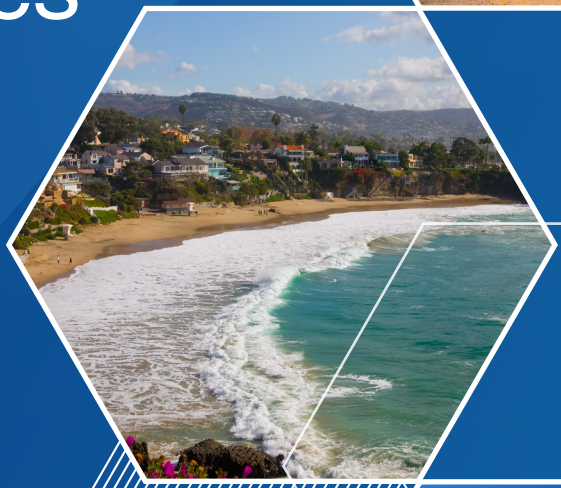
South Coast AQMD

APPENDIX IV-A

South Coast AQMD's Stationary and Mobile Source Measures



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Introduction

This Appendix describes the South Coast Air Quality Management District (South Coast AQMD) staff's proposed stationary and mobile source control measures to be included in the PM2.5 Plan. Control measures presented in this appendix are designed to achieve the 2012 Annual PM2.5 National Ambient Air Quality Standard (NAAQS) by 2030. The proposed control measures are further divided into stationary source NOx, NH3, and PM2.5 measures and mobile source measures. The measures are based on a variety of control strategies and incentive programs that are at or near commercial availability and/or are deemed technologically feasible in the next few years. South Coast AQMD will prioritize distribution of incentive funding in Environmental Justice (EJ) areas and seek opportunities to expand funding to benefit the most disadvantaged communities.

Control Measures

A control measure is a set of specific technologies and methods identified for potential implementation to reduce emissions to attain an air quality standard. South Coast AQMD's proposed stationary source measures are designed to assist with attainment of the 2012 Annual PM2.5 standard primarily through reductions of NOx, NH3, and direct PM2.5 emissions. Co-benefits from greenhouse gas (GHG) emissions reduction policies and other measures are included as well. The NOx, NH3, and direct PM2.5 stationary measures are identified by the three-letter prefix BCM. Measures pursuing co-benefits from Energy and Climate Change Programs are identified by the three-letter prefix ECC.

In the PM2.5 Plan, South Coast AQMD is proposing a total of 38 control measures. Out of the 38 proposed control measures, 23 target reductions from stationary sources. South Coast AQMD's control measures focus on stationary sources as that is the area where South Coast AQMD has the strongest regulatory authority. The majority of these measures are anticipated to be developed in the next several years and implemented prior to 2030. Table IV-A-1 provides a list of South Coast AQMD proposed PM2.5 measures for stationary sources along with anticipated emission reductions in 2030.

TABLE IV-A-1
SOUTH COAST AQMD PROPOSED STATIONARY SOURCE MEASURES

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
South Coast AQMD Stationary Source NOx Measures:		
BCM-01	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Water Heating [PM2.5, NOx]	TBD
BCM-02	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Space Heating [PM2.5, NOx]	TBD
BCM-03	Emission Reductions from Residential Cooking Devices [PM2.5, NOx]	TBD
BCM-04	Emission Reductions from Replacement with Zero Emission or Low NOx Appliances – Residential Other Combustion Sources [PM2.5, NOx]	TBD
BCM-05	Emission Reductions from Emergency Standby Engines [PM2.5, NOx]	0.04 [PM2.5] 0.36 [NOx]
BCM-06	Emission Reductions from Diesel Electricity Generating Facilities [NOx]	0.16
BCM-07	Emission Reductions from Incinerators [NOx]	0.81
	Total Quantified PM2.5 and NOx Reductions	**0.04 [PM2.5]** **1.33 [NOx]**
South Coast AQMD Co-Benefits from Energy and Climate Change Programs Measures:		
ECC-01	Co-benefits from Existing and Future Greenhouse Gas Programs, Policies, and Incentives [All Pollutants]	TBD
ECC-02	Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures [All Pollutants]	TBD
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [All Pollutants]	TBD
South Coast AQMD NH3 Measures:		
BCM-08	Emission Reductions from Livestock Waste at Confined Animal Facilities [NH3]	0.27
BCM-09	Ammonia Emission Reductions from NOx Controls [NH3]	TBD

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
BCM-10	Emission Reductions from Direct Land Application of Chipped and Ground Uncomposted Greenwaste [NH3]	0.08
BCM-11	Emission Reductions from Organic Waste Composting [NH3]	TBD
	Total Quantified NH3 Reductions	**0.35**
South Coast AQMD Direct PM2.5 Measures:		
BCM-12	Further Emission Reductions from Commercial Cooking [PM2.5]	TBD
BCM-13	Emission Reductions from Cooling Towers [PM2.5]	TBD
BCM-14	Further Emission Reductions from Paved Road Dust Sources [PM2.5]	TBD
BCM-15	Emission Reductions from Abrasive Blasting Operations [PM2.5]	TBD
BCM-16	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM2.5]	TBD
BCM-17	Emission Reductions from Prescribed Burning for Wildfire Prevention [PM2.5]	TBD
BCM-18	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves [PM2.5]	0.33~~TBD~~
BCM-19	Emission Reductions from Unpaved Road Dust Sources [PM2.5]	TBD
	Total Quantified Direct PM2.5 Reductions	**0.33~~TBD~~**
South Coast AQMD Other Measures:		
BCM-20	Application of All Feasible Measures [All Pollutants]	TBD

Note: 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.

South Coast AQMD proposes a total of 15 mobile source measures which are categorized into five groups – emission growth management, facility-based mobile sources, on-road and off-road, incentives, and other (see Table IV-A-2). Two emission growth management measures (EGM-01 to EGM-02) are proposed to identify actions to help mitigate and potentially provide emission reductions due to new development and redevelopment projects, and clean construction. Four facility-based mobile source measures (FBMSMs) (MOB-01 to MOB-04) seek to identify actions that will result in additional emission reductions at commercial marine ports, rail yards, warehouse distribution centers, and commercial airports. FBMSMs

for marine ports and rail yards are currently undergoing a process to develop Indirect Source Rules and/or other voluntary based measures. Six on-road and off-road mobile source measures (MOB-05 to MOB-10) focus on on-road light/medium/heavy-duty vehicles, international shipping vessels, passenger locomotives and small off-road engines. Additionally, two incentive-based measures (MOB-11 and MOB-12) will use established protocols such as Carl Moyer Program guidelines and report to the Governing Board periodically. MOB-12, Pacific Rim Initiative for Maritime Emission Reductions seeks NOx emission reductions from partnership with local, State, federal and international entities. One other measure (MOB-13) focuses on fleet vehicle mitigation options and the development of a work plan to support and accelerate the deployment of zero emission infrastructure needed for the widespread adoption of zero emission vehicles and equipment.

TABLE IV-A-2
SOUTH COAST AQMD PROPOSED MOBILE SOURCE MEASURES

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
South Coast AQMD Emission Growth Management Measures:		
EGM-01	Emission Reductions from New Development and Redevelopment [All Pollutants]	TBD
EGM-02	Emission Reductions from Clean Construction Policy [All Pollutants]	TBD
South Coast AQMD Facility-Based Measures:		
MOB-01	Emission Reductions at Commercial Marine Ports [PM2.5, NOx]	TBD
MOB-02	Emission Reductions at New and Existing Rail Yards [PM2.5, NOx]	TBD
MOB-03	Emission Reductions at Warehouse Distribution Centers [PM2.5, NOx]	TBD
MOB-04	Emission Reductions at Commercial Airports [PM2.5, NOx]	TBD
South Coast AQMD On-Road and Off-Road Measures:		
MOB-05	Accelerated Retirement of Light-Duty and Medium-Duty Vehicles [PM2.5, NOx]	TBD
MOB-06	Accelerated Retirement of On-Road Heavy-Duty Vehicles [NOx]	TBD
MOB-07	On-Road Mobile Source Emission Reduction Credit Generation Program [NOx]	TBD
MOB-08	Small Off-Road Engine Exchange Program [PM2.5, NOx]	TBD

Number	Title [Pollutant]	Emission Reductions (2030) (tons per day)
MOB-09	Further Emission Reductions from Passenger Locomotives [PM2.5, NOx]	TBD
MOB-10	Off-Road Mobile Source Emission Reduction Credit Generation Program [PM2.5, NOx]	TBD
South Coast AQMD Incentive-Based Measures:		
MOB-11	Emission Reductions from Incentive Programs [PM2.5, NOx]	TBD
MOB-12	Pacific Rim Initiative for Maritime Emission Reductions [PM2.5, NOx]	TBD
South Coast AQMD Other Mobile Source Measures:		
MOB-13	Rule 2202 – On-Road Motor Vehicle Mitigation Options [PM2.5, NOx]	TBD

Rule Effectiveness

The U.S. Environmental Protection Agency (U.S. EPA) has adjustment factors by industry type, but an adjustment is not necessary when emissions can be calculated by means of a direct determination. In most cases, South Coast AQMD calculates emission reductions by means of direct determination. As described below under Rule Compliance and Test Methods, the compliance demonstration for each proposed control measure, where the South Coast AQMD accounted for emission reductions, identifies the compliance mechanisms such as recordkeeping, inspection and maintenance activities, etc., and test methods such as South Coast AQMD, California Air Resources Board (CARB), and U.S. EPA approved test methods. South Coast AQMD's ongoing source testing and on-site inspection programs also strengthen the status of compliance verification. In addition, South Coast AQMD 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 South Coast AQMD'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.

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

- BCM Best Control Measures
- ECC Energy and Climate Change Sources
- EGM Emission Growth Management Sources
- MOB Mobile Sources

Title

The title contains the control measure name and the major pollutant(s) controlled by the measure.

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 PM2.5 Plan 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 SIP 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 South Coast Air Basin (Basin), description of emission sources, and pollutants.

The regulatory history contains information regarding existing regulatory control of the source category such as applicable South Coast AQMD rules or regulations and whether the source category was identified in prior air quality plans.

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 South Coast AQMD'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. 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 PM2.5 Plan and are provided in the Control Measure Summary Table. The emissions section of the control measure summary table includes the 2018 base year inventory and the 2030 future year inventory. The 2030 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, South Coast AQMD 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 South Coast AQMD 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 PM2.5 Plan inventory will be used. More specifically, emission reductions that are permanent and achieved due to mandatory or voluntary, but enforceable, actions will be credited towards SIP obligations.

Rule Compliance and Test Methods

This section addresses requirements in the 1990 Clean Air Act by which the 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, South Coast AQMD would continue to verify rule compliance through site inspections, recordkeeping, and submittal of compliance plans (when applicable).

In addition to requiring recordkeeping and monitoring requirements, the 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 South Coast AQMD, CARB, and U.S. EPA source test methods.

Cost Effectiveness

Staff relied on control measure cost-effectiveness analyses presented in the 2016 and 2022 AQMPs. Cost-effectiveness approaches include Discounted Cash Flow (DCF), Levelized Cash Flow (LCF), and Modified LCF (MLCF). The approaches differ in how compliance costs are calculated: DCF converts all costs to the present value while LCF annualizes all costs over the equipment life. The conversions are done irrespective of how the compliance costs are actually financed by each affected facility. The difference in cost conversion between DCF and LCF means that the dollar costs of compliance alternatives are expressed at different time periods; therefore, the cost-effectiveness results, albeit both in dollar per ton, are not directly comparable to each other. MLCF is an approach that uses the traditional LCF method, but modifies it to only include costs incurred between 2023-2037, which aligns with the planning horizon in the 2022 AQMP.

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.

BCM-01: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOx APPLIANCES – RESIDENTIAL WATER HEATING

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL WATER HEATING	
CONTROL METHODS:	REGULATORY APPROACH: ZERO EMISSION AND LOW NOX LIMIT, AND INCENTIVE APPROACH: ZERO EMISSION TECHNOLOGY	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.59	0.56
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	1.89	1.80
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Control measure BCM-01 seeks further NOx emission reductions from residential building water heating sources that are subject to Rule 1121 - Control of Oxides of Nitrogen (NOx) from Residential Type, Natural Gas-Fired Water Heaters.

BCM-01 sources were previously included under the 2016 AQMP control measure CMB-02 for NOx emission reductions from residential and commercial appliances, with a control strategy focused on a combination of long-term regulation and short-term incentives to replace existing water heaters with new zero emission or low NOx emission units. BCM-01 is derived from 2022 AQMP control measure R-CMB-01.

Regulatory History

Rule 1121 - Control of Nitrogen Oxides from Residential Type, Natural-Gas-Fired Water Heaters, applies to manufacturers, distributors, retailers, and installers of natural gas-fired water heaters, with heat input rates less than 75,000 Btu per hour. This type of water heater is typically a tank type for residential water heating. Rule 1121, last amended in 2004, requires the implementation of 10 ng/J NOx emission limit, which currently remains one of most stringent NOx standards for this appliance in the nation.

Rule 1121 was originally adopted in 1978, establishing a 40 ng/J NOx emission limit for residential water heaters. This rule was amended in 1999 to lower the emission limit by two steps, from 40 ng/J to 20 ng/J on July 1, 2002 (interim limit) and then 10 ng/J on January 1, 2005 (final limit). The rule was amended in 2004 to extend the compliance date for the final rule limit. With that amendment, the final emission limit of 10 ng/J became applicable on January 1, 2006, for conventional water heater of 50-gallon capacity or less, on January 1, 2007 for conventional water heater greater than 50 gallon capacity, and on January 1, 2008 for direct-vent, power-vent, and power direct-vent water heaters. Manufacturers paid a mitigation fee during the interim period prior to the final compliance date.

Proposed Method of Control

Control measure BCM-01 seeks NOx emission reductions from residential building water heating sources by: (1) requiring zero emission water heating units through a regulatory approach for both new and existing residences; and (2) allowing low NOx technologies as a transitional alternative in lieu of installing and operating zero emission water heaters, when installing a zero emission unit is determined to be infeasible (e.g., colder climate zones, or architecture design obstacles). A mitigation fee will be considered where appropriate. The mitigation fee collected would be utilized as incentives to accelerate the adoption of zero emission units.

A primary zero emission residential water heating technology is the all-electric heat pump water heater. Most homeowners who have heat pumps use them to heat and cool their homes. But a heat pump also can be used to heat water, either as stand-alone water heating system, or as a combination water heating and space conditioning system. Because they remove heat from the air, any type of air-source heat pump system works more efficiently in a warm climate. Manufacturers' heat pump water heater development involves expanding the number of available models, further improving unit energy efficiency, enhancing heat pump performance for colder weather, and developing a heat pump water heater that can operate from a (residential standard) 120-volt plug-in. The low power 120-volt design can plug into existing wall outlets without requiring expensive panel upgrades and/or home rewiring that can be required for traditional heat pumps that require 240-volts, providing a more cost-effective solution for retrofit applications.

The primary lower NOx water heating technologies include fuel cell water heaters and gas heat pump water heaters. Residential fuel cells used for the generation of electricity and hot water have been available commercially in Europe since 2009. This technology is yet to be utilized in the United States market. A residential fuel cell with a hot water storage tank is a suitable technology to provide hot water usage for a small number of residents. South Coast AQMD also has funded a natural gas heat pump water heater demonstration by Stone Mountain Technologies. A natural gas heat pump water heater is another lower NOx emission technology that uses a natural gas fired engine instead of electricity, to drive the heat pump compressor. Control measure BCM-01 also proposes to incentivize zero emission technologies adoption with a focus on electric panel upgrades needed for older homes especially for homes in disadvantaged communities. The collected mitigation fees would fund the incentives. Staff plans to allocate a significant percentage of funding to residents in disadvantaged communities and offer higher rebate amounts to those residents. Furthermore, staff will conduct outreach to disadvantaged communities including public meetings to gain feedback on the incentive program development and processes. The incentive approach would not only promote more participation in building electrification but also provide an opportunity to address any potential inequities on cost burden by allocating a portion of funding to overburdened communities. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

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 measurable 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.

- Surplus: Emission reductions must be above and beyond any South Coast AQMD, 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 State Implementation Plan (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 SIP 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 South Coast AQMD 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 for emission reductions can be identified;
    - The South Coast AQMD and the 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 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 SIP 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 the South Coast AQMD (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 SIP needs to have detailed and comprehensive guidelines that are approved by the South Coast AQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability:

- ☑ SIP should demonstrate compliance with the four key elements of the SIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance, and permanent reductions.
- ☑ A working group should be established to solicit public input and feedback during SIP 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 and submittal to the U.S. EPA annually. Tracking checklist should include:
  - ☑ Project Title.
  - ☑ Product.
  - ☑ Annual Emission Reductions (e.g., from 2030 to 2050, incremented by one year).
  - ☑ Life of project (e.g., 10 years).
  - ☑ Installation dates (e.g., fixed year 2030 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 South Coast AQMD Governing Board and published online.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary sources.

References

South Coast Air Quality Management District. (2004). Rule 1121 – Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters (Amended September 3, 2004).

South Coast Air Quality Management District. (2004). Final Staff Report: Proposed Amended Rule 1121 – Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters. South Coast Air Quality Management District. August 2004.

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Application of Southern California Edison Company for Approval of its Building Electrification Programs. December 2021. https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=432773552

BCM-02: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOx APPLIANCES – RESIDENTIAL SPACE HEATING

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL SPACE HEATING	
CONTROL METHODS:	REGULATORY APPROACH: ZERO EMISSION AND LOW NOX LIMIT, AND INCENTIVE APPROACH: ZERO EMISSION TECHNOLOGY	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.90	0.88
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	11.66	7.64
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Control measure BCM-02 seeks nitrogen oxides (NOx) emission reductions from residential space heating sources regulated by Rule 1111 - Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces.

BCM-02 sources were previously included under the 2016 AQMP control measure CMB-02 for NOx emission reductions from residential and commercial appliances, with a control strategy focused on implementing 14 ng/J Rule 1111 NOx limit and the associated Clean Air Furnace Rebate Program. BCM-02 is derived from 2022 AQMP control measure R-CMB-02.

Regulatory History

Rule 1111 reduces emissions of NOx from gas-fired fan-type space heating furnaces with a rated heat input capacity of less than 175,000 Btu per hour or, for combination heating and cooling units, a cooling rate of less than 65,000 Btu per hour. The rule applies to manufacturers, distributors, and installers of such furnaces. The applicable furnaces are mainly utilized in residential buildings.

Rule 1111 was adopted by the South Coast AQMD Governing Board in December 1978 establishing a 40 ng/J NOx emission limit. The rule was amended in 2009 lowering the NOx emission limit from 40 to 14 ng/J with a future compliance date. Rule 1111 categorizes furnaces into condensing, non-condensing, weatherized furnaces, and mobile home furnaces. Depending on the furnace type, the compliance date has been postponed by the mitigation fee alternate compliance option or temporary exemption.

Implementation of 14 ng/J NOx limit for condensing and non-condensing furnaces (about 85 percent of market coverage) for installations in new buildings or replacements in existing buildings started on October 1, 2019, except for high-altitude furnaces.[28] Implementation of 14 ng/J NOx limit for weatherized furnaces (about 10 percent of market coverage) commenced on October 1, 2021. The most recent Rule 1111 amendment in September 2021 delayed the implementation for mobile home furnaces (about 4 percent of market coverage) to October 1, 2023 and provided special consideration for high-altitude furnaces. That is, condensing or non-condensing furnaces with 40 ng/J NOx are allowed to be installed in high-altitude areas until March 31, 2022, when 14 ng/J NOx limit becomes effective. Rule 1111 also provides an exemption for downflow and large-sized (≥100,000 Btu/hour) condensing or non-condensing furnaces, replacing existing furnaces in the high-altitude areas. This niche exemption would result in a negligible amount of emission reductions forgone.

In conjunction with the Rule 1111 implementation, the Clean Air Furnace Rebate Program was launched in June 2018 with a fund of $3,000,000 to incentivize early deployment of compliant furnaces, which was

[28] Condensing or non-condensing furnaces installed at elevations greater than or equal to 4,200 feet above sea level

subsequently exhausted. So, in September 2020 this program was approved to be updated with an additional fund of $3,500,000 and expanded to incentivize all-electric heat pumps to replace central ducted Rule 1111 non-compliant furnaces. Relevant to the 2016 AQMP CMB-02 implementation, a request for proposal was issued in January 2018 and twenty-six proposals for emission reduction and technology demonstration projects were approved to be funded by the Governing Board in January 2019. Among those proposals, one burner technology development project was for residential and commercial furnaces targeting NOx emissions to be certified ranging from 7 to 8 ng/J. Although the Covid-19 pandemic caused a delay, those projects were completed in 2023. Current rulemaking is focused on zero emission standards in order to achieve air quality objectives.

Proposed Method of Control

Control measure BCM-02 seeks NOx emission reductions from residential building space heating sources by: (1) requiring zero emission space heating units through a regulatory approach for both new and existing residences; and (2) allowing low NOx technologies as a transitional alternative in lieu of installing and operating zero emission space heating units, when installing a zero emission unit is determined to be infeasible (e.g., colder climate zones, or architecture design obstacles). A mitigation fee will be considered where appropriate. The mitigation fee collected would be utilized as incentives to accelerate the adoption of zero emission units.

With regards to zero emission technologies, all-electric heat pumps offer an energy-efficient and zero emission alternative to natural gas furnaces. There are three types of heat pumps: (1) air-to-air, (2) water source, and (3) geothermal. The heat pump choice depends on whether the unit transfers heat between the building and outside air, water, or ground. The most common type is the air source heat pump. According to the United States Department of Energy, today's heat pump systems can reduce household electricity use for heating by approximately 50 percent compared to electric resistance heating such as furnaces and baseboard heaters. High-efficiency heat pumps also dehumidify better than standard central air conditioners, resulting in less energy usage and more cooling comfort during the summer months. For homes without ducts, air source heat pumps are also available in a ductless version, referred as a split system. Heat pumps have been used for many years in nearly all areas of the United States. However, when utilized in warmer climate zones such as in the South Coast Air Basin (Basin), heat pumps are even more energy-efficient and cost-effective.

A new type of heat pump for residential systems is the absorption heat pump, also called a natural gas heat pump, which is considered a low NOx emission technology. Instead of using electricity to fuel the operation, a natural gas heat pump has a natural gas fired engine to drive the heat pump compressor.

Current Rule 1111 compliant furnaces are certified at achieving 14 ng/J NOx level, however, many of these furnace models were tested below 10 ng/J for NOx emissions. Staff reviewed the source test results for 24 base models that were certified in 2021 at 14 ng/J NOx emissions. Fifteen models tested below 10 ng/J NOx level, and six of them were at or below 7 ng/J NOx level. Furthermore, lower NOx emission rates are expected by new burner development projects as demonstrated by burner development projects

currently funded by South Coast AQMD. For example, Lantec Products has completed the burner design, operational testing, and certification of residential condensing and non-condensing furnaces emitting no more than 7 ng/J NOx, and will seek to commercialize in the near future. Low NOx space heating technologies would provide an alternative or off-ramp for situations when zero emission requirement is deemed not as feasible/efficient. The examples could include buildings in a cooler climate zone, or structures with special design or function.

In addition to a regulatory approach, incentives for the purchase and installation of zero emission technology (e.g., electric heat pump) or electric panel upgrade would be considered under this control measure not only for additional emission reductions, but also to encourage further development of future zero emission space heating technology for existing residential buildings. With the additional Rule 1111 mitigation fees that have been collected and utilization of the existing Clean Air Furnace Rebate Program, future Rule 1111 incentives could be readily implemented. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms. Incentives for residents to adopt zero-emission appliances would not only promote more participation in building electrification, but also provide an opportunity to address some of the inequities by allocating a significant percentage of funding to residents in disadvantaged communities and offering higher rebate amounts to those residents. Staff plans to conduct outreach to disadvantaged communities including public meetings to gain feedback on program development and processes.

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 measurable 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.

- Surplus: Emission reductions must be above and beyond any South Coast AQMD, 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 State Implementation Plan (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 SIP 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 South Coast AQMD 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 for emission reductions can be identified;
    - The South Coast AQMD and the 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 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 SIP 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 the South Coast AQMD (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 SIP needs to have detailed and comprehensive guidelines that are approved by the South Coast AQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability:

- ☑ SIP should demonstrate compliance with the four key elements of the SIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance, and permanent reductions.
- ☑ A working group should be established to solicit public input and feedback during SIP 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., 2031, 2037) and submittal to the U.S. EPA annually. Tracking checklist should include:
  - ☑ Project Title.
  - ☑ Product.
  - ☑ Annual Emission Reductions (e.g., from 2030 to 2050, incremented by one year).
  - ☑ Life of project (e.g., 10 years).
  - ☑ Installation dates (e.g., fixed year 2030 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 South Coast AQMD Governing Board and published online.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary sources.

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BCM-03: EMISSION REDUCTIONS FROM RESIDENTIAL COOKING DEVICES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL COOKING DEVICES	
CONTROL METHODS:	Low NOx Burners, Induction Cooktops and Electric Cooking Devices	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.10	0.10
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	1.28	1.23
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Control Measure BCM-03 seeks to achieve NOx reductions from residential cooking devices including stoves, ovens, griddles, broilers, and others in new and existing residential buildings. Natural gas and electricity are the two main types of energy sources used in this source category. Conventional gas cooking appliances typically use atmospheric burners that mix primary air with fuel gas to create a combustible

mixture.[29] Gas cooking devices emit criteria pollutants such as NOx, particulate matter, and CO through incomplete combustion and oxidation processes. Electric cooking devices and induction cooktops that utilize electricity rather than gas do not generate NOx emissions on site. Induction cooktops are also highly energy efficient as they heat cookware directly, resulting in minimal heat loss. Replacing existing gas burners with zero emission and low NOx emission appliances such as electric cooking devices, induction cooktops, and low NOx gas burners can reduce emissions from residential cooking devices. Some emission sources in BCM-03 were previously included in the 2016 AQMP as control measure CMB-04, which addresses NOx emission reductions from restaurant burners and residential cooking. The proposed method of control for CMB-04 in the 2016 AQMP was a combination of regulatory approaches, incentives and/or efficiency standards. BCM-03 is derived from 2022 AQMP control measure R-CMB-03.

Background

There are over 5.3 million occupied housing units in the South Coast Air Basin (Basin). Almost 75 percent of these households use gas appliances for cooking, while the remaining households use electric cooking devices, induction cooktop, and other fuels.[30] The transition from conventional gas burners to electric cooking devices, induction cooktops, or low NOx gas burners would improve both indoor and outdoor ambient air quality.

As part of the 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy), the California Air Resources Board (CARB) has proposed statewide emissions standards for combustion-based appliances in residential and commercial buildings to accelerate the transition from fossil fuels. CARB proposed to adopt a statewide zero Greenhouse Gas (GHG) emissions standard for space and water heaters, which would have co-benefits of reducing criteria pollutants. Beginning in 2030, 100 percent of sales of new space and water heaters would need to meet zero emission standards. This requirement applies to both new construction and replacement of burned-out equipment in existing buildings. As part of the public measure suggestions, the 2022 State SIP Strategy includes the possibility of additional emissions standards for combustion-based appliances used in buildings such as stoves, work with air districts to set further such standards, work with building and energy code agencies to ready more buildings for zero emission appliances, or take other actions (including potentially incentive programs) to accelerate the removal of fossil fuels from the building stock in both new and existing buildings. Such measures can accelerate the transition away from pollution associated with combustion in these sources while creating economic opportunities for building retrofits.[31]

Regulatory History

NOx emissions from residential cooking devices are not currently regulated by South Coast AQMD. In the last few years, the State of California has established aggressive goals to reduce GHG emissions across various sectors. State climate actions can help reduce combustion-related emissions from residential

[29] Primary air - air supplied and mixed with fuel prior to ignition that controls the amount of fuel to be burned
[30] 2019 California Residential Appliance Saturation Study
[31] CARB 2022 State Strategy for the State Implementation Plan

cooking appliances. Senate Bill (SB) 100 signed in 2018 increased California's Renewables Portfolio Standard (RPS) to 60 percent renewable energy sources by 2030. California Governor's Executive Order (EO) B-55-18 established the goal of carbon neutrality and 100 percent carbon-free energy sources by 2045. The increase in renewable generation in the state will reduce NOx emissions from electricity generating facilities.[32] Furthermore, Assembly Bill (AB) 3232 requires the California Energy Commission (CEC) in consultation with the California Public Utilities Commission (CPUC) and CARB, to develop plans and projections to reduce greenhouse gas emissions from California's residential and commercial buildings to 40 percent below 1990 levels by 2030. Once materialized, AB 3232 is an opportunity to bring further NOx emission reductions from residential and commercial buildings.

Proposed Method of Control

This proposed control measure seeks NOx reductions from residential cooking devices by replacing conventional gas-fired cooking appliances with zero emission and low NOx emission devices such as electric cooking devices, induction cooktops, and low NOx burner technologies.

In the South Coast Air Basin, residential cooking accounts for about 11 percent of total residential combustion emissions in 2018. Electric and induction cooking devices offer the most reductions opportunities with no emissions on site and have been commercially available for years. Electric cooking devices include a coil or infrared heating element that generates heat by electric current and are often inexpensive due to their simple design. High efficiency induction cooktops do not have an open flame and transfer heat directly through magnetic cookware which minimizes heat loss to ambient air. Consequently, this reduces cooking times and NOx emissions and adds extra safety in food preparation. Low NOx gas burners can also provide NOx reductions compared to conventional burners. Organizations such as the Lawrence Berkeley National Laboratory (LBL) have developed a low NOx Ring Burner that can be used for residential and commercial gas cooking devices, as well as other appliances such as water heaters and furnaces. The low NOx Ring Burner can achieve NOx levels of less than 20 ppm, which is about 80 percent lower than the emissions from conventional gas burners.[33] Reductions are achieved by a ring burner design that burns a leaner premixed fuel/air mixture capable of more complete combustion and lower NOx emissions. Additional research and development with an Original Equipment Manufacturer (OEM) are needed for the LBL Ring Burner to meet the American National Standards Institute (ANSI) cooktop standards for commercialization.

NOx reductions could be achieved through a combination of regulatory and incentive approaches. Proposed method of control consists of two steps: step one is a technology assessment including testing of various cooking devices to establish emissions rates. Once emissions rates are defined, step two supports future rule development and incentive programs. The first applies to manufacturers, distributors, and installers establishing emission limits and the latter intends to encourage use of zero emission and low NOx emission technologies. The rule working group will include a diverse group of

[32] 2021 SB 100 Joint Agency Report
[33] Research and Development of Natural Draft Ultra-Low Emissions Burners for Gas Appliances

stakeholders representing manufacturers, distributors, and installers. As for the incentive approach, South Coast AQMD will consider funding various projects/programs to facilitate the deployment of zero emission and low NOx emission appliances, including, but not limited to technology development, public outreach to promote consumers' choice for clean technology, incentive funding for the purchase and installation of clean technology appliances. Partnerships with utilities will be pursued to implement incentive programs that maximize reductions in a cost-effective manner. Implementation of this control measure will be a combination of regulatory and incentive approaches. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms. Incentives for residents to adopt zero_-emission appliances would not only promote more participation in building electrification, but also provide an opportunity to address some of the inequities by allocating a significant percentage of funding to residents in disadvantaged communities and offering higher rebate amounts to those residents. Staff plans to conduct outreach to disadvantaged communities including public meetings to gain feedback on program development and processes.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary and area sources.

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BCM-04: EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO EMISSION OR LOW NOx APPLIANCES – RESIDENTIAL OTHER COMBUSTION SOURCES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL - OTHERS	
CONTROL METHODS:	REGULATORY APPROACH: ZERO EMISSION AND LOW NOX LIMIT, AND INCENTIVE APPROACH: ZERO EMISSION TECHNOLOGY	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.22	0.23
PM2.5 REDUCTION	-	TBD
PM2.5 REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	3.53	3.74
NOX REDUCTION	-	TBD
NOX REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Control measure BCM-04, as residential-others, seeks NOx emission reductions from residential combustion sources using natural gas and Liquefied petroleum gas (LPG) that are not water heating (See BCM-01), space heating (See BCM-02) and cooking equipment (See BCM-03). BCM-04 sources are miscellaneous, but primarily comprised of swimming pool heaters, laundry dryers, and barbecue grills. Further study is needed to identify other equipment that would be subject to this control measure. Such a study should be included in future rulemaking efforts.

Pool heaters are regulated under Rule 1146.2. Natural gas pool heaters normally have a capacity ranging from 75,000 to 450,000 Btu per hour. The 2012 AQMP estimated that there were about 200,000 residential pool heaters in the South Coast Air Basin (Basin).

According to the U.S. Department of Energy, laundry dryers with drum sizes less than 4.4 cubic feet are deemed as "compact sized" and dryers with drum sizes equal to or large than 4.4 cubic feet are classified as "standard sized." Residential laundry dryer drum volumes may be compact sized but for gas models typical drum volumes are between 5.6 and 7.4 cubic feet with heat input ratings between 20,000 and 25,000 Btu/hour.

The laundry market is composed of both gas and electric devices. Gas laundry dryers can be fueled by either natural gas or LPG gas. Most electric dryers operate on 240-volt to heat the equipment's coils. This is about twice the voltage used to operate the standard household devices. Some compact or portable electric dryers may operate on 110-volts. Gas and electric dryers typically have about the same equipment life. According to H&R Block (usnews.com), a gas dryer's expected lifespan is about 13 years, compared to an electric dryer's expected lifespan of 14 years.

According to a 2009 report by the Environmental Council of the States (ECOS), in 2008 U.S. consumers purchased nearly 7 million clothes dryers, of which 5.62 million were electric and 1.35 million were natural gas. That would mean 32,400 annual consumer purchase of natural gas residential laundry dryers in the South Coast Air Basin. This estimation is based on a 12 percent nationwide purchase being in California (California Energy Commission, 2013), and 20 percent California purchase being within the Basin.

For barbecue grills, according to www.statista.com, a 2013 study by Hearth, Patio & Barbecue Association found that 61 percent of users opted for gas grills and 10 percent of users owned electric rigs. In 2018, gas barbecue grill sales in the United States amounted to about 1.32 billion U.S. dollars. According to www.theatlantic.com, Hearth, Patio & Barbecue Association believes that the electric-grill market is expected to continue to grow at an average rate of 7 percent a year.

BCM-04 sources were previously included as a part of control measure CMB-02 in 2016 AQMP for NOx emission reductions from residential and commercial appliances, with a control strategy focused on regulating those currently unregulated commercial furnaces used for space heating and incentivizing zero

emission and low NOx emission technology appliances. BCM-04 is derived from 2022 AQMP control measure R-CMB-04.

Regulatory History

Pool heaters are regulated under Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters. The provisions of this rule are applicable to manufacturers, distributors, retailers, installers, and operators of new units with a rating at or less than 2,000,000 BTU per hour, excluding units regulated by Rule 1121. The provisions of this rule are also applicable to operators of existing units that are rated greater than 400,000 BTU per hour up to and including 2,000,000 BTU per hour. Rule 1146.2 does not regulate residential gas-fired tank type water heaters less than 75,000 BTU/hour heat input which are regulated under South Coast AQMD Rule 1121. Rule 1146.2 units are typically used for industrial and commercial water heating. Pool heaters are also regulated under Rule 1146.2. Natural gas pool heaters normally have a capacity ranging from 75,000 to 450,000 BTU per hour.

Rule 1146.2 was originally adopted in 1998 and was amended in 2006 to impose a lower NOx emission limit. The current Rule 1146.2 limit for NOx emissions is 14 ng/J (20 ppm), except for Type 1 units rated equal and greater than 400,000 BTU per hour installed prior to January 1, 2012 to which the NOx limit is 55 ppm, and for Type 2 units rated between 400,000 and 2,000,000 BTU per hour installed prior to January 1, 2010 to which the NOx limit is 30 ppm.

According to the 2018 amendment, Rule 1146.2 required a technology assessment that was due to the South Coast AQMD Governing Board by January 2022. This technology assessment was to determine if the current NOx emission limit should apply to both RECLAIM and non-RECLAIM units, or if a BARCT assessment should be undertaken as part of the rulemaking process to seek a lower NOx emission limit. Under the BARCT assessment, the technology to achieve a lower NOx limit will need to be feasible, available, and cost-effective. This lower NOx emission limit would apply to both RECLAIM and non-RECLAIM units. A technology assessment was completed by January 1, 2022, determining that the NOx emission limits should be lowered in order to satisfy BARCT requirements. Staff evaluated water heaters and boilers rated less than or equal to 2,000,000 Btu/hr in both non-RECLAIM and RECLAIM facilities and reviewed certification test reports submitted in recent years to understand the actual emission levels of certified models and the potential for achieving NOx emission reductions. Prior to the current rulemaking, staff reviewed 137 source tests conducted since 2017 for units required to be certified at 20 ppm for NOx emissions and found that 39 units (28 percent of units) had NOx concentrations less than 12 ppm and 21 units (15 percent of units) had NOx concentrations less than 10 ppm. As part of the 2021 technology assessment, staff also met with stakeholders seeking their input and conducted a working group meeting on December 16, 2021. Staff recommended a future rule amendment and BARCT assessment to evaluate the potential for further NOx emission reductions. Proposed Amended Rule 1146.2 is currently undergoing rule development for zero-NOx-emissions.

Residential laundry dryers and gas grills are not regulated by any South Coast AQMD rule for NOx emissions.

Proposed Method of Control

Control measure BCM-04 seeks NOx emission reductions from residential-other combustion sources by: (1) requiring zero emission technologies through a regulatory approach for some emission sources in both new and existing residences; and (2) allowing low NOx technologies as an alternative for the rest of emission sources. A mitigation fee may be required for certain lower NOx technology applications which will be evaluated during the future rulemaking process. The mitigation fee collected would be utilized as incentives to accelerate the adoption of zero emission units.

Although the currently available electric laundry dryers (electric resistance heating models) are considered zero NOx emission units, heat pump laundry dryers with a much higher energy efficiency would be the preferred zero emission technology for incentives.

Heat pump laundry dryer technology has been in existence for years as an alternative to electric resistance heating models. However, the market presence of this technology remains insignificant in the United States as the low number of this technology is probably due to the higher cost of this technology. Heat pump dryers may also have longer drying times than resistance heating models. This is due to a smaller heat pump that is typically used for cost and efficiency considerations.

Heat pump dryers with an integrated heat recovery exhaust condenser would increase the dryer's efficiency. This efficiency increase is a result of exhaust heat being captured and reused. As noted in the 2013 Department of Energy's study, under a demonstration project funded by the U.S. Department of Energy, a modified heat pump clothes dryer delivered 40-50 percent energy savings with 35 degrees Fahrenheit lower fabric temperatures and similar drying times for regular loads.

ENERGY STAR certified heat pump dryer models are available for the brands Asko, Beko, Blomberg, LG, Miele, Samsung, and Whirlpool.

The emerging zero emission technology for heating pools is the swimming pool heat pump. Heat pumps used for heating pools transfer heat from the outdoors into the water. Heat pump pool heaters work efficiently as long as the outside temperature remains above the 45–50 degrees Fahrenheit range. The warm climate of the South Coast Air Basin favors the application of pool heat pumps. As a pool heat pump works slower than a gas heater on heating the pool, it is better suited when a consistent pool temperature for a long period of time is desired. The most economical way to run this type of heater is to let the unit run automatically to keep "topping up" the heat.

Natural gas pool heaters are subject to Rule 1146.2 and it is certification requirement for NOx emissions. Staff reviewed source test results for Rule 1146.2 certification conducted since 2017. There are tests for six heater models identified by the vendors as pool heaters. As all six models were certified to meet the 55 ppm NOx limit, four of them showed emissions at 10 to 20 ppm. A low NOx limit may be feasible with the current technology.

With regards to gas grills, the electric-grill market is expected to continue to grow at an average rate of 7 percent a year. A regulatory approach would accelerate the turnover of some gas gills to zero emission grills. In addition to zero emission units, emission reductions could be achieved by lower emission technologies. As burner adjustment for cooking equipment as proposed by control measure BCM-03 would lower the NOx emissions by 70 percent, this technology could be potentially applied to gas grills as well. Further evaluation during future rulemaking will be conducted.

In addition to a regulatory approach, incentives for the purchase and installation of zero emission technology or electric panel upgrade would be considered under this control measure not only for additional emission reductions, but also to encourage further development of future zero emission space heating technology for existing residential buildings. Collected mitigation fee and future allocated funding would be utilized for the incentives. More local agencies are now proposing incentives for retrofitting gas appliances, including sources for this control measure. For example, the City of Santa Monica is offering a $300-400 rebate for replacing a gas dryer with an electric heat pump clothes dryer, incentives to electric panel upgrade, and rebates to other zero emission appliances. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

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 measurable 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.

- Surplus: Emission reductions must be above and beyond any South Coast AQMD, 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 State Implementation Plan (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 SIP 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 South Coast AQMD 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 for emission reductions can be identified;
    - The South Coast AQMD and the 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 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 SIP 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 the South Coast AQMD (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 SIP needs to have detailed and comprehensive guidelines that are approved by the South Coast AQMD Governing Board. The guidelines will be the protocol to implement the program, to ensure SIP applicability, and to maintain SIP approvability:

☑ SIP should demonstrate compliance with the four key elements of the SIP: quantifiable emissions plus incentive costs, surplus reductions, enforceable compliance, and permanent reductions.

- ☑ A working group should be established to solicit public input and feedback during SIP 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., 2031, 2037) and submittal to the U.S. EPA annually. Tracking checklist should include:
  - ☑ Project Title.
  - ☑ Product.
  - ☑ Annual Emission Reductions (e.g., from 2030 to 2050, incremented by one year).
  - ☑ Life of project (e.g., 10 years).
  - ☑ Installation dates (e.g., fixed year 2030 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 South Coast AQMD Governing Board and published online.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD Method 100.1

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary sources.

References

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BCM-05: EMISSION REDUCTIONS FROM EMERGENCY STANDBY ENGINES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	EMERGENCY STANDBY ENGINES	
CONTROL METHODS:	REGULATIONS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.15	0.14
POLLUTANT REDUCTION	-	0.04
POLLUTANT REMAINING	-	0.10
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	4.15	3.97
POLLUTANT REDUCTION	-	0.36
POLLUTANT REMAINING	-	3.61
CONTROL COST:	MODIFIED LCF METHOD: $1,027,200/TON OF NOX REDUCED^	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

^Cost-effectiveness only considers NOx reductions. Including PM2.5 reductions would further reduce the ratio.

Description of Source Category

Internal combustion engines (ICEs) are commonly used for emergency backup for electric power generation. South Coast AQMD rules require permits for stationary ICEs rated over 50 brake horsepower (bhp). Based on South Coast AQMD's permitting database, there are over 12,000 permitted emergency standby ICEs at a wide range of facilities such as commercial buildings, hospitals, convalescent facility medical support systems, cell towers, police facilities, schools, etc. Approximately 90 percent of these ICEs are diesel-fueled, and an estimated 88 percent of these diesel emergency ICEs do not meet Tier 4 Final emission standards, and thus emit higher emissions.

Background

Emergency standby ICEs typically operate only when backup power is needed and for testing and maintenance purposes. In general, they have long lifespans, meaning that older, more polluting ICEs are kept in service when cleaner technologies are available. Under Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines and Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines, emergency standby ICEs are exempt from emission limits provided permit conditions are established that limit use to 200 hours or less per year. Emissions from emergency standby ICEs are notable due to the large numbers of this equipment in the South Coast AQMD, as well as the advanced age of the equipment.

A control measure to reduce NOx and VOC emissions from emergency standby ICEs was included in the 2022 AQMP (L-CMB-04: Emissions Reductions from Emergency Standby Engines). The control measure sought to maximize NOx emission reductions by installing alternatives to ICEs where and when technically feasible and cost-effective. As described in the 2022 AQMP, alternatives to emergency standby ICEs are emerging technologies and may not be suitable for all applications. Accordingly, a feasibility assessment was identified as a first step to identify industries or specific applications (e.g., facilities with low standby power needs) that can move towards zero emission and low NOx technologies for emergency backup power. Emissions reductions for the 2022 AQMP control measure were therefore assigned to the year 2037. The purpose of this PM2.5 plan is to identify emissions reductions that can be achieved by 2030.

The PM2.5 Plan includes an emissions inventory for 2018 and 2030. The emissions inventory for L-CMB-04 (Emergency Standby Engines) in this control measure is based on emissions from point and area source ICEs.

Renewable Diesel Fuel

Renewable diesel is a synthetic diesel fuel produced from non-petroleum resources and meets CARB diesel specifications, as well as the ASTM International[34] D975 standard specification for diesel fuel. It is not interchangeable with biodiesel. Both are derived from similar feedstock, but undergo different processing methods and have different chemical properties, physical properties and environmental attributes. Biodiesel can reduce PM emissions, but can increase NOx emissions in some ICEs, and is used as a blend stock rather than as a replacement for CARB diesel fuel. Renewable diesel is currently widely available and is a drop-in replacement for CARB diesel fuel; it can be used in ICEs immediately, without the need to modify equipment or operations. The storage life of renewable diesel has also been found to be comparable with conventional diesel fuel. CARB-led evaluations of renewable diesel have found that using it in place of CARB diesel reduces PM emissions by approximately 30 percent, and NOx emissions by approximately 10 percent in ICEs without Tier 4 Final controls. In 2022, CARB amended Commercial

[34] ASTM International, formerly American Society for Testing and Materials, develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services (www.astm.org).

Harbor Craft (CHC) and In-Use Off-Road Diesel-Fueled Fleet (ORD) regulations to require the use of 99 or 100 percent renewable diesel fuel for mobile (non-Tier 4 Final) diesel-fueled ICEs by January 1, 2024.

A potential roadblock to the widespread use of renewable diesel in emergency standby ICEs is the cost differential compared to CARB diesel. The cost of renewable diesel to mobile source end-users is comparable with that of CARB diesel fuel due to credits and incentives provided by State and federal programs. There are no comparable programs for using renewable diesel in stationary sources.

Regulatory History

South Coast AQMD includes several regulations regarding ICEs, including:

- Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines;
- Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines; and
- Rule 1472 – Requirements for Facilities with Multiple Stationary Emergency Standby Diesel-Fueled Internal Combustion Engines.

Newly permitted emergency standby ICEs must be demonstrated to meet Best Available Control Technology (BACT) emission requirements. ICEs rated 50 to 750 bhp must meet Tier 3 emission standards, and ICEs rated over 750 bhp must meet Tier 2. Rule 1110.2 and Rule 1470 exempt emergency ICEs from meeting the rule's NOx, VOC, and CO emission limits provided that the engine has a permit condition limiting the engine to 200 operating hours or less per year. Nearly all, if not all, emergency standby ICEs are limited to 200 hours or less per year of operation. Additionally, Rule 1470 restricts operation of diesel emergency standby ICEs for maintenance and testing purposes to 50 hours a year or less and requires the use of CARB diesel fuel for all diesel-fueled ICEs rated over 50 brake horse power (bhp). These exempted emergency ICEs are also exempt from emissions testing, monitoring, reporting, and recordkeeping requirements of Rule 1110.2.

Proposed Method of Control

Most emergency standby ICEs within South Coast AQMD's jurisdiction are diesel-fueled, and most of those do not meet Tier 4 Final emission standards. Requiring the use of renewable diesel for all emergency standby ICEs that are not equipped with Tier 4 Final controls is a potential regulatory approach to achieve PM2.5 and NOx emission reductions in the near term. Renewable diesel is a readily available drop-in alternative to CARB diesel, and would result in immediate emissions reductions. South Coast AQMD can work with other relevant agencies to explore the use of credits and other incentives to ensure that the cost of renewable diesel to non-mobile source ICE end-users is also comparable to that of CARB diesel.

Other longer-term controls for this source category were proposed in the L-CMB-04 control measure in the 2022 AQMP. The potential regulatory approach outlined in L-CMB-04 involved removing the oldest

ICEs in the South Coast AQMD from operation where and when technically feasible and cost-effective. The approach would target the oldest diesel ICEs in operation for replacement, starting with pre-Tier 0 (pre-1988 model year) engines and then focusing on Tier 0 (1988+ model year) and Tier 1 (1996+ model year) engines. If facilities are not able to install alternatives to ICEs and sought to install new ICEs, the units would be required to be the lowest emitting diesel ICEs available or natural gas ICEs. Staff anticipates that this potential regulatory approach would begin implementation post-2030.

Emission Reductions

For a non-Tier 4 Final diesel ICE, replacing CARB diesel with renewable diesel would reduce PM and NOx emissions by approximately 30 percent and 10 percent, respectively. By applying these reductions to the emissions from all permitted non-Tier 4 Final diesel emergency standby ICEs, the estimated overall PM emissions reductions to this source category would be 27 percent, and the estimated overall NOx emissions reductions would be nine percent. These estimates would be refined as part of future rulemaking activities.

Rule Compliance and Test Methods

Compliance with the provisions of this control measure would require the use of only renewable diesel in non-Tier 4 Final diesel emergency standby ICEs. CARB recently amended its CHC and ORD regulations to require the use of renewable diesel by January 1, 2024.

Cost Effectiveness

Costs of implementing BCM-05 are based on the analysis for L-CMB-04 in the 2022 AQMP. Alternative emergency standby power technologies are emerging and are more expensive than diesel engines. Another challenge is that many of these technologies are also currently not designed to be used solely for emergency standby power and are not like-for-like replacements of emergency standby ICEs. As technologies mature and newer technologies emerge, staff anticipates that their costs will become more competitive in future years. Based on the best available information, the cost effectiveness, determined using the Discounted Cash Flow (DCF) method is estimated to be $592,000 per ton of NOx reduced; the cost effectiveness, determined using the Modified Levelized Cash Flow (MLCF) method is estimated to be $1,027,200 per ton of NOx reduced. A refined cost-effectiveness analysis for the proposed methods of control will be developed during rule development.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary engines rated over 50 bhp.

References

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BCM-06: EMISSION REDUCTIONS FROM DIESEL ELECTRICITY GENERATING FACILITIES [NOX]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ELECTRIC GENERATING UNITS AT ELECTRIC GENERATING FACILITIES	
CONTROL METHODS:	LOW NOX AND ZERO EMISSION TECHNOLOGIES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.43	0.34
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	1.55	2.06
POLLUTANT REDUCTION	-	0.16
POLLUTANT REMAINING	-	1.90
CONTROL COST:	DCF METHOD: $1,512,300/TON OF NOX REDUCED MODIFIED LCF METHOD: $2,420,000/TON OF NOX REDUCED	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

There are six diesel permitted electric generating units in the South Coast Air Basin (Basin). Electric generating units at electricity generating facilities are regulated by Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities (Rule 1135). Electricity generating facilities are investor-owned electric utilities, publicly owned electric utilities, or facilities with a combined electrical power generation capacity of 50 Megawatts or more for distribution in the state or local electrical grid system. Rule 1135 was amended in 2018 to require BARCT level emission limits as directed by the 2016 Final AQMP Resolution to transition equipment in the RECLAIM program to a command-and-control regulatory

structure. This control measure seeks PM emission reductions from diesel electric generating units by using renewable diesel and low NOx and zero emission technologies.

Background

When RECLAIM was adopted in 1993, electricity generating facilities were initially included in NOx RECLAIM and could opt-in to SOx RECLAIM. In June 2000, RECLAIM program participants experienced a sharp and sudden increase in NOx RECLAIM trading credit (RTC) prices for both the 1999 and 2000 compliance years. Based on the 2000 RECLAIM Annual Report, electricity generating facilities reported approximately 4,400 tons per year over their initial allocation. This was primarily due to an increased demand for power generation and delayed installation of controls by electricity generating facilities. The electric power generating industry purchased a large quantity of RTCs, which depleted the available RTCs. This situation was compounded because few RECLAIM facilities added control equipment. As a result, in May 2001, the Board adopted Rule 2009 – Compliance Plan for Power Producing Facilities (Rule 2009). Rule 2009 required installation of BARCT through compliance plans at electricity generating facilities. However, the six diesel engines used for power generation on Santa Catalina Island were excluded from Rule 2009 and remain in operation today.

Regulatory History

Rule 1135 was adopted in 1989 and applied to electric power generating steam boiler systems, repowered units, and alternative electricity generating sources. A NOx system-wide average emission limit and a daily NOx emissions cap was established for each utility system. Additionally, Rule 1135 required Emission Control Plans and continuous emissions monitoring systems (CEMS).

Rule 1135 was amended in December 1990 to resolve implementation and enforceability issues raised by CARB. This amendment included accelerated retrofit dates for emission controls, unit-by-unit emission limits, modified compliance plan and monitoring requirements, computerized telemetering, and an amended definition of alternative resources. Rule 1135 was amended again July 1991 to address additional staff recommendations regarding system-wide emission rates, daily emission caps, annual emission caps, oil burning, and cogeneration, along with outstanding issues related to modeling and BARCT analysis. U.S. EPA approved Rule 1135 into the State Implementation Plan (SIP) on August 11, 1998.

In 2018, Rule 1135 was amended to establish BARCT NOx limits which are needed to transition electricity generating facilities in the NOx RECLAIM program to a command-and-control regulatory structure and to implement Control Measure CMB-05 of the 2016 AQMP. The 2018 amendment expanded Rule 1135 applicability to all electric generating units at RECLAIM NOx, former RECLAIM NOx, and non-RECLAIM NOx electricity generating facilities. The amendment updated emission limits to reflect current BARCT levels.

Rule 1135 was last amended in January 2022 to revise the emission requirements for diesel internal combustion engines located on Santa Catalina Island. Rule 1135 incorporates a compliance path for Catalina Island electric generating units to meet a NOx emission cap of 13 tons per year starting January 1, 2026, to be achieved using zero or low NOx emission technology with possibly diesel engine

replacements in the interim. Staff is in the process of conducting an updated BARCT assessment to evaluate current and emerging low NOx and zero emission technologies.

Proposed Method of Control

This control measure seeks NOx emission reductions from diesel electric generating units regulated by Rule 1135 and will focus on assessing renewable diesel, low NOx and zero emission technologies for power generation. This measure proposes to implement low NOx and zero emission technologies through a regulatory approach at electricity generating facilities and to require the use of renewable diesel for any remaining diesel engines used for backup power. This approach needs to consider electrical or alternative fuel infrastructure required to operate these equipment and future electrical grid stability when transitioning to zero emission electric generating units.

Emission Reductions

Emissions reductions for this control measure are estimated to be approximately 0.16 tons per day of NOx by 2030. The target of this approach is to replace existing diesel internal combustion engines with lower-emitting technologies and utilize renewable diesel for fueling the remaining diesel engines used for backup power. Direct PM2.5 emission reductions are to be determined.

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 Rule 1135. Compliance would be verified through inspections and other recordkeeping and reporting requirements.

Cost Effectiveness

The overall average cost-effectiveness for this control measure is $1,512,300 per ton of NOx reduced.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

South Coast AQMD, 2018. Final Staff Report on Proposed Amendments to Rule 1135, November 2, 2018.
South Coast AQMD, 2022. Final Staff Report on Proposed Amendments to Rule 1135 and Proposed Rule 429.2, January 7, 2022.
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BCM-07: EMISSION REDUCTIONS FROM INCINERATORS [NOX]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	INCINERATORS AND OTHER COMBUSTION EQUIPMENT	
CONTROL METHODS:	LOW NOX AND ZERO EMISSION TECHNOLOGIES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.04	0.05
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	1.11	1.13
POLLUTANT REDUCTION	-	0.81
POLLUTANT REMAINING	-	0.32
CONTROL COST:	DCF METHOD: $900/TON OF NOX REDUCED MODIFIED LCF METHOD: $1,500/TON OF NOX REDUCED	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

Control measure BCM-07 seeks emission reductions of NOx by replacement or retrofits with low NOx emission technologies on incinerators and other combustion equipment associated with incinerators and better control of ammonia injection used currently to control NOx. Incinerators are used to burn waste material at high temperatures until reduced to ash.

Background

South Coast AQMD has adopted a series of rules to promote clean, lower emission technologies, while encouraging economic growth and providing compliance flexibility. For existing sources, replacing older

higher-emitting equipment with zero emitting equipment can apply to a single source or an entire facility. The manufacturing and deployment of zero emission and low NOx emission technologies will help reduce PM 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.

Regulatory History

Incinerators are regulated by Rule 404 – Particulate Matter - Concentration last amended in 1986.

Proposed Method of Control

Secondary PM2.5 are formed from chemical reactions of NOx and ammonia. Feed-forward systems control ammonia injection into NOx catalytic control systems. Closed loop control systems using sensors to provide feedback can more accurately reflect operating conditions reducing ammonia slip and excess NOx. Burner technologies such as low NOx burner systems (LNB) or ultra-low NOx burner systems (ULNB) are combustion control technologies utilized to lower NOx emissions. A variety of factors impact the NOx emissions with LNB or ULNB, such as burner orientation and arrangement, firebox size, heater type (force or natural draft), and fuel type. Dependent on the burner configuration and operation, additional combustion controls are used to reduce NOx emissions, such as fuel and air premix, staged fuel, staged air, and flue gas recirculation. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

NOx emissions are estimated to be reduced by 0.81 tons per day by 2030. The target of this approach is to reduce ammonia emissions by utilizing a closed loop feed-forward control system and to reduce NOx emissions with improved burner technologies. Direct PM2.5 emissions are to be determined.

Rule Compliance and Test Methods

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 South Coast AQMD Methods 5.1, 25.1 25.3, 100.1, 207.1 or other South Coast AQMD-approved test methods.

Cost Effectiveness

The overall average cost-effectiveness for this control measure is $900 per ton of NOx reduced.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

South Coast AQMD, 1986. Rule 404 – Particulate Matter - Concentration.

Jaaskelainen, H. and Majewski, W, 2018. Urea Dosing Control
https://dieselnet.com/tech/cat_scr_diesel_control.php

ECC-01: CO-BENEFITS FROM EXISTING AND FUTURE GREENHOUSE GAS 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:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	VARIOUS AGENCIES	

Description of Source Category

Sources of greenhouse gases (GHG) are typically also emission sources of criteria pollutants. Federal, State, and local mandates and programs to reduce GHG emissions provide co-benefits of criteria pollutant reductions. This control measure seeks to capture the co-benefits from existing and future GHG programs, policies, and incentives.

Background

The State of California has a successful history of fighting climate change and reducing GHG emissions. Significant efforts are currently being undertaken and planned to further reduce GHGs under the State's 2030, 2045, and 2050 targets. 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 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. 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 below 1990 levels by 2050 and a midterm target of 40 percent by 2030. California has also successfully reduced GHG emissions from the electricity generating facilities. 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. The three large investor-owned utilities and the majority of municipal owned utilities either met or surpassed the 2020 annual RPS target of 33 percent in 2020.[35] In 2015, 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 for more details on energy efficiency measures).

In the last few years, California Legislature passed a suite of bills that seek to continue to reduce greenhouse gas emissions from various sectors including electricity generation as well as residential and commercial buildings. In 2018, California passed SB 100 (California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases), which sets new standards to California's renewable portfolio by requiring the State to use 50 percent renewable electricity by 2026, 60 percent renewable electricity by 2030, and 100 percent carbon-free electricity by 2045. In addition, two new laws directed towards the State's building sector, AB 3232 (Zero-emissions Buildings and Sources of Heat Energy) and SB 1477 (Low-emissions Buildings and Sources of Heat Energy), were signed in 2018. AB 3232 requires the California Energy Commission (CEC) to assess, by January 1, 2021, the potential for reducing GHG emissions from California's residential and commercial buildings to 40 percent below 1990 levels by 2030. The assessment[36] identified key options and policies for increasing heating efficiency while reducing carbon emissions from the State's commercial and residential buildings. SB 1477 helps promote and implement clean heating technology in the State by providing $50 million per year through 2023 to encourage market-based development and adoption of low-emission, clean heating technologies for buildings. As part of the implementation of SB 1477, the CPUC created the Technology and Equipment for Clean Heating (TECH) Program and the Building Initiative for Low Emissions Development (BUILD) Program. The two programs are designed to provide incentives to reduce carbon emissions in buildings. In 2018, Governor

[35] https://www.cpuc.ca.gov/-/media/cpuc-website/industries-and-topics/documents/energy/rps/cpuc-2021-rps-annual-report-to-legislature.pdf.
[36] https://www.energy.ca.gov/data-reports/reports/building-decarbonization-assessment.

Brown also signed Executive Order B-55-18, committing California to total, economy-wide carbon neutrality by 2045.

At the federal level, the U.S. EPA is establishing regulations to limit the emissions of GHGs from stationary and transportation sources. Recently, federal targets have been established to achieve a 50-52 percent reduction from 2005 levels in economy-wide GHGs by 2030, create a carbon pollution-free power sector by 2035, and net zero emissions economy-wide by 2050.

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. Overall, California sets ambitious goals to promote clean technologies and reduce GHG emissions across all sectors. These State climate policies will result in NOx and PM2.5 reduction co-benefits in the mid to long term time frame.

Under this control measure, the criteria pollutant co-benefits associated with GHG reductions will be quantified and accounted for towards attainment of federal ozone standards. Existing and future incentives, programs, and partnerships will be evaluated for reduction of emissions of both GHGs and criteria pollutants. South Coast AQMD 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. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

To be determined.

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 South Coast AQMD and State agencies emission inventories along with reductions achieved through specific programs.

Cost Effectiveness

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

South Coast AQMD 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

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 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-02: CO-BENEFITS FROM EXISTING AND FUTURE RESIDENTIAL AND COMMERCIAL BUILDING ENERGY EFFICIENCY MEASURES [ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	EXISTING RESIDENTIAL AND COMMERCIAL POWER AND FUEL USE	
CONTROL METHODS:	REDUCED ENERGY USE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	19.30	19.95
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	27.43	23.02
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	VARIOUS AGENCIES	

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

In 1978, California adopted the California Code of Regulations building energy standards. The building energy standards adopted within Title 24 have been routinely made stronger since that time. 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 constructions.

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 South Coast Air Basin (Basin) it is estimated that 48 percent of the residential properties are occupied by tenants. In EJ communities in the South Coast Air Basin, 59 percent of 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, about 60 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 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 of SB 350 are reflected in the 2020 California Gas Report[10] and the baseline inventory for the PM2.5 Plan. Meanwhile, significant efforts are currently being undertaken and planned to further reduce GHGs under the State's 2030, 2045, and 2050 targets. In the last few years, California Legislature passed a suite of bills that seek to reduce greenhouse gas emissions from various sectors including electricity generation as well as residential and commercial buildings. In 2018, California passed SB 100 (California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases), which sets new standards to California's renewable portfolio by requiring the State to use 50 percent renewable electricity by 2026, 60 percent renewable electricity by 2030, and 100 percent carbon-free electricity by 2045. In addition, two new laws directed towards the State's building sector, AB 3232 (Zero-emissions Buildings and Sources of Heat Energy) and SB 1477 (Low-emissions Buildings and Sources of Heat Energy), were signed in 2018. AB 3232 requires the California Energy Commission (CEC) to assess, by January 1, 2021, the potential for reducing GHG emissions from California's residential and commercial buildings to 40 percent below 1990 levels by 2030.[11] The assessment identified key options and policies for increasing heating efficiency while reducing carbon emissions from the State's commercial and residential buildings. SB 1477 helps promote and implement clean heating technology in the State by providing $50 million per year through 2023 to encourage market-based development and adoption of low-emission, clean heating technologies for buildings. In 2018, Governor Brown also signed Executive Order B-55-18, committing California to total, economy-wide carbon neutrality by 2045.

Overall, California sets ambitious goals to promote clean technologies and decrease energy use in California's existing and new building stock. Reducing, managing, and changing the way energy is used in the commercial and residential sectors can provide additional emission reductions, reduce energy costs, and provide multiple environmental benefits. These State climate policies will result in NOx and PM2.5 reduction co-benefits in the mid to long term time frame.

Proposed Method of Control

South Coast AQMD has worked with the local utilities and contractors to implement weatherization programs within the Environmental Justice Communities of Coachella Valley, Boyle Heights, San Bernardino and San Fernando Valley areas. South Coast AQMD 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.

[10] 2020 California Gas Report. https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf

[11] California Building Decarbonization Assessment- Final Commission Report. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239311&DocumentContentId=72767

Co-benefits from other existing and future residential and commercial building energy efficiency measures, such as Title 24 building energy standards, and incentive programs such as the Building Initiative for Low-Emissions Development (BUILD) Program will be monitored, and the energy savings and criteria pollutant emission benefits will be quantified. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

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, such as implementation of SB 350, are generally taken into account within the baseline emissions inventory. Any future federal, State or local programs that significantly enhances the State's renewable energy and efficiency targets will result in co-benefits of NOx and PM2.5 reductions. The emission benefits from other existing and future energy efficiency measures would result in less fuel use such as natural gas usage. South Coast AQMD will continue to evaluate opportunities for additional feasible NOx and PM2.5 reductions in existing and new residential and commercial buildings through regulatory or incentive-based programs, and an evaluation of the benefits of these existing and emerging energy programs not reflected in the baseline inventory will be evaluated and quantified.

Rule Compliance and Test Methods

Not applicable.

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

South Coast AQMD 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/

SB100: California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases (2018): https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100

AB3232: Zero-Emissions Buildings and Sources of Heat Energy (2018): https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232

2020 California Gas Report: https://www.socalgas.com/sites/default/files/2020-10/2020_California_Gas_Report_Joint_Utility_Biennial_Comprehensive_Filing.pdf

2021 Integrated Energy Policy Report (CEC-100-2020-001-V3-CMD): https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report

2021-2035 California Energy Demand Updated Forecast: https://efiling.energy.ca.gov/GetDocument.aspx?tn=241239

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

[ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	EXISTING RESIDENTIAL POWER AND FUEL USE	
CONTROL METHODS:	REDUCED ENERGY USE BEYOND EXISTING REGULATIONS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	1.81	1.76
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	18.36	14.42
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	VARIOUS AGENCIES	

Description of Source Category

Energy consumption in 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 electricity generation with fossil fuel. 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, the use of energy efficient appliances and

addition of solar thermal and solar photovoltaic systems. Co-benefit reductions from existing and future energy efficiency programs are accounted for in control measure ECC-02 (Co-benefits from Existing and Future Residential and Commercial Building Energy Efficiency Measures).

ECC-03 seeks 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 low emission technologies, such as renewable gas, in all other applications. This measure is designed to reduce end use energy consumption and provide emission reductions within existing residences. Implementation 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 been shown to reduce the need for new energy infrastructure. The building energy standards adopted in California's Title 24, along with Title 20 appliance efficiency standards, have routinely become more efficient. 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 60 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 increased 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. Accelerating implementation of these measures 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. South Coast AQMD has several regulations including Rules 1121, 1146.2, and 1111, which establish 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 South Coast AQMD regulations established NOx emission thresholds, there are zero and low NOx appliances that can provide further emission reductions and energy efficiency co-benefits beyond most existing and replacement appliances. This is especially true when appliances are coupled with renewable resources such as solar photovoltaic 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, 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 pool heaters, furnaces, and cook stoves are also available.

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, which help reduce electricity costs. A household's potential for improving appliance efficiency and weatherization could be coupled with the evaluation of solar opportunities when 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 be surplus to current South Coast AQMD regulations and existing efficiency programs. This measure will be implemented in collaboration with State agencies and local utilities to develop incentive efforts. Additionally, other technologies and market programs, such as energy storage and smart grid measures like grid connected electric water heaters are expected to become less costly and incentivized more widely by utilities. The use of appliances as grid resources will be evaluated and considered during the development and implementation phases of this measure. Other residential combustion appliances, such as fireplaces, furnaces, space heaters, and outdoor heaters will also be evaluated for energy efficiency and eligibility for potential incentives.

All regulations, actions, and incentive programs directed at residential appliances will consider both energy efficiency and emission reductions. Zero emission and high efficiency applications will be prioritized to the extent they are feasible and cost-effective at the time of implementation. Lastly, South Coast AQMD will collaborate with utilities, agencies, and other organizations to attract funding and distribute them in coordination with similar existing programs.

Regulatory History

The U.S. EPA provided guidance to acknowledge emission benefits from energy efficiency measures and renewable energy mandates. While such measures are reflected in the baseline emissions, such as reduced natural gas consumption due to the requirement of energy efficiency, not all of them may be reflected in the baseline emissions due to challenges in quantifying such reductions. In such cases, those reductions will be quantified to the extent feasible and reflected as a benefit from this control measure. Emission reductions from efficiency efforts beyond current requirements and the use of smart grid technology will primarily be achieved through ambitious incentives and outreach.

Proposed Method of Control

South Coast AQMD has worked with local utilities and contractors to implement weatherization programs within the Environmental Justice Communities of Coachella Valley, Boyle Heights, San Bernardino and San Fernando Valley areas, helping to lower the implementation barrier of weatherization and smart grid efforts within Environmental Justice Communities.

South Coast AQMD staff will work with agencies, utilities, and other stakeholders to further implement weatherization and other measures that provide energy savings focusing on emission reductions within the Basin. South Coast AQMD staff will also assist in developing new tools or improving current 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 programs for residential buildings can be incentivized through voluntary public participation. To obtain credit in the SIP with emission reductions resulting from implementation, the integrity elements must be satisfied that are described in detail in the “Incentives Implementation” section. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

Weatherization, high efficiency appliances, renewable energy and smart grid measures are typically long-term measures that provide cumulative benefits. Existing energy efficiency programs with impacts on emission reductions are generally incorporated into the baseline emissions inventory. Emission benefits expected from actions going beyond SB 350 and Title 24 building energy standards are not yet within the future year emissions inventory. Accelerated focused deployment, additional programs, and additional incentives within the Basin can achieve NOx and PM2.5 emission reductions beyond existing efficiency programs and regulations. The reduction in NOx and PM2.5 emissions would largely be the result of less natural gas and electricity usage, and the magnitude of these benefits will be evaluated and quantified.

Rule Compliance and Test Methods

Not applicable.

Cost Effectiveness

The cost-effectiveness of this control measure varies based on many factors including the type of appliance to be replaced, infrastructure of the existing building, and the potential change in utility cost. ECC-03 pursues to maximize emission reductions by implementing advanced highly efficient zero emission appliance technologies and efficiency measures such as enhanced weatherization when cost-effective and feasible. Electric heat pump space and water heaters are found to be the most cost-effective high efficiency appliances, along with incorporating pool heaters and covers under current market and technology conditions. Adding solar thermal or solar photovoltaic systems can reduce energy costs, making these technologies more affordable in the long-term.

On the other hand, incentives such as rebates could lower the upfront cost. Incremental cost may be partially offset by local utility companies and State agencies who have proposed incentives for heat pumps (e.g., California TECH Initiative) or panel upgrades. Income-qualified homeowners in disadvantaged communities can be qualified for a free solar panel system to offset incremental utility costs. 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 cost for heat pumps might be lowered when the market achieves greater penetration. Technology advancement in residential appliances may also lower the cost of equipment.

Overall, cost-effectiveness for this control measure varies depending on the type of appliance to be replaced, existing infrastructure, the potential change in utility cost, and the availability of incentives from other programs. As a result, the cost-effectiveness will be determined as incentive programs and projects are developed.

Implementing Agency

South Coast AQMD 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

U.S. EPA, Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies into State and Tribal Implementation Plans, July 2012. https://www.epa.gov/sites/default/files/2016-05/documents/eeremanual_0.pdf

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/

Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher Efficiency Heat Pumps, American Council for an Energy-Efficient Economy, Report #A1603, May 2016.

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GRID Alternatives, Disadvantaged Communities - Single-family Solar Homes (DAC-SASH) Program. https://www.gridsolar.org/sceresidentialpage/

BCM-08: EMISSION REDUCTIONS FROM LIVESTOCK WASTE AT CONFINED ANIMAL FACILITIES

[NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	LIVESTOCK WASTE AT LARGE CONFINED ANIMAL FACILITIES	
CONTROL METHODS:	MANURE MANAGEMENT STRATEGIES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	8.17	6.13
POLLUTANT REDUCTION	-	0.27
POLLUTANT REMAINING	-	5.86
CONTROL COST:	DCF METHOD: $21,000/ton	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to reduce ammonia emissions from livestock waste at large Confined Animal Facilities (CAFs). The first component seeks to lower the applicability thresholds in South Coast AQMD Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities to align with the more stringent thresholds in San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 4570 – Confined Animal Facilities. This is the portion of the control measure that has been identified to satisfy Most Stringent Measures (MSM) requirements. Independent of MSM, this control measure also seeks to explore the feasibility of introducing more stringent manure management requirements to reduce ammonia emissions at CAFs.

Background

In 2018, there were approximately 126,000 dairy cattle, 1.6 million layer poultry, and 1,000 swine in the South Coast Air Basin (Basin). Although California is the largest dairy-producing state,[12] the livestock

[12] CARB 2022 Scoping Plan for Achieving Carbon Neutrality. https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf

industry in the Basin is not growing. Livestock waste emits significant amounts of ammonia that contribute to PM2.5 via atmospheric reactions with NOx to form ammonium nitrate. Emission reductions from the dairy and livestock sector have mainly been driven by the growing adoption of manure management strategies and a decreasing animal population.

Given the larger presence of dairies and CAFs in the San Joaquin Valley, South Coast AQMD consulted U.S. EPA's recent actions on SJVAPCD's PM2.5 SIP to develop control strategies that apply to this source category. U.S. EPA published a proposed rule on December 29, 2021 to approve SJVAPCD's 2018 Serious Area Plan for the 2012 annual PM2.5 NAAQS.[13] However, based on adverse public comments, U.S. EPA reversed course and proposed disapproval of several plan requirements on October 5, 2022.[14] A central issue in U.S. EPA's proposed disapproval relates to SJVAPCD's BACM analysis for Rule 4570. U.S. EPA referenced several research studies and guidance documents for ammonia reductions from CAFs that were not consulted as part of the process to develop potential control measures. Based on these references, South Coast AQMD's BACM/MSM analysis identified two measures with the potential to further reduce emissions from CAFs in the South Coast Air Basin: incorporation of solid cattle manure within 24 hours and acidifying amendments for poultry litter.

South Coast AQMD's BACM analysis also determined that SJVAPCD Rule 4570 has more stringent applicability thresholds than South Coast AQMD Rule 223 (1,000 milk cows in South Coast AQMD vs. 500 milk cows in SJVAPCD, and 650,000 birds in South Coast AQMD vs. 400,000 birds in SJVAPCD). This control measure therefore seeks to lower CAF applicability thresholds in Rule 223 to match those in SJVAPCD Rule 4570.

Regulatory History

Rule 1127 – Emission Reductions from Livestock Waste was adopted in August 2004 to address best management practices specifically for dairies, with requirements regarding manure removal, handling, and composting. Rule 1127 applies to dairy farms and related operations such as heifer and calf farms and the manure produced on them. It also applies to manure processing operations, such as composting operations and anaerobic digesters.

California Senate Bill 700 – Agriculture & Air Quality Summary and Implementation (SB 700), enacted into law on January 1, 2004, eliminated the exemption from the permit system of local air pollution control districts for agricultural operations in the farming of crops or raising of fowl or animals. The bill amended air pollution control requirements in the California Health & Safety Code to include requirements for agricultural sources of air pollution. SB 700 required California Air Resources Board (CARB) to develop a definition for the source category of large CAFs by July 1, 2005, to be used by the local air pollution control and air quality management districts to mitigate emissions from large CAFs.

[13] 86 FR 74310
[14] 87 FR 60494

Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities was adopted in August 2006 to satisfy SB 700 and California Health & Safety Code requirements for nonattainment areas. Rule 223 requires a permit to operate for all large CAFs, defined as 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. Pertaining to manure management, the dairy provisions in Rule 223 require that owners/operators implement at least six of 12 corral measures, two of seven solid manure or separated solids handling measures, one of eight liquid manure handling measures, and two of four land application measures. Poultry large CAF operators must implement at least one of seven solid manure or separated solids handling measures, and one of eight liquid manure handling measures.

In addition to ammonia, California's dairy and livestock industries account for roughly half of the State's total methane emissions from two primary sources, manure management and enteric fermentation. In 2016, the Legislature passed SB 1383 (Lara, Chapter 395, Statutes of 2016), which sets a 2030 methane emissions reductions goal of 40 percent below 2013 levels by 2030 for the dairy and livestock sector. To reach this target, CARB implemented a Short-Lived Climate Pollutant Reduction Strategy that could result in co-benefits of ammonia reductions. In 2022, CARB released an analysis on the progress the sector has made in achieving the 2030 target, as required by SB 1383.[15] This analysis shows that the dairy and livestock sector is projected to achieve just over half of the annual methane emission reductions necessary to achieve the 2030 target through modifications to manure management systems, primarily using anaerobic digesters, and additional reductions through decreases in animal populations.

Proposed Method of Control

South Coast AQMD's BACM analysis identified three measures with the potential to reduce ammonia emissions from large CAFs beyond Rule 223: lowering Rule 223 applicability thresholds, incorporation of solid manure within 24 hours, and acidifying amendments for poultry litter.

To align with the more stringent thresholds in SJVAPCD Rule 4570, South Coast AQMD proposes to lower the Rule 223 applicability thresholds from 1,000 to 500 milk cows and from 650,000 to 400,000 birds. As the lower applicability thresholds are required in SJVAPCD, staff determined that they can feasibly be implemented in the Basin and, accordingly, identified this requirement as being needed satisfy MSM.

There are other proposed controls that will be further evaluated during rulemaking. Rule 1127 currently requires the disposal of dairy manure to either a manure processing operation (e.g., anaerobic digestion or composting facilities) or to agricultural lands approved for the spreading of manure. Soil incorporation of the manure on agricultural lands reduces NH3 emissions by decreasing the exposed surface area of manure. For CAFs requiring a permit, Rule 223 includes land incorporation of all manure within 72 hours of removal as a Class One Mitigation Measure. It is technologically feasible to reduce the window from 72 hours to 24 hours while allowing exceptions (e.g., for extreme weather). Low-disturbance incorporation

[15] CARB Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target, March 2022. https://ww2.arb.ca.gov/sites/default/files/2022-03/final-dairy-livestock-SB1383-analysis.pdf

such as vertical tillage reduces ammonia emissions by 34 percent when manure is incorporated within 72 hours and by 50 percent when manure is incorporated within 24 hours. High-disturbance land incorporation, which requires chisel plowing followed by secondary tillage with a disk harrow or field cultivator, reduces ammonia emissions by 50 percent when manure is incorporated within 72 hours and by 75 percent when manure is incorporated within 24 hours. All ammonia control efficiencies for soil incorporation are estimated based on information from the Chesapeake Bay Program Watershed Model report.[16] Based on this report, high-disturbance tillage is expected to achieve the greatest reductions.

Ammonia is a weak base and reducing the pH of litter binds ammonia and reduces its volatilization. Aluminum sulfate, also known as alum, is a common compound used to treat poultry litter to reduce ammonia emissions and bind phosphorous to prevent runoff. The typical recommended application rate for aluminum sulfate is within the range of 0.1 to 0.2 lb of aluminum sulfate per broiler placed.[17] The lower bound of the aluminum sulfate application rate decreases the ammonia control efficiency by about 50% compared to application of 0.2 lb of aluminum sulfate per broiler placed.[18, 19] Larger birds will require correspondingly larger application rates to achieve the same control of ammonia.[20]

Emission Reductions

As shown in Table BCM-08-A, the total inventory for this source category is 6.13 tpd of NH3 in 2030, yet dairy cattle are responsible for over 80 percent of those emissions. Lowering Rule 223 applicability thresholds results in an estimated 5 percent NH3 emission reduction. Thus, the estimated reduction from lowering the thresholds in Rule 223 for dairy cattle and poultry layers is 0.27 tpd. Emission reductions for other proposed control measures including more stringent manure management practices will be estimated during the rulemaking process.

[16] Chesapeake Bay Phase 6.0 Manure Incorporation and Injection Expert Review Panel: Dell, C., Allen, A., Dostie, D., Meinen, R., Maguire, R (December 2016) Manure Incorporation and Injection Practices for Use in Phase 6.0 of the Chesapeake Bay Program Watershed Model. Prepared for Chesapeake Bay Program, Annapolis, MD 21403. CBP/TRS-309-16. EPA Contract No. EP-C-12-055. https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Phase_6_FINAL_MII_Final_Report.pdf

[17] See Moore, P. Treating Poultry Litter with Aluminum Sulfate. USDA ARS. Developed by Livestock GRACEnet. https://www.ars.usda.gov/ARSUserFiles/np212/LivestockGRACEnet/AlumPoultryLitter.pdf

[18] Moore, P., Watkins, S. Treating Poultry Litter with Alum. University of Arkansas (U of A) Division of Agriculture Cooperative Extension Service. https://www.uaex.uada.edu/publications/PDF/FSA-8003.pdf

[19] Moore, P., Miles, D., Burns, R. (March 2019). Reducing Ammonia Emissions from Poultry Litter with Alum. Livestock and Poultry Environmental Learning Community (LPELC). https://lpelc.org/reducing-ammonia-emissions-from-poultry-litter-with-alum/

[20] Anderson, K.; Moore, P.A., Jr.; Martin, J.; Ashworth, A.J. (2020) Effect of a New Manure Amendment on Ammonia Emissions from Poultry Litter. *Atmosphere*, *11*, 257. https://doi.org/10.3390/atmos11030257

TABLE BCM-08-A
2030 BASELINE EMISSIONS FROM LIVESTOCK WASTE

Facility type	NH3 Emissions (tpd)
Dairy Cattle	5.08
Range Cattle	0.13
Poultry - Layers	0.28
Swine	0.02
Sheep	0.08
Horses	0.51
Goats and Others	0.05
Total	**6.13**

Rule Compliance and Test Methods

Compliance with Rule 223 requirements is determined through South Coast AQMD's permitting program.

Cost Effectiveness

Staff identified approximately 36 dairy farms and no poultry farms that would be impacted by lowering the applicability thresholds for large CAFs under Rule 223 from 1,000 to 500 milk cows and 600,000 to 400,000 birds, respectively.. Rule 223 requires the affected dairy farms to submit and implement an emission mitigation plan based on different classes of mitigation measures to minimize ammonia emissions. Costs will vary per facility depending on the measures implemented from the mitigation menu. For this control measure, cost effectiveness was determined using the anticipated incremental costs that would be incurred by the 36 impacted dairy farms for the additional cost of disposing manure through composting compared to disposing manure by land application, and the cost of more frequent corral cleaning (4 instead of 2 times per year per farm). Costs are based on data from the 2016 AQMP control measure BCM-04: Emission Reductions from Manure Management Strategies and inflated to 2022 dollars. Staff is not aware of additional costs beyond those estimated in 2016 AQMP control measure BCM-04: Emission Reductions from Manure Management Strategies. Therefore, the 2022 cost-effectiveness was adjusted from the 2016 cost-effectiveness using the ratio of Marshall & Swift Indices for both years, which is calculated to be 1.4. Cost-effectiveness is estimated at $21,000 per ton of NH3 reduced. Cost-effectiveness for this control measure will be refined further during rulemaking.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from these stationary and area sources.

References

CARB 2022 Scoping Plan for Achieving Carbon Neutrality. https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf

Clean Air Plans; 2012 Fine Particulate Matter Serious Nonattainment Area Requirements; San Joaquin Valley, California. 40 CFR 52, Federal Register, Volume 86, No. 247, pg. 74310. December 29, 2021. https://www.govinfo.gov/content/pkg/FR-2021-12-29/pdf/2021-27796.pdf

Clean Air Plans; 2012 Fine Particulate Matter Serious Nonattainment Area Requirements; San Joaquin Valley, California. 40 CFR Part 52, Federal Register, Volume 87, No. 192, pg. 60494. October 5th, 2022. https://www.govinfo.gov/content/pkg/FR-2022-10-05/pdf/2022-21492.pdf

CARB Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target, March 2022. https://ww2.arb.ca.gov/sites/default/files/2022-03/final-dairy-livestock-SB1383-analysis.pdf

Chesapeake Bay Phase 6.0 Manure Incorporation and Injection Expert Review Panel: Dell, C., Allen, A., Dostie, D., Meinen, R., Maguire, R (December 2016) Manure Incorporation and Injection Practices for Use in Phase 6.0 of the Chesapeake Bay Program Watershed Model. Prepared for Chesapeake Bay Program, Annapolis, MD 21403. CBP/TRS-309-16. EPA Contract No. EP-C-12-055. https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Phase_6_FINAL_MII_Final_Report.pdf

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Ammonia: Supplemental Information for EPA in Support of 15 µg/m^3 Annual PM2.5 Standard, CARB. March 2023.

BCM-09: AMMONIA EMISSION REDUCTIONS FROM NOX CONTROLS [NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	NH3	
CONTROL METHODS:	IMPROVED SCR SYSTEMS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	12.37	12.42
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

This control measure seeks to reduce ammonia from NOx controls such as Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR). These systems can reduce Nitrogen Oxide (NOx) emissions from combustion sources very effectively. However, the use of systems also results in potential emissions of ammonia that "slip" past the control equipment and into the atmosphere. Ammonia (NH3) is a precursor gas for secondary PM formation, and so minimizing ammonia slip is essential for optimizing emission reductions from these controls.

Regulatory History

There were several rules that regulate equipment that have SCR systems. These rules include:

1- **Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines** (last amended February 4, 2022). This Rule applies to turbines with generating capacity greater than 0.3 MW except those located electric generating facilities, landfills, petroleum refineries, and publicly owned treatment works or fueled with landfill gas. There are 37 facilities with 72 turbines that are subject to Rule 1134.

2- **Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities** (last amended January 7, 2022). This Rule regulates Boilers, internal combustion engines, and turbines located at investor-owned electric utilities, publicly owned electric utilities, and facilities with combined generation capacity of ≥ 50 MW. Rule 1135 applies to 133 combustion units at 32 facilities.

3- **Rule 1146 – Emission of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters** (last amended December 4, 2020). This Rule applies to boilers, steam generators, and process heaters of equal to or greater than 5 million Btu per hour rated heat input capacity used in all industrial, institutional, and commercial operations.

4- **Rule 1147 – NOx Reductions from Miscellaneous Sources** (last amended May 6, 2022). Rule 1147 applies to manufacturers, distributors, retailers, installers, owners, and operators of combustion equipment with NOx emissions that require a South Coast AQMD permit, and when other South Coast AQMD Regulation XI rules are not applicable to the Unit. Equipment that falls under specialized exemption language of an applicable South Coast AQMD Regulation XI rules is not being regulated under Rule 1147. This rule affects approximately 5,300 units located at approximately 3,000 facilities.

5- Rule 1109.1 – Emission of Oxides of Nitrogen from Petroleum Refineries and Related Operations (adopted November 5, 2021). This Rule establishes NOx and CO concentration limits for combustion equipment at petroleum refineries and facilities with operations related to petroleum refineries. Rule 1109.1 regulated five major petroleum refineries, three small refineries, and four facilities with related operations with nearly 300 pieces of combustion equipment distributed among all facilities.

For all Rules, there is no ammonia emission limit as that is regulated under Regulation XIII and the limit is set on a case-by-case basis. Under Regulation XIII, the ammonia emissions must meet current Best Available Control Technology (BACT) limit of 5 ppm.

Proposed Method of Control

Post-combustion equipment for emission control technology systems includes SCRs. This technology reduces emissions of NOx. This method to reduce NOx emissions converts the NOx to Nitrogen and water by the reaction of NOx and NH3. The reaction between these two compounds is not perfect and there is an excess of un-reacted NH3 that goes into the atmosphere. This excess ammonia is known as ammonia slip. The units will be upgrading their SCR systems by tuning/optimizing to achieve the NOx limits specified in each rule and as a result, the ammonia slip from the upgraded SCR systems will be reduced with improved Ammonia Injection Grid (AIG) from the new /retrofitted systems. The upgraded and improved AIG improves the contact with the flue gas thus resulting in lower excess ammonia slip.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

The rule compliance and their respective compliance schedules for NOx emissions along test methods are specified in each rule. Ammonia emissions are tested by source test method 207.1 – Determination of Ammonia Emissions from Stationary Sources.

Cost Effectiveness

The cost-effectiveness for each rule is based on NOx control utilizing SCR technology to achieve the proposed NOx limits.

Implementing Agency

South Coast AQMD

References

South Coast AQMD 2016 AQMP; final2016aqmp.pdf (aqmd.gov)

South Coast AQMD 2022 AQMP Appendix VI; appendix-vi.pdf (aqmd.gov)

South Coast AQMD Rule 1134; Rule 1134

South Coast AQMD Rule 1134, Staff Report; Staff Report

South Coast AQMD Rule 1135; Rule 1135

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South Coast AQMD Rule 1147, Staff Report; Staff Report

South Coast AQMD Rule 1109.1; Rule 1109.1

South Coast AQMD Rule 1109.1 Staff Report; Staff Report

BCM-10: EMISSION REDUCTIONS FROM DIRECT LAND APPLICATION OF CHIPPED AND GROUND UNCOMPOSTED GREENWASTE

[NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	GREENWASTE COMPOSTING EMISSION REDUCTIONS	
CONTROL METHODS:	COMPOSTING OF CHIPPED AND GROUND GREENWASTE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	0.67	0.67
POLLUTANT REDUCTION	-	0.08
POLLUTANT REMAINING	-	0.59
CONTROL COST:	DCF METHOD: $91,200/TON	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This proposed control measure would seek reductions in ammonia (NH3) emissions from direct land application (DLA) of chipped and ground uncomposted greenwaste to agricultural land, to public land for erosion control or roadway management, and to consumers' properties for gardening or landscaping purposes (e.g., mulching). The control approach involves minimum composting requirements for chipped and ground greenwaste prior to DLA.

Background

Based on data reported to California's Department of Resources Recycling and Recovery (CalRecycle), California's 39.3 million residents and 1.7 million businesses generated an estimated 76.7 million tons of municipal solid waste in 2021, of which 36.9 million tons were recycled. The remaining 39.8 million tons were disposed. Disposed material contained approximately 28 percent (11.3 million tons) compostable organic materials, including 11 percent food, 6 percent landscape waste, and 16 percent wood waste. Recent legislation passed in California has aimed to reduce landfill disposal of organic materials. For example, Senate Bill (SB) 1383 (Short-Lived Climate Pollutants; Lara, Chapter 395, Statues of 2016) targets a 50 percent reduction of statewide organic waste disposal from 2014 levels by 2020, and a 75 percent

reduction by 2025. SB 1383 also establishes an additional target that at least 20 percent of currently disposed edible food is recovered for human consumption by 2025. SB 1383 organic waste mandates are implemented by local jurisdictions with oversight from CalRecycle. CalRecycle conducted a formal rulemaking process through collaboration with other stakeholders that resulted in regulations for organic waste management programs. Under SB 1383 regulations, organic waste includes a broad range of waste categories such as food, green material, landscape and pruning waste, organic textiles and carpets, lumber, wood, paper products, printing and writing paper, manure, biosolids, digestate, and sludges that will be diverted from landfills and taken to the appropriate organic waste recovery facilities. Under SB 1383 regulations, all residents and businesses in California have been required to separate food and other organic materials from the rest of their garbage since January 1, 2022. Local governments are required to take enforcement against noncompliance starting January 1, 2024.

DLA and composting are the two primary alternatives to disposal of greenwaste in landfills. Farmers who have fallow land lacking in organic matter may find DLA of uncomposted greenwaste, which includes surface placement and incorporation of greenwaste into soil, to be beneficial because this method offers gradual release of organic matter and shields the exposed soil from the damaging effects of sunlight, wind, and rain. Additionally, it serves as a solution for areas where composting facilities are not sufficient to handle municipally collected greenwaste. DLA is also economically advantageous for landowners, as it is significantly cheaper than purchasing finished compost, and often requires only the expenses for delivery and spreading. Such applications may produce greenhouse gases (GHGs) and other air pollutants such as VOCs and NH3 and have the potential to spread pathogens. With the implementation of SB 1383, DLA of greenwaste may become an increasingly common practice in California. There are limited studies, however, on the air quality impact of chipped and ground uncomposted greenwaste. According to Burger et al., uncomposted greenwaste incorporated into soil released lower GHG and VOC emissions than surface application of the greenwaste. The study also found that the VOC emissions contained greater amounts of monoterpenes, which are potent organic aerosol precursors, compared to composted greenwaste.

Organic mulch, which is a plant by-product such as bark, wood chips, or a recycled material such as chipped construction waste, is often applied as loose material to slopes and flat areas. Mulching is common following roadside plantings or highway improvement projects. Several types of organic mulch can be used including tree bark, wood chips, tree trimmings, etc. (see Caltrans' 2018 Standard Specification section 20-5.04 Wood Mulch). In general, these types of wood mulch should contain minimal leaves and must be cleaned and decontaminated from pathogens or pests prior to DLA. Wood mulch is high in carbon and low in nitrogen (carbon to nitrogen ratio = 600:1). Furthermore, it decays slowly and takes much longer to decompose compared to well-balanced greenwaste. For these reasons, emissions of NH3 from uncomposted wood mulch are anticipated to be low.

Regulatory History

South Coast AQMD Rule 1133 – Composting and Related Operations – General Administrative Requirements, established administrative requirements for greenwaste disposal facilities such as

composting facilities, chipping and grinding facilities, and material recovery facilities (MRF). The facilities are required to register with South Coast AQMD and submit annual updates of their material handling and processing activities, including throughput of incoming materials (e.g., food, green, wood), type of operations (e.g., chipping and grinding, composting, aerated static piles), and tonnage of products as a result of operations.

South Coast AQMD Rule 1133.1 – Chipping and Grinding Activities, establishes requirements for holding green materials received on-site before and after chipping and grinding.

South Coast AQMD Rule 1133.3 – Greenwaste Composting Operations, establishes requirements of composting greenwaste and/or greenwaste with foodwaste. To control VOC and NH3 emissions from composting operations, either best management practices (BMPs) or an add-on control is required based upon facility-wide annual throughput of foodwaste received. For a facility receiving up to 5,000 tons per year of foodwaste, the required BMPs are covering each composting pile with a layer of at least 6 inches of finished compost or compost overs for the first 15 days of the active phase of composting and watering the pile as needed. These BMPs have a control efficiency of 40 percent for VOCs and 20 percent for NH3. Add-on controls, such as aerated static piles and in-vessel composting, are required for facilities processing greater than 5,000 tons of foodwaste per year and those that process active composting piles containing greater than 10 percent foodwaste. The required control efficiency of an add-on control device is 80 percent for VOCs and NH3.

California Code of Regulations, Title 14, Section 17868.3 requires a pathogen reduction period of 15 days for a windrow composting process. The pathogen reduction period aligns with the active phase BMP requirements in Rule 1133.3. For aerated static piles or in-vessel composting, which are subject to the 80 percent VOCs and NH3 add-on control efficiency requirement under Rule 1133.3, a minimum of three days is required to reduce pathogens.

Proposed Method of Control

Chipped and ground greenwaste used as ground cover may have increased emissions of GHGs, NH3, and VOCs and contain pathogens if it does not first undergo composting. Therefore, this measure proposes to require composting of chipped and ground greenwaste, in accordance with the BMP requirements of Rule 1133.3, prior to DLA.

Based on Card and Schmidt's analysis, cumulative NH3 emissions during the active phase of composting account for over 70 percent of total composting NH3 emissions. Further analysis showed that up to 85 percent of NH3 emissions occur in the first 15 days out of the 22-day active phase composting period. Rule 1133.3 already has requirements to control emissions during this period. Therefore, emission reductions can be achieved by having chipped and ground greenwaste undergo at least 15 days of active phase composting prior to DLA.

Emission Reductions

Twenty-three greenwaste processing facilities in the South Coast Air Basin are potentially subject to this control measure. Among the 23 facilities, five facilities are greenwaste composting facilities that produce finished compost on-site and the remaining 18 facilities are greenwaste chipping and grinding facilities that do not produce finished compost on-site.

The 2030 baseline inventory is 0.67 tpd of NH3 for chipped and ground greenwaste that may be used for direct land application. About 70 percent of the emissions are associated with active-phase composting, while the remaining 30 percent are from the curing phase. The estimated emission reductions are 0.08 tpd of NH3 based on 20 percent control efficiency during the first 15 days of active phase composting of chipped and ground greenwaste produced at chipping and grinding and/or composting facilities.

Several assumptions were made in the quantification of emission reductions including the uncontrolled NH3 emission factor, 20 percent NH3 emission control efficiency, the chipping and grinding activity data, and the percentage of NH3 emissions during the first 15 days of active phase composting. NH3 emission reductions were quantified using the same assumptions used in the 2016 AQMP, except that chipping and grinding activity data has been updated. The activity data is the tonnage of annual throughput that these facilities reported to the South Coast AQMD for the year 2018, which is required by the Rule 1133 Registration/Annual Update requirements. If the 2018 throughput data was not readily available for the facility, the most recent throughput available between 2014 and 2019 was used as a substitute.

Staff previously estimated NH3 emissions from greenwaste composting stockpiles at an emission rate of 0.017 lbs/wet ton-day. However, emission rates from surface-applied chipped and ground, fresh greenwaste have not been investigated and thus warrant further research to refine the emissions inventory and estimated reductions.

Rule Compliance and Test Methods

A South Coast AQMD 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 would not conflict with efforts under SB 1383. South Coast AQMD staff will work with CalRecycle, CARB, and Caltrans to develop appropriate test methods to quantify emissions.

Cost Effectiveness

Cost-effectiveness for this control measure is estimated based on the analysis of cost-effectiveness of 2016 AQMP control measure BCM-10. The 2016 AQMP estimated compliance costs by assuming that 18 chipping and grinding facilities would need to purchase cover material (either 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 facilities 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 as 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 in the compliance costs calculation. Five composting facilities would also need to perform 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 purchasing of cover material is not needed. Moreover, recordkeeping costs were not considered as the composting facilities are already subject to the recordkeeping requirements in Rule 1133.3.

Staff is not aware of additional costs beyond those estimated in the 2016 AQMP. Therefore, the 2022 cost-effectiveness was adjusted from the 2016 cost-effectiveness using the ratio of Marshall & Swift Indices for both years, which is calculated to be 1.4. Cost-effectiveness is estimated at $91,200 per ton of NH3 reduced. Cost-effectiveness for this control measure will be refined further during rulemaking.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

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BCM-11: EMISSION REDUCTIONS FROM ORGANIC WASTE COMPOSTING

[NH3]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ORGANIC WASTE COMPOSTING	
CONTROL METHODS:	FOODWASTE CO-DIGESTION, INTEGRATION OF ANAEROBIC DIGESTION WITH COMPOSTING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [NH3]:	2018	2030
POLLUTANT INVENTORY	0.63	0.96
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This proposed control measure would seek emission reductions of NH3 from the processing of organic waste materials including foodwaste, greenwaste, and agricultural waste. Control approaches include foodwaste co-digestion and integration of anaerobic digestion (AD) with composting.

Background

AD is a process through which bacteria decompose organic material such as animal manure, wastewater biosolids, and foodwaste in the absence of oxygen to produce biogas. AD occurs in a sealed vessel known as a reactor, which is designed and constructed in a variety of shapes and sizes based on the site and feedstock conditions. Multiple organic materials can be combined in one digester. Co-digested materials include manure, foodwaste (pre- and post-consumer), crop residues, and fats, oils and grease (FOG) from restaurant grease traps, and many other sources. Co-digestion can increase biogas production from low-yielding (e.g., biosolids, manure) or difficult-to-digest (e.g., yard waste) organic waste. These reactors contain complex microbial communities that digest the waste and produce resultant biogas and other useful co-products (i.e., solid and liquid portions of the digestate). Biogas is composed of methane, which is the primary component of natural gas, at a relatively high percentage (50 to 75 percent), carbon dioxide (CO_2), hydrogen sulfide, water vapor, and trace amounts of other gases. Biogas can be purified by

removing the low-value constituents to generate renewable natural gas which can be sold and injected into the natural gas distribution system, compressed and used as vehicle fuel, or processed further to generate alternative transportation fuel, energy products, or other advanced biochemicals and bioproducts. Digestate is the residual material left after the digestion process and is composed of liquid and solid portions. Both portions are separated and handled independently, and can be used in many beneficial applications, such as animal bedding (solids), nutrient-rich fertilizer (liquids and solids), a foundation material for bioproducts, organic-rich compost (solids), or as soil amendments (solids).[21]

Based on data reported to California's Department of Resources Recycling and Recovery (CalRecycle), California's 39.3 million residents and 1.7 million businesses generated an estimated 76.7 million tons of municipal solid waste in 2021, of which 36.9 million tons were recycled. The remaining 39.8 million tons were disposed. Disposed material contained approximately 28 percent (11.3 million tons) compostable organic materials, including 11 percent foodwaste, 6 percent landscape waste, and 16 percent wood waste. Foodwaste can be composted or utilized to generate renewable energy; landscape waste including grass clippings and tree trimmings can be composted; and wood waste such as lumber can be transformed into mulch, used in a biofilter, or burned in a biomass plant to generate renewable energy.[22]

Recent legislation passed in California has aimed to reduce landfill disposal of organic materials. For example, Senate Bill (SB) 1383 (Short-Lived Climate Pollutants; Lara, Chapter 395, Statues of 2016) targets a 50 percent reduction of statewide organic waste disposal from 2014 levels by 2020, and a 75 percent reduction by 2025. SB 1383 also establishes an additional target that at least 20 percent of currently disposed edible food is recovered for human consumption by 2025. SB 1383 organic waste mandates are implemented by local jurisdictions with oversight from CalRecycle. CalRecycle conducted a formal rulemaking process through collaboration with other stakeholders that resulted in regulations for organic waste management programs. Under SB 1383 regulations, organic waste includes a broad range of waste categories such as food, green material, landscape and pruning waste, organic textiles and carpets, lumber, wood, paper products, printing and writing paper, manure, biosolids, digestate, and sludges that will be diverted from landfills and taken to the appropriate organic waste recovery facilities. All residents and businesses in California have been required to separate food and other organic materials from their garbage since January 1, 2022. Local governments are required to take enforcement against noncompliance starting January 1, 2024.

Foodwaste has a high moisture content and decomposes quickly, resulting in greenhouse gases, VOC and NH3 emissions in landfills. Foodwaste is second only to manure for NH3 emissions in the organic waste composting category.[23,24] The potential use of foodwaste as an energy source has long been studied

[21] https://www.epa.gov/agstar/how-does-anaerobic-digestion-work
[22] https://calrecycle.ca.gov/climate/organics/
[23] Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247
[24] Prado, G., R. Moral, E. Aguilera, 2015. A.D. Prado, Gaseous emissions from management of solid waste: a systematic review, Global Change Biology, 21, 1313–1327

because foodwaste has three times the methane (CH_4) production potential of biosolids,[25] and anaerobic co-digestion of foodwaste and sewage sludge can boost biogas generation.[26,27]

According to CalRecycle's Draft Environmental Impact Report, 46 new or expanded compost facilities and 24 new or expanded anaerobic digester facilities would be required in the South Coast Air Basin by 2030 to process the diverted waste.[28] While overall Short-Lived Climate Pollutant emissions are expected to decline, emissions from processing of organic waste via composting and anaerobic digestion are expected to grow.

Regulatory History

South Coast AQMD Rule 1133 – Composting and Related Operations-General Administrative Requirements, established administrative requirements for green waste disposal facilities such as composting facilities, chipping and grinding facilities, and material recovery facilities (MRF). The facilities are mainly required to register with the South Coast AQMD and submit annual updates with their material processing activities including receiving materials throughput and outgoing products tonnage.

South Coast AQMD Rule 1133.2 – Emission Reductions from Co-Composting Operations, requires controls of VOC and NH3 emissions from new and existing co-composting operations. Co-composting facilities which began operations after January 10, 2003 are required to conduct all active co-composting in an enclosure, to conduct all curing using a negative aeration system, and to vent the exhaust from the enclosure and the aeration system to an emission control system that has a control efficiency of 80 percent or greater for VOC and NH3 emissions. Facilities that existed prior to January 10, 2003 are required to develop a compliance plan that demonstrates an overall emission reduction of 70 percent for VOC and NH3 emissions.

South Coast AQMD Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations, establishes requirements of composting greenwaste and/or greenwaste with foodwaste. To control VOC and NH3 emissions from composting operations, either best management practices (BMPs) or add-on controls are required based upon facility-wide annual throughput of foodwaste received. For a facility receiving up to 5,000 tons per year of foodwaste, the required BMPs are covering each composting pile with a layer of at least 6 inches of finished compost or compost overs and watering the pile as needed for the first 15 days of the active phase composting. These BMPs have a control efficiency of 40 percent for VOCs and 20 percent for NH3. Add-on controls are required for a facility receiving greater than 5,000 tons

[25] U.S. Environmental Protection Agency, 2014. The benefits of anaerobic digestion of food waste at wastewater treatment facilities, USEPA Region 9. https://www.epa.gov/sites/production/files/documents/Why-Anaerobic-Digestion.pdf

[26] Deena, S.R., A.S. Vickram, S. Manikandan, R. Subbaiya, N. Karmegam, B. Ravindran, S.W. Chang, M.K. Awasthi, 2022. Enhanced biogas production from food waste and activated sludge using advanced techniques – A review, Bioresource Technology, 355, 127234

[27] Kuo, J., J. Dow, 2017. Biogas production from anaerobic digestion of food waste and relevant air quality implications, J. Air & Waste Manag. Assoc. 67, 1000–1011

[28] CalRecycle, 2019. Draft Environmental Impact Report, SB 1383 Regulations Short-Lived Climate Pollutants: Organic Waste Methane Emission Reduction, Table 2-3. https://www2.calrecycle.ca.gov/Docs/Web/119973

of foodwaste per year and those that process active composting piles for a minimum of 22 days, containing greater than 10 percent foodwaste. The required control efficiency of an add-on control device is 80 percent for VOCs and NH3. While emission controls can be achieved either by BMPs or add-on controls depending on the throughput level of foodwaste, both active and curing phases of composting are required to produce the finished compost.

Proposed Method of Control

South Coast AQMD's Rules 1133.2 (Co-Composting) and 1133.3 (Greenwaste Composting) currently do not regulate the co-digestion of foodwaste with sewage sludge or the incorporation of foodwaste digestate into greenwaste composting. The digestate produced by foodwaste co-digestion contains treated sewage sludge (referred to as biosolids) and the solid residue from the digested foodwaste. Because biosolid composting is governed by Rule 1133.2, the digestate produced by foodwaste co-digestion would also be governed by Rule 1133.2. Emissions of NH3 can be reduced by using an emission control system specified by Rule 1133.2. If foodwaste is the only feedstock input to AD, the resulting digestate could be included into greenwaste composting and NH3 emissions reduction is governed by Rule 1133.3.

This control measure proposes to expand the applicability of Rules 1133.2 and 1133.3 to regulate the co-digestion of foodwaste with biosolids and the integration of foodwaste digestate with greenwaste composting for further emission reductions.

Foodwaste Co-Digestion

Emerging technologies are available for co-digestion of foodwaste. For example, Waste Management (WM) has a proprietary Centralized Organic Recycling equipment (CORe®)[29] that recycles commercial and institutional pre- and post-consumer organic waste materials (food scraps) into an Engineered BioSlurry (EBS®). This organic slurry is co-digested in anaerobic digesters with wastewater treatment plant (WWTP) biosolids (e.g., sewage sludge) to boost biogas output. According to laboratory bench tests, EBS® significantly increased biogas production. With 10 percent EBS® volume addition to anaerobic digesters, renewable biogas production in the bench reactors increased by 112 percent.[30]

Co-digestion is a process in which energy-rich organic waste materials (e.g., FOG and/or food scraps) are added to dairy or WWTP digesters with excess capacity. CORe® accepts clean source-separated organics (SSO), pre-consumer (clean) and post-consumer (contaminated) organic waste, and packaged food material on a case-by-case basis. Wood and yard waste is not acceptable. Figure BCM-11-A illustrates co-digestion performance metrics with the WM CORe® process.

[29] https://www.wm.com/us/en/inside-wm/sustainable-technology/organics-recycling
[30] https://www.biocycle.net/los-angeles-county-wrrf-embraces-codigestion/

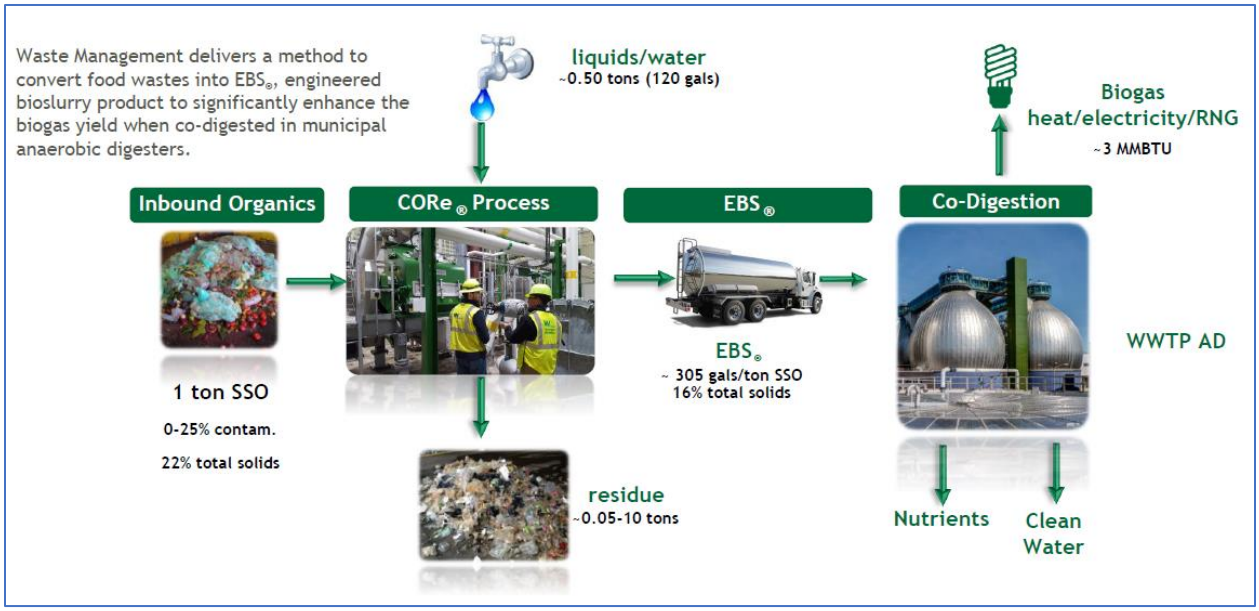

FIGURE BCM-11-A
WM CORE® AND CO-DIGESTION PERFORMANCE METRICS[31]

WM operates one CORe® facility in the South Coast Air Basin. SSO is transported to Orange County Transfer Station where the CORe® is located and loaded into the CORe® system's hopper and conveyed into a bioseparator, which separates organic material from inorganic waste. The separated organic waste is liquefied to create EBS® which is then transported via a tanker truck to the Los Angeles County Sanitation District (LACSD) Joint Water Pollution Control Plant in Carson, CA where the EBS® is added to the plant's anaerobic digestion system to increase the production of biogas. The biogas is collected and used to generate electricity and heat to serve the Plant's process needs to purify water. Leftover biosolids can be further composted.[32] Under Rule 1133.2, existing co-composting operations are required to have a 70 percent control efficiency whereas new co-composting operations must have an 80 percent control efficiency for NH3. The feasibility of the following control methods will be evaluated:

- Increasing the NH3 control efficiency of existing co-composting operations from 70 percent to 80 percent; and
- Increasing the NH3 control efficiency from 80 percent to 90 percent for new co-composting operations.

[31] https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/20230331-wm-core-codigestion-tech.pdf
[32] https://localsites.wm.com/a4480000006oO0bAAE/CORe+Flyer.pdf

Some studies also find that NH3 emissions can be reduced by optimizing the biofiltration or adding physical amendments to co-composting piles.[33,34] This will be further explored during rulemaking.

Integration of Anaerobic Digestion with Composting

With an integrated AD-composting system, digestate from AD becomes an input to the composting process, making less overall waste and a more useful product, as illustrated in Figure BCM-11-B.

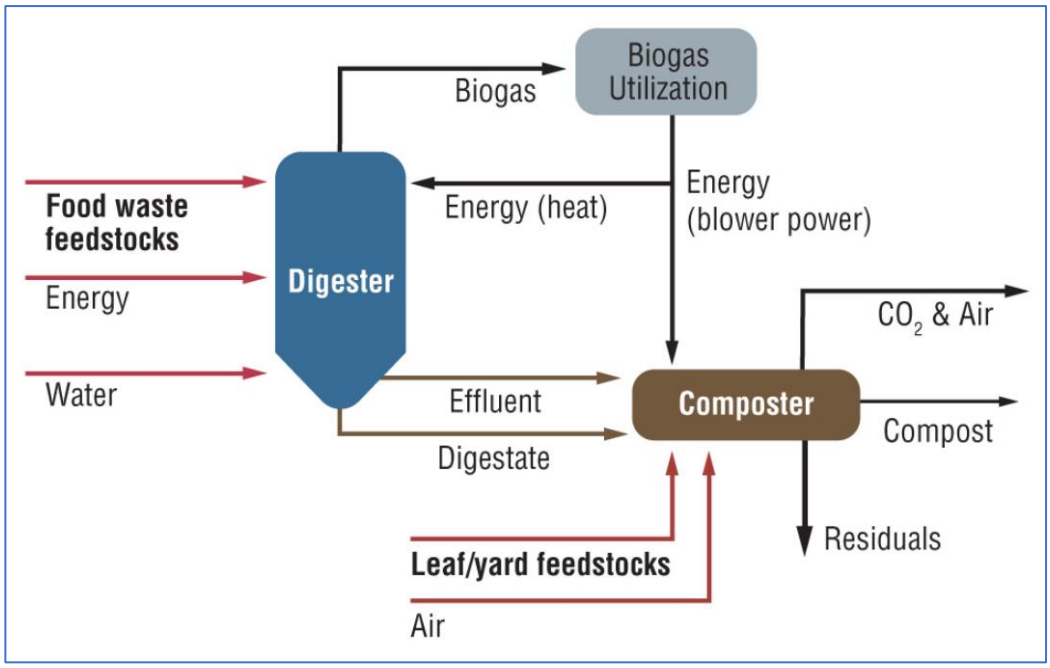

FIGURE BCM-11-B
INPUTS AND OUTPUTS FOR AN INTEGRATED AD AND COMPOSTING SYSTEM[35]

This integrated system works best where foodwaste (primarily SSO) is digested and greenwaste (primarily leaves and yard trimmings) is composted at the same facility. Digestate from AD becomes a feedstock for greenwaste composting. Composting of raw foodwaste, which typically takes 8 to 12 weeks, can be reduced to as little as 2 to 3 weeks for digestate because the material has been partially decomposed in

[33] Hwang, H.Y., S.H. Kim, J. Shim, S.J. Park, 2020. Composting process and gas emissions during food waste composting under the effect of different additives. Sustainability. 12(18), 7811
[34] Manu, M.K., C. Wang, D. Li, S. Varjani, J.W.C. Wong, 2022. Impact of zeolite amendment on composting of food waste digestate. Journal of Cleaner Production, 371(15), 133408
[35] https://www.biocycle.net/integrating-anaerobic-digestion-with-composting/

the digestion process. When foodwaste is anaerobically digested prior to composting, NH3 emissions can be up to 50 percent lower compared to composting the untreated foodwaste.[36]

Other synergistic effects of combining AD with composting include:

- Reduction and, in some cases, elimination of digester effluent treatment. Digester effluent can supply the water required for composting. Nutrients in the effluent can potentially increase compost value.
- Minimization of foodwaste processing odor as foodwaste receiving and digesting is completely enclosed.
- Direct onsite use of biogas energy. Biogas can supply electric power directly to the composting system (e.g., aeration and ventilation to biofiltration), avoiding grid electricity costs.
- Increases of the overall plant capacity with minimal footprint increase – one site, one permit, and one receiving building.
- During startup and shutdown periods of the AD system, foodwaste can be diverted to the composting system.

Emission Reductions

The 2030 baseline inventory is 0.96 tpd of NH3 for this source category. This source category has not been extensively investigated and thus warrants further research to refine the emissions inventory. As such, emission reductions will be determined during rulemaking.

Rule Compliance and Test Methods

A South Coast AQMD 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 would not conflict with efforts under SB 1383. South Coast AQMD staff will work with CalRecycle and CARB to develop appropriate test methods to quantify emissions.

Cost Effectiveness

Cost-effectiveness will be determined during rulemaking.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

[36] Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247

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Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247

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U.S. Environmental Protection Agency, 2014. The benefits of anaerobic digestion of food waste at wastewater treatment facilities, USEPA Region 9. https://www.epa.gov/sites/production/files/documents/Why-Anaerobic-Digestion.pdf

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Kuo, J., J. Dow, 2017. Biogas production from anaerobic digestion of food waste and relevant air quality implications, J. Air & Waste Manag. Assoc. 67, 1000–1011

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Waste Management, CORe. https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/20230331-wm-core-codigestion-tech.pdf

Waste Management. WM CORe, Converting Southern California Food Waste to Clean, Renewable Energy. https://localsites.wm.com/a4480000006oO0bAAE/CORe+Flyer.pdf

Hwang, H.Y., S.H. Kim, J. Shim, S.J. Park, 2020. Composting process and gas emissions during food waste composting under the effect of different additives. Sustainability. 12(18), 7811

Manu, M.K., C. Wang, D. Li, S. Varjani, J.W.C. Wong, 2022. Impact of zeolite amendment on composting of food waste digestate. Journal of Cleaner Production, 371(15), 133408

Kraemer, T. and S. Gamble, 2014. Integrating Anaerobic Digestion with Composting. https://www.biocycle.net/integrating-anaerobic-digestion-with-composting/

Nordahl, S.L., C.V. Preble, T.W. Kirchstetter, and C.D. Scown, 2023. Greenhouse gas and air pollutant emissions from composting. Environ. Sci. Technol. 57, 2235–2247

BCM-12: FURTHER EMISSION REDUCTIONS FROM COMMERCIAL COOKING [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	CHARBROILERS	
CONTROL METHODS:	LOWER THRESHOLD FOR INTEGRATED CATALYTIC OXIDIZER REQUIREMENTS FOR CHAIN-DRIVEN CHARBROILERS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	8.49	9.13
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

This proposed control measure would seek PM2.5 reductions from commercial charbroilers.

Background

Cooking activities are the largest source of directly emitted PM2.5 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. Under-fired charbroilers are responsible for the majority of emissions from this source category (2007, SCAQMD) due to the higher emission potential when compared with other cooking devices (e.g., 32.5 lbs PM 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). However, emissions from under-fired charbroilers are estimated based on 1999 survey report data and growth projection from it, indicating room for improvement. 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 snowpack.

Regulatory History

Efforts to reduce PM emissions from commercial cooking activities have been included in air quality plan 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 South Coast AQMD 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, South Coast AQMD 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 South Coast AQMD 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 (BAAQMD) 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 (80 to 85 percent reduction in direct PM 10 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. Additionally, enforcement of this regulation is minimal.

As a result of the Bay Area regulation, a subsequent South Coast AQMD 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 were 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, South Coast AQMD 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 South Coast AQMD 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). Currently, NYC DEP has an approved list of certified emission control devices with manufacturers, custom configurations, and model numbers. Configurations of multistage systems of Pollution Control Units (PCUs) commonly include filters with Maximum Efficiency Reporting Value (MERV) 15 ratings are paired with a HEPA filter or ESP (New York City, 2021). If commercial charbroiling restaurants would like to use an emission control device not listed, they are required to provide testing data to prove efficiency using EPA Method 5. Note the equivalent required PM2.5 control efficiency is about 50 percent, for new, non-solid fuel under-fired charbroilers. At this time, NYC DEP are not actively enforcing this code, so as a practical matter it is unclear whether the program is actually reducing emissions. However, NYC DEP are seeking to get approval for enforcement action on this ordinance in the near future.

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 adopted the Short-Lived Climate Pollutant Reduction Strategy (SLCP Reduction Strategy) in March 2017 which acknowledges the benefits from control of smaller sources of PM, including commercial cooking.[37]

Control Technology Research

In October 2011, the South Coast AQMD 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, South Coast AQMD 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 South Coast AQMD Test Protocol for Determining PM Emissions from Under-fired Charbroilers. All testing was initially funded by South Coast AQMD and conducted

[37] https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf

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 BCM-12-A. 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 are not as expensive as for existing facilities that may require a complete system overhaul including fire suppression, ventilation, plumbing, ductwork, mounting, and electrical components which would be expected to increase cost estimates. Control equipment for new charbroiler installations at new sites can be designed with the controls integrated into the design of the overall site.

TABLE BCM-12-A
DRAFT CONTROL DEVICE TESTING RESULTS AND PRELIMINARY COST ESTIMATES

*Device Type	PM Control Efficiency	Preliminary Device Cost Estimates (CY$)
Electrostatic Precipitator (ESP)	86%	$84,000 (2023)
Multi-Stage Filter	80%	$41,000 (2023)
Ceramic Filter/Microwave Regeneration	63%	$20,000 (2016)
Centrifugal Separator/Aerosol Mist Nebulizer	58%	$27,000 (2016)
In-Hood Baffle Filter (new – retrofit)	25%	$225–$250/linear ft. of exhaust hood (2016)

* Note that only the ESP, Multi-Stage Filter, and In-Hood Baffle Filter control devices have been demonstrated in practice. Other devices are shown for informational purposes, but they have not either been certified/proven in practice to date. Pricing and efficiency may eventually be determined to be higher also.

In addition to the above technologies, South Coast AQMD 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. South Coast AQMD 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 South Coast AQMD Governing Board in 2011 to develop a companion $150,000 contract with CE-CERT to further characterize emissions from under-fired charbroilers. A report entitled "Characterization of the Physical, Chemical, and Biological Properties of PM Emissions, VOCs, and Carbonyl Groups from Commercial Cooking Operations" has been received by South Coast AQMD 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 BCM-12-A, 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.

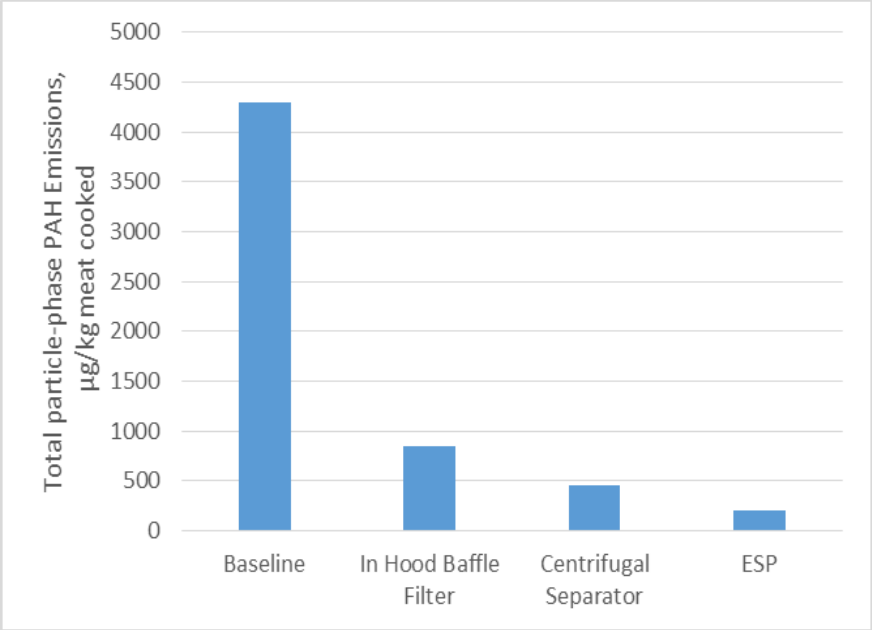

FIGURE BCM-12-A
PARTICLE-PHASE PAH EMISSIONS FOR BASELINE TEST AND THREE CONTROL TECHNOLOGIES

Findings to date show that while there is promising control technology the capital cost and required operating and maintenance costs remain prohibitively high. Also retrofitting controls on existing restaurants can be even more prohibitively expensive, and in some cases technologically infeasible. Based on discussions with restaurant operators, technology vendors, and other regulatory agencies, currently it can be extremely difficult and cost-prohibitive to add controls on existing restaurants. The installation may require structural, electrical, or water-line modifications that may not be feasible. This makes installation costs much higher for existing restaurants compared to new restaurants that can integrate emissions controls into the design. The existing structure may not have the necessary space or structural support for the control unit. Installing the control equipment may require the restaurant to temporarily shut down, resulting in loss of revenue. Furthermore, the existing restaurant may not have

the authority to make changes to the building if the space is leased and the landlord is unwilling to accommodate. Local ordinances, such as building and safety and/or fire codes will have to be followed as well.

Installation cost of controls can be prohibitively expensive. For example, SJVAPCD research shows the cost of control units themselves are expensive, ranging from $30,000 to $80,000 for the most complicated unit configurations. In addition, installation costs range from $10,000 to $20,000 for new construction and $20,000 to $60,000 or higher, depending on the structural and electrical modifications required, for retrofits. It is possible that some high-volume restaurants may be able to support this cost, but restaurants with less income would be financially unable to install these units without incentive support.

Maintenance of controls can also be prohibitively expensive. Regular maintenance of control devices is critical to ensure control effectiveness. Depending on the control technology and type and volume of food cooked, filter change-out is required on a monthly or quarterly basis, with more in-depth filter replacement or unit cleaning required annually. Annual maintenance costs including both labor and materials starts around $6,000 and can exceed $100,000 for the highest volume restaurants with solid-fuel fired under-fired charbroilers. Additional costs include electricity, water, staff labor, or cleaning service company costs.

Maintenance requires specially trained staff that may not be accessible to all restaurants: Control device cleaning is a complex process, requiring specially trained staff. Training restaurant staff to perform this task may not be feasible, and service companies capable of performing the maintenance may not be readily available nearby. Any delays in required maintenance could cause significant economic impacts to restaurants.

Due to the potential lack of economic and technological feasibility of requiring these controls and uncertainties in emissions inventory, staff recommends first obtaining current data regarding charbroilers. This could be achieved in one of two ways. The first option would be to require additional registration information of under-fired charbroilers pursuant to Rule 222. The second option would be to conduct a survey independent of Rule 222, whether it be in the South Coast AQMD jurisdiction or through a state-wide effort. Regardless of the option chosen substantial detailed data should be collected regarding throughput, hours of operation, type of restaurant and a verify of additional metrics that will allow for an accurate representation of charbroiler characteristics in the South Coast Air Basin. This report will detail meat throughputs, hours of operation, and any installed control technology. A detailed data set with several metrics evaluated will allow for a discussion of how any proposed amendment of Rule 1138 should be structured. Ideas could be further explored through focus and working group meetings prior to formally proposing a draft rule amendment.

Regarding under-fired charbroilers, research into new emission control technologies is ongoing. Specifically, South Coast AQMD is continues to monitor the situation seeking control devices that have affordable up-front costs and are cost-effective. Partnerships with other air districts, businesses, and manufacturers will be important. Demonstration and incentive funding could be the path forward to

assisting businesses with adopting currently available emission control technologies. Funding pilot studies to test efficacy and feasibility of emerging control technologies will be considered.

Proposed Method of Control

For chain-driven charbroilers, BAAQMD and SJVAPCD have adopted/amended their rules to lower the applicability threshold for emission control requirements. In 2009, SJVAPCD lowered their throughput quantity allowed for exemption from 875 pounds of meat cooked per week to 400 pounds of meat cooked per week to mirror BAAQMD's rule. South Coast AQMD currently has the applicability threshold set at 875 pounds of meat cooked per week and commits to consider reducing the threshold to 400 pounds per week. For BAAQMD and SJVAPCD, chain-driven charbroilers that require use of emission controls are required to use chain-driven charbroilers equipped with catalytic oxidizers certified by South Coast AQMD.

Emissions from under-fired charbroilers continue to be a significant contributor to the direct PM2.5 emission inventory. To date, a variety of control device technologies have been tested by CE-CERT and South Coast AQMD staff and the inter-agency working group has reviewed draft test results. Staff has also reviewed existing and proposed under-fired charbroiler control programs undertaken by the BAAQMD, the SJVAPCD, and the New York City DEP (NYC).

Based on testing conducted by CE-CERT and the demonstration projects in the San Joaquin Valley, control technology for under-fired charbroilers has continued to develop over the past few years. However, identification of affordable, commercially available PM control technologies, especially for retrofit projects at existing restaurants, remains elusive. Following identification of affordable commercially available control devices for existing restaurants, a tiered incentive and/or technology demonstration 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.

South Coast AQMD will consider implementing a registration and reporting requirement for charbroilers in order to gather better inventory and emissions information for this source category since the current registration program under Rule 222 does not stratify the inventory of charbroilers. Using new survey/registration information, South Coast AQMD would better be able to pursue reductions in commercial charbroiler emissions.

South Coast AQMD's current emission and restaurant inventory is based on a 1999 survey report conducted by a third-party consultant. The emission inventory has been extrapolated using population growth factors for the 1999 through 2030 time period. Revising our current restaurant and charbroiler inventory is important to accurately determine what the actual emissions and inventory are and will enable us to perform calculations that reflect the current state of charbroiler inventory/emissions and set exemption thresholds.

Emission Reductions

Lowering the applicability threshold for chain-driven charbroilers from 875 pounds of meat per week to 400 pounds of meat per week would likely reduce PM2.5 emissions from this source category. However, without an accurate detailed charbroiler emission and restaurant inventory, we are unable to quantify the pollution reductions that might be achieved. A district-wide or state-wide effort to assess the restaurant and charbroiler inventory and throughputs would be helpful to determining throughput distributions, thresholds, and estimates of PM2.5 reductions.

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.

Similar to NYC DEP, South Coast AQMD could look into potentially implementing a certified under-fired charbroiler emission control list or adopt the list that NYC DEP has already produced.

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD has the authority to regulate PM emissions from restaurant operations. South Coast AQMD 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-13: EMISSION REDUCTIONS FROM INDUSTRIAL COOLING TOWERS

[PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	INDUSTRIAL PROCESS COOLING TOWERS	
CONTROL METHODS:	DRIFT ELIMINATOR	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.76	0.78
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TO BE DETERMINED	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This control measure seeks reductions of PM2.5 emissions from industrial process cooling towers with drift eliminator technologies.

Background

Industrial cooling towers are 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, and a wide variety of industrial operations. They can be mainly classified into wet cooling towers and dry cooling towers.

Wet Cooling Towers

Wet cooling (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 of 500-feet in height) to generate the required airflow through the tower and is less aesthetically desirable.

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, which, when inhaled, 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.

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 PM2.5 therefore varies with TDS content. Cooling towers built in the 1970's and 1990's have drift rates of 0.01-0.002 percent, whereas cooling towers built more recently, in the 2000's, have a drift rate of 0.001 percent, due to drift eliminator advancements.

Drift Eliminators

Drift eliminators are 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 eliminators have various configurations and are made of various materials.

A recent study published in July 2023 by the California Energy Commission (CEC) measured drift emissions from two cooling towers, one that was constructed in 2004 with a specified drift eliminator efficiency of $5x10^{-4}$ percent, and the other constructed in 1957 with a specified drift eliminator efficiency of 0.2 percent. The study found that both cooling towers scrubbed nearly all coarse particulate matter, between 2.5 and 10 microns, from the incoming air, resulting in negative emissions from both towers. The study was unable to measure the PM2.5 scrubbing efficiency with certainty, but raised the possibility that cooling towers may have the same effect on these fine particles. The study also found that the drift eliminators of both cooling towers were more efficient than specified; the measured efficiency for the cooling towers were, roughly one order of magnitude lower for the tower built in 2004, and two orders of magnitude lower for the tower built in 1957.

More research may be required to verify the PM2.5 scrubbing efficiency of drift eliminators, as well as the overall efficiency of drift eliminators.

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 load 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 the U.S. EPA, the installation cost of a dry cooling tower would be approximately 3.3 times that of an equivalent wet cooling tower.

Regulatory History

Cooling towers are largely exempt from permits per 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.

Rule 1404 – Hexavalent Chromium Emissions from Cooling Towers was amended in April 1990 and prohibits the use of hexavalent chromium-containing water treatment chemicals from being added to cooling tower circulating water.

Rule 222 – Filing Requirements for Specific Emission Sources Not Requiring a Written Permit Pursuant to Regulation II was amended in May 2017, establishing a registration program for industrial cooling towers. An industrial cooling tower is defined as a cooling tower located at a chemical plant, refinery or other industrial facility that is not used for comfort cooling. Under the registration program, facilities are required to submit information on water circulation rates and the average amount of total dissolved solids in the water for industrial cooling towers as a method of estimating PM emissions.

South Coast AQMD 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

A potential control method outlined in the 2016 AQMP in BCM-02: Emission Reductions from Cooling Towers, proposed to phase in the use of drift eliminators with 0.001 percent drift rate for existing cooling towers where cost-effective. The proposed control method also discussed a potential BACT drift rate of 0.0005 percent for new construction. However, prior to developing a policy to implement controls, an emissions inventory and an equipment universe must be established. Information collected through the Rule 222 registration submittals may be used as a starting point to develop an equipment universe.

The recent CEC study also raised questions regarding the overall effect on emissions from cooling towers, with data showing that cooling towers may act as scrubbers for surrounding areas and emit negative emissions for coarse particles, and potentially have the same effect on PM2.5 emissions. The study also found that drift eliminators may vastly outperform their efficiency specifications. These findings should be examined prior to implementing controls.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

To be determined.

Cost Effectiveness

The 2016 AQMP included a cost estimate of $1.37 million to retrofit a local refinery cooling tower with a high efficiency drift eliminator. The reduction in total PM, PM10, and PM2.5 was also previously estimated at approximately 173, 11, and 0.4 tons per year, respectively. Cost-effectiveness for BCM-02 in the 2016 AQMP was estimated at approximately $15,000 per ton of PM10, but was determined not cost-effective for reducing PM2.5 at over $400,000 per ton. Adjusting previous AQMP cost assumptions to 2022 costs would result in a higher cost-effectiveness estimate above $400,000 per ton. Additionally, it is possible that this control measure may be less cost-effective if the efficiencies of existing drift elimination installed at cooling towers are greater than specified, as outlined in the CEC study.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources such as cooling towers.

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BCM-14: FURTHER EMISSION REDUCTIONS FROM PAVED ROAD DUST SOURCES [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	PAVED ROAD DUST	
CONTROL METHODS:	ENHANCED STREET CLEANING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	8.55	9.11
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TO BE DETERMINED	
INCENTIVE COST:	TO BE DETERMINED	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Background

Fugitive dust emissions occur whenever vehicles travel over a paved surface such as a road or parking lot through the re-suspension of loose material. While fugitive dust emissions are primarily in the coarse size fraction (PM10-2.5), entrained paved road dust is a major direct PM2.5 source due to the large number of roadways and high traffic volumes in the region. Paved road dust emissions have been found to vary with what is termed the "silt loading" present on the road surface. According to U.S. EPA, silt loading is more specifically defined as the mass of silt-sized material (75 microns or less) 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). U.S. EPA guidance encourages preventative over mitigative controls to reduce paved road dust PM emissions.

Regulatory History

In accordance with U.S. EPA guidance, South Coast AQMD has implemented a comprehensive program to reduce paved road dust emissions through both preventative and mitigative controls. Examples of preventative controls are included in numerous South Coast AQMD rules that require access improvements to reduce the amount of material tracked out from a facility onto surrounding paved public roads, including:

- Rule 403 – Fugitive Dust
- Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities
- Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations
- Rule 1158 – Storage, Handling, and Transport of Coke, Coal and Sulfur
- Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations
- Rule 1466 – Control of Particulate Emissions from Soils with Toxic Air Contaminants

Additionally, Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations requires new or widened roads to be constructed with curbing or, as an alternative, paved shoulders. Most local governments implement mitigative controls through routine street sweeping conducted at frequencies of once or twice per week. Existing National Pollution Discharge Elimination System (NPDES) regulations also require local governments to establish street sweeping programs as part of a comprehensive effort to reduce debris from entering storm drains. South Coast AQMD has also established mitigative controls for paved road dust through requirements for local governments to procure only certified street sweeping equipment (Rule 1186) that operate on alternative fuels (Rule 1186.1 – Less Polluting Sweepers).

Proposed Method of Control

Existing South Coast AQMD regulations implement paved road dust controls based on U.S. EPA guidance. Since paved road dust emissions are a function of silt loadings, additional street cleaning could be a strategy to reduce PM2.5, however, studies that examine the effect of street sweeping on ambient PM levels are scarce. A recent study in Chiayi City, Taiwan concluded that street sweeping combined with street washing is effective at reducing ultrafine particle concentrations. Another study conducted in Krakow, Poland found that street sweeping followed by intensive street washing reduced road dust PM2.5 by 20-33 percent. However, since NPDES regulations prohibit street washing due to concerns over increasing the amount of debris entering storm drains, these studies are not applicable to southern California. The only studies identified as potentially applicable found that closed system regenerative air sweepers are more efficient, and less polluting compared to vacuum and mechanical brush sweepers.

Emission Reductions

Mandating increased street sweeping frequencies has unknown impacts on PM2.5 levels. Therefore, a pilot project along with a comprehensive atmospheric measurement campaign would be needed to assess the effectiveness of street sweeping as a method to reduce ambient PM2.5. New test protocols that evaluate the PM2.5 performance of sweepers, such as those in Toronto and Europe, may also be needed.

Rule Compliance and Test Methods

Compliance with this control measure can be monitored through recordkeeping and inspections.

Cost Effectiveness

Street sweeping costs vary greatly based on the number of miles and frequencies and whether the work is conducted with in-house or contracted resources. A survey of several large cities conducted in 2018 determined that the median annual cost of street sweeping was $52.31 per curb mile. A curb mile is one mile of city street from the face of the curb, extending out onto the street by the width of the sweeper. In the case of streets or other roadways without curbs, a curb mile is one mile down the center of the roadway by the width of the sweeper. Total curb miles swept are determined by the frequency of the street cleaning and the road surface in the jurisdiction. For example, if one curb line of a road is swept for 2 miles on both sides of the street on a weekly basis, a total of 16 curb miles are swept during a month. The cost of mandating increased street sweeping frequencies can be substantial considering that the City of Los Angeles is responsible for over 230,000 curb miles. A pilot project would provide further insight into the cost-effectiveness of this measure.

Implementing Agency

South Coast AQMD has the authority to adopt and enforce rules and regulations to reduce emissions from fugitive dust sources.

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BCM-15: EMISSION REDUCTIONS FROM ABRASIVE BLASTING OPERATIONS

[PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	PM2.5	
CONTROL METHODS:	AIR POLLUTION CONTROL (APC) EQUIPMENT	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This control measure seeks to reduce PM2.5 emissions from abrasive blasting operations.

Background

Existing South Coast AQMD Rule 1140 (Abrasive Blasting) regulates opacity requirements for confined and unconfined abrasive blasting operations using various abrasives. The California Health and Safety Code prohibits local districts from requiring emission and performance standards more or less stringent than the State regulation. Rule 1140 (Amended 1985) has been developed for consistency with the California Code of Regulations Title 17, Subchapter 6 – Abrasive Blasting. Current permit conditions for abrasive blasting require venting to a PM air pollution control (APC) equipment when in full use.

Regulatory History

Rule 1140 is considerably similar to the California Code of Regulations, Title 17, Subchapter 6 — Abrasive Blasting provisions, which have been adopted by most California Air Districts. State law prohibits more stringent requirements. As such, the current Rule 1140 meets the BACT requirements.

Proposed Method of Control

Baghouses or dry filters are the most frequently used APC equipment. This control measure proposes voluntary applications of a portable blasting enclosure/booth with a dust collection system by providing incentives, primarily focusing on dry abrasive blasting operations conducted in open areas using portable blasting equipment with or without a written South Coast AQMD permit.

Emission Reductions

To be determined.

Rule Compliance and Test Methods

South Coast AQMD's Rule 1140 states that before blasting all abrasives used for dry unconfined blasting shall contain no more than 1% by weight material passing a No. 70 U.S. Standard sieve, and after blasting the abrasive shall not contain more than 1.8% by weight material five microns or smaller.

All abrasives used for dry unconfined blasting shall comply with the performance requirements of sections (c)(1)(A) and (c)(1)(B) in Rule 1140 when 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. In addition, Rule 1140 states that visible emission evaluation of abrasive blasting operations shall be conducted in accordance with the following provisions:

1. Emissions shall be read in opacities and recorded in percentages.
2. The light source should be behind the observer during daylight hours.
3. The light source should be behind the emission during hours of darkness.
4. The observer position should be at approximately right angles to wind direction and at a distance no less than twice the height of the source but not more than a quarter mile from the base of the source.
5. Emissions from unconfined abrasive blasting shall be read at the densest point in the plume, which point shall be at least 25 feet from the source.
6. Where the presence of uncombined water is the only reason for failure to comply with opacity limits, the opacity limits shall not apply. The burden of proof in establishing that opacity limits shall not apply shall be upon the operator.

7. Emissions from unconfined abrasive blasting employing multiple nozzles shall be evaluated as a single source unless it can be demonstrated by the operator that each nozzle, evaluated separately, meets the requirements of this rule.
8. Emissions from confined abrasive blasting shall be read at the densest point after the air contaminant leaves the enclosure.

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD.

References

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Rule 1140 - Abrasive Blasting; RULE 1140. ABRASIVE BLASTING (aqmd.gov)

California Code of Regulations Title 17, Subchapter 6; CCR: Title 17 Sections 92000 - 92530 Abrasive Blasting (ca.gov)

BCM-16: EMISSION REDUCTIONS FROM STONE GRINDING, CUTTING AND POLISHING OPERATIONS

[PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	STONE FABRICATION OPERATIONS	
CONTROL METHODS:	WET DUST SUPPRESSION, PORTABLE HEPA FILTERS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

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 stonework can contribute to regional PM levels and 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 exempt from permitting requirements under South Coast AQMD Rule 219.

Regulatory History

South Coast AQMD Rule 219 does not require permits for machining equipment exclusively used for polishing, cutting, surface grinding, etc. However, South Coast AQMD 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 workplace 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 South Coast AQMD 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

To be determined during rule development.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources.

References

Occupational Safety and Health Administration (OSHA), Worker Exposure to Silica during Countertop Manufacturing, Finishing and Installation, OSHA – HA-3768-2015. https://www.osha.gov/sites/default/files/publications/OSHA3768.pdf

California Code of Regulations, Title 8, Section 1530.1 – Control of Employee Exposures from Dust Generating Operations Conducted on Concrete or Masonry Materials

BCM-17: EMISSION REDUCTIONS FROM PRESCRIBED BURNING FOR WILDFIRE PREVENTION

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	N/A	
CONTROL METHODS:	INCENTIVE FUNDING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
PM2.5 INVENTORY	0.27	0.27
PM2.5 REDUCTION	-	N/A
PM2.5 REMAINING	-	N/A
ANNUAL AVERAGE [NOX]:	2018	2030
NOX INVENTORY	0.01	0.01
NOX REDUCTION	-	N/A
NOX REMAINING	-	N/A
CONTROL COST:	$5,100 PER TON OF TSP PREVENTED; TBD FOR NOX	
INCENTIVE COST:	$318,240	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This proposed control measure will seek particulate matter emission reductions and property defensible space enhancements from fuel reduction efforts via hand-thinning, mechanical thinning, and the use of chipping equipment (chipping) to mitigate excess fuels at properties located in the residential urban-wild-interface (UWI) areas of the San Bernardino National Forest (SBNF).

Background

Wildfires are a natural part of healthy Southern California forest ecosystems. Frequent and low- to moderate-intensity natural wildfires allow for fire-adapted species to reproduce, remove dying or dead flora, and increase forest resiliency through maintaining a natural biomass density.

Beginning in the early 20th century, fire suppression became the standard approach to managing fire. Fueled by fire suppression initiatives from the U.S. Forest Service as a result of the Theodore Roosevelt administration, changes to the social perception of forests, and economic pressure for optimizing timberlands not for forest health but for timber density, the natural cycle of fire-induced forest clearing and rejuvenation was disrupted. Several areas, including Southern California, have experienced severe wildfires as a result of overgrown fuel sources that have accumulated over the last several decades. Combined with increasing urbanization and increased climate change, flagrant wildfires are becoming more destructive and frequent, with 9 of 10 of the largest, most destructive, and most deadly fires in California's history occurring within the last decade.

Since the last third of the 20th century, policies against controlled burns were lifted on public and private lands and prescribed fire began to reemerge as a tool to combat human-caused forest compositional changes. However, progress has been slow and many acres remain to be fully treated. A 2019 study "We're Not Doing Enough Prescribed Fire in the Western United States to Mitigate Wildfire Risk," written by University of Idaho fire scientist Crystal Kolden, concluded that although California intentionally burned around 90,000 acres in 2018, however, the ideal burn rate is 5-10 times that amount.

While effective, prescribed burns have a complex administrative process in order to be approved, including burn and smoke management plans requiring regulatory approval. Prescribed burns also have social and safety implications as they are inherently a stronger and more complex approach to fuel reduction than thinning mechanisms. Hand-thinning and mechanical-thinning are fuel reduction methods that can be used in addition to or in-place of prescribed burning to achieve the objective of reduced fuel loads. These methods are often chosen in UWI areas due to proximity to structures and human life.

Thinning methods are also often paired with either prescribed pile burns or with chipping. Prescribed pile burns are similar to prescribed burns (often called "broadcast burns") but are localized to individual piles of loaded fuel from thinning efforts. Chipping involves no burning but changes the physical composition of the fuel.

Fuel composition encompasses four different categories. *Ground fuels* are the lowest elevation fuel that do not generally contribute to wildfire intensity or spread and consist of below-surface materials such as organic soils, duff, decomposing litter, roots, buried logs, and portions of stumps that lie below the surface. *Surface fuels* are on or near the ground floor that are often the most hazardous fuels, which is especially true in drier forests that have been affected by fire suppression and hyper-focused timber harvesting. Surface fuels consist of leaf and needle litter, dead branch material, downed logs, bark, tree cones, short shrubs, grasses, and other herbaceous materials. *Ladder fuels* are the next vertical fuel layer and are the second-most dangerous fuel as they allow for vertical extension of lower-intensity ground and

surface fires into the canopy of larger trees. Ladder fuels consist of small trees, large shrubs, and the understory layer of trees. *Crown fuels* are the highest vertical fuel layer and include the canopy of large trees and play a smaller role in overall fire hazard potential.

Pairing thinning with chipping, also known as mastication, reduces flammable material and changes the physical composition from voluminous and flammable surface, ladder, and occasionally canopy fuels, into dense and less flammable chips. Thinning efforts primarily target ladder fuels to both reduce continuity between surface and crown fuels as well as promote native species propagation in areas where natural fires have been suppressed. Chips are a class of organic mulch and may be spread on the site where the fuel is collected, spread on private or government properties, or delivered to county facilities for processing. There is currently a shortage of data on mulch spread on the site of fuel collection on long-term ecological impact, with some studies showing an increase in non-native herbaceous and shrub flora and a short-term increase in surface fire hazard.

This mulch provides a multitude of benefits including reduced water consumption for adjacent flora, enhanced soil temperature insulation, reduced invasive weed propagation, improved erosion and dust control, mitigation of soil compaction, and aesthetic improvements. If gathered in sufficient enough quantities, chip material may also serve as an input to biomass processing facilities for energy production.

Homes and structures can catch fire through a variety of mechanisms, including embers which can float away from a main fire, radiant heat which can indirectly ignite materials from a sightline to a flame if in close enough proximity, and direct flame contact. Home hardening is the process of selecting materials, installation techniques, landscaping, and spacing considerations to increase the resiliency of homes or structures against these ignition mechanisms.

The California Department of Forestry and Fire Protection (CalFire) currently specifies 4 zones for defensible space for structures. *Zone 0* requirements, put into law in 2020 by Assembly Bill 3074, extend 0-5 feet from a structure and allows for no combustible material. *Zone 1* extends to 30 feet and requires removal of highly combustible materials such as dead vegetation. *Zone 2* extends to 100 feet and requires optimized spacing and vegetative care, such as no overgrown grass and appropriate spacing between plants, shrubs, and trees. CalFire also recommends removing all tree branches at least 6 feet from the ground and maintaining a vertical spacing under trees equal to 3 times the height of the tallest nearby shrub.

The practice of thinning and use of chips as ground cover can facilitate defensible space modifications by removing excess surface and ladder fuels and enhance the resiliency of underlying soil through increased water retention, complementing home hardening efforts.

The Mountain Rim Fire Safe Council (the "Council”), encompassing 110 square miles and much of the San Bernardino UWI, has successfully demonstrated the effectiveness of chipping initiatives and has successfully received CalFire and Southern California Edison funding in the past for thinning and chipping treatment.

Regulatory History

There are no South Coast AQMD funding initiatives specifically addressing fuel reduction efforts in communities in the San Bernardino National Forest. Rule 444 currently applies to open burning activities, which includes prescribed fire burning, but does not include a fuel reduction provision or mechanism for private landowners to conduct prescribed burning on residential properties. Rule 444 currently only allows for prescribed burning on public lands or lands open to the public, such as scout and Christian camps, when conducted by fire management agencies only.

Proposed Method of Control

The proposed method of control is to coordinate with other agencies to provide funding for chipping operations for the remaining untreated area in the Council's UWI. This would be similar to the CalFire and Southern California Edison grants the Council has received in the past. The Council has not been able to provide sufficient chipping operations to its constituency due to the overwhelming demand for the service that has already exhausted its most recent grant.

The Council has received a total of three grants for chipping operations, awarded in 2014, 2017, and 2018. Although the 2018 grant was intended to be a 4-year grant, the Council had a nearly 300 percent increase in enrollment in its constituency from the 2017 grant and the funds were exhausted 18 months early.

The Council has provided records detailing the volunteer match to the grant funds. With the chipping program in place, homeowners in the UWI are much more compliant and engaged with assisting with fuel load reduction by trimming and removing excess hazardous vegetation, such as dead trees and leaf litter, for chipping than without the program. Using the number of volunteer hours from these property owners for each grant and the California Volunteer Rate, the Council estimates a 440 percent volunteer match to grant funds.

The Council's 2017 and 2018 grants' funds were provided by the California Climate Investments Program, with a requirement to track the amount of fuel collected. The Council also tracked the 2014 amount of fuel collected. The total fuel collected was 1,682,215 cubic feet which is equivalent to approximately 20,187 green tons. The unit of measure, green tons, refers to the weight of material as it currently exists, moisture included, and bone-dry tons (BDT) refers to the dry-weight component of the green tonnage, without moisture.

As of 2021, the Council estimates that 25,000 properties still remain untreated, even after the three grants had been received and chipping was implemented.

Studies show that the combination of thinning and chipping costs approximately $500-$1,500 per acre treated. Over the course of the three grants, the Council has treated approximately 1,491 acres with grant funds of $284,242 and a volunteer match of $1,259,920, or a total of $1,544,162 expended for fuel reduction. Adjusting each grant's funds and each grant's corresponding volunteer match for inflation to

June 2023, the total is $1,895,756. This results in a cost-per-acre of $1,271. Based solely on grant funds, the cost-per-acre is $234/acre.

The 1,491 treated acres covered 2,281 properties, or an average of 0.65 acres per property. For the 25,000 remaining properties, a total of 16,250 acres remain to be treated assuming 0.65 acres per property. With the current grant-portion cost-per-acre of $234, this results in grant funds of $3,802,500. Given the extensive and ongoing nature of fuel reduction, it is advisable to stage the total number of treated acres over several years. This proposal recommends providing a portion of this total amount as funding for an initial pilot for one grant cycle to last 2 years. The increasing engagement of the chipping program in the subject area suggests that subsequent cycles have an increasing enrollment. The assumed number of participating properties is at least that of the highest enrollment in a previous year, which was 1,046 properties in 2020. Providing funding for 2 years results in a total of at least 2,092 properties or 1,360 acres. This results in pilot funding in the amount of $318,240. Upon conclusion of this pilot, a review shall be completed and a vote conducted on whether to continue providing funding for additional years based on treated area and overall success of the pilot grant.

While it is possible additional CalFire grants may be received by the Mountain Rim Fire Safe Council, funds from the South Coast AQMD would supplement, enhance, and broaden the positive impact of chipping activities and allow any future CalFire grant funds to be targeted to any number of additional fire-related initiatives: fire hazard abatement assistance; hazardous dead tree removal, document shredding, elimination of interior fuels, the publication of "Living with Wildfire in the Inland Empire", house numbering, leaf litter and pine needle collection, and fire prevention outreach and education.

Additional projects are conducted by the Council without any funding: Gold-Spotted Oak Borer Task Force (an invasive species), goats for fuel reduction; BioChar for woody debris disposal, pine needle collection and disposal (for use as biochar and/or use at ski resorts), home hardening compliance, demonstration of fire safe gardens/landscape sites (to showcase drought resistant, low water native species in various areas), and others such as a statewide chipping locator service currently in development. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

While there are no direct emission reductions associated with this proposal, it provides a preventative mechanism that may reduce emissions in the future. A flagrant, uncontrolled wildfire is undesirable, and can lead to destruction of properties as well as multiple tons of pollutants, including toxic pollutants, depending on the size of the wildfire and what is burning. Fortunately, there has not been a major fire in the San Bernardino UWI area since 2018 and thus the mitigated impact in terms of wildfire severity cannot be measured. However, it is reasonable to assume that, should a wildfire break out, that the 1,360 acres' worth of fuel, if not collected, would be burned, which is a likely scenario given the collected fuel is primarily ladder fuels. Additionally, structures that have not had thinning and chipping treatment are at an increased risk of burning and emitting toxic contaminants from interior fuel burning such as benzene,

methylene chloride, vinyl chloride monomer, naphthalene, asbestos, and arsenic. These contaminants were released into the town of Paradise's drinking water supplies as it burned during the 2018 Camp Fire.

The average cubic feet of collected fuel per acre over the last 3 grants is 1,130 cubic feet per acre. Applied to the pilot grant's 1,360 acres, this equates to a total of 1,536,800 cubic feet of fuel proposed to be collected.

Several studies have reviewed the emissions profile of burned fuel. These emissions vary extremely widely depending on a number of factors including type of fuel (plant, shrub, or tree), species of fuel, humidity, available oxygen, temperature, wind, moisture content, and other factors.

One such source is a calculator developed by the University of Washington and used by the U.S. Forest Service which estimates emissions from pile burning based on fuel type, volume of fuel pile, packing density (large trees have higher packing density), bone-dry mass (removing moisture), and percentage of mass consumed. Using a total of 1,536,800 cubic feet of fuel collected (assumed to be a conifer composition with 90 percent combustion efficiency) and revising the calculator's packing density from 20 percent to 75 percent, the total emissions are 4.24 tons (PM), 3.00 tons (PM_{10}), 2.62 tons ($PM_{2.5}$), 60.72 tons (CO), 1,862 tons (CO_2), 4.91 tons (CH_4), and 3.32 tons (non-methane hydrocarbons). This source determines foregone emissions from preventing wildfire of the collected fuel only.

Another source is the U.S. EPA's AP-42, CH 13.1: "Wildfires and Prescribed Burning," which gives various emission factors for several different regions of the country. Although California is its own region (Region 5), due to the majority of California's forest being outside of Southern California and the region of the Council being closer in climate to that of the Southwestern region (Region 3), Region 3's emission factors were chosen. Region 3's emission factors are also lower than that of Region 5, providing a more conservative estimate of an emissions profile from burning. These emission factors are given in kg/Hectare units and are shown as 191 (PM), 1,570 (CO_2), 269 (CH_4), and 45 (NOx). Converting the pilot acreage of 1,360 acres to hectares yields 550.37 hectares. Converting kilograms (kg) to tons yields a conversion factor of 0.0011 tons/kg. This yields the following: 115.6 tons (PM), 950.49 tons (CO_2), 162.85 tons (CH_4), and 27.24 tons (NOx). This source determines foregone emissions from preventing wildfire of the total land area in the pilot grant. It is reasonable to assume that if a given land area is not treated, that more fuel than just that amount collected will burn as well. The collected fuel will contain excess ladder fuels, which if not collected, may lead to canopy fires and total combustion of a given land area.

Rule Compliance and Test Methods

Due to the nature of this control measure, no rules or test methods are proposed.

Cost Effectiveness

The pilot funding amounts to a grant of $318,240 to treat 1,360 acres for fuel reduction in the San Bernardino UWI. Should these materials be prevented from burning in a wildfire, the PM emissions

prevented amount to 9.86 tons - 115.6 tons. Total Suspended Particles (TSP) will be used to aggregate all PM emissions and is defined as all particulates with a diameter less than or equal to 100 microns. A median of value of 62.73 tons TSP is selected, as the most probable scenario is that all of the excess surface and ladder fuels and a portion of canopy fuels would be combusted in a wildfire. Using this median value, the cost-effectiveness is $318,240/62.73 tons = $5,073 per ton of TSP prevented.

Implementing Agency

South Coast AQMD has the authority to provide grant funds to prevent emissions from excess fuel.

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BCM-18: FURTHER EMISSION REDUCTIONS FROM WOOD-BURNING FIREPLACES AND WOOD STOVES

[PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	RESIDENTIAL WOOD COMBUSTION	
CONTROL METHODS:	REMOVE LOW-INCOME EXEMPTION ALLOWING WOOD-BURNING ON NO-BURN DAYS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	4.94	4.82
POLLUTANT REDUCTION	-	0.33~~TBD~~
POLLUTANT REMAINING	-	4.49~~TBD~~
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to seek additional PM2.5 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, NOx, SOx, 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 (PM2.5). 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.

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. In 2020, South Coast AQMD amended Rule 445 to extend the No-Burn Day requirement by mandating Basin-wide curtailment in all cases where any source receptor area exceeds a daily air quality forecast of 30 µg/m^3. Ozone and PM contingency measures were also added, including the establishment of new curtailment thresholds. 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 PM2.5 air quality is forecast to exceed 30 µg/m^3. These no burn provisions apply to the entire Basin whenever a PM2.5 level of greater than 30 µg/m^3 is forecast for any monitoring station that has recorded violations of the federal 24-hour PM2.5 standard in either of the previous two years. In 2021, this limit dropped to 29 µg/m^3, when the first contingency measure in the rule was triggered due to a failure to attain the PM2.5 24-hour standard by the due date. 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. 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 adopted the Short-Lived Climate Pollutant Reduction Strategy (SLCP Reduction Strategy)[65] in March 2017, which includes recommended control measures and emission reduction targets for residential wood combustion. Ultimately, the SLCP Reduction Strategy, along with

[65] https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf

other planning efforts, was incorporated into CARB's 2022 Scoping Plan Update[66] targeting to achieve carbon neutrality by 2045. Residential wood burning emissions, which account for 95 percent of residential black carbon emissions, are being reduced through Statewide programs like the Woodsmoke Reduction Program[67] established by SB 563 (Lara, Chapter 671, Statutes of 2017). The Woodsmoke Reduction Program offers financial incentives for homeowners to replace old, inefficient, and highly polluting wood stoves, wood inserts, or fireplaces with cleaner burning and more efficient home heating devices and is part of California Climate Investments,[68] a Statewide initiative that uses billions of dollars from the cap-and-trade program to improve public health and the environment, especially in disadvantaged communities, reduce greenhouse gas emissions, and boost the economy.

In 2019, the SJVAPCD amended Rule 4901 to introduce a two-tiered curtailment program which applies differently to hot-spot vs. non-hot-spot counties. In the "hot-spot" counties of Madera, Fresno, and Kern, the level one PM2.5 threshold is 12 μg/m^3 and the level two PM2.5 threshold is 35 μg/m^3. For the non-hot-spot counties in the San Joaquin Valley (San Joaquin, Stanislaus, Merced, Kings, and Tulare), the level one PM2.5 threshold is 20 μg/m^3 and the level two PM2.5 threshold is 65 μg/m^3. In 2023, the SJVAPCD amended Rule 4901 to add a contingency measure for applicable PM2.5 NAAQS (Section 2.5 – Section 5.7.3 Contingency Provision). If triggered, the contingency measure would align the non-hot-spot curtailment thresholds with the more stringent hot-spot thresholds.

Proposed Method of Control

Based on a review of other air districts' wood smoke control programs, the curtailment program in Rule 445 is as stringent as, if not more stringent than similar programs in other air districts. As presented in Appendix III, a quantitative analysis was conducted to compare the emission reductions achieved by Rule 445 to those that would be achieved if other air districts' programs were implemented in the Basin. The analysis demonstrated that the current Basin-wide curtailment threshold of 29 μg/m^3 provides equivalent to or greater stringency than other air districts curtailment programs ~~if the low-income exemption is removed~~. However, based on U.S. EPA Region 9's comment, ~~ Therefore,~~ South Coast AQMD will ~~retain the current curtailment threshold. South Coast AQMD will also~~ consider lowering the curtailment threshold to 25 μg/m^3 and removing the low-income exemption, while retaining the sole-source of heat exemption to allow wood burning on no-burn days for ~~the~~ households with no other source of heating than wood burning. ~~South Coast AQMD may also consider lowering the curtailment threshold if future analyses demonstrate that this would be necessary to maintain the stringency of Rule 445.~~ South Coast AQMD will consider to remove the low-income exemption in Rule 445 as well.

Independent of MSM, this control measure also seeks to assess the feasibility of expanding access to incentives, especially for disadvantaged communities. Since 2008, South Coast AQMD has implemented programs which provide financial incentives to encourage the public to switch to cleaner hearth devices.

[66] https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf
[67] https://ww2.arb.ca.gov/our-work/programs/residential-woodsmoke-reduction/woodsmoke-reduction-program
[68] https://ww2.arb.ca.gov/our-work/programs/california-climate-investments

The current program encourages households to upgrade wood-burning devices through South Coast AQMD 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.

Emission Reductions

~~To be determined during rulemaking.~~Refer to Attachment C of Appendix III for a quantification of reductions.

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.

In general, compliance will be difficult to quantify as South Coast AQMD does not have the resources necessary to verify compliance with the curtailment program at the millions of residences with wood-burning devices.

Cost Effectiveness

The cost-effectiveness of this control measure has not been determined, however, increasing the number of curtailment days would result in few cost increases, if any, to the impacted community. Households that lack an alternative source of heat would continue to be able to burn on no-burn days so there would be no requirement to upgrade to a gas or electric furnace.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from residential wood combustion sources. South Coast AQMD 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.

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BCM-19: EMISSION REDUCTIONS FROM UNPAVED ROAD DUST SOURCES [PM2.5]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	UNPAVED ROADS AND LOTS	
CONTROL METHODS:	DEVELOP AN INVENTORY TO ASSESS THE SUITABILITY FOR PAVING	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	1.67	1.67
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

This measure seeks to evaluate the potential to reduce PM2.5 emissions from well-traveled unpaved lots, roads, shoulders and other surfaces by applying paving materials.

Background

Fugitive dust emissions occur whenever vehicles travel over a surface such as a paved or unpaved road or parking lot through the re-suspension of loose material. While fugitive dust emissions are primarily in the coarse size fraction 10 to 2.5 microns, entrained road dust is a major direct PM2.5 source. Road dust emissions vary according to the "silt loading" present on the road surface. According to U.S. EPA, silt loading is more specifically defined as the mass of silt-sized material (75 microns or less) per unit area of the travel surface. Unpaved roads entrain more fugitive PM per Vehicle Miles Traveled (VMT). Sources affecting silt loading generally include: 1) road composition; 2) vehicle-related deposition; 3) dust fall; 4) litter; 5) mud and soil; 6) erosion from adjacent areas; 7) spills; 8) biological debris; 9) ice control compounds; 10) recent or current precipitation; and 11) the vehicle types using the road. Because of the importance of silt loadings and road composition to emissions, paving an unpaved road is a

substantial contributor to reducing fugitive road dust emissions. U.S. EPA guidance encourages preventative over mitigative controls to reduce paved road dust PM emissions.

Paving of unpaved surfaces is a common strategy used in construction projects and other community improvement initiatives to reduce dust and airborne particulate matter emissions, including PM2.5. Other air districts have implemented unpaved road dust control measures that include paving as one method of controlling particulate matter emissions. Some have established traffic thresholds that would trigger the paving requirements set therein, and methodologies for PM emissions quantification.

Regulatory History

In accordance with U.S. EPA guidance, South Coast AQMD has implemented a comprehensive program to reduce paved road dust emissions through both preventative and mitigative controls. Examples of preventative controls are included in South Coast AQMD rules that require access improvements to reduce the amount of material tracked out from a facility onto surrounding paved public roads, including:

- Rule 403 – Fugitive Dust
- Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities
- Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations
- Rule 1158 – Storage, Handling, and Transport of Coke, Coal and Sulfur
- Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations
- Rule 1466 – Control of Particulate Emissions from Soils with Toxic Air Contaminants

Additionally, Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations requires new or widened roads to be constructed with curbing or, as an alternative, paved shoulders. Most local governments implement mitigative controls through routine street sweeping conducted at frequencies of once or twice per week. Existing National Pollution Discharge Elimination System (NPDES) regulations also require local governments to establish street sweeping programs as part of a comprehensive effort to reduce debris from entering storm drains. South Coast AQMD has also established mitigative controls for paved road dust through requirements for local governments to procure only certified street sweeping equipment (Rule 1186) that operate on alternative fuels (Rule 1186.1 – Less Polluting Sweepers).

South Coast AQMD's rules do not prohibit the construction of new unpaved roads in urban areas. However, the South Coast AQMD has recently developed a Paving Project Plan for the Eastern Coachella Valley as part of the AB 617 Community Air Protection Program (CAPP), which has been approved by CARB. This plan was developed in response to community concerns related to particulate matter emissions from unpaved surfaces in the community of Eastern Coachella Valley. This paving plan includes an emissions reduction quantification methodology based on VMT.[1] The quantification methodology has been approved by CARB and is being applied to this Control Measure for paving of unpaved surfaces in the SCAB.

SJVAPCD has also adopted two unpaved road regulations, Rules 8061 and 8071, that offer a template for how other air districts can manage this source of PM emissions.[2]

Proposed Method of Control

The purpose of this control measure is to develop an inventory of unpaved roads and parking lots within urban areas in the Basin and assess the suitability for paving. In total, there are approximately 1,900 miles of unpaved roads in the Basin. However, not all of these roads are well-traveled or highly used and therefore the suitability for paving must be determined on a case-by-case basis. Factors that will be considered include vehicle miles travelled, proximity to AB 617 communities, and whether the road exists in natural or protected lands (e.g., local and regional parks, National Forests, etc.). In addition, this control measure will further evaluate the effects of paving on climate-related drought conditions and heatwaves frequently experienced in the Basin. Paving surfaces that would otherwise allow for underground aquifers to replenish during rainstorms must be considered when assessing suitability for paving. Paving unpaved surfaces, especially in urban areas, also creates heat island effects resulting in higher temperatures than outlying areas. In densely urbanized areas, paved roads absorb and re-emit the sun's heat more than natural landscapes becoming "islands" of higher temperatures relative to outlying areas. The costs of less permeable areas for surface drainage and heat island effects will be evaluated.

Emission Reductions

To be determined during rulemaking.

Rule Compliance and Test Methods

To be determined during rulemaking.

Cost Effectiveness

The cost projections of paving unpaved areas vary due to materials used for paving, be it asphalt, concrete, or some combination, and the need for striping, curbing, and other improvements. The Fugitive Dust Handbook published by the Western Regional Air Partnership estimate the costs of paving one mile of unpaved road at $44,100/mile-year with an estimated useful life of 25 years; a similar cost estimate for paving unpaved lots $0.23/square foot-year for a useful life of 25 years, though these costs have likely increased since publication.[3] CARB's Unpaved Road Dust, Non-Farm Roads Methodology estimated the total unpaved city and county land for the SCAB at 167.3 miles, though 'high-traffic' and adjacency to 617 communities were not limiting factors in these estimates.[4] Using these figures, a high cost estimate for paving the total unpaved city and county land in the SCAB would be approximately $184 million, though again these are total miles not 'high-traffic' miles, so the total unpaved lot area that would be considered by this measure would be significantly smaller. This methodology estimates that the tons of PM/year reductions of paving the total road miles at 553.3 tons/year, or 1.52 tpd for an estimated cost

effectiveness figure of $13,334/ton. If only 10% of the road miles is paved, this could result in a reduction of 55 tons/year of PM. While most unpaved roads are in public jurisdictions, many unpaved lots are private and there is not currently an inventory of those spaces, and estimating cost effectiveness for those areas is not possible at this point. In addition, the costs of less permeable areas for surface drainage and heat island effects are unknown at this time.

Implementing Agency

South Coast AQMD has the authority to regulate emissions from stationary sources such as unpaved roads.

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BCM-20: 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 [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD*	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

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

Description of Source Category

This control measure seeks to explore all feasible measures that achieve criteria pollutant reductions. Existing rules and regulations reflect current best available retrofit control technology (BARCT). However, BARCT continually evolves as new technology becomes available that is feasible and cost-effective. South Coast AQMD staff would continue to review actions taken by other air districts for applicability in our region. Through this proposed control measure, South Coast AQMD 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. South Coast AQMD 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.

Regulatory History

The California Clean Air Act (CCAA) requires that "extreme" ozone nonattainment areas include all feasible measures.[69] Although this is a PM2.5 plan, feasible measures which achieve NOx reductions for ozone attainment will also assist with PM2.5 attainment. Feasible measures also encompass measures that target direct PM2.5 and ammonia reductions.

The term "feasible" is defined in the 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 South Coast AQMD to adopt rules requiring best available retrofit control technology for existing sources. H&SC §40406 specifically defines BARCT as "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."

Proposed Method of Control

South Coast AQMD staff will continue to review new emission limits or controls introduced through federal, State or local regulations to determine if South Coast AQMD 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, South Coast AQMD will consider adopting and implementing new retrofit technology control standards, based on research and development and other information, that are feasible and cost-effective. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

[69] California Health and Safety Code (H&SC) § 40920.5

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 SIP 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-effectiveness for this control measure cannot be determined because the future set of “all feasible” measures are not known. South Coast AQMD 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

South Coast AQMD 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)

California Code of Regulations, Section 153

EGM-01: EMISSION GROWTH MANAGEMENT FROM NEW DEVELOPMENT AND REDEVELOPMENT

[ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	NEW DEVELOPMENT AND REDEVELOPMENT PROJECTS	
CONTROL METHODS:	TO BE DEVELOPED THROUGH A PUBLIC PROCESS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to identify emission reduction opportunities and to mitigate and, where appropriate, reduce emissions from new development or redevelopment projects such as residential, commercial, and industrial projects that are otherwise not included in other Facility Based Mobile Source Measures (FBMSMs) identified in the PM2.5 Plan. 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. Through a public process with the Working Group, the measure is designed to identify control measures and a path forward to reducing emissions related to indirect sources required to meet and balance the needs of the South Coast Air Basin (Basin) in demonstrating attainment of the federal standards with evolving land use development patterns, growing economy, and the needs of the Basin's increasing populations for clean air, public health, infrastructure, and jobs.

Background

The South Coast Air Basin population is projected to increase 7.9 percent by 2030, resulting in new residential, commercial, and industrial development activities, according to the Southern California

Association of Governments (SCAG). The majority of that growth will occur as infill to existing urbanized areas. By 2045, SCAG's 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) expects 51 percent of housing and 60 percent of jobs to be located in areas served by high quality transit. They are increased from the projected 46 percent of housing and 55 percent of jobs for 2040 in SCAG's 2016 RTP/SCS. As a result of the changing distribution and density of development, SCAG reports an increase in vehicle miles traveled (VMT) in the Basin between 2018 and 2030: daily VMT is projected to increase by 1.8 percent, from 388 million miles to 395 million miles.

A variety of existing and future programs, such as California's 2016, 2019, and the recently adopted 2022 Building Energy Efficiency Standards (i.e., Title 24) will contribute to emission reductions when compared to existing development activities. 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. However, additional numbers and length of passenger vehicles and trucks trips, landscape maintenance equipment, and construction emissions from new developments and redevelopments will contribute to regional and localized air pollution. EGM-01 aims PM2.5 co-benefit emission reductions primarily from project construction activities by increasing the deployment of zero and low NOx emission technologies for on-road and off-road mobile sources.

In recent years project developers and local jurisdictions have actively explored and implemented innovative policies that reduce emissions. One recent example includes the Net Zero Newhall Ranch development project located in the Santa Clarita Valley of Los Angeles County. The project is committed to reducing or mitigating the project's greenhouse gas emissions to zero. While net-zero greenhouse gas emission projects do not necessarily target Nitrogen Oxides (NOx) emission reductions they may provide quantifiable co-benefits of NOx and other criteria pollutant emissions. Another example includes Clean Construction policies used by Los Angeles County Metropolitan Transportation Authority (LA Metro), Los Angeles World Airport (LAX), and the Port of Los Angeles. These policies generally provide a step-down approach, where project developers must use Tier 4 final equipment, but are allowed to use lower tiered equipment if certain criteria are met (such as an inability to identify any manufacturers of a particular type of Tier 4 final equipment). While these policies reduce emissions for these specific projects, it is unclear if these are State Implementation Plan (SIP) creditable due to the complexity of demonstrating the U.S. EPA's integrity elements for SIP credit, which require the emission reductions to be surplus, permanent, enforceable and quantifiable. Finally, as part of the environmental review process under California Environmental Quality Act (CEQA) and/or National Environmental Policy Act (NEPA), some projects have chosen to contribute money to an air quality mitigation fund that would be used to incentivize the purchase and use of cleaner equipment to offset emissions.

A number of air districts in California have already adopted and are implementing indirect source rules, policies, and/or collection of mitigation fees to address emissions from new development and redevelopment projects. Common approaches include an emissions threshold test to determine the applicability of the rule, and mitigation fees, and/or demonstrations that feasible direct, on-site mitigation measures have been implemented. These examples by other air districts are provided for informational purposes only, and do not necessarily reflect a model of what an applicable rule that may be developed

by South Coast AQMD would entail. Given the uniqueness and severity of the air quality in the Basin in comparison to other regions in California and the United States, unique considerations will be given in developing enforceable mechanisms in order to meet federal air emissions standards.

In December 2005, the San Joaquin Valley Air Pollution Control District (SJVAPCD) adopted Rule 9510 – Indirect Source Review, which was approved by the U.S. EPA in May 2011. In December 2017, SJVAPCD amended Rule 9510. The purpose of the rule is to reduce emissions of NOx and PM10 from the construction of a development project that seeks to gain a final discretionary approval from a public agency (upon full build-out) with design features, on-site measures, and off-site measures. The rule also applies to transportation or transit development projects whose construction exhaust emissions will equal or exceed 2 tons per year of NOx or 2 tons per year of PM10. The rule requires applicants of new development projects to provide documents necessary to perform an emissions generation analysis. 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. Off-site reductions are subject to criteria including, but not limited to, being quantifiable and surplus. Such offsite reductions are analyzed annually to ensure their effectiveness.

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 a 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.

EGM-01 was first adopted as part of the mobile source control measure strategies within the 2016 AQMP. After the adoption, South Coast AQMD staff convened 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 and held four Working Group meetings from May 2017 to January 2018 to explore a framework and identify opportunities, innovative approaches, strategies, and actions to mitigate and potentially reduce emissions from new

development or redevelopment projects. In March 2018, an initial concept for EGM-01 was developed and consisted of the pursuit of voluntary emission reduction strategies in addition to the development of an indirect source rule focused on reducing construction emissions from projects over a certain size or activity threshold using several compliance options. Potential options that staff proposed and presented to the South Coast AQMD's Governing Board included a new voluntary fleet certification program coupled with a facility/project requirement to utilize at least some certified clean fleets, a mitigation fee option, crediting options for activities like installation of charging/fueling infrastructure, or other emission reduction measures. In May 2018, the South Coast AQMD's Governing Board considered staff's proposal and directed staff to continue to work with the Working Group to develop rule concepts, timelines, and cost-benefits estimates.

Based on Governing Board direction, staff held three additional Working Group Meetings for the development of EGM-01 and surveyed the Working Group on investigative approaches to identify emission reduction costs. The Working Group identified that the fundamental step in proceeding with emission reduction strategies for New Development and Redevelopment Projects would require a cost-benefit analysis to investigate the costs of construction and assess the impacts of emission reduction strategies on these projects individually and at a larger scale regionally, specifically as it related to affordable housing projects. A Request for Proposal (RFP) to study the feasibility of emission reductions from construction and cost of emission reduction strategies on new development and redevelopment projects was drafted by staff with input from the Working Group. The RFP sought to profile the universe of off-road construction equipment available in the Basin and identify the incremental cost to upgrade existing off-road construction equipment to Tier 4 standards. The RFP was released for a 60-day period from September 2019 to November 2019. No proposals were received, and no contract was awarded.

Proposed Method of Control

South Coast AQMD is not required to adopt an indirect source rule simply because another air district found it feasible. However, a demonstration of infeasibility may be required in light of the actions taken by other air districts if South Coast AQMD does not pursue a regulatory approach in developing an indirect source rule for this facility sector.

South Coast AQMD staff will solicit public input including, but are not limited to, types of projects affected, including affordable housing projects; effects on real-estate prices and jobs; economic growth forecast and impacts; the latest Title 24 green building standards; and regionwide policy shifts toward infill development and active transportation with implications for trip generation, as documented in SCAG's 2020 RTP/SCS pursuant to SB 375. Promising emission reduction strategies are being pursued or implemented by new development or redevelopment projects under CEQA and/or NEPA. Through a public process, South Coast AQMD staff will continue to explore potential actions to encourage net-zero developments, use of zero emission technologies in developing new or redeveloping projects, and installation of charging and fueling infrastructure and develop concepts and innovative approaches that could include, but are not limited to, voluntary CEQA air quality mitigation programs. South Coast AQMD will continue collaborating with local utilities, local governments, SCAG, and the state Energy and Public

Utility Commissions and leverage their policies, programs, and resources to encourage acceleration of clean construction equipment and more rapid growth of alternative fuel and/or electric vehicle charging infrastructure in South Coast AQMD's jurisdiction. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

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 development and redevelopment projects affected by the measure and the method of control to be implemented to reduce emissions for all pollutants. 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 technologies discussed earlier.

Rule Compliance and Test Methods

Compliance will be verified via South Coast AQMD outreach and field inspection. 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 South Coast AQMD Governing Board's consideration for adoption.

Cost Effectiveness

South Coast AQMD will continue to work through a public process to identify methods for evaluating cost-effectiveness for the measure based on the control methods to be implemented by new development and redevelopment projects that will be subject to the measure.

Implementing Agency

Implementing agencies would include counties, cities, or other local or regional agencies that implement new development or redevelopment projects. South Coast AQMD may also be an implementing agency but may not "infringe upon the existing authority of counties and cities to plan or control land use" (California H&SC Section 40716).

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EGM-02: EMISSION REDUCTIONS FROM CLEAN CONSTRUCTION POLICY [ALL POLLUTANTS]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	CONSTRUCTION EQUIPMENT/VEHICLES AND ACTIVITIES	
CONTROL METHODS:	TO BE DEVELOPED	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

The purpose of this control measure is to identify potential approaches to mitigate and control emissions from construction activities in the South Coast Air Basin (Basin). This measure is to develop a Clean Construction Policy (CCP) with a set of recommended control measures and approaches that can be utilized for reference and voluntary implementation by local municipalities and public agencies.

Background

Indirect sources such as construction projects involve and attract mobile sources, both on- and off-road, that emit significant amounts of harmful air pollutants that can adversely affect air quality and public health. To mitigate and reduce emissions from these indirect sources, EGM-01: Emission Reductions from New Development and Redevelopment Projects, was first adopted as a control measure in the 2007 Air Quality Management Plan (AQMP) and subsequently included in the 2016 AQMP. EGM-01 is designed to reduce emissions related to new residential, commercial, industrial, and institutional development and redevelopment projects. While EGM-01 will be based on mandated measures and approaches, such as an indirect source rule, to address air emissions from the new development and redevelopment projects, the CCP to be developed under EGM-02 will be offered as a voluntary measure for municipalities and other public agencies to adopt fully or partially in their respective programs. If the CCP is adopted and widely applied by the large majority of municipalities and public agencies to mitigate and reduce emissions from

construction activities in the Basin, EGM-02 will be implemented in lieu of EGM-01 where applicable and feasible.

The 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." The objective of the voluntary Clean Construction Policy is to encourage the implementation of the cleanest technology and equipment available as well as best management practices for construction activities, especially those located in or near environmental justice communities.

Regulatory History

To mitigate and reduce emissions from construction activities, a number of municipalities and agencies in California have adopted clean (or green) construction policies for their own projects and/or public projects within their jurisdiction. In April 2007, the City and County of San Francisco adopted an Ordinance requiring public projects to reduce emissions at construction sites starting in 2009. In March 2015, the Ordinance was expanded to require construction sites to further reduce emissions in areas with high background levels of air pollutants. The Ordinance requires contractors of publicly funded construction projects (greater than 20 days in length) to significantly reduce emissions by implementing: (a) the use of cleaner diesel-fueled engines, (b) alternative sources of power (if available) instead of portable diesel engines, (c) the preparation of a Construction Emissions Minimization Plan, which includes best management practices, and (d) construction activities monitoring and reporting. In July 2011, the Lost Angeles County Metropolitan Transportation Authority (Metro) adopted a Green Construction Policy (GCP) to reduce harmful diesel exhaust emissions from on-road vehicles, off-road equipment, and portable generators used for construction projects on their properties and at their rights-of-way. The GCP requires that off-road construction equipment must meet the Tier 4 engine standards, on-road vehicles to meet 2010 standards, and portable generators be BACT-compliant. In addition, the GCP requires the use of renewable diesel and 5-minute idling limit. It also requires contractors to consider, where feasible, emissions-reducing technology such as hybrid drives and specific fuel economy standards. To ensure compliance, Metro conducts periodic inspections of sites and construction equipment and also provides assistance to help contractors to meet the requirements. Other authorities such as the Port of Los Angeles (POLA) and the Los Angeles World Airports (LAWA) have implemented similar policies and guidelines to reduce emissions related to construction activities. In 2008, the POLA Board of Harbor Commissioners adopted the Los Angeles Harbor Department Sustainable Construction Guidelines, and on August 4, 2017, LAWA published a Sustainable Design & Construction Requirements for new construction and major renovation projects owned by LAWA or its tenants.

Together, these policies require cleanest-tier diesel engines available, hybrid and electric off-road equipment (where feasible), and best management practices.

Proposed Method of Control

This measure seeks to mitigate and reduce emissions generated by construction activities in the Basin through the voluntary adoption and use of a CCP. The goal of the CCP would be to reduce emissions by certain percentages compared to the statewide average for development projects. Although the CCP will be developed in collaboration with local municipalities and agencies, construction industry, and other affected stakeholders, a set of draft guidelines for the proposed CCP is provided below with recommended control measures and best management practices based on clean construction policies and ordinances that are already adopted and currently implemented in California.

The proposed approach to the CCP guidelines would consist of a hierarchy that prioritizes direct, on-site emission reductions. These emission reductions should first come from zero emission off-road construction equipment and on-road haul and material delivery trucks. If zero emission off-road and on-road equipment is not available or feasible for implementation, then the next cleanest, commercially available off-road and on-road equipment should be utilized during construction activities.

The alternative to direct, on-site emission reductions would be to achieve regional emission reductions off-site and outside of the area of the project. This may be accomplished through the use of credits from non-new source review programs, although this approach would be the least favorable and should be utilized as a last resort option to achieve emission reductions from construction activities.

Examples of potential voluntary measures that could be utilized to reduce emissions from construction activities are discussed below.

All off-road construction equipment used during construction activities should be zero emission to the extent possible. If it is not feasible to have all off-road construction equipment units be zero emission, then a step-down approach should be utilized to ensure that the majority of off-road construction equipment will be zero emission. Any diesel-powered off-road construction equipment greater than 50 horsepower should meet the U.S. EPA Tier 4 Final off-road emission standards, if possible. Additionally, any emissions control device used by contractor(s) should achieve emission reductions that are generally equivalent to what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations. Although these are just examples of voluntary measures, the responsible entity should identify specific measures in applicable bid documents, purchase orders, and contracts.

A copy of each unit's certified tier specification, BACT documentation, and CARB or South Coast AQMD operating permit shall be provided at the time of mobilization of each applicable unit of equipment. All construction equipment must be tuned and maintained in compliance with the manufacturer's recommended maintenance schedule and specifications that optimize emissions without nullifying engine warranties. All maintenance records for each equipment and their construction contractor(s) should be made available for inspection and remain on-site for a period of at least two years from completion of construction.

All on-road construction equipment (e.g., haul and material delivery trucks), especially those greater than 14,000 lbs Gross Vehicle Weight Rating, should be zero emission to the extent possible. If it is not feasible to have all on-road construction equipment be zero emission, then a step-down approach should be utilized to ensure that the majority of on-road construction equipment will be zero emission. Any diesel-powered on-road construction equipment is encouraged to have engines that meet the 2010 U.S. EPA engine standards, or 0.2 g/bhp-hr NOx and 0.01 g/bhp-hr PM.

Cleaner off- and on-road construction equipment will become increasingly more feasible and commercially available as technology advances. If using zero emission technologies is not feasible at the start of construction activities, it could become feasible in a reasonable period of time for projects with extended or long-term construction schedules. These projects are encouraged to develop a process with performance standards to require and/or accelerate the deployment of the lowest emission technologies and the utilization of zero emission or low NOx emission off- and on-road construction equipment. Examples of these voluntary standards may include:

- Developing a minimum amount of zero emission or low NOx off- and on-road construction equipment that must be used each year during construction to ensure adequate progress. Include this requirement in construction management plans and business development agreement(s).
- Establishing a contractor(s) selection policy that prefers contractor(s) who can supply and use zero emission or low NOx off- and on-road construction. Include this policy in the Request for Proposal, procurement documents, and purchase order(s) for selecting contractor(s), tenant(s), or operator(s).
- Establishing a policy to select and use vendors that use zero emission or low NOx on-road construction equipment. Include this policy in the vendor contracts and business agreements.
- Establishing a purchasing policy to purchase and receive materials from vendors that use zero emission or low NOx on-road construction equipment to deliver materials. Include this policy in the procurement documents and purchase orders with vendors.
- Developing a project-specific process and criteria for periodically assessing progress in implementing the use of zero emission and low NOx off- and on-road construction equipment during the duration of construction activities.
- Best management practices such as scheduling truck trips to avoid sensitive land use (e.g., homes and schools), limiting engine idling time, maintaining an equipment inventory, and reducing construction duration by 10 percent for projects located in environmental justice communities, and design considerations including appropriate points for staging areas, and maintaining a buffer zone between truck traffic and sensitive receptors.

Emission Reductions

Emission reductions are not estimated at this time. The amount of emission reductions that can be achieved from this measure will be based on the number and type of participating construction projects

and the method of control to be implemented to reduce Nitrogen Oxides (NOx) and fine Particulate Matter (PM2.5) emissions by each of those projects.

Cost Effectiveness

To Be Determined.

Implementing Agency

South Coast AQMD, Local Municipalities and Agencies.

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MOB-01: EMISSION REDUCTIONS AT COMMERCIAL MARINE PORTS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	PORTS AND PORT-RELATED SOURCES (OCEAN-GOING VESSELS, ON-ROAD HEAVY-DUTY TRUCKS, LOCOMOTIVES, COMMERCIAL HARBOR CRAFT, AND CARGO HANDLING EQUIPMENT, AND STATIONARY PORT EQUIPMENT)	
CONTROL METHODS:	INDIRECT SOURCE RULES, MARKET INCENTIVES, VOLUNTARY PROGRAMS	
EMISSIONS (TONS/DAY)*:		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.71	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	36.99	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD, PORTS OF LOS ANGELES AND LONG BEACH	

Description of Source Category

The goal of this measure is to assist in achieving the committed emission reductions described in the State SIP (State Implementation Plan) Strategy related to on-road heavy-duty vehicles, off-road equipment, and federal and international sources that operate in and out of the Ports of Los Angeles and Long Beach (San Pedro Bay Ports or Ports). This measure is also a continuation of control measure MOB-01 from the 2016 and 2022 Air Quality Management Plans (AQMPs). It is not expected that this measure will achieve the full emission reductions associated with the committed measures from the State SIP Strategy. Instead, this measure seeks to reduce emissions from port-related sources through a rule, as well as incentive

funding and/or other voluntary programs. 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. Environmental Protection Agency, U.S. EPA) into the SIP. Affected sources 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.

Background

Emissions and Progress

The Ports of Los Angeles (POLA) and Long Beach (POLB) are the largest in the nation in terms of container throughput, and the mobile sources travelling to and from the ports collectively make up the single largest fixed source of air pollution in Southern California. Emissions from port-related sources were reduced significantly between 2006 and 2012 through efforts by the Ports and a wide range of stakeholders. In large part, these emission reductions resulted from programs developed and implemented by the Ports in collaboration with port tenants, marine carriers, trucking interests and railroads. Regulatory agencies, including the U.S. EPA, California Air Resources Board (CARB), and South Coast AQMD, participated in these earlier collaborative efforts, 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 earlier port measures included the first version of the Clean Trucks 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 II and III Nitrogen Oxides (NOx) 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.

Recently, the Ports implemented an update to the Clean Trucks Program. The centerpiece of this new program is a charge to cargo owners of $10 per twenty-foot equivalent unit (TEU) of loaded cargo that is trucked to or from the Ports. Zero emission trucks are exempt from the $10/TEU rate. At POLB, low NOx trucks (those meeting CARB's 0.02 g/hp-hr standard) purchased before November 8, 2021 are exempt from the $10/TEU rate through the end of 2034, while low NOx trucks entered into the drayage registry before the end of 2022, or purchased before July 31, 2022 and registered within a month after receipt are exempt through the end of 2031. At POLA, the low NOx truck exemption only applies to low NOx trucks entered into the drayage registry by the end of 2022, and only lasts through the end of 2027. The fee rate collection started in April 2022, with the funding disbursement anticipated in the following year. This program is anticipated to annually raise up to $90 million, and funding will go primarily towards deploying zero emission trucks and funding zero emission infrastructure, with POLB having provided some early funding for low NOx trucks using the anticipated fee revenue. Through September 2023, the Ports have collected $116.1 million in revenue from the Clean Trucks Program fee, and are disbursing these funds

mainly as plus-ups to increase the level of incentive per truck provided through CARB's Hybrid and Zero Emission Truck and Bus Voucher Incentive Project (HVIP) for zero emission drayage truck purchases.

The supply chain has been disrupted in recent years with the COVID-19 pandemic, and the Ports experienced significant congestion beginning from late 2020. At its peak, there were more than 100 container vessels in queue waiting for a berth, and emissions may have increased by more than 25 tons of NOx and 0.5 tons of PM2.5 per day. A new voluntary program[43] was subsequently established by the Pacific Merchant Shipping Association, the Pacific Maritime Association, and the Marine Exchange to keep container vessels from anchoring within 150 miles from shore, resulting in lower emissions from vessels closer to shore.

Port-related sources such as marine vessels, locomotives, trucks, harbor craft and cargo handling equipment, continue to be among the largest sources of NOx in the region, thus contributing to PM2.5 emissions not only as primary but also secondary sources. 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 PM2.5 ambient air standards by federal deadlines. This measure provides assurance that emissions from the South Coast Air Basin (Basin)'s largest magnet of mobile sources will continue to support attainment of the federal 8-hour ozone and the 24-hour and annual PM2.5 standards. In addition, reductions in PM2.5 emissions will also reduce cancer risks from diesel particulate matter.

Clean Air Action Plan (CAAP)

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 staff of the South Coast AQMD, CARB, and the U.S. EPA, adopted the San Pedro Bay Ports CAAP. The CAAP was amended in 2010 and 2017, 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 and greenhouse gas emissions 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 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 South Coast AQMD, CARB, and the U.S. EPA. Based on the latest inventories, emissions from port-related sources are continuing to decrease from 2005 emission levels, albeit at slower levels in recent years compared to earlier years.[44] Although the ports met their 59 percent NOx reduction goal from the 2010 CAAP by 2020, this goal did not include emission reductions needed from the "black box" described in the

[43] Pacific Maritime Management Services (PacMMS). Online at: https://mxsocal.org/

[44] The congestion at the ports during 2021 showed an increase in emissions from previous years by 40% for NOx and 48% for PM2.5

2007 AQMP—which also contained defined (non-"black box") measures that served as the basis for the 2010 CAAP emission reduction goals. In addition, the 2017 CAAP did not update the NOx emission reduction goal. In 2021, the ports did not maintain the 59 percent NOx reduction goal due to the significant increase in ocean-going vessel emissions during the recent Ports' congestion period. Additional NOx emission reductions are still needed to attain federal air quality standards. As an example, the Ports' implementation of their 2017 CAAP is expected to result in about 2 to 3 tons per day of NOx reductions by 2031, yet their 'fair share' as described in the 2022 AQMP is about 16 to 17 tons per day.[45]

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 switch locomotives, and incentives for lower emission marine vessels.

Regulatory History

Port emission sources are regulated at the international, federal, and local level. There is also anticipated regulation that the IMO is proposing that would affect Port sources. The key regulations affecting Port sources are listed below.

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 the 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's International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI, which came into force in May 2005, set new international NOx emission limits on marine engines with >130 kW power output installed on new vessels retroactive to the year 2000. In October 2008, the IMO adopted an amendment which placed a limit on marine fuel sulfur content of 0.1 percent by 2015 for specific areas known as Emission Control Areas (ECA). The North American and U.S. Caribbean Sea 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 or use SOx scrubber as an alternative compliance method. In addition, the 2008 IMO amendment required new ships with their keel laid after January 1, 2016 that enter the North American and U.S. Caribbean Sea ECA to meet Tier III NOx emission limits which are 80

[45] Determined by the percent reductions deemed necessary in the 2022 AQMP for each mobile source related to port operations, with the percent reductions applied to projected port-specific emissions based on the Ports' emissions inventory figures

percent lower than the Tier I emission limits and 75 percent lower than the Tier II emission limits. However, only about 3.5 percent of vessels calling at the Ports met these standards in 2021. For Tier III vessels that use selective catalytic reduction (SCR) engine retrofit systems for NOx control, any un-reacted ammonia emissions, or ammonia slip, from urea injection into the exhaust gas can potentially contribute to secondary formation of PM.

IMO GHG Strategy

In October 2018 IMO adopted an initial strategy to reduce GHG emissions from the global ship fleet. Compared to the 2008 level, the strategy set a reduction target of 40 percent by 2030 for carbon intensity and a reduction target of at least 50 percent by 2050 for total annual GHG emissions from international shipping. This strategy was further revised in 2023, including an amended 2050 target of net-zero GHG emissions, and new IMO standards are expected to be developed to implement the 2023 strategy. This level of GHG reductions will require the use of low or zero carbon fuels, with the latest target set at 5-10 percent of all energy used by international shipping by 2030; however, the effect on NOx and PM from this fuel switch may vary widely depending on which fuels are used and what controls are added to ship engines. Several programs have been adopted in recent years as short-term measures to attain the decarbonization targets, including the energy efficiency design index (EEDI) for newbuilt ships, the efficiency existing ship index (EEXI) for in-service ships, and the carbon intensity indicator (CII). Collectively, by reducing fuel consumption, these measures may indirectly lower NOx and PM emissions albeit to a limited extent.

U.S. EPA Marine Vessel Regulations

In 2010, the U.S. EPA adopted standards that apply to Category 3 (C3) engines (>30 liters per cylinder displacement) 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.). The Department of State is the head of the U.S. delegation to the IMO; however, the U.S. EPA is also a participating member of the delegation. In that capacity the U.S. EPA has provided input to the fuel sulfur and NOx emission standards adopted by IMO and also works within international organizations to establish global engine and fuel standards. The U.S. delegation to the IMO is generally led by the State Department, with Coast Guard, the U.S. EPA, and other relevant agencies provide any necessary support and technical advice.

CARB Marine Fuel Rule

Beginning in 2009, CARB began implementing the State's fuel sulfur regulation, applicable to both domestic and foreign flagged vessels, in waters out to 24 nm of the California baseline (i.e., Regulated California Waters or RCW). The rule initially limited sulfur content in marine gas oil (MGO) to 1.5 percent sulfur by weight and in marine diesel fuel (MDO) to 0.5 percent sulfur by weight. Beginning on January 1, 2012, all OGVs when operating in the RCW must switch to either type of distillate grade fuel with at

maximum 0.1 percent sulfur content in weight, and unlike the IMO sulfur oxides (SOx) ECA requirements, the use of SOx scrubber is not permitted as an alternative compliance method.

CARB At-Berth Regulation

In 2020 CARB amended its At-Berth regulation that requires ships to reduce emissions while they are docked at a berth. This emission reduction is achieved either by plugging a ship into the land-based electrical grid (shore power), or by capturing emissions and sending them to control equipment. The amended regulation requires all container, reefer, and cruise vessel visits to reduce emissions at berth by 2023, and roro (roll-on, roll-off) and tanker vessels by 2025.

CARB Commercial Harbor Craft Regulation

In 2022 CARB amended its Commercial Harbor Craft regulation that requires vessel owners and operators to reduce emissions from harbor craft operations. The amended regulation establishes expanded and more stringent emission requirements for vessel engines starting in 2023 and requires deployment of zero emission and advanced technology (ZEAT) for certain vessel categories starting in 2025. The amended regulation also makes facility owners and operators jointly responsible for installation and maintenance of shore power and ZEAT support infrastructure.

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 NOx 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. The CHE regulation was amended in 2011 to provide added compliance flexibility.

U.S. EPA Emission Standards for New Locomotives

To reduce locomotive emissions, the U.S. EPA in 2008 established a series of increasingly stricter emission standards for new locomotives, including remanufactured locomotive engines. The emission standards are implemented by "Tier" with Tier 0 as the least stringent and Tier 4 being the most stringent. For Tiers 0, 1, and 2, the remanufacture standards are more stringent than the new manufacture standards for those engines for some pollutants. Additionally, in 2023, the U.S. EPA removed from its rule certain provisions which previously preempted the State control of non-new locomotives for a period of 133 percent of the useful life of a new locomotive or engine.

CARB In-Use Locomotive Regulation

In April 2023, CARB adopted the In-Use Locomotive Regulation that will achieve emission reductions from locomotives operating throughout the state, including at the Ports. The final regulation includes a requirement for railroads to establish a spending account in 2026 and to pay into the account on an annual basis depending on the tier of locomotive used in the state. Lower tiers would pay more into the account than higher tiers. Funds from this account could be used to purchase Tier 4 and cleaner locomotives through 2030, and zero emission locomotives thereafter, or for the development of zero emission locomotive technologies including the supporting infrastructure. The regulation also would prohibit locomotives older than 23 years from operating in the state starting in 2030, and require new locomotives to be zero emissions if they are built in or after 2030 for switch, industrial, and passenger, and 2035 for line haul. The regulation provides flexibility for achieving compliance, allowing for alternatives to meet milestone deadlines and granting extensions in cases such as technological limitations or emergency circumstances. Finally, the proposal adopts the U.S. EPA's existing idling limits into state law.

U.S. EPA Emission Standards for New Trucks

To reduce emissions from on-road, heavy-duty diesel trucks, the U.S. EPA established a series of cleaner emission standards for new engines, starting in 1988. Currently, all new heavy-duty trucks of 2010 or later model years (MY) have to meet the emission standards including 0.20 g/bhp-hr for NOx and 0.01 g/bhp-hr for PM.

On December 20, 2022, U.S. EPA adopted a regulation to reduce NOx emissions from heavy-duty vehicles effective March 27, 2023. The rule requires control equipment on trucks to last longer, and to control emissions better in low load duty cycles (such as drayage activity). Starting with MY 2027, the adopted regulation will lower the 2010 NOx emission standard by 82.5 percent. The adopted regulation also increases the useful life of regulated heavy-duty vehicles by at least 50 percent. However, for drayage trucks, this federal regulation is no more stringent than CARB's recently adopted Advanced Clean Fleets regulation for drayage trucks (see below).

U.S. EPA proposed the Heavy Duty Greenhouse Gas (HD GHG) Phase 3 regulation on April 12, 2023. This proposed update would provide new GHG standards for heavy-duty highway vehicles starting MY 2028 through MY 2032 and revise certain standards established under GHG Phase 2. This document proposes eliminating the last MY year of the HD GHG Phase 2 advanced technology incentive program for certain types of electric highway heavy-duty vehicles. U.S. EPA is proposing to add warranty requirements for batteries and other components of zero emission vehicles and to require customer-facing battery state-of-health monitors for plug-in hybrid and battery electric vehicles.

CARB Regulations for Drayage Trucks

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 the 2007 on-road emission standards by 2014. From January 1, 2023, the Drayage Truck Regulation was

sunset, and drayage trucks are now subject to the Truck and Bus Regulation and must have a MY 2010 or newer engine.

In April 2023, CARB adopted the Advanced Clean Fleets Regulation which will apply a phase-in approach for ZE vehicle implementation for drayage, high priority, federal, state and local agency fleets. For medium- and heavy-duty vehicles, the regulation imposes a manufacture sales mandate which states manufacturers are only allowed to sell ZE medium- and heavy-duty vehicles for purchase in California, starting with MY 2036 vehicles. Drayage trucks will be required to start transitioning to ZE technology beginning in 2024 with full 100 percent ZE implementation by 2035.

Additionally, CARB also adopted the Heavy-Duty Inspection and Maintenance regulation, which began implementation in January 2023 and ensures that emissions control systems on in-use heavy-duty vehicles driven in California, including drayage trucks, are operating as designed and are repaired in a timely manner if they malfunction.

MOUs

In 1998, CARB entered into an MOU with Class 1 railroads UP and BNSF which established a fleet average emissions limit for locomotives operating in the Basin. The intended effect of this MOU was 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 rail yards 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.

Proposed Method of Control

This measure seeks to reduce emissions related to on-road heavy-duty vehicles, off-road equipment, harbor craft, locomotives, and ocean-going vessels that operate in and out of the San Pedro Bay Ports. This measure will include development of a rule that will be applicable to sources at the San Pedro Bay Ports, as well as pursuit of incentive funding or other voluntary measures that can also achieve and/or facilitate emission reductions. In February 2022, South Coast AQMD began the rule development process for Proposed Rule 2304 –Commercial Marine Ports – Container Terminals. Depending upon how the proposed rule is ultimately structured, it may also require some level of federal approval before it can be fully implemented. To the extent possible, the proposed rule will be structured so as to allow incentive funding to be used to deploy cleaner technologies. Emission reductions may also be achieved if new regulations are developed and implemented at the federal or international level.

The proposed rule for commercial marine ports will continue to be developed through a public process that includes a working group, meetings with individual stakeholders, facility tours, community forums, and reports to the South Coast AQMD Governing Board Mobile Source Committee. The proposed rule is anticipated to be brought to the Governing Board for its consideration in 2024. Incentive programs and/or

other voluntary programs will use their own public process specific to each program. During rule development, staff will consider technical feasibility, identify industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and may consider alternative compliance mechanisms.

Emission Reductions

Potential emission reductions will be determined as the proposed rule is developed and as programs are implemented. Emission reductions from any proposed rule or other program applicable to marine ports might not be creditable into the SIP at time of adoption. If so, the emission reductions that do occur will ultimately be SIP-creditable at a later date (e.g., through retrospective analysis after rule implementation), or quantified through other measures (e.g., incentive programs) or inventory analysis, so long as they are quantifiable, permanent, surplus, enforceable, and real.

Rule Compliance and Test Methods

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 South Coast AQMD 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.

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 strategies identified through the public process.

Implementing Agency

There are many potential implementing agencies for this measure. The proposed rule would be implemented by South Coast AQMD. Voluntary programs (e.g., vessel speed reduction) may be implemented by the Ports of Long Beach and Los Angeles. Incentive programs may be implemented either by the agency issuing the funding (e.g., California Energy Commission, Federal Maritime Administration, etc.) or co-implemented by the Ports of Long Beach and Los Angeles if they receive the funding. Regulations adopted at the federal or international level would be implemented by the applicable federal agency. For example, the Emission Control Area under the IMO's MARPOL Annex VI is enforced by both the U.S. Coast Guard and the U.S. EPA.

References

CARB (2022). 2022 State Strategy for the State Implementation Plan, September 2022

IMO (2018). Adoption of the Initial IMO Strategy on Reduction of GHG Emissions from Ships and Existing IMO Activity Related to Reducing GHG Emissions in the Shipping Sector, April 2018

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MOB-02: EMISSION REDUCTIONS AT NEW AND EXISTING RAIL YARDS

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	NEW AND EXISTING RAIL YARDS	
CONTROL METHODS:	INDIRECT SOURCE RULE, MARKET INCENTIVES, VOLUNTARY PROGRAMS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.37	TBD
POLLUTANT REDUCTION	TBD	TBD
POLLUTANT REMAINING	TBD	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	15.57	17.97
POLLUTANT REDUCTION	TBD	TBD
POLLUTANT REMAINING	TBD	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

There are nine major rail yards conducting intermodal operations within the jurisdiction of South Coast AQMD, with additional freight rail yards supporting the movement of goods and commodities and performing critical functions such as classification of rail cars, locomotive fueling, equipment repair and maintenance, and so on. There are a variety of mobile emission sources related to freight rail yard

operations including interstate line-haul locomotives, regional and local switch locomotives, on-road heavy-duty drayage trucks, cargo-handling equipment (CHE), and transportation refrigeration units (TRUs). In addition, the South California Regional Rail Authority (SCRRA or Metrolink) and Amtrak provide commuter rail transportation within the South Coast Air Basin (Basin). SCRRA maintains their passenger locomotives at two locations in the Basin. This measure seeks to reduce NOx and particulate matter emissions related to the operation of rail yards. Through the public process, South Coast AQMD will assess and identify potential actions that could result in further emission reductions from rail yards located within the South Coast AQMD jurisdiction.

Background

Rail yard operations generate significant levels of nitrogen oxides (NOx) and particulate matter (PM) emissions that contribute to the region's challenges to attain federal National Air Ambient Air Quality Standard (NAAQS). Moreover, environmental justice communities are located adjacent to many of these existing rail yards. Due to high rail and vehicle traffic in the area, nearby communities are subject to high levels of Nitrogen Dioxide (NO2) and diesel particulate emissions. During periods of routine locomotive maintenance, there have been concerns raised regarding excessive emissions from idling locomotives or during periods of routine locomotive maintenance. At the same time, due to projected economic and population growth, it is anticipated that locomotive activities will increase, and construction of new intermodal rail yards could potentially facilitate this projected growth, thereby resulting in further increased NOx and PM emissions.

Regulatory History

U.S. EPA Emission Standards for New Locomotives

To reduce locomotive emissions, the U.S. EPA in 2008 established a series of increasingly strict emission standards for new locomotives, including remanufactured locomotive engines. The emission standards are implemented by "Tier" with Tier 0 as the least stringent and Tier 4 being the most stringent. For Tiers 0, 1, and 2, the remanufacture standards are more stringent than the new manufacture standards for those engines for some pollutants. Additionally, in 2023, the U.S. EPA removed from its rule certain provisions which previously preempted the State control of non-new locomotives for a period of 133 percent of the useful life of a new locomotive or engine.

CARB Regulation for In-Use Locomotives

In April 2023, CARB adopted the In-Use Locomotive Regulation that will achieve emission reductions from locomotives operating in California. The final regulation includes a requirement for railroads to establish a spending account in 2026 and to pay into the account on an annual basis depending on the tier of locomotive used in the state. Lower tiers would pay more into the account than higher tiers. Funds from this account could be used to purchase Tier 4 and cleaner locomotives through 2030, and zero emission locomotives thereafter, or for the development of zero emission locomotive technologies including the supporting infrastructure. The regulation also would prohibit locomotives older than 23 years from

operating in the state starting in 2030, and require new locomotives to be zero emissions if they are built in or after 2030 for switch, industrial, and passenger, and 2035 for line haul. The regulation provides flexibility for achieving compliance, allowing for alternatives to meet milestone deadlines and granting extensions in cases such as technological limitations or emergency circumstances. Finally, the proposal adopts the U.S. EPA's existing idling limits into state law.

U.S. EPA Emission Standards for New Trucks

To reduce emissions from on-road, heavy-duty diesel trucks, the U.S. EPA established a series of cleaner emission standards for new engines, starting in 1988. Currently, all new heavy-duty trucks of 2010 or later model years (MY) have to meet the emission standards including 0.20 g/bhp-hr for NOx and 0.01 g/bhp-hr for PM.

On December 20, 2022, U.S. EPA adopted a regulation to reduce NOx emissions from heavy-duty vehicles effective March 27, 2023. The rule requires control equipment on trucks to last longer, and to control emissions better in low load duty cycles (such as drayage activity). Starting with MY 2027, the adopted regulation will lower the 2010 NOx emission standard by 82.5 percent. The adopted regulation also increases the useful life of regulated heavy-duty vehicles by at least 50 percent. However, for drayage trucks, this federal regulation is no more stringent than CARB's recently adopted Advanced Clean Fleets regulation for drayage trucks (see below).

U.S. EPA proposed the Heavy Duty Greenhouse Gas (HD GHG) Phase 3 regulation on April 12, 2023. This proposed update would provide new GHG standards for heavy-duty highway vehicles starting MY 2028 through MY 2032 and revise certain standards established under GHG Phase 2. This document proposes eliminating the last MY of the HD GHG Phase 2 advanced technology incentive program for certain types of electric highway heavy-duty vehicles. U.S. EPA is proposing to add warranty requirements for batteries and other components of zero emission vehicles and to require customer-facing battery state-of-health monitors for plug-in hybrid and battery electric vehicles.

CARB Regulations for Drayage Trucks

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 the 2007 on-road emission standards by 2014. From January 1, 2023, the Drayage Truck Regulation was sunset, and drayage trucks are now subject to the Truck and Bus Regulation and must have a MY 2010 or newer engine.

In April 2023, CARB adopted the Advanced Clean Fleets Regulation which will apply a phase-in approach for ZE vehicle implementation for drayage, high priority, federal, state and local agency fleets. For medium- and heavy-duty vehicles, the regulation imposes a manufacture sales mandate which states manufacturers are only allowed to sell ZE medium- and heavy-duty vehicles for purchase in California, starting with MY 2036 vehicles. Drayage trucks will be required to start transitioning to ZE technology beginning in 2024 with full 100 percent ZE implementation by 2035.

Additionally, CARB also adopted the Heavy-Duty Inspection and Maintenance regulation, which began implementation in January 2023 and ensures that emissions control systems on in-use heavy-duty vehicles driven in California, including drayage trucks, are operating as designed and are repaired in a timely manner if they malfunction.

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 NOx 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. The CHE regulation was amended in 2011 to provide added compliance flexibility.

South Coast AQMD Regulation XXXV – Railroads and Railroad Operations

South Coast AQMD 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 rules from being implemented until they become federally enforceable through inclusion in the SIP. Since the District rules have not become part of California's U.S. EPA-approved SIP at the time of the ruling, the court stated the Regulation XXXV rules do not have the force and effect of federal law and are found to be preempted by the Interstate Commerce Commission Termination Act of 1995.

MOUs

In 1998, the railroads and California Air Resources Board (CARB) entered into a Memorandum of Understanding (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 the U.S. EPA's Tier 2 locomotive standard by 2010. The MOU addressed NOx emissions from locomotives. Under the MOU, NOx levels from locomotives are reduced by 57 percent. However, little progress in emission reductions occurred in the most recent decade. As of 2020, only 5.9 percent of locomotive activities operated by Union Pacific (UP) within the South Coast Air Basin was with the cleanest Tier 4 locomotives, and the corresponding figure was 7.5 percent by Burlington Northern Santa Fe Corp (BNSF). In contrast, about 78 percent of locomotive activities operated by UP was with Tier 2 or older locomotives, and the corresponding figure was 66 percent by BNSF.

On June 30, 2005, UP and 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.

Proposed Method of Control

This measure seeks to reduce emissions related to on-road heavy-duty drayage trucks, off-road equipment including cargo handling equipment and transportation refrigeration units, and both line-haul and switch locomotives, that operate in and out of rail yards.

In May 2018, South Coast AQMD directed staff to pursue both regulatory and non-regulatory approaches to reduce rail yard related emissions. Following the initial rule development for existing rail yards, staff began in July 2021 to focus on developing a new indirect source rule (ISR) in response to the announcement of plans to construct two new intermodal rail yards: the Southern California International Gateway (SCIG) proposed by the Port of Los Angeles, and the Colton Intermodal Facility as a proposed component of California High Speed Rail (HSR) – Los Angeles to Anaheim section. While no further updates have been provided on SCIG to date, the Colton component was subsequently removed from consideration by the HSR Authority in mid-2023. Given this development, between August and November 2023, staff efforts were temporarily pivoted to explore a potential MOU to reduce emissions associated with all rail equipment owned/operated by Class I railroads that are deployed solely within the South Coast Air Basin. However, the parties were unable to reach a consensus, and the MOU effort was discontinued.

In the same year, CARB adopted its In-Use Locomotive regulation which is projected to accelerate the turnover to zero emission for locomotives deployed to California, starting in 2030 for switch locomotives (used for yard/localized jobs or passenger transportation) and 2035 for line-haul (used for both interstate goods movement and regional/local switching operations). Additionally, CARB also adopted the Advanced Clean Fleets regulation which mandates the transition of drayage truck fleet to zero emission by 2035.

This measure will include development of a proposed rule applicable to rail yard sources, as well as pursuit of incentive funding, technology demonstration, or other measures that can also achieve and/or facilitate emission reductions in addition to the proposed rule. The proposed rule will focus on localized realization of emission reduction benefits consistent with recently adopted statewide regulations affecting rail yard sources. The rule design will take into account differences in rail yard operations and equipment deployment patterns to ensure the proposed rule would act as a strengthening mechanism to assist with local implementation of state regulations. Depending upon how the proposed rule is ultimately structured, it may also require some level of federal approval before it can be fully implemented. To the extent possible, the proposed rule will be structured so as to allow incentive funding to be used to deploy cleaner technologies. Emission reductions may also be achieved if new regulations are developed and implemented at the federal level.

The proposed rule will continue to be developed through a public process that includes a working group, meetings with individual stakeholders, facility tours, community forums, and reports to the South Coast AQMD Governing Board Mobile Source Committee.

Emission Reductions

Potential emission reductions will be determined as programs are implemented. Emission reductions from any program applicable to rail yards might not be creditable into the SIP at time of adoption. If so, the emission reductions that do occur will ultimately be SIP-creditable at a later date (e.g., through retrospective analysis after rule implementation), or quantified through other measures (e.g., incentive programs) or inventory analysis, so long as they are quantifiable, permanent, surplus, enforceable, and real.

Rule Compliance and Test Methods

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 South Coast AQMD 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.

Cost Effectiveness

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

Implementing Agency

South Coast AQMD has the authority to regulate emissions from indirect sources, including rail yards.

References

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California Air Resources Board (2005). ARB/Railroad Statewide Agreement: Particulate Emissions Reduction Program at California Rail Yards. June 2005.

California Air Resources Board (2011). Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards. September 2012.

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California Air Resources Board (2023). In-Use Locomotive Regulation, September 2023.

California Air Resources Board (2023). Advanced Clean Fleets Regulation, August 2023.

South Coast AQMD (2006). Regulation 35 – Railroads and Railroad Operations.

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).

U.S. EPA (2022). Final Rule: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards. December 2022.

U.S. EPA (2023). Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3, April 2023.

U.S. EPA (2023). Final Rule: Locomotives and Locomotive Engines; Preemption of State and Local Regulations, November 2023.

MOB-03: EMISSION REDUCTIONS AT WAREHOUSE DISTRIBUTION CENTERS [PM2.5, NOx]

CONTROL MEASURE SUMMARY[46]		
SOURCE CATEGORY:	MOBILE SOURCES (ON-ROAD VEHICLES, OFF-ROAD VEHICLES)	
CONTROL METHODS:	Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	42	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	$12.6 MILLION – $979 MILLION (DEPENDENT ON THE MENU-BASED STRATEGY)	
INCENTIVE COST:	INCENTIVES ARE NOT DIRECTLY RELATED	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Mobile Sources: (Includes Cargo Handling Equipment)

- On-Road Vehicles; and
- Off-Road Vehicles.

[46] http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-May7-027.pdf?sfvrsn=10

Background

A large portion of the Nitrogen Oxides (NOx) emission inventory in the South Coast Air Basin (Basin) comes from the goods movement industry. More than half of the emissions from that sector result from heavy-duty diesel trucks. In addition, about 37% of the PM2.5 emissions in the Basin comes from mobile sources. Regulation of mobile sources is under the purview of the U.S. Environmental Protection Agency (U.S. EPA) and California Air Resources Board (CARB), but the South Coast Air Quality Management District (South Coast AQMD) has indirect source authority to be able to regulate the warehouses that attract diesel trucks and operate other mobile source vehicles (such as yard hostlers, forklifts, etc.). Warehouses are considered a point source of emissions in local disadvantaged communities.

There is a definite air quality need to reduce NOx and PM2.5 emissions from warehouse operations to achieve the following:

- Assist in meeting attainment goals;
- Assist related regulations in gaining emission reductions;
- Assist in the shortfall of incentive funds;
- Increase the use of zero emission vehicles;
- Assist in state actions on cleaner technology; and
- Reduce pollution burden in local communities.

Regulatory History

- Truck and Bus Regulation;
- Advanced Clean Trucks (ACT) Regulation;
- Low NOx Omnibus;
- Heavy-Duty Inspection and Maintenance Program; and
- Advanced Clean Fleet Regulation.

Proposed Method of Control

Rule 2305 requires annual compliance by applicable warehouse operators to implement emission reducing strategies based on the volume of truck traffic to each individual warehouse. Based on the volume of truck traffic, each warehouse operator would earn/acquire points through a variety of flexible options. The Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program is a menu-based point system that would award WAIRE Points for completing items on a prescribed menu. Warehouse operators can propose a site-specific strategy evaluated similar to the actions/investments on the WAIRE Menu, and upon approval could earn the warehouse operator WAIRE Points. There is a mitigation fee option, where the funds paid to the mitigation fee program would fund incentives for cleaner technologies back in the communities of the warehouse operator that paid the mitigation fee. During rule development, staff considered technical feasibility, identified industry-specific affordability issues, cost-effectiveness and incremental cost-effectiveness, and considered alternative compliance mechanisms.

Emission Reductions

The WAIRE Program provides a suite of options for warehouse operators to comply. Rule 2305 requires warehouse operators to annually earn WAIRE Points by completing any combination of: 1) implementing actions from the WAIRE Menu, 2) developing and implementing an approved Custom WAIRE Plan, or 3) paying a mitigation fee. Revenues from the mitigation fees will be used to incentivize the installation of zero emission vehicle charging/fueling infrastructure or the turnover of existing diesel fleet vehicles with a low NOx or zero emissions truck. The staff report for Rule 2305 analyzed 19 different scenarios for compliance by warehouse operators to show the range of potential outcomes and emission reduction benefits from the rule.

Actions on the WAIRE Menu promote transportation electrification and fleet turnover with low NOx and zero emissions trucks. Most the actions result in NOx and PM2.5 reductions from cleaner trucks or offsetting reliance on electricity from local natural gas-fired power plants through solar panel installations or by reducing exposure at the local communities sited near warehouses. For the truck usage analysis of emission reductions, a retrospective analysis was conducted based on the surplus reductions observed in the EMFAC model.

TABLE MOB-03-A
ESTIMATED BASELINE TRUCK EMISSION (TONS PER DAY) ASSOCIATED WITH RULE 2305 WAREHOUSES REQUIRED TO EARN WAIRE POINTS

	2019		2023		2031	
	NOx	Diesel PM	NOx	Diesel PM	NOx	Diesel PM
EMFAC 2017 Baseline	41.67	0.67	20.19	0.14	20.18	0.14
Reductions from CARB ACT, Low NOx Omnibus and Heavy-Duty I/M Regulations	0	0	-0.005	< -0.01	-3.37	-0.03
Total	**41.67**	**0.67**	**20.19**	**0.14**	**16.81**	**0.12**

Rule Compliance and Test Methods

Rule 2305 has several reporting requirements to ascertain responsible entities, establish baseline operation numbers, and tracking annual progress. Warehouse operators that are required to earn WAIRE Points must submit an Annual WAIRE Report (AWR) which would then be reviewed and/or audited

through both a desktop and field audit to determine compliance with reporting requirements and WAIRE Program requirements.[47]

Cost Effectiveness

The total costs of implementing Rule 2305 ranges from $12.6 million to $979 million depending on the WAIRE Menu actions/investments implemented by the warehouse operator, and in some scenarios results in an overall savings. Potential economic impacts have been thoroughly analyzed in the socioeconomic impact assessment for Rule 2305. These analyses concluded that the public health benefits of the rule are expected to outweigh the potential costs by a ratio of about 3:1, for most compliance scenarios that were analyzed. Further, the cost-effectiveness of Rule 2305 was found to be similar to the cost-effectiveness of several mobile source regulations adopted by CARB in recent years.

Implementing Agency

South Coast AQMD has the indirect source authority to implement Rule 2305 which complements the mobile source emission standards and regulations that U.S. EPA and CARB can enact.

References

South Coast AQMD May 7, 2021 Governing Board Package. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-May7-027.pdf?sfvrsn=10

[47] http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-May7-027.pdf?sfvrsn=10.

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 FURTHER AIR QUALITY IMPROVEMENT PROJECT OPTION	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE:	2018	2030
POLLUTANT INVENTORY	TBD	TBD
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	N/A	
INCENTIVE COST:	N/A	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

There are five major commercial airports located in the South Coast Air Basin (Basin): Los Angeles International Airport (LAX), John Wayne Orange County Airport (SNA), Hollywood Burbank Airport (BUR), Ontario International Airport (ONT), and Long Beach Airport (LGB). Due to projected increases in airline passenger transportation and expansion of operations at commercial airports, emissions from airport operations may increase unless the increased emissions are mitigated. For this reason, the Facility-Based Mobile Source Measure (FBMSM) for Commercial Airports, which controls non-aircraft mobile sources at commercial airports, was adopted by the South Coast Air Quality Management District (South Coast AQMD) on December 6, 2019. The measure consists of Memoranda of Understanding (MOUs) between the South Coast AQMD and the aforementioned airports and the South Coast AQMD's enforceable commitment to achieve 0.52 and 0.37 ton per day NOx reductions in 2023 and 2031, respectively. Each airport developed their own Air Quality Improvement Plans/Measures during the development of the FBMSM for Commercial Airports and used them as the basis for the Memorandum of Understandings (MOUs). The FBMSM for Commercial Airports was intended to assist with the implementation of the

"Further Deployment of Clean Technologies" measures for mobile sources in the 2016 State SIP Strategy.[48] MOB-04 seeks to continue tracking implementation of the MOUs to assist with attainment of the 2012 annual PM2.5 National Ambient Air Quality Standard (NAAQS).

Background

There are a variety of emission sources related to commercial airport operations. In addition to aircraft, ground support equipment (GSE) such as baggage handling equipment, food service trucks, fuel trucks, and aircraft tugs contribute to airport emissions. Emissions associated with passenger transportation to and from the airport, delivery of goods and fuel for aircraft transport, and stationary equipment also contribute.

Historically, airport authorities have mitigated airport-related emissions and airport ground support equipment and on-road vehicles are regulated by California Air Resources Board (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. Environmental Protection Agency (U.S. EPA) establishes aircraft emission standards nationally.

Regulatory History

Emission standards for 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 NOx 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 NOx standards by 32 percent for newly-certified commercial aircraft engines.

On June 1, 2012, the U.S. EPA Administrator signed a final rule to revise the standards to be consistent with the current ICAO CAEP/6 and CAEP/8 requirements to further reduce NOx emissions. The first set of standards require that all new engines meet the ICAO CAEP/6 standards. The CAEP/6 standards represent approximately a 12 percent emission reduction from the ICAO Tier 4 levels. The second set of standards, Tier 8, took effect in 2014 and represent approximately a 15 percent reduction from Tier 6 levels.

South Coast AQMD's Fleet Rules

[48] 2016 State SIP Strategy. https://ww2.arb.ca.gov/resources/documents/2016-state-strategy-state-implementation-plan-federal-ozone-and-pm25-standards

South Coast AQMD's fleet rules apply to several vehicle categories operating at airports. Rule 1191, Clean On-Road Light- and Medium-Duty Public Fleet Vehicles, applies to all state and local government agencies located in the South Coast AQMD's jurisdiction, including state, regional, county, and city government departments and agencies, and any special districts such as water, air, sanitation, transit, and school districts, with 15 or more non-exempt light-duty vehicles. This regulation requires that these entities acquire low emission gasoline or alternative fuel vehicles when procuring new vehicles. Rule 1196, Clean On-Road Heavy-Duty Public Fleet Vehicles, is a similar regulation that applies to on-road heavy-duty vehicles with a gross vehicle weight of at least 14,000 pounds. It requires all applicable government agencies and special districts with fleets of 15 or more vehicles (including commercial airports), to acquire a gasoline, dual-fuel or alternative fueled engine or vehicle when purchasing or leasing a new vehicle. Airports and operators must also comply with Rule 1194, Commercial Airport Ground Access, which requires all public fleets and those under contract or exclusive franchise to a public entity providing passenger transportation services out of commercial airports to acquire low emission or alternative-fueled vehicles. This rule applies to passenger cars, light-duty trucks, and medium- and heavy-duty transit vehicle fleets of 15 or more vehicles. Passenger shuttle buses and taxi cabs under a contract or exclusive franchise serving airports must comply with this rule as well.

CARB GSE MOU

In 2002, CARB executed an MOU for GSE with commercial airlines and cargo operators in the Basin. GSE is utilized for various functions at airports such as refueling aircraft, transporting cargo and luggage, and providing maintenance. The 2002 MOU has the following objectives for airlines to meet; meeting a 2.65 g/bhp-hr hydrocarbon plus NOx emission rate performance target, converting at least 30 percent of the aggregate GSE fleet to electric, acquiring at least 45 percent of new GSE purchases be electric, and reducing diesel GSE emissions by installing particle filters. The date to achieve these objectives was December 31, 2010. However, the MOU was terminated in 2006 because CARB's statewide regulations addressed many aspects of the GSE MOU.

CARB In-Use Off-Road Diesel-Fueled Fleets Regulation

CARB requires emission reductions from existing off-road diesel-fueled vehicles through its statewide In-Use Off-Road Diesel-Fueled Fleets Regulation. The regulation applies to all off-road diesel vehicles with engines greater than 25 horsepower including diesel-powered GSE and other diesel off-road equipment and vehicles operated at airports. The regulation imposes limits on idling, restricts the addition of older vehicles to fleets, and requires fleet owners to retire, replace or repower older engines to achieve progressively lower fleet average emission rates, or comply with the Best Available Control Technology (BACT) requirements. This rule requires mandatory reporting of applicable equipment to CARB through the Diesel Off-road On-line Reporting System (DOORS).[49]

CARB On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation

[49] Available at https://ssl.arb.ca.gov/ssldoors/doors_reporting/doors_login.html

CARB's regulation requires emission controls and replacements for existing diesel trucks and buses through its statewide On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation, commonly referred to as the Truck and Bus Regulation. Heavy-duty vehicles with a gross vehicle weight greater than 14,000 pounds are required to be retrofitted with diesel particulate filters based on truck model years and according to specified schedules. In addition, replacement of older heavy-duty vehicles is mandated based on a tiered schedule that began in 2015. By 2023, nearly all trucks and buses will be required to have model year 2010 engines or newer.

CARB Heavy-Duty Omnibus Regulation

CARB's Heavy-Duty Omnibus Regulation represents a comprehensive update to the California emission standards and other emission-related requirements for heavy-duty engines and vehicles. This regulation requires vehicles with a gross vehicle weight greater than 10,000 pounds to achieve more stringent NOx emission standards beginning with model year 2024 engines. The regulation also modifies the test cycle used to determine compliance with the standards to better represent real-world emissions. Finally, the regulation ensures that emission controls are sufficiently durable to control emissions over the vehicle's useful life by lengthening the criteria pollutant emissions warranty beginning with model year 2027 engines.

CARB Advanced Clean Trucks

The purpose of CARB's Advanced Clean Trucks Regulation is to accelerate the widespread adoption of zero emission vehicles (ZEVs) in the medium- and heavy-duty truck sector and reduce the amount of harmful emissions generated from on-road mobile sources. This is accomplished through a zero emission sales requirement for manufacturers of vehicles with a gross vehicle weight greater than 8,500 pounds. The sales requirement takes effect in 2024 and reaches its most stringent level in 2030. The regulation also includes a reporting requirement for large entities regarding their use of trucks and buses.

CARB Heavy-Duty Inspection and Maintenance Regulation

CARB's Heavy-Duty Inspection and Maintenance regulation ensures that emissions control systems on heavy-duty vehicles driven in California are operating as designed and are repaired in a timely manner if they malfunction. Affected vehicles are required to undergo inspections every six months beginning in 2023. Depending on vehicle capability, owners are required to submit On-Board Diagnostic data or submit results from a smoke opacity test. The opacity test would also include a visual inspection of the emissions control system to ensure the components are installed according to the manufacturer's specifications. Finally, the regulation calls for expanding a roadside emissions monitoring network and increasing field inspections.

CARB Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation

CARB's LSI regulation applies to off-road LSI engine forklifts, sweepers/scrubbers, industrial tow tractors, and airport ground support equipment operated within the State of California. Additionally, it applies

only to vehicles with engines of at least 25 horsepower and 1.0 liter displacement that are part of fleets of four vehicles or more. The regulation requires that applicable fleets achieve specific fleet average emission levels (FAELs) for hydrocarbons and NOx. These standards became more stringent over time until reaching the lowest regulated FAEL in 2013. The regulation also mandates reporting of applicable equipment to CARB through DOORS.

CARB Zero Emission Airport Shuttle Regulation

CARB's Zero Emission Airport Shuttle Regulation, adopted by the CARB Governing Board in June 2019, promotes the use of zero emission ground transportation to and from airports in California. The regulation requires that at least 33 percent, 66 percent, and 100 percent of airport shuttle fleets be zero emission vehicles by December 31, 2027, 2031 and 2035, respectively. It also requires fleet owners to report fleet information annually starting in 2022 and to have zero emission certificates for 2026 and later model year vehicles.

Proposed Method of Control

The measure for Commercial Airports, which is based on the airports' implementation of MOU measures, seeks to reduce emissions from non-aircraft airport sources including ground support equipment (GSE), airport shuttle buses, and heavy-duty trucks. The MOU measures establish performance targets for 2023 and 2031 for these sources. All airport MOUs include a GSE measure, with three airports also including measures for shuttle buses and/or heavy-duty trucks. In addition to the MOU measures, each airport is implementing Air Quality Improvement Plans/Measures (AQIPs/AQIM), which will lead to further reductions. The AQIPs/AQIM cover sources including construction, light-duty fleets, and passenger transportation.

The South Coast AQMD will continue working with the airports to facilitate implementation of the MOU measures to meet the targets in 2023 and 2031. The airports are required to submit progress reports on implementing their respective MOU measures by June 1st every year. The first annual progress report was submitted to the U.S. EPA on November 2, 2021. The progress was discussed at the Airport MOU Working Group, which is comprised of stakeholders from, but not limited to, the airline industry, airport authorities, local governments, and community representatives. Working group meetings will be continued to monitor the airports' progress through 2032. South Coast AQMD will encourage airports to accelerate implementation of the MOU measures ahead of 2031 so that emission reductions in 2030 can be quantified.

Emission Reductions

The measure for Commercial Airports contains an enforceable commitment to achieve 0.52 and 0.37 ton per day NOx reductions in 2023 and 2031, respectively. While there are no committed reductions in 2030 beyond the 2023 commitment, it is expected that continued implementation of the MOUs will result in further reductions. Staff will seek to quantify emission reductions in 2030.

Rule Compliance

Compliance with the MOUs will be verified in accordance with the process identified in the MOUs. The MOUs require that each airport submit detailed progress reports, emissions inventories, and calculations by June 1st each year followed by the South Coast AQMD's report to the U.S. EPA by November 1st.

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 the MOUs has not been determined.

Implementing Agency

South Coast AQMD is responsible for tracking progress associated with implementation of the MOUs.

References

South Coast Air Quality Management District. Facility Based Mobile Source Measure for Commercial Airports (Adopted December 6, 2019).

MOB-05: ACCELERATED RETIREMENT OF LIGHT-DUTY AND MEDIUM-DUTY VEHICLES [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	GASOLINE- AND DIESEL-POWERED LIGHT- AND MEDIUM-DUTY VEHICLES UP TO 8,500 LBS GROSS VEHICLE WEIGHT	
CONTROL METHODS:	INCENTIVE PROGRAM FOR VOLUNTARY EARLY RETIREMENT OF OLDER LIGHT- AND MEDIUM-DUTY VEHICLES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.87	2.47
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	75.62	24.37
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	UP TO $9,500 PER VEHICLE RETIRED. THE MAXIMUM FUNIDING LIMIT WILL SOON BE INCREASED UP TO $12,000 PER VEHICLE. ADDITIONAL FUNDING UP TO $2,000 FOR ELECTRIC VEHICLE CHARGING EQUIPMENT	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

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 with up to 8,500 lbs. gross vehicle weight rating (GVWR). These vehicles include passenger cars, sports utility vehicles, vans, and light-duty pick-up trucks.

Background

Significant strides have been made in reducing emissions from motor vehicles through California Air Resources Board (CARB)'s mobile source regulations. As a result, a "new" vehicle today is approximately 99 percent less polluting compared to a vehicle manufactured a couple of decades ago. Incentives have also played a key role in accelerating the adoption of these cleaner vehicles by consumers. However, light-

and medium-duty vehicles still account for over 15 percent of the NOx emissions from all sources in the South Coast Air Basin (Basin). Accelerated and wider use of advanced technologies such as battery electric, fuel cell, and plug-in hybrid electric vehicles that are capable of zero emission transportation is essential if clean air standards are to be achieved, especially for in-use vehicles.

Regulatory History

In January 2012, CARB adopted the Advanced Clean Cars (ACC) Program, including Low-Vehicle Emission (LEV) III criteria pollutant emission standards, LEV III GHG standards, and Zero Emission Vehicle (ZEV) regulation amendments to address model years 2015 through 2025. On August 25, 2022, CARB adopted the Advanced Clean Cars II (ACC II) standards as a continuation of the ACC Program to rapidly scale down emissions from light-duty passenger cars, pickup trucks and SUVs starting with the 2026 model year through 2035. The Zero Emission Vehicle Regulation was amended to increase the ZEV production requirements for manufacturers with all new passenger cars and light-duty trucks sold in California to be 100% ZEVs by 2035. The ACC II also includes increasingly stringent standards for conventionally fueled cars and trucks to ensure continued progress in the development of cleaner engines and fuel technologies for these vehicles.

On April 12, 2023, the United States Environmental Protection Agency (U.S. EPA) announced new, more ambitious standards to further reduce harmful air pollutant emissions from light- and medium-duty vehicles beginning with model year 2027. If adopted, these new proposed standards, which serve as a continuation of U.S. EPA's final standards for federal greenhouse gas emissions standards for passenger cars and light trucks for model years 2023 through 2026, would be phased in over model years 2027 through 2032. In addition to reducing vehicle emissions of greenhouse gases and criteria pollutants, the new proposed standards would leverage advances in clean car technology and provide greater benefits ranging from improving public health to saving drivers money through reduced fuel and maintenance costs.

On September 23, 2004, the California 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 South Coast AQMD implemented, under the AB 923 program, the High Emitters Repair or Scrap (HEROS) pilot program to identify and retire high emitting on-road vehicles.

Subsequently, CARB adopted the Enhanced Fleet Modernization Program (EFMP) regulation in June 2009. The regulation implements the voluntary vehicle scrap and replacement voucher provisions of AB 118 (Nunez). The EFMP augments the State's existing voluntary accelerated vehicle retirement program, referred to as the Consumer Assistance Program (CAP) which is administered by the Bureau of Automotive Repair. 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 all-battery electric and plug-in hybrid electric vehicles. CARB amended the EFMP regulation in 2014 to reflect these legislative directives. The amended EFMP provides 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 Clean Car 4 All (CC4A, formerly EFMP Plus-Up) funding under the California Climate Investments to augment the EFMP for eligible low- and moderate-income residents living in disadvantaged communities (DAC) for the purchase or lease of cleaner, more fuel-efficient combustion vehicles and advanced technology vehicles. Eligible residents may receive additional funding assistance from the CC4A. The South Coast AQMD has been implementing the EFMP and CC4A under the Replace Your Ride Program (RYR) since July 2015 with qualified applicants receiving up to $9,500 to replace their existing cars with newer, cleaner vehicles or other clean modes of transportation (e.g., transit passes or car-sharing). The maximum funding limit will soon be increased to $12,000 for residents in Disadvantaged Communities (DAC). A new option was introduced in July of 2022 for applicants that choose an E-bike in lieu of a clean replacement vehicle. E-bike applicants receive a flat $7,500 incentive regardless of DAC status of their residence. If the E-bike costs less than $7,500, the remainder will be credited to the applicant for expenditure on public transit or car-sharing. To date, the program has incentivized over 20 E-bikes.

Since its inception, the RYR has replaced almost 10,000 vehicles, having achieved approximately 29.5 tons per year (tpy), 1.6 tpy, and 6.0 tpy of NOx, PM2.5, and VOC emission reductions, respectively.

Proposed Method of Control

This action is to accelerate replacement of older light- and medium-duty vehicles with newer, cleaner vehicles or other clean mode of transportation, including transit passes, through the Replace Your Ride Program. Qualified applicants currently receive up to $9,500 as voucher per retired vehicle. The maximum voucher amount is expected to increase up to $12,000 which includes additional incentives for residents in a DAC zip code. For plug-in hybrid and battery electric vehicles, an additional incentive of up to $2,000 is also provided for the installation of electric vehicle charging equipment under this program.

Emission Reductions

Emission reductions are not estimated at this time as it will depend on the actual number of vehicles participating in the Replace Your Ride or other incentive programs.

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.

Implementing Agency

South Coast AQMD is the implementing agency under the guidelines set forth by CARB for the EFMP and CC4A. Funding would be provided by CARB with South Coast AQMD administering the replacement voucher provisions of the EFMP regulation.

References

South Coast AQMD (2023). Announcements – Residents Can Soon Receive Up to $12k for Upgrading to An Electric Vehicle. June 2023. http://www.aqmd.gov/docs/default-source/news-archive/2023/ryr-june2-2023.pdf

CARB (2015). AB118 Enhanced Fleet Modernization Program Regulation. April 2015. https://ww2.arb.ca.gov/sites/default/files/2021-03/finalregulationorder2014-S2.pdf

CARB (2021). EFMP Retire and Replace Program Statistics. June 2021. https://ww2.arb.ca.gov/sites/default/files/2021-09/EFMP%20Website%20Statistics%20Tables%20Cumulative%202021_Q2%2009-21-21.pdf

MOB-06: ACCELERATED RETIREMENT OF ON-ROAD HEAVY-DUTY VEHICLES [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ON-ROAD HEAVY-DUTY VEHICLES (GREATER THAN 8,500 LBS GVWR)	
CONTROL METHODS:	ACCELERATED REPLACEMENT OF EXISTING HEAVY-DUTY VEHICLES WITH ZERO OR LOW NOX EMISSION VEHICLES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.57	1.15
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	103.15	23.24
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

The intent of this control measure is to seek additional emissions reductions from existing heavy-duty vehicles with gross vehicle weight rating (GVWR) greater than 8,500 lbs through an accelerated vehicle replacement program with zero or low NOx emission vehicles.

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 and public health. The two primary pollutants resulting from diesel fuel combustion are particulate matter (PM) and Nitrogen Oxides (NOx). Diesel PM contains over 40 known cancer-causing substances and California identified diesel PM

as a toxic air contaminant based on its potential to cause cancer in 1998. In August 2021, South Coast AQMD released a report titled, "MATES V Multiple Air Toxic Exposure Study." This report, the fifth in a series of such studies beginning in 1987, concluded that around 50 percent of the cancer risk associated with breathing ambient air can be attributed to diesel PM 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 the attainment of ozone and PM ambient air quality standards, as well as mitigating its toxic air quality impact.

Regulatory History

The regulation of heavy-duty diesel emission sources is the primary responsibility of California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (U.S. EPA). In California, vehicles with a GVWR above 8,500 lbs and up to 14,000 lbs are classified as light heavy-duty vehicles; vehicles with GVWR between 14,001 to 33,000 lbs are classified as medium heavy-duty vehicles; and vehicles over 33,000 lbs are classified as heavy heavy-duty vehicles. US and California regulations do not require that medium heavy-duty and heavy heavy-duty diesel vehicles be chassis certified, instead engine certifications are required. Light heavy-duty vehicles may be certified using the heavy-duty engine or light-duty chassis certification procedures, depending on the application.

Emissions standards for new diesel engines powering heavy-duty vehicles were first established for the 1974 model year and have gradually increased in stringency over time. Current standards in effect are established by CARB and the U.S. EPA for 2010 and subsequent model-years, which includes a 0.2 g/bhp-hr NOx emission standard (usually called "2010 engine" standard).

In August 2020, CARB approved the Low NOx Heavy-Duty Vehicle and Engine Omnibus Regulation that sets new standards for heavy-duty on-road engines, which requires a further 90 percent reduction of NOx emissions to be phased-in over 2024-2031. The regulation also introduces a number of other requirements such as a new Low Load Cycle (LLC) and extended emission durability periods. The mandatory low NOx standards apply to diesel and Otto cycle engines with a GVWR greater than 10,000 lbs. The Omnibus standards are implemented in two main stages: (1) MY 2024-2026 at 0.05 g/bhp·hr over the Federal Test Procedure (FTP) and the Ramped Modal Cycle (RMC), and 0.20 g/bhp·hr over the Low Load Cycle (LLC); (2) MY 2027 and later at 0.02 g/bhp·hr over the FTP and the RMC test cycles, and 0.05 g/bhp·hr over the LLC test cycle. CARB has recently proposed amendments to the Omnibus Regulation, which includes higher sales limits for legacy engines (0.2 g/bhp-hr NOx) from MY 2024 through MY 2026 to allow for smoother transition to the new standards by manufacturers. Public comments are due by September 18, 2023.

In December 2008, CARB adopted the Truck and Bus Regulation which applies to a significant number of heavy-duty vehicles with the gross vehicle weight rating of 14,001 lbs and greater. The Regulation requires replacement of existing vehicles with 2010 engine standard-compliant vehicles based on a compliance schedule which starts from January 1, 2015. By January 1, 2023, all trucks and buses must have 2010 standard compliant engines with a few exceptions.

In June 2020, CARB adopted the Advanced Clean Truck (ACT) Regulation that accelerates a large-scale transition of heavy-duty vehicles from Class 2b to Class 8 (above 8,500 lbs) to zero emission technology. The regulation has two components: a manufacturer sales requirement and a reporting requirement. Manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines would be required to sell zero emission trucks as an increasing percentage of their annual California sales starting in 2024. By 2035, zero emission truck/chassis sales would need to be 55 percent of Class 2b–3 truck sales, 75 percent of class 4–8 straight truck sales, and 40 percent of truck tractor sales. Large employers including retailers, manufacturers, brokers and others are required to report information about shipments and shuttle services. Fleet owners, with 50 or more trucks, are also required to report about their existing fleet operations.

On December 9, 2021, CARB Board approved the proposal for the Heavy-Duty Inspection and Maintenance Regulation (HD I/M). This new regulation requires owners of non-gasoline heavy-duty vehicles with gross vehicle weight ratings over 14,000 pounds to periodically demonstrate that their vehicles' emission control systems are properly functioning in order to legally operate within the state. This regulation is designed to achieve criteria emission reductions by ensuring that malfunctioning emissions control systems are timely repaired. This regulation would replace CARB's existing heavy-duty vehicle inspection programs. To enhance CARB's ability to enforce the HD I/M Regulation, CARB will deploy roadside vehicle emission monitoring and an automated license plate recognition camera network throughout California to identify potentially non-complaint vehicles. All non-gasoline heavy-duty vehicles operating in California would be required to have a valid HD I/M compliance certificate to operate legally in the state, and the HD I/M program compliance would be tied to DMV vehicle registration for in-state vehicles. The HD I/M Regulation is expected to provide the largest benefits in regions with the most heavy-duty truck traffic. Thus, it would reduce adverse health impacts and improve air quality, especially in disadvantaged communities disproportionally impacted by truck emissions.

On April 28, 2023, CARB Board has approved the Advanced Clean Fleets (ACF) regulation, with the goal of achieving a full transition to zero emission truck and bus fleets by 2045 everywhere feasible in California and significantly earlier transition for certain market segments such as last mile delivery and drayage applications. The regulation applies to owner-operators and other fleets performing drayage operations, public agencies, federal governments, and high-priority fleets that own, operate or direct vehicles with a GVWR greater than 8,500 lbs. High priority fleets include any entity with $50 million or more in gross annual revenue, or any broker or fleet owners that in combination owns, operates, or dispatches 50 or more vehicles. High priority and federal fleets will be required to either purchase only zero emission vehicles (ZEVs) beginning in 2024 or elect to use the ZEV Milestones Option, which allows fleets to meet ZEV targets as a percentage of total fleet starting in 2025 with higher ZEV fleet percentages required in subsequent milestone dates. Public fleets will be required to purchase ZEVs when they make new purchases starting in 2024 (50 percent ZEVs starting 2024, and 100 percent ZEVs starting 2027) or may elect to meet ZEV targets using the ZEV Milestone Option. As for drayage trucks, starting January 1, 2024, only zero emission drayage trucks would be eligible to be added to the CARB drayage truck registry. By 2035, all drayage trucks would be required to be zero emission. The ACF also set requirements for all new heavy-duty vehicle sales to be ZEVs starting 2040.

At the federal level, On August 5, 2021, the U.S. EPA announced the Clean Trucks Plan to reduce greenhouse gas (GHG) and criteria pollutants emissions from heavy-duty trucks through a series of rulemakings over the next three years. The first rulemaking, which was finalized on December 20, 2022, applies to heavy-duty vehicles starting in model year 2027 with new certification standards for criteria pollutants, including 0.035 g/bhp-hr NOx over the Federal Test Procedure (FTP) and Supplemental Emissions Test (SET) cycles. This rule also requires lower NOx emissions over a much wider range of testing conditions both in the laboratory and during real world operations. In addition, the final rule also includes provisions for longer useful life and significantly increased warranty periods, which will ensure continued emissions control throughout the use of vehicles. On April 12, 2023, the U.S. EPA announced proposed Phase 3 greenhouse gas standards for heavy-duty vehicles from model years 2027 through 2032, building on the Phase 2 standards. The proposed rule is projected to achieve significant reductions not only in carbon emissions but also for criteria pollutants' emissions through the increased use of zero emission vehicles.

In 2000 and 2001, South Coast AQMD 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 1186.1, 1192, 1193, 1194, 1195, and 1196 affect street sweepers, transit buses, waste collection vehicles, heavy-duty vehicles operating at commercial airports, school buses and heavy-duty vehicles operated by public entities, respectively. The 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.

Proposed Method of Control

The objective of this control measure is to accelerate the retirement of old heavy-duty vehicles with low NOx or zero emission vehicles. One of the options being considered is a plus-up program to leverage existing incentive programs such as Carl Moyer and Prop 1B or other grant funding opportunities by providing supplemental funding to help truck owners and fleets with the purchase of cleaner engine vehicles, including zero emission trucks. This type of program would be especially helpful for individual operators and owners (IOOs) with limited financial resources to purchase or lease zero emission trucks which are still relatively costly compared to conventional vehicles.

Emission Reductions

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

Cost Effectiveness

The cost-effectiveness of the proposed action is not estimated at this time. Cost-effectiveness limits in the Carl Moyer Guidelines might be referenced.

Implementing Agency

South Coast AQMD

References

South Coast AQMD (2021). MATES V Multiple Air Toxic Exposure Study. http://www.aqmd.gov/home/air-quality/air-quality-studies/health-studies/mates-v

DieselNet. Heavy-Duty Onroad Engines Emission Standards. https://dieselnet.com/standards/us/hd.php

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CARB (2019). Truck and Bus Regulation Compliance Requirement Overview. https://ww2.arb.ca.gov/our-work/programs/truck-bus-regulation/truck-and-bus-regulation-fact-sheets

CARB (2020). Advanced Clean Trucks Fact Sheet. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet

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CARB (2021). Facts about the Proposed Heavy-Duty Inspection and Maintenance Regulation. https://ww2.arb.ca.gov/sites/default/files/2021-10/HD%20IM%20FactSheet-final.pdf

CARB (2021). Advanced Clean Fleets Fact Sheet. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-fact-sheet

MOB-07: ON-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION PROGRAM

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ON-ROAD HEAVY-DUTY VEHICLES (14,001 LBS AND GREATER GVWR)	
CONTROL METHODS:	ACCELERATED DEPLOYMENT OF LOW NOX AND ZERO EMISSION VEHICLES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.19	0.89
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	91.52	20.20
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This measure seeks to develop mechanisms to incentivize the early deployment of zero and low NOx emission heavy-duty trucks through the generation of mobile source emission reduction credits (MSERCs) which could be used as an alternative means of compliance with South Coast AQMD regulations, where applicable. These MSERCs will be used only by entities affected by the PM2.5 Plan control measures MOB-01 through MOB-04, EGM-01, and EGM-03; and cannot be used to offset emissions from stationary sources.

Background

MSERC generation programs have been developed and implemented by South Coast AQMD to provide an incentive for the early deployment of cleaner, advanced technologies that are not otherwise required to

comply with existing air regulations. Generation of such credits have been used as an alternative means of compliance with South Coast AQMD regulations that allow for such use. South Coast AQMD continues to work with affected stakeholders on the development and update of MSERC 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 advance such discussions with interested stakeholders and the U.S. EPA.

Regulatory History

In September 1995, South Coast AQMD adopted Rule 1612 – Credits for Clean On-Road Vehicles, which provides a quantification protocol for entities to generate MSERCs that could be used for compliance with other South Coast AQMD rules. Rule 1612 establishes a mechanism for the quantification of emission benefits from the implementation of projects that deploy on-road vehicles meeting the optional low NOx emission standards or are not otherwise required by a regulation or other enforceable mechanism. Mobile source emission reductions associated with said projects are converted to credits that could be used by the project proponent or sold to other entities to meet other South Coast AQMD rules as allowed by those regulations. MSERCs generated pursuant to Rule 1612 have been used to comply with Rule 2202 – On-Road Motor Vehicle Mitigation Options.

In March 2001, South Coast AQMD adopted Rule 1612.1 – Mobile Source Credit Generation Pilot Program, which sets forth credit generating mechanisms for mobile sources to generate MSERCs through the voluntary replacement of specific categories of diesel-fueled heavy-duty vehicles or yard hostlers with clean technologies. Although South Coast AQMD Rule 1612 permits the use of MSERCs for compliance with other South Coast AQMD regulations, the NOx MSERCs generated under this pilot program can only be used for compliance with South Coast AQMD's RECLAIM program. Rule 1612.1, which was approved by the U.S. EPA in 2002, provides local air quality benefits to community members who live in and around areas where participating vehicles operate. These benefits include reductions in NOx, diesel particulate matter (DPM), carbon monoxide (CO), and toxic air contaminant emissions associated with the use of heavy-duty diesel engines. The resolution adopted with the 2016 AQMP included a Governing Board's directive to transition the RECLAIM program to a command-and-control regulatory structure. As part of the transition, South Coast AQMD has been developing landing rules including Rule 1109.1 to control NOx emissions from petroleum refineries and related operations. With the RECLAIM Program scheduled for a phase out by as early as 2025 for NOx and 2026 for SOx, Rule 1612.1 may be amended to expand the use of MSERCs.

Proposed Method of Control

This measure seeks to amend Rule 1612.1 and/or 1612 to provide greater flexibility, such as expanding the eligibility of vehicle types and projects as well as providing more flexibility in the application and use of MSERCs, for accelerated deployment of zero and low NOx emission heavy-duty vehicles in the Basin and Coachella Valley. The focus of the amendment will be to encourage the deployment of commercially available zero and low NOx emission heavy-duty vehicles that do not receive or cannot receive public funding assistance. MSERCs must be real, surplus, quantifiable, permanent, and enforceable as defined

by the 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, Advanced Clean Fleets Regulation, mandatory engine exhaust emission standards, or other relevant regulations.

The discussions of potential enforceable mechanisms will be through a public process. South Coast AQMD staff will establish a working group, hold a series of working group meetings, along with public workshops. The purpose of the public process is to allow South Coast AQMD staff to work with a variety of stakeholders, potentially affected industries, other agencies, and environmental and community groups to solicit input and comments. 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.

Emission Reductions

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

Cost Effectiveness

To Be Determined during rulemaking.

Implementing Agency

South Coast AQMD.

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MOB-08: SMALL OFF-ROAD ENGINE EQUIPMENT EXCHANGE PROGRAM [PM2.5, NOx]

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 [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.32	0.12
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	8.27	5.88
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

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

Background

Small off-road engines (SORE) are spark-ignition engines rated at or below 25 horsepower (19 kilowatts) that are primarily used for lawn, garden, and other outdoor power equipment including trimmers, leaf blowers, lawn mowers, lawn tractors, as well as other commercial/industrial equipment. The SORE category does not include compression ignition engines or recreational vehicles. Although a small sector of the lawn and garden equipment operates on diesel such as riding lawn mowers, stump grinders, and other commercial turf equipment, most of the candidate equipment that are eligible for exchange programs under this measure are gasoline-powered.

Over half of the 15.4 million SORE population in California (61 percent) falls in the Residential Lawn and Garden equipment category, followed by Other Equipment types such as portable generators and pressure washers (20 percent), Federally Regulated Construction and Farming (11 percent), and Commercial Lawn and Garden equipment (8 percent). Although commercial lawn and garden equipment accounts for only 8 percent of the total SORE population, it is responsible for approximately 20 percent of smog-forming emissions from SORE during the summer in CA.

Since 2003, South Coast AQMD has sponsored a lawn mower exchange program for residential lawn mowers which is now known as the Electric Lawn Mower Rebate Program. The program is designed to incentivize residential users with a rebate of up to $250 for the purchase of a new electric lawn mower when they turn in their old gas-powered lawn mowers to an approved scrapper. Since its inception, this program has replaced approximately 59,000 high polluting gasoline-powered lawn mowers with electric lawn mowers.

In addition to the Electric Lawn Mower Rebate Program, South Coast AQMD has also sponsored a commercial leaf blower buyback program which provided $200 as an incentive to buy back an old two-stroke leaf blower. The payment was then applied toward the purchase of a new four-stroke gasoline-powered unit which are less polluting than the two-stroke units. Expanding the program to include other commercial lawn and garden equipment, South Coast AQMD launched the Commercial Electric Lawn and Garden Equipment Incentive and Exchange Program (Commercial L&G Equipment Program) in 2018, which aims to accelerate the replacement of old gasoline- or diesel-powered commercial lawn and garden equipment with zero emission, battery electric technology. This program provides a point-of-sale discount of up to 75 percent off the purchase price of a variety of new electric equipment including lawn mowers (ride-on, stand-on and walk-behind mowers), handheld trimmers, chainsaws, and pruners in addition to backpack and handheld leaf blowers. In exchange, participants are required to turn in their old commercial-grade equipment to an approved dismantler for scrapping. Eligible participants include commercial gardeners and landscapers, local governments, school districts and colleges, and non-profit organizations. Since its inception in 2018, the Commercial L&G Equipment Program has funded over 7,300 commercial lawn and garden equipment replacements with zero emission alternatives.

Regulatory History

In 1990, California Air Resources Board (CARB) became the first regulatory agency to adopt exhaust emissions standards for SORE engines. In 2003, CARB developed the first set of evaporative emissions standards for this category. As a result of the CARB regulations, SORE equipment today is 40-80 percent cleaner than they were when the program began.

On September 23, 2020, California adopted Executive Order N-79-20 to require the phasing out of gasoline-powered vehicles and equipment and transition to zero emission alternatives. Specifically, the order sets a goal to transition off-road vehicles and equipment operations to 100 percent zero emission by 2035, where feasible. As a strategy to meet this goal, the CARB Board approved amendments to the SORE Regulation on December 9, 2021, requiring most newly manufactured SORE equipment to be zero

emissions starting in 2024. However, these new requirements do not apply to in-use sources, which presents a need for programs and/or regulations to reduce emissions from existing SORE engines.

Proposed Method of Control

In order to increase the penetration of new low-emission and zero emission equipment, this measure seeks to expand the existing exchange programs such as Electric Lawn Mower Rebate Program and Commercial Lawn and Garden Equipment Exchange Program by increasing the number of outreach and exchange events and available funding. In addition, South Coast AQMD has recently started a new battery rebate program for commercial lawn and garden equipment that were previously funded by the Commercial Lawn and Garden Exchange Program. The battery rebate program will fund up to 75 percent of the rechargeable battery cost with a maximum limit of three batteries per equipment. South Coast AQMD will continue to seek additional funding opportunities and resources to expand the scope and types of equipment and engines that can be funded by these programs.

Emission Reductions

Emissions reductions are not estimated as they will depend on the number and types of engines/equipment participating in the existing and future programs to be developed under this measure.

Cost Effectiveness

The cost-effectiveness will also depend on the types of engines and/or equipment participating in the exchange programs.

Implementing Agency

South Coast AQMD.

References

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MOB-09: FURTHER EMISSION REDUCTIONS FROM PASSENGER LOCOMOTIVES

[PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	LOCOMOTIVE ENGINES (PASSENGER)	
CONTROL METHODS:	ACCELERATED REPLACEMENT OF EXISTING LOCOMOTIVE ENGINES	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.02	0.01
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	0.96	0.81
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

Diesel-electric locomotives generate emission of diesel PM and other pollutants, which have been shown to be harmful to human health, causing illness, and premature death. The purpose of this control measure is to promote earlier and cleaner replacement or upgrade of existing passenger locomotives with Tier 4 or cleaner locomotives.

Background

Generally, diesel-electric locomotives have a large diesel engine (main traction engine) for generating electric power, which in turn drives electric traction motors in each axle to propel the locomotive. Typically, passenger locomotives have engines with about 3,800 horsepower and these locomotives remain in commercial service for 25 to 40 years.

California's locomotive emission inventory is consisted of four categories: line-haul, switcher, short line, and passenger; with passenger contributing approximately 6 percent of the total statewide locomotive Nitrogen Oxides (NOx) emissions (CARB 2016 Technology Assessment: Freight Locomotives). Generally powered by medium speed diesel engines, passenger locomotives are designed for lighter load and higher speed compared to other categories. Unlike other categories, passenger locomotives typically have a main propulsion engine and onboard hotel power (a generator of about 600 horsepower) that provides electricity via cable for lights, air conditioning, and other comfort-related features to the connected passenger railcars.

Two passenger railroads, Metrolink and Amtrak, operate rail lines in the South Coast Air Basin (Basin) as well as the surrounding counties. Metrolink operates 62 stations across the South Coast's four-county region as well as Ventura, moving approximately 12 million passengers annually over a 538 track-mile network. Amtrak operates approximately 70 intercity trains and 100 commuter trains per day in California. Its contract commuter services include the Metrolink commuter service, which serves a five-county area in the Los Angeles Basin, with seven lines, 55 stations, and approximately 40,000 weekday passengers.

Both Amtrak and Metrolink operate commuter rail services for the Southern California Regional Rail Authority. Southern California Regional Rail Authority adopted a locomotive replacement plan for Metrolink which includes the procurement of Tier 4 locomotive engines. Specifically, the plan directed the replacement of Metrolink's fleet of Tier 0 to Tier 2 locomotive engines with Tier 4 locomotives in a 5-year span. Since 2013, the South Coast AQMD's Governing Board has awarded a total of $110.8 million through the Carl Moyer Program over multiple funding cycles to fund the replacement of Metrolink's Tier 0 & Tier 2 locomotives with Tier 4 locomotives. Metrolink took delivery of its first Tier 4 locomotives in 2016 and has since replaced a total of 40 passenger locomotives with Tier 4 engines.

Regulatory History

Under the Clean Air Act, only the U.S. Environmental Protection Agency (U.S. EPA) has authority to establish emissions standards for new locomotives. By regulation, "new" locomotives include both newly manufactured as well as remanufactured or rebuilt locomotives. In 1998, and again in 2008, the U.S. EPA promulgated regulations for the control of emissions from locomotives. 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 with emission levels 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. The U.S. EPA locomotive emission standards apply to 1973 and newer locomotives upon engine rebuild and new 2002 and later locomotives.

At the state level, on April 27, 2023, the California Air Resources Board (CARB) adopted the In-Use Locomotive Regulation to further reduce criteria pollutants, toxic air contaminants, and greenhouse gas emissions from diesel-powered locomotives. Notably, under the Regulation, beginning in 2024, locomotive operators will be required to fund their own trust account (Spending Account) based on the emissions created by their locomotive operations in California; the dirtier the locomotive, the more funds must be set aside. Funds from the Spending Account must be used to purchase the cleanest locomotives or upgrade existing locomotives to the cleanest tier. Additionally, only locomotives less than 23 years old will be able to operate in California starting in 2030, and all passenger locomotives with an original engine build date of 2030 or newer will be required to operate in a ZE configuration – i.e., qualify as either a ZE locomotive or ZE capable locomotive to operate in the state.

Proposed Method of Control

Through this measure, South Coast AQMD will continue to not only promote earlier replacement or upgrade of existing passenger trains with Tier 4 locomotives, but also support the development and adoption of zero or low NOx emission technologies. Amtrak's fleet that travels in the Basin is almost exclusively Tier 0 locomotives. Metrolink currently operates 15 Tier 2 locomotives as standby units when Tier 4 locomotives are down due to maintenance and repairs. South Coast AQMD will continue to work with both railroads to upgrade Tier 0 to Tier 2 locomotives with Tier 4 and cleaner engines. Tier 4 locomotives are 65 percent to 85 percent cleaner compared to Tier 2 and Tier 0, respectively, and have higher horsepower to pull more passenger cars per locomotive.

In addition, South Coast AQMD is continuing to work collaboratively with other stakeholders to explore the feasibility of zero and low NOx emission locomotive technologies such as battery electric or fuel cell engine-driven systems. For example, South Coast AQMD has been actively participating in the development and demonstration of zero emission battery-operated switcher locomotives in CARB-funded projects in the San Pedro Bay Ports since 2018.

There are other development and demonstration projects in the Basin. The San Bernardino County Transportation Authority is currently leading the way in the development of zero emission rail technology with a plan to debut the first of its kind battery and hydrogen-powered passenger train servicing San Bernardino and Redlands. Named ZEMU (zero emission multiple unit), the locomotive will be powered by a hybrid hydrogen fuel cell/battery technology to propel the train.

Emission Reductions

Emission reductions are not estimated for this control measure as it will depend on the actual type and number of locomotives participating in the program. For reference, the replacement of Metrolink's 40 Tier 0 and Tier 2 locomotives with Tier 4 locomotives has resulted in the reductions of 495 tons per year of NOx, 33.9 tons per year of Reactive Organic Gases (ROG), and 13.8 tons per year of particulate matter (PM).

Cost Effectiveness

According to the previous estimates by Metrolink staff, replacing Tier 0 passenger locomotives with Tier 4 locomotives would cost approximately $6.2 million per locomotive, and repowering Tier 2 locomotives would cost approximately $2.4 million each. These estimates would likely increase in future projects and the cost would be even greater for zero and low NOx emission locomotives. The exact cost-effectiveness will depend on the number and types of locomotives participating in the program.

Implementing Agency

South Coast AQMD.

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MOB-10: OFF-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION [PM2.5, NOx]

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 LOW NOX AND ZERO EMISSION EQUIPMENT WHERE APPLICABLE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	1.64	0.85
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	37.28	12.90
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This measure seeks to develop mechanisms to incentivize the early deployment of Tier 4, zero, and low NOx off-road mobile combustion equipment, where applicable, through the generation of mobile source emission reduction credits (MSERCs). These MSERCs will be used only by entities affected by the PM2.5 Plan control measures MOB-01 through MOB-04, EGM-01, and EGM-03; and cannot be used to offset emissions from stationary sources. Furthermore, these MSERCs will be discounted to provide additional emission reductions to help meet air quality standards.

Background

Based on preliminary inventories, off-road equipment (construction, industrial, etc.) targeted in this measure would collectively account for approximately 8 percent of the total basin-wide NOx emissions in

2030. These off-road equipment categories are also a significant source of diesel Particulate Matter (PM) emissions which is a toxic air contaminant with over 40 known cancer-causing substances. Accelerated deployment of Tier 4 and cleaner technologies to reduce both NOx and diesel PM emissions from off-road equipment will be critical in achieving our air quality goals and also to protect public health.

Mobile source emission reduction credit generation programs developed by South Coast AQMD provide an incentive to deploy cleaner, advanced technologies that are not otherwise required to comply with existing regulations. Generation of such credits may be considered surplus and have been used to comply with other South Coast AQMD regulations. South Coast AQMD continues to work with affected stakeholders on the development of MSERC generation rules and the U.S. Environmental Protection Agency (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 the U.S. EPA.

Regulatory History

In September 1995, South Coast AQMD 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 South Coast AQMD 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 said projects are converted to credits that could be used by the project proponent or sold to other entities to meet other South Coast AQMD rules as allowed by those regulations.

In May 1996, South Coast AQMD 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 South Coast AQMD 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 low NOx emission off-road mobile equipment in the South Coast Air Basin (Basin) and Coachella Valley. The focus of the amendment will be to encourage the deployment of commercially available zero and low NOx 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 the 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 low NOx 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). If Tier 5 standard is adopted in the future, low NOx would be based 90 percent cleaner than the Tier 5 standard. Zero emission mobile equipment include, but are not limited to, commercially available battery-electric or fuel cell powered equipment.

The discussions of potential enforceable mechanisms will be through a public process. Through this process, South Coast AQMD staff will establish a working group, hold a series of working group meetings, along with public workshops. The purpose of the public process is to allow South Coast AQMD staff to work with a variety of stakeholders, potentially affected industries, other agencies, and environmental and community groups to solicit 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.

Emission Reductions

Emission reductions are not estimated at this time and will depend on the actual type and number of off-road vehicles/equipment participating in the program.

Cost Effectiveness

To be determined during rulemaking.

Implementing Agency

South Coast AQMD.

References

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California Air Resources Board. (2023). Off-Road Diesel Regulation. https://ww2.arb.ca.gov/our-work/programs/truckstop-resources/road-zone/road-diesel-regulation.

MOB-11: EMISSION REDUCTIONS FROM INCENTIVE PROGRAMS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	ON-ROAD AND OFF-ROAD MOBILE SOURCE VEHICLES AND EQUIPMENT	
CONTROL METHODS:	IMPLEMENTATION OF INCENTIVE PROGRAMS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	5.80	3.06
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	189.10	76.97
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD	

Description of Source Category

This control measure seeks to apply the administrative mechanism, as initially proposed in the 2016 Air Quality Management Plan (AQMP), to quantify and take credit for the emissions reductions achieved through the implementation of incentive programs administered by South Coast AQMD for State Implementation Plan (SIP) purposes. The incentive program-funded source category includes, but is not limited to, all on-road vehicles with a Gross Vehicle Weight Rating (GVWR) over 8,500 lbs (excluding motor homes), commercial harbor craft, locomotives, and off-road equipment from the sectors of port operations, rail operations, agricultural, industrial, construction, airport ground support, and oil drilling.

Background

South Coast AQMD 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 which results in early and surplus emissions reductions. Such accelerated deployment also provides a signal for technology providers, engine and automobile manufacturers, and academic researchers to develop and commercialize the cleanest combustion engines and further the efforts to commercialize zero emission technologies into a wider market. Some of the major incentive programs that are administered by South Coast AQMD are discussed below.

Carl Moyer Memorial Air Quality Standards Attainment Program

The Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program) is a grant program that funds the incremental cost of cleaner-than-required engines, equipment, and other sources of air pollution. The Moyer Program was placed into State law in 1998 and the first set of Moyer Program Guidelines was adopted by California Air Resources Board (CARB) in 1999. The California Legislature has since periodically modified the Moyer Program to address evolving needs and to reflect advancing technologies as well as regulatory changes. For example, in 2004, Assembly Bill (AB) 923 and Senate Bill (SB) 1107 provided increased and continued funding while significantly expanding the Moyer Program to include light-duty vehicles and agricultural sources. Projects with Volatile Organic Compounds (VOCs) and Particulate Matter (PM) reductions were also included in 2004. This change allowed the Program to more comprehensively address air pollution challenges, including the air toxic risks from diesel engines. In 2013, AB 8 further extended funding from the AB 923 tire fees through 2023 and reauthorized the Moyer Program. Most recently, SB 513 has provided new opportunities for the Moyer Program to advance zero and low NOx emission technologies by substantially increasing cost-effectiveness limits and also including infrastructure projects for funding. It also allowed Moyer Program to leverage co-funding from other incentive programs without penalizing cost-effectiveness.

The Moyer Program helps to fund a variety of vehicles and equipment. Typical project types include replacement of old vehicles and equipment, engine repowers, and installation of retrofit devices. The Program also provides funding for installation of fueling/charging infrastructure for funded sources. Emission reduction technologies must be certified or verified by CARB and projects selected for funding must meet cost-effectiveness limits and achieve at least 15 percent reduction in NOx. In addition, projects reducing PM and/or VOC emissions are also eligible for funding provided they are cost-effective. For SIP purposes, emissions reductions funded through the Moyer Program must be permanent, surplus, quantifiable and enforceable.

The Moyer Program has been successful in reducing smog-forming and toxic emissions cost-effectively by providing incentives to obtain early or extra emissions reductions, especially from emission sources in minority and low-income communities and areas disproportionately impacted by air pollution. Since 1998, South Coast AQMD has awarded $570 million through the Moyer Program and has funded close to 8,700

vehicles and equipment with approximately 9,500 tons per year of accumulated NOx and 270 tons per year of accumulated PM reductions.

Proposition 1B: Goods Movement Emission Reduction Program

In 2006, California voters approved a bond measure called Proposition 1B. Proposition 1B authorized the Legislature to appropriate $1 billion in bond funding to the CARB to quickly reduce air pollution emissions and health risks from freight movement along California's priority trade corridors. The State Fiscal Year (FY) 2007-08 budget included implementing legislation, via SB 88, that created the Goods Movement Emission Reduction Program. AB 201 included a minor clarification. These bills are codified in the Health and Safety Code, sections 39625 et seq. SB 88 required CARB to adopt guidelines to ensure the Program achieve the statutory objectives.

The implementing statutes directed CARB to maximize the emission reduction benefits and achieve the earliest possible health risk reduction in communities heavily impacted by goods movement. This program supplements regulatory actions and other incentives to cut diesel emissions. By statute, the program can only fund emissions reductions "not otherwise required by law or regulation." Key pollutants targeted by the program include diesel PM and NOx that contribute to the formation of both PM2.5 and ozone. The projects funded under the program also provide co-benefits by reducing greenhouse gases and black carbon emissions that contribute to climate change.

Since 2009, South Coast AQMD has awarded $494 million through Proposition 1B and funded over 7,500 projects including heavy-duty vehicles and equipment in the sectors of shore power, locomotives, cargo handling, and transport refrigeration units (TRUs), with approximately 7,650 tons per year of accumulated NOx and 230 tons per year of accumulated PM reductions.

Lower-Emission School Bus Program

The Lower Emission School Bus Program is a grant program that provides funding for replacing old, high-emitting public school buses with new cleaner buses, and also for installing retrofit control devices on in-use diesel buses to reduce toxic PM emissions. The primary goal of the Lower Emission School Bus Program is to reduce school children's exposure to both cancer-causing and smog-forming pollution. The program does not impose any regulatory requirements on schools and their participation in the program is voluntary.

Since 2001, South Coast AQMD has awarded $372 million in total through the program and replaced/retrofitted over 5,300 school buses with approximately 890 tons per year of accumulated NOx and 65 tons per year of accumulated PM reductions achieved.

Community Air Protection Program

In 2017, Governor Brown signed AB 617 (C. Garcia, Chapter 136, Statutes of 2017) to develop a new "community-focused" strategy to reduce emissions of criteria pollutants and toxic air contaminants (TAC) in communities that are affected by a high cumulative exposure burden. AB 617 directed CARB, in

conjunction with local air districts to establish the Community Air Protection Program (CAPP). AB 617 also calls for CARB and air districts to actively engage with members of heavily impacted communities, follow their guidance, and address local sources of concern. AB 617 includes a variety of strategies to address air quality issues in impacted communities, including community-level monitoring, uniform emission reporting across the State, stronger regulation of pollution sources, and incentives for both mobile and stationary sources.

To support the AB 617 effort, the California Legislature has appropriated incentive funding to support early actions to address localized air pollution in the most impacted communities. Budget bills passed in 2017, 2018, 2019 and 2020 have provided funds, "to support local air districts' implementation of Chapter 136 of the Statutes of 2017" [AB 134 (2017), SB 856 (2018), AB 74 (2019), SB 74 (2020)]. The funding has enabled actions such as: establishing steering committees, developing and implementing emission reduction programs including staffing, outreach, strategies, and enforcement, as well as deploying air monitoring, reporting emissions, and implementing new requirements regarding best available retrofit control technologies.

The Legislature directed that air districts spend the funds appropriated in AB 134 on mobile source projects pursuant to the Carl Moyer Program and the Proposition 1B Program. The Legislature expanded the scope of the CAPP incentives appropriated in SB 856 to include additional project types. The project types called for in SB 856 include:

- Mobile source projects. Eligibility continues through either the Moyer Program or the Proposition 1B Program, with a focus on zero emission equipment;
- Zero emission charging infrastructure projects. Eligibility continues with a focus on medium- and heavy-duty vehicle infrastructure;
- Stationary source projects. New eligibility for the replacement of equipment at locations of stationary sources of air pollution not subject to the Cap-and-Trade Program, which will result in direct reductions of TACs or criteria air pollutants; and
- Community-identified projects. New eligibility for programs developed by an air district consistent with the actions identified in the applicable Community Emissions Reduction Program pursuant to AB 617, provided there is community input through a public process.

The CAPP program is now underway and South Coast AQMD staff are working in local communities to reduce air pollution in these most impacted communities. Since the inception of the program, the South Coast AQMD has awarded $219 million in total on mobile source projects through the Moyer Program and also allocated $48 million for stationary and/or community-identified projects.

Other incentive programs administered by the South Coast AQMD are discussed below.

Air Quality Improvement Program (AQIP) funds clean vehicle and equipment projects, research of biofuels production and air quality impacts of alternative fuels, and workforce training, etc. Each year, the Legislature appropriates funding to CARB for these incentives to reduce emissions and support advanced technology demonstrations and deployments.

On-Road Voucher Incentive Program (VIP) provides vouchers for truck replacements. The voucher amount ranges from $10,000 to $60,000 depending on factors such as miles traveled per year, weight class of the old vehicle, emission standards of the replacement vehicle, and whether the replacement vehicle is new or used. Funding also depends on the future compliance date to replace or retrofit the vehicle. The VIP program is funded with the Carl Moyer funds at local air district discretion. This program is limited to owners/operators with fleets of 10 or fewer vehicles that have been operating at least 75 percent (mileage-based) in California during the previous twenty-four (24) months.

Funding Agricultural Replacement Measures for Emission Reductions Program (FARMER) provides funding for agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. The FARMER Program is supported in part by California Climate Investments, a statewide program that puts billions of Cap-and-Trade dollars to work. This program prioritizes funding to disadvantaged communities.

Proposed Method of Control

The proposed measure is based on the implementation of incentive programs administered by South Coast AQMD. The measure proposes to take credit for the emissions reductions achieved through existing and future projects that are funded by these incentive programs for SIP purposes. Examples of projects include heavy-duty vehicle/equipment replacements, installation of retrofit units, and engine repowers. The emissions reductions are provided in two parts. The first part of the measure is to calculate the actual emissions reductions associated with existing projects that were funded by 2021 with the remaining project life through 2030. The second part of this measure is based on potential reductions that are projected from the implementation of future projects to be funded through these incentive programs. These reductions are estimated based on the projected level of funding for the programs and average emissions reductions achieved by past projects, discounted by control factors for future years. For on-road vehicle sectors (HD trucks and school buses), the Calculator for Spending Incentives (CSI), which is an internally developed model to identify at a screening level the most cost-effective projects, is used to calculate NOx and PM emission reductions.

Emission Reductions

To be determined.

~~Emissions reductions from existing projects with remaining project life and future projects are reflected in the control measure summary tables below. Emissions reductions in 2030 associated with existing projects that were funded as of 2021 are provided in Table MOB-11-A. Projected emissions reductions from the future projects in 2030 are listed in Table MOB-11-B.~~

~~TABLE MOB-11-A~~

~~NOX AND PM EMISSION REDUCTIONS IN 2030 ASSOCIATED WITH EXISTING PROJECTS~~

~~Project Sector~~	~~Project Type~~	~~Funding Source*~~	~~No. of Units~~	~~NOx (tons/day)~~	~~PM (tons/day)~~
~~Marine~~	~~Repower~~	~~CM~~	~~135~~	~~0.22~~	~~0.004~~
~~Locomotives~~	~~Replacement~~	~~CM~~	~~15~~	~~0.15~~	~~0.008~~
~~TOTAL~~			~~150~~	~~0.37~~	~~0.012~~

~~TABLE MOB-11-B~~

~~PROJECTED NOX AND PM EMISSION REDUCTIONS IN 2030 ASSOCIATED WITH FUTURE FUNDING~~

~~Project Sector~~	~~Project Type~~	~~Funding Source*~~	~~No. of Units~~	~~NOx (tons/day)~~	~~PM (tons/day)~~
~~On-Road HD Trucks~~	~~Replacement~~	~~CM, Prop1B, CAPP, VIP, AQIP~~	~~4,728~~	~~0.88~~	~~0.008~~
~~School Buses~~	~~Replacement~~	~~LESBP~~	~~855~~	~~0.25~~	~~0.003~~
~~Agriculture~~	~~Replacement~~	~~FARMER, CAPP~~	~~100~~	~~0.08~~	~~0.015~~
~~Construction~~	~~Repower~~	~~CM, CAPP, AQIP~~	~~676~~	~~1.92~~	~~0.065~~
~~Construction~~	~~Replacement~~	~~CM, CAPP, AQIP~~	~~362~~	~~0.99~~	~~0.025~~
~~Other Off-Road~~	~~Replacement~~	~~CAPP~~	~~426~~	~~0.78~~	~~0.016~~
~~Marine~~	~~Repower~~	~~CM, CAPP, AQIP~~	~~428~~	~~1.32~~	~~0.045~~
~~TRU~~	~~Replacement~~	~~CM, CAPP, AQIP~~	~~222~~	~~0.03~~	~~0.000~~
~~Locomotives~~	~~Replacement~~	~~CM, CAPP, AQIP~~	~~37~~	~~0.40~~	~~0.024~~
~~TOTAL~~			~~7,834~~	~~6.66~~	~~0.201~~

~~*CM: Carl Moyer Program; CAPP: Community Air Protection Program; VP: Voucher Incentive Program; AQIP: Air Quality Improvement Program; LESBP: Lower-Emission School Bus Program; FARMER: Funding Agricultural Replacement Measures for Emission Reductions Program~~

Cost Effectiveness

~~The cost-effectiveness will vary depending on the programs that are used to fund individual projects. Generally, the cost-effectiveness limits will be mainly based on the latest Carl Moyer Program Guidelines, which is currently set at $33,000 per weighted ton (NOx + ROG + 20 x PM) for conventional technology projects. The limit increases to $109,000 per weighted ton for optional advanced technology, and $300,000 per weighted ton for school buses. For on-road projects, higher limits could be applied at the discretion of air districts: up to $200,000 per weighted ton for on-road optional advanced technology (0.02 g/bhp-hr of NOx or cleaner), and up to $500,000 per weighted ton for on-road optional zero emission technology.~~ To be determined.

Implementing Agency

South Coast AQMD.

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MOB-12: PACIFIC RIM INITIATIVE FOR MARITIME EMISSION REDUCTIONS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	OCEAN-GOING VESSELS	
CONTROL METHODS:	COORDINATED PROGRAMS, E.G., PER-PORT-CALL INCENTIVES, AMONG PARTICIPATING PORT REGIONS ACROSS THE PACIFIC RIM TO ENCOURAGE DEPLOYMENT OF CLEANER SHIPS TO THE TRANSPACIFIC TRADE LANE	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	0.63	0.71
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	32.21	32.57
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD AND OTHER DOMESTIC AND INTERNATIONAL PARTNERING AUTHORITIES	

Description of Source Category

An ocean-going vessel (OGV) is a commercial, government, or military vessel, excluding articulated tug barges, meeting any of the following criteria: (1) a vessel greater than or equal to 400 feet in length overall; (2) a vessel greater than or equal to 10,000 gross tons under the convention measurement (international system); or (c) a vessel propelled by a marine compression ignition engine with a per-cylinder displacement of greater than or equal to 30 liters, i.e., Category 3 marine diesel engines. (See California Code of Regulations Section 93130.2.(b)(50).)

Background

The Port of Long Beach and the Port of Los Angeles (jointly referred to as "Ports") are co-located at the San Pedro Bay, within the South Coast Air Basin. They are the two largest commercial marine ports in North America in terms of cargo container throughput. When combined, the twin ports would rank among the ten largest container ports in the world. In recent years, OGVs of various types make between 3,700-4,000 port calls each year to the San Pedro Bay Ports Complex, with container ships accounting for slightly over half of these calls (1,900-2,200 annual calls), followed by tanker ships (500-700 annual calls). Correspondingly, based on the most recent emissions inventory reports published by the Ports for calendar year 2021 activities, container ships accounted for 64 percent of total OGV emissions that are directly related to port operations, with 21 percent for tankers, and 16 percent for the remaining vessels.

Shipping emissions have been a major concern for the residents in the port adjacent communities and the surrounding regions, particularly from vessel maneuvering, berthing, and anchoring in and around the harbor area. Additionally, when ships transit to and from the ports, much of the associated emissions occur along the coast and impact the air quality in downwind areas. Since 2014, California Air Resource Board (CARB)'s OGV At Berth Regulation has significantly reduced Nitrogen Oxides (NOx) and other pollutant emissions from auxiliary engines of container, passenger, and refrigerated cargo vessels. Further emission reductions are expected as the amended At Berth Regulation extends to more vessel types and further increases rule stringency. In the meantime, nearshore vessel speed reduction (VSR) programs have proven to be highly effective in reducing vessel fuel consumption, and correspondingly air pollutant emissions. In 2005, the Ports began incentivizing voluntary VSR by all OGVs down to 12 knots, initially within 20 nautical miles (nm) from Point Fermin and later expanded to 40 nm. In recent years, the Protecting Blue Whales and Blue Skies (BWBS) program also began incentivizing VSR by container ships and auto carriers down to 10 knots, which greatly supplements the annual voluntary VSR request issued jointly by the United States Coast Guard and the National Oceanic and Atmospheric Administration for large swaths of Southern California waters.[50]

According to the CARB's projections developed for the 2022 SIP, without additional control programs and regulations, transit emissions allocated to the South Coast Air Basin were expected to increase by more than 35 percent from 2018 to 2031, and most of the projected increase would come from the combustion of marine fuel in the vessel's main (propulsion) engine. Despite the success of abovementioned regulations and programs, NOx emissions from OGVs today and in the future are expected to make up about 40 percent of the entire air basin's carrying capacity for the 2015 ozone standard of 70 ppb. In addition to ozone, reducing NOx emissions from OGVs will also provide co-benefit of reducing secondary formation of PM2.5.

A major factor is the slow turnover of the OGV fleet to cleaner engine tiers, due to long OGV service life ranging from at least 20 years for vessels serving transoceanic routes to 40 years for vessels serving regional and other shorter routes. As a result, even though the International Maritime Organization

[50] See https://www.ourair.org/wp-content/uploads/2021-Attachment-A-VSR-Zone-Maps.pdf, which shows the BWBS program area in Southern California and is overlaid with the 40-nm radius of the Ports VSR program area.

(IMO)'s cleanest Tier III NOx engine standards are applicable to OGVs with keels laid in 2016 or later when operating in the North American Emission Control Area (ECA)—which encompasses the entire California OGV emissions inventory domain, only 3.5 percent of all port visits at the San Pedro Bay Complex were made by Tier III vessels in 2021. In the same year, 35 percent of port calls were made by Tier II vessels, indicating the majority (more than 60 percent) of port calls were made by Tier I or unregulated vessels. Compared to the older engine tiers, Tier III standards are on average 75 percent cleaner than Tier II and 80 percent cleaner than Tier I when measured by the average NOx emission rates weighted by engine certification load points.[51]

Among the 1,900-2,200 annual calls by container ships at the San Pedro Bay Ports, an estimated two-thirds to three-quarters of these port calls were made by vessels serving the transpacific trade lane. This is not surprising given that the Ports of Long Beach and Los Angeles are the largest U.S. gateway for imports originating from Asia, accounting for about 50 percent of containerized import value from East and Southeast Asia according to international trade data published by the U.S. Department of Commerce.[52] Figure MOB-12-A below plots the tier and age distributions of all vessels that were deployed to the transpacific routes between the Ports and at least one major Asian Pacific port between 2016 and 2019.[53] Consistent with the Ports' emissions inventory reports, it shows: 1) the majority of these vessels are subject to IMO Tier I emission limits or unregulated; 2) the unregulated vessels are slowly being replaced by Tier II vessels; and 3) many newly build ships were constructed on keels laid before 2016, thereby not subject to Tier III standards. In fact, the spikes in keels built (left panel of Figure MOB-12-1) are largely driven by the effective date of each IMO marine engine standard, whereas vessel ages (right panel of Figure MOB-12-1) show a smoother distribution reflecting a steadier trend of natural turnover coupled with market demand.

[51] NOx emissions vary by engine load, and the engine certification test cycles for OGV propulsion engine rely on a weighted average of NOx emission rates at various engine loads: 100 percent (weighting factor: 0.15), 75 percent (weighting factor: 0.15), 50 percent (weighting factor: 0.5), and 25 percent (weighting factor: 0.2). However, a typical container ship calling the San Pedro Bay Ports are estimated to operate at about 10 percent (off-cycle) propulsion engine load if slowing down to 10 knots. NOx emissions at such very low loads are expected to be much higher per unit of energy consumed (measured in g/kWh); meantime, due to less energy consumed when operating at slow speeds, it is generally expected that the increase in NOx emission rates would be more than offset by fuel/energy consumption.

[52] Data accessible at: https://usatrade.census.gov.

[53] Asian Pacific ports included in the analysis are Busan, Cai Mep-Vung Tau, Dalian-Yingkou, Fuzhou, Guangzhou (Nansha) , Haiphong, Hong Kong, Incheon, Kaohsiung, Keelung, Kobe-Osaka, Laem Chabang, Lianyungang, Nagoya-Yokkaichi, Naha, Ningbo-Zhoushan, Port Klang, Qingdao, Shanghai (including Yangshan), Shenzhen (including Chiwan, Dachan Bay, Mawan, Shekou and Yantian) , Shimizu, Singapore, Taipei, Tianjin, Tokyo-Yokohama-Kawasaki, Xiamen-Zhangzhou, and Yosu.

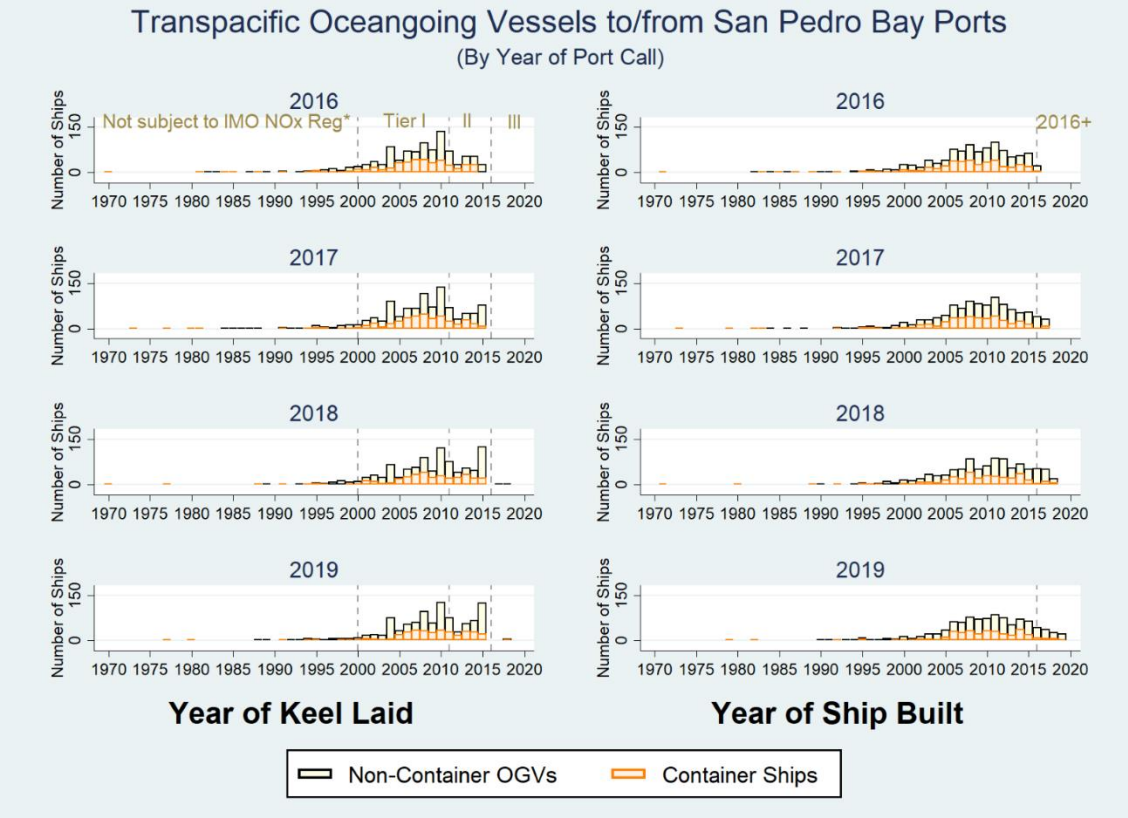

FIGURE MOB-12-A
TRANSPACIFIC OGVS CALLING SAN PEDRO BAY PORTS

In order to achieve emission reductions to attain health-protective federal and state air quality standards as expeditiously as possible, it is necessary to accelerate the deployment of newer vessels meeting IMO Tier III emission limits. But with the long service life of OGVs, a concurrent focus must be placed on retrofitting Tiers I and II OGVs to the extent practicable. However, given the lack of any in-use NOx emission requirements (which typically fall under federal/international authority) and the high project cost and complexity in retrofitting OGVs with the most common Tier III technologies including exhaust gas recirculation (EGR) and selective catalytic reduction (SCR),[54] the most feasible pathway would be to incentivize NOx retrofit with significantly more cost-effective technologies. One potential candidate would be water-in-fuel emulsion (WiF), which has more than a decade of research and development (R&D) history but has remained in the stage of technology demonstration due to the lack of regulation-driven market demand. While WiF cannot achieve Tier III standards, it may result in up to 40 percent NOx reductions for nearshore operations, or when main engine is operated at less than 50 percent loads. In

[54] Any un-reacted ammonia emissions, or ammonia slip, from urea injection into the exhaust gas as part of NOx control in SCR systems can contribute to secondary formation of PM, therefore potentially offsetting at least part of the PM benefits from NOx reductions. However, staff is not aware of publicly available emission testing results indicating whether, or to what extent, ammonia slip could be an issue for marine engine SCR systems

comparison, the effectiveness of Tier III technologies, especially SCR, are expected to exponentially decrease when engine loads become too low to maintain the required exhaust gas temperature for SCR to function properly. Additionally, there are exhaust filtration technologies being developed and tested for primary PM control of marine engine exhaust gas.

At the same time, any effort to reduce marine engine emissions at California ports could potentially benefit the port and coastal communities located on the other side of the Pacific as well. Based on staff's compilation of multiple reports and studies using data between 2013 and 2018, shipping accounted for significant shares of emissions in many major port cities in Asia. In Hong Kong and the entire country of Japan, where land-based sources have been subjected to increasingly stringent emissions and energy efficiency requirements, shipping accounted for 41-49 percent of primary PM2.5 emissions alone, not counting secondarily formed particulates, and 37 percent of their NOx emissions are also attributable to both domestic and international shipping. In Shanghai, Shenzhen, Qingdao, Tianjin, and Kaohsiung, shipping was also found to account for 9-24 percent of citywide NOx emissions. Similar to Southern California, shipping's share of NOx emissions is expected to increase further across our trading partners in East and Southeast Asia, due to limited scope and applicability of domestic programs and regulations in reducing OGV NOx emissions when compared to emission reduction efforts for land-based sources, particularly power plants and freight moving trucks.

Figure MOB-12-2 shows that container ships accounted for approximately three-quarters of all OGV port calls made in 2016-2019 across the San Pedro Bay Ports, the San Francisco Bay Ports, and all large-scale East and Southeast Asian ports. In contrast, this fleet of container ships made up just over one-third of all OGVs deployed to this trade lane during the same period. Furthermore, container ships constituted nearly all of the "transpacific frequent callers," defined for analytical purposes as those OGVs making a combination of 5 or more calls at the San Pedro Bay ports in a given year and also 5 or more calls in the same year at one or more ports on the other side of the Pacific Rim. On average, a frequent caller container ship made about 50 calls per year across the Pacific Rim ports. In contrast, a non-container OGV made only an average of 7 port calls per year in the same trade lane. In 2019, out of the approximately 120 frequently calling container ships deployed to the transpacific trade lane, more than half of them had visited major Asian ports including the ports of Busan, Shanghai, Ningbo-Zhoushan, Shenzhen, and Hong Kong, and more than a third of them had also called the ports of Tokyo Bay Ports (Keihin Port) and Kaohsiung. This port call pattern implies that many of the Pacific Rim port regions, including Southern California, share the common interest in investing in greener containerized goods movement.

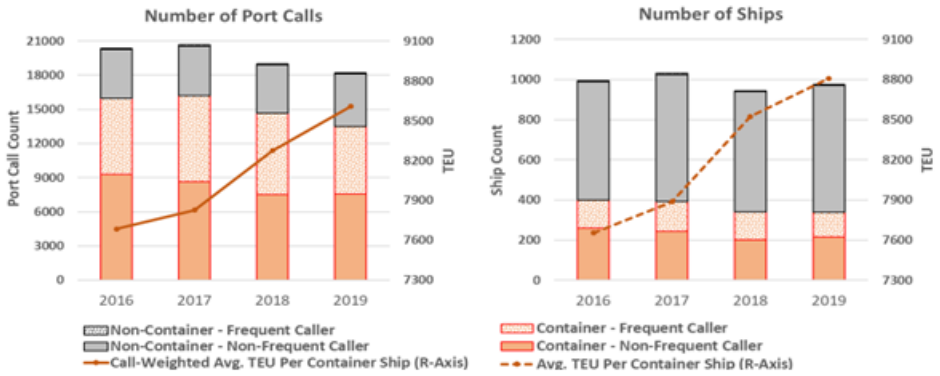

FIGURE MOB-12-2
PORT CALL PATTERN OF TRANSPACIFIC OGVS

With the common need and shared opportunity to reduce shipping emissions and to protect the health of port community residents across the Pacific, this control measure proposes to establish partnerships with other Pacific Rim ports and port regions in developing and implementing the Pacific Rim Initiative for Maritime Emission Reductions (PRIMER). PRIMER is envisioned as a multi-regional framework where all partnering regions can coordinate individual incentives and program requirements in order to maximize the effectiveness of all programs. There are several potential advantages of PRIMER:

Targeted approach. PRIMER partners will be encouraged to continue their existing or adopt new non-regulatory mechanisms to facilitate voluntary adoption of cleaner marine technologies by OGV owners and operators. The mechanism can be either monetary or non-monetary incentives that will be awarded based on each port visit, and the program participating requirements will be coordinated to the maximal extent feasible to ensure a participating OGV can take full advantage of the incentive offered by any PRIMER partner. Such per-port-call incentive will be most attractive to the OGVs frequently calling the partnering Pacific Rim ports, with minimal impact on the other OGVs whose owners/operators do not find a business case in undertaking the clean technology investment to qualify for the incentives.

Suitable for both new and in-service OGVs. Unlike the engine emission standards that are generally applicable to newbuilds only, the non-regulatory incentives can encourage retrofit investments among the in-service OGVs deployed to the transpacific shipping routes while also motivating the deployment of cleaner new OGVs to these routes.

Cost-effective for incentive providers. Investing in cleaner marine technology is no small feat, especially for the vessel-based emission abatement technologies. The required upfront capital investment tends to be very high while the payback period sought by the industry is short. The short payback period is further complicated by the industry's need to maintain enough flexibility in vessel deployment, which is the case for both liner and tramp services alike. By coordinating clean shipping

incentives with other Pacific Rim ports on a targeted group of frequently calling OGVs, each PRIMER partner will be able to reduce the level of incentive needed by each individual port to effectively attract visits by cleaner OGVs, and the collective efforts will also shorten the payback period for the ship owner/operator who has made the technology investment.

Minimized free riding. Most emission abatement technologies, specifically for NOx reductions, are auxiliary devices that can be switched on and off. While this means that reporting requirements by participating OGV operators will be necessary for the PRIMER partnering port regions to verify emission reductions realized at each port visit, it also means that concerns of potential free riding by non-partnering ports will be possibly minimized if there is no incentive for those OGVs equipped with emission abatement technology to switch to lower-emitting operating mode.

Additionally, PRIMER can also serve as a platform for information exchange and experience sharing among partnering ports. In light of the IMO decarbonization targets and the corresponding global efforts to identify low- and zero-carbon solutions, NOx/PM abatement technologies are expected to remain highly relevant in the deep-sea-going sector. This is because, without significant technology breakthrough, internal combustion engines fueled by low-carbon biofuel blends or zero-carbon alternatives such as ammonia, hydrogen, and methanol, are commonly acknowledged as the most feasible propulsion technologies to achieve decarbonization goals among those ships serving the transoceanic routes. However, the combustion process will inevitably produce NOx and PM, so the installation of pretreatment (e.g., WiF and EGR) or aftertreatment (e.g., SCR, filtration) system may be still necessary pursuant to the IMO Tier III requirements for any dual- or multi-fuel vessels. Given that NOx/PM control will likely remain highly relevant in the future, incentivizing investments in optimizing NOx/PM abatement nearshore will not only help address the disproportionate air quality impacts on port regions from the in-service fleet, but also from the future low- and zero-carbon OGVs.

Finally, PRIMER can complement and work in conjunction with the Clydebank Declaration for Green Shipping Corridors, which is a multi-nation initiative announced at the 26th United Nations Climate Change Conference of the Parties (COP 26) at the end 2021. The Clydebank Declaration aims to promote zero-carbon emission maritime routes between 2 or more ports, with the goal of establishing at least 6 such routes/corridors by 2025. The U.S., being one of the signatories, is anticipated to either work towards decarbonizing one or more domestic shipping routes, or work with other current and prospective signatories in establishing international green shipping corridors. Given the outsized importance and cargo throughput of the San Pedro Ports among all U.S. ports, it would be of utmost priority for the U.S. to work with our Asian Pacific trade partners to explore such partnerships to achieve both climate and air quality objectives. As of July 2023, six Green Shipping Corridor have been announced between POLA and/or POLB with Asia Pacific port partners. While these agreements are focused on GHG reductions through alternative fuel bunkering and/or operational changes such as digitalization, PRIMER will focus on nearshore NOx reductions, with co-benefits for PM2.5 and potentially GHG.

Regulatory History

International Maritime Organization (IMO) Emissions and Fuel Standards

The IMO's International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI, which came into force in May 2005, set new international NOx emission limits in Regulation 13 on marine diesel engines installed on new vessels retroactive to the year 2000. The NOx limits are applicable to diesel engines of over 130 kW output power (other than those used solely for emergency purposes) irrespective of the tonnage of the ship where such engines are installed. 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 North American and U.S. Caribbean Sea 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 or use SOx scrubber as an alternative compliance method. In addition, the 2008 IMO amendment required new ships built after January 1, 2016 that enter the North American and U.S. Caribbean Sea ECA to meet Tier III NOx emission limits which are 80 percent lower than the Tier I emission limits and 75 percent lower than the Tier II limits.

IMO GHG Strategy

In October 2018, IMO adopted an initial strategy to reduce GHG emissions from the global ship fleet. Compared to the 2008 levels, the strategy set a reduction target of 40 percent by 2030 for carbon intensity and a reduction target of at least 50 percent by 2050 for total annual GHG emissions from international shipping. This strategy was further revised in 2023, including an amended 2050 target of net-zero GHG emissions, and new IMO standards are expected to be developed to implement the 2023 strategy. This level of GHG reductions will require the use of low or zero carbon fuels, with the latest target set at 5-10% of all energy used by international shipping by 2030; however, the effect on NOx and PM from this fuel switch may vary widely depending on which fuels are used and what controls are added to ship engines. Several programs have been adopted in recent years as short-term measures to attain the decarbonization targets, including the energy efficiency design index (EEDI) for newbuilt ships, the efficiency existing ship index (EEXI) for in-service ships, and the carbon intensity indicator (CII). Collectively, by reducing fuel consumption, these measures may indirectly lower NOx and PM emissions albeit to a limited extent.

U.S. EPA Marine Vessel Regulations

In 2010, the U.S. Environmental Protection Agency (U.S. EPA) adopted standards that apply to Category 3 (C3) engines (>30 liters per cylinder displacement) 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. is a 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. The U.S. delegation to the IMO is generally led by the State Department, with Coast Guard, the U.S. EPA, and other relevant agencies provide any necessary support and technical advice.

CARB Marine Fuel Rule

Beginning in 2009, CARB began implementing the State's fuel sulfur regulation, applicable to both domestic and foreign flagged vessels, in waters out to 24 nm of the California baseline (i.e., Regulated California Waters or RCW). The rule initially limited sulfur content in marine gas oil (MGO) to 1.5 percent sulfur by weight and in marine diesel fuel (MDO) to 0.5 percent sulfur by weight. Beginning in January 1, 2012, all OGVs when operating in the RCW must switch to either type of distillate grade fuel with at maximum 0.1 percent sulfur content in weight, and unlike the IMO sulfur oxides (SOx) ECA requirements, the use of SOx scrubber is not permitted as an alternative compliance method.

CARB OGV At Berth Regulation

Adopted in 2007, the original At Berth regulation was designed to reduce NOx and PM emissions from the operation of auxiliary engines on container vessels, passenger vessels, and refrigerated cargo vessels while these vessels are docked at berth at a California port. As such, starting from 2014, 50 percent of a regulated fleet's visits to the Ports were required to plug into shore power (also known as alternative maritime power (AMP) or cold ironing), or use other compliance options to achieve equivalent emission reductions. The percentage of fleet-based requirement would increase to 80 percent in 2020. In 2020, several amendments were adopted which, from 2023, would require rule compliance at each and every vessel visit by container vessels, passenger vessels, and refrigerated cargo vessels; from 2025, by roll-on and roll-off vessels, as well as tanker vessels visiting the ports of Los Angeles and Long Beach; and from 2027, all remaining tanker vessels.

MOUs

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

Proposed Method of Control

This measure seeks to supplement the implementation of the 2022 State SIP (State Implementation Plan) Strategy "Federal Action: Cleaner Fuel and Vessel Requirements for Ocean-Going Vessels." It is not expected for this measure to achieve the full emission reductions associated with this specific SIP measure, but rather, this measure seeks to recognize OGV emission reductions that are the result of voluntary actions and may be considered surplus to the emission reduction commitments of the State SIP Strategy. Vessel owner/operator would register their vessels with verified emission reductions from the IMO Tier II emission limits and would be eligible for port-specific incentives for every port call made by a registered vessel at a port covered by program(s) administered by one of the PRIMER partners.

Emission Reductions

The amount of emission reductions that can be achieved from this control measure will be dependent on the type of OGVs and number of port calls 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 2022 SIP Measure "Federal Action: Cleaner Fuel and Vessel Requirements for Ocean-Going Vessels" 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 the U.S. EPA determination that such reductions are approvable as part of the SIP.

Rule Compliance and Test Methods

The proposed measure is an incentive program, and therefore, rule compliance is not applicable. However, program participation would require pre-registration by vessel owner/operator, and emission reductions will be verified through submittal and review of records, reports, and emission inventories. 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 cost of commercialized technologies, frequency of ports calls, the number of PRIMER partnering ports and the collective incentive amounts.

Implementing Agency

South Coast AQMD, along with other domestic and international partners, will collectively be the implementing agencies for port-specific incentive programs designed to encourage frequently calling OGVs to adopt cleaner and low NOx marine engine technologies.

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MOB-13: RULE 2202 – ON-ROAD MOTOR VEHICLE MITIGATION OPTIONS [PM2.5, NOx]

CONTROL MEASURE SUMMARY		
SOURCE CATEGORY:	MOBILE SOURCES	
CONTROL METHODS:	STREAMLINE VARIOUS RIDESHARE STRATEGIES AND TELECOMMUTING OPTIONS	
EMISSIONS (TONS/DAY):		
ANNUAL AVERAGE [PM2.5]:	2018	2030
POLLUTANT INVENTORY	2.4	2.1
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
ANNUAL AVERAGE [NOX]:	2018	2030
POLLUTANT INVENTORY	55.5	18.9
POLLUTANT REDUCTION	-	TBD
POLLUTANT REMAINING	-	TBD
CONTROL COST:	TBD	
INCENTIVE COST:	TBD	
IMPLEMENTING AGENCY:	SOUTH COAST AQMD/LOCAL OR REGIONAL AGENCIES	

Description of Source Category

Rule 2202 has been designed to reduce emissions from motor vehicles used by employees for commute trips. Rule 2202 applies to larger employers in the region with more than 250 employees and requires that these employers mitigate emissions from employee commute trips into the worksite. Rule 2202 is designed to reduce emissions of Volatile Organic Compounds (VOCs), Oxides of Nitrogen (NOx), and Carbon Monoxide (CO), by an equal or greater amount to that achievable through a trip reduction program. Rule 2202 will also reduce PM2.5 emissions as a co-benefit. Rule 2202 provides employers with a menu of options to select from to implement a combination of emission reduction strategies to meet

an emission reduction target (ERT) for their worksite. The types of vehicles included in Rule 2202 emission calculations are passenger vehicles and light-duty vehicles (LT1 and LT2).

Background

There are three main compliance options for Rule 2202:

Air Quality Investment Program (AQIP)

Employers may participate in the AQIP by submitting an air quality investment, to be placed in a restricted fund as set forth in Rule 311 - Air Quality Investment Program Fees. These funds are then used for air quality improvement projects that will achieve the emission reduction targets for a given compliance period. Some examples of projects that have been funded using AQIP funds are the replacement of older, high-polluting diesel-powered street sweepers with lower-emission compressed natural gas (CNG) sweepers, replacement or repower of older, high-polluting heavy-duty diesel engines with cleaner engine/vehicle technologies, various port-related clean air projects, and the replacement of gasoline-powered lawn and garden equipment with zero emissions, battery-electric powered equipment.

Emission Reduction Strategies (ERS)

Emission Reduction Credits (ERCs) may be used to meet an employer's emission reduction target. These credits are purchased by the regulated employer from a third-party credit vendor/broker. The credits are then transferred to South Coast AQMD and retired. ERCs that were approved for transfer into the program before June 6, 2014 and were issued in accordance with Regulation XIII may be used to meet an employer's emission reduction target. These ERCs have been primarily generated through facility shutdowns and equipment replacement projects. Mobile source emission reduction credits (MSERCs) issued in accordance with the provisions of Regulation XVI - Mobile Source Offset Programs may also be used. These credits have been primarily generated through old vehicle scrapping services.

Employee Commute Reduction Program (ECRP)

As an alternative to meeting an ERT, Rule 2202 also allows employers the option to implement an ECRP. The implementation of an ECRP is expected to lead to achievement and maintenance of the employer's designated Average Vehicle Ridership (AVR) target, determined by the worksite's AVR Performance Zone pursuant to Rule 2202(l)(3), through the reduction of work-related vehicle trips. As part of the ECRP, employers must choose 15 commute reduction strategies to implement at their worksite from a larger menu of strategies. These strategies can be developed and implemented to meet the individual needs of employers in achieving the designated AVR target.

Regulatory History

Rule 2202 was adopted in 1995 as a replacement to Rules 1501 – Work Trip Reduction Plans and 1501.1 - Alternatives to Work Trip Reduction Plans, to achieve an equal or greater amount of emission reductions.

In 1987, Regulation XV was adopted which required trip reduction plans for employers with 100 or more employees. Rule 1501 was amended in 1993 and Rule 1501.1 was adopted in 1995 to comply with federal and state requirements for "extreme" nonattainment areas. In 1995, Rule 2202 was adopted to respond to state legislation prohibiting mandatory trip reduction plans. Subsequently, Rule 2202 provided worksites of 100 or more employees a menu of emission reduction options to meet an emission reduction target for their worksite. The passage of SB 836 in 1996 directed South Coast AQMD to raise the employee threshold level from 100 to 250 employees, while SB 432 permanently exempted worksites with fewer than 250 employees from complying with the rule. Rule 2202 continues to allow affected employers the option of implementing a traditional trip reduction program to comply with the rule.

Proposed Method of Control

Telecommuting

Rule 2202 currently provides credit for telecommuting under the ECRP compliance option by including telecommuting as one of the optional direct strategies specified in the rule. As defined, telecommuting is characterized as working at home, off-site, or from a telecommuting center for a full workday that eliminates the trip into the worksite or reduces travel distance to the worksite by greater than 50 percent.

During the COVID-19 pandemic in 2020 and 2021, many Rule 2202 regulated employers incorporated telecommuting practices which have shown to be a very effective way of reducing emissions caused by employee commute trips into the worksite. Many employers have reported extremely high AVR scores, primarily due to the increased amount of telecommuting, over the 2020/2021 reporting period.

While Rule 2202 does currently provide credit for telecommuting, future rule amendments may include a larger focus on telecommuting strategies and provide additional incentives for regulated employers to adopt telecommuting policies. Based on reported information from regulated employers, telecommuting has shown to be an extremely effective measure for reducing emissions from employee-related commute trips. Other future rule amendments may include enhancements on current basic support and direct strategies, as well as streamlined compliance and reporting options. Options for inclusion of Rule 2202 for State Implementation Plan (SIP) creditability will also be explored.

Emission Reductions

The following emission reductions were achieved by Rule 2202 activities for year 2018:

TABLE MOB-13-A
RULE 2202 EMISSION REDUCTIONS FOR 2018

Program Type	VOC tons/day	NOx tons/day	CO tons/day
Employee Commute Reduction Program (including Offset)	0.47	0.35	3.97
Air Quality Investment Program	0.55	0.15	3.16
Emission Reduction Strategies	0.96	0.55	6.14
Total Achieved	1.98	1.05	13.27
Target	1.46	0.93	10.39

Rule Compliance and Test Methods

To be determined.

Cost Effectiveness

To be determined.

Implementing Agency

South Coast AQMD.

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