older higher-emitting equipment or material with new lower-emitting equipment or material.

Background

In the past, the SCAQMD has adopted a series of programs to promote clean, low emission technologies while encouraging economic growth and providing compliance flexibility. The SCAQMD continues to implement incentive programs to help promote efficient clean equipment purchases, efficiency projects, and conservation techniques that provide toxic and criteria pollutant emissions benefits, as well as greenhouse gas emission reductions. The manufacturing and deployment of zero and near-zero emission technologies will help reduce

criteria pollutant emissions in the region, accelerate removal of equipment that can last for many decades, and advance economic development and job opportunities in the region.

Regulatory History

SCAQMD currently offers a number of funding/grant resources to encourage the immediate use of clean, low emission technologies. The incentive programs, which include incremental funding or subsidies, are designed to promote voluntary introduction of alternative improved practices and new technologies on an accelerated schedule. Examples of such funding programs include:

- Financial Assistance for Alternative Dry Cleaning Equipment Purchases;
- Wood Stove & Fireplace Change-Out Incentive Program; and
- Carl Moyer Memorial Air Quality Standards Attainment Program for vehicle retrofit and replacement.

Additionally, regulatory relief incentives have been incorporated into several SCAQMD rules including:

- Reduced recordkeeping for Super-Compliant coatings, adhesives and solvents in Rule 109 – Recordkeeping for Volatile Organic Compound Emissions;
- Reduced fees for ultra-low VOC architectural coatings in Rule 314 – Fees for Architectural Coatings;
- Less frequent source testing for low-emitting point sources in Rule 1420.2 – Emission Standards for Lead from Metal Melting Facilities; and
- Less frequent inspection schedules for high-compliance facilities in Rule 1173 – Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants.

However, incentivizing the use of cleaner, less polluting, products and equipment requires additional efforts to broaden the scope of stationary source incentives.

Proposed Method of Control

This control measure would seek to incentivize VOC emission reductions from various stationary and area sources through incentive programs for the use of clean, low emission materials or processes. Facilities would be able to qualify for incentive funding if they utilize equipment or material, or accept permit conditions which result in cost-effective emission reductions that are beyond existing requirements. The program would establish procedures for quantifying emissions benefits from clean technology implementation and develop cost-effectiveness thresholds for funding eligibility.

Mechanisms will be explored to incentivize residences and businesses to choose the cleanest technologies as they replace equipment or material and upgrade facilities, and to provide incentives to encourage businesses to move into these technologies sooner. Although replacement of older, higher emitting sources is expected to have the greatest potential for emission reductions, providing incentives and eliminating barriers for new sources to manufacture and use ultra clean technologies is also important.

Industrial Facility Modernization can result in substantial emission reductions, especially if the cleaner equipment or material is at zero or near-zero emission levels. Efforts to encourage clean manufacturing facilities to site and operate in the Basin can result in emission reduction benefits as well as other co-benefits to the local economy, particularly to the surrounding community. Consistent with this effort, there are two primary objectives:

1. Provide incentives to replace older higher-emitting equipment or material with newer lower emitting equipment or material for area and stationary sources,.
2. Encourage new businesses that use and/or manufacture near-zero and zero emission technologies to site in the Basin.

Through the years, a variety of incentives have been implemented, such as exempting cleaner sources from permitting, implementing measures to streamline permit processing for cleaner sources, use of short-term mobile source credits, mitigation fee programs, the Air Quality Investment Program (AQIP), and emissions averaging provisions in rules. The incentive programs, which include incremental funding or subsidies, are designed to promote voluntary introduction of new technologies on an accelerated schedule. These programs may also provide manufacturers with incentives to accelerate the deployment of cleaner technologies. Such an example is the use of energy-curing technologies which includes ultraviolet light (UV), electron beam (EB), heat and light emitting diode (LED) cured coatings. Some radiation cured inks and coatings are near-zero VOC, 100 percent solid products that do not cure by solvent evaporation but are cured through exposure to radiation which causes a polymerization reaction to convert the liquid coating into a solid film. Another example is powder coatings, which are dry, free-flowing powders containing no solvents that are applied electrostatically and cured with heat. One barrier to more wide spread adoption of these near-zero VOC technologies is the upfront cost of the application and curing equipment, making these technologies attractive candidates for incentive measures.

For stationary sources, the SCAQMD staff has compiled a list of potential incentives to encourage businesses to use zero or near-zero technologies or enhancements to the SCAQMD's existing programs to reduce or eliminate barriers to implement state of the art technologies. The list below represents an "initial list" of potential concepts. It is expected that as the SCAQMD staff and stakeholders further explore incentives approaches, additional concepts may be identified. The SCAQMD staff is committed to further investigating the concepts listed below and others.

- Incentive Funding:** Incentive funding involves the creation of economic incentives to reduce the cost and encourage businesses to replace their existing high emitting equipment or material with equipment or material that is zero or near-zero emitting. It includes mechanisms such as loans and grants. Funding for these programs could derive from mitigation fees, penalty or settlement fees, or federal or State grants and programs.
- Permitting and Fee Incentives and Enhancements:** Permitting and fee incentives and enhancements would include the expansion of the existing certification program and pre-approved permit program to include additional qualified categories. Incentives involving reduced permitting fee programs for advanced technologies which significantly reduce emissions as well as other permitting enhancements identified as priority projects are also discussed and require less District's effort to permit or enforce in this incentive approach.
- NSR Incentives and Enhancements:** The mechanism of credit offsets and NSR incentives includes expanding the number of exemptions under Rule 1304 – Exemptions and expanding the use of the priority reserve

under Rule 1309.1 – Priority Reserve for businesses using or providing advanced clean technologies. In addition this mechanism includes the adoption of a Clean Air Investment Fund and potential short-term leasing of offset credits.

- ☑ **CEQA Incentives:** CEQA incentives will focus on mechanisms the SCAQMD staff can provide in the CEQA process such as expedited review.
- ☑ **Branding Incentives:** Branding incentives can recognize businesses or equipment for reach a superior level of air quality excellence. Branding incentives can vary from recognition awards to specific labeling or certification.
- ☑ **Recordkeeping and Reporting Incentives:** Recordkeeping and reporting incentives can reduce the recordkeeping and reporting requirements for specific zero and near-zero emission technologies.

Emission Reductions

Predicting VOC emission reductions from these voluntary activities is challenging. The availability and amount of incentives would directly affect the level of VOC emission reductions achieved. Emission benefits from incentives can be quantified based on program participation, technology/material penetration, and other assessment and inventory methods. Implementing additional incentive programs will include a means to quantify these benefits as they are developed. Updated emission reductions achieved from these activities will be incorporated into the subsequent SIP revisions as projects are implemented.

Rule Compliance and Test Methods

Not applicable.

Cost-Effectiveness

The decision regarding when to replace existing equipment can vary; some facilities may replace equipment or reformulate material when it is no longer operable or outdated, while other facilities may replace equipment or material well before it reaches that point. Regardless, equipment/material replacement and/or installation of pollution controls can represent a significant financial decision where the operator must assess for the capital cost to purchase new equipment, installation, operating and maintenance costs.

The SCAQMD has implemented several funding programs to help facilitate specific technologies and compliance with SCAQMD rules. One such example involved the establishment of the Rule 1470 Risk Reduction Fund in May 2012. This fund was adopted by the SCAQMD Governing Board to set aside \$2.5 million to offset the cost of purchasing diesel particulate filters for new diesel emergency standby engines as required under Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines. Another program is the Dry Cleaner Financial Incentive Grant Program which was designed to assist local dry cleaners to switch to non-perchloroethylene dry cleaning systems to comply with Rule 1421 – Control of Perchloroethylene Emissions from Dry Cleaning Systems. Up to \$20,000 was available for CO₂ machines and \$10,000 for water-base system machines. For a limited time, \$5,000 was available for hydrocarbon machines. Since 2008, the program has provided approximately \$265,000 to local dry cleaners in order to upgrade their systems. In addition, there are several existing incentive programs which help promote higher efficiency and lower emitting technologies such

as the: Lawn Mower and Leaf Blower Exchange; SOON Program; Carl Moyer Memorial Air Quality Standards Attainment Program; MSERC Credit Programs; and Voucher Incentive Program.

The cost-effectiveness of this measure cannot be determined, given the potential variety of programs and projects that will be developed. The cost-effectiveness for specific incentive programs can be determined as they are developed and implemented by the SCAQMD.

Implementing Agency

The implementing agency will be the SCAQMD, in potential cooperation with other local governments, agencies, businesses, technology manufacturers and distributors, and community groups.

References

2016 AQMP White Paper – Industrial Facility Modernization (November 2015)

GROUP 2

SCAQMD MOBILE SOURCE CONTROL MEASURES

**EGM-01: EMISSION REDUCTIONS FROM NEW DEVELOPMENT AND REDEVELOPMENT PROJECTS
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		NEW DEVELOPMENT OR REDEVELOPMENT PROJECTS		
CONTROL METHODS:		MOBILE SOURCE EMISSION REDUCTION ACTIONS WHICH MAY INCLUDE MITIGATION FEE OPTIONS		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	TBD	TBD	TBD	TBD
VOC REDUCTION	TBD	TBD	TBD	TBD
VOC REMAINING	TBD	TBD	TBD	TBD
NOX INVENTORY	TBD	TBD	TBD	TBD
NOX REDUCTION	TBD	TBD	TBD	TBD
NOX REMAINING	TBD	TBD	TBD	TBD
CO INVENTORY	TBD	TBD	TBD	TBD
CO REDUCTION	TBD	TBD	TBD	TBD
CO REMAINING	TBD	TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	TBD	TBD	TBD	TBD
VOC REDUCTION	TBD	TBD	TBD	TBD
VOC REMAINING	TBD	TBD	TBD	TBD
NOX INVENTORY	TBD	TBD	TBD	TBD
NOX REDUCTION	TBD	TBD	TBD	TBD
NOX REMAINING	TBD	TBD	TBD	TBD
CO INVENTORY	TBD	TBD	TBD	TBD
CO REDUCTION	TBD	TBD	TBD	TBD
CO REMAINING	TBD	TBD	TBD	TBD
CONTROL COST:	TO BE DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD/LOCAL OR REGIONAL AGENCIES			

Description of Source Category

The purpose of this measure is to mitigate and, where appropriate, reduce emissions from new development and redevelopment projects. The measure is designed to reduce emissions related to new residential, commercial, industrial and institutional development, including redevelopment, required to meet the needs of the Basin's future residents and economy. These projects are considered indirect sources. An indirect source is any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor) for which there is a State Ambient Air Quality Standard. Examples of indirect sources include residential housing, entertainment centers, shopping malls, historical tourist attractions, amusement parks, parking lots, commercial office facilities, airports, ports, warehouse/distribution centers, schools, etc.

For the purposes of this measure, indirect sources include all facilities not covered by another 2016 AQMP Control Measure; specifically, control measures MOB-01 through MOB-04 to the extent that these control measures are part of the adoption of the Final 2016 AQMP. In addition, during the rule development process, additional indirect sources may be included or excluded. The District will work with affected stakeholders and other regulatory agencies to ensure that duplication of efforts and regulations that have the same emission reduction benefits will be avoided in any proposed District rule to the maximum extent possible. In addition, as part of the public process, discussion on potential strategies to mitigate or reduce emissions from new development and redevelopment projects will take into consideration evolving development patterns and other existing regulations aimed at new development within the Basin.

Background

New development projects produce new sources or relocate existing sources of air pollution in the form of new vehicle trips, use of consumer products, landscape maintenance, new stationary source processes such as fuel combustion, as well as emissions generated during construction activities. Each day millions of vehicles travel the roads in the Basin and the length of vehicle trips is expected to increase as outlying areas continue to be developed. In addition, older residential, commercial and industrial areas may undergo major redevelopment involving construction activities, with emissions comparable to new development projects. Redevelopment projects may also generate additional vehicular traffic compared to the projects they replace because redevelopment projects often involve increasing population density compared to the previous use. Redevelopment includes demolishing existing buildings, increasing overall floor area or building additional capacity on an existing property. For example, the conversion of an industrial warehouse to an office building could create as much emissions as constructing a new building because it would involve a complete remodel. Greater use of alternative fuels and deployment of cleaner near-zero and zero-emission technologies in on-road vehicles will further reduce the emissions impacts accounted by vehicle trips alone.

Lead agencies for projects subject to the California Environmental Quality Act (CEQA) currently prepare an air quality analysis as part of their environmental documents, including emissions during construction and operations. Typical emissions during the construction phase of development projects include, but are not limited to, fugitive dust emissions, combustion emissions from off-road mobile sources (construction equipment) and on-road mobile sources, and coating and asphalt evaporative emissions. Operational emissions include, but are not limited to: area sources (e.g., water heater emissions), on-road mobile source emissions (worker commute trips, delivery truck

trips, etc.), consumer products and other emissions sources depending on the specific type of land use. The District is a commenting agency on air quality analyses for new development and redevelopment projects that are subject to CEQA in the Basin and Coachella Valley.

Regulatory History

California Health and Safety Code (H&SC) Section 40716 states that “a District may adopt and implement regulations to reduce or mitigate emissions from indirect and areawide sources of air pollution”. As an example, a 1993 California Attorney General opinion states that “a District’s regulations may require the developer of an indirect source to submit the plans to the District for review and comment prior to the issuance of a permit for construction by a city or county. A District may also require the owner of an indirect source to adopt reasonable post-construction measures to mitigate particular indirect effects of the facility’s operation [as a stationary source]. Such regulations could be enforced through an action for civil penalties...” (Cal. Attorney General Opinion 92-519.) While other types of indirect source measures could be developed, the same attorney general’s opinion concluded that the District may not impose a permitting system upon indirect sources per se, given the primacy of local land use control. H&SC Section 40716 also states that “nothing in the section constitutes an infringement on the existing authority of counties and cities to plan or control land use, and nothing in the section provides or transfers new authority over such land use to a district” when an air district adopts and implement regulations to reduce or mitigate emissions from indirect and areawide sources of air pollution or encourage or require the use of measures that reduce the number or length of vehicle trips.

New residential, commercial, industrial and institutional development, including redevelopment, are required to meet the needs of the Basin’s future residents and economy. The Basin population will grow 12 percent by 2031, resulting in new homes and job-generating development, according to the Southern California Association of Governments (SCAG). The majority of that growth will occur as infill to existing urbanized areas. By 2040, SCAG’s 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) expects 46 percent of housing and 55 percent of jobs to be located in areas served by high quality transit. As a result of the changing distribution and density of development, SCAG reports a significant decrease in vehicle miles traveled per capita in the Basin between 2012 and 2040: daily per capita VMT is projected to decrease in 2040 by 7.4 percent, from 22.1 miles to 20.5 miles. New development and redevelopment projects will also be constructed in compliance with Title 24 green building requirements that greatly reduce construction and operational emissions compared with existing development.

A number of air districts in California have already adopted and implemented indirect source rules, policies, and/or the collection of mitigation fees. These examples are provided for reference only, and do not necessarily reflect a model of what an applicable rule that may be developed by District would entail. Given the uniqueness and severity of the air quality problem in the Basin in comparison to other regions in California and the United States, unique considerations will be given in developing regulations or other enforceable mechanisms in order to meet federal air emissions standards.

In December 2005, the SJVAPCD adopted Rule 9510 – Indirect Source Review, which was recently approved by U.S. EPA. The purpose of the rule is to reduce emissions of NO_x and PM₁₀ from new development projects that seek to gain a discretionary approval (*upon full build-out*) of any one of the following: minimum 50 residential units, 2,000 square feet (SF) of commercial space, 25,000 SF of industrial space, 20,000 SF of medical office space, 39,000 SF of general office space, 9,000 SF of educational space, 10,000 SF of government space, 20,000 SF of recreational space, or 9,000 SF of uncategorized space. The rule also applies to transportation projects whose construction

exhaust emissions will result in a total of 2 tons/year of NOx and PM10 combined. The rule is designed to reduce the impact of the development projects to the extent needed for the SJVAPCD region to reach attainment of ozone and PM standards by determining the level of reduction needed on a per-project basis that would achieve the emission reduction committed in the PM and ozone attainment plans.

The rule requires applicants of new development projects to provide documents necessary to perform an emissions generation analysis. The SJVAPCD calculates a required emission reduction amount based on total emissions and identifies credits for specific on-site emission reduction measures included in the project. Required reductions not achieved by voluntary on-site measures would be achieved off-site through a mitigation fee. Offsite reductions are subject to criteria including, but not limited to, being quantifiable and surplus. Such offsite reductions are analyzed annually to ensure their effectiveness.

Sacramento Metropolitan Air Quality Management District is working on proposed Rule 1051 – “Indirect Source Rule for New Land Use Projects” requiring new residential, commercial and industrial land uses to mitigate construction NOx emissions by 20 percent and operational emissions to a percentage of the project’s NOx emissions. Mitigation fees to fund an offsite mitigation account and a fee rate have yet to be determined.

Proposed Method of Control

The District is required by State law to consider all feasible control measures (H&SC Sections 40913, 40914 40920.5), which would include consideration of a measure that is at least equivalent to the programs implemented by other air districts. In response to this requirement, the District will consider whether a rule similar to SJVAPCD Rule 9510 or other mechanisms that will result in mitigating or help mitigate and potentially further reduce emissions associated with new development or redevelopment projects could apply in the Basin and Coachella Valley.

An EGM-01 working group consisting of affected stakeholders from local governments, the building industry, developers, realtors, other business representatives, environmental/community organizations, and other stakeholders, was established as part of the 2007 AQMP. The District will re-convene the working group to explore potential actions and innovative approaches to mitigate and potentially reduce emissions from new or redevelopment projects. As part of the working group process, discussions and review will include, but are not limited to, changes in the indirect source emissions inventory as a result of economic slowdown and forecasted future economic growth; the latest Title 24 green building standards that affect project emissions; and a regionwide shift toward compact development and active transportation with implications for trip generation, as documented in SCAG’s 2016 RTP/SCS pursuant to SB 375. Through the working group process, the District will examine the effectiveness of the SJVAPCD rule framework in the context of the Basin, including cost-effective operational, construction or mobile source emission reductions given development density trends, Title 24 building requirements, clean vehicle penetration, and other South Coast-specific factors. Further, the District and the working group will examine possible incentive programs and other methods to create demand for cleaner technologies and materials, and designs that accommodate new technology deployment (such as including footprints for vehicle charging stations) in new developments that will help make substantive and reasonable strides to emission reductions. If emission mitigation actions cannot be readily achieved by the project proponent, District staff will consider (with input from stakeholders) the potential and effectiveness of an alternative mitigation fee, which will be used to identify emission reduction projects in the vicinity of the proposed project. The inclusion

of industry stakeholders early on in the planning process will help to spur innovative market and cost sensitive solutions.

In addressing indirect sources, the District will develop implementation and compliance methods that will not unduly restrict local or regional jurisdictions' prerogatives respecting land use approvals.

During rule development, special consideration will be given to the need to assure that any rule adopted will integrate with and enhance the CEQA process and not impede the project approval process in light of CEQA timelines. To this end, the District may consider a local delegation option in which a local or regional jurisdiction may elect to implement a program equal to or more stringent than the District's for mitigating or reducing emissions associated with new development or redevelopment projects. Coachella Valley Association of Government's PM10 mitigation measures in Rule 403 – Fugitive Dust are good examples of how local ordinances can be implemented in a District rule. This delegation will include technical training and field auditing to be conducted by the District.

Emission Reductions

The amount of emission reductions that can be achieved from this measure will be determined dependent on the type and number of new and redevelopment projects affected by the measure and the method of control to be implemented to reduce VOC, NOx, and PM2.5 emissions. The reliance merely on VMT as an applicable metric will be avoided to the maximum extent possible due to the advances in fleet change and emission control technology discussed earlier.

Rule Compliance

Compliance will be verified via District outreach and field inspection.

Test Methods

Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes. If a protocol does not exist for a specific project, a protocol will be developed for the District Governing Board's consideration for adoption.

Cost-Effectiveness

The cost-effectiveness will be developed during the control measure implementation process based on the mitigation measures included in the menu of options.

Implementing Agency

California Health and Safety Code (H&SC) Section 40716 states that "a District may adopt and implement regulations to reduce or mitigate emissions from indirect and areawide sources of air pollution" provided, however, that the District may not "infringe on the existing authority of counties and cities to plan or control land use."

References

Control Strategy Symposium, SCAQMD, June 2015

SCAQMD, 2012 Air Quality Management Plan, Appendix IV-A, December 2012

SCAQMD, 2007 Air Quality Management Plan, Appendix IV-A, June 2007

**MOB-01: EMISSION REDUCTIONS AT COMMERCIAL MARINE PORTS
[NO_x, SO_x, PM]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	PORTS AND PORT-RELATED SOURCES (I.E., OCEAN-GOING VESSELS, ON-ROAD HEAVY-DUTY TRUCKS, LOCOMOTIVES, HARBOR CRAFT, AND CARGO HANDLING EQUIPMENT)			
CONTROL METHODS:	EMISSION REDUCTION METHODS WOULD BE PROPOSED BY THE PORTS POTENTIALLY COULD INCLUDE CLEAN TECHNOLOGY FUNDING PROGRAMS, INCREASED EFFICIENCIES, AIR QUALITY IMPROVEMENT PROJECT OPTIONS, LEASE PROVISIONS, PORT TARIFFS, OR INCENTIVES/DISINCENTIVES TO IMPLEMENT MEASURES, TO THE EXTENT COST-EFFECTIVE AND FEASIBLE STRATEGIES ARE AVAILABLE			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NO _x INVENTORY	41.95	47.80	46.35	42.03
NO _x REDUCTION		TBD	TBD	TBD
NO _x REMAINING		TBD	TBD	TBD
SO_x INVENTORY	3.90	0.81	0.82	0.91
SO _x REDUCTION		TBD	TBD	TBD
SO _x REMAINING		TBD	TBD	TBD
PM_{2.5} INVENTORY	1.03	0.83	0.84	0.93
PM _{2.5} REDUCTION		TBD	TBD	TBD
PM _{2.5} REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
NO _x INVENTORY	39.37	TBD	42.39	35.60
NO _x REDUCTION		TBD	TBD	TBD
NO _x REMAINING		TBD	TBD	TBD
CONTROL COST:	TO BE DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD, PORTS OF LOS ANGELES AND LONG BEACH			

NOTE: This control measure replaces CM #2007MOB-03 (2007 AQMP) and CM #2012IND-01 (2012 AQMP).

Description of Source Category

The goal of this measure is to assist in implementing the State SIP Strategy “Further Deployment of Clean Technologies” measures related to on-road heavy-duty vehicles, off-road equipment, and federal and international sources that operate in and out of the Port of Los Angeles and the Port of Long Beach (San Pedro Bay Ports or Ports). It is not expected for this measure to achieve the full emission reductions associated with the “Further Deployment” measures. But rather, this measure seeks to identify emission reductions of NO_x, SO_x, and PM_{2.5} from port-related sources through voluntary actions identified in the San Pedro Ports Clean Air Action Plan (CAAP) that are considered real, surplus, quantifiable, and enforceable. To the extent that these actions are sustained over a long-term basis and the emission reduction levels are maintained, the emission reductions may be credited as surplus reductions (as defined by the U.S. EPA) into the SIP. Affected sources would be proposed by the Ports and could include some or all port-related sources (on-road heavy-duty trucks, cargo handling equipment, harbor craft, marine vessels, locomotives, and stationary equipment), to the extent that cost-effective and feasible strategies are available.

Other sources—i.e. sources that are unrelated to the Ports—would not be in any way subject to emission reductions under this measure (including through funding of emission reduction measures, or purchase of emission credits, by the Ports or port tenants).

Background

Emissions and Progress. The Ports of Los Angeles and Long Beach are the largest in the nation in terms of container throughput, and collectively are the single largest fixed source of air pollution in Southern California. Emissions from port-related sources have been reduced significantly since 2006 through efforts by the Ports and a wide range of stakeholders. In large part, these emission reductions have resulted from programs developed and implemented by the Ports in collaboration with port tenants, marine carriers, trucking interests and railroads. Regulatory agencies, including U.S.EPA, CARB and SCAQMD, have participated in these collaborative efforts from the outset, and some measures adopted by the Ports have led the way for adoption of analogous regulatory requirements that are now applicable Statewide as well as at the Ports. These port measures include the Clean Truck Program and actions to deploy shore-power and low emission cargo handling equipment. The Ports have also established incentive programs, which have not subsequently been adopted as regulations. These include incentives for routing of vessels meeting the International Maritime Organization (IMO) Tier 2 and 3 NO_x standards, and vessel speed reduction. In addition, the Ports are, in collaboration with the regulatory agencies, implementing a Technology Advancement Program to develop and deploy clean technologies of the future.

Port-related sources such as marine vessels, locomotives, trucks, harbor craft and cargo handling equipment, continue to be among the largest sources of NO_x in the region. Given the large magnitude of emissions from port-related sources, the substantial efforts described above play a critical part in the ability of the Basin to attain the national ozone and PM_{2.5} ambient air standards by federal deadlines. This measure provides assurance that emissions from the Basin’s largest fixed emission source will continue to support attainment of the federal 8-hour ozone and the 24-hour and annual PM_{2.5} standards. In addition, reductions in PM_{2.5} emissions will also reduce cancer risks from diesel particulate matter.

Clean Air Action Plan. The emission control efforts described above largely began in 2006 when the Ports of Los Angeles and Long Beach, with the participation and cooperation of the staff of the SCAQMD, CARB, and U.S. EPA,

adopted the San Pedro Bay Ports CAAP. The CAAP was further amended in 2010, updating many of the goals and implementation strategies to reduce air emissions and health risks associated with port operations while allowing port development to continue. In addition to addressing health risks from port-related sources, the CAAP sought the reduction of criteria pollutant emissions to the levels that assure port-related sources decrease their “fair share” of regional emissions to enable the Basin to attain State and federal ambient air quality standards.

The CAAP focuses primarily on reducing diesel particulate matter (DPM), along with NOx and SOx. The CAAP includes proposed strategies on port-related sources that are implemented through new leases or port-wide tariffs, Memoranda of Understanding (MOU), voluntary action, grants or incentive programs.

In addition to the CAAP, the Ports have completed annual inventories of port-related sources since 2005. These inventories have been completed in conjunction with a technical working group composed of the SCAQMD, CARB, and U.S. EPA. Based on the latest inventories, emissions from port-related sources are continuing to decrease from 2005 emission levels. However, additional emission reductions will be needed to help the region meet the ozone and PM2.5 ambient air quality standards by their applicable dates.

While many of the emission reduction targets in the CAAP result from implementation of federal and State regulations (either adopted prior to or after the CAAP), some are contingent upon the Ports taking and maintaining actions which are not required by air quality regulations. These actions include the Expanded Vessel Speed Reduction Incentive Program, lower-emission switching locomotives, and incentives for lower emission marine vessels. This AQMP measure is designed to provide an ability for the Ports’ actions to be credited in the State Implementation Plan after the emission reductions have occurred. If the actions are to be credited in the SIP, assurance must be provided that, if emissions do not continue to meet projections, the Ports working with affected stakeholders will develop and implement actions to get back on track, to the extent that cost-effective and feasible strategies are available. A demonstration to U.S. EPA will need to be made that the actions meet U.S. EPA’s guidance in order to be credited into the SIP.

The Ports are in the process of updating the CAAP. Commonly termed “CAAP 3.0”, the Ports are seeking to develop strategies to improve operational efficiencies, while meeting long term sustainability goals through the deployment of zero and near-zero emission technologies to the greatest extent feasible. As part of this effort, the Ports have developed roadmaps for the deployment of zero-emission technologies. SCAQMD staff, CARB, and U.S. EPA have been in discussions with Port staff on the 2016 AQMP/SIP process.

Regulatory History

The CAAP sets out the emission control programs and plans that will help mitigate air quality impacts from port-related sources. The CAAP relies on a combination of regulatory requirements and voluntary control strategies that go beyond U.S. EPA or CARB requirements, or are implemented earlier than the requirements of applicable regulatory rules. The regulations that the CAAP relies on include international, federal and State requirements controlling port-related sources such as marine vessels, harbor craft, cargo handling equipment, locomotives, and trucks. Key regulatory and other actions taken to date are as follows:

- *International Maritime Organization (IMO) Emissions and Fuel Standards.* The IMO MARPOL Annex VI, which came into force in May 2005, set new international NOx emission limits on Category 3 (>30 liters per cylinder displacement) marine engines installed on new vessels retroactive to the year 2000. In October 2008, the IMO adopted an amendment which places a global limit on marine fuel sulfur content of 0.1 percent by 2015 for

specific areas known as Emission Control Areas (ECA). The ECA extends 200 nautical miles from the U.S. coast. The Basin off-coast waters are included in the ECA and ships calling at the Ports have to meet this new fuel standard. In addition, the 2008 IMO amendment required new ships built after January 1, 2016 that enter an ECA to meet a Tier III NOx emission standard which is 80 percent lower than the Tier I emission standard.

- *U.S. EPA Marine Vessel Regulations.* In 2010, U.S. EPA adopted standards that apply to Category 3 (C3) engines installed on U.S. vessels and to marine diesel fuels produced and distributed in the United States. That rule added two new tiers of engine standards for C3 engines consistent with the IMO standards described above. It also includes a regulatory program to implement IMO MARPOL Annex VI in the United States, including engine and fuel sulfur limits, and extends the ECA engine and fuel requirements to U.S. internal waters (i.e., rivers, lakes, etc.). U.S. EPA is also a participating member of IMO and provided input to the fuel sulfur and NOx emission standards adopted by IMO and works within international organizations to establish global engine and fuel standards.
- *U.S. EPA Emission Standards for Locomotives.* To reduce emissions from switch and line-haul locomotives, the U.S. EPA in 2008 established a series of increasingly strict emission standards for new or remanufactured locomotive engines. The emission standards are implemented by “Tier” with Tier 0 as the least stringent and Tier 4 being the most stringent. U.S. EPA also established remanufacture standards for both line haul and switch engines. For Tiers 0, 1, and 2, the remanufacture standards are more stringent than the new manufacture standards for those engines for some pollutants.
- *U.S. EPA and CARB Emission Standards for New Trucks.* To reduce emissions from on-road, heavy-duty diesel trucks, U.S. EPA established a series of cleaner emission standards for new engines, starting in 1988. The U.S. EPA promulgated the final and cleanest standards with the 2007 Heavy-Duty Highway Rule. Starting with model year 2010, all new heavy-duty trucks have to meet the final emission standards specified in the rule.
- *CARB In-use Fleet Rules.* Between 2005 and 2010, CARB adopted several rules that reduce emissions at the Ports by requiring accelerated modernization of equipment by replacing or repowering old equipment with new equipment. These rules include: In-Use Truck and Bus Rule, In-use Off-road Equipment Rule, Cargo Handling Rule, Drayage Truck Rule, Commercial Harbor Craft Rule, and the At-Berth Auxiliary Engine (Shore power) Rule. The majority of marine vessel emissions are created by main propulsion engines during transiting and maneuvering, but auxiliary engines emissions are often times nearly equivalent to or higher than the emissions from main propulsion engines and occur primarily while the vessel is at berth.
- *CARB Marine Fuel Rule.* In December 2005, the CARB Board voted to adopt fuel sulfur standards for marine auxiliary engines, including those on foreign flag vessels, in waters out to 24 nautical miles. The rule limited sulfur content in marine diesel fuel to 5,000 to 15,000 ppm depending on fuel type beginning in 2009, decreasing to 5,000 to 10,000 ppm beginning in August 2012 and to 1,000 ppm sulfur content in January 1, 2014.
- *MOUs.* In 1998, CARB entered into an MOU with the Union Pacific and Burlington Northern Santa Fe railroads which established a fleet average emissions limit for locomotives operating in the Basin. The intended effect of this MOU is to accelerate introduction of Tier 2 or cleaner locomotives (achieving an approximate 57 percent level of NOx control) in this region. In June 2005, CARB entered into a second MOU with the same two railroads that is intended to reduce health risks near railyards and identify actions to achieve a projected 20 percent

reduction in DPM emissions. Finally, several years ago, the ports, shipping interests, and regulatory agencies entered into a MOU seeking voluntary reductions in vessel speed to reduce NOx emissions.

- *SCAQMD Rules Governing Locomotive Idling and Risk Assessment.* In 2005 and 2006, the SCAQMD adopted rules requiring railroads to minimize unnecessary locomotive idling, and to develop emissions inventories and health risk assessments and notify the public of health risks. A federal District Court decision prevents these rules from being implemented until they become federally enforceable through inclusion into the SIP. The SCAQMD has submitted the idling rules to the U.S. EPA for approval into the SIP.

Areas where the CAAP went beyond existing regulatory requirements or accelerated the implementation of current IMO, U.S. EPA, or CARB rules include emission reductions from ocean-going vessels through lowering vessel speeds, accelerating the introduction of 2007/2010 on-road heavy-duty drayage trucks prior to the implementation of the CARB Drayage Truck Regulation, maximizing the use of shore-side power for ocean-going vessels while at berth, early use of low-sulfur fuel in ocean-going vessels, and the restriction of high-emitting locomotives on port property. In addition, the Ports have established policies for greater use of cleaner equipment such as construction equipment operating on port property and improving operational efficiencies that have potential co-benefits in reducing emissions.

The CAAP has included emission reduction targets similar to the emission reduction targets provided in the AQMP. Specifically, the CAAP included emission reduction targets associated with the short- and near-term measures provided in the 2007 AQMP to help the region meet air quality standards.

Proposed Method of Control

This measure seeks to implement the State SIP Strategy “Further Deployment of Clean Technologies” measures related to on-road heavy-duty vehicles, off-road equipment, and federal and international sources that operate in and out of the San Pedro Bay Ports. It is not expected for this measure to achieve the full emission reductions associated with the “Further Deployment” measures. But rather, this measure seeks to recognize port-related emission reductions that are the result of voluntary actions and may be considered surplus to the emission reduction commitments of the State SIP Strategy “Further Deployment” measures provided in Appendix IV-B of the 2016 AQMP. Examples of voluntary actions include greater deployment of zero or near-zero emission technologies, greater use of renewable fuels that may have the potential to reduce criteria pollutant emissions, and strategies that result in improved operational efficiencies with criteria pollutant and greenhouse gas emission reduction benefits. In addition, actions that potentially accelerate earlier emission reduction that help meet the overall AQMP percentage emission reduction targets in 2023 and 2031 (to be established with the final adoption of the 2016 AQMP) will be recognized to the extent that such actions meet U.S. EPA guidance for such actions to be approved into the SIP. The “Further Deployment” measures emission reductions associated with port-related sources will be used as a starting point for discussion on what level of emission reductions could be achieved through voluntary actions. The voluntary actions could occur port-wide or occur at individual port facilities (i.e., marine terminals and rail yards). The Ports through its CAAP update can decide the most effective approaches to achieve the overall emission reductions. Emission reductions (to the extent that they are real, surplus, and quantifiable) that occurred through the identified actions as reported by the Ports on an annual basis will be incorporated in the revised baseline emissions as part of the SIP revision process (either as part of the Rate-of-Progress reporting requirements of the Clean Air Act or reflected in new baseline emissions inventory for future AQMP/SIP revisions). Since many of these actions are voluntary in nature, any emission reductions credited

towards attainment of the federal air quality standards must contain an enforceable commitment that the emission reductions remain real and permanent (as defined by U.S. EPA) if for some reason the emission reductions are not maintained after they are reported into the SIP. To ensure that the emission reductions are approvable by U.S. EPA, there may be a need to develop a rule (or an enforceable mechanism) as a commitment that the emission reductions are long-term and considered permanent and to commit to additional actions should the emission reductions not be realized in a given year.

The discussions of potential enforceable mechanisms will be through a public process. Through this process, the District staff will establish a working group, hold a series of working group meetings, and hold public workshops. The purpose of the public process is to allow the District staff to work with a variety of stakeholders such as the Ports, potentially affected industries, other agencies, and environmental and community groups to provide input and comments. It is envisioned that through the public process, there will be discussions on the types of voluntary actions that could lead to additional emission reductions. To the extent that such actions can be quantified and are determined to be surplus (i.e., the emission reduction benefits are not the result of a regulation), the emission reductions will be recognized into the SIP.

Table IV-A-3 provides a schedule for the public process. The public process will begin immediately after the adoption of the Final 2016 AQMP by the SCAQMD Governing Board. Within six months of the public process, SCAQMD staff will report to the SCAQMD Governing Board (either through the Governing Board's Mobile Source Committee or to the full Board), the progress in identifying voluntary actions (which may be actions identified in the CAAP or other actions that affect port-related sources) and whether the emission reductions associated with the identified actions can be quantified. If steps are not taken to implement the voluntary actions, SCAQMD staff will recommend to the Board whether to consider development of rules that are within the SCAQMD's legal authority or other enforceable mechanisms to achieve emission reductions to help attain federal air quality standards. A recommendation whether to proceed with formal rulemaking shall be made no later than one year after the adoption of the Final 2016 AQMP.

Emission Reductions

The amount of emission reductions that can be achieved from this control measure will be dependent on the type and number of sources, pieces of equipment, and vehicles affected by the measure and the method of control to be implemented to reduce NO_x, SO_x, and PM_{2.5} emissions primarily from mobile sources. As emission reductions are realized, the emission reductions will be attributed to the State SIP Strategy "Further Development of Clean Technologies" measures and reductions will be taken as part of future Rate-of-Progress reporting and future AQMP revisions.

Rule Compliance

Compliance with this control measure will depend on the type of control strategy implemented. Compliance will be verified through actual emissions reported, and enforced through submittal and review of records, reports, and emission inventories. Enforcement provisions will be discussed as part of the public process to develop enforceable mechanisms to ensure that the emission reductions remain permanent. If other enforceable mechanisms are established outside of the SCAQMD public process, or the State or federal government implement regulatory actions, that achieve equivalent emission reductions, compliance will be enforced through the provisions of those actions.

Test Methods

Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes.

Cost-Effectiveness and Feasibility

The cost-effectiveness of this measure will be based on the strategies identified through the public process.

Implementing Agency

The Ports are listed as an implementing agency to the extent that the Ports will be implementing the CAAP, which will contain many of the voluntary actions to be considered under this measure. The SCAQMD will seek to work in a collaborative manner with the Ports and other stakeholders to identify strategies that result in emission reductions from port-related sources to assist in meeting the emission reductions associated with State SIP Strategy “Further Deployment of Clean Technologies” measures related to on-road heavy-duty vehicles, off-road equipment, and federal and international emission sources operating at the Ports and minimize to the greatest extent feasible public exposure to emissions from port-related sources. The SCAQMD staff and the Ports through a public process will develop an enforceable mechanism to recognize the voluntary actions that are beyond regulatory requirements and can be credited in the SIP in a timely manner. The enforceable mechanism whether it be a rule adopted by the District or other enforceable means such as Memorandum of Understanding or Agreement will contain provisions to ensure that the emission reductions continue for the region to achieve and maintain federal air quality standards. The District and Ports will work with CARB to develop such provisions for approval by U.S. EPA.

References

San Pedro Bay Ports (2010). San Pedro Bay Ports Clean Air Action Plan, 2010 Update, October 2010.

SCAQMD (2007). Air Quality Management Plan, Appendix IV-A, June 2007

SCAQMD (2012). Air Quality Management Plan, Appendix IV-A, December 2012

SCAQMD (2015). SCAQMD 2016 AQMP Control Strategy Symposium, June 2015

**MOB-02: EMISSION REDUCTIONS AT RAIL YARDS AND INTERMODAL FACILITIES
[NOx, PM]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		RAILYARDS AND INTERMODAL FACILITIES		
CONTROL METHODS:		MOBILE SOURCE EMISSION REDUCTION EFFORTS INCLUDING DEPLOYMENT OF CLEANER TECHNOLOGIES, INCREASED EFFICIENCIES, OR AIR QUALITY IMPROVEMENT PROJECT OPTION		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NOx INVENTORY	TBD	TBD	TBD	TBD
NOx REDUCTION		TBD	TBD	TBD
NOx REMAINING		TBD	TBD	TBD
PM2.5 INVENTORY	TBD	TBD	TBD	TBD
PM2.5 REDUCTION		TBD	TBD	TBD
PM2.5 REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
NOx INVENTORY	TBD	TBD	TBD	TBD
NOx REDUCTION		TBD	TBD	TBD
NOx REMAINING		TBD	TBD	TBD
PM2.5 INVENTORY	TBD	TBD	TBD	TBD
PM2.5 REDUCTION		TBD	TBD	TBD
PM2.5 REMAINING		TBD	TBD	TBD
CONTROL COST:	TO BE DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD			

This measure seeks to further reduce emissions associated with railyard operations to help achieve federal ambient air quality standards.

Description of Source Category

There are 15 freight railyards and intermodal facilities (of which nine are considered major railyards) located within the jurisdiction of the SCAQMD. In addition, the South California Regional Rail Authority (SCRRA or Metrolink) and Amtrak provide commuter rail transportation in the SCAQMD. SCRRA maintains their passenger locomotives at two locations in the Basin. There are a variety of emission sources related to railyard and intermodal facility operations including locomotives, on-road heavy-duty trucks, cargo-handling equipment, transportation refrigeration units (TRUs), and maintenance shops. The goal of this measure is to assist in implementing the State SIP Strategy "Further Deployment of Clean Technologies" measures related to on-road heavy-duty vehicles, off-road equipment, and federal sources that operate in and out of railyards and intermodal yards. It is not expected for this measure to achieve the full emission reductions associated with the "Further Deployment" measures. But rather, this measure seeks to identify emission reductions of NO_x and PM_{2.5} from these sources through voluntary actions identified through a public process. Through the public process, the District will assess and identify potential actions that could result in further emission reductions at rail yards and intermodal facilities. To the extent that these actions are voluntary in nature and are sustained over a long-term basis and the emission reduction levels are maintained, the emission reductions may be credited as surplus reductions (as defined by the U.S. EPA) into the SIP.

Background

As mentioned above, there are nine major freight rail yards and intermodal facilities and two commuter rail maintenance facilities in the SCAQMD. Residential communities are located adjacent to many of these rail yards. The District has received complaints from residents living near railyards of emissions from locomotives, on-road trucks, and cargo handling equipment that operate at railyards. During periods of routine locomotive maintenance, there have been concerns raised regarding excessive emissions from idling locomotives or during periods of routine locomotive maintenance. Due to projected economic and population growth, it is projected that freight and passenger locomotive activities will increase and potentially result in increased emissions.

Regulatory History

U.S. EPA Emission Standards for Locomotives

To reduce emissions from switch and line-haul locomotives, the U.S. EPA in 2008 established a series of increasingly strict emission standards for new or remanufactured locomotive engines. The emission standards are implemented by "Tier" with Tier 0 as the least stringent and Tier 4 being the most stringent. U.S. EPA also established remanufacture standards for both line-haul and switch engines. For Tiers 0, 1, and 2, the remanufacture standards are more stringent than the new manufacture standards for those engines for some pollutants.

In 1998, the railroads and CARB entered into an MOU to accelerate the introduction of Tier 2 locomotives into the Basin. The MOU includes provisions for a fleet average in the Basin, equivalent to U.S. EPA's Tier 2 locomotive standard by 2010. The MOU addressed NO_x emissions from locomotives. Under the MOU, NO_x levels from locomotives are reduced by 57 percent.

On June 30, 2005, Union Pacific Railroad (UP) and Burlington Northern Santa Fe Railroad (BNSF) entered into a Statewide Rail Yard Agreement to Reduce Diesel PM at California Rail Yards with the CARB. The railroads

committed to implementing certain actions from rail operations throughout the State. In addition, the railroads prepared equipment inventories and conducted dispersion modeling for diesel PM at a number of rail yards.

U.S. EPA and CARB Emission Standards for On-Road Heavy-Duty Engines and Trucks

To reduce emissions from on-road, heavy-duty diesel trucks, U.S. EPA established a series of cleaner emission standards for new engines, starting in 1988. The U.S. EPA promulgated the final and cleanest standards with the 2007 Heavy-Duty Highway Rule. Starting with model year 2010, all new heavy-duty trucks have to meet the final emission standards specified in the rule.

In December 2007, CARB adopted regulation that applies to heavy-duty diesel trucks operating at California ports and intermodal rail yards. This regulation eventually required that all drayage trucks meet 2007 on-road emission standards by 2014.

CARB Cargo Handling Equipment Regulation

On December 8, 2005, CARB approved the Regulation for Mobile Cargo-Handling Equipment (CHE) at Ports and Intermodal Rail Yards (Title 13, CCR, Section 2479), which is designed to use Best Available Control Technology (BACT) to reduce diesel PM and NO_x emissions from mobile cargo-handling equipment at ports and intermodal rail yards. The regulation became effective December 31, 2006. Since January 1, 2007, the regulation imposes emission performance standards on new and in-use terminal equipment that vary by equipment type.

SCAQMD Regulation XXXV – Railroads and Railroad Operations

The SCAQMD adopted Regulation XXXV – Railroads and Railroad Operations, which consists of three rules that address emissions from locomotives and rail yards. Rule 3501 – Recordkeeping for Locomotive Idling, requires recordkeeping of idling events in order to identify opportunities for reducing idling emissions and to assist in quantifying idling emissions. Rule 3502 – Minimization of Emissions from Locomotive Idling, requires railroads to minimize unnecessary locomotive idling. Rule 3503 – Emissions Inventory and Health Risk Assessment for Railyards, requires operators of railroads and rail yards to develop emissions inventories, prepare health risk assessments and notify the public of health risks. A federal District Court decision prevents these rule from being implemented until they become federally enforceable through inclusion in the SIP. Rules 3501 and 3502 have been submitted to U.S. EPA for inclusion into the State implementation plan (SIP). However, U.S. EPA has not made a decision on the approval of the rules.

Proposed Method of Control

To implement this measure, District staff will convene a stakeholders working group consisting of the railroads, marine ports (to the extent that they own or oversee the rail operations at their facilities), industry stakeholders, environmental and community organizations, and other affected stakeholders to discuss and identify actions or approaches that can be implemented to further reduce emissions at rail and intermodal yards. The identified actions can be voluntary or can be regulations or other enforceable mechanisms promulgated by a local, state, or federal agency. Voluntary actions include, but not limited to, greater deployment of zero and near-zero emission technologies, greater use of renewable fuels that may have the potential to reduce criteria pollutant emissions, and strategies that result in improved operational efficiencies with criteria pollutant and greenhouse gas emission reduction benefits.

Since many of the identified actions are most likely voluntary in nature, the District staff seeks to work collaboratively with railyard operators and affected stakeholders to develop methods to quantify the emission reductions associated with the identified actions. To the extent that these actions are considered surplus to the emission reductions identified in the AQMP and the State SIP Strategy, they may be credited into the SIP as part of future Rate-of-Progress Reporting or part of future AQMP revisions. To be credited into the SIP, the emission reductions must be approved by U.S. EPA and meet U.S. EPA guidelines for approvability of voluntary measures. As such, the commitment to maintain emission reductions and remedy any shortfalls in emissions reductions associated with the identified actions may be in the form of a regulation adopted by the District within its legal authority or through other enforceable mechanisms.

Table IV-A-3 provides a schedule for the public process. The public process will begin immediately after the adoption of the Final 2016 AQMP by the SCAQMD Governing Board. Within six months of the public process, SCAQMD staff will report to the SCAQMD Governing Board (either through the Governing Board's Mobile Source Committee or to the full Board), the progress in identifying actions that result in emission reductions and whether the emission reductions associated with the identified actions can be quantified. If steps are not taken to implement the identified actions, SCAQMD staff will recommend to the Governing Board whether to consider proceeding with the development of rules that are within the SCAQMD's legal authority or other enforceable mechanisms to achieve emission reductions to help attain federal air quality standards. A recommendation whether to proceed with formal rulemaking process shall be made no later than one year after the adoption of the Final 2016 AQMP.

Emission Reductions

The actual amount of emission reductions achieved from this measure will be dependent on the type and number of rail yards and intermodal facilities affected by the measure and the method of control to be implemented to reduce NO_x and PM_{2.5} emissions primarily from mobile sources operating at affected rail yards and intermodal facilities. To the extent that a rail yard is located on marine port property, the rail yard may be considered as part of the efforts to reduce emissions at commercial marine ports (2016 AQMP Control Measure MOB-01) and not be affected by this control measure. Quantified emission reductions that are real, surplus, permanent, and enforceable will be reflected in future emissions inventories as part of the Rate-of-Progress reporting requirements or in baseline emissions inventories as part of future AQMP revisions.

Rule Compliance

Compliance with either a rule or other enforceable mechanisms will be verified via field inspection. If an enforceable mechanism is established as a result of the public process or if the State or federal government implement actions that achieve equivalent emission reductions, compliance will be enforced through the provisions of those actions.

Test Methods

Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes.

Cost-Effectiveness

The cost-effectiveness of this measure will be based on the type and number of rail yards and intermodal facilities affected by the measure and the strategies identified through the public process.

Implementing Agency

The District will work with affected parties, the public, and other stakeholders to identify potential actions to help meet the emission reductions associated with the State SIP Strategy “Further Deployment of Clean Technologies” measures for on-road heavy-duty vehicles, off-road equipment, and federal sources.

References

SCAQMD (2006). Regulation 35 – Railroads and Railroad Operations (2006)

SCAQMD (2015). SCAQMD 2016 AQMP Control Strategy Symposium, June 2015

U.S. EPA (2008). Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder; Republication, June 30, 2008 (73FR37096).

**MOB-03: EMISSION REDUCTIONS AT WAREHOUSE DISTRIBUTION CENTERS
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	WAREHOUSE DISTRIBUTION CENTERS			
CONTROL METHODS:	MOBILE SOURCE EMISSION REDUCTION EFFORTS INCLUDING DEPLOYMENT OF CLEANER TECHNOLOGIES, INCREASED EFFICIENCIES, OR AIR QUALITY IMPROVEMENT PROJECT OPTION			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	TBD	TBD	TBD	TBD
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	TBD	TBD	TBD	TBD
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	TBD	TBD	TBD	TBD
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	TBD	TBD	TBD	TBD
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	TBD	TBD	TBD	TBD
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	TBD	TBD	TBD	TBD
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
CONTROL COST:	TO BE DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

The goal of this measure is to assist in implementing the State SIP Strategy “Further Deployment of Clean Technologies” measures related to on-road heavy-duty vehicles, off-road equipment, and federal sources that operate in and out of warehouse distribution centers. It is not expected for this measure to achieve the full emission reductions associated with the “Further Deployment” measures. But rather, this measure seeks to identify emission reductions of NO_x and PM_{2.5} from these sources through voluntary actions identified through a public process. Innovative methods to achieve emission reductions would need to be implemented in order to allow continued development of warehouses in the region to meet the demands of economic and population growth. This measure could include reduction of emissions from high-cube warehouses that attract a large number of heavy-duty diesel trucks on a daily basis. Emissions from these trucks produce local and regional air quality impacts. Through a public process, the District will assess and identify potential actions that could result in further emission reductions at warehouse distribution centers. To the extent that these actions are voluntary in nature and are sustained over a long-term basis and the emission reduction levels are maintained, the emission reductions may be credited as surplus reductions (as defined by the U.S. EPA) into the SIP.

Background

Over the past decade, warehouse and distribution centers have been steadily increasing in size and number throughout the region. The greatest growth in warehouses/distribution centers has been in the Riverside and San Bernardino areas. Based on the Southern California Association of Governments, by 2035 over one billion square feet of warehousing will be needed in the Southern California area to support goods movement activities (SCAG, 2010).

Distribution centers and/or warehouses are facilities that serve as a distribution point for the transfer of goods. A warehouse/distribution center can be comprised of multiple centers or warehouse/distribution centers within an area. The size can range from 100,000 square feet to well over a million square feet. As an example, the District has reviewed at least eight new projects for warehouse projects totaling 17.75 million square feet since late 2008 in the vicinity of the city of Perris in Riverside County and more are currently being proposed. The proposed World Logistics Center in Moreno Valley is over 40 million square feet. Such facilities include cold storage warehouses, goods transfer facilities, and transloading facilities, where imported goods are sorted, tagged, repackaged and prepared for retail distributions. These operations involve trucks, trailers, shipping containers, and other equipment with diesel engines. Depending on the size and type, a warehouse/distribution center may have hundreds of diesel trucks a day that deliver, load, and/or unload goods, generally operating seven days a week. To the extent that these trucks are transporting perishable goods, they are equipped with diesel-powered transport refrigeration units (TRUs) or TRU generator sets. The activities associated with delivering, storing, and loading freight produces NO_x and PM emissions, including DPM. Within the warehouse, there may be stationary source equipment such as refrigeration units. In addition, cargo handling equipment such as forklifts and yard tractors are used to move goods at warehouses. Lastly, warehouse employee commute trips contribute to the overall emissions associated with warehouse distribution activities.

Regulatory History

California Health and Safety (H&S) Code Section 40716 states that “a district may adopt and implement regulations to reduce or mitigate emissions from indirect and areawide sources of air pollution”. As examples of this authority,

a 1993 California Attorney General opinion states that “a district’s regulations may require the developer of an indirect source to submit the plans to the district for review and comment prior to the issuance of a permit for construction by a city or county. A district may also require the owner of an indirect source to adopt reasonable post-construction measures to mitigate particular indirect effects of the facility’s operation. Such regulations could be enforced through an action for civil penalties...” H&S Code Section 40716 also states that the authority of an air district to reduce or mitigate emissions from indirect and areawide sources of air pollution does not constitute an infringement on the existing authority of counties and cities to plan or control land use. While other types of indirect source rules are also possible, according to the Attorney General, an indirect source rule could not require the source to obtain a permit from an air district prior to construction.

Proposed Method of Control

The District is currently working with industry stakeholders on conducting in-use truck trip and emissions information at various warehouse distribution types. This information along with emissions occurring in and around individual warehouse distribution centers will serve as the basis for developing actions that will seek opportunities to mitigate and potentially reduce emissions beyond existing levels. A stakeholders working group will be convened to discuss warehouse emissions related issues and provide input in the development of mechanisms to implement this measure. The District’s desire is to develop enforceable mechanisms that demonstrates the commitment to implement actions that will result in additional emission reductions that will either enable the deployment of zero and near-zero emission technologies or result in surplus emission reductions. Some example actions include incentivizing cleaner trucks that are zero or near-zero emissions to operate at warehouse centers, encouraging employees to increase rideshare activities or purchase zero-emission and plug-in hybrid vehicles, using zero and near-zero equipment in and around the warehouse center such as zero-emission or alternative fueled yard tractors and forklifts. Reducing vehicle emissions may require the space and infrastructure to allow for the operation of electric or alternative fueled vehicles such as electric vehicle charging stations and refueling units. Other voluntary actions include strategies that result in improved operational efficiencies with criteria pollutant and greenhouse gas emission reduction benefits.

The identified actions can be voluntary or can be regulations or other enforceable mechanisms promulgated by a local, state, or federal agency. To the extent that these actions are considered surplus to the emission reductions identified in the AQMP and the State SIP Strategy, they may be credited into the SIP as part of future Rate-of-Progress Reporting or part of future AQMP revisions. To be credited into the SIP, the emission reductions must be approved by U.S. EPA and meet U.S. EPA guidelines for approvability of voluntary measures. As such, the commitment to maintain emission reductions and remedy any shortfalls in emissions reductions associated with the identified actions may be in the form of a regulation adopted by the District within its legal authority or through other enforceable mechanisms.

Table IV-A-3 provides a schedule for the public process. The public process will begin immediately after the adoption of the Final 2016 AQMP by the SCAQMD Governing Board. Within six months of the public process, SCAQMD staff will report to the SCAQMD Governing Board (either through the Governing Board’s Mobile Source Committee or to the full Board), the progress in identifying actions that result in emission reductions and whether the emission reductions associated with the identified actions can be quantified. If steps are not taken to implement the identified actions, SCAQMD staff will recommend to the Governing Board whether to consider proceeding with the development of rules that are within the SCAQMD’s legal authority or other enforceable mechanisms to achieve emission reductions to help attain federal air quality standards. A recommendation

whether to proceed with formal rulemaking process shall be made no later than one year after the adoption of the Final 2016 AQMP.

Emission Reductions

As mentioned above, this proposed measure is to help implement the State SIP Strategy “Further Deployment of Clean Technologies” measures for on-road heavy-duty vehicles, off-road equipment, and federal sources to help the region meet federal ambient air quality standards. The amount of emission reductions that can be achieved from this control measure will be dependent on the type and number of warehouse distribution centers affected by the measure and the actions or strategies identified through the public process. Any emission reductions that can be quantified and considered surplus to the region’s overall emission reduction targets will be attributed towards the emission reduction commitment associated with the “Further Deployment” measures and could be recognized in the SIP as part of the Rate-of-Progress reporting or in future AQMP revisions as long as the reductions meet U.S. EPA determination that such reductions are approvable as part of the SIP.

Rule Compliance

Compliance with either an adopted rule or other enforceable mechanism will be verified via field inspection. Enforcement provisions will be discussed as part of the public process to develop enforceable mechanisms to ensure that the emission reductions remain permanent. If other enforceable mechanisms are established outside of the SCAQMD public process, or the state or federal government implement regulatory actions, that achieve equivalent emission reductions, compliance will be enforced through the provisions of those actions.

Test Methods

Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes.

Cost-Effectiveness

The cost-effectiveness of this measure will be based on the type and number of warehouse distribution centers affected by the measure and the strategies identified through the public process.

Implementing Agency

The SCAQMD will work with affected parties, the public, and other stakeholders to identify potential actions to help meet the emission reductions associated with the State SIP Strategy “Further Deployment of Clean Technologies” measures for on-road heavy-duty vehicles, off-road equipment, and federal sources.

References

SCAQMD (2015). SCAQMD 2016 AQMP Control Strategy Symposium, June 2015.

**MOB-04: EMISSION REDUCTIONS AT COMMERCIAL AIRPORTS
[ALL POLLUTANTS]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		COMMERCIAL AIRPORTS		
CONTROL METHODS:		MOBILE SOURCE EMISSION REDUCTION EFFORTS INCLUDING DEPLOYMENT OF CLEANER TECHNOLOGIES, INCREASED EFFICIENCIES, OR AIR QUALITY IMPROVEMENT PROJECT OPTION		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	TBD	TBD	TBD	TBD
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	TBD	TBD	TBD	TBD
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	TBD	TBD	TBD	TBD
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	TBD	TBD	TBD	TBD
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	TBD	TBD	TBD	TBD
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	TBD	TBD	TBD	TBD
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
CONTROL COST:	TO BE DETERMINED			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

There are six major commercial airports located in the Basin and Coachella Valley. Due to projected increases in airline passenger transportation and expansion of operations at various commercial airports, potential increases in emissions may result unless the increased emissions are fully mitigated. Several airport authorities are implementing emissions mitigation measures as a result of environmental impact findings, while other airports have initiated actions that can lead to additional emission reductions. The goal of this measure is to assist in implementing the State SIP Strategy "Further Deployment of Clean Technologies" measures related to on-road vehicles, off-road equipment, and federal and international sources that operate in and around commercial airports and identify additional actions that can lead to reduction in local exposure to air toxic emissions. It is not expected for this measure to achieve the full emission reductions associated with the "Further Deployment" measures. But rather, this measure seeks to undertake a stakeholder process and draft for SCAQMD Governing Board consideration an indirect source rule for commercial airports within the South Coast Basin by February 1, 2019 to control emissions of NO_x, PM_{2.5}, lead, and diesel particulate matter from non-aircraft sources.

Background

There are a variety of emission sources related to commercial airport operations. In addition to aircraft emissions, emissions from ground service equipment such as baggage handling equipment, food service trucks, fuel trucks, and aircraft tugs are contributors to airport related emissions. Emissions associated with passenger transportation to and from the airport, delivery of goods for aircraft transport, and stationary equipment contribute to the overall emissions at airports. Emissions as a result of new construction or expansion of runways and terminal construction and renovations, are associated with short-term air quality impacts in the communities surrounding airports.

Historically, airport authorities have mitigated airport-related emissions to some extent and a large number of airport ground service equipment and on-road vehicles are regulated by CARB. However, aircraft emissions are primarily regulated by the federal government or by the International Civil Aviation Organization (ICAO). ICAO establishes new aircraft engine emission standards internationally, while the U.S. EPA establishes aircraft emission standards nationally.

Regulatory History

Aircraft

In 1973, the U.S. EPA published emissions standards and test procedures to regulate gaseous emissions, smoke, and fuel venting from aircraft engines. In 1997, the standards were revised to be more consistent with those of the ICAO Committee of Aviation Environmental Protection (CAEP) for turbo engines used in commercial aircraft. These standards (CAEP/2) included new CO, HC, and NO_x emissions standards of 118 grams per kilonewtons (g/kN), 19.6 g/kN, and 40 g/kN, respectively. In 2005, the standards were harmonized with ICAO CAEP/4 requirements which tightened the CAEP/2 NO_x standards by 32 percent for newly-certified commercial aircraft engines.

On June 1, 2012, the U.S. EPA Administrator signed a final rule to further revise the standards to be consistent with the current ICAO CAEP/6 and CAEP/8 requirements to further reduce NO_x emissions. The first set of standards require all new engines meet the ICAO CAEP/6 standards. The CAEP/6 standards represent

approximately 12 percent emission reduction from the ICAO Tier 4 levels. The second set of standards, Tier 8, took effect in 2014 and represents approximately a 15 percent from Tier 6 levels.

Ground Service Equipment

Ground service equipment (GSE) move and load baggage, tow aircraft, and provide electrical power, engine starting, air conditioning, fuel, food, and lavatory service for aircraft at airports. Due to their specialized design and use, GSEs have long useful lives. Most GSEs can be electrified to operate in battery electric configurations. In addition, new GSEs are available in diesel, propane, and natural gas configurations meeting Tier 4 emissions standards. Ground service equipment generally runs for short periods under load and is then shut off. GSEs are typically owned by individual airlines and may move from airport to airport depending on the service needs of individual airlines.

Ground service equipment is regulated by CARB under two separate regulations. GSEs that operate on gasoline are subject to CARB's Large Spark Ignition Engine Regulation, while diesel-powered GSEs are subject to CARB's In-Use Off-Road Diesel Fleet Regulation. In addition, the SCAQMD has authority to implement the SOON (Surplus Off-Road Opt-In for NOx) provision of the In-Use Off-Road Diesel Fleet Regulation to provide funding for cleaner ground service equipment.

Passenger Transportation

Beside ground service equipment, passenger shuttle services are generally provided by the airport authority either through their own fleet of shuttles or through outside contracts with an independent shuttle service providers. In addition, taxicab pickup service is typically regulated by the airport authority. Airport shuttle services are subject to SCAQMD Rule 1194, which requires the purchase of alternative fuel shuttle buses. Almost every airport has been providing alternative fuel shuttle bus service.

Environmental-Related Activities at Commercial Airports

There have been various levels of actions to further reduce emissions from airport related sources. The Los Angeles World Airport Authority (LAWA) has been implementing actions to further reduce landside emissions including greater use of alternative fuel passenger shuttles and airport fleet vehicles. LAWA has adopted green construction policies calling for the use of the cleanest construction equipment for projects at Los Angeles International Airport (LAX). More recently, LAWA adopted a requirement for their airline tenants to meet the Statewide fleet average provisions of the CARB Large Spark Ignition (LSI) Regulation for ground support equipment specifically at LAX. John Wayne Airport has a requirement for alternative fueled taxicab services and have ensured that John Wayne Airport comply with various State and local air quality regulations. Both airports are evaluating approaches to improve operational efficiencies that could lead to addition emission reductions. Similar actions have been taken at other commercial airports located in the Basin and Coachella Valley. However, there is a general recognition that each commercial airport may have unique operating conditions and authority. Depending on the size and types of operations, each airport may or may not implement the same types of actions or to the same level as other commercial airports.

Proposed Method of Control

In order to quantify emission reductions resulting from environmental actions at various commercial airports, a methodology needs to be developed that addresses both the unique characteristics (legal and operational) and available infrastructure (existing and planned) at each of the airports in the Basin. This is important in light of the different airport elements at the six major commercial airports located in the Basin and Coachella Valley, including aircraft operations and movements, passenger and cargo handling, airport infrastructure available and planned, and surface vehicle traffic volumes. As such, the District would convene a working group made up of affected stakeholders from the airline industry, airport authorities, local governments, community representatives, and other affected stakeholders to discuss airport emissions related issues and provide input in the development of mechanisms to implement this measure.

There are several emission reduction approaches that could be implemented to mitigate and potentially further reduce emissions at airports. Such approaches can be incentive based or regulatory based, or a combination of the two. Airport authorities may use their authority to implement strategies to further reduce emissions through the deployment of cleaner combustion or zero and near-zero emission technologies during construction activities or develop mechanisms for the use of cleaner equipment. Airlines are constantly evaluating ways to improve passenger transportation and overall system efficiencies. Such strategies have the potential to further reduce criteria pollutant emissions. Any strategy that is considered for implementation will be evaluated for feasibility and authority to implement such strategy.

Since many of the identified actions are most likely voluntary in nature, the District staff seeks to work collaboratively with commercial airport operators, commercial airlines, environmental and community organizations, and other affected stakeholders to develop methods to quantify the emission reductions associated with the identified actions. To the extent that these actions are considered surplus to the emission reductions identified in the AQMP and the State SIP Strategy, they may be credited into the SIP as part of future Rate-of-Progress Reporting or part of future AQMP revisions. To be credited into the SIP, the emission reductions must be approved by U.S. EPA and meet U.S. EPA guidelines for approvability of voluntary measures. As such, the commitment to maintain emission reductions and remedy any shortfalls in emissions reductions associated with the identified actions may be in the form of a regulation adopted by the District within its legal authority or through other enforceable mechanisms. The District staff would undertake a stakeholder process and draft for SCAQMD Governing Board consideration an indirect source rule for commercial airports within the South Coast Basin by February 1, 2019 to control emissions of NO_x, PM_{2.5}, lead, and diesel particulate matter from non-aircraft sources.

Table IV-A-3 provides a schedule for the public process. The public process will begin immediately after the adoption of the Final 2016 AQMP by the SCAQMD Governing Board. Within six months of the public process, SCAQMD staff will report to the SCAQMD Governing Board (either through the Governing Board's Mobile Source Committee or to the full Board), the progress in identifying actions that result in emission reductions and whether the emission reductions associated with the identified actions can be quantified. If steps are not taken to implement the identified actions, SCAQMD staff will recommend to the Governing Board whether to consider proceeding with the development of rules that are within the SCAQMD's legal authority or develop other enforceable mechanisms to achieve emission reductions to help achieve the emission reductions associated with the State SIP Strategy "Further Deployment" measures. A recommendation whether to proceed with formal rulemaking shall be made no later than one year after the adoption of the Final 2016 AQMP.

Emission Reductions

As mentioned above, this proposed measure is to help implement the State SIP Strategy “Further Deployment of Clean Technologies” measures for on-road heavy-duty vehicles, off-road equipment, and federal sources. The amount of emission reductions that can be achieved from this control measure will be dependent on the type and number of commercial airports affected by the measure and the actions or strategies identified through the public process. Quantified emission reductions that are real, surplus, permanent, and enforceable will be attributed towards the emission reduction commitment associated with the “Further Deployment” measures and reflected in future emissions inventories as part of the Rate-of-Progress reporting requirements or in baseline emissions inventories as part of future AQMP/SIP development as long as the reductions meet U.S. EPA determination that such reductions are approvable as part of the SIP.

Rule Compliance

Compliance with either an adopted rule or other enforceable mechanism will be verified via field inspection. Enforcement provisions will be discussed as part of the public process to develop enforceable mechanisms to ensure that the emission reductions remain permanent. If other enforceable mechanisms are established outside of the SCAQMD public process, or the state or federal government implement regulatory actions, that achieve equivalent emission reductions, compliance will be enforced through the provisions of those actions.

Test Methods

Approved emission quantification protocols by federal, State or local agencies will be used to track and report emission reductions for SIP purposes.

Cost-Effectiveness

The cost-effectiveness of this measure will be based on the type and number of commercial airports affected by the measure and the strategies identified through the public process.

Implementing Agency

The District will work with affected parties, the public, and other stakeholders to identify potential actions to help meet the emission reductions associated with the State SIP Strategy “Further Deployment of Clean Technologies” measures for on-road vehicles, off-road equipment, and federal and international sources.

References

SCAQMD (2015). SCAQMD 2016 AQMP Control Strategy Symposium, June 2015.

**MOB-05: ACCELERATED PENETRATION OF
PARTIAL ZERO-EMISSION AND ZERO-EMISSION VEHICLES
[VOC, NOX, CO]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		GASOLINE- AND DIESEL-POWERED ON-ROAD VEHICLES WITH GROSS VEHICLE WEIGHT RATING UP TO 8,500 LBS		
CONTROL METHODS:		INCENTIVES FOR PARTIAL ZERO EMISSIONS VEHICLES AND ZERO EMISSIONS VEHICLES		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	131.18	52.79	50.05	33.77
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	120.79	37.02	33.56	17.08
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	1,173.46	417.78	388.43	235.78
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	135.92	55.52	52.64	35.57
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	107.77	33.07	29.97	15.27
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	1,156.31	409.88	380.96	230.92
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
CONTROL COST:	TBD. MINIMUM INCENTIVES FUNDING - \$75,000,000/YEAR			
IMPLEMENTING AGENCY:	CARB, SCAQMD			

Description of Source Category

The purpose of this early action measure is to seek emission reductions from existing passenger cars, sports utility vehicles, and other light- and medium-duty vehicles through the increased use of partial zero-emission and zero-emission vehicles that would provide substantial improvements in emissions performance beyond current conventional gasoline and diesel vehicle technologies. This measure would continue the use of voluntary incentive programs that would facilitate the commercial deployment of plug-in hybrid-electric, battery electric, and fuel cell vehicles.

Background

Emissions from passenger vehicles continue to represent a significant portion of the emissions inventory in the Basin in, adversely affecting regional air quality. The intent of this measure is to specifically mitigate impacts associated with passenger car emissions through early deployment of partial zero- and zero-emission vehicles that are currently available commercially or expected to be offered commercially in the coming years.

Regulatory History

To address California's acute air quality problems, the federal Clean Air Act provides California the authority to adopt and enforce rules to control mobile source emissions within California with a waiver of preemption from U.S. EPA. The California Air Resources Board (CARB) is the responsible agency to adopt emissions standards that are as stringent as or more stringent than federal requirements.

Significant strides have been made in reducing emissions from motor vehicles through CARB's mobile source regulations that apply predominately to new vehicles. As a result, a "new" vehicle today is approximately 99 percent less polluting compared to a vehicle manufactured a couple of decades ago. However, on-road and off-road mobile sources account for about 70 percent of ozone precursor emissions in the State. Because of the large emissions contribution, requiring the use of advanced technology such as plug-in hybrid electric vehicle technology capable of zero-emission transportation is essential if clean air standards are to be realized, especially for in-use vehicles. In January 2012, the CARB adopted amendments to the Low Emission Vehicle (LEV) program and the Zero-Emission Vehicle (ZEV) regulation.

In addition, CARB implements a "Clean Vehicle Rebate Project" (CVRP) that provides individual vehicle incentives of up to \$5,000 for fuel cell vehicles, \$2,500 for full zero-emission vehicles, \$1,500 for plug-in hybrid vehicles, \$900 for neighborhood electric vehicles, and \$900 for zero-emission motorcycles. An additional \$1,500 may be available to eligible lower income residents who purchase a fuel cell, full zero-emission, or plug-in hybrid vehicle. For the 2016/2017 fiscal year, a total of \$133 million was appropriated by the state legislature for the statewide program.

Proposed Method of Control

This measure proposes to continue the CVRP through 2023 with a minimum number of 15,000 vehicles per year to be incentivized through the CVRP. The proposed incentives would be up to \$5,000 per vehicle. As part of this action, additional funding opportunities will be sought.

Emission Reductions

This measure implements the CVRP. Emission reductions are not estimated since production of zero-emission and plug-in hybrid electric vehicles are accounted as part of the Advanced Clean Car Program, and the vehicles are accounted in the EMFAC model.

Rule Compliance and Test Methods

Not applicable.

Cost-Effectiveness

This proposed control measure will affect light- and medium-duty vehicles with gross vehicle weight ratings up to 8,500 lbs. The estimated funding level is \$75 million per year to incentivize a minimum of 15,000 vehicles per year.

The cost-effectiveness of this control measure has not been estimated at this time. The cost-effectiveness will be affected by any changes to the per vehicle incentive levels or if total funding levels are not realized.

Implementing Agency

CARB is currently implementing the AB 118 CVRP. This early action measure would continue the implementation of the CVRP.

References

CARB (2012). Advanced Clean Cars Regulation, January 2012.

CARB (2014). Implementation Manual for the FY 2014-15 Clean Vehicle Rebate Project (CVRP), December 2014.

**MOB-06: ACCELERATED RETIREMENT OF OLDER LIGHT-DUTY AND MEDIUM-DUTY
VEHICLES
[VOC, NOx, CO]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	GASOLINE- AND DIESEL-POWERED LIGHT- AND MEDIUM-DUTY VEHICLES UP TO 8,500 LBS GROSS VEHICLE WEIGHT			
CONTROL METHODS:	INCENTIVES PROGRAM FOR THE VOLUNTARY EARLY RETIREMENT OF OLDER LIGHT- AND MEDIUM-DUTY VEHICLES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	131.18	52.79	50.05	33.77
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	120.79	32.04	33.56	17.08
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	1,173.46	417.78	388.43	235.78
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	135.92	55.52	52.64	35.57
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	107.77	33.07	29.97	15.27
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CO INVENTORY	1156.31	409.88	380.96	230.92
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
CONTROL COST:	UP TO \$9,500 PER VEHICLE RETIRED INCLUDING INCENTIVE REPLACEMENT VOUCHER. ESTIMATED PUBLIC FUNDING – UP TO \$20,000,000/YEAR			
IMPLEMENTING AGENCY:	CARB, BUREAU OF AUTOMOTIVE REPAIR, SCAQMD			

Description of Source Category

The purpose of this control measure is to implement a strategy to accelerate retirement of older gasoline- and diesel-powered vehicles up to 8,500 lbs. gross vehicle weight (GVW). These vehicles include passenger cars, sports utility vehicles, vans, and light-duty pick-up trucks.

Background

Light-duty vehicles are major contributors of air pollutants in the Basin. While vehicle miles traveled increased more than 50 percent over the last 20 years, vehicle emissions have dropped by a factor of almost three due to increasingly stringent vehicle emission standards. Yet, the light- and medium-duty vehicle fleet continues to contribute more than a third of the Basin's total emissions of ozone and particulate matter forming pollutants in part due to high emitting vehicles.

Motor vehicle emissions progressively increase as vehicles age and accumulate mileage. The causes of these emissions increases are numerous, but can be broadly categorized in terms of normal deterioration of properly functioning on-board emission control system components, emission control system malfunctions due to design flaws and/or lack of proper maintenance, and tampering. In recognition that emission reductions could occur through regular emission testing of vehicles and repair of those vehicles with high in-use emissions, Smog Check programs have been established in an attempt to ensure that vehicles stay clean as they age, but room for improvements in such programs exist. In addition, through the Bureau of Automotive Repairs (BAR) High Emitter profile, certain model year vehicles are considered inherently high emitters despite passing Smog Check.

Regulatory History

On September 23, 2004, the Governor signed AB 923 (Firebaugh) which resulted in a significant increase in incentive funding for programs that achieve emission reductions from vehicular sources and off-road engines. The legislation identified and emphasized that in-use higher emitting vehicles are sources that need additional scrutiny and control in part because of their large contribution to the fleet's total emissions. To address this, the District is implementing, under the AB 923 program, pilot programs to identify and retire high emitting on-road vehicles. In addition, based on cost-effectiveness guidelines, model year 1992 and older vehicles would be considered for early retirement.

CARB adopted the EFMP Regulation in June 2009. The regulation implements the voluntary vehicle scrap and replacement voucher provisions of AB 118 (Nunez). The legislation includes \$30 million annually statewide for an EFMP. The EFMP augments the State's existing voluntary accelerated vehicle retirement program, referred to as the Consumer Assistance Program (CAP). The focus of the EFMP is to augment existing retirement programs and provide funding through vehicle replacement vouchers to retire the highest polluting vehicles in the areas with the greatest air quality problems.

In 2014, the State Legislature passed two bills (SB 459 – Pavley and AB 1365 – De Leon) that placed an emphasis on increasing the efficacy of the EFMP and encouraged opportunities for low and moderate-income residents to purchase cleaner, more fuel efficient combustion vehicles and advanced technology vehicles such as full battery-electric and plug-in hybrid electric vehicles. The EFMP Regulation was revised by CARB in 2014 to reflect the legislative desire and a one-year pilot program was initiated in the Basin and Coachella Valley. The EFMP provided up to \$4,500 to eligible low- and moderate-income residents for the replacement of older vehicles with newer or

new vehicles. Under separate actions, CARB allocated funding under the Greenhouse Gas Reduction Funds to augment the EFMP for eligible low- and moderate-income residents living in disadvantaged communities for the purchase of cleaner, more fuel efficient combustion vehicles and advanced technology vehicles. Eligible residents may receive additional funding assistance of up to \$5,000 augmenting the EFMP. The District has been implementing the EFMP since July 2015. For the 2016/2017 fiscal year, a total of \$60 million was appropriated by the state legislature for statewide implementation of the EFMP and EFMP Plus-Up.

Proposed Methods of Control

This action is to retire at a minimum, 2,000 light- and medium-duty vehicles per year. The proposed incentives would be up to \$9,500 which includes a replacement voucher under the AB 118 EFMP program and Greenhouse Gas Reduction Fund.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual number of vehicles participating in the program.

Cost-Effectiveness

Since the EFMP guidelines are developed based on funding appropriated by the State Legislature with the desire to provide sufficient funding for low- and moderate-income residents to access newer, cleaner, and more fuel efficient combustion vehicles and advanced technology vehicles, no cost-effectiveness threshold has been established. After the completion of the initial pilot program, CARB will reassess the program efficacy and may report on the program's cost-effectiveness.

Implementing Agency

The implementing agencies would be the District under guidelines set forth by CARB for the EFMP. Funding would be available from CARB and BAR for the EFMP with the District's administration of the replacement voucher provisions of the EFMP regulation.

References

CARB (2014). AB118 Enhanced Fleet Modernization Program Regulation, November 2014.

**MOB-07: ACCELERATED PENETRATION OF PARTIAL ZERO-EMISSION AND ZERO-EMISSION LIGHT-HEAVY- AND MEDIUM-HEAVY-DUTY VEHICLES
[NO_x, PM]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	ON-ROAD LIGHT-HEAVY- AND MEDIUM-HEAVY-DUTY VEHICLES (8,501 TO 33,000 LBS GVWR)			
CONTROL METHODS:	ACCELERATED PENETRATION OF PARTIAL ZERO-EMISSION AND ZERO-EMISSION LIGHT-HEAVY- AND MEDIUM-HEAVY-DUTY VEHICLES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	10.52	4.49	4.18	2.74
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NO _x INVENTORY	70.38	26.01	21.88	16.18
NO _x REDUCTION		TBD	TBD	TBD
NO _x REMAINING		TBD	TBD	TBD
CO INVENTORY	67.77	21.28	19.33	11.63
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	10.41	4.44	4.12	2.70
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NO _x INVENTORY	66.39	24.77	20.90	15.60
NO _x REDUCTION		TBD	TBD	TBD
NO _x REMAINING		TBD	TBD	TBD
CO INVENTORY	67.94	21.40	19.44	11.75
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
CONTROL COST:	TBD. ESTIMATED PUBLIC FUNDING – \$18 MILLION PER YEAR			
IMPLEMENTING AGENCY:	CARB AND SCAQMD			

Description of Source Category

The intent of this measure is to seek greater emission reduction benefits through the early deployment of near-zero, partial zero-emission and zero-emission light-heavy- and medium-heavy-duty vehicles with gross vehicle weight ratings (GVWR) from 8,501 lbs to 33,000 lbs.

Background

Emissions from heavy-duty diesel mobile sources continue to represent a significant and increasing portion of the emissions inventory in the Basin, adversely affecting regional air quality. The two primary pollutants resulting from diesel fuel combustion are particulate matter (PM) and oxides of nitrogen (NOx). PM typically constitutes the visible emissions from diesel engine exhaust, and it contains over 40 known cancer-causing substances. In 1998, California identified diesel PM as a toxic air contaminant based on its potential to cause cancer. In May 2015, the District released a report titled, "The Multiple Air Toxic Exposure Study in the Basin." This report, the fourth in a series of such studies beginning in 1987, concluded that around 68 percent of the carcinogenic risk associated with breathing ambient air can be attributed to diesel particulate emissions. Diesel engines also emit significant quantities of NOx, which is a precursor to ozone and secondary particulate matter formation. Additional control on diesel engine emissions is essential for attainment of ozone and PM ambient air quality standards, as well as mitigating its toxic air quality impact.

Regulatory History

Setting emission standards for heavy-duty diesel mobile emission sources is the responsibility of CARB and U.S. EPA. Specifically, heavy-duty vehicle engines are subject to specific emission standards pursuant to State and/or federal requirements. Emission standards for new diesel engines powering heavy-duty vehicles were first established for the 1973 model-year and have gradually increased in stringency over time. The current set of heavy-duty engine emission standards has been established by CARB and U.S. EPA for 2010 and subsequent model-years, which includes a 0.2 g/bhp-hr NOx emission standard. In 2013, CARB established optional heavy-duty engine exhaust standards for NOx that are up to 90 percent cleaner than the 2010 standard.

In December 2010, CARB amended the Truck and Bus Regulation which applies to a significant number of heavy-duty vehicles with gross vehicle weight ratings of 14,001 lbs and greater. Heavier trucks (26,001 lbs and greater) must meet regulatory requirements beginning January 1, 2012. Lighter trucks (14,001 lbs to 26,000 lbs) must meet regulatory requirements beginning January 1, 2015.

In 2013, CARB adopted a new set of optional NOx emission standards for on-road heavy-duty engines. Engines certified to one of the optional NOx emission standards (0.1, 0.05, and 0.02 g/bhp-hr) not only provide greater emission reductions than engines simply meeting the current mandatory standard but also the ability to access incentives funding.

The Carl Moyer Memorial Air Quality Standards Attainment Program is in its 16th year. The Carl Moyer Program was placed into State law and is the enabling mechanism to fund the cleanup of older diesel vehicles and equipment. At its initial inception, the Carl Moyer Program was funded annually through a State budget line item that must be approved by the State legislature. In 2004, the State Legislature approved Senate Bill (SB) 1107, which allowed for the funding of the Carl Moyer Program.

The SB 1107 funds are generated from new vehicle sales. In lieu of having Smog Check inspections in the first four years, new vehicles are now subject to their first Smog Check inspection after six years. A fee of \$48 is assessed at the time of vehicle purchase, which is typically less expensive than the Smog Check inspection and certificate. Half of the \$48 is directed to CARB, who distributes the funds among local air districts for implementation of the Carl Moyer Program.

In addition, the State legislature passed Assembly Bill (AB) 923, which provides funding until 2015 and allowed California local air districts to opt into a local Moyer Program. The AB 923 program has two components. One is a tire disposal fee which generates about \$10 million a year and is distributed by CARB among the local air districts. The other is a \$2 Department of Motor Vehicle registration fee that each local air district's Board has the authority to approve independently and generate funds from vehicles registered within their respective district boundaries. Fees generated are used for both the Carl Moyer and the School Bus Programs.

The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (AB 118, Statutes of 2007, Chapter 750), established two key programs administered by the California Energy Commission (CEC) and CARB. CEC has been administering the Alternative and Renewable Fuel and Vehicle Technology Program, to provide to specified entities, upon appropriation by the Legislature, grants, loans, loan guarantees, revolving loans, or other appropriate measures, for the development and deployment of innovative technologies that would transform California's fuel and vehicle types to help attain the State's climate change goals. Many of the innovative technologies provide criteria pollutant reduction co-benefits. CARB administers the Air Quality Investment Program, which is a voluntary incentive program to fund clean vehicle and equipment projects, research of biofuels production and the air quality impacts of alternative fuels, and workforce training.

In 2013, the State Legislature approved AB 8 and SB 11, which extended the Carl Moyer Memorial Air Quality Standards Attainment Program, AB 923, and the AB 118 Alternative and Renewable Fuel and Vehicle Technology Program and Air Quality Investment Program to January 1, 2024.

In 2000 and 2001, the District adopted a series of clean fleet vehicle rules which require public fleets and certain private fleets under contract or exclusive franchise to a public agency, to purchase alternative fuel powered vehicles at the time the fleet is expanding or replacing existing vehicles in its fleet. Rules 1192, 1193, 1194, 1195, and 1196 affect transit buses, waste collection vehicles, heavy-duty vehicles operating at commercial airports, school buses, and heavy-duty vehicles operated by public entities.

More recently, the State legislature appropriated \$150 million from the Greenhouse Gas Reduction Fund for heavy-duty vehicle and off-road equipment investments for zero and near-zero emission projects.

Currently, heavy-duty diesel engine manufacturers are introducing electric-hybrid systems in medium-heavy-duty on-road vehicle applications. Such systems in conjunction with a 2010-compliant conventionally-fueled or alternative-fueled engine can potentially result in additional NOx emissions benefits. Many of the hybrid systems introduced to-date are for lighter vehicles with gross vehicle weight ratings from 8,501 to 26,000 lbs. There are also commercially available models with gross vehicle weight ratings about 26,000 lbs.

In addition to hybrid systems, there is currently one natural gas engine certified to the 0.02 g/bhp-hr optional NOx exhaust emissions standard. (For purposes of this measure, the term "near-zero" is used for engines meeting the 0.02 g/bhp-hr level.) The integration of combustion engines at such a level with hybrid systems provides greater certainty that criteria pollutant emissions will be lowered when the vehicle is not utilizing the hybrid system.

In its final rulemaking on the Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2, U.S. EPA indicated that it will begin a process to develop new on-road heavy-duty engine NOx emission standards that will be significantly cleaner than the current on-road heavy-duty engine emission standards.

Proposed Method of Control

This measure seeks additional emission reductions through the early introduction of electric hybrid vehicles where feasible and near-zero emission heavy-duty vehicles everywhere else. The proposed actions would continue the State hybrid truck and bus voucher incentive project (HVIP) which accelerates the deployment of hybrid and zero-emission medium-heavy-duty vehicles in the Basin. In addition, fleets will be encouraged to acquire near-zero emission medium-heavy-duty vehicles in the near-term to help meet federal air quality standards by 2023 where there are no commercially available zero-emission medium-heavy-duty vehicles or zero-emission vehicles that are commercially available, but cannot be used in certain vocations.

The District staff will seek necessary legislative authority to authorize the SCAQMD to require the accelerated purchase and use of near-zero and zero-emission heavy-duty on-road vehicles for public fleets within the South Coast Basin. The District's fleet rules will be amended to require accelerated purchase and use of near-zero and zero-emission heavy-duty on-road public vehicles within the South Coast Basin no later than two years after the SCAQMD obtains any necessary legislative authority to control emissions of NOx, PM2.5, and diesel particulate matter.

The 2016 HVIP implementation manual includes trucks and buses that are equipped with low NOx engines. Incentives of up to \$60,000 per vehicle to help fund hybrid and zero-emission vehicles. For trucks with low NOx engines, the funding is at \$15,000 per vehicle. In implementing this measure, the funding would place the highest priority towards zero-emission vehicles and hybrid vehicles with a portion of their operation in an "all-electric range" mode. In the near-term, funding for low NOx engines will be encouraged for vocations where zero-emission technologies are not available or could not be used in certain applications.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual number of vehicles participating in the program.

Rule Compliance and Test Methods

Vehicles funded under the HVIP must meet the provisions of CARB's HVIP implementation manual.

Cost-Effectiveness

This proposed control measure will affect heavy-duty engine manufacturers, heavy-duty diesel truck owners, and heavy-duty diesel fleet operators. Costs of replacement engines vary depending on the specific model and vehicle application, and an evaluation would need to be conducted to determine the specific types of trucks and engine models that would be primarily affected by this measure, as well as prioritizing vehicle applications on a cost-effectiveness basis for engine or vehicle replacement. For Fiscal Year 2016/2017, the State legislature appropriated

\$150 million from the Greenhouse Gas Reduction Fund to fund near-zero and zero emission on-road heavy-duty vehicles. The proposed incentives of up to \$60,000 per vehicle will help offset the capital cost of the vehicles.

Implementing Agency

CARB, District or U.S. EPA could jointly or separately implement incentive programs that would help offset the costs associated with new hybrid or zero-emission truck purchase, engine repower, and/or retrofit kit installation.

References

SCAQMD (2015). Multiple Air Toxic Exposure Study, MATES-IV.

CARB (2016a). Implementation Manual for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project. Effective Date: June 1, 2016.

CARB (2016b). Proposed Fiscal Year 2016-17 Funding Plan for Low Carbon Transportation and Fuels Investments and the Air Quality Improvement Program.

**MOB-08: ACCELERATED RETIREMENT OF OLDER ON-ROAD HEAVY-DUTY VEHICLES
[NOx, PM]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		ON-ROAD HEAVY-DUTY VEHICLES (33,001 LBS AND GREATER GVWR)		
CONTROL METHODS:		ACCELERATED REPLACEMENT OF EXISTING HEAVY-DUTY VEHICLES WITH VEHICLES MEETING OPTIONAL NOx EMISSION STANDARDS AND RETROFITTING/REPOWERING EXISTING HEAVY-DUTY VEHICLES TO ACHIEVE LOWER EMISSION LEVELS		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NOx INVENTORY	99.75	51.81	30.00	31.58
NOx REDUCTION		TBD	TBD	TBD
NOx REMAINING		TBD	TBD	TBD
PM2.5 INVENTORY	3.17	0.64	0.54	0.68
PM2.5 REDUCTION		TBD	TBD	TBD
PM2.5 REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
NOx INVENTORY	94.83	49.57	28.86	30.41
NOx REDUCTION		TBD	TBD	TBD
NOx REMAINING		TBD	TBD	TBD
CONTROL COST:	TBD. ESTIMATED PUBLIC FUNDING – \$200 MILLION PER YEAR			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

The intent of this control measure is to seek additional emission reductions from existing heavy heavy-duty vehicles with gross vehicle weight ratings (GVWR) greater than 33,000 lbs to help achieve the emission reductions associated with the State SIP Strategy “Further Deployment of Clean Technologies” measure for on-road heavy-duty vehicles. Additional emission reductions could be achieved through an accelerated vehicle replacement program with new engines that meet the cleanest optional NOx emissions standard or through regulatory actions. In addition, for heavy-duty vehicles not replaced with new models, existing vehicle engines would be repowered with commercially available engines meeting one of the optional NOx exhaust emission standards established by CARB or modified with retrofit kits to achieve lowest possible emission levels.

Background

Emissions from heavy-duty diesel mobile sources continue to represent a significant portion of the emissions inventory in the Basin, adversely affecting regional air quality. The two primary pollutants resulting from diesel fuel combustion are PM and oxides of nitrogen (NOx). PM typically constitutes the visible emissions from diesel engine exhaust, and it contains over 40 known cancer-causing substances. In 1998, California identified diesel PM as a toxic air contaminant based on its potential to cause cancer. In March 2015, the District released a report titled, “The Multiple Air Toxic Exposure Study in the Basin.” This report, the fourth in a series of such studies beginning in 1987, concluded that around 68 percent of the carcinogenic risk associated with breathing ambient air can be attributed to diesel particulate emissions. Diesel engines also emit significant quantities of NOx, which is a precursor to ozone and secondary particulate matter formation. Additional control of diesel engine emissions is essential for attainment of ozone and PM ambient air quality standards, as well as mitigating its toxic air quality impact.

Regulatory History

The regulation of emissions from heavy-duty diesel mobile emission sources is the primary responsibility of CARB and U.S. EPA. Specifically, heavy-duty vehicle engines are subject to specific emission standards pursuant to State and/or federal requirements. Emission standards for new diesel engines powering heavy-duty vehicles were first established for the 1973 model-year and have gradually increased in stringency over time. The current most stringent set of heavy-duty engine emission standards has been established by CARB and U.S. EPA for 2010 and subsequent model-years, which includes a 0.2 g/bhp-hr NOx emission standard.

In December 2008, CARB adopted the Truck and Bus Regulation which applies to a significant number of heavy-duty vehicles with gross vehicle weight ratings of 14,001 lbs and greater. Heavier trucks (26,001 lbs and greater) must meet regulatory requirements beginning January 1, 2014. Lighter heavy-duty trucks (14,001 lbs to 26,000 lbs) must meet regulatory requirements beginning January 1, 2015.

In 2013, CARB adopted a new set of optional NOx emission standards for on-road heavy-duty engines. Engines certified to one of the optional NOx emission standards (0.1, 0.05, and 0.02 g/bhp-hr) not only provide greater emission reductions than engines simply meeting the current mandatory standard but also the ability to access incentives funding.

The Carl Moyer Memorial Air Quality Standards Attainment Program is in its 16th year. The Carl Moyer Program was placed into State law and is the enabling mechanism to fund the cleanup of older diesel vehicles and

equipment. At its initial inception, the Carl Moyer Program was funded annually through a State budget line item that must be approved by the State legislature. In 2004, the State Legislature approved Senate Bill (SB) 1107, which allowed for the funding of the Carl Moyer Program.

The SB 1107 funds are generated from new vehicle sales. In lieu of having Smog Check inspections in the first four years, new vehicles are now subject to their first Smog Check inspection after six years. A fee of \$48 is assessed at the time of vehicle purchase, which is typically less expensive than the Smog Check inspection and certificate. Half of the \$48 is directed to CARB, who distributes the funds among local air districts for implementation of the Carl Moyer Program.

In addition, the State legislature passed Assembly Bill (AB) 923, which provides funding until 2015 and allowed California local air districts to opt into a local Moyer Program. The AB 923 program has two components. One is a tire disposal fee which generates about \$10 million a year and is distributed by CARB among the local air districts. The other is a \$2 Department of Motor Vehicle registration fee that each local air district's Board has the authority to approve independently and generate funds from vehicles registered within their respective district boundaries. Fees generated are used for both the Carl Moyer and the School Bus Programs.

The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (AB 118, Statutes of 2007, Chapter 750), established two key programs administered by the California Energy Commission (CEC) and CARB. CEC has been administering the Alternative and Renewable Fuel and Vehicle Technology Program, to provide to specified entities, upon appropriation by the Legislature, grants, loans, loan guarantees, revolving loans, or other appropriate measures, for the development and deployment of innovative technologies that would transform California's fuel and vehicle types to help attain the State's climate change goals. Many of the innovative technologies provide criteria pollutant reduction co-benefits. CARB administers the Air Quality Investment Program, which is a voluntary incentive program to fund clean vehicle and equipment projects, research of biofuels production and the air quality impacts of alternative fuels, and workforce training.

In 2013, the State Legislature approved AB 8 and SB 11, which extended the Carl Moyer Memorial Air Quality Standards Attainment Program, AB 923, and the AB 118 Alternative and Renewable Fuel and Vehicle Technology Program and Air Quality Investment Program to January 1, 2024.

In 2006, California voters approved a bond measure called Proposition 1B. The bond measure would generate \$19 billion of which \$2 billion would go towards improving California's freight transportation infrastructure, \$1 billion towards the cleaning up older diesel vehicles, and \$200 million to school bus retrofits. The funding is predicated on bond sales. To-date, over 6,000 older diesel trucks have been replaced with either newer diesel trucks or alternative fuel trucks.

More recently, the state legislature appropriated \$150 million from the Greenhouse Gas Reduction Fund for heavy-duty vehicle and off-road equipment investments for zero and near-zero emission projects.

In 2000 and 2001, the District adopted a series of clean fleet vehicle rules which require public fleets and certain private fleets under contract or exclusive franchise to a public agency, to purchase alternative fuel powered vehicles at the time the fleet is expanding or replacing existing vehicles in its fleet. Rules 1192, 1193, 1194, 1195, and 1196 affect transit buses, waste collection vehicles, heavy-duty vehicles operating at commercial airports, school buses and heavy-duty vehicles operated by public entities. The District Clean Fleet Vehicle Rules have been successfully implemented since their adoption with a significant number of alternative fuel vehicles now in service

in a majority of public fleets and certain private fleets under exclusive franchise to a public entity such as refuse collection fleets and private school bus providers.

California Health and Safety Code Section 40447.5 allows the District to require operators of public and commercial fleets, consisting of 15 or more vehicles, to purchase vehicles powered by methanol or other equivalently clean burning alternative fuel, when adding or replacing vehicle(s) to their fleet. Section 40447.5 specifically authorizes the District to regulate fleets of 15 or more vehicles, operating substantially in the SCAQMD. Development of fleet rules is also based on California Health and Safety Code Section 40919, which allows certain nonattainment air districts (those that are designated serious or above for ozone) to adopt measures requiring fleets to use a significant number of low-emission vehicles. The state provisions do not require that fleets purchase alternative fuel vehicles on a specified schedule, but rather, at the time a fleet is adding or replacing vehicles in its fleet. Section 40447.5 covers public and commercial (private) fleets. In 2004, the U.S. Supreme Court ruled that the fleet rules are “emission standards.” In later litigation, the Ninth Circuit held that the District has the authority to implement the fleet vehicle rules to public fleets and certain private fleets under exclusive arrangement with government entities. However, the fleet rules do not apply to private fleets that do not have contractual arrangements with a governmental entity. Moreover, fleet rules may be adopted by the District that directly affects private fleet if the fleet rules are submitted by the state to U.S. EPA for approval and U.S. EPA grants a waiver.

In its final rulemaking on the Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2, U.S. EPA indicated that they will begin a process to develop new on-road heavy-duty engine NOx emission standards that will be significantly cleaner than the current on-road heavy-duty engine emission standards.

Proposed Method of Control

While the Truck and Bus Regulation will ultimately require a majority of the heavy-duty trucks to meet 2010 heavy-duty exhaust emission standards by 2023, there is a need to deploy on-road heavy-duty trucks that have engines that are considered “near-zero” or have “zero-emission mile” capability. For the purposes of this control measure, “near-zero” is defined as 0.02 g/bhp-hr NOx emissions. This measure seeks additional emission reductions from on-road heavy-duty vehicles beyond the emission reductions targeted in CARB’s Truck and Bus Regulation. In addition, the proposed action is to direct a portion of available public funding to assist in replacing older diesel trucks serving the Port of Los Angeles and Port of Long Beach, railyards and intermodal yards, and warehouse distribution centers to a truck with an engine meeting one of the optional NOx heavy-duty exhaust emission standards. The incentive programs will place the highest priority on on-road vehicles that meet the cleanest optional NOx emission standard and provide their service to the above facilities in the region and have gross vehicle weight ratings of 26,001 lbs or greater. As private fleets affected by the Truck and Bus Regulation begin compliance with the Regulation, those fleets will be encouraged to procure new vehicles with engines meeting the cleanest optional NOx emissions standard. Incentives funding could potentially be available for the procurement of the vehicles.

A priority will be placed on voluntary incentives funding to achieve the emission reductions identified in the State SIP Strategy “Feasible Deployment of Clean Technologies” measure for heavy-duty vehicles. However, given the significant NOx emissions associated with the heavy heavy-duty vehicle sector, there is a need to consider actions other than voluntary incentive programs for this emissions source sector. These actions could include the identification of non-monetary incentive programs such as preferential access at marine ports and warehouse

distribution centers for near-zero and zero-emission trucks or creation of dedicated truck lanes. In addition, operational efficiency improvements that result in lower emissions, if quantifiable and meet U.S. EPA guidance for SIP approval, could be recognized in future SIP Rate-of-Progress reporting and future AQMP revisions. Other actions that could be considered include: the development of a provision from the State for the District to implement a SOON-like (Surplus Off-Road Option for NOx) provision for the largest on-road truck fleets operating in the Basin; or any enforceable mechanism to accelerate deployment of on-road heavy-duty trucks with engines meeting one of the optional NOx emission standards or have some “zero-emission” mile or “all electric range” capability, which may include consideration of the development of a clean fuel vehicle rule that is within the District’s legal authority to implement such as the District’s Rule 1190 series clean fleet vehicle rules. The District staff will seek necessary legislative authority to authorize the SCAQMD to require the accelerated purchase and use of near-zero and zero-emission heavy-duty on-road vehicles for public fleets within the South Coast Basin.

Relative to the development of a private fleet vehicle rule, District staff will work closely with CARB and U.S. EPA to ensure that any rule developed under this process will be approvable by U.S. EPA. In addition, District staff will consider the various types of on-road heavy-duty vocations to craft a rule that recognizes the commercial availability and performance capabilities of alternative fuel and zero-emission vehicles such that affected fleets may transition to the cleanest heavy-duty vehicles possible and minimize economic impacts on the fleets. Lastly, the District staff will explore the potential to increase the deployment of zero-emission vehicles wherever feasible and near-zero emission vehicles everywhere else. To this end, the District will work with affected stakeholders to develop provisions that will allow for NOx and PM emissions equivalency if an alternative fuel or zero-emission heavy-duty vehicle is not commercially available or cannot be used in a specific application. In addition, District staff will evaluate the need to expand the existing clean fleet vehicle rules for public and certain private fleets to further the deployment of zero-emission vehicles wherever possible and near-zero emission vehicles everywhere else, including any necessary amendments to State law. The District staff will amend the District’s fleet rules to require accelerated purchase and use of near-zero and zero-emission heavy-duty on-road public vehicles within the South Coast Basin no later than two years after the SCAQMD obtains any necessary legislative authority to control emissions of NOx, PM2.5, and diesel particulate matter.

Other local actions, State or federal government actions that achieve equivalent or greater emission reductions needed to meet the State SIP Strategy for on-road heavy-duty vehicles can be considered in lieu of this measure.

The District staff will convene a stakeholders working group consisting of trucking industry representatives, environmental and community organizations, and other affected parties to further discuss the above potential actions or approaches that can be implemented to further reduce emissions from on-road heavy-duty trucks as part of a public process. The identified actions will be prioritized by the District staff. Reports will be provided to the District Governing Board on the progress in identifying actions on a routine basis, but no later than six months after the adoption of the Final 2016 AQMP by the District Governing Board. Since the primary approach is predicated on voluntary actions and incentives funding, if steps are not taken to implement identified voluntary actions or significant increases in funding for on-road heavy-duty vehicles are not realized one year after the adoption of the Final 2016 AQMP, District staff will provide to the District Governing Board recommendations whether to proceed with the development of rules similar to the District’s clean fleet vehicle rules or development of other enforceable mechanisms for the Board’s consideration and direction. Since many of the actions discussed above may affect facilities identified in Control Measures MOB-01 through MOB-04, the schedule for the public process is similar to the schedule provided in Table IV-A-3.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual number of vehicles participating in the incentives program and the actions or strategies identified through the public process. Depending on the types of implementation actions identified for this measure, additional emission reductions will be quantified. Quantified emission reductions that are real, surplus, permanent, and enforceable will be attributed towards the emission reduction commitment associated with the “Further Deployment” measures and reflected in future emissions inventories as part of the Rate-of-Progress reporting requirements or in baseline emissions inventories as part of future AQMP/SIP development as long as the reductions meet U.S. EPA determination that such reductions are approvable as part of the SIP

Rule Compliance and Test Methods

Compliance with requirements of an incentive program(s) used to offset the costs of new heavy-duty vehicles, engines, or retrofit kits could be jointly or separately administered by District or CARB. If a District rule is adopted, the District would enforce through field inspections and reporting requirement provisions of the rule.

Cost-Effectiveness

The cost-effectiveness of the proposed action is not estimated. Recent funding for goods movement related vehicles under the Proposition 1B Air Quality Improvement Funds provided at least \$50,000 per truck replaced. There are diesel-powered engines currently certified at levels below 0.1 g/bhp-hr and close to 0.05 g/bhp-hr. The Manufacturers of Engine Control Association estimated that the estimated incremental cost of the control technologies to reach 0.02 g/bhp-hr is around \$500 on average. Funding levels may potentially be up to \$25,000 or more for such engines to incentivize early deployment. However, for trucks with engines that have zero-emission mile capability, greater funding incentives may be needed in the near-term.

Implementing Agency

CARB, District or U.S. EPA could jointly or separately implement incentive programs that would help offset the costs associated with new truck purchase, engine repower, and/or retrofit kit installation. In particular, there is a need to incentivize emission reductions from interstate trucks registered outside of California, but operating substantially within California. The District has certain authority to implement clean fleet vehicle rules under State law.

References

CARB (2010). Amendments to the On-Road Truck and Bus Regulation.

CARB (2010). Proposition 1B Goods Movement Emissions Reduction Program: Final Guidelines for Implementation.

CARB (2015). Draft Technology Assessment: Lower NOx Heavy-Duty Diesel Engines.

**MOB-09: ON-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION
PROGRAM
[NOx, PM]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:		ON-ROAD HEAVY -DUTY VEHICLES (14,001 LBS AND GREATER GVWR)		
CONTROL METHODS:		ACCELERATED DEPLOYMENT OF NEAR-ZERO AND ZERO-EMISSION TRUCKS		
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NOX INVENTORY	139.92	64.63	40.03	42.65
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
PM2.5 INVENTORY	4.91	1.17	1.06	1.3
PM2.5 REDUCTION		TBD	TBD	TBD
PM2.5 REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
NOX INVENTORY	132.78	61.87	38.54	41.16
NOX REDUCTION		TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD
CONTROL COST:	TBD			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

This measure seeks to develop mechanisms to incentivize the early deployment of zero and near-zero emission trucks through the generation of mobile source emission reduction credits that can be used only by entities affected under the 2016 AQMP control measures MOB-01 through MOB-04, MOB-08, and EGM-01. Any mobile source emission reduction credits generated cannot be used to offset emissions from stationary sources. The mobile source emission reduction credits will be discounted to provide additional emission reductions to help meet air quality standards.

Background

Mobile source emission reduction credit generation programs have been developed by the District to provide an incentive to deploy cleaner, advanced technologies that are not otherwise required to comply with existing air regulations. Generation of such credits may be considered surplus and have been used to comply with other District regulations. The District continues to work with affected stakeholders on the development of mobile source emission reduction credit generation rules and the U.S. EPA to define an approach that can be approved into the SIP. This proposed measure provides a forum to continue such discussions with interested stakeholders and U.S. EPA.

Regulatory History

In 1995, the District adopted Rule 1612 – Credits for Clean On-Road Vehicles, which provides a quantification protocol for entities to generate mobile source emission reduction credits that could be used for compliance with other District rules. Rule 1612 establishes a mechanism for the quantification of emission benefits as a result of implementation of projects that deployed on-road vehicles meeting optional NO_x emission standards or are not otherwise required by a regulation or other enforceable mechanism. Mobile source emission reductions associated with the project are converted to credits that could be used by the project proponent or sold to other entities to meet other District rules as allowed by those regulations.

In March 2001, the District adopted Rule 1612.1 – Mobile Source Credit Generation Pilot Program, which sets forth credit generating mechanisms for mobile sources to generate mobile source emission reduction credits (MSERCs) through the voluntary replacement of specific categories of diesel-fueled heavy-duty vehicles or yard hostlers with clean technologies. NO_x MSERCs would then be available for use in the District's RECLAIM. Rule 1612.1 could provide local air quality benefits to community members who live in and around areas where participating vehicles operate. These benefits include reductions in particulates, carbon monoxide (CO), and toxic air contaminant emissions associated with the use of heavy-duty diesel engines. Regional air quality benefits would accrue from: 1) the rule provision that automatically retires nine percent of MSERCs generated for the benefit of the environment, 2) the non-credited reduction of diesel emissions components other than NO_x, and 3) the accelerated and increased replacement of heavy-duty diesel vehicles with alternative clean fuel vehicles. Rule 1612.1 was approved by U.S. EPA into the SIP. However, given the time since approval, the rule needs to be updated.

PROPOSED METHOD OF CONTROL

This measure seeks to amend Rule 1612.1 and/or 1612 to provide greater flexibility for entities to initiate projects to accelerate the deployment of zero and near-zero emission trucks in the Basin and Coachella Valley. The focus of the amendment will be to encourage the deployment of commercially available zero and near-zero emission trucks that do not receive or cannot receive public funding assistance. Mobile source emission reduction credits must be real, surplus, quantifiable, permanent, and enforceable as defined by U.S. EPA. As such, any project considered for generation of emission reduction credits must go beyond regulatory requirements such as the provisions of the Truck and Bus Regulation or mandatory engine exhaust emission standards.

For the purposes of this measure, a near-zero emission engine is one that meets the CARB optional NO_x emissions standard of 0.02 g/bhp-hr. Zero-emission trucks include, but are not limited to, commercially available battery-electric trucks, fuel cell trucks, hybrid-electric trucks with all-electric range (AER) and zero-emission hybrid or battery-electric trucks with “wayside” power (such as electricity from overhead wires). Zero-emission trucks can be powered by grid electricity stored in a battery, by electricity produced onboard the vehicle through a fuel cell, or by “wayside” electricity from outside sources such as overhead catenary wires, as is currently used for transit buses and heavy mining trucks. All technologies eliminate fuel combustion and utilize electric drive as the means to achieve zero-emission and higher system efficiency compared to conventional fossil fuel combustion technology. Hybrid-electric trucks with all electric range can provide zero emission in certain corridors and flexibility to travel extended distances (e.g. outside the region) powered by alternative fuels, conventional fuels, or fuel cells.

EMISSION REDUCTIONS

Emission reductions are not estimated at this time and will depend on the actual number of vehicles participating in the program.

Rule Compliance and Test Methods

Compliance would be based on monitoring, recordkeeping, and reporting requirements that have been established in existing regulations. In addition, compliance would be verified through inspections and other recordkeeping and reporting requirements.

COST-EFFECTIVENESS

Not determined.

IMPLEMENTING AGENCY

SCAQMD

References

SCAQMD (1998). SCAQMD Rule 1612 – Clean On-Road Vehicles

SCAQMD (2001). SCAQMD Rule 1612.1 – Mobile Source Credit Generation Pilot Program

**MOB-10: EXTENSION OF THE SOON PROVISION FOR CONSTRUCTION/INDUSTRIAL
EQUIPMENT
[NOx]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	OFF-ROAD DIESEL-FUELED CONSTRUCTION, INDUSTRIAL EQUIPMENT, AIRPORT GROUND SUPPORT EQUIPMENT, AND DRILLING EQUIPMENT			
CONTROL METHODS:	ACCELERATED TURNOVER OR RETROFIT OF OLDER EQUIPMENT AND ENGINES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
NOX INVENTORY	29.61	18.42	17.01	10.20
NOX REDUCTION		2.00	2.00	2.00
NOX REMAINING		16.42	15.01	8.20
SUMMER PLANNING	2012	2022	2023	2031
NOX INVENTORY	35.07	21.88	20.22	12.08
NOX REDUCTION		2.00	2.00	2.00
NOX REMAINING		19.88	18.22	10.08
CONTROL COST:	TBD. FUNDING FROM SOON – UP TO \$30 MILLION PER YEAR			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

The purpose of this measure is to promote faster turnover of older in-use construction and industrial diesel engines.

Background

In 2023 and 2031, off-road equipment is projected to be the second largest source category of NOx emissions and accounts for 14 percent of the total NOx emissions in the Basin. Heavy-duty construction, industrial, airport ground support (GSE), and drilling equipment are eligible for participation in the District's Surplus Off-road Opt-in for NOx (SOON) program and represent almost 40 percent of the off-road equipment category NOx emissions. In 2007, CARB adopted the In-Use Off-Road Diesel-Fueled Fleets Regulation that reduces primarily PM and secondarily NOx

emissions through retrofit controls, engine repowers, equipment replacement and fleet reduction. NOx emission reduction of about 17 percent is expected to be achieved with full implementation of the regulation by 2023.

Regulatory History

The Federal Clean Air Act prohibits States from regulating emissions from new engines used in construction and farming equipment less than 175 horsepower. Diesel engines greater than 175 horsepower are regulated by CARB. In September 1996, CARB, U.S. EPA, and the diesel engine manufacturers signed a statement of principles, which called for a cooperative effort to reduce NOx, VOC, and PM emissions by more than 60 percent. In August 1998, U.S. EPA adopted new emission standards pertaining to off-road diesel engines. Subsequently, in January 2000 and in December 2004, CARB adopted amendments to existing California emission standards to harmonize with the federal requirement. These amendments included a tiered approach starting from 1996 for Tier 1 and concluding in 2015 with all new engines required to meet Tier 4 standards.

In order to accelerate the introduction of new low emission equipment, CARB adopted the In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road rule) in 2007. The rule applies to diesel fueled construction, mining, industrial, airport ground support equipment, and mobile oil drilling equipment and established annual fleet average emission targets. Fleets that do not meet the fleet average in any year are required to “turnover,” (i.e., retire, replace, retrofit, or repower) a specified percentage of their horsepower. The Off-Road rule was amended in 2011, which relaxed the target emission reductions and set the initial date for large fleet compliance to 2014.

As part of the Statewide regulation, CARB adopted the SOON provision that allows air districts to opt-in to additional NOx emission reductions from the largest off-road fleets subject to the regulation. The SCAQMD has been implementing the SOON provision since 2008. The SCAQMD Governing Board set aside up to \$30 million per year to implement the SOON provision.

Proposed Method of Control

New off-road diesel engines are now required to meet Tier 4 emission standards. Tier 4 includes optional phase-in provisions (Interim Tier 4 standards) with relaxed standards from 2008 to 2014, depending on horsepower category. Beginning in 2015, all new off-road diesel engines between 75 hp and 750 hp, which represent most off-road construction equipment, are required to meet exhaust emissions standards of 0.3 g/bhp-hr NOx and 0.015 g/bhp-hr PM. To comply with these standards, advanced fuel injection, air induction, and after-treatment technologies are required. The emission reductions from Tier 4 engines compared to Tier 0 engines is at least 95 percent for NOx and PM.

The long life of off-road equipment means that older, high emitting engines will remain in the off-road equipment population beyond 2020. District staff believes that using incentive programs, such as the Carl Moyer Program and the SOON Provision of the Off-Road rule, significant emission reductions could be realized by accelerating fleet turnover through equipment replacement and engine repowers.

During the last eight years, the SOON program has funded 476 engine repowers or vehicle replacements at an average cost-effectiveness of approximately \$11,300/ton NOx reduction. Historically, the District Governing Board has allocated up to \$30 million per year for the program. However, more recently, the Governing Board has allocated up to \$10 million per year to extend the program beyond 2023. This measure proposes to extend the

current SOON Program beyond 2023 to 2031 with a minimum allocation of \$10 million and potentially higher levels upon the Governing Board's approval.

Emission Reductions

While the NOx emissions from the off-road category are projected to be around 38 tpd in 2023 and 33 tpd in 2031, emissions from vehicles eligible to participate in the SOON program are around 17 and 10 tpd in 2023 and 2031, respectively. Reductions from this proposed measure are estimated to be 1 tpd for NOx assuming \$30 million per year is available. Assuming that level funding is available, cumulative emission reductions will be approximately 5 tpd by 2023 and 12 tpd by 2031.

Cost-Effectiveness

The SOON program has funded 476 engine repowers or vehicle replacements during the last eight years at an average cost-effectiveness of approximately \$11,300/ton NOx reduced. Most projects have been engine repowers from Tier 0 to Tier 3. Tier 4 engine repowers have been technically infeasible in most cases and most repowers will continue to be with Tier 3 engines. To achieve Tier 4 emission goals, equipment replacement will be required resulting in significantly higher cost-effectiveness and cost per equipment than experienced with repowers. This measure proposes to extend the SOON program with proposed funding of at least \$10 million per year. Historically, the District Governing Board has allocated up to \$30 million per year, which resulted in around 2 tpd of NOx reductions.

Implementing Agency and Issues

The District would continue implementation of the SOON provision of the In-Use Off-Road Diesel-Fueled Fleets Regulation. The implementation follows the District's SOON Program Administrative Guidelines and CARB's Carl Moyer Program Guidelines to ensure that emission reductions are quantifiable, surplus, enforceable and permanent.

- **Quantifiable:** Emission reductions are based on established calculations and records supporting the underlying data including historical usage, emission factors from engine certification data, rated horsepower, average load factors, and contracted years of operation.
- **Surplus:** Fleets must provide evidence of compliance with the regulation (the DOORS Compliance Snapshot) and planned future commitments for fleet turnover if needed to meet future compliance requirements.
- **Enforceable:** Contract language provides several methods for ensuring that contracted emission reductions are obtained or SOON funding is recovered in the event contracts are not fulfilled.
- **Permanent:** Emission reductions are permanent during the contract period because the old equipment is destroyed. The new equipment continues operating at the lower emission level after the contract ends.

References

CARB (2010). Emissions Inventory Model for Baseline and Final Proposal (Access database) – OSM vehicle scenario table; total population adjusted for 2012 Growth Factor of 1.046. Database available at http://www.arb.ca.gov/msprog/ordiesel/offroad_1085.htm

CARB (2010). Initial Statement of Reasons – Proposed Amendments to the Regulation for In-Use Off-road Diesel Fueled Fleets.

CARB (2011). Final Regulation Order Dec 2011- Regulation for In-Use Off-Road Diesel-Fueled Fleets.

CARB (2015). Carl Moyer Program Guidelines, Chapter 7 – Off-Road Compression Equipment and Chapter 9 – Off-Road Equipment Replacement

SCAQMD (2008). Rule 2449 – Control of Oxides of Nitrogen Emissions from Off-Road Diesel Vehicles.

SCAQMD (2008). Rule 2449 – SOON Program Administrative Guidelines.

SCAQMD (2014). Rule 2449.1 - Control of Oxides of Nitrogen Emissions from Off-Road Diesel Vehicles.

SCAQMD (2014). Rule 2449 – SOON Program Administrative Guidelines.

**MOB-11: EXTENDED EXCHANGE PROGRAM
[VOC, NOx, CO]**

CONTROL MEASURE SUMMARY				
SOURCE CATEGORY:	SMALL OFF-ROAD ENGINES (SORE) AND LARGER DIESEL-POWERED LAWN AND GARDEN EQUIPMENT			
CONTROL METHODS:	EXCHANGE EXISTING IN-USE SORE FOR ELECTRICAL EQUIPMENT, OR NEW LOW-EMITTING ENGINES			
EMISSIONS (TONS/DAY):				
ANNUAL AVERAGE	2012	2022	2023	2031
VOC INVENTORY	9.28	7.25	7.22	7.47
VOC REDUCTION		TBD	TBD	TBD
VOC REMAINING		TBD	TBD	TBD
NOX INVENTORY	3.48	3.81	3.88	4.10
NOX REDUCTION		2.8	2.91	1.00
NOX REMAINING		1.01	0.97	3.10
CO INVENTORY	87.4	88.42	87.2	89.3
CO REDUCTION		TBD	TBD	TBD
CO REMAINING		TBD	TBD	TBD
SUMMER PLANNING	2012	2022	2023	2031
VOC INVENTORY	10.14	8.16	8.92	8.6
VOC REDUCTION		5.0	5.8	TBD
VOC REMAINING		3.16	3.12	TBD
NOX INVENTORY	3.92	4.29	4.49	4.63
NOX REDUCTION		2.5	2.91	1.00
NOX REMAINING		1.79	1.58	3.63
CO INVENTORY	77.7	76.5	80.0	79.7
CO REDUCTION		44.7	52	TBD
CO REMAINING		31.8	28	TBD
CONTROL COST:	THE COST-EFFECTIVENESS OF THIS CONTROL MEASURE WILL VARY DEPENDING ON THE TYPE OF EQUIPMENT BUT HAS RANGED FROM \$800/TON FOR LEAF BLOWERS TO \$10,000/TON FOR LAWN MOWER EQUIPMENT			
IMPLEMENTING AGENCY:	SCAQMD			

Description of Source Category

The purpose of this control measure is to promote accelerated turn-over of in-use small off-road engines (SORE) and other engines such as larger diesel-powered lawn and garden equipment through expanded voluntary exchange programs.

Background

The SORE category consists of spark ignition engines that run on gasoline or alternative fuel such as liquefied petroleum gas (LPG) or compressed natural gas (CNG), and are rated below 25 horsepower (19 kW). The SORE equipment category includes handheld and non-handheld lawn and garden equipment such as string trimmers, leaf blowers, lawn mowers, generators, and lawn tractors, as well as other commercial/industrial equipment. The SORE category does not include compression ignition engines or recreational vehicles. The vast majority of candidate equipment eligible for exchange under this measure use gasoline. A sector of lawn and garden equipment operate on diesel fuel. These equipment include diesel-powered riding lawn mowers, stump grinders, and other commercial turf equipment.

Since 2003, the District has sponsored lawn mower buyback programs for residential users of old lawn mowers. This program has resulted in over 55,000 high polluting gasoline-powered lawn mowers taken out of service from 2003 to the present. The program is designed so that an individual turns in their old lawn mower in exchange for paying up to \$250 towards a new electric-powered lawn mower. In addition to the lawn mower exchange program, the District has recently sponsored a gasoline-powered leaf blower exchange program targeted at commercial operators. In this program, an individual turns in their old gasoline-powered two-stroke leaf blower in exchange for paying \$200 towards a new four-stroke gasoline-powered leaf blower certified to the CARB new engine emission standards. The new four-stroke units are less polluting than the two-stroke units. The leaf blower buyback program has resulted in over 12,000 older leaf blowers being exchanged for cleaner combustion leaf blowers.

While the residential lawnmower and commercial hand-held leaf blower exchange programs are important programs, additional emission reductions will be needed from larger commercial lawn and garden equipment such as riding lawnmowers. Zero-emission commercial lawn and garden equipment are currently commercially available from a number of vendors. The District is currently sponsoring a zero-emission commercial lawn and garden equipment loaner program to test and evaluate equipment performance in a various commercial applications.

Regulatory History

Since September 2003, CARB has established emission standards (exhaust and evaporative) for new SORE engines. However, CARB regulations do not impact existing equipment. As part of its commitment in the 2003 AQMP, in September 2003, the CARB Board also directed CARB staff to conduct research for potential increased use of electric equipment for small off-road engines. In April 2004, CARB staff reported to the Governing Board that there is a high possibility of increasing the penetration for electric equipment through voluntary measures, incentive programs, and other consumer awareness programs.

CARB's SORE is undergoing review with potential amendments that may result in additional emission reductions. Larger diesel-powered lawn and garden equipment may or may not be subject to the In-Use Off-Road Diesel Fleet Regulation depending if the equipment is federally preempted.

Proposed Method of Control

In order to increase the penetration of new low emission and zero-emission equipment, this measure is proposing to expand the District's existing lawn mower and leaf blower exchange program to cover larger commercial lawn and garden equipment that are subject to federal preemption or may not be required to turnover to newer equipment. This expansion will be accomplished by increasing the number of exchange events and available funding for these programs. In addition, other SORE equipment may also be considered for exchange programs for accelerating the turnover of existing engines.

Emission Reductions

This control measure promotes faster turnover rate of in-use engines to electric versions of the same equipment type or engines that meet the new low-emission standards. The expected emission reductions for this control measure would depend on the number and types of engines participating in the program. It is estimated that around 32,000 existing larger commercial lawn and garden equipment could be replaced with zero-emission or cleaner low-emission gasoline-powered or alternative fuel-powered equipment resulting in around 2.9 tons/day of NOx reduction in 2023. The estimates for other type of equipment targeted in an exchange program would vary and are not estimated for this control measure.

Cost-Effectiveness

The cost-effectiveness will depend on the types of engines or equipment participating in the exchange program. In the District's leaf blower exchange program, low emission units were offered at a cost of \$200 instead of a typical retail price of \$460. The total cost of this program was \$225,000 funded through the District's Air Quality Investment Program (AQIP). The cost-effectiveness of this leaf blower exchange program is reported to be \$1,060 per ton.

Implementing Agency

The District has successfully implemented voluntary exchange programs for leaf blowers and lawn mowers since 2003. The extended exchange program is expected to be implemented by the District taking into consideration requirements that emission reductions are quantifiable, surplus, enforceable and permanent.

References

CARB (2003). Staff Report – Initial Statement of Reasons for Proposed Rulemaking Public Hearing to Consider the Adoption of Exhaust and Evaporative Emission Control Requirements for Small Off-Road Equipment and Engines Less Than or Equal to 19 Kilowatts, August 8, 2003.

CARB (2004). Staff Report – Potential Electrification Programs for Small Off-Road Engines, April 2, 2004.

**MOB-12: FURTHER EMISSION REDUCTIONS FROM PASSENGER LOCOMOTIVES
[NO_x, PM]**

CONTROL MEASURE SUMMARY					
SOURCE CATEGORY:	LOCOMOTIVE ENGINES (PASSENGER)				
CONTROL METHODS:	ACCELERATED REPLACEMENT OF EXISTING LOCOMOTIVE ENGINES MEETING TIER 4 OR CLEANER EXHAUST STANDARDS				
EMISSIONS (TONS/DAY):					
ANNUAL AVERAGE	2012	2019	2022	2023	2031
NO _x INVENTORY	2.95	3.11	3.43	3.46	3.86
NO _x REDUCTION		TBD	TBD	TBD	TBD
NO _x REMAINING		TBD	TBD	TBD	TBD
PM _{2.5} INVENTORY	0.057	0.060	0.066	0.067	0.075
PM _{2.5} REDUCTION		TBD	TBD	TBD	TBD
PM _{2.5} REMAINING		TBD	TBD	TBD	TBD
SUMMER PLANNING	2012	2019	2022	2023	2031
NO _x INVENTORY	2.95	3.11	3.46	3.16	3.86
NO _x REDUCTION		TBD	TBD	TBD	TBD
NO _x REMAINING		TBD	TBD	TBD	TBD
CONTROL COST:	THE COST-EFFECTIVENESS OF THIS MEASURE WILL VARY DEPENDING ON THE TYPE OF CONTROL EQUIPMENT. THE AVERAGE COST-EFFECTIVENESS IS ESTIMATED TO BE AROUND \$15,000/TON.				
IMPLEMENTING AGENCY:	SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY (METROLINK)				

Description of Source Category

The purpose of this control measure is to promote earlier and cleaner replacement or upgrade of existing passenger locomotives to meet Tier 4 locomotive emission standards by 2023. If new locomotive engine emission standards beyond the current Tier 4 standards are established, this measure will seek the procurement of cleaner locomotives as the older locomotives are replaced or remanufactured.

Background

Diesel-electric locomotives have a large diesel engine (main traction engine) for generating electric power which in turn drives electric motors in each axle. Passenger locomotives have engines with about 3,800 horsepower and four drive axles. U.S. EPA locomotive emission standards apply to 1973 and newer locomotives upon engine rebuild and new 2002 and later locomotives. Locomotives remain in commercial service from 25 to 40 years.

Two passenger railroads, Metrolink and Amtrak, operate passenger train service in the Basin and the surrounding counties. Metrolink operates seven service lines, 57 stations, and moves approximately 40,000 passengers daily over a 512 track-mile network located almost exclusively within the Basin. Amtrak operates three interstate routes and one intrastate route that travel through the Basin. Metrolink locomotives contribute approximately 77 percent of passenger locomotive emissions of NO_x and PM_{2.5}, with Amtrak locomotives responsible for the remainder. Metrolink's fleet of 52 locomotives consists of 30 older Tier 0 locomotives and 22 Tier 2 locomotives. Metrolink is in the process of upgrading their fleet so that all locomotives will meet the cleanest (Tier 4) locomotive emission standards by 2023, which will result in a fleet with at least 85 percent lower emissions than the current fleet. Amtrak's fleet that travels in the Basin is almost exclusively locomotives meeting the Tier 0 emission standards and plans are being made to upgrade them to Tier 0+ emission standards since there is no requirement to purchase new locomotives that meet the current Tier 4 emission standard.

Regulatory History

U.S. EPA promulgated regulations for the control of emission from locomotives in 1998 and 2008. The regulations require locomotives to meet increasingly more stringent emission levels (Tier 0 thru Tier 4) when they are manufactured and in some cases additional emissions improvements when they are remanufactured at the end of their useful life. For newly manufactured passenger locomotives the cleanest emission standard (Tier 4) is required beginning in 2015 and will result in emissions that are over 90 percent cleaner than those from unregulated locomotive engines. For passenger locomotives manufactured before 2012 (i.e., meeting Tier 0, 1 or 2 emission standards), modest emissions improvements (referred to as "plus" standards) are required at the date of remanufacture which usually occurs seven to 10 years after the new locomotive is put into service.

Locomotives by design remain in operation for a long time (typically over 30 years). As such, emission reductions from natural turnover of the passenger locomotive fleet will take many years to be realized. Additionally, as most of the passenger locomotives operating in the Basin meet the Tier 0 or Tier 2 standards, they are only required to meet the more modest Tier 0 plus and Tier 2 plus standards on remanufacture unless they are replaced with new locomotives.

Proposed Method of Control

Metrolink's Board (Southern California Regional Rail Authority) has adopted a locomotive replacement plan which includes the procurement of Tier 4 locomotive engines to replace its 30 Tier 0 locomotives over the next five years. Metrolink has ordered 20 new Tier 4 locomotives with partial funding by the District from the Carl Moyer Program. In 2015, Metrolink received an additional award by the District from the Carl Moyer Program partially funding replacement of an additional 10 Tier 0 locomotives. The 2015 award included an additional locomotive to expand the fleet and a requirement that Metrolink repower nine Tier 2 locomotives with Tier 4 engines. The remaining 13

Tier 2 locomotives will be repowered with Tier 4 engines. These actions will result in 100% Tier 4 Metrolink passenger locomotives by 2023.

In addition, the District will encourage Amtrak to replace or repower their Tier 0 locomotives to meet Tier 4 locomotive emission standards rather than remanufacturing these engines.

Emission Reductions

Emission reductions from repowering the last 13 Tier 2 Metrolink locomotives to Tier 4 are estimated to be 0.32 ton/day for NO_x and 0.01 ton/day PM_{2.5} in 2023.

Cost-Effectiveness

Metrolink staff estimates that replacing their Tier 0 locomotives with new Tier 4 locomotives will cost approximately \$6.2 million per locomotive, and repowering their Tier 2 locomotives, approximately \$2.4 million each. Total cost to upgrade the fleet will be \$245 million. Assuming a 20-year locomotive life, the cost-effectiveness of the upgrades will be in the range of \$15,000 per ton of emissions reduced.

Implementing Agency

The Southern California Regional Rail Authority will be considering the procurement of additional Tier 4 locomotive engines. The implementation follows established CARB Carl Moyer Program Guidelines to ensure that emission reductions are quantifiable, surplus, enforceable and permanent.

- **Quantifiable:** Emission reductions are based on established calculations and records including historical usage, emission factors from engine certification data, and contracted years of operation.
- **Surplus:** Emission reductions are surplus to the federal locomotive regulations for rebuilding in-service locomotives and no State or local requirements regarding accelerated replacement or engine upgrade have been established.
- **Enforceable:** Emission reductions are enforceable through a written contract with Metrolink. Contract language provides several methods for ensuring that contracted emission reductions are obtained or District funding is recovered in the event contracts are not fulfilled.
- **Permanent:** Emission reductions are permanent because the old engines are destroyed.

References

CARB (2015). Carl Moyer Program Guidelines, Chapter 11 – Locomotives.

Southern California Regional Rail Authority (2012). Adoption of Locomotive and Equipment Fleet Plan.

**MOB-13: OFF-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION PROGRAM
[NOx, SOx, PM]**

CONTROL MEASURE SUMMARY					
SOURCE CATEGORY:		OFF-ROAD DIESEL-FUELED CONSTRUCTION, INDUSTRIAL EQUIPMENT, AIRPORT GROUND SUPPORT EQUIPMENT, AND DRILLING EQUIPMENT			
CONTROL METHODS:		ACCELERATED DEPLOYMENT OF TIER 4 EQUIPMENT AND NEAR-ZERO AND ZERO-EMISSION EQUIPMENT WHERE APPLICABLE			
EMISSIONS (TONS/DAY):					
ANNUAL AVERAGE	2012	2019	2022	2023	2031
NOX INVENTORY	29.61	23.98	18.42	17.01	10.20
NOX REDUCTION		TBD	TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD	TBD
PM2.5 INVENTORY	1.41	1.06	0.76	0.68	0.32
PM2.5 REDUCTION		TBD	TBD	TBD	TBD
PM2.5 REMAINING		TBD	TBD	TBD	TBD
SUMMER PLANNING	2012	2019	2022	2023	2031
NOX INVENTORY	35.07	28.50	21.88	20.22	12.08
NOX REDUCTION		TBD	TBD	TBD	TBD
NOX REMAINING		TBD	TBD	TBD	TBD
CONTROL COST:	TBD				
IMPLEMENTING AGENCY:	SCAQMD				

Description of Source Category

This measure seeks to develop mechanisms to incentivize the early deployment of zero and near-zero emission off-road mobile equipment where applicable or the early deployment of Tier 4 or cleaner combustion equipment where applicable through the generation of mobile source emission reduction credits that can be used only by entities affected by the 2016 AQMP control measures MOB-01 through MOB-04 and EGM-01. Any mobile source emission reduction credits generated cannot be used to offset emissions from stationary sources. The mobile

source emission reduction credits will be discounted to provide additional emission reductions to help meet air quality standards.

Background

Mobile source emission reduction credit generation programs have been developed by the District to provide an incentive to deploy cleaner, advanced technologies that are not otherwise required to comply with existing air regulations. Generation of such credits may be considered surplus and have been used to comply with other District regulations. The District continues to work with affected stakeholders on the development of mobile source emission reduction credit generation rules and the U.S. EPA to define an approach that can be approved into the SIP. This proposed measure provides a forum to continue such discussions with interested stakeholders and U.S. EPA.

Regulatory History

In 1995, the District adopted Rule 1620 – Credits for Clean Off-Road Mobile Equipment, which provides a protocol for entities to generate mobile source emission reduction credits that could be used for compliance with other District rules. Rule 1620 established a mechanism for the quantification of emission benefits as a result of implementation of projects that deployed cleaner off-road mobile equipment meeting the cleanest NOx emission standards (currently Tier 4) or were not otherwise required by a regulation or other enforceable mechanism. Mobile source emission reductions associated with the project are converted to credits that could be used by the project proponent or sold to other entities to meet other District rules as allowed by those regulations.

In May 1996, the District adopted an emission reductions credit generation rule for lawn and garden equipment. Rule 1623 – Credits for Clean Lawn and Garden Equipment focused on projects that replaced older gasoline powered lawn and garden equipment with new zero-emission models. Similar to Rule 1620, emission reduction credits generated under Rule 1623 can be used for compliance with other District rules if allowed by those rules.

Proposed Method of Control

This measure seeks to amend Rule 1620 to provide greater flexibility for entities to initiate projects to accelerate the deployment of zero and near-zero emission off-road mobile equipment in the Basin and Coachella Valley. The focus of the amendment will be to encourage the deployment of commercially available zero and near-zero emission off-road mobile equipment that do not receive or cannot receive public funding assistance. Mobile source emission reduction credits must be real, surplus, quantifiable, permanent, and enforceable as defined by U.S. EPA. As such, any project considered for generation of emission reduction credits must go beyond regulatory requirements.

For the purposes of this measure, a near-zero emission engine is one that is certified to be at least 90 percent cleaner than the current Tier 4 off-road emission standard for the horsepower specification of the off-road engine or meets the lowest optional NOx emission standard for on-road heavy-duty engines if the on-road engine is used in an off-road application. Zero-emission mobile equipment include, but are not limited to, commercially available battery-electric or fuel cell operated equipment.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual type and number of off-road vehicles participating in the program.

Rule Compliance and Test Methods

Compliance would be based on monitoring, recordkeeping, and reporting requirements that have been established in existing regulations. In addition, compliance would be verified through inspections and other recordkeeping and reporting requirements.

Cost-Effectiveness

Not determined.

Implementing Agency

SCAQMD

References

SCAQMD (1995). SCAQMD Rule 1620 – Clean Off-Road Mobile Equipment

SCAQMD (1996). SCAQMD Rule 1623 – Credits for Clean Lawn and Garden Equipment

**MOB-14: EMISSION REDUCTIONS FROM INCENTIVE PROGRAMS
[NO_x, PM]**

CONTROL MEASURE SUMMARY					
SOURCE CATEGORY:		ON-ROAD AND OFF-ROAD MOBILE SOURCE VEHICLES AND EQUIPMENT			
CONTROL METHODS:		IMPLEMENTATION OF FUNDING INCENTIVE PROGRAMS SUCH AS CARL MOYER MEMORIAL AIR QUALITY STANDARDS ATTAINMENT PROGRAM, PROPOSITION 1B, ETC.			
EMISSIONS (TONS/DAY):					
ANNUAL AVERAGE	2012	2019	2022	2023	2031
NOX INVENTORY	169.53	104.38	83.05	74.05	52.85
NOX REDUCTION		TBD*	TBD*	9.47*	5.62*
NOX REMAINING		TBD	TBD	TBD	TBD
PM2.5 INVENTORY	6.32	2.71	1.93	1.74	3.03
PM2.5 REDUCTION		TBD*	TBD*	0.25*	0.17*
PM2.5 REMAINING		TBD	TBD	TBD	TBD
SUMMER PLANNING	2012	2019	2022	2023	2031
NOX INVENTORY	167.85	108.07	83.75	58.76	53.24
NOX REDUCTION		TBD*	TBD*	10.97*	7.82*
NOX REMAINING		TBD	TBD	TBD	TBD
CONTROL COST:	\$18,262 PER TON (BASED ON THE MOST CURRENT CARL MOYER GUIDELINES)				
IMPLEMENTING AGENCY:	SCAQMD				

* Emission reductions reflect reductions associated with existing projects and future projects based on anticipated funding under the Carl Moyer Program and Proposition 1B. Specific reductions are provided in Tables 1 through 4 below.

Description of Source Category

The purpose of this measure is to develop a rule similar to SJVAPCD Rule 9610 – State Implementation Plan Credit for Emission Reductions Generated through Incentive Programs such that emission reductions generated through incentive programs can be credited in State Implementation Plan (SIP) emission inventories. Such emission reductions have been accounted in the development of historic base year emissions inventories where actual

emission reductions have occurred. Future emission reductions from adopted regulations can be credited towards attainment of air quality standards. However, future emission reductions as a result of incentive-based programs cannot be credited towards attainment prospectively without a demonstration and commitment that the reductions are real, quantifiable, surplus, enforceable, and permanent (for mobile sources to the extent of their useful life). The lack of a SIP-credibility mechanism is now a major constraint in developing future AQMPs since the reductions cannot be counted in the future year emissions baseline. This proposed measure would provide a new administrative mechanism to credit towards SIP requirements for future emission reductions achieved in the Basin through incentive programs administered by the District, CARB, or U.S. EPA.

Background

The District has a long history of successful implementation of incentive programs that help fund the accelerated deployment of cleaner engines and aftertreatment technologies in on-road heavy-duty vehicles and off-road mobile equipment. Such accelerated deployment not only result in early emission reductions, but also provides a signal for technology providers, engine and automobile manufacturers, and academic researchers to develop and commercialize the cleanest combustion engines possible and further the efforts to commercialize zero-emission technologies into a wider market. Some of the major incentive programs are discussed below.

Carl Moyer Memorial Air Quality Standards Attainment Program

In fiscal year 1998-99, the California State Legislature created the Carl Moyer Memorial Air Quality Standards Attainment Program, to facilitate the move to cleaner-burning engines, which otherwise would have taken decades. The program continues to drive early introduction of clean air technologies, and includes funding for measures that reduce NOx, VOC, and PM caused by the combustion of diesel fuel and gasoline in on-road vehicles and off-road engines. The program also funds after-treatment devices such as diesel oxidation catalyst and PM filters.

A variety of vehicle classes and types are funded under the Carl Moyer Program to help purchase new vehicles or new engines/repowers and for installation of retrofit units on older engines. New vehicles and engines must achieve a least 30 percent reduction, and repowered vehicles and retrofits must achieve a 15 percent reduction of NOx emissions compared to current emission standards. New on-road engines should be CARB-certified to meet an optional NOx emissions standard and retrofits should be CARB-verified. Projects reducing PM and/or VOC are also eligible for funding provided they are cost-effective. Alternative fuel engines, such as those using compressed natural gas, liquefied natural gas, propane and electricity will be given preference for funding if less polluting. Cleaner diesel engines may also be considered in the off-road category.

Vehicles and equipment funded must remain in operation for at least three years, and 75 percent of their use must be within the Basin. All potential projects must meet cost-effectiveness requirements to be eligible for funding consideration.

The Carl Moyer Program under its new guidelines also includes “Fleet Modernization” and “Light-Duty Vehicle Repair and Scrapping” programs. The fleet modernization Program replaces older heavy-duty diesel vehicles with 2007 and newer diesel or 2010 and newer natural gas vehicles. The Light-Duty Vehicle Repair and Scrapping Program identifies high polluting light-duty vehicles with remote sensing and offers repair or scrapping options.

Proposition 1B – Air Quality Improvement Fund

In 2006, California voters approved a bond measure called Proposition 1B. The bond measure would generate \$19 billion of which \$2 billion would go towards improving California's freight transportation infrastructure, \$1 billion towards the cleaning up older diesel vehicles, and \$200 million to school bus retrofits. The funding is predicated on bond sales. To-date, over 6,000 older diesel trucks have been replaced with either newer diesel trucks or alternative fuel trucks. In addition, Proposition 1B funding has helped with installation of shore side power for marine vessels and assisted in the purchase of cleaner locomotives. Proposition 1B is in its final year and the last round of funding is anticipated to help cover the cost for the replacement of 1,000 older trucks and a number of cargo handling equipment and locomotives.

The U.S. EPA recently provided an overview of six components that a measure would need to consider at a minimum, in order for U.S. EPA to determine if the emission reductions can be approved into the SIP. The six components are based on U.S. EPA's analysis of the various voluntary emission reduction program guidance that U.S. EPA has issued to-date and the six components are common among the guidance. The six components are:

- Demonstration/documentation that the emission reductions associated with the economic incentive programs (EIP) are quantifiable, surplus, enforceable, and permanent.
- An enforceable commitment to monitor emission reductions achieved by EIPs and to rectify shortfalls in emission reductions no later than statutory implementation deadlines.
- Technical analyses/support – documentation to explain how the State/District have relied upon EIP emission reductions in the emission inventories, RFP demonstration, and attainment or maintenance demonstration, as applicable
- Demonstration of State funding and legal authority – documentation to show that State has adequate funding, personnel, implementation authority, and other resources to implement the EIP on schedule
- Procedures for public disclosure of information – provisions to ensure that EPA and the public have access to emission data in accordance with the requirements of the Clean Air Act, Section 114 and U.S. EPA's implementing regulations in 40 CFR 2.301.
- Provisions to measure and track programmatic results – evaluation procedures to retrospectively determine overall effectiveness of program and procedures to correct emissions projections.

Emission reductions in 2023 and 2031 associated with projects awarded to-date and projected emission reductions as a result of future awards are provided in Tables 1 through 4, respectively.

TABLE 1

NOx and PM Emission Reductions in 2023 Associated with Existing Project Awards

Funding Source	Implementation Status	Project Types	No. of Units	NOx tons/day	PM tons/day
AB 923	2013	School Bus Replacement	264	0.15	0.01
Prop 1B	Projects implemented since 2013 and still operational in 2023	Freight Locomotives	10	0.14	0.01
SB 1107 & AB 923	In operation since 2013 and still operational in 2023	Off-road Equipment		1.71	0.05
		Harbor Craft (Fishing Vessels)		1.96	0.07
		Freight Locomotives		0.87	0.02
Total				4.84	0.16

TABLE 2

Projected NOx and PM Emission Reductions in 2023 Associated with Future Funding

Funding Source	Implementation Status	Project Types	No. of Units	NOx tons/day	PM tons/day
AB 923	Future Projects from 2017 to 2023	School Bus Replacement	600	0.22	0.01
Prop 1B	Future Projects to be implemented by end of 2016 through 2019	Cargo Handling Equipment	29	0.16	0.00
		Freight Locomotives	10	0.14	0.01
SB 1107 & AB 923	Projected from 2017 through 2023	On-road		4.11	0.03
Total				4.63	0.05

TABLE 3

NOx and PM Emission Reductions in 2031 Associated with Existing Project Awards

Funding Source	Implementation Status	Project Types	No. of Units	NOx tons/day	PM tons/day
AB 923	2016	School Bus Replacement	144	0.05	0.00
Prop 1B	Projects implemented since 2013 and still operational in 2031	--	--	--	--
SB 1107 & AB 923	In operation since 2013 and still operational in 2031	Off-Road		1.71	0.05
		Freight Locomotives		0.87	0.02
Total				2.63	0.07

TABLE 4

Projected NOx and PM Emission Reductions in 2031 Associated with Future Funding

Funding Source	Implementation Status	Project Types	No. of Units	NOx tons/day	PM tons/day
AB 923	Future Projects from 2017 to 2031	School Bus Replacement	600	0.22	0.01
Prop 1B	Future Projects to be implemented by end of 2016 through 2019	Cargo Handling Equipment	29	0.16	0.00
		Freight Locomotives	10	0.14	0.01
SB 1107 & AB 923	Projected from 2017 through 2031	On-road Heavy-Duty Trucks		2.47	0.02
Total				2.99	0.04

Regulatory History

In addition to the legislature introducing the Carl Moyer Program, SB 1107 and AB 923 were passed with support from the business community, environmental groups, and public agencies, which provide a long-term source of funding for the expansion of the Carl Moyer Program.

Proposed Method of Control

The proposed measure is based on the implementation of the financial incentives programs currently implemented by the District such as the Carl Moyer Program and Proposition 1B. The measure proposes to take credit for the emission reductions achieved through past and future projects funded under these programs for SIP purposes. Examples of projects include on-road heavy-duty vehicle modernization, installation of retrofit units, and engine repowers. The emission reductions are provided in two parts. The first part of the measure is the actual emission reductions associated with current projects that will have remaining useful life in 2023 and 2031. The second part of this measure is based on future reductions to be achieved from the implementation of new projects under the Carl Moyer Program and other incentive programs such as Proposition 1B. These reductions were estimated based on the committed level of funding for this Program and a conservative cost-effectiveness assumption of \$18,262 per ton specified in the Carl Moyer Program guidelines (although existing projects have substantially lower cost-effectiveness). Emission reductions associated with both parts are shown in Tables 1 through 4.

Emission Reductions

The emission reductions from existing projects that will have remaining useful life and projected future projects based on current funding levels of the control measure are reflected in the Control Measure Summary Table. In addition, the implementation of Light-Duty Vehicle Repair and Scrapping will start generating VOC emission reductions.

Rule Compliance and Test Methods

The District has developed policies and procedures to ensure that this control measure is successfully implemented. In addition to the District's requirements for program implementation, the District adheres to CARB's Carl Moyer Guidelines. Because the Carl Moyer Program is implemented by a partnership of CARB and the District, CARB has oversight authority to ensure that funds are expended as required by the Health and Safety Code and to ensure that the Carl Moyer Program Guidelines are met. CARB is required to audit the District's program by reviewing the District's solicitation, evaluation, selection, contract, and invoicing process. CARB staff also visits a sample of funded projects to ensure that public funds are used to pay for qualifying projects that are operating and obtaining emission reductions.

Cost-Effectiveness

The cost-effectiveness of this control measure is based on the Carl Moyer Program guidelines, which is currently set at an upper limit of \$18,262 per ton.

Implementing Agency

CARB

References

SJVAPCD (2013). SJVAPCD Rule 9610 – State Implementation Plan Credit for Emission Reductions Generated Through Incentive Programs.

U.S. EPA (2016). Presentation at the SCAQMD 2016 AQMP Advisory Group Meeting (May 4, 2016).

SECTION 2

PM2.5 CONTROL MEASURES

BCM-01: FURTHER EMISSION REDUCTIONS FROM COMMERCIAL COOKING [PM]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	UNDER-FIRED CHARBROILERS		
CONTROL METHODS:	ADD-ON CONTROL EQUIPMENT WITH VENTILATION HOOD REQUIREMENTS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
PM2.5 INVENTORY	10.4	11.9	12.3
PM2.5 REDUCTION			3.3*
PM2.5 REMAINING		11.9	9
CONTROL COST:	\$15,000–\$18,000/TON		
IMPLEMENTING AGENCY:	SCAQMD		

* Reductions are designed to serve as a contingency measure and are approximate. Reductions will be submitted into the SIP once final feasible control levels are established.

Description of Source Category

This proposed control measure would seek PM reductions from commercial under-fired charbroilers.

Background

Cooking activities are the largest source of directly emitted PM_{2.5} emissions in the Basin. The inventory estimates provided in the above summary table include emissions from charbroilers (chain-driven and under-fired), griddles, deep fat fryers, ovens, and other equipment. However, under-fired charbroilers are responsible for the majority of emissions from this source category (2007, SCAQMD) given the higher emission potential when compared with other cooking devices (e.g., 32.5 lbs per 1,000 lbs of meat cooked via under-fired-charbroiler compared to 5 lbs PM per 1,000 lbs of meat cooked via a griddle). An under-fired charbroiler consists of three main components: a heating source, a high temperature radiant surface, and a slotted grill (grate). The grill holds the meat or other food while exposing it to the radiant heat. PM and VOC emissions occur when grease from the meat falls onto the high temperature radiant surface. Most under-fired charbroilers burn natural gas; however, solid fuels, such as charcoal or wood with or without the addition of ceramic stones, are sometimes used. Restaurant PM emissions are also classified as a black carbon source which recent studies identify as contributing to climate change both directly by absorbing sunlight and indirectly by disrupting cloud formation, precipitation patterns and water storage in snow pack.

Regulatory History

Efforts to reduce PM emissions from commercial cooking activities have been included in AQMP control measures since the early 1990s. While the goal has been to develop a comprehensive rule applicable to all commercial

cooking activities the only available, cost-effective PM control was initially limited to chain-driven charbroilers. In 1997, the SCAQMD Governing Board adopted Rule 1138 – Control of Emissions from Restaurant Operations, which requires chain-driven charbroilers to install a catalytic oxidizer (or equivalent) control device. These types of charbroilers were uniquely suited for the implementation of commercially available, low cost catalyst oxidizers (flameless incineration) which operate with the necessary exhaust temperature of 700–800° F. Rule 1138 applies to commercial cooking operations with chain-driven charbroilers cooking more than 875 pounds of meat per week and required control devices must be certified to achieve an 83 percent reduction in PM emissions.

Since adoption of Rule 1138, SCAQMD staff efforts to reduce emissions from commercial cooking operations have been focused on under-fired charbroilers and a series of reports were made to the SCAQMD Governing Board in 1999, 2001, and 2004 to present results of under-fired charbroiler control technology research. Affordable controls were not commercially available at that time for under-fired charbroilers.

In 2007, the Bay Area Air Quality Management District (Bay Area AQMD) adopted Regulation 6, Rule 2 (Commercial Cooking) which included provisions for both chain-driven and under-fired charbroilers. The Bay Area regulation requires a catalytic oxidizer for chain-driven charbroilers with a throughput of at least 400 pounds of beef per week. Under-fired charbroilers with more than 10 square feet of cooking area are required to limit emissions to 1 pound of PM₁₀ per 1,000 pounds of cooked beef (greater than 90 percent reduction in direct PM emissions) under the Bay Area rule. Requirements for chain-driven charbroilers have been successfully implemented, however, there are no commercially-available devices that meet the Bay Area AQMD emissions standards for under-fired charbroilers.

As a result of the Bay Area regulation, a subsequent SCAQMD rule development effort to control PM emissions from under-fired charbroilers was initiated in 2008. A Working Group of approximately 35 members from affected industry, equipment manufacturers and researchers was formed to initially discuss current research and later to provide comment on draft rule language. Three working group meetings were held in 2008 and 2009 and a public workshop was held in August 2009. Due to concerns over control device availability and initial equipment costs affecting small businesses, Proposed Rule 1138 amendments were postponed. Instead, SCAQMD initiated further research on under-fired charbroiler control technologies with the goal of identifying and testing lower cost devices.

In 2015 the New York City Department of Environmental Protection (DEP) initiated a program to reduce PM emissions from commercial charbroilers. The DEP program generally follows SCAQMD and other California air district requirements for chain-driven charbroiler restaurants (e.g., flameless catalytic oxidizers) but also establishes requirements for new restaurants with under-fired charbroilers. Specifically, the DEP regulation prohibits operation of a new under-fired commercial charbroiler cooking more than 875 pounds of meat per week unless an Electrostatic Precipitator (ESP) or other type of device achieving a 75 percent PM₁₀ reduction (including condensable PM) is installed. Provisions for certification of emissions control devices and recordkeeping requirements are also established by the DEP program which is in effect as of September 1, 2016 (New York City, 2016).

AB 32 (California Global Warming Solutions Act of 2006) includes provisions to achieve and maintain Statewide GHG emission limits, however, recent legislation [Senate Bill 605 (SB 605), Lara, Chapter 523, Statutes of 2014] requires CARB to develop a plan to reduce what are referred to as short lived climate pollutants, including black carbon. In response to SB 605, CARB has recently circulated for comment the Short-Lived Climate Pollutant

Reduction Strategy (SLCP Reduction Strategy) which acknowledges the benefits from control of smaller sources of PM, including commercial cooking.

Control Technology Research

In October 2011, the SCAQMD Governing Board approved approximately \$200,000 for control device testing and authorized the release of a Program Opportunity Notice (PON) to solicit proposals from control device manufacturers. Under the PON process, SCAQMD staff and an inter-agency working group consisting of representatives from U.S. EPA, SJVAPCD and Bay Area AQMD reviewed manufacturer proposals based on anticipated emission reductions and available cost data. Equipment showing promise would be subject to an initial screening test. Based on screening results, equipment could be tested using the full SCAQMD Test Protocol for Determining PM Emissions from Under-fired Charbroilers. All testing was initially funded by SCAQMD and conducted under an existing contract with the University of California at Riverside – Center for Environmental Research and Technology (CE-CERT). Subsequent additional funding was provided by U.S. EPA, and the Bay Area AQMD has funded a related charbroiler testing project at the CE-CERT facility.

To date, screening tests have been conducted on control device configurations provided by eight manufacturers. Protocol tests were then conducted on the most promising technologies and draft test results have been received on five control device configurations. Types of devices include commercially or near-commercially available technologies, including a multi-stage filter system, an Electrostatic Precipitator (ESP), and an in-hood baffle filter. Protocol tests were also conducted on prototype designs consisting of an inertial separator/aerosol mist device and a ceramic filter with microwave regeneration. Draft test results and preliminary device cost information is presented in Table 1. The preliminary cost information is for control devices only and does not include installation or operation costs which can vary significantly based on the facility. Also, cost estimates for new facilities represent an incremental increase in costs to what traditionally would have been installed whereas a retrofit device installed at an existing facility may require a complete system overhaul including fire suppression, ventilation, and electrical components which would be expected to increase cost estimates.

TABLE 1
Draft Control Device Testing Results and Preliminary Cost Estimates

Device Type	PM Control Efficiency	Preliminary Device Cost Estimates
Electrostatic Precipitator (ESP)	86%	\$31,000
Multi-Stage Filter	80%	\$47,000
Ceramic Filter/Microwave Regeneration	63%	\$20,000
Centrifugal Separator/Aerosol Mist Nebulizer	58%	\$27,000
In-Hood Baffle Filter (new – retrofit)	25%	\$225–\$250/linear ft. of exhaust hood

In addition to the above technologies, SCAQMD staff is reviewing test results from a low cost device intended to reduce emissions by preventing the generation of smoke at the source instead of removing particulates from the exhaust stream with a traditional PM control device. SCAQMD staff are also reviewing other promising

technologies intended to provide low to mid-range control efficiencies at lower costs. All of the CE-CERT test results and manufacturer supplied cost data, along with previous control device testing, are being compiled and will be presented in a technical and cost feasibility analysis intended to guide future regulation of PM emissions from under-fired charbroilers.

An additional action was approved by the SCAQMD Governing Board in 2011 to develop a companion \$150,000 contract with CE-CERT to further characterize emissions from under-fired charbroilers. A draft of the report, entitled "Characterization of Under-Fired Charbroiler Emissions" has been received by SCAQMD and the report confirms that under-fired charbroiler PM emissions are primarily less than one micron in size, are dominated by organic carbon and include compounds which are known toxics, mutagens, and carcinogens. As presented in Figure 1, the CE-CERT Characterization report also documented that several of the control technologies could significantly reduce Polycyclic Aromatic Hydrocarbons (PAHs) compounds which have mutagenic and carcinogenic properties. Applicable information from the characterization study will be included in the technical and cost feasibility report.

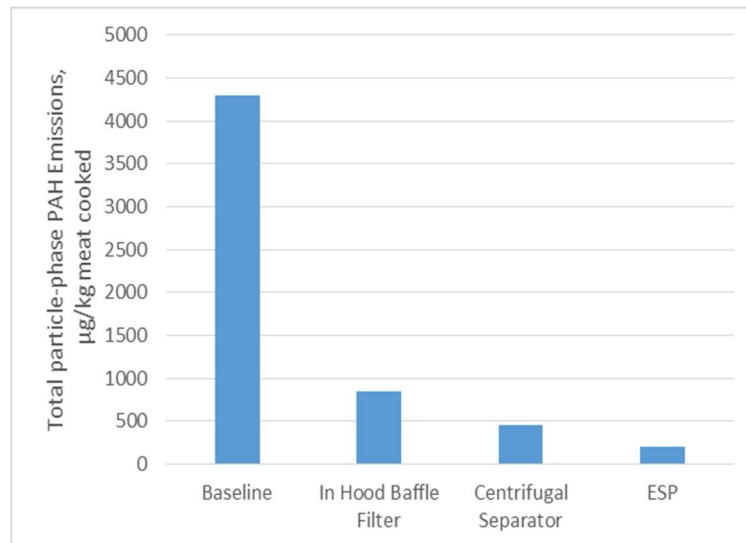


FIGURE 1

Particle-phase PAH Emissions for Baseline Test and Three Control Technologies

The SJVAPCD strategy for meeting the federal PM_{2.5} NAAQS includes plans to expand their commercial charbroiling rule. Through a public rule development process, SJVAPCD plans to further reduce air pollutant emissions from under-fired charbroilers beginning in 2017. For reference, the 2012 SJVAPCD PM_{2.5} plan estimated a 20 percent reduction in PM_{2.5} emissions was feasible by placing requirements on restaurants with under-fired charbroilers. In anticipation of the rule development effort, the SJVAPCD Governing Board authorized \$750,000 in funding to conduct a series of demonstration projects where participating restaurants will be provided funding for the full cost to purchase, install, and maintain PM control device systems over two years of operation. Participating restaurants will be allowed to keep the equipment after the demonstration period has concluded. Project funding was approved in June of 2015 and a control device has been installed in one

restaurant and SJVAPCD staff is currently negotiating agreements between other control device vendors and host restaurants with the goal of up to five demonstration sites. SCAQMD staff is reviewing the SJVAPCD demonstration project as part of the technical and cost feasibility report.

Proposed Method of Control

The proposed reductions are designed to serve as a contingency measure. It will be implemented if the Basin does not attain the PM_{2.5} annual standard by 2025.

Emissions from under-fired charbroilers continue to be a significant contributor to the direct PM_{2.5} emission inventory. To date, a variety of control device technologies have been tested by CE-CERT and SCAQMD staff and the inter-agency working group has reviewed draft test results. SCAQMD staff has also reviewed existing and proposed under-fired charbroiler control programs undertaken by the Bay Area AQMD, the San Joaquin Valley APCD, and the New York City DEP.

Testing conducted by CE-CERT and the demonstration projects in the San Joaquin Valley show control technology for under-fired charbroilers has continued to develop over the past few years. Identification of affordable, commercially-available PM control technologies, especially for retrofit projects at existing restaurants, remains elusive. If necessary to meet contingency measure commitments, the SCAQMD is proposing to require PM control devices for new restaurants with high-use under-fired charbroilers, provided appropriate control devices can be identified. Requiring control devices for new restaurants would allow control systems to be designed into the proposed ventilation system thereby avoiding potentially prohibitive retrofitting costs. Applicability thresholds and the required PM control efficiency would be established during the rule development process.

If needed, a delayed effective date would be proposed to allow control device manufacturers to submit equipment for evaluation using the under-fired charbroiler testing protocol and equipment would be certified based on test results. Applicable sources could then select the control device which met operational needs and certification standards as required by a potential future SCAQMD regulation. Similar to existing Rule 1138 provisions, efforts could also be taken to develop a control device registration program as an alternative to the SCAQMD permit process.

The longer term goal of this control measure, if necessary to meet contingency measure commitments, would be to potentially develop requirements for existing restaurants based on the above described SCAQMD experiences and continuing efforts by other air agencies to develop under-fired charbroiler control programs. Following identification of affordable commercially-available control devices for existing restaurants, a tiered program could be developed that targets higher efficiency controls for under-fired charbroilers at large volume restaurants, with more affordable, lower efficiency controls at smaller restaurants. Small business incentive programs funded by mitigation fees or other sources could also be explored to help offset initial purchase and installation costs for existing restaurants.

Emission Reductions

If triggered as a contingency measure, the proposed control program for new under-fired charbroiler sources would limit emissions growth from this source category. Based on information from the control measure summary, existing emissions from this source category are projected to increase from 11.9 tons to 12.3 tons per day from

2021 to 2025, or 0.4 tons per day. Those emissions estimates are from all commercial cooking sources although under-fired charbroiler emissions are the largest portion of this source category. Emissions reductions from requirements for new under-fired charbroilers cannot be estimated until the applicability threshold and the control device efficiency requirement has been established. For comparative purposes, uncontrolled emissions from an under-fired charbroiler cooking 1,250 pounds of beef per week were estimated at approximately one ton of PM2.5 per year (SCAQMD, 2009).

If commercially-available, affordable control devices can be identified requiring existing high activity charbroiler restaurants to install control devices with at least an 80 percent control efficiency has been estimated to reduce emissions by approximately 2 tons per day by 2025. Establishing a requirement for existing lower activity restaurants to install a lower efficiency (e.g., 25 percent) control devices has been estimated to yield an additional 1.3 tons of PM2.5 reductions per day. Taken together, the requirements for existing high and lower use charbroiler restaurants to install PM control devices has been estimated to reduce emissions by approximately 3.3 tons of directly emitted PM2.5 per day by 2025. Reducing directly emitted PM emissions from commercial cooking is also consistent with the SLCP Reduction Strategy goals to reduce black carbon emissions.

Rule Compliance and Test Methods

Compliance determinations could be made through inspections aided by facility recordkeeping and equipment registrations or certifications.

The “Protocol – Determination of Particulate and Volatile Organic Compound Emissions from Restaurant Operations” is the test method currently being used for testing of charbroilers and potential control devices. The test methods are used by qualified labs to certify the emissions level of specific control systems but are not employed to test emissions at individual restaurants.

Cost-Effectiveness

A cost effectiveness assessment for new restaurants to install a PM control device for high use, under-fired charbroilers will be conducted as part of the rule development effort. The cost effectiveness for a restaurant cooking 1,250 pounds of beef per week to install a control device with 85 percent PM control efficiency was previously estimated at approximately \$8,000 per ton of PM2.5 reduced (SCAQMD, 2009).

If affordable, commercially-available control devices can be identified, the cost-effectiveness associated with achieving 2 tons per day reduction by requiring existing high use under-fired charbroiler restaurants to install 80 percent efficient control devices has been estimated at approximately \$15,000 per ton PM2.5. The cost-effectiveness of requirements for existing lower activity restaurants to install lower efficiency devices has been estimated at approximately \$18,000 per ton of PM2.5 reduced. SCAQMD staff continues to work with control device manufacturers and restaurants to quantify costs, especially for retrofit technologies. SCAQMD staff would analyze industry cost impacts as part of any potential rule development process. In addition to cost-effectiveness, given that many restaurants are small businesses, affordability will also be assessed relative to capital and installation costs, as well as ongoing operational costs. Where affordability may be an issue for smaller, low-volume restaurants an incentive program to help cover capital costs may be beneficial. As mentioned, small business incentive programs funded by mitigation fees or other sources could be explored to help offset initial purchase and installation costs for existing restaurants.

Implementing Agency

The SCAQMD has the authority to regulate PM emissions from restaurant operations. SCAQMD staff also participates in an informal restaurant emissions working group with staff from other California air districts and U.S. EPA. During this process, participating agencies have shared staff resources and provided funding to conduct research projects.

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**BCM-02: EMISSION REDUCTIONS FROM COOLING TOWERS
[PM]**

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	INDUSTRIAL COOLING TOWERS		
CONTROL METHODS:	DRIFT ELIMINATOR		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
PM10 INVENTORY	TBD	TBD	TBD
PM10 REDUCTION		TBD	TBD
PM10 REMAINING		TBD	TBD
CONTROL COST:	TO BE DETERMINED		
IMPLEMENTING AGENCY:	SCAQMD		

Description of Source Category

This control measure seeks reductions of PM emissions from industrial cooling towers through the use of the latest drift eliminator technologies. The proposed control measure will reduce PM emissions from existing cooling towers by requiring the use of more efficient drift eliminators that keep drift losses to 0.001 percent of the circulating water flow rate (0.0005 percent for newly constructed cooling towers), which will also result in water conservation.

Background

According to the surveys conducted in 1988 by the SCAQMD for the development of Rule 1404 – Hexavalent Chromium Emissions from Cooling Towers, there were approximately 4,300 cooling towers operating in the Basin. Industrial cooling towers are widely used to remove large amounts of heat absorbed in the circulating cooling water systems at power plants, petroleum refineries, petrochemical plants, natural gas processing plants, etc. A large cooling tower at a refinery typically handles approximately 350,000 gallons of water per minute, but most industrial cooling towers are considerably smaller. Industrial cooling towers can be mainly classified into dry towers and wet towers.

Wet Cooling Towers

Wet cooling towers (direct or open circuit cooling tower) are enclosed structures containing a labyrinth-like packing or “fill” and are operated on the principle of latent and sensible cooling. The sensible cooling occurs as the air temperature increases by absorbing heat from the process water. The latent cooling occurs as some of the process water evaporates. As a result, hot water from the process stream is cooled as it descends through

the fill while in direct contact with air that passes through it. The cooled water is collected in a cold water basin and is recycled to absorb more heat. The heated air leaving the fill is discharged to the atmosphere. Wet cooling towers can be further categorized as mechanical-draft and natural-draft cooling towers.

Mechanical-draft cooling towers use large fans to force or draw air through the cooling towers, and are referred to as forced or induced-draft. Mechanical forced-draft cooling towers use mounted fans from the sides to force air into the towers. The more common induced-draft towers use mounted fans at the top to draw air in through the sides and expel it through the top of the towers. The induced draft towers discharge warm air at higher velocities, resulting in better dispersion of the expelled air, minimizing re-circulation of discharged air flow back into the air intake, thus maximizing cooling towers performance.

Natural-draft cooling towers generate airflow from natural driving pressure caused by the difference in density between the outside cool air and the inside hotter, humid air. The driving pressure is a function of the outside and inside air density and the height of the cooling tower. Natural-draft cooling towers require significant height (can be in excess 500-foot height) to generate the required airflow through the tower and is less aesthetically desirable.

Dry Cooling Towers

Dry cooling towers are closed systems where circulating water does not interact with ambient air and heat rejection occurs through sensible heat transfer. Sensible heat transfer is achieved by passing the circulating water through finned tubes over which ambient air is passed. Sensible heat transfer limits the maximum attainable water outlet temperature to the local ambient dry bulb temperature.

Although dry cooling towers do not directly emit any pollutants to the atmosphere, they generate indirect emissions due to additional parasitic losses and reduced heat transfer efficiency. Parasitic losses result from the additional fan load required to move more air in dry cooling towers. Reduced heat transfer efficiency and parasitic losses will require increased fuel consumption to attain an equivalent power output. In addition, according to U.S. EPA, the installation cost of a dry cooling tower would be approximately 3.3 times that of an equivalent wet cooling tower.

Drift Issues Associated with Wet Cooling Towers

Since wet cooling towers provide direct interaction of the cooling water and the air passing through, some of the water may be entrained in the air stream and carried out of the cooling towers as drift droplets. Drift droplets contain the same minerals and chemicals as the circulating water, and can be converted to airborne emissions upon release. Drift droplets can also potentially carry bacteria such as Legionella. Inhaling airborne water droplets containing Legionella can pose significant health issues.

Large drift droplets that settle out of the exhaust air stream and deposit near the towers can cause damage to surrounding equipment and vegetation due to wetting, icing, and salt deposit. Other drift droplets evaporate before being deposited on the surrounding areas, discharging PM emissions as the drift droplets evaporate and form fine particulate matter by crystallization of dissolved solids. The rate of PM discharged to the atmosphere depends upon the following:

- The mass fraction of Total Dissolved Solids (TDS) in circulating water;

- Drift factor which is the percentage of water that leaves as drift droplets with respect to circulating water flow rate; and
- Circulating water flow rate through the tower.

In addition to PM, heavy toxics may also be released through drift droplets. Toxic compounds may be introduced to the circulating water intentionally (as with chromium compounds for water treatment) or as a result of leakage from a process heat exchanger that handles fluid containing toxics.

The amount of solid mass in each drop is dependent on the TDS content and drift droplet size distribution. The estimated fraction of PM emissions as PM₁₀ and PM_{2.5} therefore varies with TDS content.

Drift rates range between 0.01 percent and 0.0005 percent of the circulating water flow, for the 1970s era cooling towers to the cooling towers with advanced technology that are available currently, respectively.

Regulatory History

Cooling towers are largely exempt from permits requirement under Rule 219 – Equipment Not Requiring a Written Permit Pursuant to Regulation II, which exempts towers that are not used to cool process water by evaporation and do not use chromium compounds to treat circulating water. In the past, chromium compounds were added to cooling tower water to protect equipment and piping from corrosion, and to control algae growth in the towers.

Cooling towers that have used hexavalent chromium for water treatment are subjected to Rule 1404. Rule 1404 phased-out the use of hexavalent chromium (Cr+6) and limited the concentration of Cr+6 in circulating water to 0.15 mg/L as of 1990. The use of Cr+6 in cooling towers built after 1990 is prohibited in the Basin. However, older cooling towers might still emit chromium, but that is likely only in trace quantities.

SCAQMD rules pertaining to PM mass rates and concentrations in discharged air could be applied to cooling towers (Rule 404 – Particulate Matter - Concentration and Rule 405 – Solid Particulate Matter - Weight). However, these rules are generally ineffective for the control of PM emissions from cooling towers due to characteristically lower emission rates or concentrations.

Proposed Method of Control

Drift eliminators are usually incorporated into the design of cooling towers to limit the amount of drift droplets from the air stream before air exits the towers. Drift eliminators rely on the inertial impaction principle caused by sudden change in direction of the air stream passing through the eliminators. The momentum of the heavier water droplets causes them to separate from the air stream and impinge against the drift eliminators. The water droplets coalesce into a film that will fall back into the towers.

Drift eliminator configurations include blade-type, wave form, and cellular designs. They can be made of ceramics, fiber reinforced cement, fiberglass, metal, plastic, and wood, formed into closely spaced slats, sheets, honeycomb assemblies, or tiles. The selected materials may include other features, such as corrugations and water removal channels to further enhance drift removal rates.

Blade drift eliminators are more durable compared to other configurations due to their heavier gauge blades. They are designed for effectively capturing drift droplets in a most cost-effective manner.

In general, cellular drift eliminators provide the greatest effective surface area for maximum drift removal efficiency at minimum pressure drop. With proper installation, a cellular drift eliminator can keep drift losses to less than 0.001 percent of the recirculating water flow rate, resulting in water savings as well. In addition, cellular drift eliminators can be trimmed for a tightest fit, hence further improve the drift eliminator efficiency.

Cooling towers built in the 2000s have a drift rate of 0.001 percent while the older ones built in 1970's and 1990's have higher drift rates (0.01–0.002 percent). The proposed control measure will seek to phase-in the use of drift eliminators with 0.001 percent drift rate for existing cooling towers where cost-effective. This can be achieved by retrofitting the older cooling towers with a modification to the cooling fans to accompany the drift eliminators. Newly constructed cooling towers have demonstrated ultra-low drift rate of 0.0005 percent. This drift rate has been achieved in practice and could be considered BACT for new construction.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

To be determined.

Cost-Effectiveness

To be determined.

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources such as cooling towers.

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**BCM-03: FURTHER EMISSION REDUCTIONS FROM PAVED ROAD DUST SOURCES
[PM]**

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	PAVED ROAD DUST		
CONTROL METHODS:	MINIMUM STREET SWEEPING FREQUENCY, TARGETED CLEANING OF ROADS WITH HIGH SILT LOADINGS, WHEEL WASHING SYSTEMS FOR STATIONARY SOURCES		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
PM2.5 INVENTORY	7.8	8.5	8.7
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TO BE DETERMINED		
IMPLEMENTING AGENCY:	SCAQMD		

Description of Source Category

The purpose of this control measure is to reduce paved road dust emissions.

Background

Particulate emissions occur whenever vehicles travel over a paved surface such as a road or parking lot through the re-suspension of loose material. Paved road dust emissions have been found to vary with what is termed the “silt loading” present on the road surface. Silt loading is more specifically defined as the mass of silt-sized material (> 75 micrometers in diameter) per unit area of the travel surface. Sources affecting silt loading generally include: 1) pavement wear and decomposition; 2) vehicle-related deposition; 3) dust fall; 4) litter; 5) mud and soil carryout from unpaved areas; 6) erosion from adjacent areas; 7) spills; 8) biological debris; 9) ice control compounds; 10) recent precipitation history; and 11) recent road sweeping/cleaning history. Because of the importance of silt loadings to emissions, paved road dust control techniques attempt to either prevent material from being deposited on the surface (preventative controls) or remove material deposited on travel lanes (mitigative controls). Examples of preventative controls include covering of haul trucks or paving of access areas to construction sites. Street sweeping is an example of a mitigative control. In general, preventative controls are usually more cost-effective than mitigative controls to reduce paved road dust PM emissions.

Regulatory History

In accordance with U.S. EPA guidance, SCAQMD has implemented programs to reduce paved road dust emissions through both preventative and mitigative controls. SCAQMD Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations, for example, requires access improvements which are intended to reduce the amount of material tracked out from a facility onto surrounding paved public roads. Similarly, SCAQMD Rule 403 – Fugitive Dust, requires access improvements for sites greater than five acres and all material tracked out from applicable sources must be removed at the conclusion of the work day or at any time it extends more than 25 feet out from a site. SCAQMD Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations, includes requirements for local governments which are responsible for public paved road construction and maintenance activities. Rule 1186 requires new or widened roads to be constructed with curbing or, as an alternative, paved shoulders. Local governments are also required to remove material deposited onto roads as a result of wind, water erosion, or by other means, and are also required to procure only SCAQMD Rule 1186-certified street sweepers when replacing equipment.

Proposed Method of Control

Existing SCAQMD Rules 1157 and 403 requirements to reduce track out from stationary sources (e.g., aggregate facilities, construction sites, landfills, etc.) are based on a list of options. Further emission reductions could be achieved by specifying the most effective track out prevention measures, such as use of a wheel washing system, for sites with high vehicular activity exiting the site, or those with repeated track-out violations.

Existing Rule 1186 requires the procurement of Rule 1186-certified street sweepers for equipment purchases or contracts initiated after January 1, 2000. Based on information provided by local governments, street sweepers typically have a useful life of seven to 10 years, and thus presumably, all street sweepers in use today by local governments are certified devices. Rule 1186 requires that certified equipment be used on public roads currently subject to routine street sweeping but does not specify frequency. Accordingly, further paved road dust PM2.5 emission reductions could be sought through specifying the frequency of street sweeping. In the San Joaquin Valley, for example, a regulation requires street sweeping at a frequency of at least once per month for roads where sweeping is conducted. Street sweeping as part of routine roadway and highway maintenance may be included in a state, regional and/or local jurisdiction's National Pollutant Discharge Elimination System (NPDES) permits as part of federal Clean Water Act provisions to reduce debris from entering the storm drain system. NPDES permits are governed by the U.S. EPA and issued and maintained by regional water quality control boards. SCAQMD will coordinate with NPDES permittees and regional water quality control boards to ensure rules of this Plan or future Plans do not conflict with or otherwise compromise NPDES permit requirements. This review is not intended to be a part of the NPDES permit approval process or a reevaluation of existing NPDES permits, but is intended to determine current street sweeping or highway maintenance requirements and practices to ensure that any SCAQMD rulemaking would not be in conflict with existing NPDES permit requirements.

As part of efforts to reduce paved road dust silt loadings and the corresponding PM emissions, an evaluation of existing SCAQMD fugitive dust regulations will be conducted to determine if additional PM2.5 emissions can be achieved.

Emission Reductions

Emissions in the control measure summary represent baseline PM_{2.5} emissions from all road classifications (e.g., freeways, collector streets, etc.) and emission reductions from a potential control program have not yet been estimated. Future emission reduction calculations will take into account any adjustments to U.S. EPA AP-42 or CARB emission factors.

Rule Compliance and Test Methods

Compliance with this control measure can be monitored through recordkeeping and inspections. Street sweeper certification standards are presently contained in Rule 1186 and the SCAQMD Test Protocol: Rule 1186 Certified Street Sweeper Compliance Testing.

Cost-Effectiveness

The cost-effectiveness of this control measure has not been determined. The design of a wheel washing system will vary greatly depending on site-specific characteristics and anticipated traffic levels. Basic wheel washer system costs for a site with 100 trucks exiting a day have been estimated to range from \$55,000 to \$63,000 (approximately \$12,500 for installation) and operational costs will vary with local utility rates. Wheel washing systems can also be leased for approximately \$3,000 per month with one time installation/removal, including transportation, costs estimated at approximately \$14,000. Operational and maintenance costs will depend on site-specific conditions. Street sweeping costs vary greatly based on number of miles and frequencies and whether the work is conducted with in-house or contracted resources. One local jurisdiction estimated twice monthly contract sweeping costs at \$25 per curb mile. SCAQMD will continue to analyze the most recent emission factors for paved road dust and will provide cost-effectiveness information as it becomes available.

Implementing Agency

The SCAQMD has the authority to adopt and enforce rules and regulations to reduce emissions from fugitive dust sources.

References

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BCM-04: EMISSION REDUCTIONS FROM MANURE MANAGEMENT STRATEGIES**[NH3]**

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	FRESH LIVESTOCK WASTE		
CONTROL METHODS:	YEAR-ROUND OR SEASONAL/EPISODIC MANURE MANAGEMENT – ACIDIFIER APPLICATION, DIETARY MANIPULATION, FEED ADDITIVES, AND OTHERS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
NH3 INVENTORY	9.61	5.20	4.0
NH3 REDUCTION*		0.26	0.20
NH3 REMAINING		4.94	3.80
CONTROL COST:	\$15,000/TON NH3		
IMPLEMENTING AGENCY:	SCAQMD		

* The ammonia emission reductions include only estimates from the implementation of the feasible measure to lower the threshold for large confined animal facilities in existing Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities.

Description of Source Category

The purpose of this control measure is to reduce ammonia emissions (a PM2.5 precursor) from livestock waste with an emphasis on dairy manure. The control measure will seek to use manure management, such as acidifier application, dietary manipulation, feed additives, and other manure control strategies, which can be applied on a year-around basis. To minimize costs, some control techniques could be seasonally or episodically applied during times when high ambient PM2.5 levels are of concern.

Background

Ammonia contributes to formation of PM2.5 via atmospheric reactions with NOx and SOx emissions to form aerosol ammonium nitrate and ammonium sulfate. Livestock waste produces significant amounts of ammonia emissions.

In 2013, there were approximately 154,000 dairy cattle, 7.9 million poultry, and 5,500 swine in the Basin. In general, with existing regulation (i.e., Proposition 2 – known as cage-free proposition that passed in 2008), economics, and product demand, the livestock industry in the South Coast jurisdiction is not considered a growth industry. However, due to large amount of cow manure generated daily and with recent research findings that

freshly excreted manure in the animal housing areas is a significant source of ammonia emissions, selection of effective measures to minimize ammonia emissions from fresh manure is the focus of this control measure.

In the 2014 Update to the Climate Change Scoping Plan, short-lived climate pollutants (SLCPs) including methane, black carbon, and fluorinated gases (hydrofluorocarbon), were identified as an important aspect of a comprehensive approach to addressing climate change. Pursuant to Senate Bill [SB] 605 (Lara, Chapter 523, Statutes of 2014), in coordination with other State agencies and local air agencies, CARB developed the proposed SLCP Reduction Strategy to address SLCP reductions. California's dairy and livestock industries account for roughly half of the State's total methane emissions. About half of the methane emissions are attributed to enteric fermentation and the other half of the methane emissions come from manure management practices, primarily lagoon storage of flushed manure from milking cows. Potential methane reduction strategies are still being studied, including converting flush systems to dry manure systems, changing nutrition and feed supplements, and increasing milk production efficiencies to reduce methane emissions from the dairy industry.

Regulatory History

Rule 1133.2 – Emission Reductions from Co-Composting Operations requires proper composting and control in order to achieve a minimum of 70 percent and 80 percent VOC reductions, respectively, from existing and new co-composting (including manure composting) facilities with similar reductions for ammonia.

The 2007 AQMP Control Measure MCS-05 – Emission Reductions from Livestock Waste sought additional emission reductions from confined animal facilities (CAFs), beyond those achieved by current Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities and Rule 1127 – Emission Reductions from Livestock Waste. Control Measure MCS-05 suggested adding control requirements for swine operations to meet the objectives of California Senate Bill (SB) 700 – Agriculture & Air Quality Summary and Implementation. The control measure aimed to require more stringent controls (Class Two Mitigation Measures) for large confined animal facilities and lesser controls (Class One Mitigation Measures) for smaller confined animal facilities not currently subject to Rule 223 by bringing them into the SCAQMD's permit system. The control measure also aimed to further expand the scope of Rule 1127 based on anticipated results of ongoing and future scientific research regarding manure management. Overall, MCS-05 estimated 20 percent emission reduction from each of the dairy, poultry, and swine categories.

Currently, Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities (CAFs) requires a Permit to Operate for all large CAFs, which include facilities with (1): 1,000 or more milking cows; or 3,500 or more beef cattle; or 7,500 or more calves, heifers, or other cattle; or (2): 650,000 or more laying hens; or (3): 3,000 or more swine. In addition, the rule also requires these large facilities to submit and implement an emission mitigation plan developed based on different classes of mitigation measures to minimize VOC emissions from housing, feed operations, and manure handling.

Rule 1127 – Emission Reductions from Livestock Waste, requires best management practices for dairies, and specific requirements regarding manure removal, handling, and composting; however, the rule does not focus on fresh manure, which is one of the largest dairy sources of ammonia emissions.

In 2011, staff conducted a Technology Assessment that included a revised emissions inventory for all pollutants, including ammonia, to reflect new emission factors as well as current and future livestock animal headcounts. Based on the revised emissions inventory, industry-level projections (i.e., mostly negative growth), and current regulatory requirements, Rule 1127 amendments were not pursued at that time.

The 2012 AQMP Control Measure BCM-04 – Further Ammonia Reductions from Livestock Waste sought ammonia emission reductions from cow manure through seasonal or episodic application of the acidifier sodium bisulfate (SBS). The control measure also suggested a two-stage implementation. Phase I would include a technical assessment of the aforementioned method of control. If deemed feasible and effective, Phase II would implement the measure as needed to address future PM_{2.5} standards. Rule requirements would be specific to dairies in the AQMD jurisdiction and may be unique to localized operations only. SBS application will continue to be included in this control measure.

Proposed Method of Control

The following are new approaches to reduce ammonia emissions from manure and through modification of the animal food intake.

Acidifier Application

Reducing the pH level in manure through the application of acidifiers is one of the potential mitigation strategies for ammonia. SBS is being considered for use in animal housing areas where high concentrations of fresh manure are located. Research indicates best results with the use of SBS on hot spots. SBS can also be applied to manure stock piles and at fencelines, and upon scraping manure to reduce ammonia spiking from the leftover remnants of manure and urine. In California, SBS has been used at dairies in Tulare, Fresno, Merced, Stanislaus, San Joaquin, Kings, Kern, San Bernardino, Riverside, San Benito, and Sacramento, mainly to prevent cow lameness and nuisance flies. It has also been used by dairies in Walla Walla, Columbia, and Whitman (Washington), Wallowa (Oregon), and Wisconsin.

The emission reductions associated with SBS application are unknown at this time. Based on historical data, application may only be required for eight weeks out of the year; hence, seasonal or episodic application of SBS may be effective during times when high ambient PM_{2.5} levels are of concern.

Research indicates emission reduction potential in the range of 60 percent; however, SBS application timing and manure coverage variables require further evaluation. Existing information regarding SBS application at dairies in the Basin indicates an overall emission reduction potential of about 50 percent. Current use of SBS and application coverage volume and rates, along with cost, will be examined in conjunction with the above referenced Phase I pilot program and assessment.

Dietary Manipulation

Dietary manipulation, such as lowering the protein content and including high-fiber ingredients, is an effective method to decrease ammonia emissions from monogastric animals and ruminants manure. Experiments found up to 76 percent ammonia, as well as methane, emission reductions in manure of dairy cows fed with reduced protein diet. For swine, with the addition of amino acid supplements, lowering crude protein content by 3 percent would decrease nitrogen excretion by approximately 30 percent and ammonium concentration of the slurry by 37 percent. The decrease in nitrogen excretion reduces the concentration of ammonium, which in turn decreases ammonia emissions. In addition, the reduction in ammonium concentration also lowers the slurry pH which affects ammonia volatilization. Lower ammonia emissions are also found in manure of laying-hen fed low-protein and high-fiber diet (i.e., DDGS, a corn distiller's dried grains with solubles, or EcoCal™, a mixture of calcium sulfate and zeolite). Research indicates that lowering 1 percent of crude protein diet results in a 10 percent decrease in

ammonia emission from laying hens in high-rise houses while egg production is not compromised. Manure of hens fed with 10 percent DDGS is found to emit 40 percent less ammonia. Dietary manipulation can also be considered for household pets. The use of dietary manipulation also has a co-benefit resulting in decreased potential for methane production from ruminant digestive system.

Feed Additives

Research indicates that for each 1 percent increase in fermented carbohydrates, such as bran and pulp, added into growing-finishing diets, a 14 percent ammonia emission reduction would occur. The reduction may be due to a pH effect or a shift of urinary to fecal nitrogen excretion.

Additives that either bind ammonia or inhibit urease (an enzyme that breaks down to ammonia) also showed reductions in ammonia emission (26 percent over a seven-week period in swine fed yucca extract).

The use of amino acid and enzyme supplements can reduce nitrogen excretion up to 40 percent, which in turn, reduces ammonia emissions. Feed additives can be considered as a seasonal or episodic control strategy when ambient PM_{2.5} concentrations are highest. In addition to ammonia emission reductions, feed additives can also help in reducing enteric methane emissions from dairy cows. Enteric fermentation accounts for 29 percent of California's methane inventory.

In addition, the following are new approaches aiming to reduce ammonia emissions from manure.

Manure Slurry Injection

Manure slurry injection would provide a significant (greater than 90 percent) reduction in odor and ammonia emissions compared to conventional land spreading. Manure injection would require approximately four to five times less fresh air dilutions than land spreading to reach the odor threshold. However, potential soil salinity and groundwater contamination must be carefully examined.

Conventional tillage and no-till injection systems are available for slurry and liquid manure. Currently, the injection systems are not commercially available for solid manures. Manure injection might disturb the soil or crop root system (forages, pasture/sod) and is more costly due to higher tractor horsepower and additional equipment maintenance. Cost increases as application rate decreases and distance from the manure storage site increases. At a 5,500 gallons per acre application rate, commercial drag hose injection cost is currently \$0.014/gal compared to \$0.0085/gal for land spreading. Manure injection can be considered as a seasonal or episodic control strategy.

Microbial Manure Additives

The use of bacterial products (Bacillus based) has demonstrated to effectively reduce ammonia emissions in broiler, layer, and turkey manure by lowering the gram negative bacterial population. Gram negative bacteria break down nitrogen in uric acid and convert it to ammonia emissions. Typical treatment costs are \$0.005 per broiler, \$0.055 per 40-lb turkey, and \$0.028 per 16-lb hen, and \$2.0 per ton of feed for layers.

Manure Belt Cleaning In Laying Hen House

Increasing manure belt cleaning frequency in laying hen house from once every four days to once every two days has the potential to reduce ammonia emissions by 45 percent. More frequent cleaning should be conducted when ambient PM_{2.5} concentrations are highest in the region.

Cage-Free Egg Laying Manure Removal

Cage-free egg laying hens produce eggs as well as manure in their living areas. Manure in the barns needs to be removed preferably on a daily basis to reduce ammonia emissions and minimize dust particles containing pathogens and toxins. The Aviary system where cage-free chicken can move up and down several levels and manure belt collects the falling dirt and manure is one of the many options available commercially. Manure belts of this system should be cleaned at least once every two days.

Poultry Manure Thermal Gasification

An emerging approach to manure management involves thermal gasification, whereby, after approximately 20 percent moisture content is removed, egg-laying manure is fed into a thermal gasifier where remaining moisture is evaporated, organic solids are converted into syngas, and mineral-rich ash is produced. Combustion gases from the process are treated by a bag filtration system before being released into the atmosphere. Syngas is ducted to a thermal oxidizer for heat generation. Ash byproduct is used as an animal feed supplement.

For example, by processing 240 tons of poultry manure daily from 5 million egg layers, the \$30 million thermal gasifier plant in Pennsylvania is anticipated to reduce approximately 50 percent of ammonia emission and over 34,000 tons of carbon dioxide-equivalent greenhouse gases annually in addition to other benefits, such as biomass energy and mineral production.

CARB SLCP Reduction Strategy

Some control methods proposed in this control measure, such as dietary manipulation, feed additives, and manure removal can also be used as potential control methods to reduce livestock methane emissions, consistent with CARB's SLCP Reduction Strategy. The SLCP Reduction Strategy proposes potential 75 percent methane reductions from manure management in 2030 and 25 percent methane reductions from enteric fermentation in 2030—combined more than 40 percent reduction in methane emissions from entire dairy sector in 2030—with rulemaking beginning in 2017.

Finally, this control measure will implement all feasible control measures, including lowering the threshold for Large Confined animal facilities under Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities.

Emission Reductions

Lowering the headcount threshold for Large Confined animal facilities is estimated to result in a reduction in emissions (from additional 46,000 cows regulated relative to a threshold reduction from 1,000 cows to 500 and 650,000 chickens to 400,000). The approach would be much more efficient depending on the options in the mitigation menu for cows and chickens that are implemented, and reductions from the remaining proposed control methods will be determined during rule development.

Rule Compliance and Test Methods

To be determined.

Cost-Effectiveness

The costs that would incur to the 36 dairy farms impacted by the proposed lower threshold include the additional cost of disposing manure through composting compared to disposing manure by land application, and the cost of more frequent corral cleaning (4 versus 2 times per year per farm). The cost of corral cleaning would be approximately \$204.50 per cleaning. The analysis assumes that 119,732 tons of manure is sent to fabric in-vessel (FIV) composting operations, which would cost approximately \$31 per ton of manure. In the absence of the composting facilities, the base case assumes that manure will be land spread in the Basin (least cost option currently available, which is approximately \$10.20 per ton of manure).

The cost-effectiveness analyses uses the Discounted Cash Flow (DCF) method to compute the present value of the additional proposed control measure' costs and the incremental emissions reduction over a 10-year period (the assumed equipment lifetime) with a 4 percent real interest rate, which gives the present value factor of 8.111. DCF cost effectiveness can then be calculated as:

$$\text{Cost Effectiveness} = \frac{\text{Additional Compliance Cost} \times 8.111}{\text{Incremental Emission Reductions}_{\text{tons/year}} \times 10 \text{ years}}$$

Where:

- Additional Annual Compliance Cost = (FIV_{cost/ton} – In-basin spreading) x tons manure + extra corral cleaning costs*

$$= ((\$31 - \$10.2) \times 119,732) + \$14,724$$

$$= \$2.5 \text{ million}$$
- Emission Reductions_{tons/year} = (Annual Emission Reductions with Current Rule 223) – (Annual Emission Reductions with lower threshold)*

The 2016 annual emission reductions are 0.37 tons/day (135 tons/year) ammonia and 0.07 tons/day (26 tons/year) VOC.

Pollutant	Additional Emission Reductions from Impacted Dairies	Cost-effectiveness
VOC	26 tons/year	\$78,000/ton
Ammonia	135 tons/year	\$15,000/ton

Implementing Agency

The SCAQMD has the authority to regulate emissions from livestock waste.

References

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BCM-05: AMMONIA EMISSION REDUCTIONS FROM NO_x CONTROLS [NH₃]

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	VARIOUS NO _x SOURCES		
CONTROL METHODS:	AMMONIA SLIP CATALYSTS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
NH ₃ INVENTORY	TBD	TBD	TBD
NH ₃ REDUCTION		TBD	TBD
NH ₃ REMAINING		TBD	TBD
CONTROL COST:	TO BE DETERMINED		
IMPLEMENTING AGENCY:	SCAQMD		

Description of Source Category

The purpose of this control measure is to seek reductions of ammonia from NO_x controls such as Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR).

Background

Ammonia slip results from the injection of ammonia into the flue gas stream of combustion equipment such as boilers, engines, furnaces, and turbines that utilize either SCR or SNCR. Ammonia (or urea) is used in these control systems to react with NO_x for conversion into nitrogen gas (N₂) and water (H₂O). These systems are capable of reducing NO_x emissions from combustion sources very effectively. However, the use of these systems also results in potential emissions of ammonia that “slip” past the control equipment and into the atmosphere.

Ammonia molecules react with NO_x molecules at a 1:1 stoichiometric ratio. NO_x reductions are readily achievable if excess ammonia is used. However, ammonia is a precursor for particulate matter. SCR and SNCR systems include balancing and feedback loops to prevent too much or too little ammonia from being injected, while maintaining a sufficiently fast response time for any load changes.

Regulatory History

SCAQMD Rule 1105.1 – Reduction of PM₁₀ and Ammonia Emissions from Fluid Catalytic Cracking Units which applies to fluid catalytic cracking units at petroleum refineries, contains an ammonia slip limit of 10 ppmv corrected to 3 percent oxygen (O₂) dry, averaged over 60 consecutive minutes. Although there are no other source specific rules for ammonia emissions resulting from the use of add-on controls for combustion equipment, there are limits

set forth in the SCAQMD's Best Available Control Technology (BACT) guidelines for major and non-major polluting facilities. Ammonia slip emissions for large IC engines at facilities with add-on controls have a limit of less than or equal to 10 ppmv (corrected to 15 percent O₂). The limits at non-major polluting facilities for gas turbines are less than or equal to 9 ppmv for smaller units and 5 ppmv for larger units (corrected to 15 percent O₂). For large boilers and process heaters at non-major polluting facilities, the ammonia slip limits are less than or equal to 5 ppmv (corrected to 3 percent O₂). At major polluting facilities, the ammonia slip limits for gas turbines and for boilers and process heaters are 5 ppmv (corrected to 15 percent O₂) and 5 ppmv (corrected to 3 percent O₂), respectively.

Proposed Method of Control

Recent advances in catalyst technology have resulted in the development of ammonia slip catalysts that selectively convert ammonia into nitrogen (N₂). These catalysts could be installed post-SCR and would result in less ammonia slip.

Emission Reductions

Ammonia slip catalysts can generally achieve at least a 75 percent ammonia reduction, which can vary based on process parameters. Potential emission reductions based on the ammonia slip inventory are yet to be determined.

Rule Compliance and Test Methods

SCAQMD Method 207-1, Determination of Ammonia Emissions from Stationary Sources, or any alternative or equivalent test method approved by the Executive Officer, CARB, and U.S. EPA.

Cost-Effectiveness

To be determined.

Implementing Agency

The SCAQMD has the authority to regulate emissions from stationary sources.

References

1. *SCR and Advanced Ammonia Slip Catalyst*, Johnson Matthey Presentation, SCAQMD 2016 AQMP Control Strategy Symposium, June 2015.
2. Gil, Elena. *Evaluation of Ammonia Slip Catalysts*, Department of and Chemical Biological Engineering, Chalmers University of Technology, Göteborg, Sweden, 2013.

BCM-06: EMISSION REDUCTIONS FROM ABRASIVE BLASTING OPERATIONS**[PM]**

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	ABRASIVE BLASTING		
CONTROL METHODS:	DUST COLLECTION WITH AIR FILTRATION		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
PM2.5 INVENTORY*	0.006	0.006	0.007
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TO BE DETERMINED		
IMPLEMENTING AGENCY:	SCAQMD		

* Inventory will be re-assessed as part of rulemaking process.

Description of Source Category

Abrasive blasting is the cleaning, preparing or texturizing of the surface of a material such as metal or masonry by forcibly propelling a stream of abrasive material against the surface. Sand is the most widely used blasting abrasive. Other abrasive materials include slag, steel or iron shot/grit, garnet or walnut shells. Abrasive blasting operations are done in both confined and unconfined conditions.

Background

Abrasive blasting includes both permitted and non-permitted sources. Based on the preliminary permit record, SCAQMD received a total of 243 permit applications for abrasive blasting operations since 1991. There are 84 active permits received from 58 facilities within the SCAQMD jurisdiction. Out of the active permits, 68 permits are for cabinet/machine/room abrasive blasting and the remaining 16 permits are for portable/open abrasive blasting. More than one half of the active permits are from manufacturing industry establishments. Because some abrasive blasting equipment are exempt from a written permit according to Rule 219, the total universe of abrasive blasting operations is expected to be much broader than the permit record.

Regulatory History

SCAQMD Rule 1140 – Abrasive Blasting was first adopted in February 1980 and then amended in 1985 to conform to the California Code of Regulations (CCR) Title 17, Subchapter 6 – Abrasive Blasting. The CCR and Rule 1140 establish both operating requirements and abrasive materials requirements. These regulations establish prohibition against visible emissions from confined or unconfined abrasive blasting operations. Abrasive blasting operations are also subject to the no visible emissions requirements in the SCAQMD Rule 1155 – Particulate Matter (PM) Control Devices, for operations used in conjunction with a PM air pollution control device. This control measure would seek voluntary applications of proposed control methods by providing incentives.

The California Health and Safety Code prohibits local districts from requiring emission and performance standards more or less stringent than the State regulation as stated in Section 41904, *“the standards shall be statewide, and no rule or regulation of any district that is applicable to sandblasting operations shall be stricter or less strict than the standards adopted by the State board pursuant to the recommendations of the committee.”* SCAQMD Rule 1140 has been developed with the ultimate goal of consistency.

Proposed Method of Control

Current permit conditions for abrasive blasting in confined (cabinet/machine/room) conditions require venting to a PM air pollution control (APC) equipment when in full use. Baghouses or dry filters are the most frequently used APC equipment. For open and portable blasting operations, venting to APC equipment is not required unless abrasives contain a carcinogenic toxic material. This control measure proposes voluntary applications of the following methods of control by providing incentives, primarily focusing on dry abrasive blasting operations conducted in open areas using portable blasting equipment with or without a written SCAQMD permit:

- Blasting Enclosures and Dust Collection
 - A portable blasting enclosure/booth can be installed at the outdoor job site with a dust collection system. The portable enclosure for outdoor blasting can be used to further reduce emissions even when abrasives used do not contain any known carcinogenic toxic material. The blasting emissions can then be vented to PM APC equipment with a combination of filters installed. If abrasives contain a known carcinogenic material, a manufacturer-certified HEPA filter can be used in the APC equipment for additional control.
 - The outdoor workspace may be walled off with permanent or temporary construction barriers while maintaining a negative pressure environment.
 - Pressure conditions can be monitored to ensure proper pressure is maintained so that blasting dust would not escape out of the enclosed workspace. Portable or fixed differential pressure monitors may be considered to continuously monitor and assist in the maintenance of pressure condition.

Emission Reductions

The universe of PM emissions and emission reductions will be investigated during implementation of this control measure. Once dust is captured by a collection system, cartridge-type dust collectors can achieve up to 99.9 percent removal efficiency on 0.2–2 µm particles, if well maintained. A HEPA filter is generally certified by

manufacturers to remove PM down to a size of 0.3 μm with 99.97 percent efficiency. Dust collection efficiency of these systems can vary based on the operation and equipment type.

Rule Compliance and Test Methods

All abrasives used for dry unconfined blasting should be tested in accordance with “Method of Test for Abrasive Media Evaluation, Test Method No. Calif. 371-A,” or other test method approved by the Executive Officer.

Cost-Effectiveness

Cost-effectiveness will be determined during control measure implementation.

Implementing Agency

The SCAQMD has the authority to regulate emissions from both permitted and non-permitted blasting operations.

References

1. SCAQMD, Rule 1140 – Abrasive Blasting, Amended August 2, 1985.
2. SCAQMD, Rule 1155 – Particulate Matter (PM) Control Devices, Amended May 2, 2014.
3. California Code of Regulations, Title 17 Subchapter 6 – Abrasive Blasting (Sections 92000-92530).
4. DOE, Specifications for HEPA filters used by DOE contractors, U.S. Department of Energy, DOE-STD-3020-2005, December 2005.

**BCM-07: EMISSION REDUCTIONS FROM STONE GRINDING, CUTTING AND
POLISHING OPERATIONS
[PM]**

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	STONE FABRICATION OPERATIONS		
CONTROL METHODS:	WET DUST SUPPRESSION, PORTABLE DUST COLLECTOR WITH HEPA FILTER		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
PM2.5 INVENTORY*	0.013	0.017	0.017
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TO BE DETERMINED		
IMPLEMENTING AGENCY:	SCAQMD		

* Inventory will be re-assessed as part of rulemaking process.

Description of Source Category

Stone fabrication such as grinding, cutting, drilling, scarifying, polishing, carving, and etching generates significant amounts of dust emissions containing PM10, some PM2.5, and silica particles which are known to cause lung diseases or silicosis. Uncontrolled PM emissions from stone work can contribute to regional PM levels, can cause high concentrations of PM locally, while also elevating the exposure of workers and neighborhood residents to toxic silica particles.

Background

Masonry or building materials such as concrete, stone, granite, tile, brick, and mortar can be processed for a variety of purposes at confined (e.g., stone shops) or unconfined (outdoor) worksites. Examples of these processes include, but are not limited to, grinding, milling, cutting, scarifying, drilling, carving, etching, and polishing operations for residential and commercial new construction and renovation. Many of those operations are performed by builders, landscapers and remodeling contractors, and may not be properly controlled for dust emissions. These operations are most likely to be exempt from requiring a permit under Rule 219.

Regulatory History

SCAQMD Rule 219 does not require permits from machining equipment exclusively used for polishing, cutting, surface grinding, etc. However, SCAQMD Rule 403 – Fugitive Emissions, prohibits fugitive emissions from any onsite mechanical activities, including cutting, from exceeding a 20 percent opacity limit.

Proposed Method of Control

This control measure would seek to control PM including silica particles. Both dry and wet dust control options are available. Some of these methods of control are already regulated by the California Occupational Safety and Health Administration (Cal/OSHA) as existing work place standards.

- Wet Control Methods: wet systems involve spraying water onto the rotating cutting disc to reduce dust emissions. Emissions are expected to be minimal, provided the waste material is disposed of properly. This method will produce a wet slurry associated with the wet dust suppression, in which case wet vacuuming, wet wiping, and wet sweeping can be implemented as housekeeping measures.
- Dry Control Methods:
 - Local exhaust ventilation (LEV) would be suitable for hand-held power tools (e.g., cut-off saws and grinders). It uses guards and directors attached to the tools to act as a dust collecting hood. The guard or director is connected to an industrial vacuum cleaner which provides sufficient exhaust ventilation to capture the majority of dust emitted during the cutting or grinding operation. The vacuum cleaner is equipped with high efficiency particulate air (HEPA) filter to protect workers from silica dust.
 - Dry cutting emissions can be controlled at the point of operation using a portable dust collector, air scrubber and negative air machine to prevent dust from being released into the atmosphere. A combination of a variety of filter media can be customized to achieve appropriate controls, including HEPA filters.
- Incentives: financial incentives can be made available to exchange existing dry/wet equipment with new equipment that includes integrated add-on controls.

Emission Reductions

HEPA filters are certified by manufacturers to be 99.97 percent efficient in removing particles 0.3 microns or larger once airborne dust is diverted to a collection system. However, the collection efficiency of these systems can vary widely. The PM emissions inventory and emission factors from these mechanical activities are currently not determined and will be examined during rule development.

Rule Compliance and Test Methods

Some work may be conducted at residential job sites, which presents enforcement challenges. A SCAQMD rule, other enforceable instrument, or use of equipment certification or incentives will be considered. The most efficient regulatory approaches will be selected considering cost-effectiveness.

Cost-Effectiveness

Cost-effectiveness for proposed methods of control will be determined during rule development.

Implementing Agency

SCAQMD has the authority to regulate emissions from non-vehicular sources.

References

1. Occupational Safety and Health Administration, Hazards of Operating Unguarded Stone Cutters and Splitters in Landscaping and Other Worksites, Safety and Health Information Bulletin, SHIB 01-25-2013 (online accessed in September 2015).
2. California Code of Regulations, Title 8, Section 1530.1 – Control of Employee Exposures from Dust-Generating Operations Conducted on Concrete or Masonry Materials.

**BCM-08: FURTHER EMISSION REDUCTIONS FROM AGRICULTURAL,
PRESCRIBED AND TRAINING BURNING
[PM]**

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	OPEN BURNING		
CONTROL METHODS:	INCENTIVIZE BURN ALTERNATIVES, BURN PROHIBITIONS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
PM2.5 INVENTORY	0.34	0.68	0.68
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TO BE DETERMINED		
IMPLEMENTING AGENCY:	SCAQMD		

Description of Source Category

This control measure proposes to further reduce PM emissions from open burning sources.

Background

Agricultural burning involves collection and combustion of vegetative materials produced from the growing and harvesting of crops. Prescribed burning is the planned burning of vegetative materials, usually conducted by a fire protection agency or the department of forestry in order to control plant disease and pests or to reduce fire episode impacts. Training burns are hands-on activities conducted by fire protection agencies to practice suppressing fires. Based on 2015 burn permit acreage data, over 90 percent of agricultural burns are conducted within the Coachella Valley area (Salton Sea Air Basin) but a limited amount of agricultural burning continues within the western Riverside/San Bernardino County portions of the Basin. Prescribed burns occur on the northern and eastern boundaries of the Basin and are sometimes incorporated into fire suppression activities. Training burns occur throughout the region. The emissions estimates shown in the table above are all of the year's open burning emissions divided by 365 days and represent annual average day emissions. Open burning emissions estimates presented on a 24-hour (daily) basis, which could include individual agricultural and prescribed burns, would be higher. Biomass burning is also a source of black carbon (soot) which recent studies suggest influences climate by directly absorbing light, reducing the reflectivity of snow and ice through deposition and interaction with clouds.

Regulatory History

Open burning activities are currently subject to SCAQMD Rule 444 – Open Burning provisions which are intended to minimize PM emissions and smoke in a manner that is consistent with State and federal laws. Under the program, open burning is allowed on a permissive burn day, provided that a permit and an event authorization is obtained, and that such burning event is not prohibited by a fire protection agency. A permissive burn day is declared by SCAQMD when certain meteorological conditions are met. Rule 444 also includes general requirements (i.e., burning time window and ignition device) for open burning, as well as additional requirements, such as moisture level and firing methods for agricultural burning. A Smoke Management Plan is required for prescribed burning. In addition, Rule 444 sets SCAQMD-wide maximum daily burn acreage for agricultural and prescribed burning, but allows for training burns if the duration is less than 30 minutes and clean fuel is utilized.

In 2013, Rule 444 was amended to align burn prohibitions with the SCAQMD Rule 445 – Wood-Burning Devices requirements during the winter season. As a result, Rule 444 now limits open burning whenever a mandatory winter burning curtailment is called under Rule 445 for individual source/receptor areas or the entire Basin. These revised provisions do not apply to open burning sources above 3,000 feet in elevation.

AB 32 (California Global Warming Solutions Act of 2006) includes provisions to achieve and maintain Statewide GHG emission limits. Recent legislation [Senate Bill (SB) 605 (Lara, Chapter 523, Statutes of 2014)] requires CARB to develop a plan to reduce what are referred to as short lived climate pollutants, including black carbon. In response to SB 605, CARB has recently circulated for comment the Short-Lived Climate Pollutant Reduction Strategy (SLCP Strategy) which includes recommended control measures and emission reduction targets. For anthropogenic (non-forest) black carbon sources such as agricultural burning, the SLCP Strategy includes a 50 percent reduction target in emissions by 2030 when compared to business as usual (BAU) conditions. Ultimately, the SLCP Reduction Strategy, along with other planning efforts, will be incorporated into the 2030 Target Scoping Plan update scheduled for completion by 2017 (CARB, 2016).

Proposed Method of Control

Further PM emission reductions could be achieved through use of a fee schedule and/or an incentive program to limit agricultural burning and promote burning alternatives (e.g., chipping/grinding or composting). For example, under current program requirements, agricultural producers greater than 10 acres are charged approximately \$150 for a burn permit and smaller sites pay no fees. One approach to reduce emissions could involve establishing an administrative fee as part of the burn permit program based on acreage or amount of material burned, to the extent these factors are related to efforts required for processing and enforcing. Fees would not be charged to producers using alternatives to burning. Another approach could involve providing incentives to agricultural producers, especially in peak PM_{2.5} areas, to implement alternatives to burning. A demonstration project could also be established where a SCAQMD contractor could be utilized to conduct chipping/grinding and removal activities in peak PM_{2.5} areas at no cost to producers.

Rule 444 was amended in 2013 to align no burn prohibitions with Rule 445 no burn day requirements during the months of November through the end of February. As described in Control Measure BCM-09, the PM_{2.5} threshold used to forecast no burn days under Rule 445 could be lowered or the winter season could be potentially expanded to also include October and/or March. Realigning Rule 444 burn prohibitions with any potential changes to the Rule 445 no burn day provisions could further reduce open burning emissions during peak PM_{2.5} episodes.

Approximately 90 percent of agricultural burning occurs outside of the Basin. If necessary to maintain PM2.5 attainment in the Salton Sea Air Basin or in response to a public concerns, Rule 444 provisions applicable to the Basin could be extended to Salton Sea Air Basin sources. Additionally, the current prohibition of open burning within 1,000 feet of a sensitive receptor could be applied to the burning of currently exempted plant materials, such as Russian Thistle (tumbleweeds).

Alternatives to agricultural open burning, such as chipping/grinding/land application and composting are consistent with the SLCP Reduction Strategy goals to reduce biomass burning. The proposed 2016 SLCP Reduction Strategy also includes recommended actions such as thinning overstocked forests either manually, mechanically, or through use of prescribed fire to reduce wildfire risk and the associated black carbon emissions. It is acknowledged prescribed fire is a black carbon source; however, unlike wildfires, the SLCP Reduction Strategy describes it can be timed to favorable atmospheric conditions to ultimately reduce the risk of crown fires, which are a driver for large, catastrophic wildfires. Lastly, the Governor's Cap-and-Trade Expenditure Plan for the 2016-17 proposed budget includes \$140 million for CAL FIRE to support forest health and resiliency programs that reduce GHG emissions.

Emission Reductions

The emissions in the control measure summary represent baseline annual average day emissions from agricultural burning. The emission reductions from this control measure have not been estimated. For reference, a report to the SJVAPCD Governing Board estimated a net PM2.5 reduction of approximately seven pounds per acre when shredding and land application of material was utilized instead of open burning. Implementing agricultural burning alternatives is also consistent with SLCP Reduction Strategy goals to reduce black carbon emissions.

If Rule 444 provisions were realigned to match potential changes to Rule 445 under BCM-09, there likely would be a slight increase in the number of no-burn days under Rule 444. However, no annual emission reductions would be anticipated as the burning prohibited during a revised program would likely be switched to other, non-episodic times of the year.

Rule Compliance and Test Methods

Rule compliance could be achieved through recordkeeping and inspections.

Cost-Effectiveness

The cost-effectiveness of this control measure has not been estimated but costs to implement burning alternatives would be expected to be higher due to equipment and labor costs. The SJVAPCD report on alternatives to agricultural burning estimated shredding and land application of vineyard material for a 20 acre site at approximately \$975 per acre while open burning was estimated to cost approximately \$200 per acre.

Cost impacts from an increase in burning prohibitions due to elevated PM2.5 levels are expected to be minimal as burning would likely be switched to other times of the year.

Implementing Agency

The SCAQMD has the authority to regulate emissions from open burning sources. SCAQMD will also seek partnerships with CAL FIRE, Resource Conservation Districts, County agricultural commissioner's offices and other agencies to secure funding to implement programs to promote open burning alternatives.

References

California Code of Regulations, Title 17 – Agricultural Burning Guidelines.

CARB, 2016. California Air Resources Board; Proposed Short-Lived Climate Pollutant Reduction Strategy; April 2016.

SCAQMD, 2013. South Coast Air Quality Management District, Final Staff Report Rule 444 – Open Burning, May 2013.

SJVAPCD, 2010. San Joaquin Valley Air Pollution Control District, Final Staff Report and Recommendations on Agricultural Burning, July 2010.

U.S. EPA, 2016. U.S. Environmental Protection Agency, Black Carbon Background Publication <https://www3.epa.gov/blackcarbon/basic.html#where> and Effects of Black Carbon Publication <https://www3.epa.gov/blackcarbon/effects.html>.

**BCM-09: FURTHER EMISSION REDUCTIONS FROM WOOD-BURNING FIREPLACES
AND WOOD STOVES
[PM]**

CONTROL MEASURE SUMMARY			
SOURCE CATEGORY:	RESIDENTIAL WOOD COMBUSTION		
CONTROL METHODS:	MANDATORY CURTAILMENTS, INCENTIVE PROGRAMS		
EMISSIONS (TONS/DAY):			
ANNUAL AVERAGE	2012	2021	2025
PM2.5 INVENTORY	5.2	4.9	4.9
PM2.5 REDUCTION		TBD	TBD
PM2.5 REMAINING		TBD	TBD
CONTROL COST:	TO BE DETERMINED		
IMPLEMENTING AGENCY:	SCAQMD		

Description of Source Category

The purpose of this control measure is to seek additional emission reductions from residential wood burning activities.

Background

The types of devices used to burn wood in a typical residence are fireplaces and wood heaters (e.g., fireplace inserts and free-standing wood stoves). Since fireplaces are very inefficient heat sources and given the temperate climate in the Basin, they are used primarily for aesthetic purposes. Fireplace inserts and wood stoves are much more efficient and in some residences, are used as the primary source of heating.

Emissions from residential wood burning devices are caused primarily by incomplete combustion and include PM, CO, NO_x, SO_x, and VOC. Particulate emissions, however, have been the focus of most air district control programs. Studies indicate that the vast majority of particulate emissions from residential wood combustion are in the fine (2.5 micrometers or less) fraction. Additionally, incomplete combustion of wood produces polycyclic organic matter (POM), a group of compounds classified as hazardous air pollutants under Title III of the federal Clean Air Act. Biomass burning is also a source of black carbon (soot) which recent studies suggest can influence climate by directly absorbing light, reducing the reflectivity of snow and ice through deposition and interacting with clouds. According to CARB, soot from residential wood combustion is forecast to be the largest individual anthropogenic (man-made) source of black carbon in 2030 if no new programs are implemented.

In 2011, CARB conducted a Statewide evaluation of emissions from residential wood combustion based on the most recent emission factors, activity data, and data from the American Housing Survey, and the U.S. Census Bureau where available. The results of the updated residential wood combustion emissions inventory, including reductions from existing control programs, are provided in the emissions summary which represents all of the emissions occurring within the year expressed in terms of an annual average day. Average winter day emissions would be higher as it is estimated that 90 percent of residential wood burning occurs in the months from October through the end of March.

Regulatory History

Control measures for residential wood combustion were included in the 2007 and 2012 AQMPs and Rule 445 was adopted in 2008 and amended in 2013 to implement those control measures. Under the Rule 445 provisions, only gaseous-fueled hearth devices are allowed in new developments. For additions or modifications to existing developments, Rule 445 allows any gaseous-fueled device but any wood-burning devices sold or installed must be U.S. EPA Phase II-certified or equivalent. Rule 445 prohibits the burning of any product not intended for use as a fuel (e.g., trash) in a wood burning device and requires commercial firewood facilities to only sell seasoned firewood (20 percent or less moisture content) from July through February. Rule 445 also established a mandatory wood burning curtailment program extending from November 1 through the end of February each winter season. During a wood burning curtailment period, the public is required to refrain from both indoor and outdoor solid fuel burning in specific areas when PM_{2.5} air quality is forecast to exceed 30 µg/m³. These no burn provisions apply to the entire Basin whenever a PM_{2.5} level of greater than 30 µg/m³ is forecast for any monitoring station that has recorded violations of the federal 24-hour PM_{2.5} standard in either of the previous two years. Lastly, Rule 445 requires commercial firewood or other wood-based fuel sellers to notify the public of the Check Before You Burn wood burning curtailment program through a labeling program.

AB 32 (California Global Warming Solutions Act of 2006) includes provisions to achieve and maintain Statewide GHG emission limits. Recent legislation [Senate Bill (SB) 605 (Lara, Chapter 523, Statutes of 2014)] requires CARB to develop a plan to reduce what are referred to as short lived climate pollutants, including black carbon. In response to SB 605, CARB has recently circulated for comment the Short-Lived Climate Pollutant Reduction Strategy (SLCP Reduction Strategy), which includes recommended control measures and emission reduction targets. For residential wood combustion, the SLCP Reduction Strategy includes a 50 percent reduction target in black carbon emissions by 2030 when compared to business as usual (BAU) conditions. Ultimately, the SLCP Reduction Strategy, along with other planning efforts, will be incorporated into the 2030 Target Scoping Plan update scheduled for completion by 2017.

Proposed Method of Control

Wood smoke reduction programs have been implemented in this area since 2008 and in other jurisdictions for many years. The stringency of each air district's program depends on the region's PM air quality and the relative contribution of fine particulates from this source category. While it is acknowledged that the Basin has some of the highest ambient PM concentrations in the nation, speciated air quality data indicates that the contribution of residential wood smoke to regional particulate pollution is less than 10 percent. However, given that residential wood burning is one of the last lesser-controlled sources of direct PM_{2.5} emissions, curtailment programs can be very cost-effective relative to other source categories.

In 2014, the SJVAPCD amended Rule 4901 and the threshold used to forecast no burn days was reduced to 20 $\mu\text{g}/\text{m}^3$. The Bay Area AQMD recently adopted amendments to the Regulation 6, Rule 3: Wood Burning Device regulation. The original Bay Area AQMD proposal would have required multiple day burn prohibitions to prevent smoke accumulation leading to exceedance of the federal NAAQS but this proposal was removed as the current rule has been determined to provide the agency enough flexibility to declare consecutive no burn days in anticipation of a possible exceedance. SCAQMD is evaluating the amended Bay Area AQMD regulation which also includes clarifications to exemptions.

Based on a review of U.S. EPA guidance documents and other air district wood smoke control programs the existing SCAQMD curtailment program threshold could be lowered and a review of historical air quality data indicates establishing a 20 $\mu\text{g}/\text{m}^3$ threshold, as was done in the San Joaquin Valley, could result in 28 additional no burn days each winter above the estimate of 24 days at the current threshold. For reference, air quality data from the last three years indicates, on average, 11 additional no burn days would be anticipated each winter if the curtailment threshold was set at 25 $\mu\text{g}/\text{m}^3$. Another control option could be to utilize a similar approach as Bay Area AQMD and forecast more consecutive no burn days. The Check Before You Burn program could also be extended to also include the months of October and/or March as high PM_{2.5} levels can occur during these periods. All of these potential control options would increase the number of no burn days which could lower the contribution of wood smoke to ambient PM_{2.5} levels in the winter months. Although these episodic reductions are designed to address 24-hour PM_{2.5} concentrations, a consistent reduction in wintertime PM_{2.5} from reduced wood burning could have an impact on annual average PM_{2.5} concentrations. Further analysis will be conducted to determine the appropriate approach to achieve the emission reductions necessary to assist attainment of the annual average federal PM_{2.5} NAAQS as needed.

Since 2008, SCAQMD has implemented programs which provide financial incentives to encourage the public to switch to cleaner hearth devices. The current program encourages households within inland (high PM_{2.5} areas) to upgrade wood-burning devices through SCAQMD incentives of up to \$1,600 to offset purchase and installation costs. Although this program has been effective, additional reductions may be achieved through the use of higher incentives or expansion of the eligible geographic area. Experience has shown that education and outreach to targeted households is vital to ensure program participation; An additional element of this control measure would focus on expanding the effectiveness of incentive programs.

The proposed 2016 SLCP Reduction Strategy includes recommended actions to further reduce non-forest black carbon emissions from residential wood combustion. Specific measures include prohibition of wood-burning devices in new developments, removal of old fireplaces and woodstoves and replacement with EPA-certified devices, electric heaters or gas fireplaces through incentive programs and education and outreach to develop a better public understanding of health and environmental impacts from wood smoke. The proposed SLCP Reduction Strategy also states that the Governor's 2016–17 proposed budget includes \$40 million of cap-and-trade expenditures to implement a residential woodstove replacement program, however, the funding must be appropriated by the Legislature.

Emission Reductions

The emission reductions from this control measure have not been estimated but previous control measures and Rule development efforts have estimated emission reductions from the mandatory wood burning curtailment program. It should be noted that while controlling emission from residential wood burning is primarily intended

to reduce PM_{2.5} emissions, an added benefit is reduced emissions of CO, VOC, NO_x, SO_x, and hazardous air pollutants. Emission reductions from existing and potential new wood smoke reduction programs are also consistent with the SLCP Reduction Strategy goals to reduce black carbon emissions from residential wood combustion sources.

Rule Compliance and Test Methods

Compliance with this control measure is reliant on use of incentives and verification through complaint response. U.S. EPA is responsible for certifying wood burning devices under Title 40 Code of Federal Regulations, Part 60, Subpart AAA.

Cost-Effectiveness

The cost-effectiveness of this control measure has not been determined, however, increasing the number of curtailment days would result in relatively few cost increases to the impacted community.

Based on results of the current and former SCAQMD incentive programs, a basic gas log set can be purchased at a local retailer and installed by a contractor into a home with an existing wood burning fireplace plumbed for natural gas for approximately \$400 to \$500. Average cost associated with removal and replacement of conventional (uncertified) wood heater with a U.S. EPA Phase II-certified device has been estimated at \$4,000 per unit.

Implementing Agency

The SCAQMD has the authority to regulate emissions from residential wood combustion sources. SCAQMD will also seek partnerships with CARB, hearth product manufacturers and other air districts to secure funding to expand on current incentive programs that encourage the public to switch to lower emission fireplaces and woodstoves through financial incentives.

References

Bay Area AQMD, 2015. Bay Area Air Quality Management District, Air District Proposed Amendments to Regulation 6, Rule 3: Wood Burning Devices, August 17, 2015.

CARB, 2011. California Air Resources Board; Area Source Methodology, Section 7.1 Residential Wood Combustion; March 2011.

CARB, 2016. California Air Resources Board; Proposed Short-Lived Climate Pollutant Reduction Strategy; April 2016.

Naeher, 2007. Woodsmoke Health Effects: A Review, *Journal of Inhalation Toxicology*, 19:67-107, 2007

SJVAPCD, 2014. San Joaquin Valley Air Pollution Control District, Rule 4901 – Wood Burning Fireplaces and Wood Burning Heaters; Amended September 18, 2014.

SCAQMD, 2013. South Coast Air Quality Management District; Draft Final Staff Report for Proposed Rule 445 – Wood Burning Devices; May 2013.

U.S. EPA, 1996a. U.S. Environmental Protection Agency AP-42, Section 1.9, Residential Fireplaces; October 1996.

U.S. EPA, 1996b. U.S. Environmental Protection Agency AP-42, Section 1.10, Residential Wood Stoves; October 1996.

U.S. EPA, 2016. U.S. Environmental Protection Agency, Black Carbon Background Publication <https://www3.epa.gov/blackcarbon/basic.html#where> and Effects of Black Carbon Publication.

**BCM-10: EMISSION REDUCTIONS FROM GREENWASTE COMPOSTING
[VOC, NH₃]**

As this measure is a continued implementation from the 8-hour ozone control measures, the reader is referred back to BCM-10 in Section 1 of this Appendix.